West Indies

Central America
Folder 2

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HAITIAN VIGNETTES

By John Houston Craige

Captain, U. S. Marine Corps

TWO young men lolled over the gunwale of a tiny tramp steamer, avidly drinking in the beauty of the scene of tropical loveliness that lay before them.

One was massive, blond, powerful, with huge white teeth and a glass eye three shades darker than the blue of its natural mate. He was ordinarily called "Blink"—a revolutionist, smuggler, gun runner, Louisiana French-Irish. One of those indomitable Americans with a Napoleon complex and an itching foot, he drilled dusky armies and made a name to conjure with on the Spanish Main until his sudden demise in the troubles attendant upon a Guatemalan revolution.

The other young man was tall and lean, with thick shoulders, pale-gray eyes, and a thatch of sandy hair—myself.

The syncopated beat of drums came faintly across the quiet waters of the bay. Blink beat time absently on the ship's rail with his knuckles.

"It draws you, this country," he said. "The Indians called it Haiti, 'The Mountainous.' The French named it Domingue—on their maps. Informally they referred to all their beautiful Creole dominion here in the lap of the Caribbean as 'Le Pays des Revenants.' You might translate that as 'The Country of the Ghosts,' or 'The Country You Are Bound to Come Back To.' I have a notion the French felt that it was a little bit of both.

GHOSTS OF EXPLORER, PRIEST, AND PIRATE

"Ghosts? What a host must walk the jungles and hills over there at night! Columbus, Cortez, Pizarro, Francis Drake, L'Ollonois, Las Casas, Captain Kidd, Toussaint L'Ouverture, Dessalines, Christophe; explorer, conqueror, colonist; buccaneer, priest, pirate, picaroon; saint, slaver, spawn of the devil. What a country!

"This was the capital of a vast French-African empire before Paris dreamed of Algiers. Haiti, Louisiana, Guadeloupe, Martinique. Half a continent and a dozen islands. French aristocrats, African slaves. A sweet, luxurious realm worth the ransom of a dozen kings. The domain of Circe, fascinating, mysterious. Anyone who tried the life here and had to go away spent the rest of his days seeking to get back, even if only to lay his bones in the shadow of one of those big purple hills.

"What made the fascination? Was it the people or the country? Was it French or African, or a mixture of the two? Or was it purely West Indian, something distinct from either? I don't know, but whatever it was, it hasn't lost any of its strength. No man who sets his foot on the shores of this country can ever forget it. You may love it or you may hate it, but somehow you can never get it out of your mind, and the first thing you know you're heading back for more of it. You'll see."

My friend was something of a poet, yet there was cold fact in what he said. At least I found it so. That was a score of years ago; but, one way or another, Haiti has seldom been completely out of my life from that day to this.

PORT-AU-PRINCE, CITY OF CONTRASTS

Around the land-locked bay steep hills towered, horseshoewise, north, east, and south, mounting to incredible heights in the clear tropical sky. It was early morning, but already the ship's iron deck was almost unbearably hot to the touch. Ashore, mist and shadow still shrouded valley and mountain side, while the first rays of the sun just commenced to gild the roofs and pinnacles of the buildings of the town along the bayside.

The city had an air of beauty and ugliness, naïveté and mystery, magnificence and squalor. It attracted and repelled. The breeze brought to our nostrils languorous tropical perfumes mingled with stenches. There was a sinister suggestion of menace in the hushed streets. Revolution and war brooded over the place. Occasionally we could hear outcries and the sounds of gunshots. The syncopated thump of innumerable tom-toms floated out to us over the water, blended with the high-pitched buzzing near at hand of bloodthirsty malarial mosquitoes that hung in clouds about our ship as we rocked at anchor.

The lower town lay along a curving, painted bay, like a huge gorgeous fish stranded on a green and white coral shoal, a long, brilliant-hued fish, from ardent

Photograph by Clifton Adams

PORT-AU-PRINCE'S ONE AND ONLY WHARF IS PRIVATELY OWNED

Into this West Indies harbor come many private yachts in winter. American seaplanes make stops on their Caribbean route. Cargo boats bring general merchandise, petroleum, cement, steel, drugs, flour, and lumber. Then they load coffee, cacao, wax, cotton, goatskins, raw sugar, and sisal.

equatorial waters. Close under the Bel Air hills its head nestled, the rising walls of the Cathedral upthrust, like parched gills hopelessly gasping for breath. Ridges of brilliant mango and breadfruit trees marked the green line of its back, following ancient watercourses down past the Champ de Mars toward the Outer Cemetery in leafy masses of glittering emerald and malachite against brown dust and parched jungle.

At the bend of the spine gleamed a scarlet dorsal fin of giant flamboyant trees, big as northern oaks, each clothed from root to crest in a solid mass of crimson bloom. Myriads of iron roofs, some red, some green, some brightly galvanized, reflected the sun like brilliant scales.

South, where the road curved towards Bizoton, a triangle of brightly colored villas added a tail, one fluke nestling in a clump of nodding coconut palms, the other brightly outlined against a rolling eminence.

The year was 1912 and the city was Port-au-Prince. Before that time it had never boasted a Marine garrison, a sanitary inspector, a paved street, or a Chamber of Commerce. A filthy, beautiful, glamorous, appalling city, capital of a unique and fascinating country.

BEFORE THE AMERICAN OCCUPATION

"Better not go ashore," said the captain of our ship. A revolution, it appeared, was in progress. But Blink had business connected with a certain arms shipment and I wanted to stretch my legs.

Revolutions were not a novelty to either of us, and an extra one more or less was rather an attraction. So in due time we found ourselves in a cranky native coracle propelled by a couple of grinning black boys in G strings gliding over the coral-paved waters of the bay through floating refuse of a most unromantic nature.

An all-pervading stench of decayed vegetation and lack of sanitation gripped our nostrils. Our craft nosed silently into the shore. Blink jabbered noisily to the black boys. They grinned and responded at length. Blink said that the Haitian patois was close enough to Louisiana Creole to be intelligible to him.

"End of the run," said he. "The boys say we land here. This is Fort Caca. Means

Photograph by Clifton Adams

HAITI'S NATIONAL PALACE FACES THE CHAMP DE MARS AT PORT-AU-PRINCE

Where this "White House" now stands, the author, on his first visit, saw only ruins (see text, page 439). The Republic's government is administered by a President and two Chambers whose members hold office according to a constitution dating from 1889. The country has been independent since 1804.

Fort Manure. This is all built land. I wouldn't be too curious as to what it is built of. The third Government before the last one put a fort near here to help defend the bay. They were proud of the fort and christened it with ceremony. I don't know if its name would make much of a hit anywhere else, but it seems to be quite all right here. Naïve, these Haitians, what?"

Gingerly we scrambled up the narrow path from the water's edge and picked our way for a couple of hundred yards, until the trail widened out into a street and commercial Port-au-Prince spread before us.

A CRAZY-QUILT OF CONTRAST

Like everything else about the town, this was a crazy-quilt of contrast. Perhaps half of the buildings were of stone and masonry, with walls from 18 inches to three feet thick and heavy iron doors and windows. The other half were of flimsiest wooden construction, mostly unpainted and bleached to a phosphorescent gray by the sun, many of them cocked at the craziest imaginable angles. Here and there along the streets were gaps showing the charred remnants of structures destroyed by fires, ancient and recent.

None of the streets had sidewalks, and as far as we could see not a square yard of paving existed. Close under the fronts of the houses, each street had deep-washed ditches in place of gutters, filled with sewage of all description, while progress in the street itself was rendered hazardous by broken bottles, rocks, deep ruts, and sump holes filled with mud and rubbish.

Along footpaths that twisted a tortuous way around the obstructions of the streets, a throng of women glided. Barefooted and clad in blue denim dresses, they plodded along. A few bore burdens on their heads or guided diminutive donkeys almost buried beneath enormous loads, but for the most part they were empty-handed and manifestly apprehensive.

Not an able-bodied male was to be seen and the iron shutters of places of business were closed. This, said Blink, was because of the impending revolution. Plundering might break out at any moment. Men were

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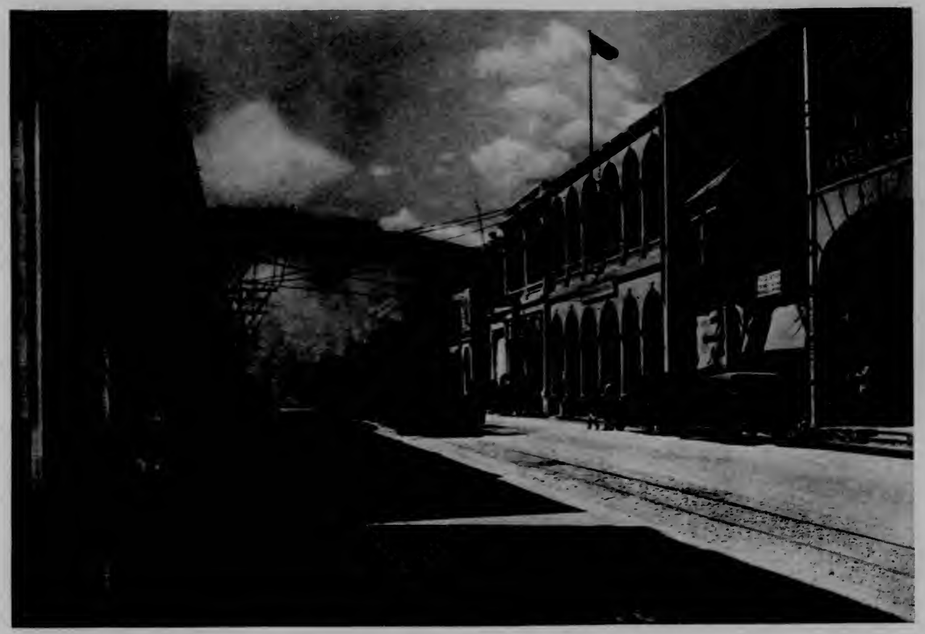

LOCOMOTIVES WHISTLE AND RING BELLS DOWN MAIN STREET OF PORT-AU-PRINCE

This narrow-gauge train, puffing down the Rue Grand, is loaded with sugar cane. The cane is hauled from the fields, through the city streets, and out to the mill.

Photographs by Clifton Adams

"ALWAYS ROOM FOR ONE MORE" ON ANY BUS IN HAITI

With American occupation came leagues of new, good roads, so now automobiles carry men and goods between the capital and many outlying towns and villages. This vehicle is near the Custom-house, Port-au-Prince.

likely to be shot on sight, or, escaping this, were certain to be impressed into one or another of the contending armies.

There were men who were not able-bodied, however, and women also. Beggars sat at every street corner and a throng followed at our heels. Blind men and men with patched eyes, men and women with withered limbs and limbs that were swollen to enormous size by tropical elephantiasis, monsters of all sorts with deformities surpassing the imagination and the pathology of more temperate climes. All of them of an indescribable inky jet.

Drawn by A. H. Bumstead

600 MILES SOUTHEAST OF FLORIDA LIES HAITI

Its 2,550,000 French-speaking Negroes rule the western third of the tropic island of Hispaniola, off the coast of which Columbus' flagship, the *Santa Maria,* ran aground and was abandoned in 1492. At Môle St. Nicolas the Great Admiral landed. Within 20 years was begun the importation of slaves, the seeds of the Negro nation of to-day. Cap Haitien, on the north coast, was the capital in the days when Haiti was a French colony, but now the seat of government is Port-au-Prince, near a region of rich, irrigated sugar lands.

TOM-TOMS LEAD TO THE CHAMP DE MARS

Over all the sun beat down, silent, merciless, interminable. To the visitor its rays seemed to have a solid quality, a tangible substance, a weight. They burdened the shoulders, cramped the heels, deadened the brain.

As we made our way inland, the streets trended gradually upward and the ominous thump of the tom-toms came louder to our ears. Suddenly we came out on an open space several acres in extent. It was evidently a park, but dismally neglected and overrun with the swarming vegetation of the Tropics.

"Champ de Mars," said Blink. Waving to the right, where lay a great charred hole in the ground with masonry and beams blackened by smoke protruding from it, he continued, "Haitian White House, used to be the National Palace.

"Well, I'm leaving you here. Have a good time, but better get back to the ship before dark."

Blink cut off to the right with the assuredness of one who knows where he is going. I continued to follow the road inland.

Presently the street climbed sharply to a deep, mysterious canyon. On either hand rose banks of earth and rock and above them walls of masonry.

Here and there gateways and entrances afforded vistas of parklike grounds filled with a well-ordered profusion of tropical trees and shrubs, while far back from the road discreet glimpses could sometimes be obtained of spacious villas and porticoed residences.

THE ESTATES OF THE WEALTHY

Masses of tropical verdure overhung the walls on either hand and the air was heavy with the scent of frangipani and bougainvillea. Here, evidently, was a quarter occupied by the estates of the wealthy. Fascinated by the charm of the scene, I toiled on, catching glimpses, through occasional windings in the trail ahead, of a noble mountain crowned with green luxuriance.

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Retake of Preceding Frame

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"DO YOU BELIEVE THAT COLUMBUS REALLY LOST THIS ANCHOR?"

Visitors to the National Palace, or Haitian White House at Port-au-Prince (see page 437), are shown this rusty relic which, tradition says, was lost when the *Santa María*, flagship of Columbus, was wrecked on a reef in the bay at Cap Haitien, Christmas Eve, 1492. Once it was taken to Paris and pawned, then recovered after much difficulty.

overall denim. Some had very few clothes indeed. A few had red pantaloons and blue coats with the round gold-laced caps reminiscent of the French Army. Perhaps half of them had guns of one sort or another. Nearly all had machetes, the long cane knife of the country.

IN THE MIDST OF A REVOLUTION

Foot and horse, clothed and unclothed, surged along together. From time to time the spirit would move one of the warriors with a gun and he would fire a shot or perhaps half a dozen shots in rapid succession. Then he would shoulder his piece or sling it across his back and go on as if nothing had happened.

Another would burst into a cacophony of shouts and cries. Instantly the whole host would take it up. Then the volume would dwindle and subside until time for a fresh outburst. The roar of the drums and the shriek of conch-shell horns were deafening.

I looked for the enemy, but there didn't seem to be any. Everybody was in the best of humor and all acted as if they were having the time of their lives. Eventually I decided it must be one of Haiti's famous revolutions.

Suddenly a wild and raucous clamor burst from the trail ahead. The ever-present throb of drums swelled into a stuttering roar. Shots rang out. Flames stabbed from the green-bordered trail. Smoke hung in the still air and reports rattled and reverberated. A motley column surged into view. It wasn't in military order, or, in fact, in any order. Disorder was its most salient feature.

It was composed in almost equal parts of Negroes on foot and Negroes on horseback. Hardly any of the Negroes had shoes. Some of them had trousers and smocks of blue

As a rule, the natives did not harm foreigners on these occasions, I had heard. But I wasn't sure that all members of this army knew the rules, and so I didn't want to take chances on being the victim to make a Haitian holiday. A hundred yards back I noticed a break in the wall on the right of the road where a modest villa stood. Thinking this might offer an opportunity to

NATIVE GIRLS IN SHORTS ARE STILL AN UNCOMMON SIGHT IN HAITI

Posed by members of an athletic club, this picture represents the most modern group at Port-au-Prince. One might travel over the island for years and not meet another discus thrower.

Photographs by Clifton Adams

AWNINGS AND PALMS ARE THE "WALLS" OF THIS HAITIAN LIVING ROOM

Because of the mild climate, few glass windows are used; even screens are rare, although most people who can afford to do so sleep under mosquito nets. Many of the better homes are floored with imported French tiles; furniture and other household equipment come from France. Illustrated magazines and newspapers of France are preferred by Haitians, whose language is French.

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STRIPPED OF POWER, THE TYRANT CHRISTOPHE FELL HERE IN A PARALYTIC FIT

Downhearted, deserted by most of his former followers, the Black King was stricken in this chapel at Limonade while at Mass on August 15, 1820. His head hit the floor just under the plaque which, translated, reads, "Here fell King Christophe."

get out of the path of the advancing multitude, I made my way in that direction.

Scrambling across a 6-foot ditch, I climbed into the garden of the villa and stood behind a thick clump of shrub, close against the portico of the house. Draped from a veranda were a couple of British flags, which cheered me measurably.

REFUGE IN A BRITISH HOME

I had a feeling of being minutely scrutinized. Presently a bolt grated and a long French window swung open. A carefully groomed colored gentleman dressed in a faultless morning coat made his appearance.

"Better come in, sir," he said. "We foreigners are ordinarily safe in time of disturbance, but one cannot always be certain."

By this time the head of the column, shouting and blazing away, had come abreast of us; so I did not stand on order or ceremony, but accepted his hospitality with much thanks and stepped hastily into the house.

"You are quite safe here, sir," said my host. "The British flag is a firm shield and a sure defense. Allow me," he said gracefully. "I am Ludovicus Tilghman, barrister-at-law, late of London." I told him my name and we shook hands warmly, my admiration for the British Empire rising a couple of notches.

Inside was the typical interior of a British home of the upper middle class. It might have been Chelsea. Copies of the *Times* and the *Daily Mail* were on the table. I learned that my host was a Barbadian who had spent some years in the mother country.

"This sort of thing is no doubt new to you," he said. "You may perhaps enjoy a view of it. We shall see it better if you will permit me to conduct you above." In a spacious living room on the upper floor blinds were tilted discreetly to permit a view and chairs were brought.

"This," said my host, "is the fifth time this has happened in my short residence here. It is a great nuisance. Revolution, and all that sort of thing. Paralyzes business. These people have absolutely no conception of law and order. No Magna Carta, no Bill of Rights. Suffrage a ghastly sham. Trial by jury a joke. Presidents arrive one day and are exiled or assassinated the next.

Photograph by Clifton Adams

"WHAT LUCK?" THE WOMEN SHOUT, AS THE FISHING FLEET COMES IN

Even a vagabond rooster, hunting a fish head, comes down to meet the boats. True to form in Haiti's easy-going life, offshore winds blow the boats out to the fishing grounds every morning, then shift, blowing them home at night (see Color Plate VII).

Only one ruler of this country ever finished his term and got out alive and in peace. The rest were murdered, died mysteriously, took their own lives, or were driven into exile.

"What a country for this civilized 20th century! Upsetting to the whole Anglo-Saxon scheme of life. What they need is a liberal application of the Pax Britannica, don't you think? But I beg your pardon; I presume you are from the United States."

I hastily assured my host that, although I was indeed a Yankee, a little peace, British or otherwise, would do no harm.

I asked about the mob that was defiling outside.

"These gentry are *cacos*," he said. "Mercenary soldiers, bandits, that sort of thing. Some politician gives them a few shillings and promises them loot. They come down from the mountains. A president is driven out and another comes in. They kill a few dozen, a few hundred, or perhaps a few thousand, and loot what they can. Then they go back to their mountains and wait for the next revolution."

When the end of the ragged army passed we returned below. My host proffered coffee. Thunder rumbled in the distance. I arose to go.

"Better not go yet," said my host. "The storm is due in twenty minutes."

"What storm?" I inquired.

"You shall see," said he.

THE DRAMA OF A HAITIAN STORM

On the veranda the air was thick, still, and oppressive. Far above the head of the valley up which our road ran, inky clouds shrouded the mountain side. Where we stood the sun shone brightly and the trees hung motionless, but an electric tenseness gripped the atmosphere. On the steep sides of the mountain black masses of clouds whirled with frightful velocity, enormous streamers of mist separating themselves from the parent body and driving this way and that like gray curtains.

Athwart the rays of the sun, torrents of rain descended on hilltop and valley thousands of feet above.

As we stood, the first huge drop of the storm fell in the dust at our feet with a plop, leaving a wet spot as big as a silver dollar.

Photograph by Clifton Adams

STRIPPED OF POWER, THE TYRANT CHRISTOPHE FELL HERE IN A PARALYTIC FIT

Downhearted, deserted by most of his former followers, the Black King was stricken in this chapel at Limonade while at Mass on August 15, 1820. His head hit the floor just under the plaque which, translated, reads, "Here fell King Christophe."

get out of the path of the advancing multitude, I made my way in that direction.

Scrambling across a 6-foot ditch, I climbed into the garden of the villa and stood behind a thick clump of shrub, close against the portico of the house. Draped from a veranda were a couple of British flags, which cheered me measurably.

REFUGE IN A BRITISH HOME

I had a feeling of being minutely scrutinized. Presently a bolt grated and a long French window swung open. A carefully groomed colored gentleman dressed in a faultless morning coat made his appearance.

"Better come in, sir," he said. "We foreigners are ordinarily safe in time of disturbance, but one cannot always be certain."

By this time the head of the column, shouting and blazing away, had come abreast of us; so I did not stand on order or ceremony, but accepted his hospitality with much thanks and stepped hastily into the house.

"You are quite safe here, sir," said my host. "The British flag is a firm shield and a sure defense. Allow me," he said gracefully. "I am Ludovicus Tilghman, barrister-at-law, late of London." I told him my name and we shook hands warmly, my admiration for the British Empire rising a couple of notches.

Inside was the typical interior of a British home of the upper middle class. It might have been Chelsea. Copies of the *Times* and the *Daily Mail* were on the table. I learned that my host was a Barbadian who had spent some years in the mother country.

"This sort of thing is no doubt new to you," he said. "You may perhaps enjoy a view of it. We shall see it better if you will permit me to conduct you above." In a spacious living room on the upper floor blinds were tilted discreetly to permit a view and chairs were brought.

"This," said my host, "is the fifth time this has happened in my short residence here. It is a great nuisance. Revolution, and all that sort of thing. Paralyzes business. These people have absolutely no conception of law and order. No Magna Carta, no Bill of Rights. Suffrage a ghastly sham. Trial by jury a joke. Presidents arrive one day and are exiled or assassinated the next.

Photograph by Clifton Adams

"WHAT LUCK?" THE WOMEN SHOUT, AS THE FISHING FLEET COMES IN

Even a vagabond rooster, hunting a fish head, comes down to meet the boats. True to form in Haiti's easy-going life, offshore winds blow the boats out to the fishing grounds every morning, then shift, blowing them home at night (see Color Plate VII).

Only one ruler of this country ever finished his term and got out alive and in peace. The rest were murdered, died mysteriously, took their own lives, or were driven into exile.

"What a country for this civilized 20th century! Upsetting to the whole Anglo-Saxon scheme of life. What they need is a liberal application of the Pax Britannica, don't you think? But I beg your pardon; I presume you are from the United States."

I hastily assured my host that, although I was indeed a Yankee, a little peace, British or otherwise, would do no harm.

I asked about the mob that was defiling outside.

"These gentry are *cacos*," he said. "Mercenary soldiers, bandits, that sort of thing. Some politician gives them a few shillings and promises them loot. They come down from the mountains. A president is driven out and another comes in. They kill a few dozen, a few hundred, or perhaps a few thousand, and loot what they can. Then they go back to their mountains and wait for the next revolution."

When the end of the ragged army passed we returned below. My host proffered coffee. Thunder rumbled in the distance. I arose to go.

"Better not go yet," said my host. "The storm is due in twenty minutes."

"What storm?" I inquired.

"You shall see," said he.

THE DRAMA OF A HAITIAN STORM

On the veranda the air was thick, still, and oppressive. Far above the head of the valley up which our road ran, inky clouds shrouded the mountain side. Where we stood the sun shone brightly and the trees hung motionless, but an electric tenseness gripped the atmosphere. On the steep sides of the mountain black masses of clouds whirled with frightful velocity, enormous streamers of mist separating themselves from the parent body and driving this way and that like gray curtains.

Athwart the rays of the sun, torrents of rain descended on hilltop and valley thousands of feet above.

As we stood, the first huge drop of the storm fell in the dust at our feet with a plop, leaving a wet spot as big as a silver dollar.

At the bottom of the 7-foot chasm that served the road in place of a gutter a foot of water hissed and boiled where dry rocks had been 15 minutes earlier. A thin stream trickling from above twisted and writhed through the dust in the road.

Rain drops pattered thicker and faster. The light of the sun grew pale and sickly. At length, with a blinding flash and earth-shaking reverberations, the storm burst upon us. An icy wind rushed down the mountain side. Lithe, elastic palms whipped almost to the earth, while massive mangoes and oaks labored and groaned. The sky opened and water crashed down in torrents. Lightning flashed above a cannonade of thunder. Balls of fire streaked down from the heavens and ran along the ground, dazzling the sight and bursting at last in unbearable effulgence.

In spite of their depth and capacity, the gutters at each side of the road soon filled to the brim. Before long the road itself was covered with a foot of water. Soon it was three feet. Tree trunks and carcasses of pigs and goats swept by. A horse and man came swirling along.

Then, with a final orgy of lightning and a roar that seemed to split the skies, the storm departed as quickly as it had come.

My host drew out his watch. "Five o'clock," he said. "Just on time. Ought to be 5:15 to-morrow. You have still an hour of daylight to regain your ship."

Down the steep road and past the ruined palace of the Champ de Mars I made my way, overtaking Blink, also hastening seaward.

A LINE OF SHACKLED LOSERS

The revolution, like the storm, had passed over the town. Bands of native warriors wandered in the streets. Everywhere shutters were closed tightly and the flags of foreign nations fluttered from nearly every balcony. It did not seem that there could be so many aliens in the city. As we made our way to the water front, we passed a line of half-naked Negroes tied neck to neck with straw ropes and guarded by a dozen barefoot soldiers.

"Losers," said Blink, carelessly. "They belong to the President's army. Or maybe they are the enemies of somebody on the winning side. They take them right down there a piece and shoot them. Then they push them into the swamp."

Despite the fate in store for them, the captives did not seem depressed. They chattered and begged cigarettes from us. Occasionally the guards would fall to beating one of the captives with their gun butts or clubs.

Back aboard the ship we found that two new passengers had come aboard—a small, heavily bearded Frenchman and his charming Parisian wife. He was the editor of a French paper and was writing a book on Haiti. He was brimming with enthusiasm and spoke English fluently. He told of terraced gardens he had visited, magnificent villas, books, music, beauty and gayety, spotless napery, gleaming glass and silver—all the refinements and delights of civilization.

WHY HAITIANS ARE DIFFERENT

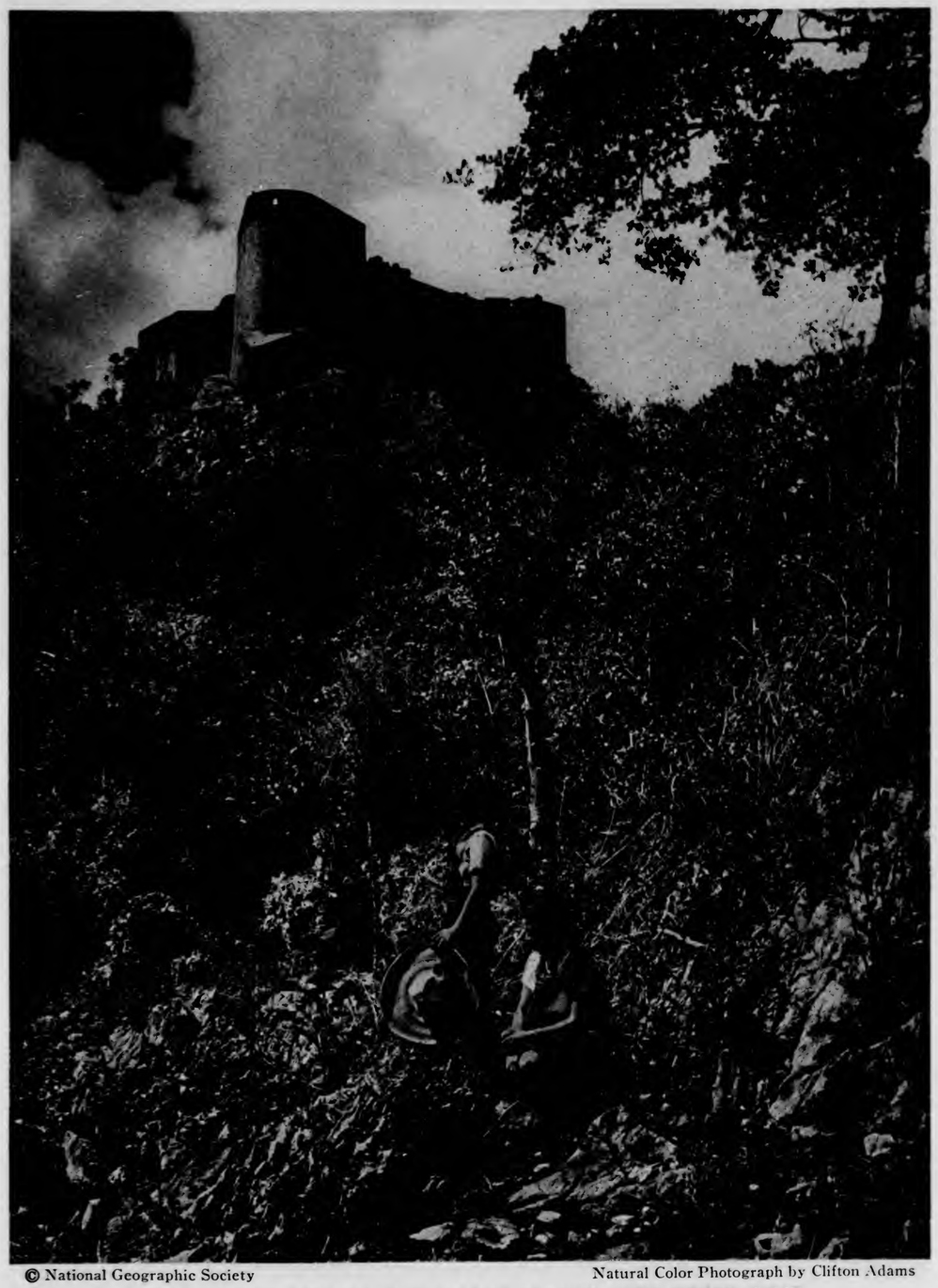
This didn't sound like the Haiti I had just seen. I asked him about it. He chuckled a bit, then looked thoughtful. Yes, he said, he knew about the things I had seen. They were all part of the picture.

"To understand this country," he said, "you must begin by comprehending two things: first, the origin of its people; second, its isolation. Consider, *mon ami*. We French brought here thousands of black slaves, savages from the Congo. They cross-bred with colonial whites—some able whites, aristocrats, the best blood of France. The mulatto caste grew up. Ah, there's a fascinating study for you!

"Old Papa Mendel taught the world's biologists that when you mix two races you are likely to pull the most amazing individuals out of the hat. Mix the daughter of a Dahomey chief with a French marquis and you may get a man with the skin of a Cetywayo and the brain of a Talleyrand. You may get a woman with a black skin and a white soul or one with a white skin and black mentality. What possibilities for variety, drama, suffering!

"For the hundred years of Haiti's independence this mixing has been going on in isolation from the rest of the world. A caste of intelligent, highly educated mulattoes grew up, and beneath them a caste of primitive, black, transplanted Africans. Each caste reacted on the other, and in the passage of time members of each caste grew to be different from any other people in the world—Haitians.

"The mulattoes were French in language and education, but they absorbed from the blacks much of their African mysticism and



 Natural Color Photograph by Clifton Adams

CHRISTOPHE'S CITADEL DEFIED THE FRENCH—WHO NEVER CAME

His Black Majesty needlessly crowned the 2,886-foot Bonnet-à-l'Evêque with the impregnable fortress La Ferrière. Today the century-old ruin, like a huge stone battleship stranded on a mountain, lures travelers to a hard three-hour climb up the steep trail.

THIS GAUDY KITE MOANS AND GROANS AS IT DIVES IN AËRIAL JOUSTS

Haitian boys build into their home-made toys of colored paper vibrating vanes that make queer noises. Sometimes they tie pieces of broken glass to the tails and try to maneuver the kites so as to cut the tails and strings of those of other boys.

 Natural Color Photographs by Clifton Adams

LITTLE BROTHER WORKS A PRIMITIVE CANE CRUSHER

Natives of the fertile district southwest of Port-au-Prince use a mill of one-boy power and one-stalk capacity. The juice is not boiled into molasses or sugar, but sweetens the family coffee. In the crude mortar behind the standing girl, corn and cassava are pounded into rough meal.

OLD GLORY FLIES BESIDE THE FLAG OF HAITI AT THE RACES

Spring meetings, open only to horses raised on the island, were supervised by officers of the United States Marine Corps at Bowen Field, the military airport of Port-au-Prince. Citizens of both Republics mingle in the friendly crowd of devotees of the sport.

 Natural Color Photographs by Clifton Adams

MASKED STRUTTERS REHEARSE FOR MARDI GRAS

Haiti celebrates the beginning of Lent with ceremonies half Latin, half African. In Port-au-Prince exquisitely gowned beauties vie for the crown as Queen of Beauty, but rural joymakers, clad in brilliant costumes and grotesque straw headdresses, dance to the beat of work drums.

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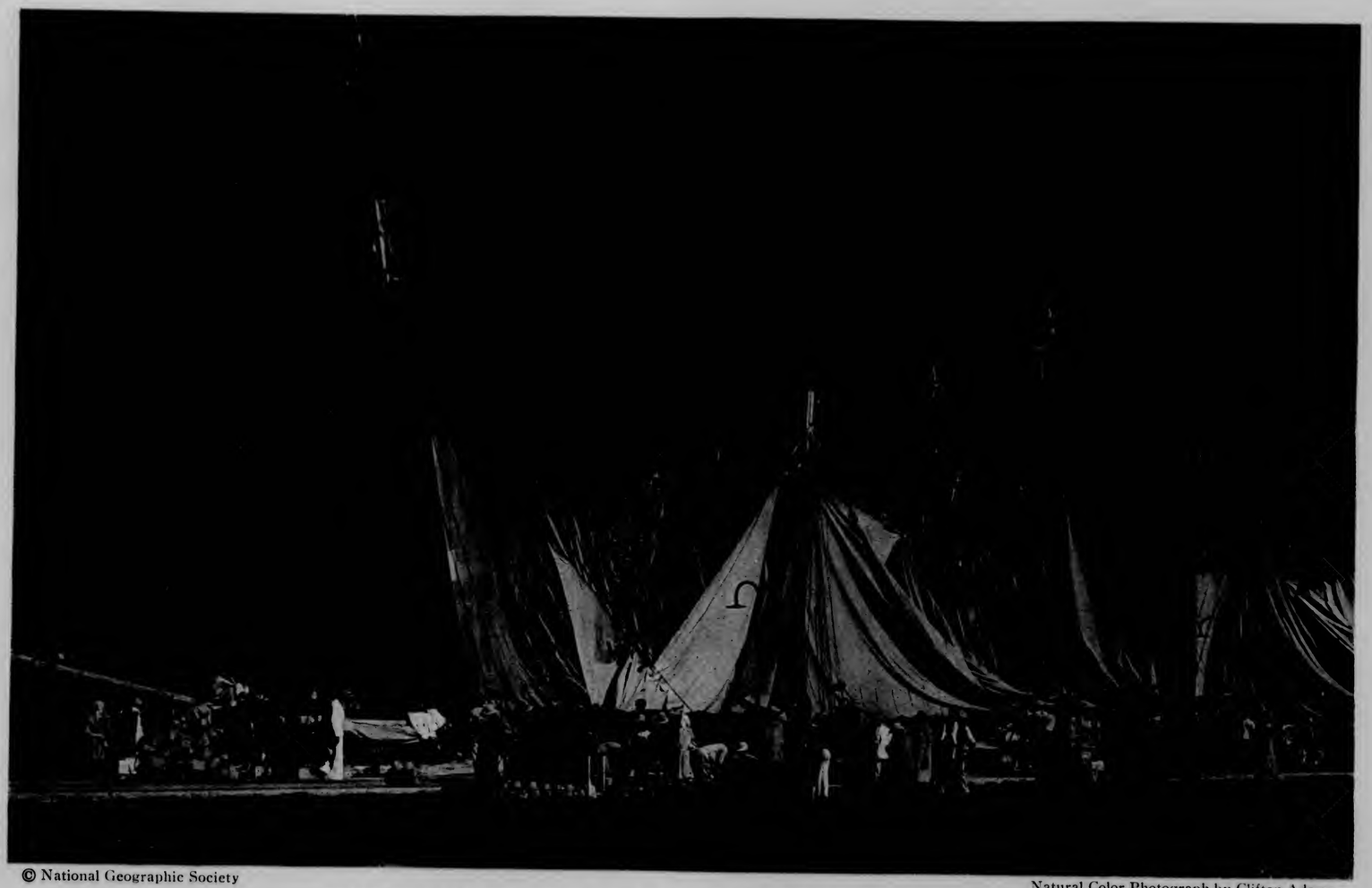


Natural Color Photograph by Clifton Adams

COAST PACKETS SUN THEIR WINGS AT WHARF CABOTAGE, PORT-AU-PRINCE

Haiti is a rugged country, and before the American days there were few roads. Scores of roughhewn wooden craft with white, red, or purple sails cruised along the coasts. Now highways have come, and high-speed trucks compete with the ships.

 Courtesy of Bruce S. Ingram

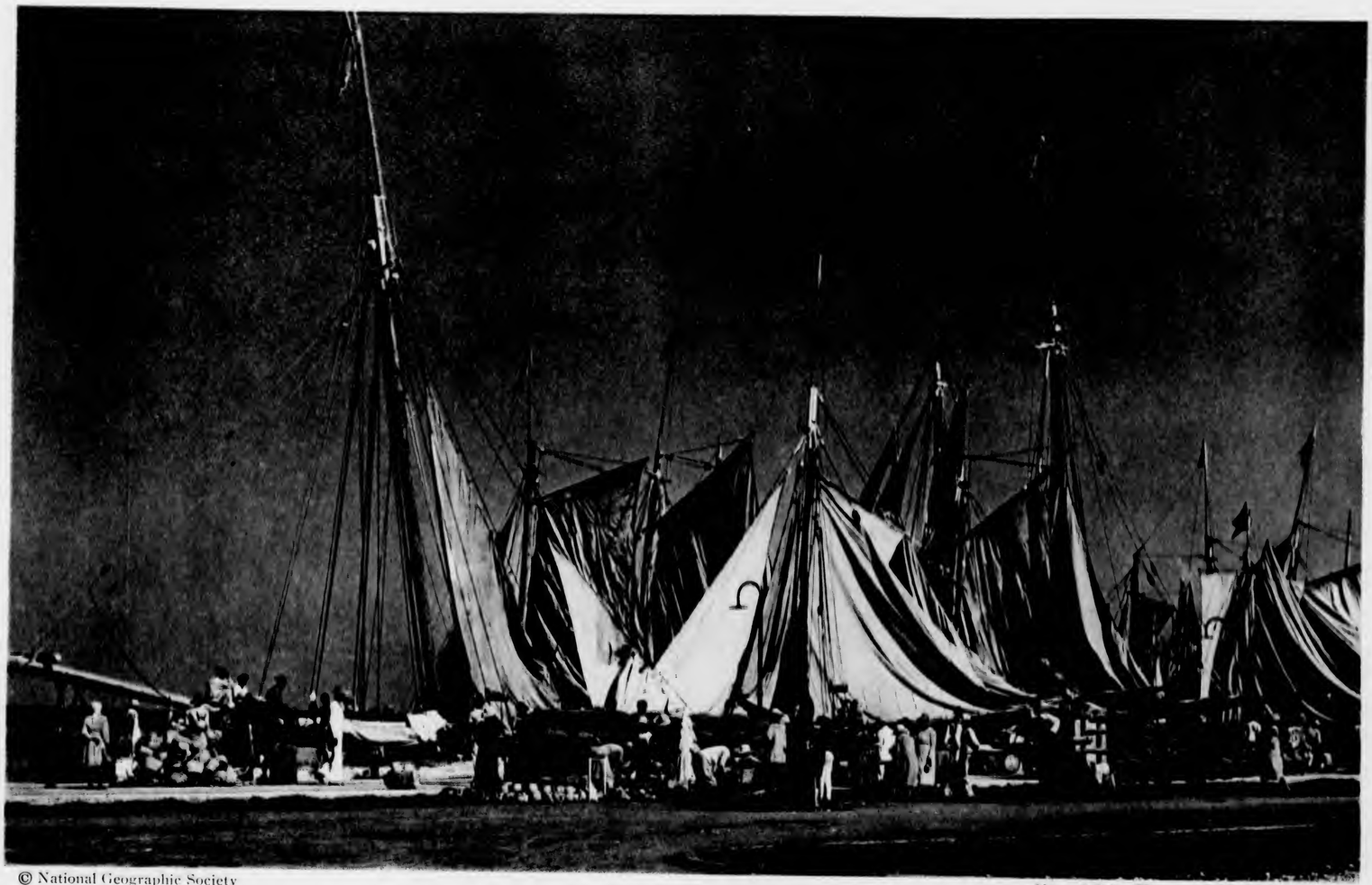
THE BLACK NAPOLEON, HENRY CHRISTOPHE, ONCE KING OF HAITI

Born a slave about 1765, he became a leader in the Haitian slave uprising. Made president in 1807, and crowned king five years later, he shot himself—tradition says with a golden bullet—in 1820. Painted by Richard Evans, from life, and exhibited at the Royal Academy in 1818.

Natural Color Photograph by Clifton Adams

SOULOUQUE'S GOLDEN CROWN IS SELDOM EXHIBITED

The gem-incrusted relic is usually kept sealed in a vault of the Banque Nationale d'Haiti in Port-au-Prince. A Government official guards the masterpiece of a French jeweler, which, in old prints of the coronation in the forties, is shown on the head of the second "Emperor," Faustin the First.



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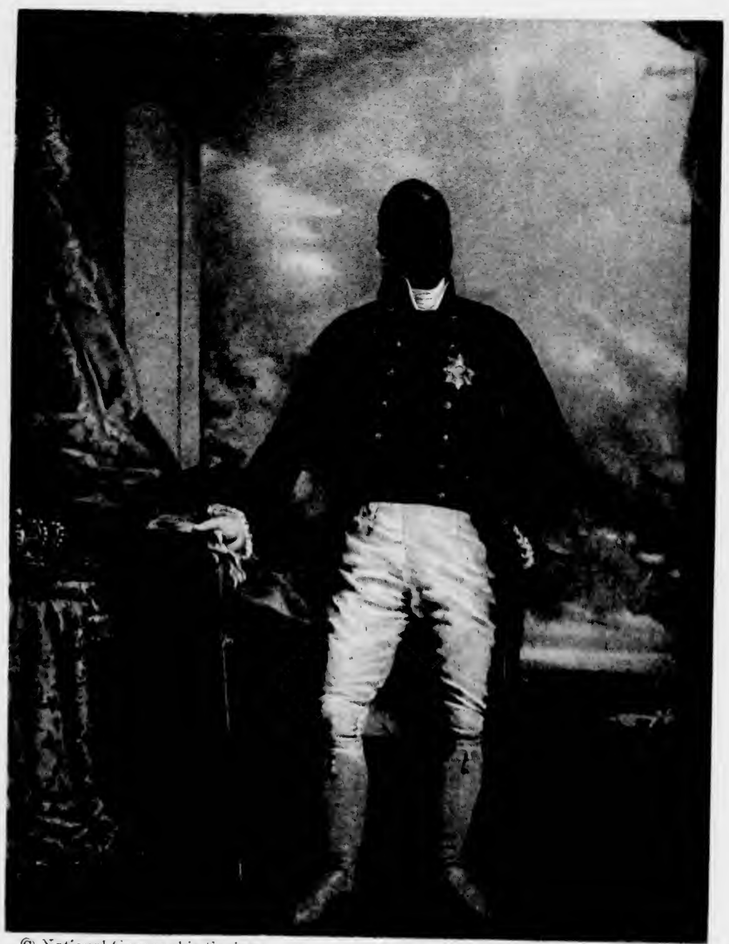

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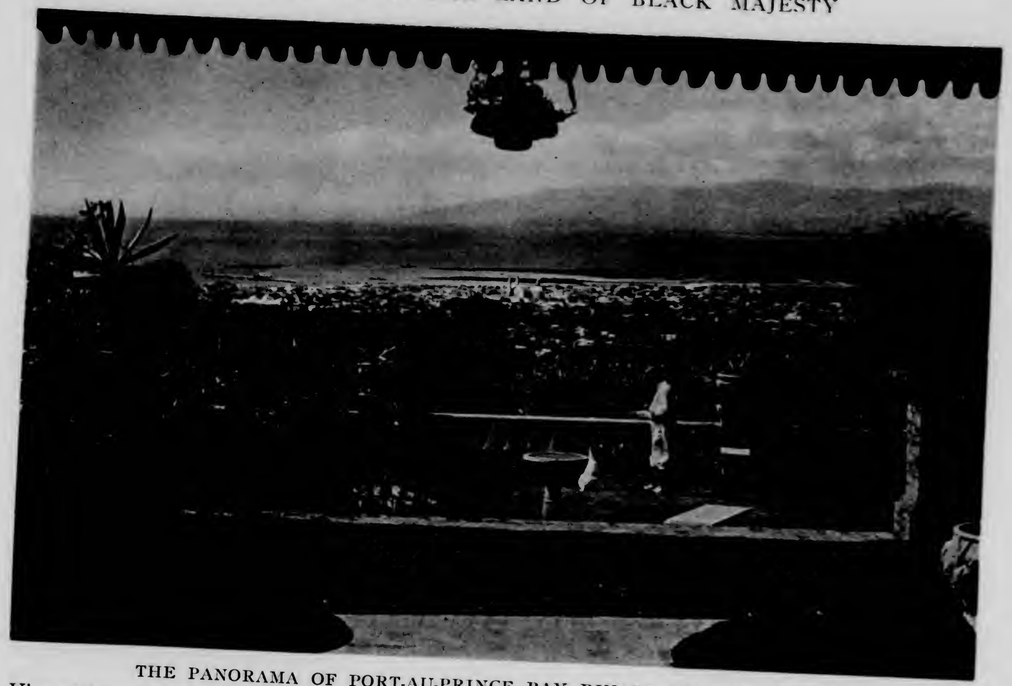
EARLY SHOPPERS RUSH TO HAITI'S "IRON MARKET"

The structure covers about half a city block. It was designed and built in the early nineties by President Florvil Hippolyte, who never tired of admiring the Moorish towers connecting its two parts.

 Natural Color Photographs by Clifton Adams

BARGAIN HUNTERS SHOP IN SIDEWALK FIVE-AND-TENS

Merchandise of all descriptions is stacked on the pavement in front of stores in Port-au-Prince's poorer districts. Most of the buyers are country women who bring the produce of their small farms to the city for sale. Sometimes they have as much as 50 cents gold for an orgy of spending, but usually a dime or a quarter is their limit.



THE PANORAMA OF PORT-AU-PRINCE BAY RIVALS THAT OF NAPLES

Viewed from the hills where live the city's wealthy and cultured classes, Haiti's capital presents an aspect of breath-taking loveliness. The Presidential Palace may be discerned on the left.

 Natural Color Photographs by Clifton Adams

EXOTIC COLOR TOUCHES EVEN THE FOOD FISH

Tempting to the eye is the fishwife's offering of red snapper and other delicious varieties, glowing with brilliant reds, blues, yellows, and greens. The wind blows the fleet out to sea in the morning, and, changing, wafts it back with the catch. When the breeze does not turn, native anglers toot horns and beat pans.

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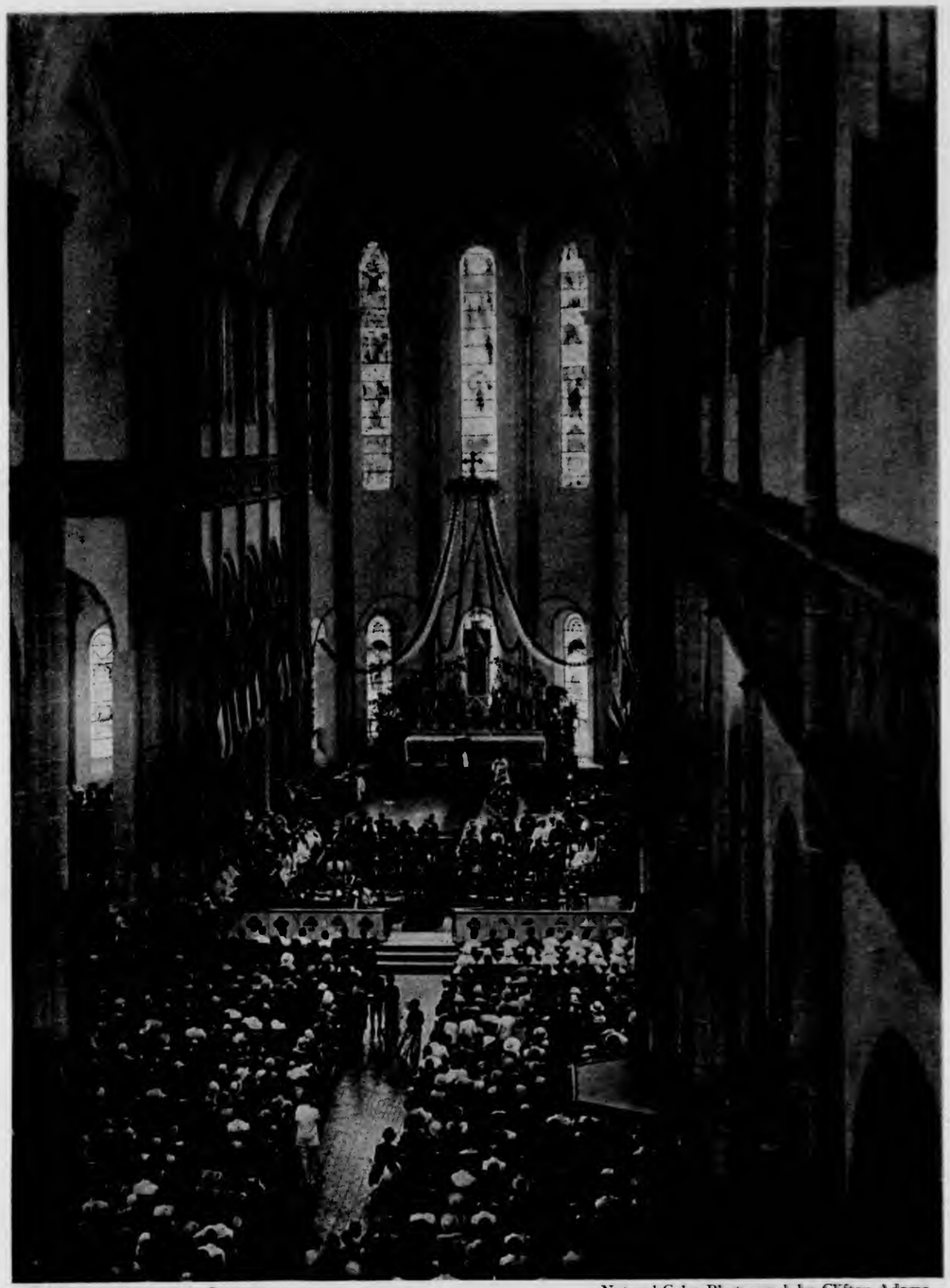

 Natural Color Photograph by Clifton Adams

A BRILLIANT SERVICE HONORS THE ARCHBISHOP OF HAITI

In the rosy twilight of the new Cathedral in Port-au-Prince, President Sténio Vincent, his Cabinet, the diplomatic bodies, and many notables of the capital attend High Mass, celebrating the fiftieth anniversary of the ministry of a revered ecclesiastic.

superstition. The blacks held to their mother religion, the voodoo, and many of their African social customs, but they absorbed in turn a few French words and a veneer of Christianity.

"In the main, the mulattoes held the wealth of the country and all the powers of the government, modified by the propensity of the blacks for periodical revolution and plundering. Neither caste felt any responsibility for maintaining order, sanitation, facilitating business, or paying debts, private or public. The country was chronically bankrupt. Commercial obligations were not worth the paper on which they were written. Epidemics of disease found a hotbed. While the intellectuals produced poems and lived epics, the perpetual tales of uprisings irritated the civilized capitals of the world.

"That is why all this must go. This is an age of standardization, sanitation, uniformity. The world is growing smaller. Haiti's isolation cannot last. The great nations of the world will not permit any small country to maintain what they regard as a nuisance at their gates, however exotic and fascinating its spiritual life may be. In twenty years this country will be cleaned up, civilized. As a poet I deplore it, but as a realist I know that it is inevitable."

Next morning our ship steamed out of Port-au-Prince harbor and soon the towering purple mountains remained only as vague cloud masses on the horizon. With me, however, it was not to be a case of "out of sight, out of mind." As we plowed northward through cobalt tropical waters, the sights and experiences of my day ashore seemed to grow clearer rather than to fade, and to assume a rational sequence until the whole spread out before me like a vast picture, a cunningly wrought vignette etched into the tablets of my memory.

HAITI RETAINS THE FRENCH LANGUAGE

Haiti occupies the western third of the island of Hispaniola, second in size of the Greater Antilles, which lies between Cuba and Puerto Rico. Haiti is the only Latin-American republic in which French is the official language. Its neighbor, the Dominican Republic, which occupies the eastern two-thirds of Hispaniola, thinks and speaks in Spanish.

The Haitian Republic is about 10,204 square miles in area, not quite as large as the State of Maryland. It is made up principally of three ranges of towering mountains, interspersed with fertile alluvial plains, mostly small, and plateaus and valleys (see map, page 439).

The island of Haiti, or Santo Domingo, was the second largest discovered by Columbus on his first voyage. His name for it, Hispaniola, has recently been revived as a distinctive name for the entire island.

In Haiti proper, from 1805 to 1915, 26 men held executive power. These included two emperors, one king, and 23 presidents. One committed suicide, four were killed outright, five died in office, and fifteen were driven into exile by revolutions. Only one retired voluntarily at the end of his constitutional term. He must have been an eccentric, even for Haiti.

U. S. MARINES CLEAN UP THE CAPITAL

One morning at the breakfast table I read headlines that United States forces had occupied Haiti. A president had been killed in Port-au-Prince streets. Debt payments had been defaulted. The French Legation had been violated. Foreign protests rose in chorus.

I remembered my French friend's words. He had been a true prophet. Fewer than 20 years had passed, but the cleaning-up process had begun. The world was emphatic in declaring that Haiti must change her ancient ways. In July, 1915, Uncle Sam undertook the disagreeable and expensive task of seizing her by the slack of her ragged skirts and dragging her into the modernity of the 20th century.

One day I got orders to pack my kit for Haiti. Nearly ten years had elapsed since my first visit to Port-au-Prince, and I knew that many changes must have taken place since Uncle Sam stepped in.

The transport steamed in to Port-au-Prince harbor. Same purple bay; same amethyst hills; same rolling thump of drums. But something was missing from the picture. Where was the stench of yesteryear? Gone, apparently. In its place, only the clean odor of roasting coffee.

The same host of black boys surrounded the ship to dive for coppers, but their boats were different. In the old days these craft were made of logs crudely fastened together, or of huge single tree trunks, hollowed out. Now they were made of packing cases, mostly those which had held gasoline cans. Some of the craft had "Standard Oil" in bright letters on prows or sides. Where

Photograph by Clifton Adams

MARDI GRAS CARNIVAL HONORS ONE OF ITS QUEENS

As in New Orleans and elsewhere, the annual festival in Port-au-Prince is the year's most colorful spectacle. Then merchants vie with each other in the construction and display of ornamental floats; citizens of all ranks, high and low, and many in costume, share in merrymaking.

formerly nakedness had been the rule, now most of the lads wore a garment of some sort. One had a pair of swimming trunks of which he was visibly proud.

Ashore, the harbor front was a mass of concrete buttressed with pilings. Fort Caca and its malodorous mud were gone. Inland and upward ran wide, well-kept streets, each paved with concrete. Sump holes and pools of stagnant water had disappeared. At the sidewalk edges now ran gutters with frequent sewer inlets. Overhead hung electric lights, while gangs of street cleaners plied their brooms with vigor. The beggars with the hideous deformities had disappeared, many of them, I was told, cured by U. S. Navy doctors and sent back to work.

Crowning wonder of all, dozens of automobiles chugged hither and yon. At the time of my first visit there had been none. Inland, where I had seen the charred ruins of the old palace, now rose the white magnificence of a new structure, said by many to be the finest public building in the West Indies (see page 437).

My duties took me to Cap Haitien, about 185 miles north of Port-au-Prince (page 474). I journeyed thither by automobile in eight hours over an excellent gravel road. In the old days there had been only a narrow trail. He who made the trip had to go on horseback and spend at least a week on the way. The road was thronged with country people, men and women, going about their business unconcernedly.

I was struck by the increase in the quantity and quality of the clothing worn. In the old days garments were sketchy enough and nakedness not uncommon in the back districts. Now the men were clothed from neck to knee, and even the poorest of the women had some sort of skirt. Flour and cement sacks, discarded by the Marines, seemed to constitute the latest thing in fashions. At least half the pedestrians seemed to have "Portland Cement" or "Pillsbury's Best" stenciled across some prominent portion of their anatomy. Later, prosperity rose still further and these exflour and cement sacks were discarded for more conventional garments of blue denim.

LIKE A PILGRIM TRAIN, MARKETWOMEN ON DONKEYS FILE UNDER THE ARCH

Donated by a native in honor of former President Hippolyte, this structure was a Haitian conception of the Arc de Triomphe in Paris. It stands near the "central" (sugar mill) of the Haitian-American Sugar Company. The sign warns of a 15-mile-an-hour speed limit.

Photographs by Clifton Adams

SUBSTANTIAL HOMES LIKE THIS ARE RARE IN HAITI

Most of the dense population dwells in the shady interior, sheltered in primitive huts of grass or palm leaves. This home, built by an upper-class Haitian, stands in the best residential district of Port-au-Prince.

Photograph by Clifton Adams

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Retake of Preceding Frame

The older huts were all situated on prominent, exposed hills, but new ones, I noticed, were near wells or on the banks of streams. The reason, I was told, was that the chief requirement of a hut in the old days had been safety for its male occupants. The dwellings had to be so located that their inmates could keep a sharp lookout in all directions to spot the approach of a caco band and make a quick escape to avoid being recruited as members of its force. Now there were no cacos, so the new huts could be placed with an eye to convenience.

But the significant thing, that remains graven on my mind after the passage of years, is the visit I made to the stronghold of one of Haiti's famous rulers.

CHRISTOPHE'S CITADEL DOMINATES CAP HAITIEN

Historic Cap Haitien is situated on a shallow bay on the north coast of Haiti. On a coral reef just offshore, historians believe, Columbus' flagship, the *Santa María*, was wrecked. In the days of the French, the Cap, then called Cap Français, was the capital of the colony (see map, page 439).

As I went about the old town, I was conscious of a strange hump on the skyline to the southeast, many miles distant.

"Oh, that?" said my host. "Christophe's Citadel—the most imposing structure of man in the American Tropics. Why don't you go up to-morrow?"

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His was a success story. From a barefoot slave boy he rose to be a ruler of power and magnificence. A despotic and cruel ruler, perhaps, but one who was honest, proud, and courageous. He made his country respected and feared for the first time in its history by the great powers of Europe, the *blancs* (whites). That is why black Haitian lads to-day regard Christophe's memory much as American schoolboys regard that of George Washington (see Color Plate V).

THE "SUCCESS STORY" OF HAITI'S BLACK KING

"Henry Christophe," said Lake, "born probably between 1760 and 1765, came to Cap Haitien from the British island of St. Christopher (the old name for St. Kitts). He ran away on a French ship and was sold as a slave boy in Haiti. He became a French officer's servant and sailed north to take part in the siege of Savannah in our own Revolution. He was a proud, high-spirited lad, intelligent, and quick to learn.

"When the French fleet returned, Christophe was sold to the owner of a tavern, the Hotel Couronne. You can still see the ruins of the place and the big *mapou* tree where the French gentlemen tied their horses. He was a good servant—polite, efficient, obliging. While he waited on guests, he learned what he could from each. In his successful days he often told how he had picked up scraps of helpful information or had acquired useful traits by imitating this or that patron.

"But within him, as he grew to manhood, he began to feel that he was a superior man. He compared himself to the customers at his master's inn, and almost always the balance seemed to be to his advantage. Although he hid his feelings skillfully, he began to hate the system that condemned Christophe, the able, to remain all his life the hopeless servant of any incompetent master who had the price of his purchase.

"He acquired two great motivating ambitions that remained with him throughout his life. First, he wanted to prove that he, Christophe, was the equal or superior of any man in the world. Next, that black men were inherently equal or superior to their white brethren.

"When the troubles attending the French Revolution broke out in the colony, he became a private in the French Colonial Army. Soon his abilities made him an officer; in a few years a general. Then, when the blacks under Toussaint L'Ouverture rebelled against the French, he commanded the forces of the insurrection in all the northern communes of the colony. After the defeat of the French, he became the second president of the Republic, and eventually mounted the throne as self-crowned king of the North American monarchy."

Photograph by Clifton Adams

CONCH SHELLS AND CHAIRS, CORAL AND DRIED FISH, FOR SALE!

Native bumboats with odd cargoes swarm about when liners reach Port-au-Prince. Passengers toss down coins, for which natives quickly dive should the coin fall into the sea, and purchases are hauled up on a string.

THROUGH THE MARKET AND ON TO THE CITADEL

As Lake held forth, we rolled past the market place, where drowsy market people were beginning to bestir themselves.

Out across a shaky iron bridge we drove into what had once been the French Royal Highway of the Plaine du Nord, the Haut du Cap, of colonial days. In the French time this had been an avenue wide enough for four carriages to pass abreast. On each side it had been flanked with palatial villas. We could see the crumbling gateposts of many of them, and, back in the shadows, the ruins of *habitations* that once had been.

Here the road was deserted no longer, but as far as the glare of the headlights could penetrate it was thronged with market women and their donkeys, streaming into town with their goods for the morning market. Bare of foot, turbaned, with their long blue gowns fluttering behind them, they swung along, backs rigid, haunches rolling, some chattering and gesticulating, but for the most part silent, weary from their long night on the trail.

Our car nosed east and began to pull uphill. Cocks crowed vociferously, and the scent of dawn was in the air. As we ground along mile after mile, the plain which we traversed constantly mounted higher. From ravines and valleys echoed the thump of drums, never silent in the Haitian mountains, and sprinkled here and there over their almost perpendicular sides shone the red flames of tiny fires.

Gradually earth and air brightened until the sun showed a segment of its red disk over the crest of the jagged mountains on the Dominican border. The nose of our car pointed straight at the Citadel.

Now it was distant and indistinct no longer. Right over our heads it seemed to tower, like a great medieval fortress set on an almost perpendicular mountain peak rising to a tremendous height (see Color Plate I and illustration, page 478). Lake

The older huts were all situated on prominent, exposed hills, but new ones, I noticed, were near wells or on the banks of streams. The reason, I was told, was that the chief requirement of a hut in the old days had been safety for its male occupants. The dwellings had to be so located that their inmates could keep a sharp lookout in all directions to spot the approach of a caco band and make a quick escape to avoid being recruited as members of its force. Now there were no cacos, so the new huts could be placed with an eye to convenience.

But the significant thing, that remains graven on my mind after the passage of years, is the visit I made to the stronghold of one of Haiti's famous rulers.

CHRISTOPHE'S CITADEL DOMINATES CAP HAITIEN

Historic Cap Haitien is situated on a shallow bay on the north coast of Haiti. On a coral reef just offshore, historians believe, Columbus' flagship, the *Santa Maria*, was wrecked. In the days of the French, the Cap, then called Cap Français, was the capital of the colony (see map, page 439).

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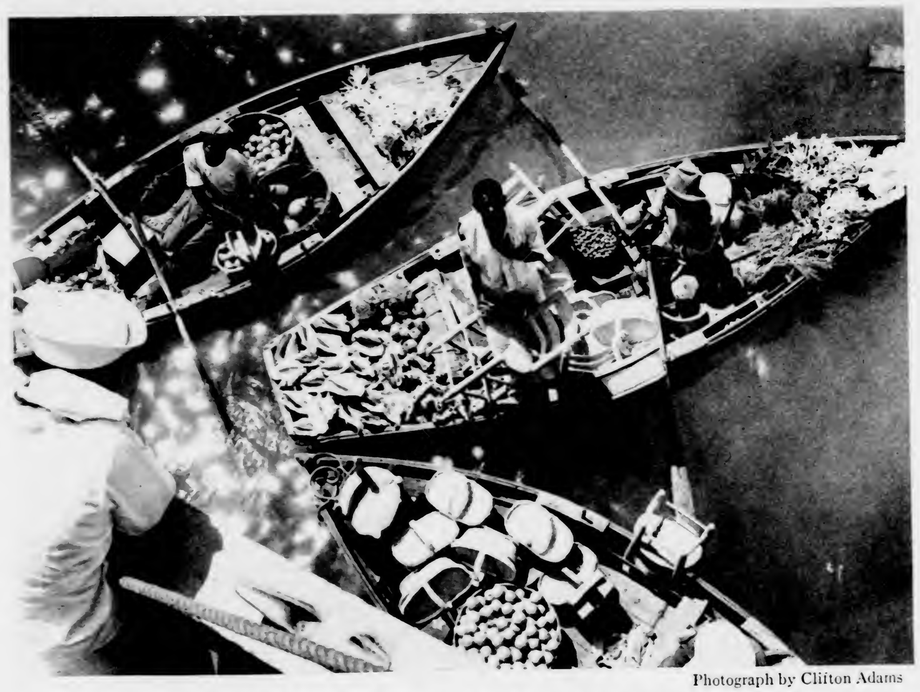

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Photograph by Henry W. Moore

COASTAL TRADING CRAFT MUST COMPETE NOW WITH TRUCKS THAT USE NEW ROADS ALONG THE BEACHES

Anchored on the Port-au-Prince water front at a spot known as the Wharf Cabotage (see Plate IV), these small sailing craft are typical of the fleet that formerly carried all goods and passengers about the island before motor trucks absorbed so much of this trade. On each is a tiny altar and an image of the native water god, Papa Agoué. Sailors blow horns to raise a wind, and sometimes beat Papa Agoué when winds are too strong.

BELOW THE BASTIONS OF AN OLD COLONIAL FORT SPREADS A FINE PANORAMA OF PORT-AU-PRINCE AND ITS ROADSTEAD

Photographs by Clifton Adams

AMERICAN CAPITAL AND ENERGY CREATED THIS 22,000-ACRE SISAL PLANTATION (SEE PAGE 473)

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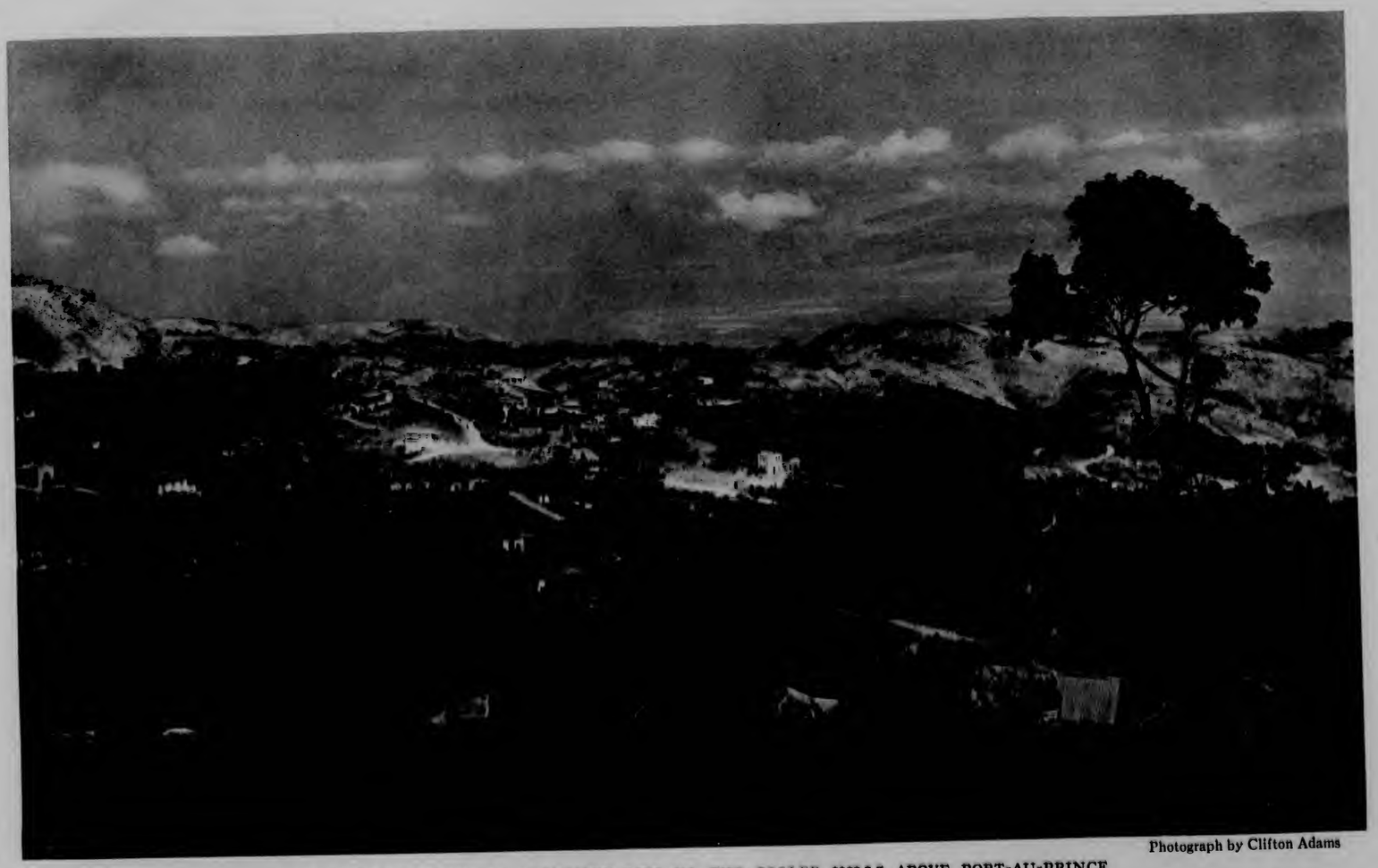

Photograph by Clifton Adams

THE RESORT COLONY OF KENSKOFF LIES IN THE COOLER HILLS ABOVE PORT-AU-PRINCE

Made more easily accessible by good roads built since the American occupation, this hill colony is much sought now both by foreigners and well-to-do native families. Set about 4,600 feet above the city, it enjoys cool breezes and affords a rare view of Port-au-Prince and the sea.

Photograph by Clifton Adams

"HOLD STILL! IT PULLS A LITTLE—BROKEN GLASS ALWAYS DOES!"

When one wants a shave in rural Haiti, all he has to do is break an old bottle, hand a scrap of glass to a bystander and say, "If you please!" Friends usually shave each other. The barber here, using a piece of glass, is not one by trade. In a regular shop in the country areas, a shave costs about one cent.

Photograph by Elizabeth R. Hibbs

WOMEN MAY WALK 50 MILES OR MORE TO MARKET

They enjoy the social wrangle of barter in the market place, where they trade their breadfruit, cassava flour, avocados, and mangoes for a few candles, matches, some salt, calico, or a bit of soap. Walking at night when it is cooler, women may spend several days on a trip, stopping at different markets along the way.

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TRAINING YOUTH IN THIS CENTRAL SCHOOL OF AGRICULTURE, HAITI SEEKS TO AID THE VAST RURAL POPULATION

Connected with the modern institution at Damiens is an experimental station. Boys study animal husbandry, soils, and farm crops adapted to the island. Efforts are made, under American instruction, to improve the culture of cane, cotton, sisal, coffee, fruit, and other crops. Field agents of the United States Department of Agriculture have introduced many vegetables and increased quality and production.

informed me that the peak was known as the Bonnet-à-l'Evêque, the Bishop's Bonnet, and that its altitude was nearly 3,000 feet. The Citadel covered the whole mountain top; there was no room for anything else.*

The enormous size of the structure sank deeply into my imagination. It was roughly square and measured something like 500 feet to a side. Someone once estimated that it contained nearly half a million tons of building material, every pound of which had to be carried up the precipitous side of the mountain more than 2,000 feet above the plain. Ten thousand men were continuously employed.

Lake explained that Christophe built the Citadel as a result of the same driving motives that accounted for a majority of his kingly actions—fear and emulation of the white European powers. He and his little kingdom were free. He resolved that they should remain so, and to that end he decided to build an impregnable fortress to shelter himself and his army should an invader ever attempt to conquer his realm.

He strained every resource of his kingdom and worked his subjects without mercy. The king was a man of huge size and gigantic physical strength, skilled as a mason. Often, tradition says, he would take trowel

* See "A Little-Known Marvel of the Western Hemisphere (Christophe's Citadel)," by Maj. G. H. Osterhout, Jr., in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1920.

Photograph by Albert K. Dawson

THE OLD MARCHÉ EN HAUT, OR "HIGH MARKET," OF PORT-AU-PRINCE IS NOW ABANDONED

Such open squares form market places in all Haitian towns and cities. Wares for sale and barter are laid in little piles, sometimes on straw mats, more often in baskets or on the bare ground. The two most prominent market squares in Port-au-Prince now are the Low Market and Iron Market (see Plate VI), which do business daily. Some wooden houses in the background are built on masonry foundations, remains of French colonial architecture.

and mortar and perform more work in a few hours than the best of his subjects could do in a full day. Always the king drove his workmen. Twenty thousand, it is said, died of hardship and exhaustion, but the king sent his overseers for fresh drafts of peasants and the work continued without pause.

SANS SOUCI, WHERE CHRISTOPHE HELD HIS COURT

Our car crossed a tiny stream and ran through the streets of a squalid native town, Milot. Here had been Sans Souci, the palace where King Henry held his court and where his queen and royal family had their residence. Lake announced that we had finished our journey by automobile and would make the rest of the trip on horseback.

We mounted and trotted off to have a look at Sans Souci before beginning the climb to the Citadel itself. The ruins of the palace and its grounds occupy a pleasant valley about ten acres in extent at the foot of the Bishop's Bonnet. As in the case of the Citadel, the palace was built in emulation of similar structures in Europe of which the king had heard. Christophe, it seemed, had many palaces, all fine.

One day it came to his ears that in Prussia was a much finer palace than any of his, and that it was known as Sans Souci. He resolved to build one of the same name

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CARGOES OF HAITIAN CALABASHES LOOK LIKE TOY BALLOONS

These big gourds, of cannonball size, are borne to market from the hills near Bizoton. The skinny horse walks along the track of the railroad that connects Port-au-Prince with Léogane.

that should be bigger and finer (see illustration, page 477).

He employed women and old men who could not stand the tremendous exertion of carrying building material up to the Citadel. Of these, corvées of 5,000 at a time were used. The building was begun in 1811 and finished the following year.

All of the little valley in which the palace was situated was paved with marble tiles and squares brought from France as ballast in the king's coffee ships. Shrubbery imported from the tropical countries of the world lined its walks and gardens. Cool mountain streams were directed through marble pools and channels.

THE DUKE OF MARMELADE

There were suites within the palace for the ministers of state, for the officers of the palace guard, for the members of the royal family, and for the nobles of the kingdom. A nobility was another of the institutions which the king had created to place his realm on a footing of equality with those of European sovereigns. Among the nobility were the unforgettable Count of Limonade and Duke of Marmelade.

Costly works of art and French mirrors lined the walls of the corridors of the palace, and the Throne Room shone with a magnificence of gold and silver bullion that fairly dazzled all beholders. Appended to the palace was a magnificent royal chapel, a state theater, and barracks for the royal guards; not far away was the arsenal which the king had created for manufacturing and storing powder and shell.

Nearly all of this had vanished in our time. In accounting for the rapid disappearance, local tradition says that the upper stories of the palace and other buildings were of costly wood, and were burned when Sans Souci was sacked after the king's death (see illustration, page 442).

We remounted our horses for the long climb up to the Citadel itself. The trail followed a well-defined zigzag up the side of the precipitous mountain. Once this zigzag had served as the bed of a paved and graded road on which two carriages of state could pass abreast. Vegetation, mountain storms, and a hundred years of neglect had done their work, however. Of the magnificent road, little trace remained except the contour of the grade that had once served as its

Photograph by Clifton Adams

HAITI HAS ITS "HORSEBACK FARMER" WATCHING FIELD HANDS AT WORK

Cotton grows high and is not cut back; much grows wild. This field, being picked, belongs to the experimental farm of Haiti's agricultural school, near Port-au-Prince (see page 462).

bed. Only here and there, where a recent storm had cut deeply into the soft earth, could be seen the huge flagstones and paving blocks of the old Royal Road.

Up a path just wide enough for their feet, our horses toiled and labored. Mile after mile it mounted precipitously into the air. Larger and larger loomed the Citadel.

At last, rounding a final turn, we came under its frowning walls, and after a scramble up a steep slope passed inside through a narrow gateway.

THE CITADEL HOUSED 10,000 TROOPS

Inside the rectangular courtyard, or Place d'Armes, the Citadel seemed more huge than ever. Lake told me that it was begun in 1804 and was still not complete at the king's death, in 1820. The work was carried forward under the supervision of three captive French engineers, one of whom, La Ferrière, gave it the name by which it is often called, "La Citadelle La Ferrière."

Inside the Citadel were an arsenal, storehouses for supplies, and barracks that could accommodate 10,000 troops, as well as a small palace. There were stationed the best trained soldiery of the kingdom. The sides of the hill on which the fortress was built were smoothed away so that they could be commanded in all directions by artillery fire. Batteries of the heaviest cannon of Christophe's day were installed in casemates commanding all approaches. They are still in position to-day (see page 485).

It seems difficult to believe that these huge guns could be dragged to the summit of the Bishop's Bonnet by manpower alone. A typical story of King Henry explains how this was accomplished. Christophe had assigned a hundred men the task of transporting one of these monster cannon up the zigzag roadway in a working day. At noon, while inspecting the work, he noted that they had made little progress.

A delegation waited on the king. "Sire," said their spokesman, "the task you have given us is beyond our strength. We cannot possibly move this heavy cannon the distance you have required of us."

"That is too bad," replied the king. "I am very sorry. What I have to do grieves me immensely, but the king's word is sacred. I have said that you must take this gun to the top of the mountain and I am sure you can do so. If you do not think so, I must

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It seems difficult to believe that these huge guns could be dragged to the summit of the Bishop's Bonnet by manpower alone. A typical story of King Henry explains how this was accomplished. Christophe had assigned a hundred men the task of transporting one of these monster cannon up the zigzag roadway in a working day. At noon, while inspecting the work, he noted that they had made little progress.

A delegation waited on the king. "Sire," said their spokesman, "the task you have given us is beyond our strength. We cannot possibly move this heavy cannon the distance you have required of us."

"That is too bad," replied the king. "I am very sorry. What I have to do grieves me immensely, but the king's word is sacred. I have said that you must take this gun to the top of the mountain and I am sure you can do so. If you do not think so, I must

Photograph by Ernest G. Holt

HAITI'S BUSIEST ROAD RUNS FROM PORT-AU-PRINCE TO CAP HAITIEN

First built by the French in colonial times, largely for military use, this 185-mile stretch was improved and modernized after the American occupation. In generations past, millions of blacks have walked its length, which echoes now to the rumble of crowded motorbusses. In all, Haiti enjoys about 1,200 miles of improved highways. The hut at the right is typical of the countryside.

find some way to stimulate you. I think I can find a way."

Saying this, the king ordered his executioners to select 50 of the 100 men and put them to death. The remaining 50 took the cannon to the top of the mountain and placed it in position well ahead of the scheduled time.

SOLDIERS ORDERED TO MARCH OFF CLIFF

On the cleared slopes of the hill the king ordered to be planted yams, bananas, plantains, and other food-producing plants in large quantities, enough to feed the men of his garrison. All of the roofs of the building and its appendages were made watertight and fed a system of cisterns. Providing the usual amount of rain fell, the garrison of the Citadel would never be short of water.

The wall of the castle flanking the space used as a drill ground is a continuation of a sheer cliff. Here the vertical drop is more than 200 feet. Legend says that Christophe, having heard of the iron discipline of the Prussian soldiers of Frederick the Great, resolved to drill regiments of Haitian soldiers that would outdo those famous grenadiers. When he had trained a regiment to his liking, he would form it facing this 200-foot drop and give the command "Forward March!" If they were properly disciplined, according to the king's idea, the soldiers would march off into space, file after file, until they received the command to halt from the royal lips.

Should any soldiers fail to march off the cliff at his command, Christophe had ways of making them wish they had done so.

HIS MAJESTY'S MOUNTAIN REVELS

Lake led me to the south wall and pointed out some scarcely discernible heaps of crumbling stones several miles distant—the remains of two other palaces, Ramier and Bellevue, respectively. They were small palaces used by the king in his lighter moments. In them were assembled the best wines and liquors, the best cooks at his command, and the most beautiful women of his kingdom. Here he went frequently for extended revels, taking with him the favorite noblemen of the court and occasionally some foreign visitor.

So much has been written and related of the savage, sensational side of Christophe's character that the world is in danger of losing sight of another aspect. He was arbitrary, harsh, and ruthless, of course; but for all that, he was inspired by an ideal, that of building the feeble, ignorant people into a powerful, enlightened state. To attain this end he was willing to make any sacrifice himself or impose any hardship, however savage, upon his people.

Into this task he threw himself with ferocious energy, and the list of his accomplishments reads like a fairy tale. His country must be well armed, powerful. He built the Citadel and other impregnable fortresses. He trained an army which was pronounced the most powerful in the Western Hemisphere. His country must be rich.

He decreed that every one of his subjects must work so many hours a day. He regulated by law just what each must do, and what must be produced. No man must work too long or produce goods likely to leave a surplus on the marts of the kingdom. His was an early parallel of the present-day American idea of planned production.

He instituted a currency that was an example of stability for its day. The unit, a round silver piece about the size of an American dollar, was called the "gourde."

From the earliest days all the countries of the Caribbean, including Haiti, used the Spanish dollar, or *peso*. About the middle of the 16th century the Spanish ran short of silver and so debased their dollars that they were mostly lead, and hence practically valueless. Then vast quantities of silver came from Mexico and Peru, and the Dons reformed their currency. To distinguish the good new dollars from the worthless old ones, the Spanish mints marked each of them with the words "peso—gordo." Gordo is an adjective and means solid, substantial.

In Haiti the natives knew that the new dollars were good dollars, but they did not know what the words stamped on them meant. The Spanish words sounded harsh to their ears; so, in referring to the coins, they frenchified peso—gordo into "piastre-gourde." Later they dropped the piastre from the hyphenated combination, and when the first silver Haitian coins were minted they were inscribed simply as "gourdes," which they have remained ever since.

CHRISTOPHE'S GOLDEN BULLET

Last place of all to which my guide conducted me was a ramshackle lime and plaster structure in the center of the main courtyard of the Citadel. It looked much like a dog-house, but the roof had fallen in and the sides were cracked.

"Christophe's tomb," said Lake.

In 1820, after 14 years of despotic power, Fate overtook King Henry at divine services. Stricken with paralysis, his giant body was cold and dead from the waist down. Revolution broke out. Day by day the paralysis crept upward and the rebels gained ground. At last, realizing the game was up, the crippled monarch caused himself to be attired in his robes of state and placed on his royal throne. There he said farewell to his family and loyal friends.

Then, as the sun was setting, he blew out his brains with a golden bullet he had long carried, believing that it alone had power to cause his death (see page 442).

As we inspected the tomb, a group of peasants approached. "Pilgrims," said Lake.

"If half the stories of how Christophe dealt with his subjects are true," I replied,

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NEAR CROIX DES BOUQUETS A PEASANT BUILT THIS HOUSE OF MUD WALLS AND THATCHED ROOF

In Haiti there is practically no middle class, and this native dwelling is superior to the average countryman's home. Around even the most humble home, however, flowers are often planted.

"I should think they would hate his memory and want to forget him."

"You'd be wrong," my guide replied. "In the north, here, he is regarded as the greatest Haitian who ever lived. He made himself feared and respected by the European powers. He made it possible while he lived for the Haitians to be proud of their country and race. For that they are willing to forgive a great deal."

ASSIGNED TO THE HAITIAN GENDARMERIE

Once again Fate turned up the cards that sent me to Haiti in 1925, this time as an officer in the Gendarmerie d'Haiti, the native constabulary, trained and commanded by U. S. Marines. This was a force of romance. It was made up of black troopers under white officers and was a sort of police unit rather than a real army. I was to hold a commission under the Haitian flag for three years as a member of this force.

I was assigned to command a district on the central plain, with headquarters at the village of Hinche, about 80 miles from Port-au-Prince, in almost the geographic center of Haiti. The district of which it was the capital was about the size of that portion of New Jersey south of Atlantic City, and had a population estimated at a quarter of a million Negroes so black that the darkest resident of Harlem's black belt would be suspected there of being a white man.

Some of the primitive beings there, I was told, had heads shaped like peanuts and shuffled on the sides of their feet in lieu of walking. To police this area I was to have a company of about 200 black troopers, officered by four lieutenants.

Long before dawn I cranked up my small car and set out for Hinche to take over my first command.

In the car beside me was Destiné, my new "Number One Boy" and my first venture in black ivory. Destiné was a wonderful type of tropical servant, the sort who make the White Man's Burden bearable down near the Equator. He was short, slim, jet-black, with a nose like a squashed tomato and lips so thick they gave him the appearance of having a bill like a duck. He did not look quick-witted or intelligent, but appearances in Destiné's case were deceptive. His father had been a Jamaican and he could stretch a broad A and drop an H as well as any cockney living, besides reading and writing English and speaking all known varieties of Haitian dialects.

Photograph by Clifton Adams

SUCH WOODEN HOUSES, FACED WITH FANCY WOODWORK, ARE COMMON IN PORT-AU-PRINCE

Fruit trees grow about the house and a fence guards against stray pigs, chickens, and unwelcome guests; otherwise, country visitors would calmly enter and take a nap under the trees.

My good angel must have sent Destiné to annex me. He appeared one morning and announced, "I have come, sah, to be your butler, sah." Every *blanc* had a butler, Destiné informed me. I hadn't realized this, but it seemed reasonable, and as Destiné considered the matter settled, I took him on at the princely wage of six dollars a month and found.

CLIMBING STEEP MOUNTAIN GRADES

Our motor hummed along steadily between fields of rustling cane. For 15 miles the road followed easy curves almost at water level toward the mighty central massif of mountain ranges that divides Haiti from the Dominican Republic border to the sea. Then the ascent commenced. In the next mile we must have climbed several hundred feet (see map, page 439).

Now the peaks of the central range, jagged and precipitous, towered almost over our heads, some of them reaching more than 5,000 feet into the air. The wall in front seemed impenetrable. Just as it appeared that we were about to crash into the vertical cliff, a crevice revealed itself and the road oozed to the left down a canyon hitherto invisible, which led out onto the side of the mighty mountain known to the Haitians as Morne à Cabrit, or Goat Mountain.

Up the south face of this mass of rock that rears its head more than 3,500 feet above the plain, the road zigzagged its tortuous way. Two thousand, three thousand feet, we crawled and wriggled back and forth along the precipitous face of the mountain on the road carved like a shelf into the face of the cliff. Everywhere the rock dropped almost perpendicularly from the outside edge of the road hundreds, sometimes thousands, of feet.

At our feet lay the southern plain of Haiti, the Cul de Sac, one of the country's agricultural treasure houses. Thirty miles away across the shimmering flat lay Port-au-Prince, a city of doll houses. Far and near lay habitations, canefields, towns, and villages.

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Retake of Preceding Frame

For the last time our car crawled up an almost perpendicular grade to reach the top of the pass, 4,000 feet above the sea.

Then we dropped down over a road that had much the contour of an old-fashioned roller coaster through a maze of valleys and peaks, coming out eventually a dozen miles beyond the high point on the central plateau of Haiti near the old frontier town of Mirebalais.

This central plain, or *savane,* stretches more than 50 miles from north to south and varies from 10 to 30 miles across. In the rainy season it is covered with tall Congo grass, which turns to tinder in the arid months and is swept by searing prairie fires.

By the wells and watercourses the natives lived in wretched clusters of huts, their existence one of poverty and misery. In the winter they were likely to be rained out and in the summer it was more than probable that their poor huts would be destroyed by fire. In the old days they avenged themselves on society by providing savage warriors for the bands of cacos which ravaged the land for so many years, but since the arrival of the American Marines even this consolation has been denied them.

TRAPPED BY A RIVER FLOOD

When our car came down out of the mountains at Mirebalais, Destiné and I thought that the remainder of our journey would prove uneventful. We were wrong. In Haiti the unexpected always happens. A gendarme officer at Mirebalais told us that there was a bad river on our trail, the Peligre. It was one of a total of 42 rivers and streams which we must cross, all of them by fords. It was the rainy season and the rain was due at about 1 o'clock.

We arrived at the river well before 1 o'clock; got nearly across; then our car stuck. Destiné was all upset. The flood was almost due. The sun was shining brightly, and it was difficult for me to believe that a flood was in prospect.

"You don't know these rivers, sah," said Destiné. It was the rain that fell in the mountains, he continued, that produced the floods.

Meantime a couple dozen Haitian peasants had waded into the river and stood around our car: the towing crew, it developed—another custom of the country. These men lived on the banks of the stream near the ford and waited for cars to get stuck. Then they would make big wages pulling the stranded automobiles to the bank and safety. Sometimes each made as much as ten cents gold a week.

The head "boy" of the towing crew was a dignified old citizen with woolly white side whiskers. He bargained with Destiné in a series of sneezes, coughs, and grunts. Bargaining finished, our towing crew hitched a couple of lengths of stout grass rope to the front springs of our car, the boss boy commanded "Allez vite!" and in a jiffy we were high up on the far bank of the stream.

Just in time, too! As I was mopping some of the water off my motor there came a sound like the rumbling of an earthquake. Suddenly, half a mile up the canyon of the stream, a wall of water 10 feet from base to crest burst into view, sweeping down the valley with express-train speed, bearing trees, animals, wreckage of all description in its resistless course. My watch said 1:15. The flood wasn't quite on time, luckily for us. We reached Hinche just before sunset.

My district stretched about 50 miles north and south from Hinche and perhaps 30 miles east and west. There were four good-sized villages besides Hinche itself, but the greater part of its teeming population lived in thatched huts hidden by the high grass, wherever they could find a stream or a spring to afford a water supply.

Enforcing the law was somewhat complicated. The laws were French. They were well enough known in the seacoast towns, but few of the natives of the back districts had ever heard of any law less primitive than that of the club and the knife. Education for them was a minus quantity. In all my district the men and women who could read and write might be counted on the fingers of my two hands.

A LESSON IN POVERTY

The natives' lack of material wealth was almost beyond the comprehension of the inhabitant of a modern, civilized community. To them an empty tin can was a rare treasure and an empty flour sack a rich find. Before I had been long in the district, I had a lesson in their poverty.

One morning in the dry season the fire alarm sounded. A grass-thatched hut in the village blazed and crackled while its owner and his family crouched near by in apathetic grief. Soon the hut was totally consumed.

Next morning among the reports on my desk was one which read: "Fire discovered

10 a. m. yesterday. House of Jean Bonhomme totally destroyed. Loss, $1.25." At first I thought the clerk had misplaced his decimal point, but the report proved correct.

Here is how the figure was arrived at: The cost of the hut was all labor cost, building material being obtainable free from the nearest mud bank or brush thicket. It took about six days' labor to build the house, labor in the Hinche district being priced at 15 cents a day. This brought the total to 90 cents. The remaining 35 cents was made up of furniture, household goods, and personal property.

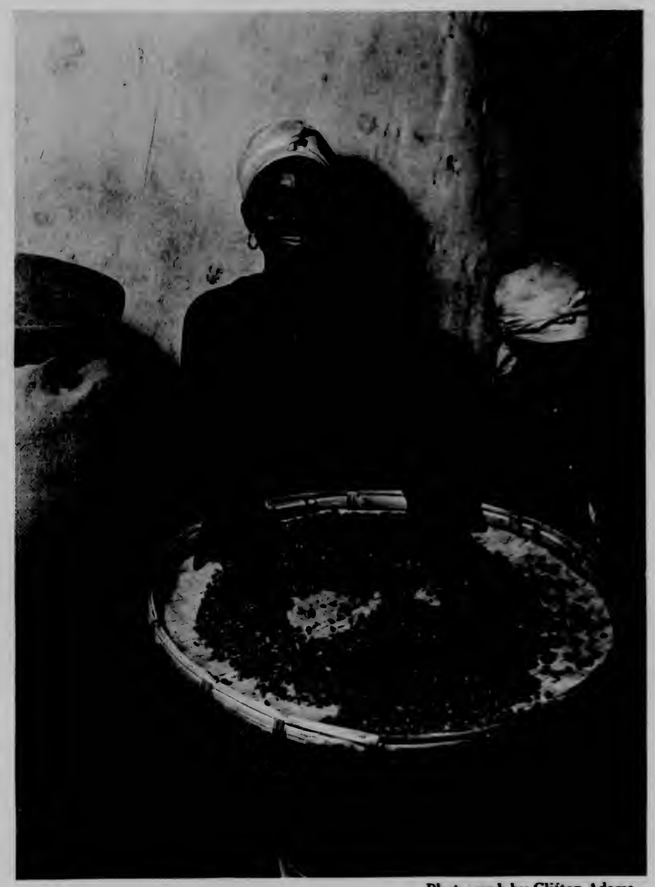
Sorry for the family's loss, I had the peasant call and presented him with all my loose change, amounting to about $1.50 American. He was overcome by the munificence of the gift and salaamed to the dust. Later, I heard that he bought himself quite a country estate with his new wealth.

One day a local wizard put a *wanga* on me. Wanga is an African word and means a voodoo spell. There are good and bad wangas and wangas to produce all imaginable results. Every white man and every native have wangas put on them from time to time. Natives take them seriously, but whites pay little attention to them. But there are cases on record of misfortunes following in strange series on the trails of those on whom a deadly wanga has been placed.

My wanga was a horse spell. It consisted of a plait of braided horsehair woven in curious fashion around a bit of leather cut from my stirrup strap. Strangely enough, shortly after I noticed the wanga, a horse ran away and my saddle turned over.

The voodoo was one of the outstanding facts in life in the Hinche district. The drums were never silent.

Despite its bizarre aspects, my life in Hinche comprised many pleasant features. When I met the natives on the trail, the men would touch their hats and the women would bow. Then they would say: "Bonjour, Papa Blanc." I always took pains to salute gravely in return and say: "Bonjour, mon fils," or "Bonjour, ma fille," as the case might be.



Photograph by Clifton Adams

GREEN COFFEE BERRIES ARE SPREAD ON FLAT PANNIERS AND DEFTLY SORTED BY SINGING NATIVES

Trained women and girls work in groups; some sit under sheds, some out in the open, and all do piecework. Often they sing what they call "meringues," which are extemporaneously intoned by a leader. When a stranger stops to watch them work, they immediately begin to sing about him, usually enjoying a laugh at his expense.

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The natives' lack of material wealth was almost beyond the comprehension of the inhabitant of a modern, civilized community. To them an empty tin can was a rare treasure and an empty flour sack a rich find. Before I had been long in the district, I had a lesson in their poverty.

One morning in the dry season the fire alarm sounded. A grass-thatched hut in the village blazed and crackled while its owner and his family crouched near by in apathetic grief. Soon the hut was totally consumed.

Next morning among the reports on my desk was one which read: "Fire discovered 10 a. m. yesterday. House of Jean Bonhomme totally destroyed. Loss, $1.25." At first I thought the clerk had misplaced his decimal point, but the report proved correct.

Here is how the figure was arrived at: The cost of the hut was all labor cost, building material being obtainable free from the nearest mud bank or brush thicket. It took about six days' labor to build the house, labor in the Hinche district being priced at 15 cents a day. This brought the total to 90 cents. The remaining 35 cents was made up of furniture, household goods, and personal property.

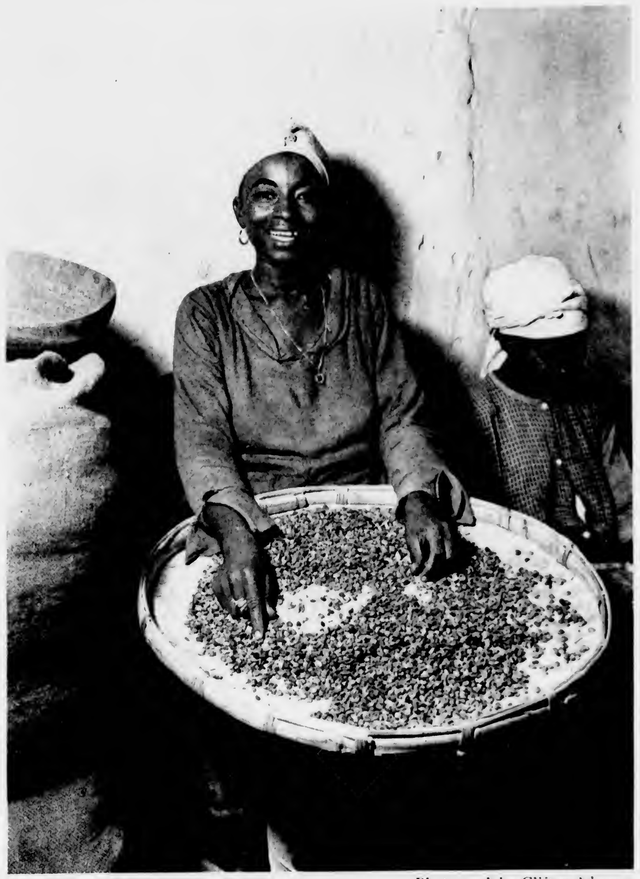
Sorry for the family's loss, I had the peasant call and presented him with all my loose change, amounting to about $1.50 American. He was overcome by the munificence of the gift and salaamed to the dust. Later, I heard that he bought himself quite a country estate with his new wealth.

One day a local wizard put a *wanga* on me. Wanga is an African word and means a voodoo spell. There are good and bad wangas and wangas to produce all imaginable results. Every white man and every native have wangas put on them from time to time. Natives take them seriously, but whites pay little attention to them. But there are cases on record of misfortunes following in strange series on the trails of those on whom a deadly wanga has been placed.

My wanga was a horse spell. It consisted of a plait of braided horsehair woven in curious fashion around a bit of leather cut from my stirrup strap. Strangely enough, shortly after I noticed the wanga, a horse ran away and my saddle turned over.

The voodoo was one of the outstanding facts in life in the Hinche district. The drums were never silent.

Despite its bizarre aspects, my life in Hinche comprised many pleasant features. When I met the natives on the trail, the men would touch their hats and the women would bow. Then they would say: "Bonjour, Papa Blanc." I always took pains to salute gravely in return and say: "Bonjour, mon fils," or "Bonjour, ma fille," as the case might be.



Photograph by Clifton Adams

GREEN COFFEE BERRIES ARE SPREAD ON FLAT PANNIERS AND DEFTLY SORTED BY SINGING NATIVES

Trained women and girls work in groups; some sit under sheds, some out in the open, and all do piecework. Often they sing what they call "meringues," which are extemporaneously intoned by a leader. When a stranger stops to watch them work, they immediately begin to sing about him, usually enjoying a laugh at his expense.

Photograph by Elizabeth R. Hibbs

LIFE IS JUST A MERRY-GO-ROUND FOR THE BOY ON THE CIRCLING POLE

Whip in one hand, cigarette or banana in the other, he shouts at the plodding ponies, while a primitive mill squeezes the juicy cane. In the background, juice boils to molasses, is skimmed, and boiled again for making brown sugar and rum. Refined sugar can be made only in the larger mills.

Photograph by Clifton Adams

WHO HAS A STRING? OR A ROPE? HOW ENDLESS IS MAN'S QUEST FOR SIMPLE THINGS!

Miles of stout, clean agave fiber, known to the trade as sisal, stripped and hung to dry before shipment from Haiti for manufacture into commercial cordage. In Yucatán, henequin, of the agave family, supplies much of the sisal that is made into twine and used to bind the United States wheat crop (see page 459).

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Official photograph, U. S. Navy

LOOKING UP THE COAST OVER CAP HAITIEN, CAPITAL OF THE ISLAND WHEN IT WAS A FRENCH COLONY

Until the French Revolution, Cap Haitien was accounted one of the most prosperous ports in the Western Hemisphere. Here General Leclerc landed with his army, to find yellow fever the chief enemy. To-day, with some 14,000 inhabitants, the city, sanitary and healthful, still trades in sugar, logwood, sisal, and pineapples (see text, page 454).

WHERE CASH IS SCARCE AND LABOR SO CHEAP, WHY BUY RICE MILLS?

Just lift the blunt stick and let it fall into the mortar hewn from a log. That hulls the rice. Winnow it then by shaking the pannier in the breeze, which blows all chaff away. Then pour the clean grain into the old oil can, and threshing is over—a process as old as rice growing.

Photographs by Clifton Adams

NATURE FURNISHES MUCH WILD FOOD, BUT THE HAITIAN MUST WORK TO PROCESS SOME OF IT

This man is grating manioc root to make cassava flour. In the basket are manioc roots, shaped like long, slim sweet potatoes. Besides being used in making bread, the cassava flour is also converted into starch and serves for laundering white clothes.

MAHOGANY CASH IS SCARCE AND LABOR SO CHEAP, MANY IDLE HANDS ARE NOT BUSY

Here the timber cycle, used to cut logs into the master beam of the little boats the men. Mahogany at that is shedding the pumps in the streets, where cash is dear and labor cheap. The people the ocean grain into the cash of cane, and discourage it over. Exposure. It sold on the cinnamon.

NATIVE LENDSHIPS MEET WITH LOOSE BUT THE HARDY MEN AT WORK TO PRODUCE MORE OF IT

The world's richest peoples look to only a few things. In the Negro is known people. Beyond the sea, they produce. In the Negro, used in tobacco bread, the cocoa, about a mile, temperate and the humidity, the tropic.

LOOKING UP THE COAST OVER CAP HAITIEN, CAPITAL OF THE ISLAND WHEN IT WAS A FRENCH COLONY

Obtain photograph, F. S. Nay

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Then there were my prisoner "house boys," from the local penitentiary. They cleaned up the public grounds and property around my house; also they loved to squat in my back yard and converse, in between begging scraps from Destiné's kitchen. Nobody guarded them; there was no need. Prisoners in Hinche didn't want to run away from jail; they wanted to stay where they were well off. I formed the habit of sitting for a while each day, after lunch, under a big tree to listen to them. They held great councils, mostly, I imagine, for my benefit. Destiné used to stand behind my chair and give me a free translation of what went on.

JAIL POPULAR WITH THE NATIVES

The head "boy" of the group was a white-haired patriarch named Ali. In the pre-American days he was a caco chief. I earned his undying gratitude by keeping him from being put out of jail. Prior to the arrival of the Americans there had been no jail, and when the first penitentiary was opened there was considerable local prejudice against sojourning there.

Later this changed. It was found that the whites didn't do anything terrible to the prisoners. In fact, they did nothing at all except give them three square meals a day and a clean, comfortable straw mat on which to sleep under a rainproof roof. The natives thought all whites were crazy. This was regarded as convincing proof. Soon the peasants became convinced that life in jail was much more comfortable and desirable than freedom, and eventually the penitentiary acquired a waiting list.

The trouble with Ali was that his sentence had expired. He didn't understand this. The gap between his comprehension and my ability to explain was so wide that I never succeeded in making it clear to him. He only knew that in the beginning he hadn't wanted to go to jail, but the gendarmes had brought him there by force.

Now that he was really beginning to like the place, they wanted to throw him out. I fixed the matter up by getting his sentence extended as a special favor.

One day word came to me that the period of my tour of duty at Hinche had expired, and I was summoned to Port-au-Prince for service in the metropolis.

The capital had undergone many changes since my first visit. More than a dozen years had elapsed, and the American Marines had been in control for ten of them. There had been no revolutions, no riots, no fires of any consequence. U. S. Navy doctors had effected startling changes in the health of the city. Epidemic diseases had been stamped out. A germ-free water supply had been provided. It was said that even malaria, the ever-present scourge of the Tropics, had been banished from the city limits.

American Navy engineers had remodeled the city. Public parks had been cleaned up and beautified. An elaborate program of public works had studded the streets of the official section of the town with gleaming white public buildings. Swamps had been drained and filled in, sewage disposed of in a sanitary manner.

Taking advantage of the new security to provide residences for the officers of the Occupation and those of the Marine Brigade, local capitalists had engineered a building boom. The fashionable residence sections of Bois Verna and Turgeau, on the hills above the lower town, had multiplied in extent.

It was computed that the Occupation brought more than a million American dollars to be spent in Haiti each year, and a large portion of it found its way into the pockets of landlords and tradesmen of the capital city. The city showed the effect of this stream of alien gold. It was a tropical Spotless Town.

In due time I arrived in Port-au-Prince and found a home, a lovely villa outside the business section of the city, in the hills to the south. It had been the seat of a French colonial family and was still known to the natives by their name, as the Habitation Martissant.

The house was a two-story wooden structure, raised on the foundations of the old colonial mansion. Its wide-spreading veranda overlooked the bay of Port-au-Prince from an altitude of some 600 feet, while its rear backed up against towering mountains which rose steeply almost from the garden wall.

In the daytime brisk sea breezes fanned its front, and at night cold air from the mountains rushed through its chambers and bedrooms, making a blanket necessary even in the hottest season.

From my front doorstep an avenue of gorgeous royal palms ran down a steep grade to the Bizoton Road, a quarter of a mile below. Oranges bloomed in the garden, mangoes came and went with the summer season, avocados flourished in profusion.

Photograph by Capt. Albert W. Stevens

LOFTY RUINS OF SANS SOUCI PALACE ATTEST THE VAULTING AMBITION OF AUDACIOUS CHRISTOPHE

Fantastic in his dreams of empire, the monarch amazed the world when at the zenith of his power he erected this architectural marvel high up in Haiti's mountain wilderness. Here he held his glittering court and other royal ceremonies in the large palace (left center). Circular ruins in the lower left corner are remains of the king's private theater. In the center area, "where once the garden smiled, still many a garden flower grows wild" (see text, page 463).

The hibiscus, poinsettia, and bougainvillea spread their luxuriance. A Haitian friend and I once counted more than 70 different varieties of tropical fruits, shrubs, and flowers. The Martissant family had been noted for their love of plants, and these were what remained of the paradise they had created here before the slave revolution.

It was pleasant to sit on the veranda in the afternoon, when the setting sun hung round and red over blue Gonâve Island, in the distance, and the city, like a map, lay unrolled at one's feet (see page 459).

A HAITIAN INAUGURAL, NEW STYLE

The town began at the edge of the sparkling waters of the bay. From above, it appeared somewhat the shape of a thick crescent moon with the concave side toward the sea. About the middle of the crescent the wharf jutted out like a thick cigar from the mouth of a man in the moon.

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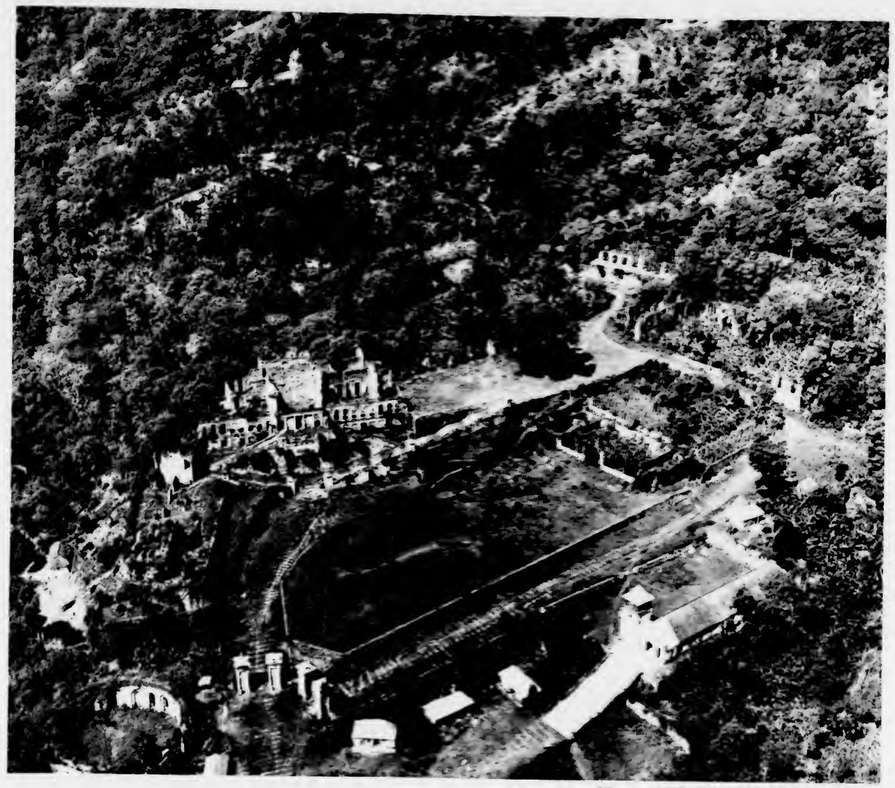

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HIGH ON THE RANGE (IN THE UPPER CENTER BACKGROUND) STANDS THE HISTORIC CITADEL OF CHRISTOPHE

With its thick walls, gun chambers, parapets, and dungeons, this giant isolated fortress is one of the most remarkable ruins in the Western World. It was built by the ex-slave waiter, Christophe, a Negro who was crowned king and diplomatically recognized by Europe. The vast structure is deserted now (see text, page 456, and Plates I and V).

Photograph by Clifton Adams

TOOTING AND THUMPING ON CRUDE INSTRUMENTS OF JUNGLE ORIGIN

Only native "music"—no tunes as we know them—is played on these bamboo horns. Drums of "voodoo" type are held between the knees and played by being beaten and rubbed with the hands. Before the girl on the right a male dancer will presently appear, holding a coin in his mouth. Unless he can give a satisfactory imitation of her dance, she takes the coin.

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SALT SCRAPED UP IN PILES WHERE SEA WATER HAS BEEN EVAPORATED

These ponds, at the mouth of the Artibonite River, and those near Fort Liberté and elsewhere, supply common salt to the people. Burros and boats carry it away in sacks and baskets.

to render disturbance impossible. Training schedules were prepared, all leave was canceled, and officers worked day and night to bring their commands to the highest possible state of proficiency. The election came and went with virtually no disorder.

About a month after the voting came the inauguration ceremonies. The world was treated to the spectacle of a Haitian president taking his seat in peace, at the legally appointed time, as the result of an election conducted in accordance with the laws of his country. This was in May, 1926. The like had happened only once before in history, in 1922, when Mr. Louis Borno succeeded Mr. Sudre Dartiguenave, first president under the American Occupation.

TAKING THE ARMY TO CHURCH

Both the incoming and the outgoing president were present on that occasion and both were alive and reasonably happy. Now Mr. Borno was succeeding himself legally and in peace, after a full and peaceful constitutional term.

My part in the ceremonies was not exciting, but interesting. I took the Army to church for the service held in honor of the occasion. This was a survival of an old custom. In former days Haitian presidents always took the army to church. When the ruler was at his devotions was a favorite time for adversaries to start a revolution. So it became the custom to keep the Army handy. Any president who failed to do so was likely to find that he was no longer president when he emerged from the doors of the sacred edifice.

Our battalion formed at the barracks and, headed by its flags and the palace band, marched to the Cathedral. This huge white structure, one of the most imposing buildings in the West Indies, faces toward the bay, and across its front is a wide concrete driveway from which half a dozen steps lead to a stately portico before the main entrance. Directly in front stands the famous Iron Market (see Color Plate VI) and around it is the heart of old Port-au-Prince.

We lined up our battalion of khaki-clad gendarmes facing the Cathedral. In their center were the National Colors with their color guard, and to the right the band, ready to render musical honors to the President and to visiting dignitaries.

Photograph by Clifton Adams

BAKING CASSAVA CAKES ON A PIECE OF SHEET IRON AT PÉTIONVILLE

First a manioc root is grated and all poison washed and squeezed out. Then the fine white flour is made into pancakes. Cassava forms a staple item in Haiti's diet.

Ornate equipages drove up. Dignitaries descended from them and made their way up the steps of the Cathedral. Other throngs of spectators arrived on foot. Droves of school children came, their stiffly starched white robes contrasting with their excited dusky faces. A troop of Haitian Boy Scouts arrived in khaki shorts.

The Cathedral began to fill up and the throngs, awaiting the arrival of the President, began to press against the ropes that separated the driveway from the spaces marked off for the public. At last came a rattle and a clatter of hoofs and a dozen aides-de-camp cantered up on horseback, escorting the presidential automobile.

Troopers took the horses and the aides climbed the steps to attend their chief. The car halted and the President descended. With measured tread he mounted the stone steps, faced about, and removed his hat. At the signal, the colors of my gendarme battalion, now directly in front of him, were raised in salute and the battalion presented arms. The band struck up the presidential march, followed immediately by the Haitian national anthem, "The Dessalinien."

As the last bar of the music died away came the deep boom of the first gun of a national salute. It was a striking ceremony.

As I stood rigidly, with my gleaming saber held at attention, I could not help thinking of other days. Now my dependable, American-trained battalion stood stolidly in immaculate lines, admired by well-dressed, prosperous-looking citizens, while the Chief of State safely went about his devotions.

Had anyone suggested to the participants that the soldiers might soon assassinate the President or begin to massacre the spectators, he would have been thought insane. It was different in the old days.

At the Fête Dieu, for example, May 28, 1891, when President Hippolyte was in church, a revolution broke out. Troops mutinied, and there was a bloody battle. But the President got the upper hand, and for hours led his regiments through the streets, shooting all he chanced to meet. A little park near the Palace was stacked with corpses piled like cordwood. I wondered if savage old Hippolyte could see us and note the changes time had wrought.

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Retake of Preceding Frame

Then we took our troops home for lunch. Other festivities were scheduled for the afternoon.

GAYETY AT THE PALACE

The Presidential Palace stirred with animation, for this was a great day on its calendar. Its white bulk, silhouetted against the heaven-climbing mountains, made a lovely picture. Like most things in Port-au-Prince, the Palace is a copy of something French, the Petit Palais of the Champs Elysées being its model. It is one of the most impressive buildings in the West Indies, yet one is never able to repress a start at its Franco-Greek façade cast against palm-sprinkled hills, on which drums beat in perpetual staccato (see page 437).

Gay streamers of bunting decorated the front of the building. On a balcony the President and his Cabinet, with their ladies, were assembled. Other balconies and windows were crowded with guests.

A battalion of gendarmes, with their American officers, led by their band and colors, passed in formal review to do honor to the Chief of State and the Haitian flag, which flew at its masthead over his head.

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Slowly the guests arrived, filling the spacious chamber. Here were blond Americans in spotless white uniforms with gleaming gold buttons and ornaments. Here were phlegmatic Englishmen, excitable Frenchmen, traders of every nationality. Here were Haitian statesmen and diplomats of every shade and coloring, in frock coats, many of them with ribbons of the orders of many courts of Europe gleaming on their shirt fronts.

BEAUTIES OF EVERY TYPE AND COLOR

There were beautiful women, blond and golden, copper and ebony mingled together, clothed in the latest creations of Worth and Paquin, with masterpieces of jewelry from the shops of the Rue de la Paix gleaming on their persons. Here fair foreign women from the snows of the North mingled with the lively *filles de couleur* of the Indies, famed for beauty from time out of mind. Here griffe (black, with a small amount of white blood), quarteronne (quadroon), and métisse mingled with mulâtresse and maraboute. Forms tall, erect, graceful; hands and feet long and shapely; faces about which a sculptor might dream.

A stately man in his middle fifties, Mr. Borno stood in the receiving line to welcome his guests. About middle height, with the face of a student, aquiline nose, and gray-brown eyes, he looked every inch a potentate, and might easily have been mistaken for an Italian or a native of the south of France. A celebrated international lawyer and an able statesman, Mr. Borno was an admirer of Mussolini and endeavored to adapt the Duce's doctrines, so far as was possible, to the needs of the Haitian State. This had advantages and defects. However that may be, he labored earnestly for the advancement of his country.

THE HAITIAN "NIGHT STICK"

As time went on, I was made Chief of Police of Port-au-Prince. Under my command were more than 200 gendarmes, selected for their intelligence and good records. Their duty was to maintain patrol systems and supervision within the city, much in the manner of police forces the world over. My policemen, being regularly enlisted gendarmes, had rifles and bayonets, but they did not carry them, except occasionally on parade. For police duty they

IN HAITI HE LAUGHS LAST WHOSE FIGHTING COCK WINS THE MONEY

Photographs by Clifton Adams

"I BET TEN GOURDES MY RED ONE WHIPS YOUR BLACK ONE!"

No metal spurs are used here. Native rooster-fighting fans file the cock's spurs sharp. Fowls that fall in battle are taken home and cooked. This Sunday morning cockpit scene was near the town of Thor.

Then we took our troops home for lunch. Other festivities were scheduled for the afternoon.

GAYETY AT THE PALACE

The Presidential Palace stirred with animation, for this was a great day on its calendar. Its white bulk, silhouetted against the heaven-climbing mountains, made a lovely picture. Like most things in Port-au-Prince, the Palace is a copy of something French, the Petit Palais of the Champs Elysées being its model. It is one of the most impressive buildings in the West Indies, yet one is never able to repress a start at its Franco-Greek façade cast against palm-sprinkled hills, on which drums beat in perpetual staccato (see page 437).

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Retake of Preceding Frame

went equipped with revolvers and *cocomacaques*.

The cocomacaque was a peculiarly Haitian institution. I met it when inspecting my first squad of policemen. The corporal carried what looked like an exaggerated walking stick. I examined it with respect. It seemed a fearful bludgeon, perhaps three feet long by two inches in diameter. Polished with oil until it took on the shine and color of ripe bananas, it was a beautiful thing. The wood seemed as hard as iron and was encircled by a succession of concentric rings, with a thick knot at the business end.

These clubs served the purpose of night sticks in American communities. I learned that the word meant "monkey coconut tree," and that the sticks were made from a species of dwarf coconut palm bearing coconuts the size of almonds.

The cocomacaque occupies a classic position in Haitian annals. Following the uprising of the slaves and the attainment of independence, it became unlawful to beat any Haitian with a whip or club, these being reminiscent of slavery.

But the new chiefs of the Haitian State felt it necessary to have something with which to inflict corporal punishment on their subjects; so Dessalines, the first emperor-president, discovered the cocomacaque. This, he decided, would inflict the maximum physical punishment with the minimum of indignity to the spirit of the new freemen.

THE AMERICAN OCCUPATION OF HAITI

As Chief of Police of Haiti's capital, I acquired functions in a number of fields of civil government and came much in contact with the remarkable organization which the United States had created under the designation of the American Occupation. The United States was endeavoring to do in Haiti something entirely new in the annals of the world. Other nations had annexed colonies, but here was a powerful nation occupying the territory of a small country by military force for the sole purpose of bringing to the weaker nation civilization and order, blessings which, in reality, Haiti would have been entirely content to get along without.

No precedents existed and the United States had evolved an organization by a series of steps as necessity arose. In the beginning there were errors; misunderstandings abounded on both sides. American authority was hopelessly divided among a number of coequal officials.

Matters came to a head after the so-called Caco Rebellion of 1919-20. A reorganization was imperative. Experts, including Dr. Carl Kelsey, of the University of Pennsylvania, visited Haiti. Brig. Gen. George Richards, Paymaster of the Marine Corps, at the instance of the United States State Department, made a study of the situation. A commission from the United States Senate conducted hearings in Port-au-Prince. As a result of recommendations, the machinery of the American Occupation was redesigned, with a High Commissioner, appointed by the President of the United States, as its supreme head. From his decision there was no appeal.

The first American High Commissioner was John H. Russell, then Brigadier General, now Commandant, of the Marine Corps. In addition to his military position he had the rank of Envoy Extraordinary and Minister Plenipotentiary. With this new organization under a unified control, a new phase of the march of Haiti toward modernity and civilization began. It is impossible to give to General Russell too much credit for his share in the work that followed. Under his administration, for the first time Haiti was given the benefit of intelligent, long-time planning in the development of her national affairs, and a government which could formulate progressive policies and execute them with untiring efficiency and rigorous probity.

Under General Russell were American treaty officials having to do with different departments of the public administration—Finance, Public Order, Public Works, Public Health, and the like. They remade the Haitian State from its foundations upward.

The Department of Finance in particular accomplished results far and away beyond what had been expected or hoped. Plunging into the obscure mazes of pre-American finances, the Yankee accountants ascertained for the first time in history just how much the Haitian Government owed, both to foreign creditors and to her own citizens.

Much of the Haitian debt was held in France. When the franc was at nearly its lowest ebb, the debt was refinanced with a loan from the United States, thus at a

Scientific Monthly, Sept. 1928

RACE CROSSING IN JAMAICA[1]

By Dr. C. B. DAVENPORT

DIRECTOR, DEPARTMENT OF GENETICS, CARNEGIE INSTITUTION OF WASHINGTON

As one travels over the world one sees that the people who inhabit its different parts differ. Thus one gets the notion that the world is inhabited by different races.

An attempt to define "race," however, is fraught with many difficulties. The difficulties are diminished by accepting the definition of students of genetics, which is as follows: A race is a group of individuals constituting a subdivision of the species characterized by the possession of some one distinctive hereditary trait. Thus, from this point of view, a blue-eyed Swede belongs to a different race from a dark-eyed Italian or even from a dark-eyed though blond-haired Swede, since eye color is an inherited trait.

Race connotes, however, a *group* of individuals having at least one and the same differential, hereditary trait. A century or two ago such human groups were found in different parts of the world fairly sharply marked off from each other. The Congo region was characterized by a group of persons with black skin, broad nose, closely coiled hair which marked them off from the Scandinavians with slightly pigmented skin, blue eyes, narrow nose and straight hair; also from the yellow-skinned, black-eyed Chinese with their small, almost bridgeless noses and from the inhabitants of the Hawaiian Islands, of great stature, light, but easily bronzed skin, wavy hair and high-bridged nose.

To-day, things are much changed. Into the Hawaiian Islands, for example, have been brought Chinese, Japanese, Filipinos, Portuguese, English and other races, who have intermingled with the Polynesians until pure-blooded representatives of the latter are becoming scarce. The race of North American Indians has for three centuries been in contact with European stocks and in these United States few of them are left of pure blood. Central Africa is being penetrated by Europeans, as it has been for centuries by Arabians and Jews, and it will be only a few score years before pure representatives of the Negro race also will be hard to find. The Negroes which were imported to the Americas have largely hybridized with the whites and Indians. The standard races of mankind are rapidly disintegrating. For race implies a certain amount of isolation under cover of which it can develop, but in these days of rapid transportation to all parts of the globe isolation is no longer possible.

Those who look to the future are naturally concerned with the question: What is to be the consequence of this racial intermingling? Especially we of the white race, proud of its achievement in the past, are eagerly questioning the consequences of mixing our blood with that of other races who have made less advancement in science and the arts. Is it possible to predict the consequences of such racial intermingling? Is there any reason for thinking that hybridization, such as is going on even among the races of Europe, leads to an inferiority of the offspring?

To-day, as never before, we are in a position to make investigations that may throw light upon this subject. First, because racial intermingling is so widely occurring and, secondly, because the technique of the study of race crossing has been worked out by the geneticists,

[1] Address delivered in April, 1928, at the Carnegie Institution of Washington, Washington, D. C.

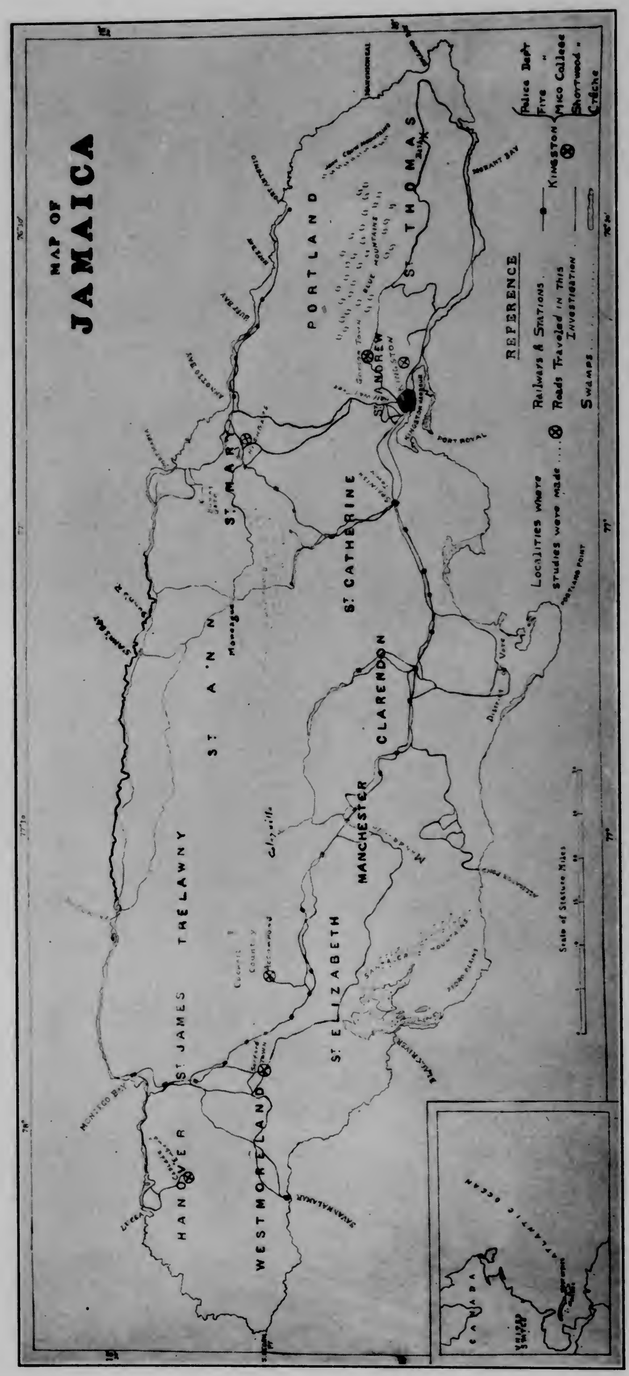


FIG. 1. MAP OF JAMAICA
SHOWING PLACES WHERE POPULATION WAS EXAMINED.

FIG. 2. a, b, NEGRO FACES; c, FACE OF A BROWN (MULATTO)

proceeding along experimental lines. The unexampled progress in the study of heredity in the last twenty-five years is due to systematic experiments in crossing of distinct races and studying the distribution of the racial traits in the first, second, third and later generations following the cross.

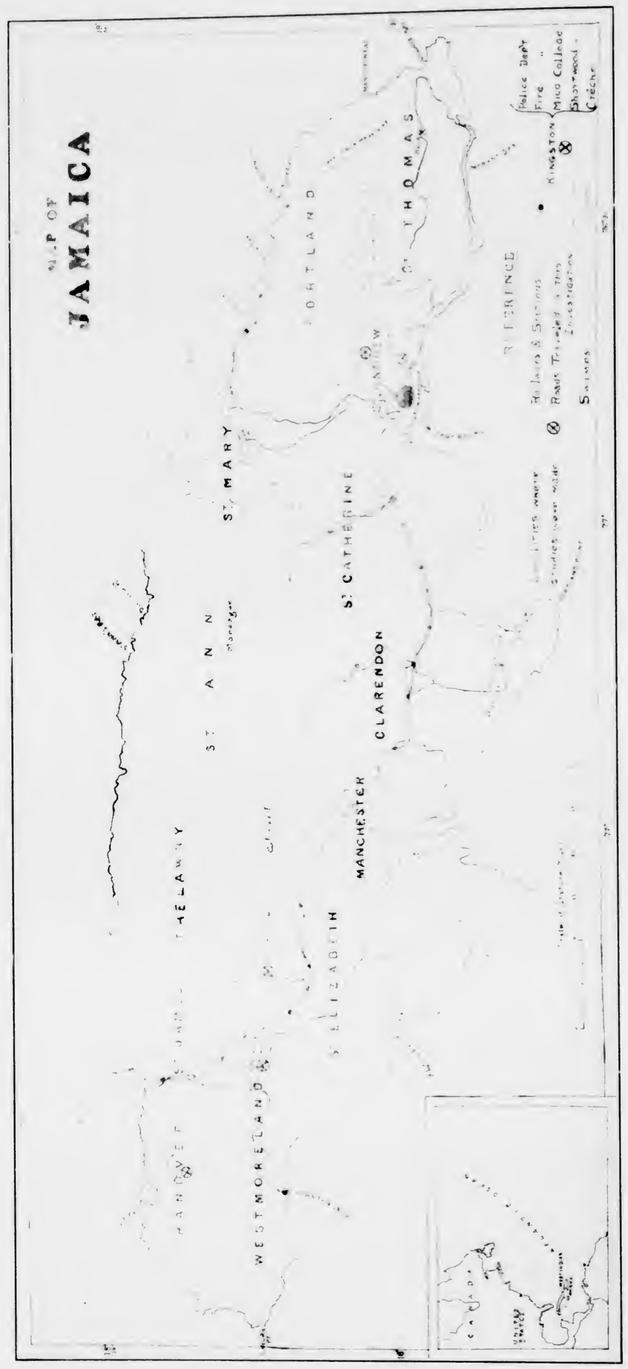
Genetical experimentation in hybridization has revealed several general principles. One is the fact that the inheritable traits do not ordinarily permanently blend in the offspring, but some of them tend to recur in their pristine purity in later generations. The principle of segregation of traits has become well established. It is recognized, however, that such segregation is the more obvious and the more complete the simpler the genetic constitution of the trait in question. If the trait is composite, composed of two or more elements, then segregation is less clear and the course of inheritance is, in general, complicated and sometimes "blending."

Another principle that has been established is that of heterosis or the hybrid vigor observed in the first generation in the offspring of a hybrid mating. This is best seen in the first generation, but its consequences are found scattered among individuals in later generations. A familiar example of such hybrid vigor is the mule, which is more vigorous than either of the parental species involved.

Still another principle observed in some cases is that of diminished efficiency of certain hybrids, owing to a conflict of instincts. Such dog-hybrids as that resulting from a cross between a collie and a terrier, or hybrids of poultry between an egg-laying and a periodically broody strain are of little value. In these cases the hybrids have lost the remarkable and valuable sets of instincts that have been built up through generations of careful breeding and are markedly inferior to either of the highly bred parental stocks.

In order to make a comparative study of the efficiency of a hybrid race and the two parental stocks from which it was derived the Carnegie Institution of Washington accepted a gift made to it and undertook a study of the topic of Negro-white crosses in the island of Jamaica, British West Indies.

The island of Jamaica (Fig. 1) is particularly well adapted to such a study, partly because there still exists a fair proportion of pure-blooded representatives of both the white and the Negro races, as well as a large number of hybrids between these races. The population speaks English and is socially so well organized as to be readily accessible



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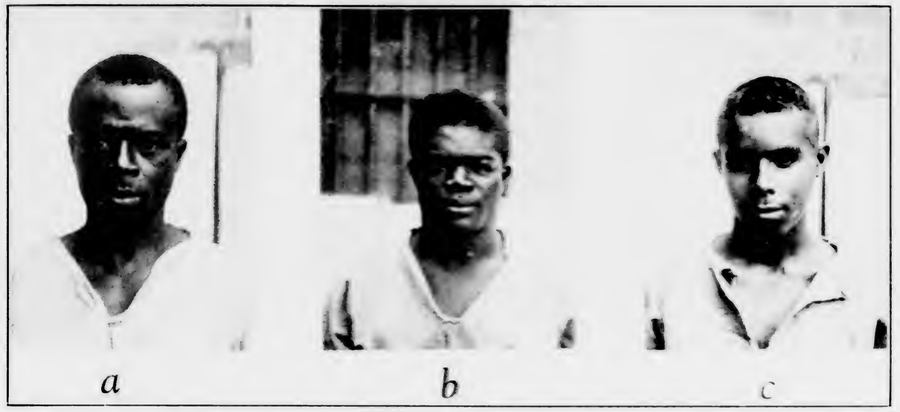

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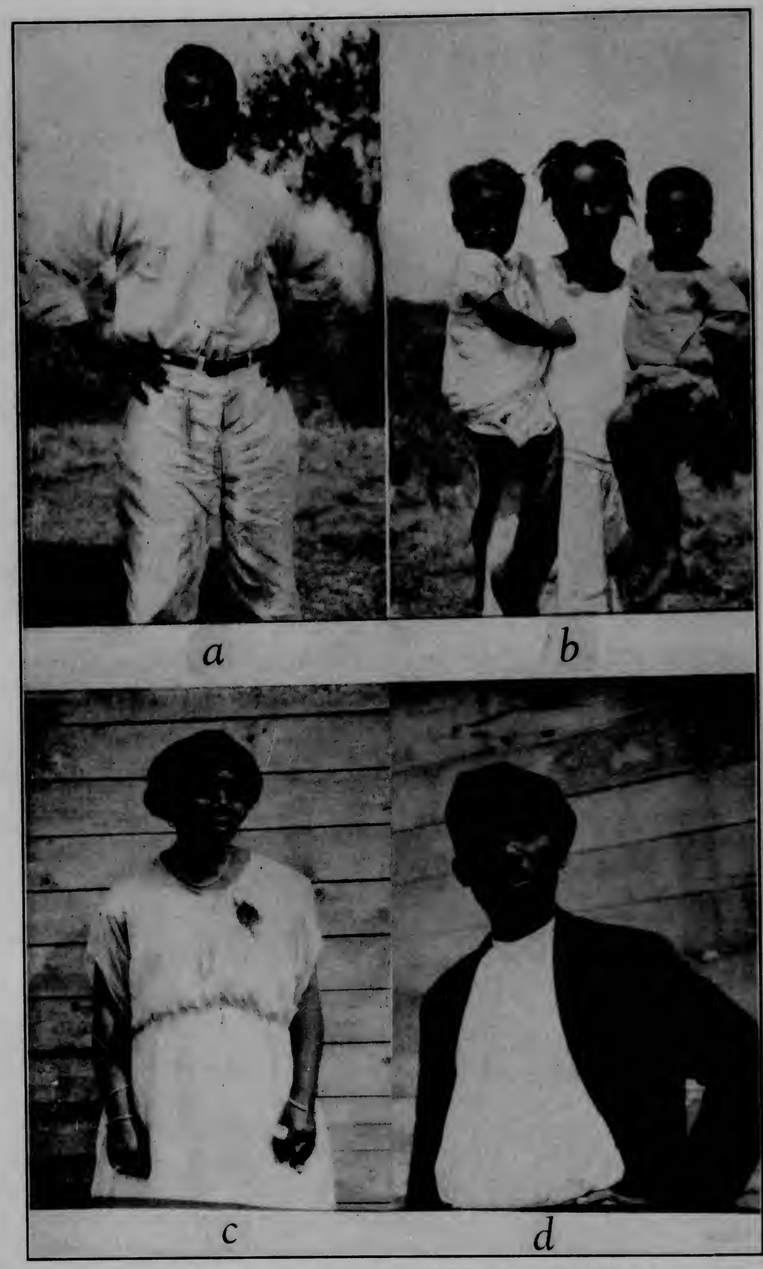

FIG. 3. a and b, BLACK MAN AND WOMAN
FROM THE MAROON TOWN OF ACCOMPONG. NOTE FACIAL FEATURES, HAIR, DISTANCE BETWEEN EYES.

c and d, BLACK MAN AND WOMAN
OF GORDON-TOWN, AN AGRICULTURAL COMMUNITY NEAR JAMAICA.

FIG. 4. EXAMPLES OF THE WHITE POPULATION OF SEAFORD TOWN
a, b, MAN AND WIFE. NOTE SHORT INTEROCULAR DISTANCE, LONG NARROW NOSE. c, SON OF MAN AND WIFE, ABOVE. d, e, SISTERS, SHOWING RESEMBLANCE CHARACTERISTIC OF AN INBRED COMMUNITY.

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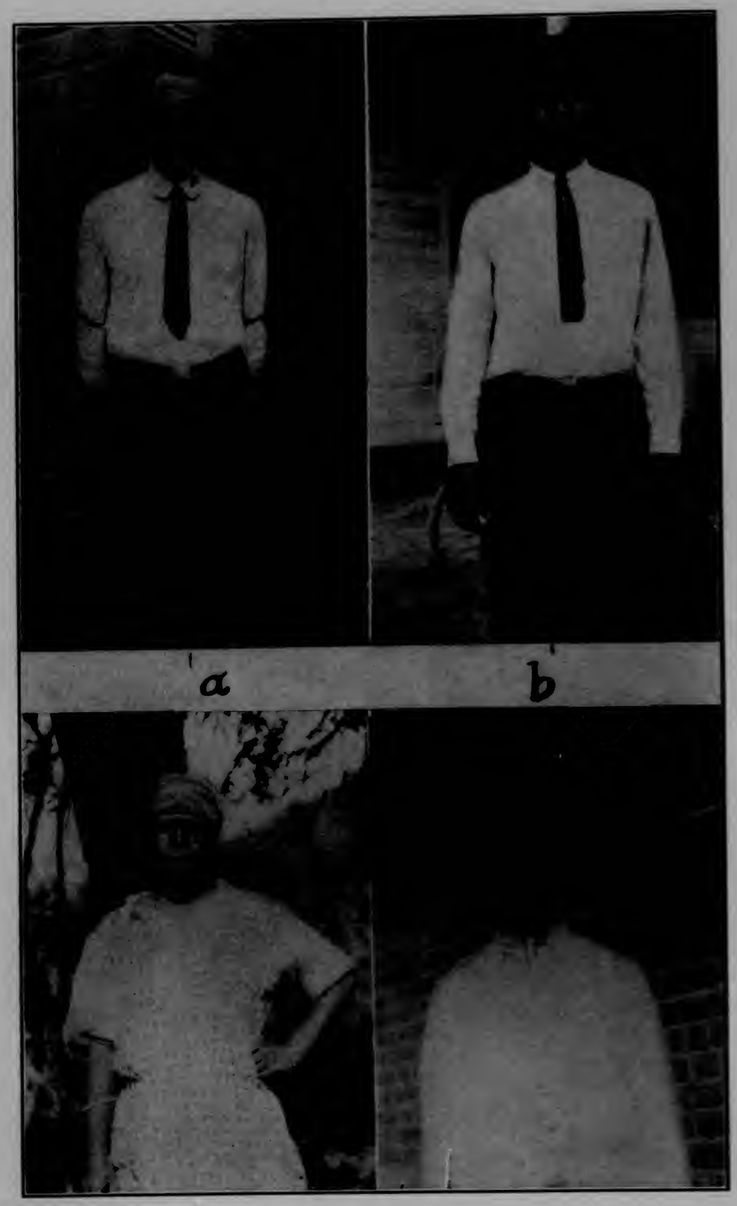

FIG. 5. a, b, TWO GRAND CAYMAN ISLANDERS
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to the investigation. We were fortunate in being able to put the work of collecting data into the hands of Mr. Morris Steggerda, who proved himself excellently fitted for the work. To carry out the program of the committee in charge of the investigation it was necessary to study carefully one hundred full-blooded Negroes—male and female—called hereafter "Blacks"; one hundred white people and one hundred mixtures between the two races—whom we may call Browns. To make the two groups comparable it was necessary to take them, as far as possible, from the same social stratum.

It was fairly easy to find full-blooded Blacks, especially in the so-called Maroon towns, such as Accompong in the West (Figs. 1; 3, a, b), to which the Negro slaves retreated many generations ago when the English seized the island from the Spanish. Many are found in farming communities of the island whose whole appearance supports their contention that they are of pure African stock (Fig. 2, c, d).

It was much more difficult to find persons of unmixed white stock living as agriculturalists in an island composed of 98 per cent. colored persons. Fortunately for our study, there is a group of Germans whose ancestors were brought to this island about four or five generations ago and which is now living at Seaford Town in the west center. This is an isolated white community, who have carefully preserved their genealogical records (Fig. 4).

But we were not able to get enough adult whites at Seaford Town, and so studies were made at Grand Cayman Island, a two days' sail to the westward of Jamaica. Here is a group of whites of English stock, rather taller than the German folk of Seaford Town (Fig. 5, a, b).

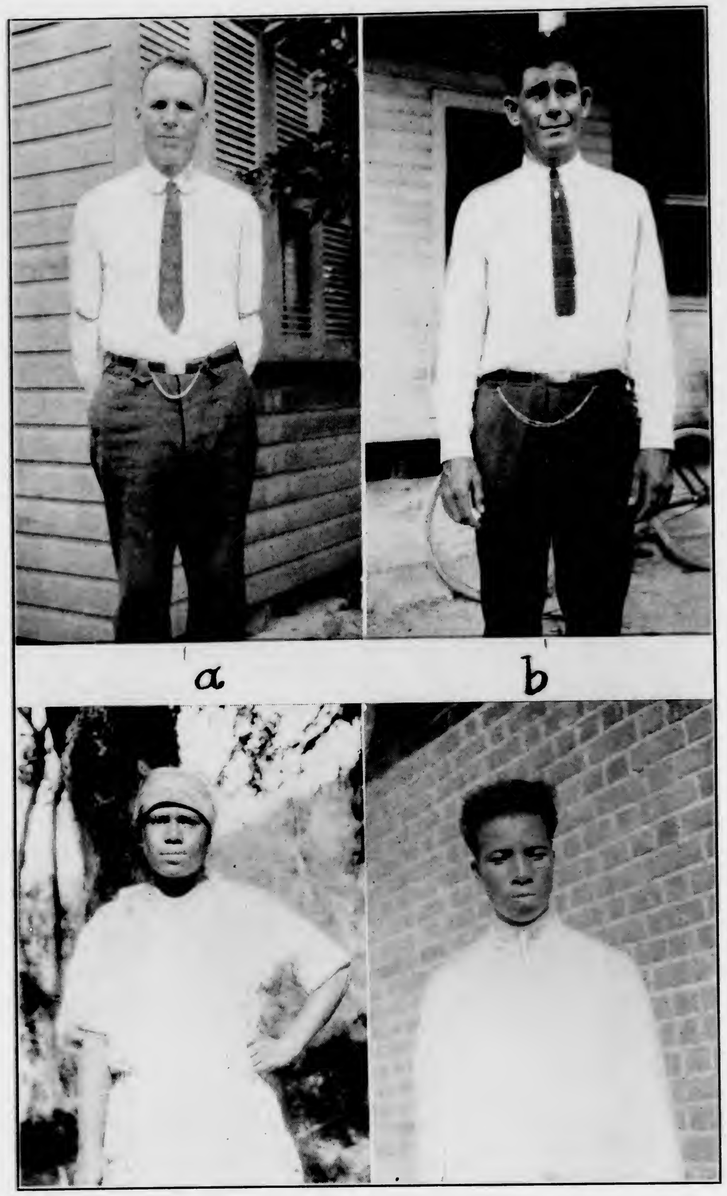
Brown (or hybrid) people it was easy to get in the required number. Some of these were agriculturalists at Gordon Town near Kingston (St. Andrew) and elsewhere (Fig. 5, c). Rather more than were desirable were studied at the training schools for teachers—both those for men and those for women—for these brought into the statistics a lot of non-agricultural people (Fig. 5, d).

Studies were made also on children; both babies at the creches, or day nurseries in Kingston, and school children from eight to sixteen years of age. The open-air schools that abound in the island offered good shelter and excellent light for the measurements and tests.

The results of this study have now been brought together.

One of the first questions raised in the study of race mixtures is that of variability. This question is of particular interest at the present moment through the circumstance that Dr. M. J. Herskovits, who has studied many Negroes in the United States, has reached the conclusion that they show a reduced variability, as compared with the white. This is opposed to the expectation, based upon genetical experimentation, that in the second hybrid generation there is increased variability. This increased variability is found, however, only when the original races are of very pure stock. Also, the increased variability is found just in those traits in which the original stocks differ. Moreover, if there are many of such dissimilar traits, the hybrids may differ from each other in presenting new combinations of such traits.

As stated, Herskovits has found that the Negro mixtures are not, in general, highly variable. For example, he has shown that they are not more, but less, variable in stature than a lot of whites measured in different parts of the country. This, however, is not to be wondered at because, on the average, the Negroes and the whites of the United States have the same stature. Variability comes about when the racial traits differ by at least one gene. Under those circumstances the offspring may



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possess, or lack, the gene and, accordingly, may possess, or lack, the trait whose development depends on that gene. Now there is no reason for supposing that there is any difference in the genes that are responsible for the stature of the average white and the average Negro, or if there are differences in the genes they do not affect stature as a whole but merely elements which go to its make-up. In studying variability of hybrids we must focus attention upon traits in which the original races differ by one or more genes.

Gene differences between races are recognized as such partly by an important difference in mean size of the trait and partly by the behavior of the trait in hybridization. If we consider the breadth of the nose we have a trait which is genetically different in the white and Negro races. The hybrids have a nose which is intermediate in breadth (Fig. 2, c) and in later generations, indeed, in a mixed Negro population, we find a very great variability in nose breadth, as shown in Table A. An examination of this table shows that the variability of the browns, as the hybrids are called, is distinctly greater than that of the whites and blacks, as the coefficient of variability which is used as a measure of such variability shows. There are no broad-nosed whites and no narrow-nosed blacks, but the browns range all the way from narrow noses to broad noses.

TABLE A

PROPORTIONAL DISTRIBUTIONS OF NASAL BREADTH IN THE THREE GROUPS

The different classes of nose width are given in the first column; in the successive column, left to right, the proportion of each racial group that has a nose of the class of width named in left hand column

Class mm	Whites percentage	Browns percentage	Blacks percentage
30–32	16.0	.....	.....
33–35	48.0	1.1	.....
36–38	26.0	9.7	.....
39–41	10.0	26.9	5.9
42–44	.....	35.5	23.5
45–47	.....	18.3	45.1
48–50	.....	1.5	21.6
51–53	.....	1.1	3.9
Mean and probable error	34.90 ± 0.24	42.61 ± 0.24	45.82 ± 0.26
Standard deviation and probable error	2.56 ± 0.17	3.44 ± 0.17	2.75 ± 0.18

Another distinguishing genetical trait is that of form of the hair, as measured by the diameter of the curl. This is, as every one knows, very small in the case of the Negroes (Fig. 2, a); very great in the case of the whites, a large proportion of whom, indeed, have no measurable curl in the hair. The browns are intermediate in respect to hair form (Fig. 5, d). The variability of this hair form, as measured by the coefficient of variation, is seen to be 50 per cent. greater in the blacks than in the whites.

Similarly, in skin color the offspring of two mulatto parents may run the whole gamut from a white skin to an ebony black, like that of the Negro ancestor. The range in variation of skin color in such hybrids is, indeed, very great.

We conclude, accordingly, that in human hybrids, as in other animal hybrids, variability of the hybrids is a widespread phenomenon, especially that those traits that are different in the parental stocks vary in the descendants. In those cases where such extraordinary variability is not found in the hybrids the conclusion is supported that the parental stocks were not themselves pure, or else that the trait depends upon a large number of genes, or that there has been selective mating, tending to eliminate variability.

We have studied about thirty physical traits in the three groups. In some of these the Negroes and whites differ so greatly that it is quite certain that distinct genes are involved. Thus the races differ in length of arm-span and leg (Fig. 6), which are both greater in the

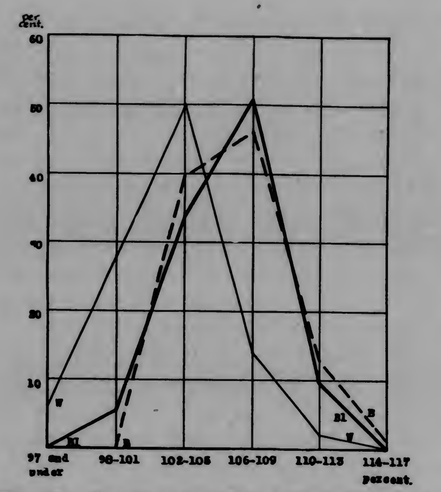

FIG. 6. GRAPHS SHOWING DISTRIBUTIONS OF SPAN ÷ STATURE FOR MALE WHITES (FINE LINE), BROWNS (BROKEN LINE) AND BLACKS (HEAVY, CONTINUOUS LINE). NOTE THE RELATIVELY SHORT ARMS OF THE WHITES. THE BROWN CURVE HAS A BROAD PEAK, COVERING BOTH PEAKS OF THE PURER RACES.

Negro than in the white. The breadth of the pelvis (Fig. 7) is much less in the Negro. The lower arm constitutes a relatively greater fraction of the entire arm in the Negro. The Negro's head is longer, but not broader or higher. The distance between the pupils is much greater than in the whites (Fig. 3, d). The feet and hands are longer in the blacks. The outer ear is not so long. There are fewer hairs developed on hand, arm and leg, and such as there are are short (Fig. 8). The internal impulses that direct development are very different in the two races.

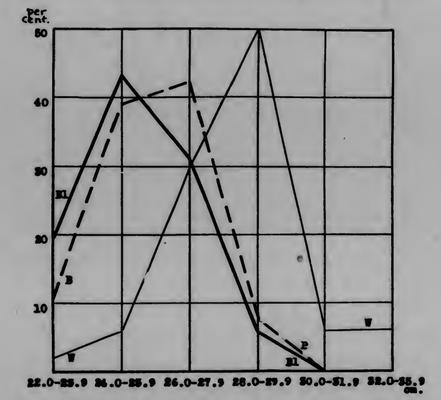

FIG. 7. GRAPHS SHOWING DISTRIBUTION OF INTERCRISTAL (PELVIC) BREADTH (IN CENTIMETERS) FOR MALE WHITES (FINE LINE), BROWNS (BROKEN LINE) AND BLACKS (HEAVY, CONTINUOUS LINE). NOTE THE RELATIVELY SMALL PELVIC BREADTH OF THE BLACKS. THE DISTRIBUTION IN CASE OF THE BROWNS FORMS A BROAD PEAK EXTENDING FROM THE PEAK OF THE BLACKS AND REACHING TOWARD THAT OF THE WHITES.

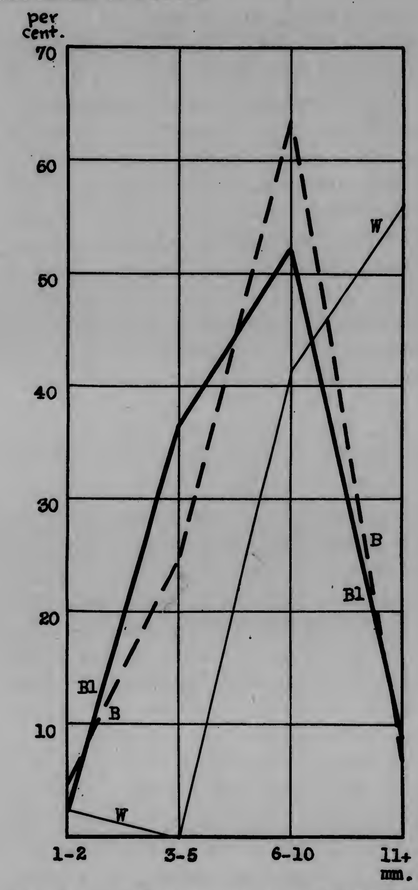

FIG. 8. GRAPHS SHOWING DISTRIBUTION OF AVERAGE LENGTHS OF HAIR ON ARMS IN DIFFERENT INDIVIDUALS OF THE 3 RACIAL GROUPS: WHITES (FINE LINE), BROWNS (BROKEN LINE) AND BLACKS (HEAVY, CONTINUOUS LINE). THE COMMONEST GRADE OF THE WHITES IS ONE ATTAINED BY FEW BLACKS OR BROWNS.

In the matter of hybrid vigor very little evidence was obtainable from the studies made in Jamaica. The most aberrant individual in size that we met was a huge woman over six feet tall. We could not be sure that she is a hybrid. This extreme case, however, was no doubt due to a pituitary disturbance, and pituitary disturbances may sometimes be due to a disharmony introduced by hybridization. On the average, however, the browns do not differ from the blacks in height and weight.

It is in the fields of the physiology and psychology that the relation of hybrids to parental stocks has the greatest social importance. In the matter of tooth decay, whose social importance is now becoming recognized on account of its relation to general health, we find a clear difference between the Negroes and the whites, in that the Negroes show a smaller amount of decay. The index of decay in the Negroes is 3.4 and in the whites 4. The browns show, indeed, a still slightly smaller average of defect, although the difference between the browns and blacks is less than the probable error. The condition in the browns is much more variable than in the blacks. The superiority of the browns is probably due to the inclusion of a considerable number of men from Mico College, young men who have been especially trained in the care of their bodies. Of the 21 per cent. of young brown males that showed no tooth decay about three quarters are from Mico College. Apart from such persons the distribution of tooth decay in browns is not very different from that of the whites.

Interesting differences between the blacks and the whites appear in their ability to make fine discriminations in the elements of musical capacity, as measured by the Seashore test. Thus the grades obtained in discrimination of pitch by the blacks are measured, on the average, by the score of 75, whereas the whites received the score of 71 and the browns the score of 77, being very close to that of the blacks. Indeed, nearly 30 per cent. of the browns received below 50 per cent. in pitch discrimination, as opposed to only 10 per cent. of the whites and 19 per cent. of the blacks. We see, then, that the blacks discriminate pitch better than the whites and that the browns are very variable, and a larger proportion of them than the whites, even, are unable to make any but the crudest discriminations.

In the matter of rhythm, also, the blacks are far superior to the whites, scoring an average of 86 to the whites' 78. The browns show a great range of scoring from 50 to 100 (Fig. 9). There is a larger percentage of the browns in the highest group than in the whites, but, conversely, in the lowest groups there are found many more browns than blacks, so that the brown group is characterized by including many persons who show very poor, as well as many who

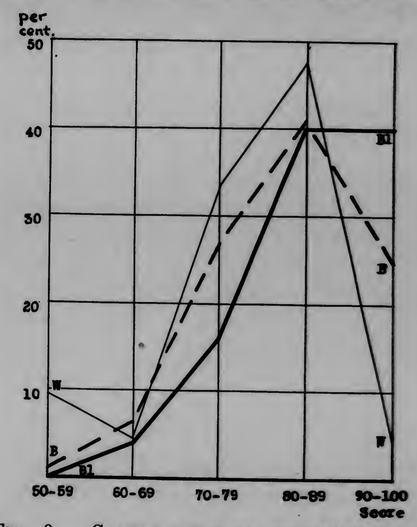

FIG. 9. GRAPHS SHOWING DISTRIBUTION OF SCORES OR GRADES OBTAINED IN THE SEASHORE TEST FOR RHYTHM IN MUSIC, IN 3 RACIAL GROUPS: WHITES (FINE LINE), BROWNS (BROKEN LINE) AND BLACKS (HEAVY, CONTINUOUS LINE). THE GREAT PREDOMINANCE OF BLACKS IN THE HIGH SCORES, AND THE VARIABILITY OF WHITES AND BROWNS ARE WELL SHOWN.

show very good appreciation of differences in rhythm.

For more strictly intellectual tests certain performance operations were carried out. Thus in the cube imitation test in which the subject has to reproduce a certain more or less complicated sequence of movements of the examiner the blacks get a score of 4½, as contrasted with that of 6½ obtained by the whites. The whites do, therefore, nearly 50 per cent. more of the test correctly than do the blacks. The browns are nearly intermediate in their efficiency in this test, although they lie somewhat closer to the blacks than to the whites.

In the matter of drawing a man, without "copy," the whites did best, while the blacks were not inferior to the browns (Fig. 10).

Another test employed was that of putting together six pieces of wood on which were drawn the parts of a man. These were to be placed so as to reconstruct the image of a man. The blacks took longer to make the reconstruction than the whites. Thus, on the average, blacks took forty-three seconds, as contrasted with twenty-six seconds required by the whites. The browns are intermediate but much closer to the blacks than to the whites in this capacity, and, as measured by the standard deviation, their scores were the most variable. But more of the browns failed to finish the test (over ninety seconds) than of the blacks (Fig. 11).

Another test applied was the so-called Knox moron test, consisting of a board with a hole into which were to be placed blocks of different form so as completely to fill the hole. The blacks, on the average, took 119 seconds to perform this test; the whites 87 seconds and the browns 113 seconds. Thus, again, the browns were intermediate and closer to the blacks than to the whites. This is a test which involves a good deal of imagery, some foresight, planning and ability to make use of past experiences

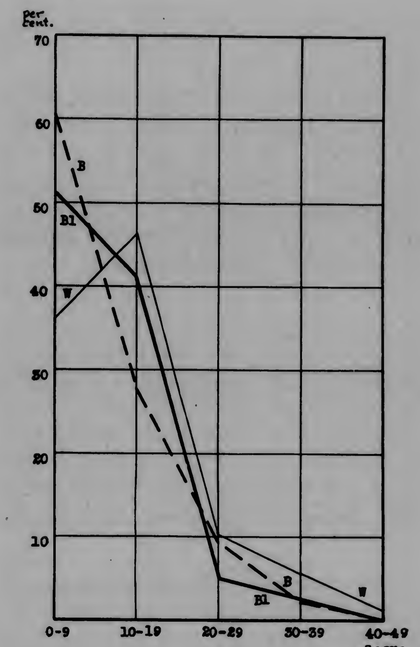

FIG. 10. GRAPHS SHOWING DISTRIBUTION OF SCORES OR GRADES OBTAINED IN THE DRAWING OF A MAN BY THE 3 RACIAL GROUPS, MALES AND FEMALES COMBINED: WHITES (FINE LINE), BROWNS (BROKEN LINE) AND BLACKS (CONTINUOUS, HEAVY LINE). THE WHITES HAVE FEWEST FAILURES (0–9) AND SHOW A LARGER PERCENTAGE IN ALL THE HIGHER SCORES THAN ANY OTHER GROUP. NOTE THE LARGE PROPORTION OF FAILURES AMONG THE BROWNS.

and this group of traits seemed to inhere in the whites of Jamaica more than in the blacks.

The Army Alpha tests of intelligence were used with some interesting results. Thus the second test is that of ability to make simple arithmetical computations. Simple questions were asked, like this: How many are 60 guns and 5 guns? More complicated questions were of this nature. A rectangular bin holds 200 cubic feet of lime. If the bin is 6′ long and 10′ wide, how deep is it? In this arithmetical test the adult blacks did better than the whites, scoring, on the average, 10 correct out of a total of 20, whereas the whites scored only 7½. The

browns scored 8.4 and thus were intermediate in their performance between the blacks and whites.

Another test in the Army Alpha is No. 3—a test of common sense. The question is asked, for example, "Why do we use stoves?" and suggested answers are "because they look well"; "they keep us warm"; "they are black." The subject is to check the appropriate answer. Now in this exercise of common sense the blacks were clearly inferior to the whites, since they scored less than 6 right out of 16, while the whites averaged 8½ right. The browns, on the other hand, scored only about 5 correct, being inferior in this respect to either the Negroes or the whites. A summary of the results of the Army Alpha tests is shown in Table B.

TABLE B

SUMMARY OF MEAN SCORES OBTAINED IN THE EIGHT ARMY ALPHA TESTS

	I	II	III	IV	V	VI	VII	VIII	Avg.
Black	*5.9*	*10.0*	5.9	15.8	8.8	*7.2*	*13.9*	9.6	9.64
Brown	5.1	8.4	5.2	12.7	6.4	5.6	10.8	9.4	*7.95*
White	4.9	7.5	*8.5*	*20.3*	*11.4*	6.8	10.2	*12.2*	*10.23*

This reveals the fact that, considering all tests together, the whites do better than the blacks, on the average, despite the fact that in respect to some of the tests the blacks are slightly superior to the whites. The browns, on the average, are inferior to either the blacks or whites.

If we consider the relative standing of the three groups at different ages we reach a somewhat surprising result, namely, that the children of ten to thirteen years do better in the brown group than in either black or white. The children of thirteen to sixteen years also are superior in the browns, but in the adults, as stated, the browns are clearly inferior to either of the parental stocks. Apparently the browns mature earlier (possibly an evidence of hybrid vigor), but their development stops earlier.

This inefficiency of the adult browns depends upon the presence of an excessively large number of persons in that group who are incapable of making any progress at all with the task before them. We have seen this in the cube imitation test, where 7 per cent. of the browns get the poorest score, as contrasted with 3 per cent. of the blacks and none of the whites. We have seen it again in the time required to put together the manikins in which 5 per cent. of the browns surpassed the limit of one and a half minutes; only 3 per cent. of the blacks and 2 per cent. of the whites (Fig. 11). Repeatedly the scores of the browns are characterized by this phenomenon. An exceptional number show complete failures; a fairly large proportion of persons are as competent in the task as the whites. The reason why the browns are intermediate between the blacks and the whites, or below either, is because of this large burden of ineffective persons who seem to be muddle-headed or incapable of collecting themselves to do the task in hand. One gets the impression that the blacks may have on the average the inferior capacity but are able to use what they have. The browns, as a whole, have a superior capacity to the blacks, but there is a much larger proportion of them who through becoming rattled or through general muddleness are unable to make any score; while, on the other hand, a large number do brilliant work.

This result serves to explain a difference of point of view of persons who have written about mulattoes. It is insisted by some that mulattoes are superior to the blacks in mental capacity. Others stress their unreliability, untrustworthiness, general inefficiency. The group who stress their superiority refer to such eminent citizens as Booker T. Washington, Frederick Douglass, Dr. DuBois. Those who stress their inefficiency see the other end of the series—the people who, apparently through mental conflicts, are extraordinarily ineffective. This, then, is one of the results of hybridization between whites and Negroes—the production of an excessive number of ineffective, because disharmoniously put together, people. A

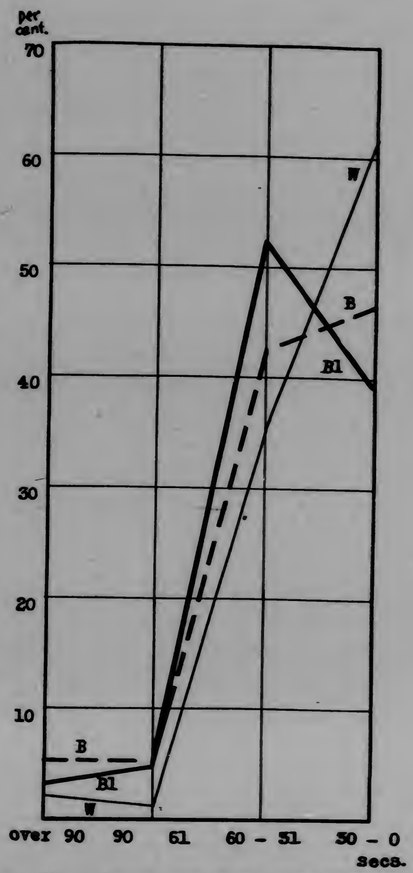

FIG. 11. GRAPH SHOWING DISTRIBUTION OF TIMES REQUIRED TO PUT TOGETHER THE PARTS OF THE MANIKIN BY 3 RACIAL GROUPS, MALES AND FEMALES COMBINED: WHITE (FINE LINE), BROWN (BROKEN LINE), BLACK (CONTINUOUS, HEAVY LINE). NOTE THAT THE WHITES DO BEST IN THE SHORT-TIME CATEGORIES (0–30 SECS.). A LARGER PROPORTION OF THE BROWNS (B) FAIL TO PUT THE MANIKIN TOGETHER (OVER 90 SECS.) THAN OF THE BLACKS (B1).

list of the traits has been prepared in which the browns are clearly inferior, on the average, to blacks and whites. This includes the ability to draw a man, without a model to copy. Such a task involves imagery and organization in which the browns seem, on the average, to be inferior. Again, they are inferior in the form substitution test in which one writes an appropriate figure in each of some five or six different form symbols many times repeated. The browns make more errors in assigning the proper figures to the symbols than do the blacks, although, on the average, they attempt rather more of the substitutions. In four of the eight Army Alpha tests the browns seem to be inferior to both the blacks and whites. These are all important tests of mentality and lead to the conclusion that, on the average, the browns are frequently inferior in mental tests, while they show more extremes of excellent and poor performance than the other groups. The only mental tests in which the browns are superior to either blacks and whites are certain exercises done by children between the ages of ten to sixteen years. This fact again illustrates the precocious development of mentality in the brown child. Also, the adult browns were superior in repeating a given series of figures.

The application of the results of the study of Negroes, whites and hybrids between them in Jamaica leads to the conclusion that physically there is little to choose between the three groups, although, on the whole, the Negro makes the better animal and, especially, is provided with better sense organs. The browns show much greater variability and, indeed, are put together differently from the average whites and blacks. Thus, whereas the whites are characterized by relatively short legs and long body and the blacks by relatively long legs and short body, some of the mulattoes have an unexpected combination of

long legs and long body and others of short legs and short body. Also, while there is a high degree of correlation between leg length and arm length, some of the hybrids are characterized by the long legs of the Negro and the short arms of the white, which would put them at a disadvantage in picking up things from the ground.

But in regard to intellectual traits the conclusions are different. The browns show great variability in performance. They comprise an exceptionally large number of persons who are poorer than the poorest of the Negroes or the poorest of the whites. On the other hand, they show some individuals of a high intellectual quality. The average of the performance of the browns is generally somewhat better than that of the Negroes. It is, however, this burden of ineffectiveness which is the heavy price that is paid for hybridization. A population of hybrids will be a population carrying an excessively large number of intellectually incompetent persons. On the other hand, a population composed of hybrids between whites and Negroes will contain persons better endowed in appreciation of music and in simple arithmetical or mental computations, as well as more resistant to certain groups of diseases, than a pure white population. If only society had the force to eliminate the lower half of a hybrid population, then the remaining upper half of the hybrid population might be a clear advantage to the population as a whole, at least so far as physical and sensory accomplishments go.

The person who seeks to secure the racial improvement of any species has only two courses open to him: Either to await new mutations in the race which he wishes to improve, or else to cross it with some other race that already has the quality he desires.

Thus the English race, which is poorly endowed with musical capacity, could get that capacity by mingling with the Negro.

The difficulty in waiting for the desired mutation to arise in the race is that it is a slow method. The method of hybridization has the difficulty that it introduces other, undesired traits into the complex. Of course, by controlled selective breeding the undesired traits can be bred out, while the desired traits are retained.

But we have no such control of human matings as is demanded if success is to follow the method of improvement by race crossing. It seems hardly applicable to mankind.

Moreover, quality of performance is not the only test of ability to play a part in society. There exists in mankind a strong instinct for homogeneity. Even children tend to mock at the cripple or deformed person. A homogeneous group of white people will always be led by its instincts to segregate itself from Negroes, Chinese and other groups that are morphologically dissimilar from themselves. We should consider the psychological, instinctive basis of this feeling. It is not sufficient merely to denounce it. It probably has a deep biological meaning and so long as it exists, so long we should be led to follow it as a guide if we are to seek to establish a commonwealth characterized by peace and unity of ideals.

Am. Anthropologist, vol. IV, no. 2, April 1891.

ON ZEMES FROM SANTO DOMINGO.

BY J. WALTER FEWKES.

There is a field for research in the ethnology and archæology of West Indian aborigines which up to the present time has been but imperfectly cultivated. From what little is known, however, of this subject enough can be gleaned to show that a rich harvest awaits research, and that, while many of the problems connected with the early history and the manner and customs of the former inhabitants of these islands are similar to those of the neighboring continent, there are others which are more local and special.

The following article is an attempt to add new information to what has already been published in regard to certain images called Zemi (Cemis, *Anglicé*)* by the aborigines. The notions which were entertained as to the meanings and uses of these idols may be gleaned from the writings of Charlevoix and others. The difficulties which encompass the study of the aboriginal manners and customs of the West Indians are somewhat increased by the introduction into the islands at an early period of an African race in the stage of savagery. The negroes brought from Africa a primitive worship and belief no higher in development than those of the natives whom they superseded. Practices of their ceremonies, more or less modified, became incorporated with those of the Indians and complicated the problem with which we now have to deal.†

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*I have, with the exception of the last syllable, followed the spelling used by Charlevoix for these Antillean idols. The form "Cemi" is used by several well-known authors. My contribution to a knowledge of the Zemes relates almost wholly to the images and not to the "spirits" which they represent.

†Especially true of historians who wrote a century or more after the introduction of African slaves, although not so applicable to Herrera, who speaks of the religion of the Caribs, but does not describe the images. In Hayti, Santo Domingo and in the New Mexican pueblos old Indian rites are wonderfully mixed with Christian ceremonials. Hence we have on one and the same day mass and tablet dances—church services followed by dances in which old-time mythological personages appear. In Mexico the same thing occurs, and in villages not far from the City of Mexico, the former focus of Aztec culture, dances are still celebrated among christianized natives in which appear personages exactly comparable with certain priesthoods in Zuñi and the Moki pueblos.

It is well known that in the Bahama Islands fetishes are made use of at the present day. The same is also true of the other West Indian Islands. I am told, for instance, by Mr. C. J. Maynard that in the Bahamas fetishes are placed at the entrances of the fields to protect the products of the same, and that the superstitious will not steal whatever is protected in that way. The belief in the power of these fetishes may either be a lineal descendant of old Lucayan superstitions or introduced negro sorceries, in which case they may have no connection with aboriginal beliefs. The discrimination between the two is very difficult and the problem a most complicated one to solve.

There are, however, certain forms of idols, known as Zemes, which there is no doubt once belonged to the aboriginal races. Some of these, which are supposed to be ancient, are considered in the following pages.

In an article on "The Latimer Collection," published in the Annual Report of the Smithsonian Institution for 1876, Prof. O. T. Mason describes and figures a series of "stone implements" from Porto Rico, to which he has given the name "mammiform stones." The form of one of these, which he figures (Fig. 42), is said to be unique.

Through the kindness of Mr. Edward Hall, of Cambridge, I have obtained a second specimen closely similar to the unique form described by Professor Mason. In details of the carving my specimen varies very considerably from that of the drawing published by Professor Mason, as I try to show in what follows.

The rarity of this form of Zeme has encouraged me to prepare the accompanying description:

The curious object is made from a hard basaltic rock, smoothly polished, except on the rounded flat under surface and in the depressions of the eyes, mouth, and ears. Its surface is smooth, but in places somewhat roughened. Indications of ornamental scratchings are present at many points. In the rough places indicating the eyes, ears, and mouth, the depressions were apparently formed by pecking with a pointed instrument, but the other surface appears to be polished partly by frequent handling. The most marked differences between my specimen and Professor Mason's are in the nose, the ring-like cutting above the eyebrows, the form of the ear, and the elevated collar back of the same organs. The relative distance of the ears from the eyes and the outline of the eyes are also different in the two specimens.

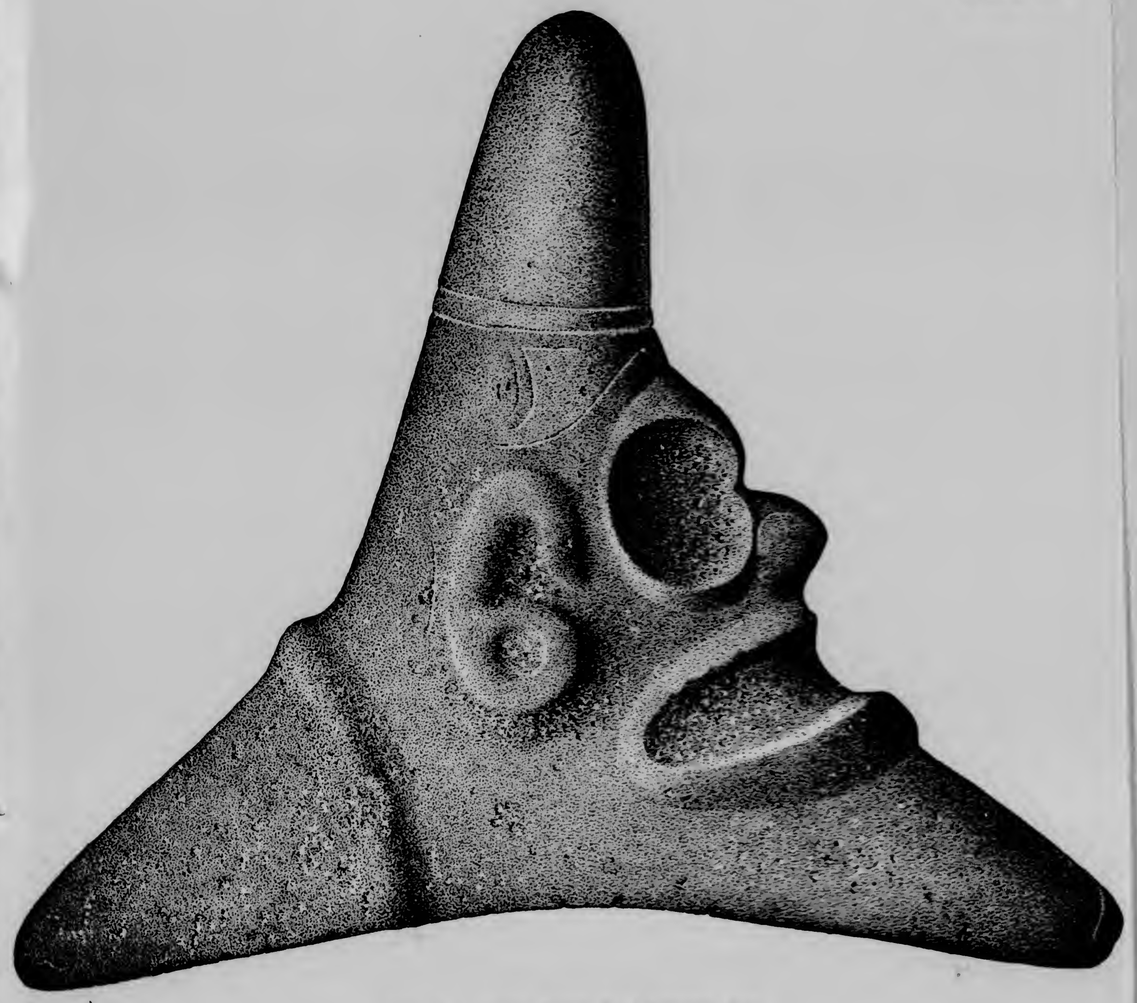

FIG. 1.—Stone Zeme with human face.

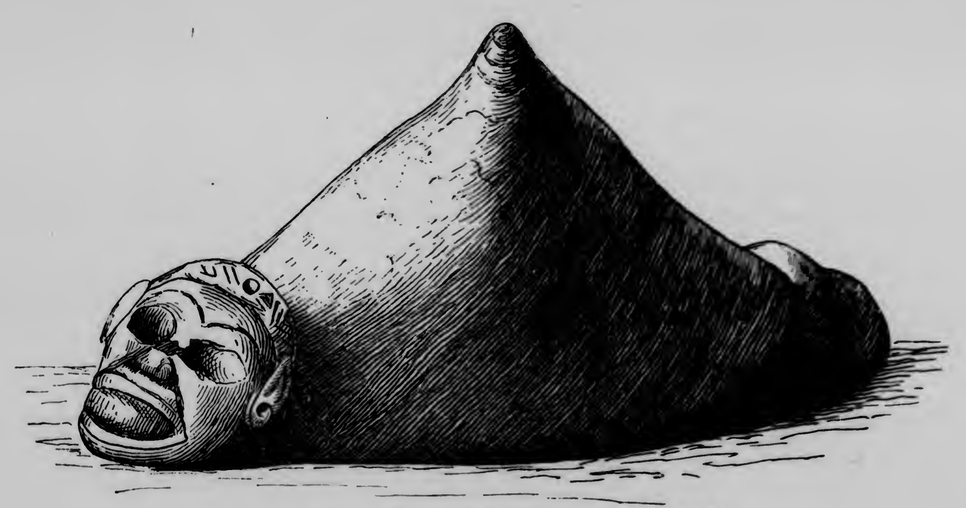

FIG. 2.—Stone Zeme with ornamented head-band.

The prominent lips show fine technique. The orifice of the mouth is broad, as if the tips of the lips were open. The nose is well formed, pointed, with curved lines or incisions on one side indicating the lobes. At the bridge of the nose, extending between the eyes, there is a straight shallow groove, which appears to be worn as if by filing. The eyes are bounded by a rim, the thin edges of which are slightly raised, while the surface of the depression is concave.

The mamma * above the face is rounded and pointed, smooth, and inclined slightly forward. It is girt at its base by two parallel grooves or shallow scratches, about an eighth of an inch apart. The region occupying the position of the temples is ornamented by a triangular figure, formed by double incised lines on the side above the ear, a straight line parallel with the two grooves above mentioned, and a curved line on the side towards the eye. The two latter markings almost meet above the middle of the concave depression of the eye. On the left-hand side of the Zeme this ornamentation is less plainly indicated than on the right. There is a slightly curved depression at the base of the forehead, extending in a crescentic form from one eye to the other. The ear has the form of a figure 6 and lies relatively nearer the eye than is represented in Mason's cut.

It is perhaps worthy of mention that we have something comparable to the lower half of the "ears" of the specimen which I have described represented on "masks" found in the Latimer collection. These are well shown in Fig. 48 in Professor Mason's paper, and a somewhat similar but more conventionalized appendage of the same nature is found in another specimen (Fig. 58) of the same paper.

Behind the ear a rounded collar† or elevated ridge girts the base of the rounded mamma. On the left side of the head near the lower half of the left ear this ridge is slightly broken or notched, but the remainder of it is well formed and in good proportions. The lower or so-called flat surface of the whole specimen is slightly

* Following Professor Mason's use of this term, I have designated the three projections mammæ, but in the case of two of these it is even less applicable than in that to which he applied it.

† What I take to be the same collar of which this is conventionalized appears in Fig. 2, in Fig. 3 as a raised ferrule above the flared base, and in Fig. 5.

rounded, very roughly cut, and slightly concave. The two projections, one forming the chin and the other the neck behind the collar, are pointed, smooth, and rounded above, with flat surface below. As the specimen rests upon them with the head uppermost the part of the flat base which is situated under the apical mamma is elevated from the table about a half inch. The tip of the chin is slightly chipped. Nostrils are not indicated, and the teeth are not represented.

I have not found the 6-like structure, which I have called the ear, so well brought out in the figures of mammilated stones by Professor Mason as in my specimen. One is at first tempted to look upon the circular lower portions of this part with its depression as representations of the ear ornaments such as one finds in the figures carved on the ruins of Yucatan or in the various Maya codices.* A more natural conclusion, however, would be that it is a rude carving representing the lower part of the ear without ornament.

As to the use of these mammiform and similar mask-like stones Professor Mason suggests at least three possibilities: †—that they were grinding stones, ensigns, or striking stones. If we accept the last two suggestions we may suppose the image to have been lashed to handles. None of these suggestions, however, are wholly satisfactory as an explanation of their use, and when tested by my specimen all seem extremely doubtful.

The carved image is not the least elaborately and carefully worked out of all the mammiform stones. Professor Mason says: "Their elegance of design and variety of execution in conformity with an ideal characterize these as the highest type of sculpture with stone implements in the world."

The mammiform stones described by Professor Mason are all from Porto Rico. The specimen which I have described was said to have been collected near the city of Santo Domingo, on the island of the same name; but as I am not able to ascertain definitely the locality

* With this thought in mind notice the form of the ear in Fig. 5; also observe the Aztec profile. See also Rosny's photographs of bas-reliefs from Copan. Mem. de la Soc. d'Ethnologie, No. 3, 1882.

* This product of Carib skill so closely resembles those figured by Charlevoix and Antonio del Monte y Tejada, and called by them Zemes that, as far as this image goes, one may very properly regard them the same. I have therefore accepted their identification. It must, however, be confessed that some of the others are more doubtful.

where it was found, and as communication between the two islands is easy, it may have been brought to Santo Domingo from Porto Rico.

The resemblance of the carved stone to a human head is too close to be denied. If we compare it with others found in the Latimer collection we can easily suppose that it is the conventionalized imitation of a human being lying on his stomach with a weight on the back. "The whole appearance of these stones," says Professor Mason, "cannot fail to remind the student of the legend of Typhœus killed by Jupiter with a flash of lightning, and buried beneath Mount Ætna."

The beauty and finish of this carved stone shows that it was of considerable value to the owners. We can hardly suppose that such a well-finished object was not something more than a stone for grinding meal or paint, or even a war implement. Possibly it is a fetish not unlike similar sacred stones well known among the Central American Indians.*

A beautiful specimen of what I consider a Passamaquoddy fetish is owned by Mrs. W. Wallace Brown, of Calais, Maine. Stone fetishes were very common among the Pueblo Indians. I have a small collection of these from a Zuñi pueblo which were used as "hunting stones." Something similar to the Zemes exists in the fetish of *A-hai-u-ta*, a mythical war-god of the Zuñis.

References to idols or Zemes made of stone, wood, or clay are to be found in the writings of those who have described the religions of the inhabitants of the West Indies. These Zemes have been found in caves, shrines, in shell heaps, and in the habitations of the natives. Some of these idols were appealed to for success in the hunt, others for propitious childbirth, and still others for rain and abundant harvests.†

* Stone fetishes were used by many tribes of North American Indians. On a visit to the Passamaquoddy tribe last year I was shown a curiously shaped stone which recalls in its shape the well-known "hunting stones" of less civilized tribes. I am told that the Passamaquoddies formerly carried these stones in hunting and fishing, evidently with the same intent as the western tribes.

† The son of Columbus, who quotes from the great admiral (Pinkerton, Voyages and Travels, etc., p. 79), says: "Most of the caciques have three great stones also, to which they and their people show great devotion. The one they say helps the corn and all sorts of grain; the second makes women be delivered without pain, and the third procures rain or fair weather, according as they stand in need of either. I sent your highness three of these stones by Antony de

It seems probable also, judging from early accounts of those whose information possibly came from the aborigines, that they were in some instances images of the animal which gave a name to the clan to which their possessor belonged. In one account I find a statement that the cacique is adorned with a figure of his Zeme painted on the body. In certain ceremonials among the aborigines of America the totem is painted on the body.

Two Zemes, identical in most particulars with the stone images which have been described, are figured by Charlevoix (Histoire de l'isle Espagnole ou S. Dominique, T. I., p. 80, 1733), by whom they are likewise called Mabouya. The same author also figures a Zeme from an Indian sepulture, which would indicate that they are sometimes buried with the dead. The rude figures of the Zemes given by this author strikingly recall some of those in the Latimer collection. Figures of similar Zemes are given by a later writer, Antonio del Monte y Tejada, in the first volume of his Historia de Santo Domingo. The last-mentioned author repeats many facts in regard to their use and character given by Charlevoix, and adds interesting data shedding light on the inner conception of the Caribs as to their notions of the Zemes and the veneration in which they were held.

It would seem from Charlevoix's account that the Zemes were very common among the ancient inhabitants of Santo Domingo, as he speaks of numbers of them being found in shell heaps and on the sites of old encampments; moreover, they were found in houses, where they served as a penates. The term Zeme appears to be a general one, referring to a great variety of forms of animals used as fetishes. We also learn that certain of these Zemes had prophetic powers, and by a skillful arrangement a concealed person was able to utter responses through the medium of the Zeme.

Judging from the many references to the Zemes which can be found, one would not go far astray in considering similarly formed figures to those* of the Latimer collection as idols. To that conclusion also the locality where the image was said to have been found points. I was told that the specimen which I have described was

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Torres and have three more to carry along with me." The short account of the religions of the natives by Columbus quoted by his son is of great value in a study of usages connected with the Zemes.

i. e., the mammiform figures.

PLATE III.

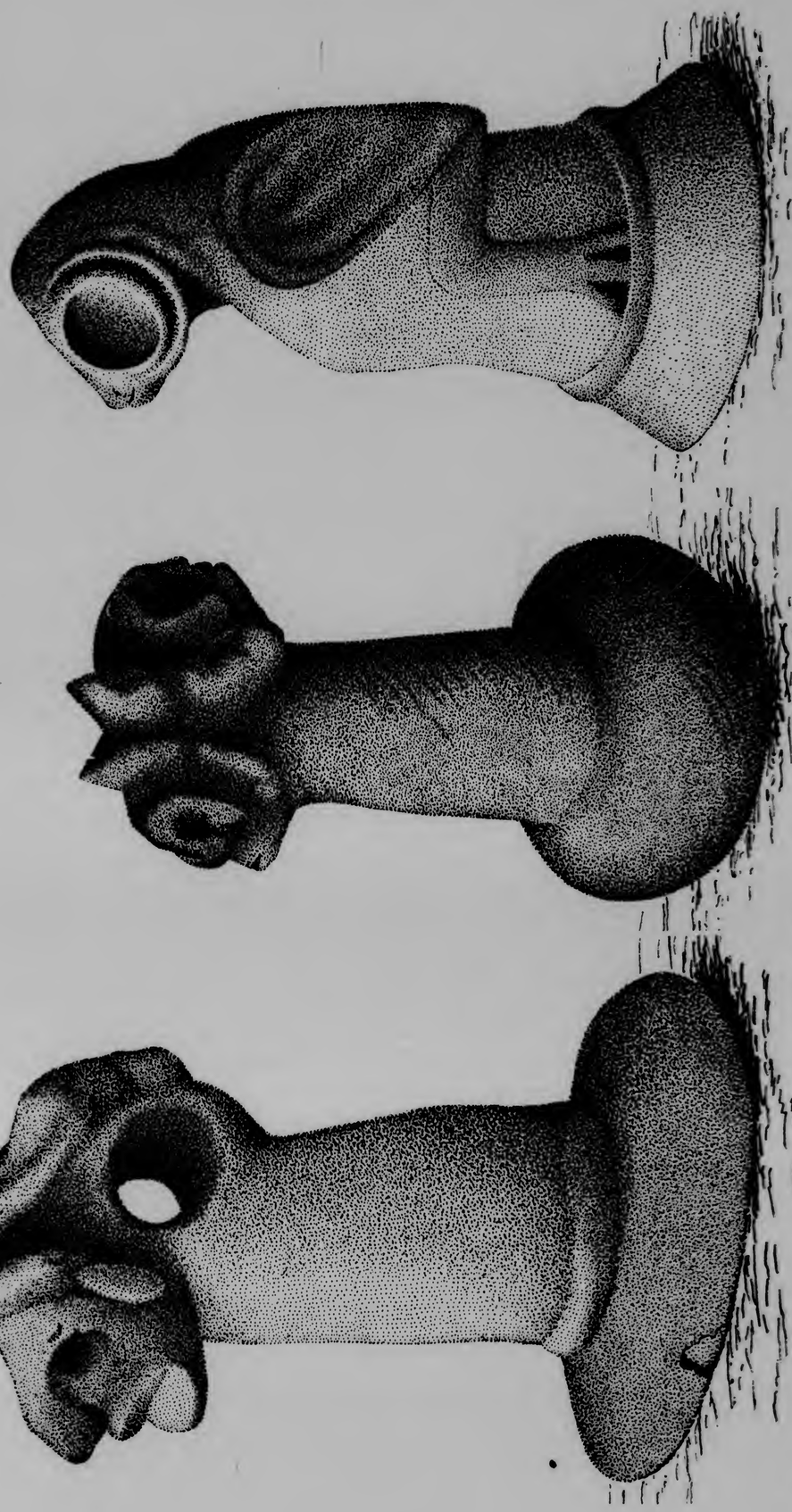

FIG. 5.—Zeme of unknown animal; Possibly of a bird.

FIG. 4.—Janus-formed Zeme, shaped like a pestle. Possibly an implement.

FIG. 3.—Upright Zeme? with discoidal base and perforated head. Possibly an implement.

taken from a cave, which accords with certain statements in Charlevoix in relation to the shrines of the Zemes.

In addition to the carved stone which I have described, my attention has been called by Capt. Nathan Appleton, of Boston, to figures of similar objects from the Island of Santo Domingo. Some of these are so exceptional in form that they merit description, but as I have not seen the specimens I have used in descriptions of these drawings made by Mr. A. Rodriguez of Santo Domingo City. The cuts which are given (Figs. 2–7) are accurate reproductions of his drawings. The shape of three Zemes, (Figs. 3, 4, 5) made of stone, is suggestive of pestles or mawls. One of these has the form of an animal's head and a body resembling that of a bird. The handle of another has two heads, each of which is more or less human in general appearance. One of these (Fig. 2) has the collar behind the mamma, as in my Fig. 1, and a somewhat diminutive head, upon the sides of which are well developed ears. The band about the forehead above the face appears in Zemes of widely different shape and in those made of very different materials. It is significant that this style of head ornamentation is so constant. Similar head-bands may be seen in several specimens, characteristically ornamented head-bands, to which I have referred.*

I have given also a figure of a wooden idol, which shows many characteristics of the stone Zemes and recalls several references which I have found in early histories of the island and its inhabitants. One of the most marked common features is the ornamental head-band. It is known that the Caribs had Zemes made of wood. Charlevoix speaks of them, and the same are mentioned by several early writers on the Caribs. Friar Roman Pane, for example, in his account of the religions of the Antilles, says certain trees were believed to send for sorcerers, to whom they gave orders how to shape their trunks into idols, and these "Cemi," being then installed in temple-huts, received and inspired their priests with oracles. (See Tylor's Primitive Culture, p. 216.)

Some of the Indians, says another writer, make Zemes of wood, as admonished by men in the woods. It is not unlikely that the two images of wood carved in imitation of serpents,† which are

*Compare with this the head-band of Mason's Fig. 45, *op. cit.*; also Rosny, Doc. Ecrits de la Antiq., Amb., p. 73.

†"At the entrance of one of their houses they saw two images of woode like

stated to have been seen at the entrance to a dwelling in Guadaloupe, were images of Zemes, although it is said that they were not idols, but simply decorations.

It is recorded that a certain Carib chief ("king") had in his dwelling a Zeme made of wood which had the shape of a four-footed beast. In Hakluyt's "Historie of the West Indies," p. 53, it is recorded that the Zemes disappeared at the advent of the Spaniards.

A curious image, of which a drawing occurs in the collection submitted to me by Captain Appleton, differs so widely from the Zemes as to lead me to doubt its relationship to them.* Still it has many characteristics which recall the most primitive of the Zemes.

In this specimen (Fig. 7) there is a close similarity to the wooden Zeme in the form of the patterns on the hands and the fingers. The textile fabrics about the knees and shoulders are highly characteristic if not unique.

Somewhat interesting, as related to the bands about the knees and shoulders in this object, is the statement in Hakluyt that "their vergins also are present" (in certain drunken debauches), "who wrappe the partes of the calfes of their legges and thyghes next the knee with bottoms of yarne and binde them harde to the end, that their calfes and thighes may swell bigger."

The position of the head-band is occupied by two raised elongated elevations, one of which is continued into a scroll to form the ear. The form of the ear itself strikingly recalls that of the stone Zemes, but is somewhat different.

It would seem, from the various historical accounts of the Zemes, that they had in the Carib mind somewhat the same significance as the fetishes in the conceptions of the inhabitants of the continent of America. The same word is used for both images and "spirits." They alike had powers of good or evil, and Boitii or sorcerers held conversations with both, being aided in various ways by these idols in imparting assistance to others. The spirits and the image seemed to be associated. "The spirit," says Tylor, "could be

unto serpents." [The Historie of the West Indies, Hakluyt, leaf 12, 2d page, First Decade (Lok, English translation)].

The same author (Fourth Decade, p. 165) says that Captain Valinia and his companions *were sacrificed* to the Zemes.

*Compare with the two raised lines on the forehead the ornamentation of the forehead of the second figure (from Copan, Rosny *teste*) in Winsor's "Narrative and Critical History," vol. I, p. 195.

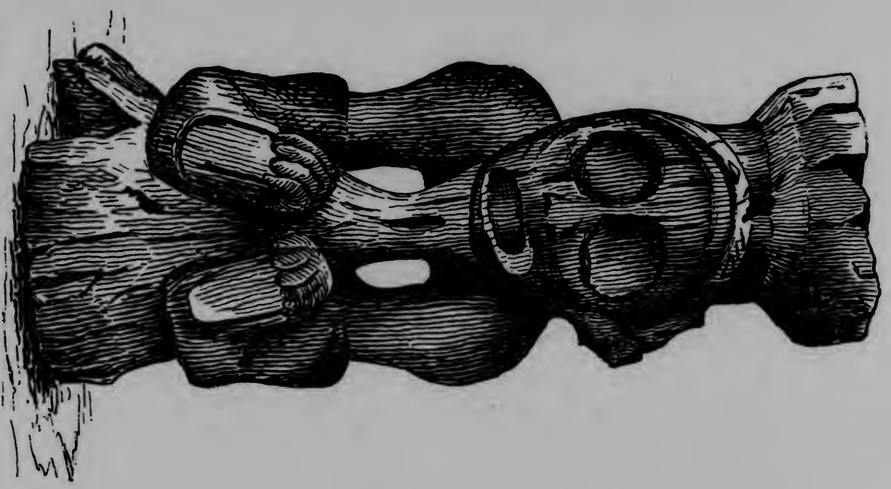

FIG. 6.—Wooden Zeme of human form.

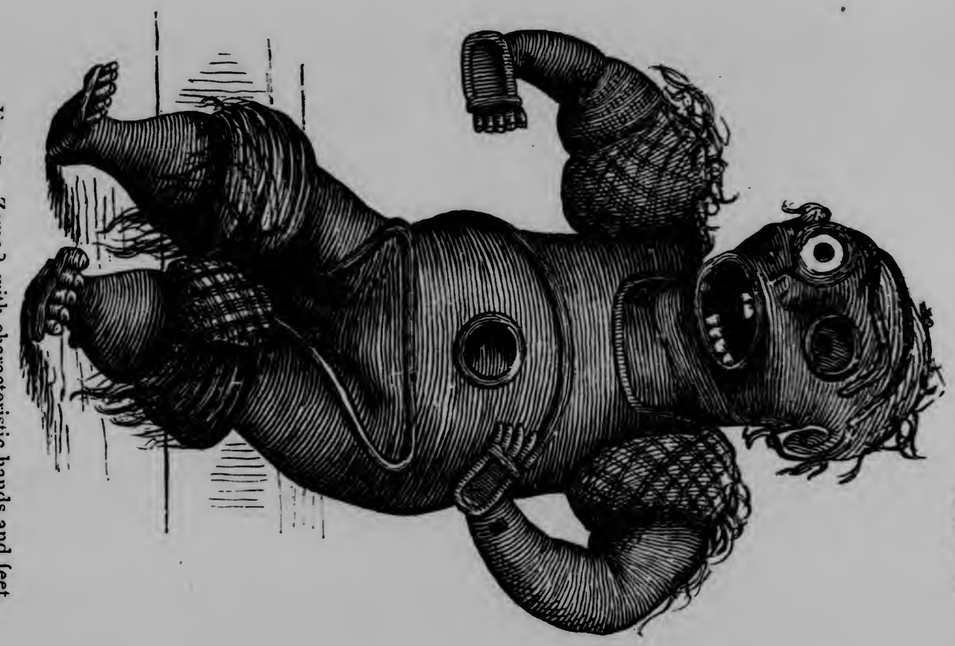

FIG. 7.—Zeme? with characteristic hands and feet.

PLATE IV.

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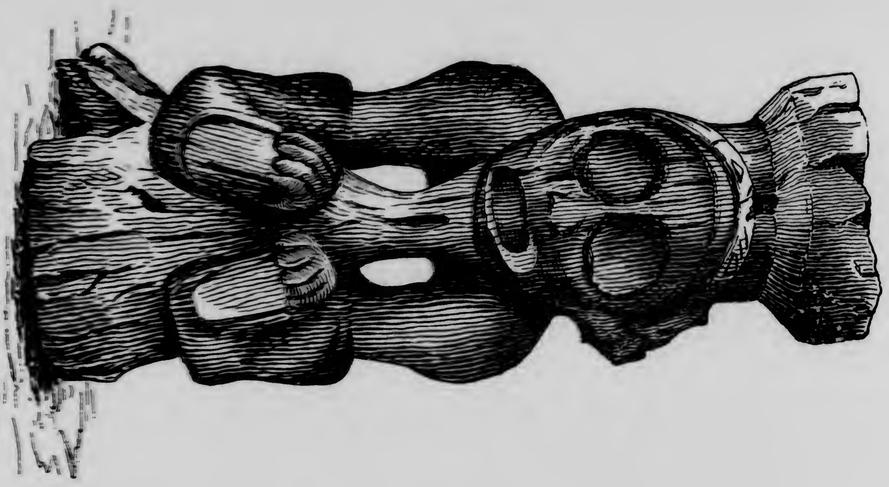

FIG. 6.—Wooden Zeme of human form.

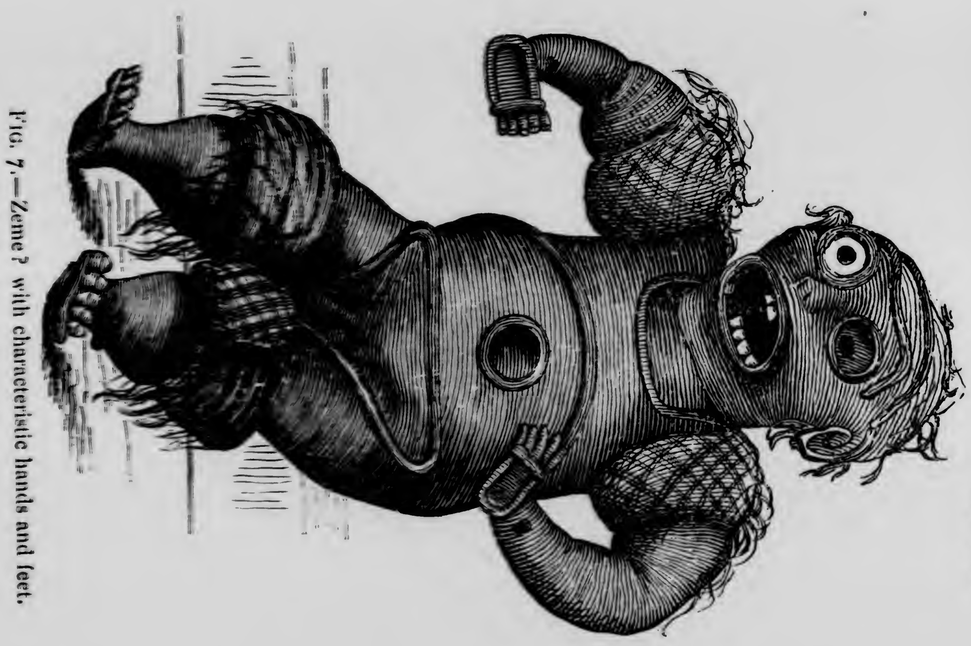

FIG. 7.—Zeme? with characteristic hands and feet.

PLATE IV.

Retake of Preceding Frame

conveyed with the image; both were called "cemi," and in the local accounts of sacrifices, oracles, and miracles the deity and the idol are mixed together in a way which at least shows the extreme closeness of their connection in the native mind. To this item also, if we trust the writings of contemporaries of Columbus, may be added the belief that all the people are descended from Zemes. "*Nemo excorocotti stirpe ortos esse dubitabat*," says one of these authors."*

This fact is interesting, as it points towards a similar idea of clan origin which is found in many rude nations. The fact is particularly instructive, as it may afford data in determination of the number and names of the Carib clans.

The heads of these Zemes, according to the Spanish writers, were sprinkled with powder, evidently in a ceremonial manner. There can be recognized in this observance something similar to a practice of the Aztecs, who sprinkled meal on the horses of the conquerors, and of the Zuñians and Mokis of the Southwest, who use the same in many ceremonials. It is most interesting to learn that, according to a good observer, they gave the name of their grandfathers to these images. One is tempted to regard this fact as another indication of the belief of the Caribs of their clan descent. This attitude towards fetishes is not peculiar to the American races, but is a marked feature in the religious conceptions of many widely separated peoples.

Last of all, and perhaps most important, is the question whether the Zemes were products of Caribs or other American races. I have throughout this article considered them as the productions of the Caribs, but am not sure that another people may not have had a hand in their manufacture. That they belonged to an aboriginal American race seems evident, and I believe that race was the Carib, but demonstration of the fact is beyond my present powers.

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*In this connection the variety of animals represented by the Zemes may have an important bearing. The "corocotti" are thought to be kinds of Zemes, but the latter term is, it must be confessed, somewhat indefinite.

THE KURDS AND YEZIDEES.—In a recent number of the Bulletin of the Société Royale Belge de Géographie (v. 14, No. 2), there appears a long account of these two peculiar races, by Prof. É. de Kovalevsky, of St. Petersburg.

The article is based on the work of Prof. Egiasaroff and Dr. Eliséeff, and on Prof. Kovalevsky's personal observations made during the scientific expedition for the ascent of Mt. Ararat.

According to Prof. Kovalevsky we have previously had but unsatisfactory accounts of the Yezidees or "Devil-worshippers" as they are usually called. These people are especially interesting on account of their religion, in which we see the influence of Christianity, and of Mohammedanism and the remnants of the religion of Zoroaster. Their chief object of adoration is the fallen angel, called the "King of the Peacock," who was cursed and cast out of heaven by the Creator, because he brought darkness and evil into being as a necessary contrast to unmixed good of the world as originally created.

The article is full of interest and will well repay reading.

THE "MOORS" OF CEYLON.—In a recent number of the Journal of the Ceylon Branch of the Royal Asiatic Society (v. 10, No. 36) is a long article by the Hon. P. Rámanáthan on the ethnology of the "Moors" of Ceylon. From their language, their history, their customs, and their physical features, he concludes that there is no doubt that they are ethnologically Tamils. Their religion is Mohammedanism.

The article is preceded by another very interesting one by Ahamadu Bawa, on the marriage customs of these "Moors."

A RECENT number of the "Mittheilungen" of the Geographical Society at Jena, contains an interesting account of a journey into the little-known country back of the German protectorate of Togoland. It was written in the Ashantee language by Peter Hall, a native Christian, and translated into German.

It contains many curious observations on the customs of the natives of this region. (Mittheilungen de geographischen Gesellschaft zu Jena, v. 8, p. 106, 1890.)

Am. Anthropologist, Vol. 5 (NS), No. 4, Dec. 1903

PRECOLUMBIAN WEST INDIAN AMULETS

By J. WALTER FEWKES

In all large collections of prehistoric objects from the West Indies there occur small images carved from stone, shell, and bone, perforated for suspension from the person. Although many of these fetishes or amulets are known, few have been described or figured, and there is little recorded information as to their various forms. It is in the hope of adding to the knowledge of these objects that I have prepared this article.

The first known figures of West Indian prehistoric amulets appear on a map of Santo Domingo, dated 1731, published by Charlevoix.[1] This map bears under the figures the legend, "*Figures superstitieuses de Zemi ou Mabouya de la façon anciens Insulaires*," showing that the "religious" character of the objects was early recognized. The suggestion that they are *zemis*, or idols, which were tied to the forehead, was first made by Professor Mason more than a hundred and twenty-five years later.

Among the early figures of Santo Dominican amulets are those of Sr Antonio del Monte y Tejada, published in his *Historia de Santo Domingo*, 1853. Two of these represent frogs; the other four are the same as those figured in this article.

In a German translation of my Vice-presidential address, *Prehistoric Porto Rico*, delivered before Section H of the American Association for the Advancement of Science, the editor of *Globus* (Nos. 18, 19, 1902) has introduced four fine figures of two amulets from Gonaives island, Hayti.

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[1] *Histoire de l'isle Espagnole ou de S. Dominigue*, Paris, 1730–01. In his preface Charlevoix states that he obtained the manuscript of this work, with permission to publish it, from the author, Jean Baptiste le Pers. Mr H. Ling Roth says that, according to Margry, le Pers repudiated Charlevoix's publication. The second volume of Charlevoix's work is dated 1731, the year borne by the map in the first volume. Three figures of zemis are given on this map, one of which belongs to my first type of human-form amulets. It is more difficult to identify the others, especially the one said to have been found in an Indian burial. Its general form resembles a tripointed idol or mammiform stone, but as no profile of the conical projection characteristic of this form is given, my identification is doubtful.

The first figures of Porto Rican amulets known to me are those published in 1877 by Mason.[1] Three of the four figures given by him undoubtedly represent amulets, but the fourth, called a "lizard-shaped amulet" (on account of a network of lines on the body, supposed to indicate scales), shows no head, thus rendering exact identification of the object impossible.

So far as known Mason was also the first American writer to identify the perforated figures as amulets, adding to his descriptions of them the significant statement that "the inhabitants of Hispaniola, on the authority of Friar Roman (Irving's *Columbus*, I, p. 390), had small images of their gods which they bound about their foreheads when they went to battle." He also points out that the inhabitants of the Lesser Antilles likewise used amulets, and thus refers to one of these objects in the Guesde collection: "The principal amulet is of carbonate of lime in bladed crystallization. It represents a *mabouya* (evil spirit) with bended arms and legs and the virile organ in a state of action. The shoulders are pierced posteriorly to allow of the suspension of the amulet."

Dr J. E. Duerden[2] thus writes of amulets from Jamaica:

"In 1879 Mr C. P. O'R. de Montagnac discovered two small stone images on some recently disturbed ground at Rennock Lodge, situated on a small plateau at a height of about 400 feet up the Long Mountain. They were associated with accumulations of marine shells and fragments of pottery, such as are met with on the top of the hill at Weireka. The larger is a neatly carved representation of a human head and neck, and is perforated behind for suspension. It is 2¾ inches long and 1⅝ inches from ear to ear; the body below the neck has been broken off. The material is a soft crystalline limestone, scratching readily with a knife, and forms a marble of a greyish or slightly greenish color, such as is found in various parts of the island, especially at the eastern end. The upper part of the head bears some resemblance to that figured in *Flint Chips* (p. 227, fig. 6), occurring on the top of a carved stone pestle found in Hayti. The nose, chin, eyes and ears are clearly distinguished; the perforation is ¼ inch in diameter and extends for 1¼ inches through the upper part of the neck.

[1] The Latimer Collection of Antiquities from Porto Rico, in the National Museum at Washington, D. C.; *Smithsonian Report* for 1876, Washington, 1877.

[2] Aboriginal Indian Remains in Jamaica, *Jour. Inst. Jamaica*, vol. II, No. 4, p. 44, July, 1897.

"The smaller object is 1¼ inches long and is likewise incomplete below. Though made of the same kind of stone, the figure is of a different shape, the facial characters not being well pronounced. It is broken at the sides, but there is a suggestion that arms were represented raised high as the shoulders, such as is shown in the 'Latimer collection,' fig. 32. . . .

"These two objects, so far as the Museum collections show, are the only ones belonging to this group of aboriginal relics hitherto found in Jamaica; though, as above quoted, somewhat similar examples are known from other parts of the West Indies."

Duerden follows Mason in regarding these objects as frontal amulets, and quotes Peter Martyr's reference to the small idols which the natives tied to their foreheads. "They were probably worn," writes Duerden, "or carried about the person and intended to act as charms or preservatives against evil or mischief."

Many precolumbian amulets were seen in Santo Domingo and Porto Rico during my late visit, several of which differ from any of those figured by the writers above mentioned. Although this article is written more especially to describe these new and unusual forms, others are included which closely resemble the amulets already considered by these authors. Some of the perforated fetishes or amulets of the Antilleans had human or animal shapes, others were stones of unusual forms which I am unable to identify. With the limited material available it would be premature to claim that a classification of West Indian amulets would be more than provisional at the present time, but of those having human forms there are two types which are readily recognized. In addition to these two types there are other forms representing animals, as frogs, reptiles, and birds.

The first of the two types mentioned is characterized by the arms and hands being raised to the ears or above the head. This unusual attitude occurs also in relief images on the rims of earthenware vessels and in some of those which decorate the ends of stone pestle handles. Possibly the hands were represented in this unnatural position to suggest the attitude of a burden-bearing god or goddess, whose personator in ceremonies supported a bundle on the head or back in this way. The attitude recalls an idol of the Calchaqui of

Argentina, figured by Ambrosetti,[1] which he is inclined to identify as that of an earth goddess. The sex of the majority of amulets in human shape from Santo Domingo is not generally represented, but one specimen was undoubtedly intended for a male.

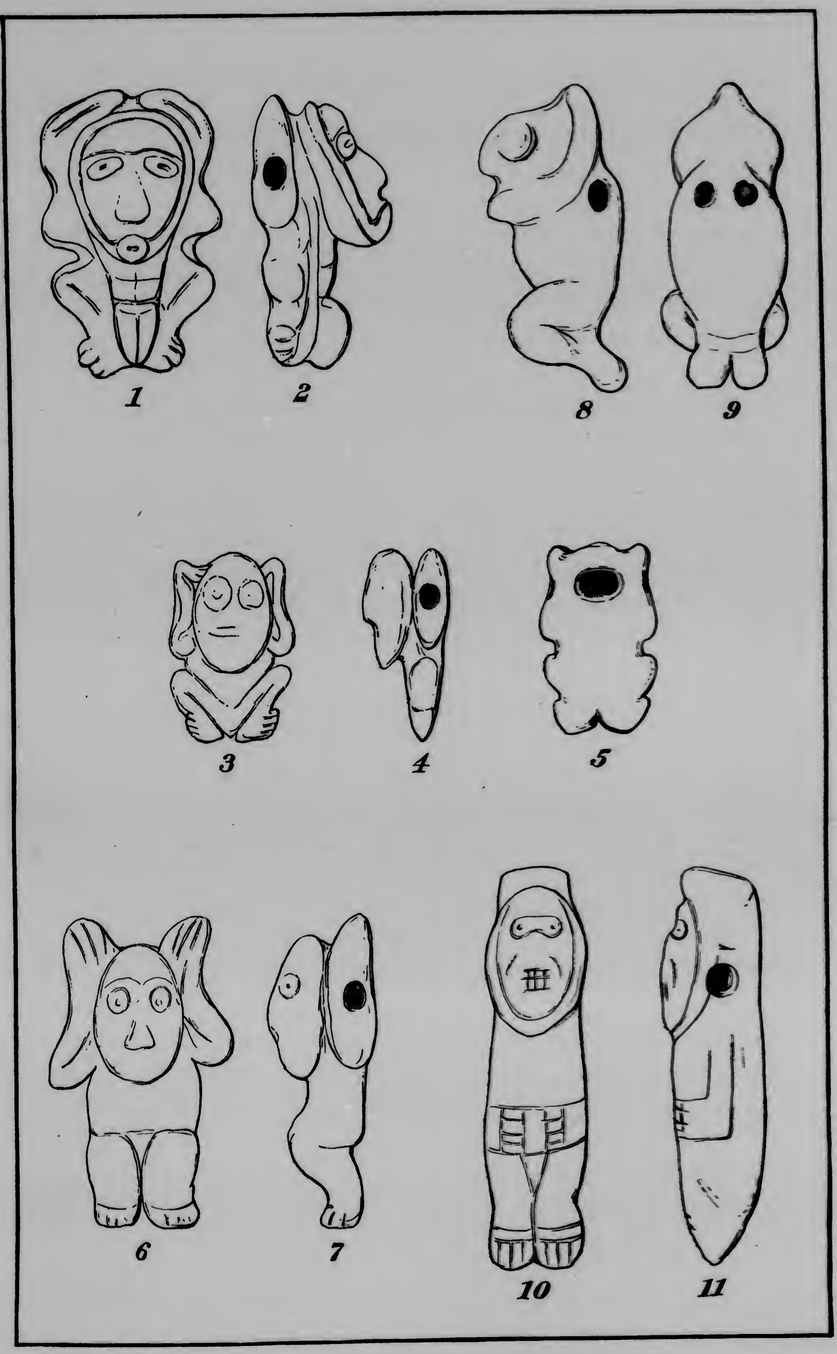
Amulets with arms raised above or at the sides of the head are not always figures of human beings, for in some instances these fetishes have bodies of animals and heads more or less anthropomorphic in character. Nevertheless this characteristic position of the arms is a good feature to use in a provisional classification of the human-formed fetishes.

One of the finest specimens of amulets of this type, or in fact of any kind, is owned by Mr Edward Hall, director of the railroad from Puerto Plata to Santiago, Santo Domingo. This beautiful amulet (pl. LII, 2, 3) is made of white stone and measures an inch and a half in length. Viewed from the front it will be noted that the arms are raised above the head, that the legs are retracted, and that the knees project on each side. The body is small, hardly equaling in length that of the face. A side view (fig. 2) shows that the head rises from the chest, and that the body is perforated from one side to the other. This specimen is said to have once belonged to a cacique, and to have been found near the headwaters of the Yaque river which flows through the Vega Real.[2]

There is in the Imbert collection another amulet (pl. LII, 3) of the same type, found in Guanabino (Santiago). When seen from the side (fig. 4) the head apparently projects directly from the chest, as in the specimen last mentioned. The specimen is light-brown in color, and is a little more than an inch in length. The front view shows that the shoulders are raised to the side of the head (a position necessitated by the position of the latter), but the hands do not extend above the head. The legs are contracted as in the last specimen, and the toes point sidewise. The back of the specimen (fig. 5) is flat, with an elliptical depression at the level of the eyes.

[1] *Op. cit.*, figs. 23*a*–23*d*. There are many resemblances between Arawak prehistoric objects and those of the Calchaqui of Argentina. These likenesses, like those of the Pueblos to the Calchaqui, are interesting coincidences of independent origin.

[2] The figures on plates LII and LIII are copies of my drawings of specimens owned by Sr Ramón Imbert and Mr Edward Hall. I take this opportunity to thank these gentlemen for permission to publish the drawings.



AMULETS FROM SANTO DOMINGO

The lateral perforations which served for suspension open into this cavity.

Another amulet of the same type (pl. LII, 6, 7) is also found in the Imbert collection. The figure of this specimen has the hands raised above the head and the knees brought together in front.

A similar position of the legs appears in the specimen shown in pl. LII, 8, 9, in which no arms are represented. The head is cut at the end of the body and not on one side. This object, also from the Imbert collection, measures two inches in length and is perforated through the back.

The first type of amulets is represented in my Porto Rican collections by a specimen of which three views are shown in the accompanying pl. LIII, 1–3. This object, which closely resembles that represented in Mason's figure 32, was purchased from Sr Benito Fernandez of Loquillo, together with many other specimens of aboriginal manufacture from eastern Porto Rico. This smoothly polished amulet is made of light-green stone mottled with black. It measures two inches in length, and a little less than an inch across the shoulders and hips. Seen from the front, the head seems to rise directly from the chest, but from the side the neck is seen to be a mere constriction. The nose and chin are prominent, but the eyes and mouth are only obscurely indicated; there are incised horizontal lines across the forehead; the arms are raised, and scratches representing fingers appear at the sides of the head in the normal place of the shoulders. The legs are contracted, giving the figure a squatting attitude, and the toes are indicated by markings. A virile organ is prominent. Two perforations for suspension are drilled at the edges of the shoulders, and a depression marks the middle line of the back.

There are three amulets of this kind in the Latimer collection, one of which is figured by Mason. These specimens came from Porto Rico, and it is probable that an amulet in the Guesde collection, from Guadeloupe, to which he refers, belongs to the same type. There are other amulets of this form in the Nazario collection.

I have not found an amulet like the last mentioned among the collections from Santo Domingo, and it is believed that the form is

distinctly characteristic of Porto Rico; but as the natives of the two islands frequently passed from one island to the other in precolumbian times, it is possible that this particular form will sooner or later be found in the former island. The failure to find this form of amulet in Cuba, Santo Domingo, and Jamaica, its existence in numbers in Porto Rico where there was considerable Carib blood, and a record of it from the Lesser Antilles, which at the time of Columbus were occupied by Caribs, make it possible that this form of amulet is Carib rather than Arawak.[1]

The amulet represented in plate LIII, 9, 10, belongs also to the first type. This object is figured in Mason's figure 33, but the figure is misleading because the artist has represented a forearm on the side of the body instead of above the head. It is doubtful whether this amulet was intended to represent a human being or an animal. (Compare the specimens shown in pl. LII, 8, 9.)

The second type of West Indian amulets of human form has the head placed normally on the body, so that the shoulders are brought to their proper position, the arms being represented on the chest, abdomen, or knees, or in front of the body. In this type the legs are brought together in such a way that the knees, and in some cases the extremities, are so imperfectly carved that this region of the amulet resembles that of a mummy. As shown in the figures, there is considerable variation in the forms of the amulets included in this type.

A good specimen of the second type, in the Imbert collection (pl. LII, 10, 11), was found at Yasica. It is made of light-brown stone and measures two and one-half inches in length. The face is carved slightly in relief; the eyes consist of two dots enclosed in a dumb-bell shaped figure, while the teeth are simply scratched on the convex surface. The fingers are indicated by parallel marks, the legs and toes being made in a somewhat similar way. A side view of the amulet (fig. 11) shows perforations at the level of the mouth. The head and body are not differentiated, the baeks of both being simply rounded.

[1] *Notas de Arqueologia Calchaqui*, fig. 23, *a–d*, Buenos Aires, 1899. While the art products of the Antilleans are *sui generis*, they are more characteristic of the Arawak than of the Carib people of South America. Antillean art was comparatively pure Arawak in Cuba and Santo Domingo, but in the Lesser Antilles it was mixed with Carib.

AMULETS FROM SANTO DOMINGO AND PORTO RICO

distinctly characteristic of Porto Rico; but as the natives of the two islands frequently passed from one island to the other in precolumbian times, it is possible that this particular form will sooner or later be found in the former island. The failure to find this form of amulet in Cuba, Santo Domingo, and Jamaica, its existence in numbers in Porto Rico where there was considerable Carib blood, and a record of it from the Lesser Antilles, which at the time of Columbus were occupied by Caribs, make it possible that this form of amulet is Carib rather than Arawak.[1]

The amulet represented in plate LIII, 9, 10, belongs also to the first type. This object is figured in Mason's figure 33, but the figure is misleading because the artist has represented a forearm on the side of the body instead of above the head. It is doubtful whether this amulet was intended to represent a human being or an animal. (Compare the specimens shown in pl. LII, 8, 9.)

The second type of West Indian amulets of human form has the head placed normally on the body, so that the shoulders are brought to their proper position, the arms being represented on the chest, abdomen, or knees, or in front of the body. In this type the legs are brought together in such a way that the knees, and in some cases the extremities, are so imperfectly carved that this region of the amulet resembles that of a mummy. As shown in the figures, there is considerable variation in the forms of the amulets included in this type.

A good specimen of the second type, in the Imbert collection (pl. LII, 10, 11), was found at Yasica. It is made of light-brown stone and measures two and one-half inches in length. The face is carved slightly in relief; the eyes consist of two dots enclosed in a dumb-bell shaped figure, while the teeth are simply scratched on the convex surface. The fingers are indicated by parallel marks, the legs and toes being made in a somewhat similar way. A side view of the amulet (fig. 11) shows perforations at the level of the mouth. The head and body are not differentiated, the baeks of both being simply rounded.

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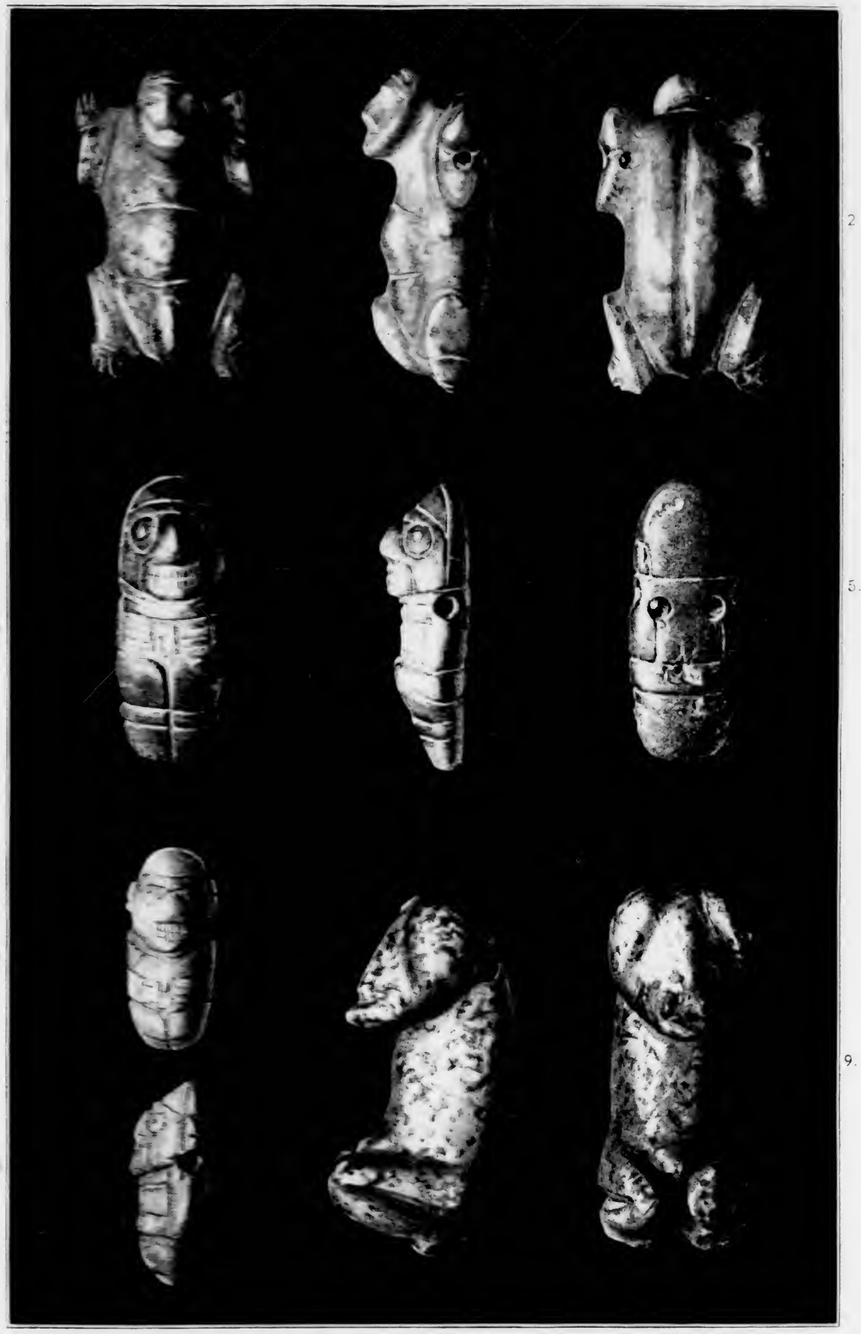


AMULETS FROM SANTO DOMINGO AND PORTO RICO

Another amulet (pl. LIV, 1) of the same type, also from the Imbert collection, was found in Janico by Sr José Tolentino. It is made of white stone and measures three and one-quarter inches in length. The eyes are enclosed by an incised dumb-bell like figure, the mouth, teeth, and cheeks being indicated by incised lines. No relief work is attempted in representing the arms, and the fingers are mere parallel marks near a pit surrounded by a circle intended for the umbilicus. The legs are comparatively large;[1] no toes are represented.

Another amulet (pl. LIV, 2, 3) in the Imbert collection, made of white stone and found at Ysabela by Sr Luis Passailaique, measures three and a half inches long and has arms appressed to the sides of the body, the fingers being indicated by incised lines. The back is slightly concave and the face is cut in low relief. Perforations, intended like the others for suspension of the object, are situated on the back on each edge at a level with the mouth. Leg-bands are indicated by lateral wart-like elevations near the position of the knees, and the toes are faintly marked.

Pl. LIV, 4–6, represents a shell amulet in the Imbert collection which also was obtained at Ysabela by Señor Passailaique. It is about two and one-quarter inches in length, and is well polished and carved. The image has a squatting posture, the knees being brought together and the body resting on the toes. The head bears carvings supposed to represent feathers; the eye-sockets and the mouth are deep; the teeth are well indicated; the left ear is broken, the right entirely gone. The arms are closely appressed to the sides of the body, and the closed hands are raised to the chest, the palms facing outward. The shoulders, knees, and feet are continued as raised bands across the back of the amulet. The perforation for suspension is situated on a level with the mouth.

An amulet from Santo Domingo, of polished dark-brown stone, purchased from Archbishop Meriña, is shown in pl. LIII, 3–5. The

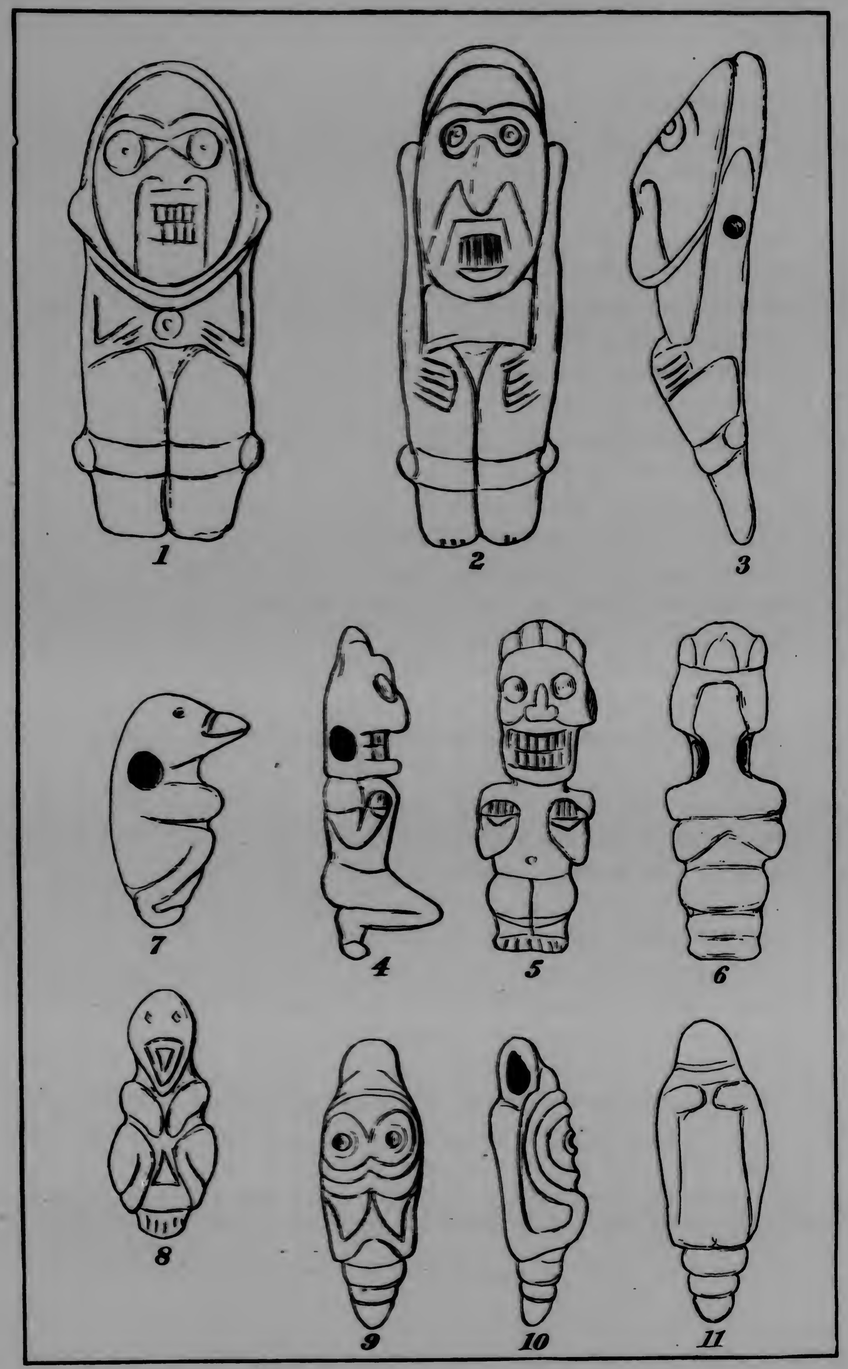
[1] In describing a most instructive effigy vase from Santo Domingo, Pinart comments on the large size of the legs, as follows: "*Ceci est curieux au plus haut degre car ces signes sont ceux tres caracteristiques de l'elephantiasis si commun dans les Indiens.*" Although the abnormal size of the legs is marked in the effigy vase which Pinart figures, as well as in a similar specimen of which I have photographs, it is questionable whether the maker of either specimen intended to represent a person afflicted with elephantiasis.

head is comparatively well cut, but the body and the limbs are more obscure. The back is flat, and holes for suspension are drilled at the edges.

A smaller amulet of white stone (pl. LIII, 7, 8), also purchased from the Archbishop, has a well-formed head, with forehead flattened as was the Antillean custom. The arms and fingers are indicated by lines, not by relief work; the legs are divided merely by a median line, and a few indistinct scratches represent the toes. The back is smooth and slightly rounded. The perforation extends completely through the amulet from side to side, below the ears, having been drilled from each side until the holes met, but the union is not perfect.

A very rare form of amulet, representing twin figures united at the sides, was purchased from Archbishop Meriña of Santo Domingo.[1] The face, eyes, nose, and mouth of each of the two component images are well made, but there are only two ears instead of four. The fingers are indicated by incised markings on the abdomen, showing that the specimen belongs to the second type of amulets representing human forms. Although imperfectly indidated, the lower extremities bear marks representing bands with which, according to early writers, the Caribs were accustomed to bind the calves of their legs. There are two drilled perforations, one at the outer edge of each component figure. This amulet is similar in size and form to an "*amuleto para amor*" from Argentina described and figured by Ambrosetti.[2] Although this author does not give the locality from which the twin amulet noted by him was found, it probably came, like others he describes, from the Calchaqui region. His identification of twin amulets as representations of the Inca god Huacanqui, or Cayam Carumí, is supported by a quotation from Montesinos[3] to the effect that the idol, or *guaca*, of lovers was "*una piedra o blanca, o negra, o parda liza, que hacen apariencias de dos personas que se abrazan.*" Although it closely resembles the Calchaqui specimen, there is no reason to suppose that the twin amulet from Santo Domingo bears any relation to the Incan idol.

[1] See *Smithsonian Misc. Coll.*, vol. 45, pl. xxxviii, Washington, 1903.
[2] *Notas de Arqueologia Calchaquí*, p. 33, Buenos Aires, 1899.
[3] *Memorias Antiguas Historiales del Peru.*



AMULETS FROM SANTO DOMINGO

In addition to the two types of amulets in human form above considered, there occur in West Indian collections small perforated images of animals, including birds, reptiles, and frogs.[1]

The only amulet of bird form here figured (pl. LIV, 7, 8), although I know of other specimens, belongs to Mr Hall of Puerto Plata, who has mounted the object as a watch-chain ornament. This specimen is finely made of dark brown or horn-colored stone, and measures an inch and a quarter in length. The beak is prominent, the wings are drawn to the breast, and the tail is marked with parallel lines indicating feathers. The perforation extends completely through the body at the level of the neck.

Another animal-shaped amulet (pl. LIV, 9–11), also owned by Mr Hall, is made of green stone; it is two inches long and is said to have been found in the Sierra del Serra, south of Santiago de los Caballeros. It is difficult in this specimen to recognize limbs, although the two appendages midway of its length may have been designed to represent flippers or fins. The two pits on one side were evidently intended for eyes. The general form of this amulet suggests an animal, and it may have been intended to represent a manatee or sea-cow.

Mention may here be made of two beautiful and unique amulets, one of shell and the other of bone, which were purchased in Santo Domingo from Archbishop Meriña.[2] The latter specimen is a complete image of human shape, while that made of shell is nondescript, having a highly conventionalized body without limbs and a realistically carved head.

It was my good fortune to see, in private collections, many amulets different in form from those here described and figured, an account of which would increase our knowledge of the variety of amulet forms from the West Indies. Among these may be mentioned two frog-shaped amulets of black stone in the excellent Nazario collection at Guayanilla, near Ponce, Porto Rico.

[1] It is difficult to tell whether some of these animals represent human beings or animals. For example, the body of the amulet shown in pl. LIII, 9, 10, has a distinctly human form, but the head is that of an animal. Mason's figure of the same specimen shows obscurely drawn arms on the side of the body, but I find no indication of such on the specimen itself.

[2] See Fewkes, Preliminary Report, in *Smithsonian Misc. Coll.*, vol. 45, pl. XLVIII, 1903.

While it is possible that some of the amulets above described may not have been bound to the foreheads of the natives, it is at least probable, as indicated by the perforations, that they were attached to or suspended from some part of the head or body. It is known that caciques wore on their breasts gold ornaments called *guanin*, since the custom is mentioned in an account of a battle with the Indians when Ponce shot a cacique (supposed to have been Aguebana II) thus adorned. As none of these gold objects escaped the rapacity of the early conquerors, and as no detailed description of them is known, it is impossible to say whether they were amulets as well as insignia of rank.

There is a striking similarity between some of the West Indian amulets and those found in Mexico. As a rule those from the Antilles are not so characteristic in shape and are not so well made as those from the mainland of Central America. We should expect to find a wider distribution of these small objects than of the larger idols, from the fact that they are more easily transported; but this distribution is not necessarily indicative of racial kinship of the owners of these objects. The similarity between Antillean and South American amulets is marked, but I find no resemblance between those from Porto Rico and from the mainland north of Mexico.

The objects described in the preceding pages are supposed to be identical with the small idols called *zemis* by early writers, who declare that the natives bound them to their foreheads when they went to war. A reference to Roman Pane's statement that the islanders wore zemis in this manner has already been made. Peter Martyr[1] describes certain idols used by the people of Hispaniola in their worship, which were undoubtedly amulets. He says: "These images the inhabitantes call *zemis*, whereof the leaste, made to the likenesse of young devilles, they bind to their foreheades when they goe to the warres against their enemies." Francisco Lopez de Gomara,[2] in describing the customs of the Indians of Hispaniola, says: "*Atanse a la frente Idolos chiquitos quando quieren pelear.*" (They bind little idols to their foreheads when they wish to fight.)

[1] Dec. 1, lib. IX, pp. 50–54.

[2] *Historia de las Indias*, p. 24, Antwerp, 1554.

Similar statements made by other writers in the early half of the sixteenth century are frequently quoted in more modern works.

The difference in the forms of these amulets might have been due to the desire to indicate, by them, the clans of the wearers, were it not for the fact that the images are so small and consequently inconspicuous that they would have been useless for such a purpose; but it is quite probable that the custom of painting the zemi or totem on the body was with this intention.[1] It is much more probable that the frontal amulets were regarded as efficacious against occult evil influences, the owner relying for protection on their magic power, in which respect they resemble all amulets. Their attachment to the forehead naturally suggests the phylacteries of the Jews.

It is probable that, in addition to the amulets which the Caribs and the Antilleans bound on their foreheads when they went to war, these people had numerous other amulets, some of which were worn on the neck or on other parts of the body or limbs. Those here considered have the form of small idols and were designed as pendants, but the aborigines also had other objects which were not suspended from the body, although likewise used as protective charms.[2]

Roman Pane has given a full account of the usages of the medicine men, or *boii*, of the islanders, which is interesting in this connection. From his description, which accords in general with primitive medicinal practices among other tribes, I will quote that portion which bears directly on the way in which a stone object, later used as a fetish, was presumably taken from the patient:[3]

"The *boii* having purged himself and taken his own drug (a custom not recommended to the modern physician), rises and goes to the sick man, . . . takes him by the legs, feels his thighs, descending by degrees to his feet, then draws hard as if he would pull something off; then he

[1] I have been informed that the country people at Boya, the old pueblo in Santo Domingo where the Indians under Henriquillo were settled, "sometimes paint designs on their faces in red as the Indians used to do."

[2] Im Thurn speaks of the natives of Guiana carrying worn stones to which they ascribe occult powers. There are innumerable other instances of this general custom among different races which may be explained on the theory of a belief in their efficacy against evil influences or practices.

[3] This translation is taken from H. Ling Roth, *Journ. Anth. Inst. of Great Britain*, vol. XVI, pp. 254–255.

goes to the door, shuts it, and says, 'begone to the mountain or to the sea or whither thou wilt,' and giving a blast as if he blowed something away, turns about, clasps his hands together, shuts his mouth, his hands quake as if he were a cold, he blows on his hand, and then draws in his blast as if sucking the marrow of a bone, sucks the man's neck, stomach, shoulders, jaws, breast, belly and several other parts of his body. This done, they begin to cough and make faces, as if they had eaten some bitter thing, and the doctor pulls out that we have said he put into his mouth at home or by the way, whether stone, flesh or bone . . . 'if it be a stone,' he says, 'keep it safe.' Sometimes they take it for certain that these stones are good, and help women in labor whereupon they keep them carefully wrapped up in cotton, putting them into little baskets, giving them such as they themselves eat, and the same they do to the *zemis* they have in their homes." [1]

Many instances of the use of charms and amulets still survive in the practices of the negro "conjure-men" of Porto Rico, but it is difficult to distinguish those of Indian from those of African descent. Of these charms several might be mentioned, thus the *uña de la gran bestia*, or "nail of the great beast," [2] is ordinarily tied in a packet of tinfoil, wrapped in cloth, and worn about the neck by the negroes as a protection. Among Porto Rican peons Indian stone celts are called *piedras de rayo*, or thunder-stones, and are used to cure certain diseases — a usage which may have been perpetuated from prehistoric times when strangely shaped stones were kept as fetishes or were used by the medicine-men for the same purpose.

In the same category, and of the same doubtful origin, may be mentioned the so-called "*collar hechecero*," or wizard collar, which can be purchased from conjurors, or, I am told, from certain dealers in obscure places in Porto Rico. These collars consist of strings or pieces of tape as long as a man's spine, with knots tied at intervals, the number of which equals that of the ribs or the vertebræ. Through each of these knots are stuck two pins in the form of a

[1] "Feeding" of fetishes and other images is a common practice among primitive idolators, and almost every special student might give instances of the usage among tribes which he has studied. The Hopi, for instance, put food to the mouths of their stone idols.

[2] According to Gumilla (*El Orinoco ilustrado*, I, p. 300) among the Achaquas of the Orinoco *la gran bestia* is the tapir. Its hoof (*uña*) was regarded as efficacious in curing the *gota coral* (falling sickness) and was tied about the neck of the sufferer for that purpose.

cross.[1] This collar is believed to have the power of causing or of averting harm at the will of the owner.

When the practices of the West Indian "conjure-man" are studied, it will doubtless be found that he still preserves the same general methods as the ancient *boii*, or aboriginal West Indian sorcerer, having merely modified the usages of the latter or replaced them with others, equally primitive, which his slave ancestors brought from Africa. To what extent the West Indian conjure-man of to-day has been influenced by aboriginal sorcery is not now known, but the subject is well worthy of study, and a rich field for research awaits the folklorist in Santo Domingo and Porto Rico.

Each amulet above described was doubtless employed, as were other fetishes, for its own particular magic power. Some of them, no doubt, were regarded as efficacious in protecting the wearer from death or disease, others were believed to cause the crops to grow or the rain to fall, while still others were used to aid women in childbirth. The form of fetish specially adapted for each of these or a hundred other needs is unknown, as no writer contemporary with their use has enlightened us in that regard; but it is not beyond the range of possibility that there may still survive among the Arawak tribes of South America information which will aid in their interpretation, and indeed it is possible that like amulets have not wholly passed out of use in the little known interior of Santo Domingo.

The number of amulets herein described and figured is inconsiderable compared with the many which renewed research will doubtless bring to light, and it is hoped that this article, incomplete though it is, may aid others in making more of these interesting objects known to science.

[1] It is said that the country people of the island sometimes embroider a cross on the shirt or undergarment of *novias*, or brides, to ensure constancy. I mention these customs, not because they are Indian survivals, but as practices still in vogue which may be aboriginal.

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THE SOCIÉTÉ CONGO OF THE ILE Á GONAVE

By ROBERT BURNETT HALL

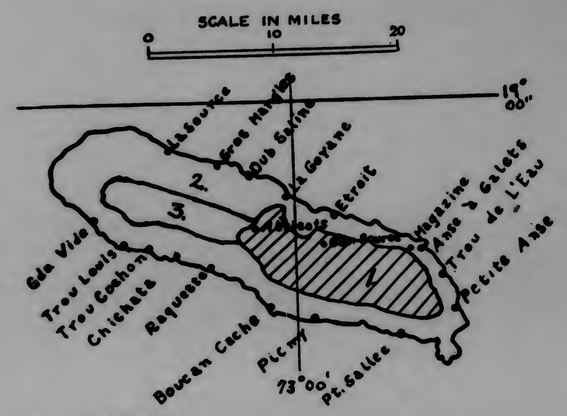
Introduction

IN ORDER to understand any aspect of Haitian life, it is necessary to remember the diversified origins of its culture. The chief elements concerned are African, French, and American Indian. The present population of the republic is composed of about 90% pure Negro and 10% mulatto, with French blood the most important white strain in the mixtures. This Negro stock was drawn from Gambia southward on the west coast of Africa and up the east coast to Mozambique and Zanzibar. There are represented, then, in Haiti, the cultural background and physical characteristics of many African peoples. The period of the French colony accounts for the French "paotis" of the people, a certain French tradition, a veneer of Roman Catholicism, and marked changes in the material culture. The amalgamation of the slaves into a homogeneous mass was carried on by arbitrary means under the French masters and has continued by optional selection since. The Indians left but little of their blood, due to the efficient methods of extermination employed by the Spaniards. They did, however, leave the chief crops and some of the agricultural practices of today.

The Ile á Gonave offers an excellent field of study to those interested in primitive society or in African inheritances among New World Negroes. Two natural features distinguish this island from the rest of the Republic of Haiti. The first is isolation and the second is the paucity of water. (See map 1.)

The extreme isolation of the island is in part due to location and in part to the inaccessible nature of its coasts. The Ile á Gonave lies well out in the great Gulf of Gonave midway between the two mountainous peninsulas of the mainland. The routes which connect the mainland with the world pass by Gonave but never touch it. The only connections with the outside are made

by the irregular trips of the small native fishing and trading boats. Throughout its history, the repelling nature of the coast lines has proved an isolating factor. At the immediate water edge, either sea-cliffs or rank growths of mangrove present themselves. Landing along those shores marked by cliffs is nearly impossible, and beyond them barren rocky slopes extend inland. By using



Map 1. Gonave Island. (1) Most densely populated and productive. High and rainy. Most springs and waterholes average planting per family from 5–10 carreaux. (2) Thorn forest and unproductive. Fishing villages comprise almost only settlement. Fresh water usually secured by boat from springs near coast. (3) Sparsely settled but extensively cultivated. Water brought overland for considerable distances. Average plantings from 30–40 carreaux. Yields low due to aridity.

boats of very shallow draught, an occasional hole in the mangrove barrier may be used to advantage. Behind the mangrove thicket stretches a sterile saline flat of considerable width, which swarms either with mosquitoes or sandflies, depending upon the season. Behind this, the thorn forest occupies the lower slopes and is exceedingly difficult to penetrate. Giant "jiggers" add to the general discomfort of the thorn forest.

The Ile á Gonave is an asymmetric anticline, rising above a slightly submerged limestone platform which is genetically related

to the alluvial plains of the main island just east of it.[1] All of the surface rock of the island is of a more or less porous limestone. The entire development of minor land forms and drainage features is that of a karst area. There are no through flowing streams and but a few surface exposures of intermittent streams. There are but two or three springs which carry water all the year. A half dozen small springs flow for part of the year. An equal number of large water-holes have some water in them throughout years of normal precipitation. At two points near the shore, fresh water bubbles up in the sea. These sources constitute the only supplies of water available for domestic use and stock watering. Rainfall is low and erratic. The northwest peninsula of the mainland cuts off the moisture-bearing trades, while the southwest peninsula stands as a barrier to the winds of the Caribbean storms. The hills of Gonave are too low to cause much cooling of the atmosphere in themselves. The average annual rainfall, along the coast, is probably about 25 inches. This may increase to 40 inches on the higher interior lands. However, individual years depart widely from the average. 1923 and 1924 are said to have been without rain. In late August of 1926 the author encountered about five inches in one week along the coast.

There have been no artifacts discovered on the island to tell of an Indian occupation. The ceramic remains and the sites so common on the main island seem to be entirely lacking. The clay figurines which make up an important part of the modern voodoo doctor's paraphernalia are imported from the mainland. Probably, the island of Gonave has been more diligently worked in this respect than any other part of the republic, due to the fact that Lieutenant F. E. Wirkus, Gendarmerie d'Haiti, has been governor of the island for over four years and has searched it from end to end. This man has located numerous Indian sites and acquired an interesting collection of artifacts during his years on the main island.

However, following the murder of the Indian Queen Anacoana

[1] W. P. Woodring, J. S. Brown, and W. S. Burbank, The Geology of the Republic of Haiti (Port au Prince, 1924). Pp. 418–422 contain the first and probably the only geological or otherwise scientific work done on Gonave to that date.

by the Spaniards in 1504, many of her followers are said to have fled to Gonave.[2] It is probable that the Indians took refuge in whatever isolated and otherwise undesirable spot the whites did not want. On the mainland they fled to the higher mountains and the small island in the Lake Enriquilo. Soon these were joined by other refugees. The runaway or "maroon" Negroes followed the practice of the Indians and occupied whatever land would most likely leave them unchanged by contact with Europeans. They often escaped the moment of landing or dived overboard as the ship sighted land.

The French paid no attention to the island and knew practically nothing of it. Even the well-informed geographer and historian of the colonial period, Moreau de St. Mery, merely mentions its existence.[3]

Since the establishment of the republic the island has proved a place of refuge or banishment for political offenders. In recent years there has been an immigration of landless peasants from adjacent sections of the mainland.

As a result of this individual history there has been little contact with Europeans and there is little if any white blood represented in the population of the island. The social and economic development has been more closely allied to African elements than on the main island.

The Société Congo

Probably the most interesting example of this sort is the Société Congo. This name is applied to the very interesting secret societies which dominate economic and social life on the Ile á Gonave. In the pages to follow, numerous extracts will be included, as notes, which appear to have a bearing upon the origins of these societies.

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[2] B. Ardouin, Geographie de L'Ile D'Haiti, 26. Eds. 1832, 1856 and 1864. (Port au Prince.) Dantes Fortunat, Nouvelle Geographie de L'Ile D'Haiti, 408 (Port au Prince, 1888).

[3] M. L. E. Moreau de St. Mery, Description topographique, physique, civile, politique et historique de la partie française de l'isle Saint-Domingue, 2: 527 f. (Philadelphia, 1797–1798).

These societies bear individual names and operate separately. In fact there is no central organization and the term Société Congo only designates the kind of society.[4] The purpose of these organizations is fourfold. First, they are cooperative labor groups; second, the members are afforded protection; third, they are mutual benefit societies; and fourth, they provide social entertainment. Two other functions are performed by these groups—disciplinary and religious. Through disciplinary measures within the organization, the members are sometimes compelled to act in accordance with civil law. This aspect can not always be relied upon, but is at times used for the collection of debts and similar offices.[5] The societies were not organized for religious purposes and ordinarily do not harbor religious ceremony. However, Voodooism, which is the deep seated religion of the mass, sometimes dominates the latter part of meetings which have been held for purely social purposes.

Each society has its own music, songs, dances, insignia, costumes, archives, and ceremonies.[6] Each society is open to men and women on an equal basis. There are no age or sex limitations.[7]

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[4] J. H. Driberg, The Lango: A Nilotic Tribe of Uganda, 97, 1923: "These groups or associations for cultivation are more or less permanent and are called 'wangtich.' '*PurKongo*' is the term used when there are fifteen or twenty assistants. Work begins at dawn and ceases at sunset. The laborers work individually without apportioning tasks, and the reward consists of liberal supplies of beer drunk at the owner's village at the end of the day." P. 405, "Pur" (means) cultivation. P. 388, "Kongo" (means) beer. It seems possible that the term Congo, as used in connection with the Société Congo and the Dansé Congo of the West Indies and its African counterpart, may have been derived from this source rather than being a geographical or cultural designation.

[5] Hutton Webster, Primitive Secret Societies, 116, 1908. This author speaks of the Egbo society as being an efficient means of debt collection, which was sometimes used by European traders. On Gonave the society is used to aid in the collection of taxes and other legitimate indebtedness. The medical officer of the Occupation Force has also employed the society to compel a badly diseased member to report for treatment.

[6] Charles Partridge, Cross River Natives, 214, 1905. "Every society or club has its own costumes, insignia, music, dances and songs." P. Amaury Talbot, In the Shadow of the Bush (London, 1912). In speaking of Egbo among the Ekoi people this author states: "Each grade (division) has its particular dances and tunes" (p. 44).

[7] Hutton Webster, Primitive Secret Societies, 122. "True Egbo is for men only. But there is an affiliated society of free women—but it is subordinate. 'Idiong' or 'Idion,' an Old Calabar Society is open only to women and Egbo members.—'Lubuku' (society) of the tribes of the Lulua River allows general admission of women on the

The one prohibiting factor is inability to do a day's work. Each group is ruled by an elaborate array of officers.[8] In fact, as the number of members in any one society is limited to approximately the number of working days in the month there is almost an office per person. However, only the senior officer receives anything but glory from his or her incumbency.

The Société Congo is not confined within the Republic of Haiti to the Island of Gonave alone. A more or less similar institution bearing the same title is found in the mountains of the southwestern peninsula. There are likewise other organizations to be found upon the mainland which perform one or more of the functions of the Société Congo. Some of these organizations will be described in a later publication. However, in no part of the republic have the societies been so strongly developed or have they taken on so many individual characteristics as in the island of Gonave. This is doubtless a result of the fact that such an organization finds greater offices to perform under the peculiar natural and cultural conditions of Gonave.

We have already noted the low and erratic rainfall and the karst character of the country. The rainfall of the tropical wet and dry climates is everywhere exacting for the agriculturist. Add to this that the underlying rock material of the area absorbs the limited precipitation with extreme rapidity, and the problem becomes acute. Clearing, planting, harvesting, in fact, every detail of agriculture must be done on schedule.[9] The poor soil and rainfall conditions of Gonave and the primitive semi-milpa methods employed do not encourage large yields. In consequence, considerable areas of land are necessary for the support of the

same status as men.—'Ndembo' of the upper Congo admits men, women and all ages freely."

[8] P. Amaury Talbot, The Peoples of Southern Nigeria, 3: 763, 1926. "There is a kind of farmer's institution known as Owe, which, among Oyos, somewhat resembles a benefit club; it is a system by which a man can call upon others to come to help him in any big work, such as clearing a new piece of bush.—In Egba-land the Owe appears to be a properly organized guild *under a president and officers*."

[9] A. Werner, British Central Africa, 184, 1906. Referring to the peoples of the Shire districts, also with a tropical wet and dry climate "Hoeing and weeding are sometimes got through more quickly, when time is pressing—as when the first rains have fallen—by means of a 'bee'."

family. Furthermore, land is to be had in plenty, for Gonave is still a frontier. The problem of clearing thirty or more acres of tropical vegetation is impossible for one man. By the time he is ready to plant, the first acres cleared will be brush-covered again. The planting, too, of such an area could scarcely be completed in the time necessitated by weather conditions. Furthermore, the average individual owns but one tool. In order to clear and plant, he will need at different times a machete, a hoe, an axe, or a crowbar. Within the society there are several of each of these tools. There is a marked tendency, often advised by the chief officers of the organization, toward the specialization of production by individuals. The peasant with a tract of coarse textured soil may produce only yams and "patats." One with compact soils specializes in legumes. Others will produce chiefly manioc, or malanga, or native cotton. Those, with land in the moist bottoms of sinkholes or solution valleys are likely to produce chiefly plantains. All differences can be ironed out later by barter within the society. Each crop has different dates of planting, cultivating, and harvesting, so that an admirable distribution of the labor results. The work of the society is largely planned for the year and directed throughout by the senior officer so that considerable unity of purpose is found. The efficiency of the societies is easily seen when the gardens of members are compared with those of individual farmers.

Another condition which has encouraged the rise of the societies has been the condition of government. The island of Gonave has been a football for Haitian politicians. Throughout the history of the republic, it has been held as a concession by one or a group of political favorites then in power. The only interest which the concessionaire has held in the island is to exploit it to the limit. Heavy taxes have been made heavier by the greed of the local tax collector. Peasants have been forcibly removed from the hut and garden which they have worked for several years to improve, only to have it given to some favorite of the local official. There has been no more, if as much, protection of life and property on Gonave than on the mainland. "Caco" bands have roamed and pillaged the countryside. Then, too, the "Hounga" man

(witch-doctor) is often a menace to individuals.[10] The unity of the society is an efficient method of combating these evils and does so with great success.

Every member of the society is assured proper burial and burial ceremonies. This is an important function in the mind of all Haitians. Weddings or rather "placements" are duly celebrated by the same body. In case of sickness or inability, due to old age, the society assists where necessary in providing food. In some cases, the society forcibly intervenes to compel a member to do things for the welfare of the individual concerned. Under the harsh conditions of life encountered on Gonave, such assistance goes a long way toward the mitigating of suffering.

Almost the entire social life of the members is found within the society. During working hours singing, drinking, and general good fellowship prevails. It is certain that more labor per man is obtained with these stimuli than would ever be the case otherwise.[11] Meals and liquid refreshments are served by the host at the end of each day's work. Frequently a barbecue and dance are held that night by the member whose field has been worked. The celebration of Saints' days, funerals, "placements," and other events keep the program of social engagements full.

What has been said so far applies in general to all of the societies which bear the general title of Société Congo. We will now consider in detail the organization and activities of one particular society which the author had opportunity to study rather closely.

The "Model de Paris"

The society, "Model de Paris," functions in the Section Grande Sources which lies in the interior upland of the southern

[10] John H. Weeks, Among the Primitive Bakongo (London, 1914). "The 'raison d'etre' for the Congo secret societies is lost in the dim and distant past. It may be that they were started to hold in check some tyrannical chiefs or to give mutual protection to members from the exactions of an upstart class of nobles or to afford protection against charges of witchcraft and the evil designs of witches—or they may have been organized to render aid to their members in their travels about the country for trade or other purposes.

[11] J. H. Driberg, The Lango: A Nilotic Tribe of Uganda, 97. In speaking of the "wangtich" agricultural societies, the author states: "Hard work and long hours are expected—and ungrudgingly accorded, with the result that cultivation by this semi-communal method far exceeds the possibilities of individual work."

The "Model de Paris" ready for the day's work.

The Queen of the "Model de Paris."

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The "Model de Paris" ready for the day's work.

The Queen of the "Model de Paris."

The President and two of the society's members
in ceremonial attire.

Filling gourds at the spring at Anse á Galet.

A part of the village of Anse á Galet.

The "Reine de le Drapeau" (front center), the "Sergeant d'Armes" (right front), the two drummers (right rear), and other members of the society.

Filling gourds at the spring at Anse á Galet.

A part of the village of Anse á Galet.

The "Reine de le Drapeau" (front center), the "Sergeant d'Armes" (right front), the two drummers (right rear), and other members of the society.

portion of Gonave. This organization is possibly the strongest on the island and is one of the oldest. It is said to have a recorded history of more than a half century. However, it differs but little in organization and function from other branches of the Société Congo in the same general vicinity. In fact, the woman who "rules" this particular organization also heads two other similar societies. It was largely through her friendliness that the more intimate details herein included were made available.

The membership of the "Model de Paris" is limited by its constitution to twenty-nine members. This number is generally maintained, as membership is highly desired by persons not belonging to such an organization. There is a long waiting list. When a vacancy in the society occurs, due to the death, departure, or expulsion of a member, the applicant with seniority on the list is first considered by the society. At a very dignified and formal meeting, vote is taken by ballot. If not more than one member vetoes the applicant that member must state, before the entire society, his reasons for disapproval. If these reasons are considered as serious by the other members, the applicant is not accepted. If two or more members object, the name is dropped. In either case, the applicant is formally notified that "no vacancies exist." He can not again enter his name until one year has elapsed.

The officers of the "Model de Paris" with their respective duties follow:

1. "*Reine.*"—The chief officer of the "Model de Paris" is La Reine. In fact, in all of the societies the chief officer bears the rank of emperor or queen, depending upon the sex. In case the society is headed by a man there is also a queen, but she has no particular powers. If, as in many societies, the chief officer is a woman, no male member bears the title of emperor. The duties of the chief officer are complex. On that incumbent devolves the responsibility for all action and a considerable portion of the policy of the society. In the "Model de Paris" the queen personally keeps the archives, which consist of names of active members and a record of past members. It is her duty to see that each member does his or her work and in turn receives the benefits of the society. It is she, who, with the advice of the society, plans the year's campaign. She must then see that the plans are carried to fruition. This includes the allocation of crop production and the temporal distribution of labor. Through her each member is notified each evening where and when to appear the following day and what the nature of the work is to be. Through her all orders for disciplinary action and all

invitations for social events are issued. These invitations have the full weight of an order and any disobedience of them is subject to drastic punishment. The responsibility of seeing that every deceased member is given a decent burial devolves upon the queen. In such cases, the society is called together and each member is assessed by her. The order of ceremony is her responsibility, the actual operation is directed by the Division de Société. The ceremony involves a great deal of mourning, singing, dancing, and drinking. The society goes about the immediate countryside in single file with each member wearing the formal insignia or costume of his office.[12] The cross and the Saints are much in evidence, as are the paraphernalia of the Papa and Mama Loi. In fact there is no differentiation between the two creeds. There is but one religion—an indefinable compromise. When a member becomes ill, each member of the society is ordered in turn to furnish food and take care of the disabled person's livestock and other immediate demands.[13] When any member becomes involved in difficulties with the local officials the queen intervenes on the application of the unfortunate and arranges a settlement. In return for these arduous duties, La Reine is well repaid. She is exempt from all manual labor and receives two full days' work on her property. She is the only officer who receives any material gain. As the particular queen in question also "rules" the "Fleur de St. Rose" and the "Fleur de St. Andrew" she receives six days of labor and so maintains the largest and best cared for garden on the island. She is also accorded many honors. On her approach, the tomtoms give four ruffles, the flag is lowered, all members stand at attention, and the machetes are brought to the position of "Present sabres." This rule applies whether the society be at work, at the dance, or at court. Various other formal courtesies are given, such as the persistent use of her title in conversation, standing at attention when speaking to her, and passing her the first cup of rum or the first helping of food.

Her influence in the community is great. She is respected and loved by all. The gardens of the members of her societies are the best tended of any on the island. Her advice is sought on many personal matters and frequently followed. She is referred to affectionately as "Te (petite) Menin" (little ruler) in spite of the fact that she weighs 250 pounds or more.

2. "*President.*"—The presidency of the society usually devolves upon some elderly member, whose wisdom and wealth are well recognized. He stands as first adviser to the chief officer and takes her place when she is absent. He is accorded much respect and the formality of his title.

3. "*President de Confidence.*"—He is the vice-president of the society. He, too, is an adviser and takes the president's office when that dignitary is absent.

[12] Partridge, op. cit., 215. "When a member dies, the other members sing and dance at his funeral obsequies. . . . . The 'mourners' paint and adorn their bodies, and drink as much gin and palm-wine as they can get, and spend hour after hour—sometimes the whole night—in 'dancing' about town in single file."

[13] Partridge, op. cit., 111. "When an old member is too old or too sick to find food for himself, the club (Egbo) does it for him."

4. "*Chef de Société.*"—This officer is chosen as the ablest agriculturist. He directs the operations of the society in the field.

5. "*Division de Société.*"—This officer is in reality the drill master. He is responsible for the instruction of the society in all its formalities. When the queen or an important civil official approaches, he gives the order of attention, sound drums, and present arms.

6. "*Reine de le drapeau.*"—This officer is the color bearer. She is responsible for the society's flag. When the society is at work or in session, the flag must be exposed for all outsiders to see. She carries the flag to all meetings of the society and observes the formalities pertaining to it.

7. "*Sergent d'armes.*"—This officer advises offenders to appear for trial and stands to the right of the accused during the trial. He also does the "sword work" (with a machete) at all ceremonies.[14]

8. "*Conseils.*"—Two "conseils" are among the officers of the society. Any member brought up for trial may choose one of these as attorney for the defense. The other then becomes the attorney of the prosecution.[15]

9. *Miscellaneous officers.*—The "Model de Paris" had three drummers at the time of investigation. Two of these men were exempt from manual labor in the field but their presence was always required. They follow the workers and beat their "tomtoms" continuously. The third drummer functions only at purely social events. These officers have no semblance of permanency and accrue to those members with the greatest talent.

One person is designated to properly kill the animal paid as a fine by an offending member. Another is the master of the barbecue. Almost any office will from time to time have an assistant. All offices bear some dignity and every member holds some office from time to time.

The Responsibilities of Membership

As the Société Congo is primarily a cooperative agricultural organization the responsibility of membership is largely related to agricultural matters. In fact, many members leave the immediate community and even the island to engage in other activities during the dry season. During this or any other absence, all property is left under the protection of the society. The dark red flag is placed above the peak of the absentee's roof and signifies that any trespasser will be answerable to the society.[16] The society only operates in full force during the crop season, which extends

[14] The titles of certain officers, the commands of the "sergent d'armes" and drill movements of the society are closely related to the French military.

[15] The title "conseil," the duties of that officer, and the court proceeding are doubtessly due to French rather than African influences.

[16] Hutton Webster, op. cit., 116. "Calabar people who find it necessary to be absent on a journey, place their property under the protection of 'Egbo,' by fastening the badge of the society to their homes."

from the middle of February to the first week in September. Each member receives one day's work by the entire society on his property and a definite system of rotation is practiced.[17] Each member then knows when to prepare for the group on his property and where he is supposed to report for work on the following day. In spite of this system the queen issues invitations to each member every evening, stating not only the place but also the time and the type of work. A number of things may happen to change the rotation temporarily. Any member is privileged to sell his day of work to the one who follows him. The established price is 50 centimes de gourde (10¢) per worker. The seller saves the price of entertaining the group and the purchaser receives two consecutive days of work. Illness, inclement weather, etc., may temporarily halt the proceedings, but the rotation is never broken.

A member may purchase the right to membership without working and still receive his days of work from the society as well as all the other benefits. This is done by paying each member 50 centimes de gourde a month. Members of this sort are rare and usually old men with some money, who are considered solid citizens of the community. Non-members may arrange with the queen for the employment of all or part of the society during the off-season. The rate again is 50 centimes per worker per day.

A Day in the Field

The society meets at early morning in order to accomplish as much work as possible before the intense tropical heat becomes too pronounced. The "Reine de la drapeaux" posts the society's flag of plain dark red, at some conspicuous point on the nearby trail. The "Chef de Société" divides the workers into two lines, sees that tools are properly distributed, and gives instructions for the day's work. The drummers sound the signal to begin and keep up a rhythmic beat as the tools of the workers glisten in the early morning sun. Before many moments, a voice joins tune with

[17] Duncan R. Mackenzie, The Spirit-Ridden Konde, 118 f., 1925. "Working parties are often formed for the hoeing, *the group spending one day in each garden*, and being fed by the owner in each case. When a headsman's garden is being done, beer is provided, and the chief usually kills an ox when he has a party hoeing for him."

the drums. When the solo is finished the entire society joins in the chorus. It is usually an old song and well known to all. The drums beat incessantly and the tools rise and fall in unison with it. Every now and then, someone sings out and the group joins in the chorus. Many of the songs are extremely lewd. New verses are often created but the tunes do not change. Always it is the solo followed by the chorus.[18] The music of the drums and the tunes and words of the songs are usually enough to inform anyone acquainted with the island as to just what society is at work.[19] The drums especially can be heard at great distance.

The owner of the property has been arranging for days for this event. Now he moves down the line passing out drinks of "taffia." Before long everyone is feeling the effects of the raw liquor and songs become lustier and lewder. Shouts of laughter follow the creation of an unusual verse. The workers call in a high voice to peasants along the trails. The whole event is hugely enjoyed.[20]

About eleven o'clock, the drummers sound the order for rest and the society gathers in the shade of the host's hut. A meal of yams and millet cakes or congo beans and cassava bread is served. The "taffia" container is always in evidence and the neighborhood resounds with laughter and shrill voices.

At about two o'clock work begins again and the performance of the morning is repeated. By four-thirty or five the "Chef de Société" usually signals the drummers to sound quitting time, if this has not been done by the host.

The evening meal is then served. This is much more elaborate

[18] J. H. Driberg, op.cit., 129. " . . . . Every now and then one will get up and sing, sometimes an old song, sometimes an improvisation, but always whether old or new, the rest join readily in the chorus.—They (the songs) always consist of a solo or recitative and a chorus.—Songs of an indelicate nature are not unusual."

[19] P. Amaury Talbot, In the Shadow of the Bush, 413, 1912 (referring to the Ekoi people): "All clubs have different tunes and peculiar ways of beating the drums, so that even at a distance it is easy to tell which of the many societies is holding a celebration."

[20] A. Werner, op. cit., 184. "The owner invites all his neighbors, men and women, and prepares large quantities of beer, with which they regale themselves after a hard morning's work. Sometimes, the pots are carried out to the garden and the party consumes refreshments there. Each person has a certain piece of ground allotted to him or her—'a roe to hoe' and the work is got through with singing and mirth."

than the noon meal and contains a number of dishes. Some meat or fish is usually included and wheat flour biscuits are occasionally served as dessert. The "taffia" is served in greater quantities. Sometimes the host issues an invitation to the group to remain for a dance that night. Before the group breaks up the "Division de Société" lines the workers up and the "Chef" asks them if they are satisfied with the treatment they have received. They all answer together either to the affirmative or negative. The "Chef" then asks the host if he is satisfied with the amount and quality of work done.[21] He answers and gives his reasons for the answer. In case of a negative answer in either case, the queen is called and both arguments are heard. If the host has been lax in affording food and drink he is fined and pays in more food and drink. If the society is found to be in the wrong they return for a while on the following Saturday and complete the work. Between two and three carreaux (one carreau is equal to 3.10 acres) is considered a good day's clearing or planting. When both sides are satisfied the meeting ends by a dipping of the flag to the host.

The majority of cases referred to the court are for not heeding the "invitation" to work. Should a member fail to appear, a red flag is placed on the roof of his house. This usually takes place early the following Saturday morning and means that the member is under arrest. He is not permitted to leave his hut or talk to anyone until the court assembles in his yard that afternoon.[22] The Queen, President, and "Chef" act as judges and the attorneys for the defense and prosecution present their angles of the case to the whole society. The judges present their decision to the society for approval, which is almost always given.

[21] J. H. Driberg, op. cit., 97. "Only in case of extreme poverty or when famine has consumed all supplies does a man cultivate unaided. Assistance is normally procured from his friends and neighbors in return for food and drink after the day's work, and the extent of assistance thus procurable is conditioned by the size of the reward, *regularized by custom, and designated by standard terminology.*"

[22] C. F. Schlenker, A Collection of Temme Traditions, Fables, and Proverbs, xiii, 1861. "The Temmes who have the 'Purrah' institution use the same method to give notice of the excommunication of an individual who has fallen under the displeasure of the society. A stick to which are fastened some leaves of grass, placed in the offender's yard, is a warning that he is not to leave his farm or have anything to do with anyone until the ban is removed." Quoted from note 6, Webster, op. cit., 116.

If the accused cannot prove sickness or some other complete alibi he is sure to be convicted. When brought to trial he is said to be "burned."[23] If found guilty a red handkerchief is tied about his arm above the elbow. Then the queen selects the largest and fattest hog or goat which the member owns and it is killed "against"[24] him. A barbecue and a dance follow. The victim is compelled to furnish the drinks immediately upon conviction and thereafter until the party terminates. This it usually does not do until well into Sunday. The entire society, however, turns up at the man's hut at some later date and works free for him for a part of a day to help offset the cost of the food and drink which they have consumed at his expense.

For more serious offenses, expulsion from the society is the common penalty. It is said by non-members that bodily torture and even death are meted out to those who betray the society or commit serious offenses against it. This the author believes to be mere gossip. However, in the long protracted dances and drinking festivities, voodooism probably enters and crimes may be committed in the name of religion. Again, however, the author believes such incidents to be exceedingly rare.

Conclusion

The Société Congo is primarily a cooperative agricultural society. It has, in addition, social, protective, and benevolent functions. In its organization and operation, influences of American Indian, French, and African cultures can be seen. Adjustments to local conditions can also be noted.

The crops produced—notably the yam, cotton, cassava, and maize—are inherited from the Indian, as is the semi-milpa system of agriculture. The French contribution is chiefly in language,

[23] G. Cyril Claridge, Wild Bush Tribes of Tropical Africa, 201, 1922. "The poor fellow was what the natives call '*burnt.*' To court he had to go, where he listened to an eloquent indictment against himself before paying the penalty (the price of a pig)."

[24] Charles Partridge, op. cit., 111. In describing the Egbo societies of the Obubura Hill district, the author quotes a member as saying: "In the old time, if we wanted any young man to join, and he refused, our chief went into town and killed a goat 'against' him and he had to pay its value to the owner. A cow was shot 'against' a member for disobedience."

religion, and tradition, all of which temper the whole. The celebration of Saints' days and the names and even the functions of some of the officers are examples of this influence. The temporal distribution of activities, methods of agriculture, and the relation of the organization to society at large result in part only from the natural and cultural environment of Gonave.

The organization and origins of the Société Congo appear to be primarily African. Not that any one African secret society can be found which will present an exact duplicate but rather the society, like the people of Haiti, is a composite drawn from many parts of the African continent.

UNIVERSITY OF MICHIGAN,
ANN ARBOR, MICHIGAN

A view on the coast of Dominica

THE MOUNTAINS OF DOMINICA

The Two Highest Mountains in the Lesser Antilles, Diablotin and Trois Pitons, on Which Plant Life Is Still in the Process of Ascent and Increase

By PAUL GRISWOLD HOWES
Curator of Natural History, The Bruce Museum, Greenwich, Connecticut

PHOTOGRAPHS BY THE AUTHOR AND DICKENSON S. CUMMINGS

THE highest and most beautifully forested of the Lesser Antilles is Dominica, which lies about midway between Guadeloupe and Martinique.

In Roseau, the capital, we heard strange stories regarding the mountains we had come to investigate. Few people have climbed Trois Pitons and Diablotin, and no accurate observations have ever been recorded so far as Dickenson Cummings and I could ascertain. Even more confusing and vague were the accounts of some who claimed to have reached the summits, and many of their statements were too absurd to record.

We were assured that the time we had selected to climb Diablotin (between March 2 and 14), was not the proper time at all, but no one realized that we were basing our plans upon actual meteorological records carefully prepared for this very purpose upon a former expedition. As it finally turned out, we were correct. We encountered ten days of perfect weather, but during the remainder of our stay in the island we saw the top of the mountain emerge only once from the clouds.

There is no place in the world where it rains harder or longer, once it sets in, than in Dominica, and I do not hesitate to say that it can be the windiest and most disagreeable, or the sunniest and most delightful country of all. One must know actual conditions in order to succeed in mountain work there, for, though the mountains are not high, they are difficult to ascend and explore.

We were told that the Diablotin region abounded in huge boa constrictors that "hung from every tree," and various other good-natured little dangers were rumored about for our special benefit, but we took these warnings philosophically.

In addition to all this, our search for data before leaving the United States had resulted in the following interesting information—the mountain Diablotin might

CLOUDS COVERING THE SUMMIT OF TROIS PITONS

The round leaves in the foreground are those of the "Ka-klanh" tree that here, near the summit, has dwindled into bushes. This tree exudes a disagreeable sticky slime whenever bruised or cut

be any height from 4747 feet, by authority of the maps, up to say 5313 feet as the Encyclopædia Britannica has it, a mere difference of 563 feet!

And so, after despairing of finding out anything of particular value in advance, we decided to ascend Trois Pitons first. It was close to our headquarters on the estate of Captain Struan Robertson, 1800 feet above sea level, and would supply us with the desired information as regards the zones to be encountered, the best methods of working, and the equipment necessary, so that we might know just what conditions we would have to face in the ascent of Diablotin in March.

Having waited many days for the weather to settle and in the interval having missed one or two clear afternoons when the clouds had lifted entirely from the mountains, we finally decided rather unexpectedly to make the ascent on the morning of February 16.

Our guide, Son Esprit, had sent a message that was never delivered, but upon his arrival with two porters for the trip, we soon were off, leaving Sylvania about nine-thirty o'clock.

The clouds hung leaden and heavy over Trois Pitons, curling down from the summit over the cloud-forest below and then evaporating as the warmer air met this vapor from above.

Leaving the trail, we crossed two rivers almost at once and found ourselves in a magnificent forest of great trees which even at this low altitude were already coated with a delicate blanket of feathery mosses, for, as we found later, this mountain is the highest in the island and therefore catches the maximum of moisture from the clouds above.

The zones on Trois Pitons and upon all of these Dominican mountains are startlingly abrupt. At 2500 feet on Trois Pitons, one runs into that strange area

where the big forest of the sub-tropical zone merges with the cloud-forest; a few feet above this, the big forest disappears altogether, leaving one in a gloomy, dripping place, inhabited by spindly trees, shaggy with dark-colored mosses. Again, at 2650 feet, a change is noted, the trees becoming stunted and fantastically gnarled, and covered with calumet vines; and at 3300 feet comes the true central cloud-forest with its dwarfed, twisted, and otherwise deformed trees, weighted and staggering under countless parasitic and epiphytic plants and dripping mosses that gush forth their water at the slightest touch.

Under foot there is deep, sticky mud, and as the mountainsides grow steeper and steeper, and the vegetation more stunted and tangled, progress without a previously marked route ends in exhaustion and total loss of direction.

To make matters worse, we were making the climb during the endless rainy weather of the spring season, and because of the peculiar manner in which the trees grow out from the mountain instead of up in the usual fashion, it was necessary to walk and climb and pull the body hand over hand through the slippery limbs for hundreds of feet at a stretch.

We forced our way ahead to 3500 feet and here for a brief period we encountered more open country because of the hurricane that during the previous September had ravaged these mountains. We were now above the clouds, and far below on the Caribbean a tiny steamer could be seen headed toward the north.

The hurricane which hit Dominica was the same one that ruined Porto Rico. From our lofty observation point we could see the strange tricks that such a storm can play. Some of the mountains were untouched, but others were covered with heavy jungle on one side only, while the other side was swept almost free of vegetation. Viewing them from a distance, I could not help but liken them to a man with a heavy growth of beard who had shaved only one side of his face.

BESIDE THE TRAIL

The vegetation at an elevation of 1850 feet on Trois Pitons includes a plant known locally as "staghorn"

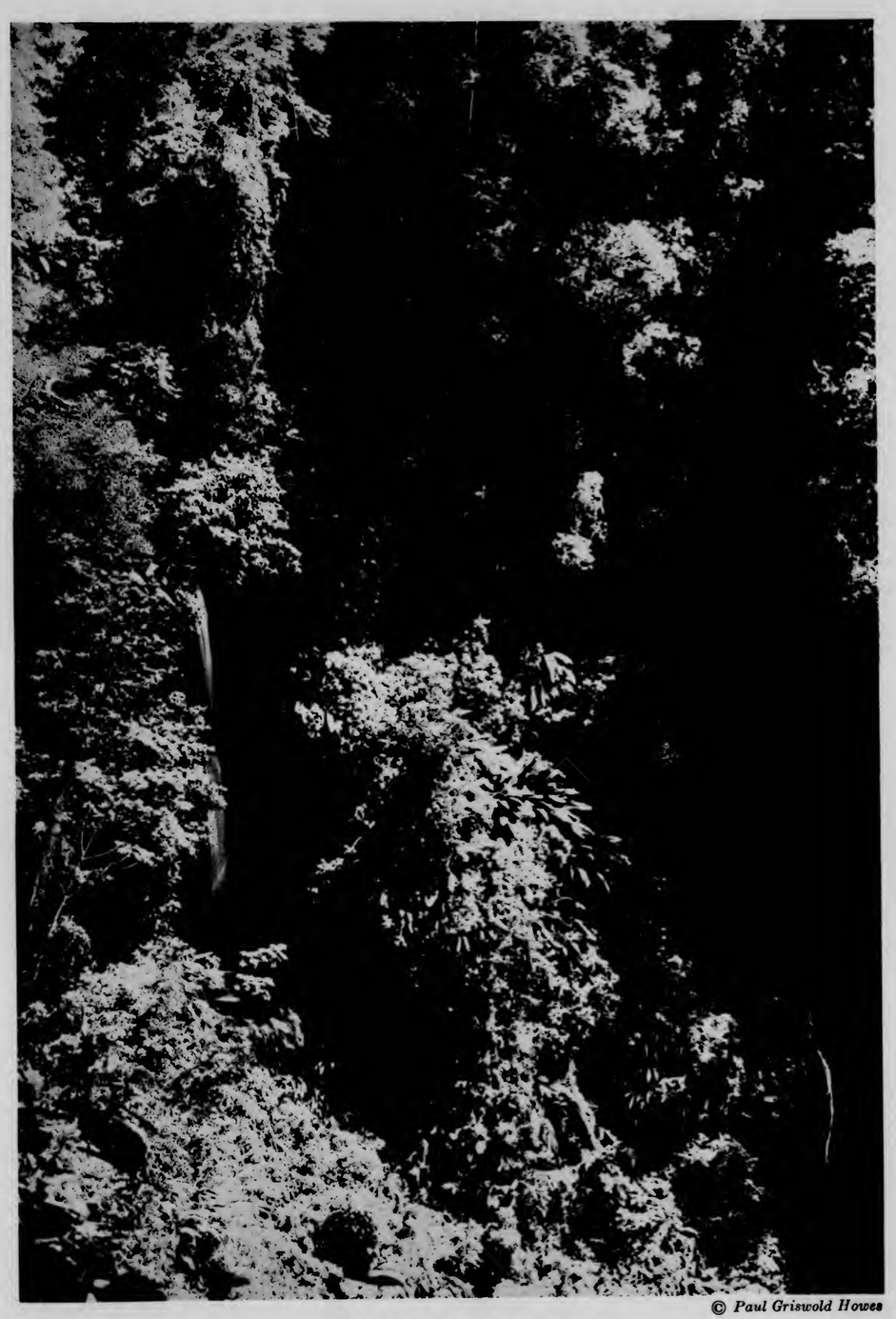
A BROMELIAD AT THE BASE OF A GOMMIER TREE
The bromeliads are parasites, the leaves of which hold water harboring all kinds of life from amœbæ to amphibians. This plant was 6 feet 8 inches high

We made photographs and records from this point and then continued our laborious way through trees that grew smaller and more stunted as we ascended. We passed through masses of lava from ancient upheavals, explored dingy, dripping caves in the clouds, and fell a dozen times into watery holes and crevasses, fortunately without serious results; then, as suddenly as we had encountered the cloud-forest, we left it and found ourselves in another world.

A tree, called by the natives "Kaklanh" or "Figi" had been encountered almost from the start of the trip. We were conscious of it continually because of a disagreeable, heavy slime which it exuded whenever bruised or cut. This sap was extremely sticky, and our clothes and hands were smeared with patches of black. It never came out of our clothes, and it was some days before we were able to remove the last of it from our skins.

At the base of the mountain these trees were twenty-five feet in height, but as we ascended they became smaller and smaller until finally they dwindled into bushes and became the dominant vegetation up to an actual *tree line* fifty feet from the summit.

We had been told that the top was all rock, but such was not the case. No more beautiful or fantastic spot could be imagined, for the whole ground was covered with countless small bromeliads that looked something like the leafy parts of pineapples. There were bromeliad bushes also, if one might call them such, consisting of fifty or a hundred small plants all stemmed together and growing as a living whole. White, gray, red, salmon, and emerald green mosses, were here also, and two or three varieties of low bushes, one in orange flower, constituted the summit vegetation for the most part. There were absolutely no trees, but a rock stuck



THE FALLS IN SALTOUN GORGE
This picture graphically illustrates the difficulties of exploration in the mountains and gorges of Dominica. Note the fall at the lower right issuing from an invisible source

SON ESPRIT—GUIDE

This native, who knows more about the mountains of Dominica than most white people, having spent his 76 years among them, told the author at the outset that Trois Pitons was higher than Diablotin

up here and there, and upon the highest one our aneroid registered 4600 feet.

It was cold and very windy, and we had to hold the tripod to keep it from blowing off the mountain. The men, used to the heat of the lower levels of a tropical island, crouched in the bushes shivering, despite the rum that had been served liberally to all hands. Clouds made seeing difficult at times, and the moisture condensed upon the glass and metal of the camera and fell from the instrument as rain.

Two things that seemed of importance stood out in my mind after we had returned to our headquarters. One was the fact that an actual tree line had been encountered, and that we had found a treeless summit. The other was that our chief man, Son Esprit, had stated that the top was all rock and that he had not made the ascent in some time. He also expressed surprise at certain forms of vegetation which we had found when nearing the top. The significance of these things I will speak of later.

On March 2 we left Roseau for the ascent of Diablotin. We traveled by launch to the little village of DuBlanc, where Mr. Shillingford, a native of Dominica, gave us every possible assistance. From here we proceeded with eleven porters up the hills to the plateau at Milton, where we pitched our base camp near the great lava gorge of the DuBlanc River. From here we directed the cutting of a passable trail to 3400 feet on Diablotin, where a second camp was established and made ready. This camp was a typical native hut of boughs and palm leaves, called an *adjoupa*. Another one was constructed by our men for themselves, less elaborate than ours, and then the trail was continued to the summit.

On March 9 we moved up from the base

© *Paul Griswold Howes*

A PRIMITIVE DOMINICAN

All types were met during the expedition, but this was the most primitive mental type found—a man who was bewildered and frightened by the camera's shining eye

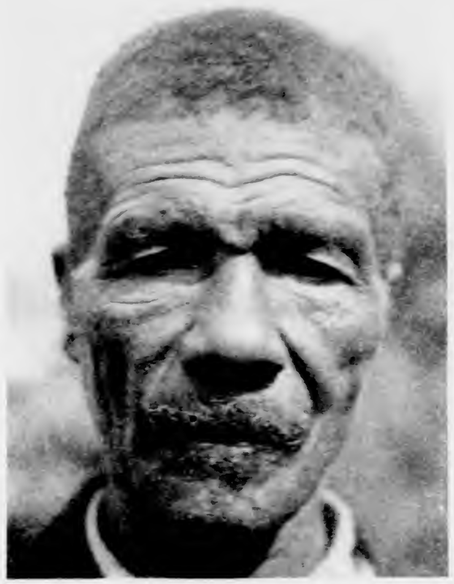
MEMBERS OF THE EXPEDITION

Paul Griswold Howes, the author of this article, stands at the right. The other white man is Dickenson S. Cummings. The negroes are local natives

to the *adjoupas* with our equipment. With us were five men: Babtiste, our own man; John Joseph, who spoke English and assumed a slightly superior air; Casimer, lean, with tremendous lips, and muscles like iron; Toulon, loud, talkative, and gay, a huge fellow, who staggered up the cliffs and through the labyrinth of the forest with a seventy-pound load; and Sicite Ploui, woodsman, hunter, and the proud possessor of mustachios and an ancient shotgun. As mascot we took a dog, whom Cummings appropriately christened "Bromeliad."

We had not gone far before Sicite spied a ramier, or wild dove. It flew from the forest floor to a limb, perched for a moment of observation, and then made off through the trees. We saw it plainly, but our hunter, wishing to impress us, placed his gun to his shoulder, cocked the hammer with much difficulty with the aid of his cutlass, and then pulled the trigger. He had fired at the spot where the dove had been fully a minute before, and now the whole forest vibrated with a deafening roar. Flame belched from the gun, and a huge cloud of smoke enveloped everything, while a shower of newspaper wads and glowing sparks fell all about us. The charge blasted away leaves and branches, and was truly a remarkable spectacle, and then to make the whole procedure more ridiculous, Sicite insisted upon searching the ground minutely for his bird!

This part of the forest of Diablotin is much like that on Trois Pitons, but the trees are of greater diameter and very beautiful. We climbed up slowly and were nearing our second camp when we heard a strange squeaking and twittering in the ferns and begonias near by. Upon investigating, we witnessed a furious battle between two tiny plumbeous warblers. They rolled about in a gray,



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A DISTANT VIEW OF DIABLOTIN

The long ridge leading to the summit of Diablotin is plainly visible in this view, which shows the mountain fifteen miles distant

© *Paul Griswold Howes*

SUBTROPICAL GROWTH ON DIABLOTIN

This beautiful forest lies at an altitude of 1700 feet. It was through such growth that the expedition was forced to travel in order to reach the summit of the mountain

© *Paul Griswold Howes*

THE FIRST PHOTOGRAPH EVER TAKEN FROM THE SUMMIT OF DIABLOTIN

The Y-shaped mark in the middle distance is the result of a huge landslide that removed a great strip of forest from the other mountain

Photograph by Dickenson S. Cummings

MR. HOWES HIGH ON MT. DIABLOTIN

Here the leader is shown in the expedition's native camp at 3400 feet elevation. The hut is made of palm leaves

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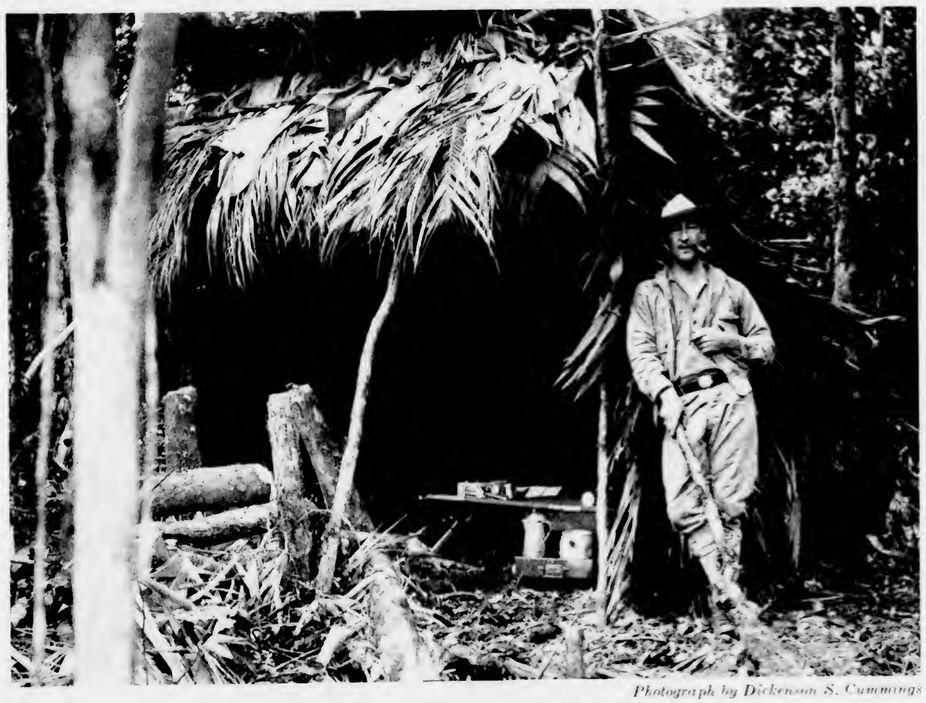

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THE CARIBBEAN SEA

From 3400 feet up the side of Mt. Diablotin. This picture was taken from one of the expedition's camps. In the center distance is the bay and the town of Portsmouth

squeaking ball of feathers and dirt. Never have I seen such a display of fury in such tiny bodies. Still more remarkable is the fact that all about them sat a gallery of their own species, cheering on the combatants and apparently enjoying the spectacle enormously.

It was late when we reached camp and found a wet howling wind blowing through our hut. The roof was dry, but the floor consisted of heavy mud. Besides this, we were badly infested with fleas which had overrun everything at our base camp, and things were not too comfortable. A huge roaring fire was successfully kindled only because we had remembered to collect a good quantity of Gommier gum from the trees below. Everything is saturated with water and soaking moss covers all the branches up in these mountains. Soon we were making ready a pot of steaming erbswurst, and we were just settling down to a little comfort, when a delegation of shivering men came grumbling to our *adjoupa*.

With the exception of Babtiste, they had all decided to try to intimidate us. Dissatisfaction with their rations, which were all too good, was the excuse for the trouble, and they demanded more food.

In the growing darkness of the abrupt Dominican night, these disgruntled black men, each armed with a long gleaming cutlass, looked rather unpleasant by the light of the fire. We stood our ground and refused point-blank to add to their rations, although actually we had been cooking an extra large batch of erbswurst in an old kerosene tin, as a special treat for them. If they wanted more food they could go back down the mountain and get it, and that ended it. They looked at one another, and their cutlasses flashed in the light of the flames, but we held our gun, which was a good gun, and we had demonstrated it

© *Paul Griswold Howes*

A HAZY VIEW FROM DIABLOTIN

Looking toward the Atlantic side of Dominica. A faint white line may be seen at the upper left-hand corner which is the surf on the Atlantic coast

© *Paul Griswold Howes*

A STRANGE VEGETABLE WORLD

At the top of Diablotin and of Trois Pitons the expedition found such growth as this. In the water gathered by the leaves of these weird plants strange life forms were found. Insects, worms, and tiny frogs of the *Eleutherodactylus* group lived among the vivid mosses. The ground vegetation was very simliar on the summits of Diablotin and Trois Pitons

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THE TREMBLEUR

Cinclocerthia ruficauda ruficauda

Found only in Dominica is the trembleur, a strange brown bird of the mountain forests that droops and trembles its wings and holds its long tail above its body. It feeds upon everything from hard nuts to tree frogs. Here it is shown one-third life size

not without reason earlier in the day, just for good luck.

They backed off to their hut, but Sicite, the gloomiest of the lot, went down the mountain again. Before morning he returned but, as far as we could find out, he brought no extra food. All the other men were cheerful and happy.

The last part of the climb on Diablotin is more exhausting than that on Trois Pitons, but conditions are very similar as regards the vegetation, until the top is reached.

After coming out into the open, we proceeded along a gradual ridge which may be seen plainly miles away from the mountain. We walked along this ridge on the edge of a great cañon and looked down on smaller mountains that had been ripped and scarred by the hurricane. The view is superb over endless great valleys and mountains, and the surf may be seen breaking all along the northeastern and eastern shores, while great masses of cloud drift by or about one, changing the scene every minute. Our photographs had to be shot through the holes in the clouds. The dense masses to the south and southwest prevented pictures being made in those directions, but as the ones we did secure toward other points of the compass were the first ever taken from the summit of this mountain, we felt well satisfied.

Diablotin was supposed to be the highest mountain in Dominica, but to our great surprise our instrument registered 4550 feet, or fifty feet lower than Trois Pitons. At the top we found one other record left by Mr. Tavernier of Roseau, some years before, and at 4450 feet another bottle contained the date and the names of a party headed by Mr. Aird and

A PARROT FOUND ONLY IN DOMINICA

Amazona bouqueti

While common in Dominica and encountered frequently by the members of the Howes-Cummings expedition, this bird occurs no place else in the world. Shown slightly over one-third life size

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ANOLIS LIZARDS
These lizards possess yellow throat fans which they extend when excited, and after eating

Mr. Archer, that did not reach the summit.

Undoubtedly our readings are correct, especially in view of the conditions which we found on the two mountains. The summit of Trois Pitons is treeless and the tree line lies about fifty feet from the top. On Diablotin there are trees fifteen feet high, almost at the very peak, and one of my photographs shows palms growing along one of the highest ridges.

It is very interesting that the vegetation appears still be to creeping up these mountains. They are not high enough to allow of permanent tree lines as in greater ranges, and I firmly believe that in the future trees will reach the top of Trois Pitons and that they will become more numerous on Diablotin.

As to the readings of Diablotin which ascribe to the mountain an altitude of 5000 feet or more, let it be said that 5000 feet would be 450 feet higher than we recorded it, which would also make the plateau at Milton 450 feet higher, or 1850 feet. This would be absurd, for the reason that the plateau is a grassy, unforested area, with underbrush and clumps or lines of medium-sized trees, with many life forms living upon it that are characteristic. Anyone who knows Dominica, or who has paid the slightest attention to conditions as they actually exist, knows that an altitude of 1850 feet or even less, anywhere on the Caribbean side, would carry one into the heavy subtropical forest zone with its attendant living forms.

Recalling what Son Esprit had said about the top of Trois Pitons, it appears that noticeable changes have taken place even between the time he went up with us, and with a former party. I should like to climb these two mountains fifteen years from now.

The zoölogy of the mountains is of much interest also, but I shall have to mention it briefly. At the top of Trois Pitons we heard frogs calling, and at all levels on Diablotin, from base camp to summit, we collected specimens of the remarkable little frog called *Eleutherodactylus antillensis*. They become paler as the altitude increases, and it is interesting that they have reached the top of this island world.

These frogs have no tadpole stage at all that is free-swimming. The entire process

A COMMON BUTTERFLY
Colænis julia Fabr.
A butterfly characteristic of the Milton Plateau at 1400 feet elevation. It extrudes a strange gland which smells strongly of banana oil and which has the power of attracting the opposite sex

AN ANTILLEAN BROAD-WINGED HAWK
Buteo platypterus antillarum
This bird, which was captured alive by the expedtion is of a common species. Stomachs examined contained giant centipedes and spiders, and the birds were frequently seen eating or carrying the black and white snake, *Leimadophis juliae*. The species is shown about one quarter life size

takes place within the unusually large eggs, which are deposited upon the ground. The young frogs step out of the eggs perfect in every detail and are about the size of a black-headed pin!

There is plenty of life up on these mountains, for the stomachs of these frogs contained flies, two kinds of beetles, and many ticks and mites. In the water caught by the leaves of bromeliads, black worms and other semi-aquatic creatures were thriving.

Molluscs in the form of land snails have reached the summit of the mountains also. A variety of *Bulimulus guadeloupensis* inhabited the plateau at Milton (1400 feet) and also a small, flat-shelled species of *Amphibulima*. The beautiful snail, *Pleurodonte josephinæ*, occurred up to 3400 feet, where a number of the shells were found beside a rock where they had doubtless been cracked open by the thrush, *Chichlherminia dominicensis*.

Species of *Neocyclotus* were also found well up on the slopes of Diablotin; this may possibly be a new species. At the summit of Diablotin I found a beautiful horn-colored *Amphibulima*, its shell streaked with delicate, waving lines of brown, and another as yet unidentified snail with a high spiral shell.

Land crabs were not uncommon in the subtropical zone of both mountains, and the streams on the lower slopes were inhabited by hundreds of shrimps and many of those strange gobies, fitted with suction discs for clinging to stones in the roaring mountain streams. The species which we found was *Sicydium punctatum*. The fishes were feeding upon algæ.

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Insects were numerous, but space prohibits a discussion of them in this article. I must mention, however, a large green mantis from 1500 feet on Diablotin that was quite different from any other species I have taken in Dominica.

Bats were encountered, but not at the higher levels, while bird life was much in evidence. The Imperial parrot, *Amazona imperialis*, and the smaller *Amazona bouqueti* both inhabit Diablotin, and the latter was seen several times on Trois Pitons. *Imperialis* is scarce, but *bouqueti* was seen many times every day during our Diablotin expedition, and on one day we saw seventeen.

On the grassy plateau at Milton and in the rows of trees and the thickets which grew here, twenty-seven species of birds were found including anis, cuckoos, four flycatchers, two warblers, two finches, and a grossbeak, a wren and a honey-creeper, three thrushes, and a solitaire called the mountain whistler (*Myiadestes dominicanus*), which is peculiar to the island. There was also a comical bird, the trembleur, *Cinclocerthia ruficauda ruficauda*, with the habit of continually drooping and trembling its wings, a swift, and four humming birds, the Antillean broad-winged hawk, *Buteo platypterus antillarum*, and a wild pigeon and a dove.

All of these except the Imperial parrot were found also between our headquarters at 1800 feet and the top of Trois Pitons, but birds were scarcer on the higher parts than on Diablotin, although the Dominican sparrow, *Pyrrhulagra noctis dominicana*, flew over the very top of it while we sat making our notes! Near by, but not actually on Trois Pitons, at 1850 feet, Cummings and I secured a specimen of the very rare *Euphonia flavifrons* three days before the end of our trip. The only other record of this we know of is that of Ober made in 1887.

Our time, was far too short for our purpose, and there is doubtless a great deal more of interest and value to be found out about these rugged mountains. I hope sometime in the future to climb them again, in order to check up on my predictions.

WHITE PIERID BUTTERFLY newly emerged from its chrysalis. This species sometimes appears in great broods, both at sea level and high in the mountains. About four times life size

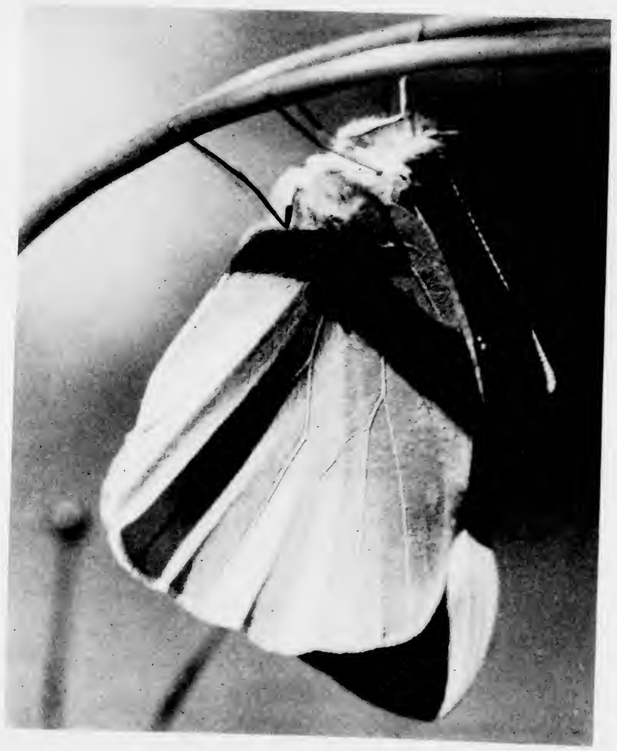
Insects were numerous, but space prohibits a discussion of them in this article. I must mention, however, a large green mantis from 1500 feet on Diablotin that was quite different from any other species I have taken in Dominica.

Bats were encountered, but not at the higher levels, while bird life was much in evidence. The Imperial parrot, *Amazona imperialis*, and the smaller *Amazona bouqueti* both inhabit Diablotin, and the latter was seen several times on Trois Pitons. *Imperialis* is scarce, but *bouqueti* was seen many times every day during our Diablotin expedition, and on one day we saw seventeen.

On the grassy plateau at Milton and in the rows of trees and the thickets which grew here, twenty-seven species of birds were found including anis, cuckoos, four flycatchers, two warblers, two finches, and a grossbeak, a wren and a honey-creeper, three thrushes, and a solitaire called the mountain whistler (*Myiadestes dominicanus*), which is peculiar to the island. There was also a comical bird, the trembleur, *Cinclocerthia ruficauda ruficauda*, with the habit of continually drooping and trembling its wings, a swift, and four humming birds, the Antillean broad-winged hawk, *Buteo platypterus antillarum*, and a wild pigeon and a dove.

All of these except the Imperial parrot were found also between our headquarters at 1800 feet and the top of Trois Pitons, but birds were scarcer on the higher parts than on Diablotin, although the Dominican sparrow, *Pyrrhulagra noctis dominicana*, flew over the very top of it while we sat making our notes! Near by, but not actually on Trois Pitons, at 1850 feet, Cummings and I secured a specimen of the very rare *Euphonia flavifrons* three days before the end of our trip. The only other record of this we know of is that of Ober made in 1887.

Our time, was far too short for our purpose, and there is doubtless a great deal more of interest and value to be found out about these rugged mountains. I hope sometime in the future to climb them again, in order to check up on my predictions.



White Pierid Butterfly newly emerged from its chrysalis. This species sometimes appears in great broods, both at sea level and high in the mountains. About four times life size

Retake of Preceding Frame

Proc. Nat. Acad. Sci. Vol. 22, No. 1. Jan. 1936.

A NEW PREHISTORIC CULTURE IN HAITI

By Froelich G. Rainey

University of Alaska, College Station, Alaska

Communicated December 5, 1935

Archaeological investigations in the region of Fort Liberté Bay, North Haiti, have disclosed certain shell heaps or kitchen middens which contain numerous secondarily chipped flint implements and no ceramic objects. These middens standing in sharp contrast to middens previously excavated in the West Indies, which normally contain pottery and no flint tools, clearly represent the remains of a distinct prehistoric culture. Non-pottery-bearing deposits have been found in Cuba, Santo Domingo and the Virgin Islands, representing what has long been thought to be a primitive, early culture in the West Indies, but flint tools have not been found in these or in any of the usual pottery-producing deposits. Since the technique of pottery manufacture was known throughout all the islands of the Antilles at the time of the conquest, the non-pottery-producing, flint-bearing deposits near Fort Liberté Bay may be interpreted as the remains of an early prehistoric culture preceding the pottery-making cultures that extended over the West Indies at the time of the discovery.

The first indication of the existence of this early culture in Haiti was observed in the large collections of archaeological specimens owned by Mr. and Mrs. Robert Pettigrew of the Haitian American Development Corporation. The many well-worked flint implements in this collection were brought in by natives who said they were found in certain sections of the plantation. In the spring of 1935 Mr. Allison V. Armour made it possible for me and Mr. B. Irving Rouse to undertake extensive investigations in north Haiti under the auspices of Peabody Museum, Yale University. Assisted by Mr. and Mrs. Pettigrew and the Haitians who had collected for them, we were able to locate five aboriginal dwelling sites which produced these flint implements.

Flint-Bearing Deposits.—Adopting the names of the old French colonial land grants, we have termed the flint-producing sites Couri No. 1, Couri No. 2, La Rivière Maurice, Savanne Carrée No. 1 and Savanne Carrée No. 2. All are within three miles of the bay but none is actually on the shore. Four of the sites are marked by shallow marine shell deposits never over forty centimeters in depth. The fifth, Couri No. 2, is a low mound one meter in height and approximately thirty meters in diameter. The composition of all five deposits is relatively homogeneous. Marine shells are scattered through black sandy soil which contains a large quantity of wood ash and charcoal. No bone refuse of any kind appears. All artifacts found throughout the deposits are made of stone, with the single

around the deficient region. In the posterior region the neural folds are often widely separated or split apart. When the same type of cut is made with the medium primitive streak stage, neural folds and somites appear posterior to the cut. No notochord was found in any explant from which Hensen's node had been removed.

Evidence has been presented[3,5] to show that the node acts as an organizer during development and is concerned in the posterior differentiation of the axial structures in the chick. Others[7,8] failed to secure posterior differentiation following the isolation or destruction of the node. On the other hand there is evidence[1,2,4,6] which seems to indicate that destruction, removal or isolation of the node from the streak does not necessarily inhibit the appearance of axial structures in areas around or posterior to it. For a discussion of this subject reference should be made to a recent paper by Dalton.[1]

Extracts of the thyroid gland and the growth promoting principle of the pituitary, when added to the culture medium either singly or in combination, failed to produce any perceptible effect on the growth or differentiation. Either the embryo was not able to utilize this material in the way it was given or the culture period, 48–72 hours, was too short for any effect to appear.

The results obtained in these studies indicate that (1) duplication of a kind may take place in the case of certain axial structures even in stages as late as those tested; (2) the isolated hypoblast does not differentiate alone while the epiblast may give nervous tissue, notochord, mesoderm and somites; (3) the differentiation of posterior axial structures, i.e., nerve cord and somites, may occur in young blastoderms from which Hensen's node together with more or less of the node field have been removed, but the notochord is lacking; (4) the addition of thyroid extract and the growth promoting principle of the pituitary to the culture medium do not cause any perceptible effect on the development of the explant.

[1] Dalton, A. J., *Jour. Exp. Zoöl.*, **71**, 17 (1935).
[2] Hoadley, L., *Arch. Biol.*, **36**, 225 (1926).
[3] Hunt, T. E., *Jour. Exp. Zoöl.*, **59**, 395 (1931); *Proc. Soc. Exp. Biol. Med.*, **28**, 626 (1931); *Anat. Rec.*, **55**, 41 (1932).
[4] Waddington, C. H., *Phil. Trans. Roy. Soc. London*, Series **B221**, 179 (1932); *Roux' Arch.*, **128**, 502 (1933).
[5] Willier, B. H., and Rawles, M. E., *Jour. Exp. Zoöl.*, **59**, 429 (1931).
[6] Kopsch, F., *Zeit. Mikro.-anat. Forschg.*, **35**, 254 (1934).
[7] Wetzel, R., *Ergänzungsheft z. Anat. Anz.*, **60**, 127 (1925); *Roux' Arch.*, **106**, 463 (1925); *Ibid.*, **119**, 188 (1929).
[8] Dantschakoff, V., *Roux' Arch.*, **127**, 542 (1932).

exception of a shell ornament curiously resembling a "fleur-de-lis." This was found near the surface at Savanne Carrée No. 1.

The majority of the artifacts found were complete or fragmentary implements made of flint or of material which could be worked into tools with the chipping or flaking process employed in the manufacture of flint implements. In order to simplify terminology, all objects of this kind will be referred to here as flint. These tools may be classed as scrapers, knives and spear-heads. The scrapers are rough flakes two or three inches in diameter and of varying shapes, with at least one side worked down by the secondary chipping process to form a relatively sharp cutting or scraping edge. The knives are rectangular implements varying from four to ten inches in length, one to three inches in width and one-fourth to one inch in thickness. Some of the knives are sharpened by the chipping process on one edge and others on both edges. All appear to have been struck from a prepared block of flint, the line of cleavage still remaining on both surfaces, but the edges having been retouched. The spear-heads are dagger-shaped implements with a well-formed stem or hilt and a sharp leaf-shaped blade. They are, apparently, long thin flakes struck from a core, which have been formed by retouching the edges. Facets of the flaking process never extend across the flat surfaces as on the flint spear-heads found in North America. They vary in length from six to ten inches and in width from two to four inches. The technique of chipping indicated by the form of all these flint tools appears to be very simple and crude, contrasting markedly with the chipping technique evidenced by the usual type of flint implement found in the Americas.

Associated with the flint tools were found numerous grinding stones which are well-formed objects made of rough granular stone. The majority have two flat grinding surfaces. In outline some are oval, some rectangular and others round. All are small enough to be grasped conveniently in one hand. In addition, a few stone objects were found which may be termed double-headed axes or hammers. These implements are oval in outline and made from coarse-grained stones, apparently by the "pecking" process. The lateral sides are invariably notched as if the implements had been intended for hafting. In some cases both ends have been ground down to form relatively sharp cutting edges, while in other cases the ends are blunt and pitted although roughly worked to an edge. These objects vary from six to fourteen inches in length and from three to ten inches in width. The smaller, sharpened tools would serve very well as axes, but the large, blunt-edged specimens could not have been used as cutting tools.

Fragments of red ocher were also found throughout all flint-bearing

deposits. Two small tubular stone beads were encountered at the Couri No. 1 site.

Pottery-Bearing Deposits.—During the period of investigation in the region of Fort Liberté Bay we also excavated six large pottery-bearing shell midden sites which have been termed Macady, Carrier, Meillac, Diale No. 1, Diale No. 2 and Moyeaux. Two of these sites are marked by shallow refuse deposits never exceeding fifty cm. in depth, and four are composed of low mounds with an altitude of one to two meters. All of these pottery-bearing sites are within four miles of the bay shore and the two at Diale extend practically to the water's edge. The composition of all these refuse deposits is essentially the same, consisting of marine and terrestrial shells, blackened soil, ash, charcoal, bones of the manati, hutia, fish, birds and turtles, interspersed with numerous ceramic objects and polished stone and shell implements.

The pottery removed from the Carrier site and from the Diale No. 2 site was essentially the same, and stood in contrast to the pottery removed from the Meillac, Moyeaux, Nacady and Diale No. 1 sites. The difference between the pottery removed from these groups of middens indicated that we were dealing with two cultural types or two phases of the same culture pattern. The pottery from the Carrier site and from the Diale No. 2 site has been termed the "Carrier type," while that from Meillac, Macady, Moyeaux and Diale No. 1 has been termed the "Meillac type." The distinctions are primarily based on pottery ornamentation, the stone and shell implements found in all pottery-bearing sites being essentially the same. Briefly, the Carrier type is characterized by vessels decorated with elaborate incising and with a peculiar modeled head lug or "adorno," while the Meillac type is characterized by numerous boat-shaped bowls with loop handles, modeled head lugs of a much simpler form, and a rarity of line and puncture incision. Pottery from both types of sites is relatively crude and coarse in composition, and the distinction is based primarily on the technique of ornamentation which is more complex on pottery of the Carrier type.

Both types of pottery from the deposits in the Fort Liberté Bay region conform to the general pattern of cultural traits found in shell middens throughout the Greater Antilles and the Virgin Islands. This complex of traits I have referred to as the "Shell Culture," and it has been tentatively associated with the Arawak-speaking peoples occupying the Greater Antilles at the time of the conquest. (Rainey, "A New Prehistoric Culture in Puerto Rico," *Proc. Nat. Acad. Sci.*, **21**, No. 1, Jan., 1935.) This Shell Culture has been found in stratified deposits in Puerto Rico overlying an earlier trait complex referred to as the Crab Culture. No indications of this earlier Crab Culture were found in north Haiti.

A stratigraphic study of Shell Culture deposits in Puerto Rico suggested

an early and a late phase with the distinction based on more complex pottery ornamentation in the late phase. These two phases of the Shell Culture are apparently duplicated in the Shell Culture deposits in Haiti, with the Meillac type corresponding to the early phase and the Carrier type to the late phase. However, we were not fortunate enough to discover a stratified deposit in Haiti, and as yet there is no proof that the Carrier type succeeded the Meillac type. A careful analysis of the material has not yet been made and it is possible that some clue to the relative ages of these two Shell Culture types in Haiti may appear with an adequate study of the material.

Conclusions.—The result of the recent excavations in Haiti may be summarized as follows: five aboriginal dwelling sites producing flint tools, grinding stones and double-headed axes or hammers, but no pottery, represent a distinct, early, and as yet unrelated culture in the West Indies; six aboriginal dwelling sites producing abundant pottery, polished stone and shell tools, but no flint implements, represent a later culture which correlates with the Shell Culture pattern (probably Arawak) that has been found distributed over the Greater Antilles and the Virgin Islands; and finally, two types or phases of this later, Shell Culture, exist in Haiti with the relative ages still problematic.

In the report of the Puerto Rican research carried out in 1934 (unpublished) I have shown that the early, Crab Culture, in Puerto Rico is distributed from Trinidad through the Lesser Antilles to Puerto Rico, and that the later, Shell Culture, is distributed from the Virgin Islands through the Greater Antilles to the Caicos Islands in the Bahamas. Since the Crab Culture material lies below the Shell Culture in stratified deposits in Puerto Rico, I have assumed that early and late periods of migration into the West Indies are indicated. At present, northeastern South America appears to be the source of both these culture movements. In the preliminary report of the Puerto Rico work undertaken in the summer of 1934 (*Proc. Nat. Acad. Sci.*, **21**, No. 1), these two culture periods were supplemented by an hypothecated "Problematic Recent Culture" based on the presence of certain carved stone objects such as "collarstones," "three-pointed stones" and "stone masks" in numerous surface collections of Puerto Rican archaeology. None of these objects were found in the shell middens excavated in 1934. Additional work in Puerto Rico (1935) has produced fragments of some of these carved stone objects associated with Shell Culture artifacts in the shell middens, indicating that the existence of a "Recent Culture" is less likely.

Correlating the Puerto Rican work with that just completed in Haiti, a tentative sequence of culture horizons in the West Indies may be indicated as follows:

III. Shell Culture (probably Arawak)
Greater Antilles and the Virgin Islands.
In stratified deposits above the Crab Culture complex in Puerto Rico and demonstrably later than the Crab Culture complex in the Virgin Islands.

B—Late phase in Puerto Rico.
Possibly the "Carrier type" in north Haiti.

A—Early phase in Puerto Rico.
Possibly the "Meillac type" in north Haiti.

II. Crab Culture
Lesser Antilles and Puerto Rico.
In stratified deposits below the Shell Culture in Puerto Rico and demonstrably older than the Shell Culture in the Virgin Islands.

I. Flint Culture
North Haiti.
In non-pottery-producing, flint-bearing deposits, not in stratified sites, but always segregated and assumed to be older than all pottery-producing deposits.

Rainey, F., *Proc. Nat. Acad. Sci.*, **21**, 12–16 (1935).

SUMMARY OF INVESTIGATIONS OF VARIABLE STARS

By Harlow Shapley

Harvard College Observatory, Cambridge, Massachusetts

Read before the Academy, November 19, 1934

In the measurement of distances, both within and outside the galaxy, and in the investigation of stellar development, stars that vary in light continue to be useful and important. Much variable star work contributes only to knowledge of the individual stars themselves, but several of the investigations in progress at Harvard, such as those summarized below, are designed to make use of stellar variation as an instrument in the attack on problems of a more general nature. In such researches emphasis is placed either on extensive surveys that are aimed to provide material for the analysis of frequencies of types, luminosities and distances, and the study of distribution in space; or on the peculiar types and anomalous behaviors of variable stars.

In successive sections the following subjects are treated:

(1) Discovery and distribution of a thousand new variable stars in the Small Magellanic Cloud.

South America (Except Peru)

1844-1934

April 1894 No2.

declare it, that I shall be a rebellious recruit in the suppression of the signs characterizing an etymology which cannot be dispensed with. I hold to the retention of phoneticism in the sciences, preserving the orthography and the conventional signs of the etymologies, leaving, then, to live in peace the *ph* and the *y*, the *ch* and the *th*, which render us the greatest service, but leaving also to be eradicated all these peculiarly strange orthographies which have no reason of being and that an inexplicable practice has perpetuated without knowing why.

"In a word, let us preserve a scientific orthography reasonable and useful."

THE TÉRRABA INDIANS.—The Térraba or Tiribi Indians of Costa Rica, Central America, dwell upon the Pacific slope, near the southern border of that country. H. Pittier, who carried on explorations among them in behalf of the territorial government, was brought to believe by their relics that they were a mixture of the various tribes which had been induced to settle in the Diquis valley by the Franciscan missionaries of the eighteenth century. Among them the Terbis or Tervis, who had come from the northern coast, were prominent, and hence the whole assemblage of tribal remnants received the name Terbis or Térrabas. The language of the Térrabas was also adopted by the other portions of the racial conglomerate and, in fact, it is much like the language of the Bribris and other tribes still extant on the Atlantic side of the cordillera.

The Brunka or Bóruka is another cognate people now living three leagues south of the Térrabas. They are of purer origin and are of altogether different appearance. To strangers they communicate words of their vernacular with great reluctance. Dr. William M. Gabb has studied their language extensively and has published a memoir on the whole linguistic group—Guatuso excepted—and Bishop B. A. Thiel has added considerably to our knowledge of it; now H. Pittier is taking up the subject again.

In the preliminaries to his "Ensayo lexicografico sobre la lengua de Térraba" he places the dialects of the Talamanca province in one linguistic family, and to this also pertain the dialects of New Granada eastward to the gulf of Darien, as

Bread is also subject to contamination in various ways—in the preparation and in the cooking, by the use of poisonous utensils, etc.

In short, *morbidité* may result equally from an excessive or an insufficient régime, a fact which renders this study a social question *par excellence*.

The rich ordinarily eat too much and the poor too little. The great eater furnishes a fertile soil in which infection easily germinates, and inversely an insufficient régime contributes to inanition.

THE ORTHOGRAPHY OF SCIENTIFIC LANGUAGE.—M. de Lacaze-Duthiers, president of the French Academy of Sciences, recently opened a séance of that body with a paper upon a subject perhaps a little unexpected, but interesting to very many—"The present orthography of scientific language."

"It is now more than a century," said he, according to *Le Temps*, "since Linnæus proposed his rules, always correct and sensible, which today are too often forgotten. He found that words or terms of too great length become nauseous. This is his expression: 'Nomina generica sesquipedalia, enunciatu difficilia vel nauseosa fugienda sunt,' and Linnæus was right.

"Here is one of these words, and you will excuse me from pronouncing it: Monolasiocallenomomophyllorum.

"What would Linnæus say if he should return in our day and have brought before him to pronounce correctly the modern chemical terms we have here?

"You know that they are seeking to artificially color white flowers. If, then, a part of the audience wishes to have these flowers green, it will be necessary for them to seek a shop for chemical products and demand the acid, diéthyldibenzyldamidotriphénylcarbinotrisulfureux, for the purpose of making a solution in which to dip these white flowers. Is it at all necessary to say that this word is of the character of those of which Linnæus said, 'Enunciatu difficilia, nauseosa, fugienda sunt'? Who, then, will say it would not be well (outside of the natural sciences, for which I do not pretend to speak) to follow the principle of Linnæus in making new names a little shorter?

"In conclusion, I declare it here, and it is here that I wish to

Guaimi, Dorasque, Changuina, Chaliva, Cuna, and others. The Bribri group of Costa Rica embraces the Cabécar, Chirripó, Estrella, Tucurrique, and Térraba, part of which are called after rivers passing through the territory. The Brunka or Bóruka differs sensibly from these and should be classed as a separate language, though of the same family. The pronunciation of all these Indians is indistinct and far from sonorous. A peculiar feature of their language is the use of classifying terms, forming compound words with substantives or adjectives to express shape and form of the objects spoken of. So in Térraba the word kwó, *seed*, when suffixed in the above manner, points to something round, curvilinear, or globular, as in bokuó, *face;* kuguó, *knee;* feringuó, *testicle*. Other classifiers of this description are -kró, -gró for *long* objects, -sho indicating *stuff* or *material* of which objects are made, -uoh forming *collective* nouns. These statements are from Carlos Gagini, "Grammatic sketch of Térraba," which forms part of the "Ensayo." Many of the sensations and mental processes which we attribute to the heart are attributed by the Costaricans to the *liver*, guo, and hence such words as *to think, remember, forget, desire, sad, joyful* are compounded with the syllable guo. A. S. GATSCHET.

THE USE OF THE BOW AND ARROW IN THE TIMOR GROUP.—Very little is known about the methods of arrow-release in the East Indian archipelago. The little I noticed on this subject during my travels through these regions in 1891, particularly in the Timor group, may be of interest.

The only localities in this group where I saw bow and arrows used are Central Timor (Belo), Adonara, and Flores. The inhabitants of Belo and Adonara practice the same release which I am at a loss to classify with certainty among any of the methods described by Prof. Edward S. Morse. The arrow is grasped between thumb and forefinger of the right hand, while the other three fingers pull the bow-string back. Some Solorese of Adonara, however, left off the little finger after the bow was strung, and the arrow was to be shot. In this latter case it would seem to indicate the secondary release. The forefinger of the bow-hand encloses loosely the arrow so as to hold it against the left

side of the bow, which is held almost vertical. Whether any extra arrows are held in the bow-hand or shaft-hand, I am not sure.

In the island of Flores, the Sika and Lio tribes, largely of Papua blood, practice the primary release. The bow-hand (left) is held as by the Belonese and Solorese, and so is the arrow, to the left of the bow, vertical. A few extra arrows are kept in the bow-hand.

Bows and arrows in Timor, Adonara, and Flores are of a rather inferior type. The arrow-heads are made of iron, bone, and wood; the arrow-butts are not feathered.

In the parts of Polynesia I visited subsequently the bow and arrow are obsolete, and survive only as playthings for children.

DR. H. TEN KATE.

THE AINU OF SAGHALIN.—Mr. B. Douglas Howard relates his experiences among the Ainu of Saghalin in his recent work, "Life with Trans-Siberian Savages (London, 1893). Says a writer in the *Scottish Geographical Magazine* for November, p. 604:

"Having got on very friendly terms with the governors of the Russian penal settlements in the far East, Mr. Howard found himself an honored guest in the most eastern of all, the island of Saghalin. Here, with the very necessary assistance of the governor, he was able to take up his abode in an Ainu village far from the touch of civilization. The people received him as a guest, installed him as Head Wizard in recognition of his professional skill as a surgeon, and finally elected him Honorary Chief. As such he was initiated into the mysteries of the making of poison for the arrow-heads, and with great difficulty saved himself from the infliction of having his ears bored and his person tattooed as marks of his Ainu adoption. . . . On his return to civilization Mr. Howard determined to continue his studies among the Ainu of Yezo, but found great difficulty in getting there. He finally reached Hakodate, shattered and bruised, having escaped with bare life from double shipwreck in two Japanese sailing vessels. This put an end to his active adventures. The book closes with an interesting comparison of the Ainu inhabitants of Saghalin and Yezo, the chief conclusion being their absolute identity in physique and customs and, apparently at least, to a large extent in language. Drunkenness, the besetting vice of the Ainu of Yezo, is unknown in Saghalin."

URBINA, FERNANDO, AND HERIBERTO CAMACHO. **La zona megaseismica Acambay-Tixmadeje, Estado de Mexico, conmovida el 19 de Noviembre de 1912.** 125 pp. Maps, diagrs., ills., bibliogr. *Inst. Geol. de Mexico Bol. Num. 32.* Mexico, 1913. [This zone, which lies in a disturbed and volcanic terrain, is the focus of the earthquake of Nov. 19, 1912. The quake was of tectonic origin and has aroused interest on account of its intensity and its location in a new center close to Mexico City.]

—— **Vera Cruz, Consular District of, Trade and Commerce of the, Report for the Year 1914 on the.** 12 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5522. London, 1915.

International railways of Central America. Map of existing, proposed, and subsidiary lines. [1:475,000.] [United Fruit Co., Boston], 1915.

Topographical map [of the] mineral concessions and lands [in Honduras of the] New York & Honduras Rosario Mining Co., by J. H. Sinclair, C. E. 1:12,000. N. Y. & Honduras Rosario Mining Co., [New York], 1911.

Mapa de Costa Rica, segun los levantamientos efectuados de 1891 a 1898 por H. Pittier, Director del Instituto Fisico-Geografico Nacional . . . Dibujado por el Asistente Enrique Silva R. 1903. Correcciones efectuadas hasta 1914. 1:500,000. [White-print copy by] United Fruit Co., [New York, 1915]. [A copy, without hypsometric tints, of the map that appeared in *Ergänzungsheft No. 175 zu Petermanns Mitt.* (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 797-798).]

The district of Panama, by Percy W. Ryde, F.R.G.S. [4 maps]: (a) Before the canal, 1:150,000; (2) Present day, 1:150,000; [the other two are bird's-eye views to correspond to the above]. G. W. Bacon & Co., Ltd., London, [1915].

WEST INDIES

—— **Cuban Tobacco Industry.** *South American Journ.*, Vol. 79, 1915, No. 23, pp. 457-458. London. [See also note on p. 219 on "The War and Cuban Commerce."]

MONAGHAN, J. C. **Jamaica.** 13 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 22c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Map of Porto Rico, compiled from the latest government sources by C. A. Reeds. 1:350,000. American Museum of Natural History, New York, 1915.

[Environs of San Sebastian, Porto Rico]. 1:100,000. [American Museum of Natural History, New York, 1915].

[Environs of Juana Diaz.] [18°6′-17°57′ N.; 66°33′-66°24′ W.]. 1:100,000. [American Museum of Natural History, New York, 1915].

SOUTH AMERICA

THE GUIANAS, VENEZUELA, COLOMBIA

WHIFFEN, THOMAS. **The North-West Amazons: Notes of Some Months Spent Among Cannibal Tribes.** xvii and 319 pp. Maps, diagrs., ills., index, bibliogr. Duffield & Co., New York, 1915. $3. 9 x 6.

To appreciate Captain Whiffen's work it is necessary to recall that Crevaux, "the Stanley of South America," explored the great region between the Amazon and the Meta, a tributary of the Orinoco, as long ago as 1879-1881. Martius had been there in 1820. Humboldt, twenty years before, had entered the northwestern corner of the Amazon basin by way of the upper Negro, and several of the conquistadors had explored its borders. Crevaux had resolutely traversed it by way of two great streams,—the Guaviare on the north and the Putumayo on the south. From that time on, the great tract between these rivers remained unknown until Dr. Hamilton Rice in 1907-1908 and again in 1912-1913 made his noteworthy explorations of the Rio Uaupes, Rio Içana, and the Rio Inirida, thus tying up the main drainage courses with Bogotá on the northwest and the Rio Negro on the southeast (*Geogr. Journ.*, Vol. 44, 1914, pp. 137-168; cf. maps). Some of the bordering country is almost as new as the region which Doctor Rice explored. Between the Napo and the Uaupes, for example, there is a large tract of country which has been explored but little except along the streams. It is here that Captain Whiffen conducted his explorations and studies over a period of a year, 1908-1909. He was accompanied by John Brown, a Barbadian negro who had married a woman from the Witoto tribe on the Issa River. It was through this relationship that the author was able to gain most of his information.

The geographical elements of the book are not easy to get at because scattered through

of the easternmost post facing the French fort of Natchitoches and the rigorous trading laws. Any Frenchman found trading on Spanish territory without a license was committed to Acapulco and thence—an interesting bit of geography in itself—despatched to the farthest limit of the Spanish domain, to San Fernandez or Valdivia. Despite the law, the remoteness of this frontier prompted friendly relations between the rival posts, and one governor at least, Barrios, is strongly suspended of collusion with the French authorities in a profitable trading alliance.

In 1731, the beginning of the period under consideration, Spanish occupation was practically limited to a line of communications and three settlements along the belt of interior prairies, the home of the most amenable, agricultural tribes. The greater part of the shore line, peopled by hunting, fishing, cannibal tribes, was absolutely unknown until fear of English invasion led to the foundation by Escandón of the successful stock-raising colony of Nuevo Santander immediately south of the province of Texas; and fear of French aggression on the northern coast, to the creation of the fort and mission of San Augustin at the mouth of the Trinity River. At the same time an expansive period in the north and west was induced by a twofold motive: desire to subdue and proselytize the Apache and check the insiduous advance of French traders from beyond the Red River. With this object in view the San Sabá and San Xavier Missions were founded. Their long-lost sites have recently been identified by the author. Difficulties of controlling the nomadic hunting tribes of the splendid buffalo country of the West proved too great for the zealous fathers. The tentative hold of these and the coast missions and even the eastern post of Los Adaes is shown by their abandonment on the passing into effect of the Louisiana Cession. The only really successful missions was the central ones of the San Antonio. Spanish policy and geographic controls operated together to delay the European settlement of Texas.

BERRY, E. W. **Erosion Intervals in the Eocene of the Mississippi Embayment.** Maps, diagr. *U. S. Geol. Surv. Prof. Paper 95-F,* pp. 73-82. Washington, 1915.

CLINE, I. M. **The Tropical Hurricane of September 29, 1915, in Louisiana.** *Monthly Weather Rev.,* Vol. 43, 1915, No. 9, pp. 456-466.

ROCKWELL, W. L. **The Water Resources of Texas and Their Utilization.** Map, diagrs., ills. *Texas Dept. of Agric. Bull. No. 43,* pp. 7-87. Austin, 1915 (?)

Railroad map of Kentucky. 1:456,000. Railroad Commission, Frankfort, 1915.

Geologic map of Tennessee, compiled by O. P. Jenkins, Assistant Geologist. 1:500,000. State Geological Survey, [Nashville], 1915.

State of Mississippi, compiled from official records of the General Land Office, U. S. Geological Survey, and other sources, under the direction of I. P. Berthrong. 1:760,320. General Land Office, [Washington], 1915.

Western States

ATWOOD, W. W. **Eocene Glacial Deposits in Southwestern Colorado.** 26 pp. Map, diagrs., ills., bibliogr. *U. S. Geol. Surv. Prof. Paper 95-B.* Washington, 1915. [Abstracted in this number, pp. 217-218.]

MEXICO AND CENTRAL AMERICA

BAUER-THOMA, WILHELM. **Unter den Zapoteken und Mixes des Staates Oaxaca der Republik Mexico.** Ills. *Baessler-Archiv,* Vol. 5, 1915, No. 3, pp. 75-97.

CLUM, H. D. **Nicaragua.** 15 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 43c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

DIETERLE, G. A. **De buitenlandsche handel van Guatemala.** *Tijdschr. voor Econ. Geogr.,* Vol. 6, 1915, No. 11, pp. 453-457. The Hague.

LUTZ, OTTO. **Beiträge zur Geologie des Panamakanals.** Diagr., ills., bibliogr. *Petermanns Mitt.,* Vol. 61, 1915, Sept., pp. 350-356; Oct., pp. 389-394. [A good summary of the geology of the isthmus, based mainly on the reports of Donald F. MacDonald, geologist of the Isthmian Canal Commission.]

NIDA, S. H. **Panama and Its "Bridge of Water."** 196 pp. Maps, diagr., ills., bibliogr. Rand, McNally & Co., Chicago, 1915. 50 cts. 7 x 4½. [A supplementary reader for fourth and fifth grades.]

PALMER, FREDERICK. **Central America and Its Problems.** xiv and 347 pp. Map, ills., index, bibliogr. Moffat, Yard & Co., New York, 1913. $1.25. 8½ x 5½.

SNYDER, A. G. **Panama.** 5pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 35b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

a mass of ethnological and other material, but as samples of interesting principles and facts the following may be given. The isolation of the forest is shown by the self-sufficiency developed by each group, which in turn has a marked effect upon the *mores.* For example, a man is prevented from ill-treating his wife by the fact that the other women would promptly make a song about it, and adverse opinion in a small self-contained group hostile to its neighbors is more efficient than any police force, whereas in a civilized community the wrong-doer may flee to another group, acquire new friends, and forget the past. Homicide within the tribe is not tolerated except for a capital offence, for if a man die it means the loss of a warrior: but these people live absolutely public lives, hence theft becomes a capital crime and an exception to the rule. The conditions of their forest life have led to the absence of laws of inheritance, since land is free for all to take who will. To our civilized ears it sounds strange to permit a man to take possession of land and the resources of the land at will but to suffer death for the theft of even a small object. The geographical distribution of dress is closely related to the geographical distribution of tribes and follows a regular progression, "and there is no sudden change in passing from one neighboring tribe to another, although the tribal distinctions are very marked."

A remarkable discovery was a drawing on bark cloth that is taken by the author to be the equivalent, among the Witoto tribe, of a map of the world. The map was made on beaten bark about two feet square. The center was divided into about a dozen squares, in which very crude human figures were represented fighting, planting, and hunting in their own territory. The dividing lines were of red vegetable pigment; on the margin were the sun, moon, and many stars.

Like other Amazonian tribes those of the northwestern Amazon country are required to break a fresh piece of ground after the second harvest, since the soil will produce but two crops in succession, though they return to the disused plantation for different palm fruits which continue to grow wild there. The qualifying test of a prospective husband and father is willingness to clear a plot of land and break and till the soil for a plantation. He need not qualify through house building, because he can share a corner in the great tribal house. For defense the Indians depend mainly upon the secrecy of the tribal dwelling, an easy matter in the absence of direct foot-paths. In addition, each tribe prepares a series of pitfalls in the forest avenues with poison stakes to impale the foe. The Indian paradise is upstream and not down because refuse is carried downstream.

The extent to which the Indian migrates is dependent upon the necessity for cultivating new plantations, for following game, and, in places, on the proximity of the white man. The migration of game is a serious matter for the Indian. Scarcity of animal life may even result in the abandonment of a homestead. Monkeys, one of the sources of food, are wanderers. When they have cleared one part of the forest of fruit and nuts they migrate to another.

The best photographs of native dances that have come out of this section of South America are contained in this book. Nothing so good has been published since Koch-Grünberg's "Zwei Jahre unter den Indianern," 1909.

PARAGUAY, URUGUAY, ARGENTINA, CHILE

CHARLEVOIX, P. F. J. DE. **Historia del Paraguay, escrita en francés por el P. —, de la Compañia de Jesús, con las anotaciones y correctiones latinas del P. Muriel. Traducida al castellaño por el P. Pablo Hernandez.** (Series: Colección de libros y documentos referentes a la historia de América, Vol. 17.) 455 pp. Index. Libreria General de Victoriano Suarez, Madrid, 1915.

This is the fifth volume in the Spanish edition of Father Charlevoix's famous "Histoire du Paraguay." The authoritative nature of the work and its freedom from the gross exaggerations and absurdities of the time have always endowed it with pre-eminence. Shortly after its appearance it was translated into English and German. Spanish translations were also commenced but suppressed in consequence of the national attitude towards the Jesuits. The present volume treats of Paraguayan history between the years 1717 and 1737, the period occupied by the rebellion of José de Antequera and the subsequent anarchies inspired by it. Antequera, described in no favorable terms by the historian, was a typical figure of his age, and Paraguay, the isolated and unstable, gave him fit opportunity to play the rôle of tyrant, precisely as it had half a century before afforded Cárdenas and was later to offer Francia and Lopez. Beyond the illustration of some of the profound effects of isolation, the volume contains little of geographical interest. Of the Jesuit reductions nothing is described save their sufferings. They were heavy enough—disbanded and recalled and disbanded and recalled again, their progress interrupted and their numbers diminished, yet the Provincial was able to supply without delay 12,000 Indians to the Governor of La Plata for his final attack on the rebels. One or two allusions

reveal the jealousy with which the Fathers were regarded by their white and mestizo neighbors. The proposal to interdict their trade in yerba maté with Buenos Aires and Santa Fé is a specific instance.

—— **Paraguay, A Step in the Progress of.** Map, ills. *Bull. Pan American Union,* Vol. 41, 1915-16, No. 5, pp. 621-640. [The latest step in the economic development of Paraguay is the concession to an American firm for new port works at Asuncion.]

PUYSEGUR, ENRIQUE, AND H. B. POUYSSÉGUR. **Expedición al Iberá.** Map, diagrs. *Anal. Soc. Científica Argentina,* Vol. 78, 1914, No. 5-6, pp. 241-258; Vol. 79, 1915, No. 1-2, pp. 35-64; No. 3-4, pp. 135-164. [Notes on the natural history, physiography, and geology of the practically unknown region of the Laguna Iberá of northern Corrientes collected during the expedition of the Sociedad Científica Argentina of 1910. The first instalment of the article bears as signature the first name, the other two instalments, the second name.]

Plano geológico de la provincia de San Luis por el Dr. Enrique Gerth. 1:500,000. Accompanies "Constitución geologica, hidrogeología, y minerales de aplicación de la Provincia de San Luis" por el Dr. Enrique Gerth, *Anal. del Minist. de Agric.: Secc. Geol., Mineralog. y Min.,* Vol. 10, No. 2. Buenos Aires, 1914.

EUROPE

FRANCE

SIEGFRIED, ANDRÉ. **Tableau politique de la France de l'ouest sous la Troisième République.** 536 pp. Maps. A. Colin, Paris, 1913. Fr. 12. 10 x 6½.

This is a truly brilliant essay toward the establishment of the geographical factor in politics. The existence of this factor has been recognized by analysts of political movements, but there has always been difficulty in extracting it from the tangle of motives which complicate the casting of a ballot. It can be operative only under a democratic system of government; it reaches its highest power under full manhood suffrage; it is restricted again by the development of strong national parties in which countrywide policies tend to outweigh local needs. In France the value of this factor is reduced by the limitations of the suffrage, but the absence of strongly dominant parties tends to enhance the operation of the geographical factor. Siegfried has taken for the present study a sufficiently large area where the conditions are fairly uniform. While we may not wholly accept the conclusions reached in this work, principally for the reason that the geographical factor does not appear satisfactorily cleared of modifying factors, yet we are to recognize the value of these results and to acknowledge that the author has added to the analysis of great political movements a new method of criticism whose value will become greater and greater just in proportion as we acquire facility in its application. His analysis of the different regions of western France thus brought under historical and critical review is most scholarly. WILLIAM CHURCHILL.

—— **Calais, Consular District of, Trade of the, Report for the Year 1914 on the.** 13 pp. *Diplomatic and Consular Reports,* Ann. Series, No. 5524. London, 1915.

CARRIGAN, CLARENCE. **Nantes.** 7 pp. *Suppl. to Commerce Repts.,* Ann. Series, 1915, No. 5f. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Corsica, Trade of, Report for 1914 on the.** 7 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5457. London, 1915.

—— **Havre, Consular District of, Vice-Consular Districts in the, Trade of the, Report for the Year 1914 on the.** 18 pp. *Diplomatic and Consular Repts.,* Ann. Series, No. 5531. London, 1915.

RIGGS, A. S. **The Beauties of France.** Map, ills. *Natl. Geogr. Mag.,* Vol. 28, 1915, No. 5, pp. 391-491.

SWITZERLAND OR THE ALPS

WEBER, JULIUS. **Geologische Wanderungen durch die Schweiz: Eine Einführung in die Geologie. (Clubführer des Schweizer Alpen-Club.) Vol. 1: Mittelland und Jura.** 256 pp. **Vol. 2: Kalk- und Schieferalpen.** 377 pp. Ills., index. Rascher & Cie., Zürich, 1913(?) Mk. 2.40. 6½ x 4½.

In these litttle books the tourist who is a mere layman may find a valuable supplement to his Baedeker. Volume 1 opens with a synopsis of the rock species of Switzer-

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and of some crudity; a few bone awls; and small obsidian arrowheads. No stone axes were found. Dr. Hough presented the problem as he found it and hesitated as yet to pronounce upon the affiliations of the people who constructed the pit houses.

Meeting of November 7, 1916

THE 501st meeting of the Society was held in the Lecture Hall of the Public Library, on Tuesday evening, November 7, 1916, at 8 o'clock. The speaker was Dr. W. E. Safford, of the Bureau of Plant Industry, U. S. Department of Agriculture. His subject was "Magic Plants of the Ancient Americans," illustrated with lantern slides.

Dr. Safford said that the practice of magic was widely spread in both North and South America in pre-columbian times, and in connection with it certain plants, principally those having narcotic properties, were used ceremonially, often as incense, or to produce hallucinations, call up the spirits of the dead, and to expel evil spirits from the sick and insane. The priests of the Temple of the Sun at Sagomozo, in the Andes of South America, prophesied and revealed hidden treasures, while in a state of frenzy caused by the seeds of a tree-datura (*Brugamansia sanguinea*), recalling similar practices of the priestesses of the oracle at Delphi. Another Peruvian plant with marvelous properties described by early explorers was *Erythroxylon Coca*, from which the valuable alkaloid cocaine is now obtained. Bags of its leaves accompanied by little gourds containing lime were found by the author in many graves near the Peruvian coast, hanging about the necks of the mummified remains of the dead. On the opposite coast of South America, or rather in Paraguay, grew the highly esteemed *Ilex paraguariensis*, or *yerba mate*. Closely allied to it is the *Ilex vomitoria* of the southeastern United States, from which the Indians made the famous "black drink," used ceremonially as a magic physic, which purged them from evil and which was also used in initiating their youths into manhood. Professional priests, or necromancers, encountered by Columbus and his companions on the island of Hispaniola, induced intoxication and called up their *zemi*, or gods, by means of a narcotic snuff, called *cohoba*, inhaled through the nostrils by means of a bifurcated tube. This snuff, hitherto believed to have been tobacco, has been recently identified by the author as the powdered seeds of a Mimosa-like tree, *Piptadenia peregrina*, still used in a similar way by various South American tribes of Indians, by some of whom an infusion of the seeds is also used to induce intoxication administered as an enema by means of a pear-shaped syringe of caout-

chouc. In Mexico the early missionaries, who were called upon to stamp out the practice of witchcraft, found that the Aztecs paid divine honors to various plants, especially to *Huauhtli* (a white-seeded *Amaranthus*): *Ololiuhqui* (a *Datura*), *Peyotl* (a spineless cactus, *Lophophora Williamsii*) also called *Teonanacatl*, or "Sacred Mushroom"; and *Picietl* (Tobacco). Of *Huauhtli* seeds ground to a paste with the syrup of Maguey images were made and adored, and afterwards broken into fragments and served as a kind of communion. This seed was produced in such quantities that it was used in paying tribute to Montezuma, at the time of the Conquest. The *Ololiuhqui* was regarded as divine, and it was considered a holy task to sweep the ground where it grew. Its spirit addressed as the Green Woman (*Xoxouhqui Cihuatl*), was invoked to expel certain diseases and to overcome weaker and inferior spirits in possession of a sick person. It is interesting to note that the use of the *Ololiuhqui*, or *Toloatzin*, as it was also called (*Datura meteloides*) still prevails among the Zuñi Indians of New Mexico, the Paiutes, and several tribes of southern California, in certain religious and ceremonial practices, especially in initiating youths into the status of manhood. The *Peyotl*, or *Teonanacatl*, called by Bancroft the "flesh of the gods," was used by the Aztecs in nocturnal feasts, very much as it is still used by Indians of the Mexican Sierra Madre and by certain tribes of the United States, who believe the visions induced by it to be supernatural. In ancient times a supply of this little narcotic plant was obtained by runners especially consecrated for the purpose, and its gathering was attended by a most formal ceremony. At the present day it is sent from the locality, where it grows, along the Rio Grande, by means of parcel post. Lastly the ceremonial and religious use of *Picietl*, or tobacco, goes back to remote antiquity It is so well known that it need not be here discussed. No other narcotic plant, perhaps, has become so widely spread or so generally used and beloved by its votaries. Though of subtropical origin its cultivation had extended before the Discovery as far north as the St. Lawrence river. Beautiful pipes of many forms, representing birds, mammals, human heads, etc., have been discovered in Indian mounds near the native city of the writer, Chillicothe, Ross county, Ohio; and more recently in the county of Scioto farther to the southward. In addition to the above plants may be mentioned a certain small scarlet bean, the seed of *Sophora secundiflora*, endemic in northern Mexico and southern Texas. This also has narcotic properties, and was so much sought after by certain tribes of Indians that they were known to exchange a pony for a string of the beans six feet in length. In one of

the secret societies of the Iowa Indians this bean is used in the initiating ceremonial; and it is interesting to note that the beans are carried as charms or amulets by the members of the society, just as in western Mexico fragments of the *Peyotl*, and in southern California parts of the *Datura*, are carried by their votaries, who believe them to be efficacious in protecting those who carry them from danger, and in bringing good luck in hunting and war. It is interesting to note a similar practice in the Old World of carrying the root of *Mandragora* (or a substitute for it) as an amulet; but most interesting of all is the similarity between the beliefs and practices of the inhabitants of the Old World and New, in connection with narcotic and other plants held to possess magic properties. The lantern slides used to illustrate the lecture were photographs of the various magic plants discussed.

This paper was discussed by Mr. James Mooney who, for a number of years, has given special study to the subject of peyote. Mr. Mooney defended those who are devoted to the peyote ceremony and claimed that, in most cases, the assertions made against the plant and its users are based upon ignorance of the facts, and are without foundation.

Meeting of November 21, 1916

THE 502nd meeting of the Society was held at the New National Museum on Tuesday afternoon, November 21, at 4 o'clock. Mr. Neil M. Judd of the U. S. National Museum presented a paper on "New Types of Pueblo Ruins found in Western Utah," illustrating his paper with chalk drawings.

Mr. Judd described a recent archaeological reconnoissance of western Utah conducted under the auspices of the Bureau of American Ethnology, stating that this resulted in the discovery of two types of prehistoric habitations not previously reported from the Southwest. The first of these was circular in form and was made by leaning logs against cross-pieces supported by four uprights which surrounded a central fire-place. Willows, grass and clay, in succession, covered the logs. Houses of the second type, usually occurring in groups forming villages, were rectangular in shape and constructed entirely of adobe. A small series of unattached cliff-dwellings, exhibiting certain features common both to structures of this second type and to stone-walled houses south and east of the Rio Colorado, was also described. A careful study of the smaller artifacts recovered from both types of western Utah ruins indicates a close cultural relationship between their respective builders and the inhabitants of prehistoric structures in other sections of the Southwest.

In a discussion of the paper Dr. J. W. Fewkes called attention to the desirability of a more accurate definition of what archaeologists mean by a "pueblo." He pointed out that the term is sometimes loosely used to include all kinds of ruined stone buildings in the Southwest. Inasmuch as the pueblo culture area owes its name to characteristic buildings or pueblos he suggested that the term be limited to terraced, congested community buildings with ceremonial rooms or kivas. If this suggestion were accepted by archaeologists many ruins on the periphery of the so-called Pueblo area would have to be classified as belonging to a pre-puebloan phase, or not regarded as pueblos at all.

Meeting of December 5, 1916

THE 503rd meeting of the Society was held in the Lecture Hall of the Public Library on Tuesday evening, December 5, 1916, at 8 o'clock. At this meeting Prof. W. H. Holmes, of the U. S. National Museum, delivered an address on "Outlines of American Aboriginal History," illustrated with lantern slides.

Introducing his subject Prof. Holmes said: It is agreed that the human race is a unit. It follows therefore that there was but one cradle and that from this man spread over the world. The early chapters of human history must always remain obscure although evidence has been found carrying the story far back into the remote past.

It was the purpose of the speaker to indicate briefly the probable course taken by the human race in spreading from the Asiatic cradle to the New World, and also to indicate the causes and course of cultural development in the various centers of American occupancy and to suggest the causes of decline.

The earliest known traces of man (or a man-like being) have been found on the island of Java. In the nature of things, it was a long time before he wandered far from his primeval home. He had to acquire the arts of the hunter and fisher before he could reach the far north and it was doubtless by way of Bering strait that he reached the New World. Portraits were shown of the various peoples whose ancestors may have been concerned in these ancient migrations—natives of Tibet, China and Siberia, the Eskimo, the Sioux, the Zuñi, and other typical American Indians; and attention was directed to the practical identity of these types. Referring to the development of culture in America it was shown that no culture above the hunter-fisher stage ever passed through the Bering gateway. All culture of higher grade is, therefore, American. As the early immigrants reached the more favorable localities of the

EARTH (CLAY) AS FOOD

Orinoco region, South America, and various other parts of the world.

See Humboldt's 'Ansichten der Natur' (Views of Nature) Bohn translation pp.142-146, 1884 (original edition 1849).

1422. Stewart, Colonel William H. The Spirit of the South. Orations, Essays and Lectures. 8vo, clo. N. Y., 1908. $2.00

1423. White, Henry Alexander. Southern Presbyterian Leaders. Illus., 8vo, cloth. N. Y., 1911. $2.00

SOUTH AMERICA

1424. Armitage, John. The History of Brazil from the Period of The Arrival of the Braganza Family in 1808 to the Abdication of Don Pedro the First in 1831. Two volumes in one. 8vo, clo. London, 1836. $3.50

1425. Bennett, George W. An Illustrated History of British Guiana compiled from various sources. Illustrated with photographs. Royal 8vo, cloth. Georgetown, Demerara, 1866. $12.50

1426. Bingham, Hiram. Inca Land. Explorations in the Highlands of Peru. Illus., 8vo, clo. Boston, (1922). $3.00

1427. Bowman, Isaiah. The Andes of Southern Peru. Geographical reconnaissance tlong the seventy-third meridan. Illus., large 8vo, clo. N. Y., 1916. $2.50

1428. Bowman, Isaiah. Desert Trials of Alacama. Illus., large 8vo, clo. N. Y., 1924. $2.50

1429. Brown, C. Barrington. Canoe and Camp Life in British Guiana. Map and illus. 8vo, clo. (slightly shaken). London, 1876. $4.00

1430. Bryce, James. South America, Observations and Impressions. With Maps. 8vo, clo. N. Y., 1912. $2.00

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Fine copy of a rare book. The real facts about "Robinson Crusoe's Island."

1433. Curtis, Wm. E. The Capitals of Spanish America. Map and many illustrations. 8vo, clo. N. Y., 1888. $3.50

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1434. Domville-Fife, Charles, W. The Great States of South America. A Concise Account of Their Condition and Resources with the Laws Relating to Government Concessions. Illustrations and Maps. 8vo, three-quarter morocco, London, 1910. $3.00

1435. Hadfield, William. Brazil, the River Plate, and the Falkland Islands with the Cape Horn Route to Australia. 8vo, half morocco. London, 1854. $3.50

1436. Macoy, Paul. Travels in South America from the Pacific Ocean to the Pacific Ocean. Ten maps and 500 illustrations. 2 vols., folio, cloth slightly shaken. N. Y., 1875. $7.50

1437. Molina, Don Juan Ignacio. Compendio de la Historia Geografica, Natural Y Civil del Reyno de Chile traducida en Espanol por Don Domingo Joseph. Map, 2 vols, 8vo, spanish calf. Madrid, 1788. $7.50

1438. Page, Thomas J. La Plata, the Argentine Confederation and Paraguay. 1853-1856. Illus., 8vo, clo. N. Y., 1859. $2.50

1439. Parker, William Belmont (Ed.) Argentines of Today. Illus., 2 vols, 12mo, clo. N. Y., (Hispanic Society), 1920. $3.75

1440. Perey, Gerardo A. Geographia e Estatistica Geral de Portugal e Colonias. Folding maps, 8vo, half morocco. Lisboa, 1875. $3.50

1441. Pompeo, Thomaz. Ensaio Estatistico da Privincia do Ceara by Thomaz Pompeo de Sousa Brasil. 2 vols, 8vo, half leather. (Brazil), 1863. $5.00

Locally printed. Quite scarce.

1442. Quichua Vocabulary. Arte, y Vocabula rio de la lengua Quichua general de los Indios el Peru. Que Computo el Padre Diego de Torres Rubio de la Compania de Jesus, y An Adio el P. Juan de Figueredo de la misma Compania. Thick 12mo, original vellum. Lima (en la Imprenta de la Plazuela de San Christoval), 1754. $35.00

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1444. Schomburgk, Robert H. Description of British Guiana, Geographical and Statistical; Its Present and Future Condition and Prospects of the Colony. Map. 8vo, clo. London, 1840. $3.00

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Important locally printed book in unusually good condition. Title and introduction mounted.

So. Am. Anthropology

Science
March 31, 1911.

ANTHROPOLOGY AT THE PROVIDENCE MEETING

THE annual meeting of the American Anthropological Association was held in Providence, R. I., December 28–30, 1910, in affiliation with the American Folk-Lore Society. The sessions were held in Manning Hall, Brown University. In the absence of President William H. Holmes, Professor Roland B. Dixon presided. The attendance was good and a number of important papers were presented. On the morning of December 29 there was a joint meeting of the association and the Archæological Institute of America in Union Auditorium, at which Miss Alice C. Fletcher presided.

ADDRESSES AND PAPERS

In the absence of President Henry M. Belden, of the American Folk-Lore Society, his address was read by Dr. Charles Peabody. Some of the most important papers read at the joint meeting are represented in this report by abstracts. These are:

Recent Progress in the Study of South American Indian Languages: Professor ALEXANDER F. CHAMBERLAIN.

The author pointed out the regions of the South American continent to which, during the last five years, scientific research had been particularly active: the Colombia-Venezuela border-land, northwestern Brazil, Ecuador-Peru-Bolivia, southern Brazil, etc. Noteworthy are the investigations of Tavera-Acosta, Koch-Grünberg, Rivet and Beuchat, Farabee, E. Nordenskiöld, von Ihering, et al. To Tavera-Acosta we owe rather extensive vocabularies of the Guahiban, Piaroan, Puinavian, Salivan and Yaruran stocks, all of which hitherto have been rather scantily represented by linguistic material. Koch-Grünberg, as a result of his sojourns in northwestern Brazil, has shown the Makuan to be an independent stock, and added much to the linguistic material in print and in manuscripts concerning the Arawakan, Cariban, Betoyan, Miranhan and Uitotan stocks. Rivet and Beuchat, studying the extensive linguistic material obtained by the former of these authors (they are now working jointly), have thrown much light on the ethnologic problems of the Ecuador-Peruvian border-land, delimiting the areas of the Jivaran (Rivet has shown Brinton's "Jivaro" to be really Jebero and, therefore, Laman, or as he terms this stock, Cahuapana), Zaparan, Laman (Cahuapana), etc. Rivet believes that the Jivaran has marked Arawakan affinities, and his later studies claim to attach some of the minor stocks of southern Colombia to the Chibchan. Dr. Farabee's investigations have resulted in the accumulation of much lexical and grammatical material concerning the Arawakan peoples of Peru; also vocabularies, etc., from tribes of Pancan, Uitotan, Jivaran and other stocks. The thorough study of this valuable material will add not a little to our knowledge of the linguistics of the Peruvian area. E. Nordenskiöld has devoted some attention to the little-known tribes of eastern Bolivia, and we may expect other data of value from him in the near future. To von Ihering belongs the credit of having first established beyond a doubt the independent character of the Chavantean stock. Here should be mentioned also the researches of Barrett recently initiated into the language of the Cayapa, etc., of the Barbacoan stock. Of works of a more or less bibliographical character the most important are Lenz's monograph on the Indian elements in Chilean Spanish, Schuller's contributions to Araucanian bibliography, etc., and Mitre's "Catalogo," with its introduction by Torres.

Recent Literature on the South American "Amazons": Professor ALEXANDER F. CHAMBERLAIN.

The author résuméd and discussed the monographs of Lasch, Friederici and Rothery, all published during the year 1910. Of these the study of Friederici seems the most satisfactory; the book of Rothery, however, the most ambitious, treating the ancient and modern Amazons all over the globe. Dr. Friederici rejects the view of Ehrenreich and Lasch of a unitary origin of the Amazon legends among the northern Caribs, with extension thence over all northern South America. Both in content and origin the Amazon legends differ notably from each other in several cases, and they are of multiple provenance. In some there is evidence of modification and contamination through European sources. Among the causes of the origins of South American "Amazon" legends he enumerates the following:

1. The notably war-like character of women in many primitive American communities.

2. The peculiar power or influential position of women (due to economic, religious, hereditary or other social reasons) in a few tribes, which made a great impression upon the mass of the surrounding communities.

3. Rumors of the barbaric splendors of the empire of the Incas, which had penetrated the wilderness to the east.

4. Reports of certain unusual sexual relations of Indian women, etc.

5. Tales of "Amazons" due to native reports misunderstood by the Spaniards, or from such tales intentionally spread by the latter.

Amazon legends are reported from the West Indies (Ramon Pane records a characteristic one), from Yucatan and from Mexico. The Mexican legends, Dr. Friederici thinks, are "the least founded of all, ethnologically or mythologically"

(p. 23). Ill-founded likewise are the legends from California and the northwest Pacific coast. Incidentally, Friederici points out that the account attributed generally to Orellana, belongs really to Carvajal, and that the river of the "Amazons" received its name from the valor of the Indian women met with by the Spanish explorers.

The Uran: A New South American Linguistic Stock: Professor Alexander F. Chamberlain.

In 1891 Brinton recognized[1] in the region of Lake Titicaca a Puquina linguistic stock, observing at the same time that "the Puquinas are also known under the names of Urus or Uros, Hunos and Ochozomas." In this he was followed by R. de la Grasserie, in his "Langue Puquina" (1896), and others since then. In 1895–96, Dr. Max Uhle collected from the Urus of Iruitu, etc.,[2] a vocabulary of some 600 words, many sentences, etc., all of which material seems to be as yet unpublished. In 1897, J. T. Polo visited the Urus of Nazacara and obtained a vocabulary of some 350 words, 33 phrases, etc. This material did not appear in print till 1901[3] and constitutes the published linguistic data concerning the Uran stock. The author presented in English alphabetic arrangement a considerable portion of Polo's vocabulary, with grammatical notes, etc. Polo's work seems to have been practically unknown to ethnologists, Roman[4] being about the only one to recognize its importance and to see that the Uran and Puquinan must be unrelated. Careful examination by the author of this paper of the Uran linguistic material and comparison with Atacamenan, Puquinan, etc., prove beyond a doubt that the language of the Urus of Bolivia constitutes an independent family of speech. The few descendants of the ancient Urus, and the fewer still who keep their mother-tongue (many having adopted Aymará) are to be found scattered along the Rio Desaguadero between Lake Titicaca and Lake Aullagas or Poopo, particularly at Iruitu, Sojapata, Ancoaqui, Ahuallamaya, Nazacara, etc. In the past they evidently occupied a much wider area between these two lakes.

It is worth noting that the confusion of the Urus with the Puquinas began with Hervas, Garcilaso de la Vega, *e. g.*, among the older authorities distinctly separating the two languages. This separation of the Uran and Puquinan stocks clears up somewhat the linguistic difficulties of this region of South America, but leaves the Puquinas, their origin and the extent of their language-area, perhaps as much of a problem as ever.

[1] "American Race," p. 221.
[2] *Globus*, Vol. 69, 1896, p. 19.
[3] *Bol. de la Soc. Geogr. de Lima*, Vol. X.
[4] "Antiq. de la Rég. Andine," Vol. I., 1908.

The Age-societies of the Plains Indians: Dr. R. H. Lowie.

Age-societies have been ascribed by ethnologists to a large number of Plains tribes. A sharp definition of the age-factor results in limiting the number to the Blackfoot, Village tribes, Arapaho and Gros Ventre (Atsina). The question arises whether in these cases the age-factor is a basic or derivative feature. Investigation proves that the age-element is a subordinate feature, the collective purchase of ceremonial regalia, songs and dances being apparently the dominant motive.

Some Aspects of New Jersey Archeology: Dr. Charles Peabody.

Slides were shown illustrating the three celebrated strata at Trenton, N. J., on the glacial terrace above the Delaware River, viz., the black soil, the yellow loam, probably of immediate post-glacial deposition and the true "Trenton" gravels underlying the yellow soil.

Attention was called to certain discoveries made during the season's work of 1910 by Mr. Ernest Volk, who has spent large portions of the last twenty-two years in exploration and observation of the region.

1. *The Bison Bone.* On June 22, 1910, in the sand pit of Mr. Ahrendt on the terrace was found an artificial pit; the cross section was: at the top six inches of black soil, under this one foot of yellow loam, and under this a red clay band one inch thick. In the pit were found the femur of a bison and accompanying it fine particles of charcoal. In the red band on one side of the pit lay a chipped water-worn pebble of argillite, and in the same red band to the left, a water-worn pebble of argillite, not chipped.

2. *The Artificial Pit.* On August 23, 1910, in the sand pit of Mr. Ahrendt, on the terrace was found another artificial pit; the cross section: at the top, six inches of black soil; under this yellow loam (with thin red bands) three feet six inches thick; and under this, overlying the pit, three or four inches of brown sand and charcoal. Nothing but charcoal of human provenance was found in the pit.

3. *The Natural Pit.* In the same sand pit, seven feet down under a somewhat similar series

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BIBLIOGRAPHICAL SECTION

HISPANIC AMERICAN BIBLIOGRAPHIES

Continuation

NICARAGUA

986. Bibliografía y cartografía de Nicaragua. (*In* Centro-América, Guatemala, 1914. 24½ cm. v. 6, p. 548–561.)

A short reading list, with notices of 78 maps, 1822–1900.

987. Kalb, Courtenay de. A bibliography of the Mosquito Coast of Nicaragua. (*In* Journal of the American geographical society. New York, 1894. 24½ cm. v. xxvi, p. 241–248.)

988. Lévy, Pablo. Notas geográficas y económicas sobre la república de Nicaragua, y una exposición completa de la cuestión del canal interoceánico y de la de inmigración con una lista bibliográfica, la mas completa hasta el día, de todos los libros y mapas relativos á la América central y general y á Nicaragua en particular. Paris, E. Denné Schmitz, 1873.

xvi, 627, [1] p. fold. map. 26½ cm.
Bibliografía y cartografía: p. [593]–613.

989. Nicaragua. Biblioteca nacional. Catálogo general de los libros de que consta la Biblioteca nacional de la República de Nicaragua. Managua, Tip. de Managua, 1882.

1 p. l., 90 p. 30½ cm.

——— ——— Managua, 1906.

990. Nicaragua. Ministerio de relaciones exteriores. Cuerpo diplomático y consular. Managua, Compañía tip. internacional, 1907.

16 p. 24 cm.

991. Pector, Désiré. Exposé sommaire des voyages et travaux géographiques au Nicaragua dans le cours du XIX siècle. Paris, Bibliothèque des Annales économiques, 1891.

8p. 24 cm.

PANAMA

992. Aguilera, Rodolfo. Galería de hombres públicos del Istmo. Panama, Tip. Casis y cia, 1906.

3 p. l., 103 p. port. 22 cm.

993. ——— Istmeños ilustres de la emancipación. Panamá, 1887.

Professors Charles E. Chapman and Herbert Ingram Priestley, of the Unversity of California, spent part of the summer in Mexico.

The death on October 7, 1920, of Dr. Homer J. Webster, acting head of the history department of the University of Pittsburg, threw the department into some disorder and it became necessary to reorganize the department immediately. Dr. Webster had planned for the academic year, 1921, a two-hour semester course in Hispanic American history. This work was taken up after his sudden demise by Assistant Professor James. The course was accordingly introduced, and was made open only to juniors, seniors, and graduate students. Enrollment for the first semester was thirty and for the second twenty-five. During the first semester, Latané's *The United States and Latin America* was used for an outline text and considerable collateral reading required. During the second semester, something of the history of Spain, Portugal, and early discoveries, explorations, and colonizations was studied, use being made of Pierson's *Syllabus of Hispanic American History*. It was fully realized that the first semester's work should have been given during the second semester, but in the disorganization caused by Dr. Webster's death it was impossible to obtain material for a study of the discovery and subsequent exploration and colonization. "Strange to say," says Dr. James, "things worked out well. This was the path of association, the psychological approach to the subject for upper classmen who were already familiar with the history of the United States. While unsound chronologically and wrong from the standpoint of logical evolution, no regret for this necessary procedure was seen by any one concerned." Great interest was displayed in the course by the students and the situation for the future of the study of Hispanic American history in the University of Pittsburgh is excellent.

994. Bridgeport, Conn. Public library. Panama and the Pacific; a reading list on the Panama canal, South and Central America, Mexico, California and the west and Alaska. Bridgeport, Conn., 1915.
12 p. 19 cm.

995. Guía-directorio de la ciudad de Panamá; guía del extranjero, consultor y auxiliar del comerciante, cicerone del tourista. año 1– Panama, Tip. Chevalier, Andreve & cía., 1906–. plates, ports. 21½ cm.

996. Méndez Pereira, Octavio. Parnaso panameño, con prólogo y biografías. Panama, Tip. el Istmo, 1916.
3 p. l., ix, 302, [7] p. 18 cm.

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iii, 90 p. 25½ cm.
"Reprinted ... from the Bulletin of the New York public library of January 1916."

998. Riverside, Cal. Public library. Panama canal; an old way to California made new. Riverside, 1912.
16 p. 17 cm. (Its Bulletin 75)

999. Scott, John. A bibliography of printed documents and books relating to the Darien company. By John Scott, rev. by George P. Johnston. Edinburgh, Priv. print., 1903.
54 p. 30 cm.

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174 p. 23 cm. (56th Congress, 1st session. Senate doc. 59).

1001. ——— List of references on the Panama Canal and the Panama Canal Zone. Prepared under direction of H. H. B. Meyer, chief bibliographer. Washington, Govt. print. off., 1919.
cover-title, 21 p. 31 cm.

1002. U. S. Superintendent of documents. Bibliography of United States public documents relating to interoceanic communication across Nicaragua, Isthmus of Panama, Isthmus of Tehuantepec, etc. Washington, Govt. print. off., 1899.
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1003. ——— Panama canal and the Canal Zone. Public documents for sale by the superintendent of documents, Washington, D. C. [Washington, Govt. print off.] 1914.
18 p. 24½ cm.

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1007. Báez, Cecilio. Cuadros históricos y descriptivos. Asunción, Talleres nacionales de H. Kraus, 1906.
344 p. port. 26½ cm.
Contains biographical sketches.

1008. Catálogo de la Biblioteca paraguaya "Solano López". Asunción, Talleres nacionales de H. Kraus, 1906.
984 p.

1009. Decoud, José Segundo. A list of books, magazine articles, and maps relating to Paraguay. Books, 1638–1903. Maps, 1599–1903. A supplement to the Handbook of Paraguay, pub. in Sept., 1902, by the International bureau of the American republics. Washington, Gov't print off., 1904.
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1011. Hernández, Pablo. Reseña histórica de la misión de Chile-Paraguay de la Compañía de Jesús desde su origen en 1836 haste el centenario de la restauración de la compañía en 1914. Barcelona, J. Pugés (s. en c.) 1914.
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77 p. front. 23 cm. (Dept. of Commerce. Bureau of foreign and domestic commerce. Special agents series, no. 143.)
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1022. Bermúdez, José Manuel. Anales de la catedral de Lima. 1534 á 1824. Lima, Imprenta del estado, 1903.
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1023. Biblioteca peruana. Apuntes para un catálogo de impresos. Santiago de Chile, Biblioteca del Instituto nacional, 1896.
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Ed. by Gabriel René-Moreno.
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1025. Boletín bibliográfico, publicación mensual (1. de enero de 1888 hasta el 15 de julio de 1901). Lima, 1888–1901.

Edited by Carlos Prince; no. 81 forms "un erudito y razonado catálogo de obras sobre los idiomas quichua y aimará";—cf. René-Moreno, Ensayo de una bibliografía general de los periódicos de Bolivia, no. 1350.

1026. Cabello, Pedro M. Guía política, eclesiástica y militar del Perú para el año de 1861. Lima, Impr. de J. M. Masias, 1861.

392, xxxiv, [8] p.

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Cf. Bib. peruana, v. 1, nos. 774–775.

1027. Calancha, Antonio de la. Corónica moralizada del Orden de San Avgvstin en el Perv, con svcesos egenplaers vistos en esta monarqvia. Dividese este primer tomo en qvatro libros; lleva tablas de capítulos, i lugares de la Sagrada Escritura. Barcelona, P. Lacavalleria, 1639.

15 p. l., 922, [27] p. illus., pl. 34 cm.

"A second ... volume of this work was printed at Lima in 1653 [or 1654] but was never published, owing probably to certain obnoxious passages contained in it. It is a smaller volume than the first, and is of very rare occurrence."—Stevens, Hist. nuggets, v. 1, 1862, p. 108. This second volume was written in part by Bernardo de Torres, whose "Cronica de la provincia pervana del Orden de los ermitaños de S. Avgvstin," Lima, 1657, was also published as a supplementary volume to the first volume of Calancha's work and included an epitome of it. *cf.* Rene-Moreno, Bolivia y Perú; notas hist. y bibl., 1905, p. [1]–9; Bibl. peruana, t. 1, 1896, nos. 404, 412; Medina, Bibl. hisp.-amer., t. 2, 1900, no. 977.

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1029. Coronel Cegarra, Félix Cipriano. Santa Rosa de Lima (Isabel Flores y Oliva) Estudio bibliográfico. (*In* Concurso literario en honor de Santa Rosa de Lima celebrado ... en el tercer centenario de su nacimiento, 30 de abril de 1886. Lima, Impr. de Torres Aguirre, 1886. p. 61–128).

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Cf. Bib. peruana, v. 1, no. 803.

1052. Mortimer, William Golden. Peru. History of coca, "the divine plant" of the Incas; with an introductory account of the Incas, and of the Andean Indians of to-day. New York, J. H. Vail & company, 1901.
xxxi, 576 p. incl. front., illus. 24 cm.
Bibliography: p. [517]-544.

1053. Paz Soldán, Mariano Felipe. Biblioteca peruana. Lima, Imprenta liberal, 1879.
xi, 544 p.
Cf. Bib. peruana, v. 1, no. 178.

1054. ——— Historia del Perú independiente. 1835–1839. Buenos Aires. Imp. del Courrier de la Plata, 1888.
2 p. l., xxviii, 408, xliv p. 26 cm.
Catálogo de documentos manuscritos e impresos que han servido para escribir esta obra": xliv p.

1055. Paz Soldán, Mateo. Geografía del Perú. Obra póstuma cor. y aum. por Mariano Felipe Paz Soldán. París, Didot hermanos, 1862–63.
2 v. front. (port.) 27 cm.
Noticia bibliográfica: v. 1, p. 715-723.

1056. ——— Géographie du Pérou. Traduction française par P. Arsène Mouqueron. Paris, A. Durand, 1863.
2 p. l., xxxi, 538 p. front. (port.) 27 cm.
Catalogue bibliographique: p. 475-484.

1057. Peru. Congreso. Cámara de senadores. Catálogo de las obras de la biblioteca de la h. Cámara de senadores. Octubre 22 de 1906. Lima, Impr. la Industria, 1906.
67 p. 25½ cm.

1058. ——— Catálogo de la biblioteca, formado por el oficial primero Don Rafael Belaúnde. 31 de julio de 1913. Lima, Emp. tip. "Unión," 1913.
75 p. 25 cm.

1059. Peru. Ministerio de relaciones exteriores. Lista del cuerpo consular extranjero y peruano, marzo de 1905. Lima, Impr. de la Industria, 1905.
53 p. 20 cm.

1060. Peru. Ministerio de fomento. Guía bibliográfica consultiva de obras, folletos, revistas y publicaciones, sobre temas relacionados con la agricultura y la ganadería nacionales, por José G. Otero. Lima, Impr. de "La Académica," 1906.
99 p. 23 cm.
"Indice de las principales leyes, decretos, y resoluciones pertinentes a la agricultura y ganaderías nacionales, 1821–1905": p. 51-99.

1061. Peru. Oficina de reparto, depósito y canje internacional de publicaciones. Catálogo de las publicaciones que la "Oficina de reparto, depósito y canje internacional" tiene disponibles para distribuir. [Lima, 1905]

10 p. 23 cm.

1062. Prado y Ugarteche, Javier. El genio de la lengua y la literatura castellana y sus caracteres en la historia intelectual del Perú. Lima, 1918.

1063. Pret, C. A. Bibliographie pérouvienne. Paris, 1903.

1064. Prince, Carlos. Bibliografia nacional. Los peruanófilos anticuarios del siglo XIX. Lima, Imp. de la Escuela de ingenieros. 1908.

2 p. l., [3]-283, [1] p. 23½ cm.
First published in Revista de ciencias.

1065. ——— I. Bosquejo de la literatura peruana colonial, causas favorables y adversas a sv desarrollo. II. Biblioteca peruana de la colonia. Lima, Impreso en casa del autor, 1910–11.

3 p. l., [5]-311 p. 21 cm.
Periódicos de la época colonial impresos en Lima: p. 229-242. Obras inéditas: p. 277-278.

1066. ——— Libros doctrinarios en idiomas y dialectos índicos peruanos. (*In* Congreso científico latino americano. Primera reunión. Buenos Aires, 1900. 23½ cm. v. 5, p. 299–360)

1067. Revista de archivos y bibliotecas nacionales; época colonial, guerra de independencia. Lima, 1899–1900.

5 v. 28 cm.
"Noticia bibliográfica" por C. A. Romero, v. 1, p. vii-xvii.

1068. Revista peruana, fundada por Mariano Felipe Paz Soldán. Carlos Paz Soldán, editor. v. 1–4. enero 1879–Junio 1880. Lima, M. Fernández, 1879–80.

4 v. pl. 26½ cm.
Ceased publication with the first number of vol. 5, June 1880.
Contains much of bibliographical value, especially M. F. Paz Soldán's Biblioteca peruana, arranged as follows: 1. Publicaciones periódicos, giving number of issues, character of contents and an Indice cronológico; 2. Bibliografía americana; 3. Viajes, geografía, estadística, límites; 4. Historia. Among the contributions of value for biographical data may be noted: Los obispos de Cuzeo; Los obispos de Trujillo; Apuntes históricos sobre las encomiendas del Perú by E. Torres Saldamando; Las fuentes de la historia eclesiástica, by M. González de la Rosa.

1069. Riva Agüero, José de la. Carácter de la literatura del Perú independiente. Lima, 1905.

1070. ——— La historia en el Perú. Lima, Imp. nacional de F. Barrionuevo, 1910.

2 p. l., [7]-558, [2] p. 21½ cm.
CONTENTS: Introducción.—Blas Valera. Garcilaso de la Vega.—Cronistas de convento.—Don Pedro Peralta.—El general Don Manuel de Mendiburu. Don Mariano Felipe Paz Soldán.—Epílogo.

1071. Salas, Carlos I. Bibliografía del coronel Don Federico Brandsen. Buenos Aires, Compañía sud-americana de billetes de banco, 1909.

5 p. l., 10-311 p., 1 l. 2 pl. 2 port. 8 facsim. 22½ cm.
CONTENTS: Bibliografía.—José de la Riva Agüero.—Antonio José de Sucre.—José Bernardo de Torre Tagle.—Andrés de Santa Cruz.

——— ——— 2. ed., considerablemente aum. Buenos Aires, Compañía sud-americana de billetes de banco, 1910.

418 p., 1 l. incl. front. ports. 21 cm.

1072. Sánchez, Luis Alberto. Historia de la literatura peruana. 1. Los poetas de la colonia. Lima, 1921.

3 p. l., 301 p. 17 cm.

1073. Sancho, Pedro. An account of the conquest of Peru, written by Pedro Sancho, secretary to Pizarro and scrivener to his army; tr. into English and annotated by Philip Ainsworth Means. New York, The Cortes society, 1917.

203 p. 21 cm. (Documents and narratives concerning the discovery and conquest of Latin America, no 2)
Bibliography: p. 199-203.

1074. Sarmiento de Gamboa, Pedro. History of the Incas by Pedro Sarmiento de Gamboa, and the execution of the Inca Tupac Amaru, by Captain Baltasar de Ocampo; tr. and ed., with notes and an introduction, by Sir Clements Markham. Cambridge, Printed for the Hakluyt society, 1907.

3 p. l., [v]-viiia, [ix]-xxii p., 1 l., 395 p. pl., port., 2 fold. maps, 8 facsim. 23 cm. (Works issued by the Hakluyt society ...2 d ser., no. XXII)
"Bibliography of Peru. 1526–1907": p. 267-358.

1075. Schütz zu Holzhausen, Damian, freiherr von. Der Amazonas. Wanderbilder aus Peru, Bolivia und Nordbrasilien. 2., durchgesehene und erweiterte aufl., unter besonderer berücksichtigung der vom verfasser gegründeten tirolisch-rheinischen kolonie Pozuzo, hrsg. von Adam Klassert. Freiburg im Breisgau, St. Louis, Mo. [etc.] Herder, 1895.

xviii, [1], 443, [1] p. illus., plates, 2 port., 2 maps. 24 cm. (Illustrierte bibliothek der länder-u. völkerkunde)
Litteratur: p. 427-438.

1076. Sociedad geográfica de Lima. Primera sección. Catálogo de la biblioteca. Lima, L. H. Jiménez [1898]. 1 pt. 26½ cm.

1077. Spain. Archivo general de Indias. Relación descriptiva de los mapas, planos, etc. del Virreinato del Perú (Perú y Chile) existentes en el Archivo general de Indias (Sevilla), por Pedro Torres Lanzas. Barcelona, Imp. Henrich y c[a], 1906.

135 p. 18 cm.

1078. Torres, Bernardo de. Crónica de la provincia Peruana del Orden de los ermitaños de S. Agustín. Lima, Impr. de J. Santos de Saldaña, 1657.

The second part is an epitome of Calanchás Crónica (1551–1593); the first part continues this chronicle from 1594 to 1657. Cf. Medina, Impr. en Lima, no. 381.

1079. Torres, J. Leopoldo. Guía bibliográfica consultiva; descripción de minas y oficinas metalúrgicas en el Perú, clasificadas por departamentos; compilación de estudios generales y locales, informes de mineralogía, geologia, explotación de minas y metalurgia insertos en las obras y publicaciones de la biblioteca de la Escuela de ingenieros de Lima. Lima, E. Morenó, 1904.
27p. 21½ cm.

1080. ——— ——— 3. ed., corr. y. aum. Lima, Tip. de "El Lucero," 1914.
97 p. 26 cm.

1081. Torres Saldamando, Enrique. Los antiguos Jesuitas del Perú; biografías y apuntes para su historia. Lima, Impr. liberal, 1882.
xv, 400 p. 24 cm.
Contains extensive bio-bibliographical notices of 157 16–17th century authors.

1082. Unanue, José Hipólito. Guía política, eclesiástica y militar del virreynato del Perú, para el año 1793–[1797]. Lima, Impr. real de los huérfanos, 1793–97.
5 v.
"Catálogo de los títulos de Castilla de este virreynato, según la antigüedad de su creación ... y de los señores que actualmente lo poseen," in Guía para 1793.

1083. Varones ilustres de la Compañía de Jesús. 2. ed., tomo 4. Misiones del Perú, Nueva Granada, Quito, Paraguay, Chile. Bilbao, Administración de "El Mensajero del Corazón de Jesús, 1889.
642 p. 24 cm.
By Juan Eusebio Nieremberg.

1084. Vidaurre, Pedro N. Relación cronológica de los alcaldes que han presidido el ayuntamiento de Lima desde su fundación hasta nuestros días. Formada de orden de la Alcaldía, y en vista de documentos auténticos, que originales se conservan en el archivo de la ciudad. Lima, Impr. de J. F. Solís, 1889.
V, [3]-109, VIII p. 21 cm.

1085. Winship, George Parker. Early South American newspapers, by George Parker Winship. Worcester, 1908.
14 p., ll. illus. 20 cm.
Reprinted from the Proceedings of the American antiquarian society for October, 1908.
"List of news sheets printed at Lima in Peru, 1621–1767, recorded in J. T. Medina's La imprenta en Lima, Santiago de Chile, 1904": p. 10–[15]

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1086. Ateneo puertorriqueño. Catálogo por orden alfabético de autores y de materias, de las obras existentes en la biblioteca del Ateneo puertorriqueño. Puerto-Rico, Tip. de "El Pais," 1897.
63 p. 21 cm.

1087. Berniér, Félix Matos. Muertos y vivos. San Juan, Puerto Rico, Tip. "El pais." 1905.
248 p., 1 l. 22 cm.

1088. Fernández Juncos, Manuel. Antología portorriqueña, prosa y verso, para lectura escolar ... New York, Filadelfia, Hinds Noble & Edredge, 1913.
v, [3], 267, [1] p. 19½ cm.
Biographical notices of 28 authors.

1089. Figueroa, Sotero. Ensayo biográfico de los que más han contribuido al progreso de Puerto.-Rico, con un prólogo del lcdo. en ciencias Don José Julián Acosta y Calvo. Ponce, Est. tip. "El Vapor," 1888.
xvii p.. 2 l., [3]–356 p., 1 l., [2] p. 23½ cm.
30 biographies.

1090. González Contreras, José María. Guía general de Puerto Rico. Puerto-Rico, Impr. de la Gaceta, 1897.
636 p. 2 port. (incl. front.) 22 cm.

1091. Lloréns Torres, Luís. América (estudios históricos y filológicos). Colección de artículos escritos y ordenados por D. Luís Lloréns Torres, con una carta-prólogo de D. Antonio Cortón. Madrid, V. Suárez [1898].
204 p. 21 cm.
Reseña bibliografica. p. 190–196.

1092. Neumann Gandía, Eduardo. Benefactores y hombres notables de Puerto-Rico; bocetos biográficos-críticos, con un estudio sobre nuestros gobernadores generales. Ponce, Est. tip. "La Libertad," 1896–99.
2 v. plates, ports., map, facsim. 22½ cm.

1093. Paniagua Oller, Angel. Episcopology of Porto Rico; a catalogue of the bishops who have occupied this see, including bishops-elect who did not take possession. Tr. by Henry Grattan Doyle. (*In* Catholic historical review. Washington, D. C., 1918. 25½ cm. v. iv, p. [348]–364.)

1094. Porto Rico. Colegio. Lista de abogados del ilustre Colegio de Puerto-Rico. Puerto Rico, 1876.
1 v. 20 cm.

1095. Porto Rico. Secretary's office. Register. San Juan [1901]–23½ cm.

1096. Porto Rico. Tribunal supremo. Listas cronológicas y alfabéticas de los abogados y notarios inscritos en este tribunal. Lista cronológica de los abogados inscritos en la Corte de distrito de los Estados Unidos para Puerto Rico. San Juan, Bureau of supplies, printing and transportation, 1914.
44 p. 22 cm.

1097. Sama, Manuel María. Bibliografía puerto-riqueña. Trabajo premiado en el certamen del Ateneo puerto-riqueño, celebrado el 29 de enero de 1887, de conformidad con el laudo del jurado calificador de la Asociación de escritores y artistas de Madrid. Mayaguez, P. R., Tipografía comercial—marina, 1887.
3 p. l., 159 p. 22 cm.

1098. U. S. Library of Congress. A list of books (with references to periodicals) on Porto Rico. By A. P. C. Griffin. Washington, Govt. print off., 1901.
55 p. 26 cm.

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1099. Album patriótico. [San Salvador, Imprenta nacional] 1915.
266, 5, [1] p. incl. illus., ports. ports. 24 cm.
A collection of political and patriotic articles, with biographical notices of President Meléndez, and other citizens of Salvador.

1100. Guía del Salvador, del comercio, industrias, profesiones, empresas de ferrocarriles, etc., etc. San Salvador, J. M. Lacayo [1907]
1 v. tables. 23½ x 12 cm.

1101. Labor del gobierno del general Fernando Figueroa, presidente constitucional de la República, 1907–1909. San Salvador, Impr. Meléndez [1909]
209 p. ports. 25 cm.
1. pte.: Biografías cortas.

1102. Mayorga Rivas, Román. Guirnalda slavadoreña. Colección de poesías de los bardos de la república del Salvador, precedidas de apuntes biográficos y juicios críticos sobre cada uno de sus autores. Con un prólogo del Dr. Don Tomás Ayón. San Salvador, Impr. del doctor F. Sagrini, 1884–86.
3 v. 21½ cm.

1103. San Salvador. Biblioteca nacional. Catálogo alfabético y por materias de todos los libros que contiene la Biblioteca nacional de El Salvador formado por Rafael U. Palacios. San Salvador, Tip. el Cometa, 1887.
1 v.

——— ——— 1. Apendice ... por Eduardo Martinez Lopez, San Salvador, 1890.

1104. ——— Catálogo general alfabético. San Salvador, 1896–97.
3 v.

1105. ——— ——— San Salvador, 1905.

URUGUAY

1106. Almanaque-guía de "El Siglo" para el año 1918, año LVI. Montevideo, 1918.
1 v. 25 cm.

1107. Araújo, Orestes. Diccionario popular de historia de la República O. del Uruguay. Montevideo, Dornaleche y Reyes, 1901–03.
3 v. 24 cm.
Contains much biographical information.

1108. ——— Gobernantes del Uruguay. Montevideo, Impr. de Dornaleche y Reyes, 1903.
2v. ports. 17½ cm.
Contents: t. 1. Advertencia. Los treinta y tres. Rivera y Lavalleja. El primer gobierno local. Independencia y anexión. Triunfos y derrotas. Sarandi. Incorporacion á la Argentina. Primeros conflictos. Itusaingó. Dictadura de Lavalleja. Conquista de Misiones. La independencia. Gobierno de Rondeau.—t. 2. Presidencias y dictaduras. Gobierno de Rivera. Presidencia de Oribe. Segunda presidencia de Rivera. Gobierno de Suáres. Después de la guerra grande.

1109. Arechavaleta, J. Naturalistas en el Uruguay. (*In* Revista histórica de la Universidad. Montevideo, 1907. 25½ cm. v. 1, p. [478]–506, [828]–842. ports.)
Bio-bibliographical data concerning naturalists who have studied the flora and fauna of Uruguay.

1110. Ateneo del Uruguay. Reglamento y catálogo general de la Biblioteca pública del Ateneo del Uruguay. Montevideo, Impr. de la Idea, de Flores hermanos, 1880.
38 p. 21 x 27 cm.

1111. Bauzá, Francisco. Historia de la dominación española en el Uruguay. 2. ed. Montevideo, A. Barreiro y Ramos, 1895–97.
3 v. fronts. 25 cm.
Reseña preliminar (v. 1, p. vii–lviii) contains: Bibliografía y archivos coloniales.—Primeros cronistas e historiadores de Indias-Escritores y viajeros subsiguientes.—Bibliografía jesuítica.—Complementación de los trabajos historiales y jurídicos.—Azara.—Movimiento bibliográfico de principios del siglo 19.—Bibliografía argentina.—Bibliografía brasileira.—Bibliografía uruguaya.

1112. Boletín bibliográfico "Barreiro" Montevideo, A. Barreiro y Ramos.
A useful publisher's list.

1113. Carve, Luis. Apuntaciones biográficas. (*In* Revista histórica de la Universidad. Montevideo, 1907–09.)
25½ cm. v. 1, p. [30]–57, 355–371, 651–670, v. 2, p. 99–108, 430–434, 459–465, 724–734. ports.
Contents: S. Vázquez, J. B. Blanco, M. Herrera y Obes, L. J. de la Peña, J. B. Lamas, C. Juanicó, E. Echeverría, F. Castellanos, L. A. Fernández, F. Ferreira, A. Lamas, J. G. Palomeque, F. A. Antuña, F. Acuña de Figueroa, F. Ferreira y Artigas, J. A. Varela, G. Pérez Gomar, F Araucho, J. M. Besnes Irigoyen, C. M. Ramírez, T. Narvaja, A. de Villegas, J. L. Terra, J J. de Herrera, M. Herrero y Espinosa, J. C. Blanco.

1114. De- Maria, Isidoro. Rasgos biográficos de hombres notables de la República Oriental del Uruguay. Montevideo, 1879–80.
3 v.

1115. Estrada, Dardo. Historia y bibliografía de la imprenta en Montevideo 1810–1865. Montevideo, Librería Cervantes, 1912.
318, [2] p. 26 cm.

1115a. ——— Fuentes documentales para la historia colonial; conferencia leída el día 28 de julio de 1917, con un discurso preliminar del doctor Gustavo Gallinal. Montevideo, Impr. y casa editorial "Renacimiento," 1918.
39 p. 20 cm.

1116. Fernández Sáldaña, J. M. Pintores y escultores uruguayos. (*In* Revista histórica de la Universidad Montevideo, 1913. 24 cm. t. 6. p. 428–450, 710–731.)

1117. ——— ——— Montevideo, Imp. "El Siglo ilustrado" de G. U. Mariño, 1916.
103 p. front., plates, ports. 23 cm.

1118. Fernández y Medina, Benjamín. La imprenta y la prensa en el Uruguay desde 1807 a 1900. Montevideo, Impr. de Dornaleche y Reyes, 1900.

87 p. 18½ cm.
Reprinted with additions from Orestes Araújo's Diccionario geográfico del Uruguay, 1900.

1119. Fors, Luis Ricardo. Las bibliotecas de Montevideo; examen y reseña de las mismas. La Plata, Impr. y enc. "La Popular," 1903.

43 p., 1 l. 21½ cm.
Appendix: 1. Clasificaciones del catálogo metódico decretado por el Gobierno oriental para la Biblioteca de Montevideo.—2. Secciones del primitivo catálogo formado por el D. Mascaró para la Biblioteca de Montevideo.—3. Clasificación del catálogo para la Biblioteca pública de La Plata, adoptada por su director Don Clodomiro Quiroga hasta 1898.—4. Catálogo sistemático de la Biblioteca pública de La Plata.

1120. García Calderón, Ventura. La literatura uruguaya (1757–1917) por Ventura García Calderón y Hugo D. Barbagelata. (*In* Revue hispanique. New York [etc.] 1917. v. 40, p. 415–542.)

A useful review with dates of prominent contemporary authors.

1121. "Guia nacional" de la República Oriental del Uruguay, año 8. Montevideo, 1908.

1 v. 28½ cm.
Edited by O. J. Arlas.

1122. Henríquez Ureña, Max. Rodo y Rubén Darío. La Habana, Sociedad editorial Cuba contemporánea, 1918.

152 p., 1 l 23 cm.
Bibliografía: p. 63–69, 141–149.

1123. Jalabert, Ricardo M. Album biográfico ilustrado y descripción histórico geográfica de la República Oriental del Uruguay, año 1904; directores propietarios: Ricardo M. Jalabert y Rodolfo Cabal. Buenos Aires, Ortega y Radaelli, 1903.

254, [2] p. incl. illus., porta. 35½ cm.

1124. Larrañaga, Dámaso Antonio. Centenario de la Bibloiteca pública de Montevideo. 1816–26 de mayo—1916. Discurso que en el acto de la inauguración pronunció el presbítero Dámaso Antonio Larrañaga. Con varias anotaciones históricas sobre la ceremonia por Arturo Scarone. Montevideo, Talleres gráficos del estado, 1916.

24 p. 23½ cm.

1125. Maeso, Carlos M. El Oriental; descripción general de la República Oriental del Uruguay, su comercio, industrias, rentas y riquezas, narraciones históricas, rasgos biográficos de Uruguayos célebres, etc. Montevideo, Impr. de Ríus y Becchi, 1884.

206 p.

1126. ——— Tierra de promisión: descripción general de la República O. del Uruguay: su comercio, industrias, rentas, riquezas, educación y progresos. Situación de los extranjeros en ella. Narraciones históricas. Rasgos biográficos de próceres de la independencia, etc. Montevideo, Impr. á vapor de la Nación, 1900.

1 p. l., [5]–211 p. 24½ cm.

1127. Montevideo. Biblioteca nacional. Anales de la bibliografía uruguaya. Año 1895. Tomo 1. Montevideo, 1896.

127 p.
Pages 95–113 give list of periodicals.
No more published?

1128. ——— Biblioteca nacional; recopilación de leyes, reglamento, plan de catálogo metódico y otras disposiciones y antecedentes relativos a dicha institución, por el director doctor Felipe Villegas Zúñiga. Años 1815 á 1906. Montevideo, Talleres gráficos A Barreiro y Ramos, 1914.

152 p. 21½ cm.

1129. ——— Memoria. Montevideo, 1881–85.

3 v. fold, tables. 27½ cm.
Includes catalogs of accessions to the library.
"Relación de todos los periódicos que aparecen en la república": 1880, fold, tab. following p. 197: "Relación de los grabados, mapas, planos y fotografías, que posée la Biblioteca nacional": 1880, p. 211–237.
Others issued?

1130. Núñez Regueiro, Manuel. Contemporary Uruguayan literature. (*In* Inter-America. New York, 1920. 24 cm. v. 3, p. 306–315.)

From Nuestra América, Buenos Aires, June, 1919.

1131. Los oradores de la Cámara; retratos, bocetos y caricaturas de algunos diputados de 1873. Montevideo, Impr. el Obrero español, 1876–. 18½ cm.

1132. Roxlo, Carlos. Historia crítica de la literatura uruguaya. Montevideo, A. Barreiro y Ramos, 1912–16.

7 v. 23 cm.
Contents: t. 1–2. 1810–1885. El romanticismo.—t. 3–5. 1885–1898. (t. 3. El arte de la forma. t. 4–5. La influencia realista.)—t. 6. 1885–1898. El cuento nativo y el teatro nacional.—t. 7. 1900–1916. La edad ecléctica.

1133. Scarone, Arturo. La Biblioteca nacional de Montevideo; reseña histórica con motivo del primer centenario de su fundación, 1816—26 mayo—1916. Montevideo, Talleres gráficos del estado, 1916.

157 p. illus., ports. 24 cm.

1134. ——— Uruguayos contemporáneos; obra de consulta biográfica. Diccionario de datos referentes a compatriotas ... y de algunos extranjeros desde largo tiempo incorporados y descollantes en nuestra vida pública. 1 ed., con un apéndice. Montevideo, "Renacimiento," 1918.

2 p. l., [vii]–xv, 676 p. illus., ports. 18½ cm.

1135. Uruguay. Archivo y Museo histórico nacional. Revista histórica. Montevideo, 1907–. 25½ cm.

Bibliographies interspersed.

1136. Uruguay. Ministerio de relaciones exteriores. Anuario diplomático y consular de la República Oriental del Uruguay. Año 1917. Montevideo, Imprenta nacional, 1917.

243 p., 2 l. 25 cm.
"Estado de servicios de los miembros del Cuerpo diplo mático y consular" (with full names and dates): p. 205–218.

1137. Uruguay. Oficina de depósito, reparto y canje internacional de publicaciones. Lista de las publicaciones existentes en la Oficina de depósito, reparto y canje internacional. Montevideo, 1890. 21½ cm.

1138. Zinny, Antonio. Historia de la prensa periódica de la República Oriental del Uruguay 1807–1852. Bienos Aires, C. Casavalle, 1883.
xxix p., 1 l., 504 p. 23½ cm.

VENEZUELA

1139. Album bibliográfico de Venezuela; año 1–, 1916–. Caracas, Litografía del comercio, 1917–. 23½ cm.
By Manuel Segundo Sánches.
Cf. also no. 1160.

1140. Anzola, Juvenal. Abogados venezolanos. Caracas, Imp. Colón, 1904.
222 p.

1141. Asociación venezolana de literatura, ciencias y bellas artes. Primer libro venezolano de literatura, ciencias y bellas artes, ofrenda al gran mariscal de Ayacucho. Contiene retratos e ilustraciones. Caracas, Tip. El Cojo, I parte; Tip. Moderna, II parte, 1895.
2 p. l., A–ABC, cccxxxvi, 216, ii p. illus. (incl. ports.) plates. 37 x 29½ cm.
By the Asociación venezolana de literatura, ciencias y bellas artes, under the special direction of R. F. Seijas.
CONTENTS: 1. pte. Las buenas letras. Las ciencias. Las bellas artes. La bibliografía.—2. pte. La antología general. Las notas biográficas. Las últimas páginas. El índice.

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Bibliography: p. 447–470.

1250. Boston Public Library. A selected list of books on the commercial relations of South America, principally with the United States. Boston, The Trustees, 1918.

2 p. l., 19 p. 17 cm. (Brief reading lists, no. 4).

1251. Brandenburger, Clemens. Neuerebrasilische wissenschaftliche literatur. (in Mitteilungen des Deutsch-Südamerikanischen und Iberischen Instituts in Köln. Stuttgart und Berlin, 1920. 24½ cm. heft 1–2, p. 49–61).

1252. Candioti, Marcial R. Bibliografía doctoral de la Universidad de Buenos Aires y catálogo cronológico de las tesis en su primer centenario 1821–1920. Buenos Aires, 1920, 804 p.

"Las tesis de jurisprudencia, incluyendo las de derecho canónico, son 3450, las de teología 22, las de medicina son 3960, los proyectos de la Facultad de ciencias exactas 1014, las tesis de la Facultad de filosofía y letras 46, agronomia y veterinaria 215 y ciencias económicas 79; lo que hace el total de 9686 de la colección. Los diez y nueve capítulos que sirven de introducción a la obra, son un verdadero tratado de crítica literaria sobre las tesis"—cf. Dr. E. S. Zeballos' review in Rev. de derecho. hist. y letras, April, 1921.

1253. Cortijo Alahija, L. Musicología latino-americana La música popular y los músicos celebres de la América-latina. Barcelona, Maucci, 1920.

443 p.

1254. Cuba Congreso. Cámara de representantes. Bibliografía sobre bancos y crédito, obras que se hallan en la biblioteca. Edición preliminar. Habana, Impr. "El Siglo xx," 1921.

59 p.
Prepared by Luis Marino Péres.

1255. Espejo, Juan Luis. Indice de documentos relativos a Chile existentes en el Public record office de Londres, Archivo de las órdenes militares de Madrid y Archivo general de Indias de Sevilla.
Santiago de Chile, 1915.

1256. ——— Nobiliario de la antigua Capitanía general de Chile. Santiago de Chile, Imprenta universitaria, 1917.

389, [1] p. coats of arms. 26 cm. Ensayo bibliográfico: p. 291–296.

1257. Francia, Felipe. Genealogía de la familia del Libertador Simón Bolívar. [Caracas] Tip. Emp. el Cojo, 1911.

30 p. plate. 21½ cm.

1258. García Samudio, Nicolás. Colombian literature. (In the Hispanic American historical review. Baltimore, 1921. 27 cm. v. 4, p. 330-347).

1259. Griffin, Grace Gardner. Writings on American history, 1906.—A bibliography of books and articles on United States and Canadian history, with some memoranda on other portions of America. New York, The Macmillan company, 1908—. 24½ cm.

"With respect to the regions lying south of the continental United States. . . the intention has been to include all writings on the history of these regions published in the United States or Europe; but the products (not relating to the United States) of South America and other southward regions has been left to their own bibliographers."—Preface, 1917.

1260. Hasse, Adelaide Rosalie. Index to United States documents relating to foreign affairs, 1828–1861. Washington, D. C., Carnegie institution of Washington, 1914–21.

4 v. 29½ cm. (Carnegie institution of Washington. Publication no. 185.)

1261. Instituto do Ceará. Revista trimensal do Instituto do Ceará, sob a direcção do barão de Studart. Ceará-Fortaleza, 1887?—. 22½ cm.

Contains much of biographical and bibliographical value, such as bio-bibliographical notices of deceased members, lists of journals published in Ceara, Estrangeiros e Ceará, etc.

1262. Lehmann, Walter. Zentral-Amerika. 1. teil. Die sprachen Zentral-Amerikas. Berlin, D. Reimer, 1920.

xii, 595 p. map. 32 cm. With extensive bibliographical references.

1263. Lutrell, Estelle. Mexican writers, a catalogue of books in the University of Arizona Library, with synopsis and biographical notes. Tucson, 1920.

83 p. parts. 23½ cm. (University of Arizona record, v 13, no. 5, Library bibliography no. 5.)

A very useful contribution to the bibliography of modern Mexican literature. Authors names are given in full with dates, followed by bio-bibliographical notes. It is arranged in five sections: 1. Mexican writers; 2. Literature in Spanish upon Mexican themes by authors native to other countries; 3. Collections, Literary criticism. Biography; 4. Bibliographies; 5. Mexican language.

1264. Navas V., José Buenaventura. Evolución social del obrero en Guayaquil; obra histórica. Guayaquil, Imp. Guayaquil, 1920.

63, [1] p. illus., ports. 19 cm.
Contains many biographical notices.

1265. Noronha Santos, Francisco Agenor de. Indice da Revista Archivo do Districto Federal com extracto alphabetico de assumptos. Rio de Janeiro, 1919.

"Contains an alphabetical index of all documents since the 16th century relating to the Brazil-capital and published in the records of the municipality." cf. Dr. Oliviera Lima's note in Hisp. Am. hist. rev., May 1921. p. 361.

1265a. Pérez, Luis Marino. Guide to the materials for American history in Cuban archives. Washington, D. C., Carnegie institution, 1907.

ix, [1] 142 p. 26 cm. (Carnegie institution of Washington. Publication no. 83.)

1266. Revista de filología española, t. 1- . Madrid, 1914—. 25½ cm. Quarterly.

Edited by Ramón Menéndez Pidal.
In addition to the critical articles and reviews the Revista contains a classified bibliography of books and articles dealing with Spain and Latin America in all languages. For convenience in filing a special edition of this indispensable bibliography is printed on one side only.

1267. Rivet, P. Bibliographie américaniste 1914–1919. (Journal de la Société des Américanistes de Paris. Paris, 1919. 28 cm. Nouv. sér., t. xi, p. 677–739).

1268. Rodríguez Lendián, Evelio. Elogio del doctor Ramón Meza y Suárez Inclán. (In Anales de la Academia de la historia. Habana, 1919—. 28½ cm. t. 1—, núm. 1—).

Includes bibliography.

1269. Salas, Carlos I. Estudio biografico-bibliográfico de la vida y obras del doctor Pedro Mártir de Angleria. Buenos Aires?, 1921.?

Only 50 copies printed.
Reviewed in La Prensa, New York, May 25, 1921.

1270. Salvador Ministerio de relaciones exteriores. Lista diplomática y consular. San Salvador, Imprenta nacional, 1920.

32 p.

1271. Serrano, Pedro. Hispanistas mexicanos. Vol. 1. Mexico, 1920.

1272. Sociedad económica de los amigos del país de la Habana. Catálogo de la biblioteca (In Revista cubana bimestre. Habana, 1920—. 24 cm.)

1273. Sparn, Enrique. Bibliograía de la geología, mineralogía y paleontología de la República Argentina. Córdoba, 1920.

58 p.

1274. Studart, Guilherme, barão de. Estrangeiros e Ceará. (In Revista trimensal do Instituto do Ceará, Ceará-Fortaleza, 1918. 22 cm. t. 32, p. 191–274.)

Lista dos auctores e de suas obras tendo referencia ao Ceará: p. 269–274.

1275. Thayer Ojeda, Luis. Navarros y vascongados en Chile. Santiago de Chile, 1904.

1276. Thayer Ojeda, Tomás. Los conquistadores de Chile. Santiago de Chile, Impr. Cervantes, 1908–13.

3 v. 26 cm.

1277. Torres Saldamando, Enrique. Los títulos de Castilla en las familias de Chile. Santiago de Chile, 1894.

2 v.

1278. Trelles y Govín, Carlos Manuel. Bibliografía antillana. (In the Hispanic American historical review. Baltimore, 1921. 27 cm. v. 4, p. 324–330).

1279. Urquidi, José Macedonio. Bolivianas ilustres. La Paz, Arnó hermanos, 1919.

2 v. ports. 19 cm.

1280. Vicuña Mackenna, Benjamín. Los orígenes de las familias chilenas Santiago de Chile, G. E. Miranda, 1903.

3 v.

1281. Zeballos, Estanislao Severo. Bibliographie argentine de droit international privé, par ordre chronologique. (In Bulletin argentin de droit international privé, fondé et publié par Estánislao S. Zeballos. Buenos Aires, 1903–10. 23 cm. v. 1–2).

An important contribution to the bibliography of the subject, the value of which is greatly enhanced by the authorative critical comments of the compiler a distinguished statesman, jurist, author and editor, former professor of private international law in the University of Buenos Aires, and three times minister of foreign affairs of Argentina. The Bulletin contains also other sections, Bibliographie étrangère, Bibliographie générale, etc., reviewing the current literature of the subject with critical appreciations.

The Revista de derecho, historia y letras, also founded and directed by Dr. Zeballos and now in its 68th volume (1921) is a valuable source of information concerning current Hispanic American bibliography, giving titles of recent publications, not only in Argentina but also in other countries. A special section "Bibliografía (catálogo razonado de mi biblioteca) gives full titles and collations, with critical reviews by the editor.

(To be concluded)

C. K. JONES.

B. Fine, Prof. E. Hastings Moore, Prof. Ormond Stone, Prof. Simon Newcomb, Prof. Charlotte Angas Scott, Prof. Henry S. White, Prof. E. W. Hyde, Prof. W. Woolsey Johnson. Prof. B. O. Peirce. The presidential address, delivered by Dr. Hill, was entitled: 'Remarks on the Progress of Celestial Mechanics Since the Middle of the Century.' It will be published in an early number of SCIENCE. Prof. James McMahon read a paper, entitled: 'Note on the separation of the velocity potential (expressed by functions of Laplace and Bessel) into two parts, representing an outward and an inward moving wave.'

THOMAS S. FISKE.

COLUMBIA COLLEGE.

CURRENT NOTES ON ANTHROPOLOGY

RESEARCHES IN SOUTH AMERICAN LANGUAGES.

FROM the rich field of South American linguistics several valuable products have lately been gleaned.

That deserving of the first mention is the narrative of a journey across the Cordillera from Chili eastward, recited in the Huilliche dialect of Araucanian. It was carefully taken down by Dr. Rodolfo Lenz and is printed in the 'Anales de la Universidad de Chile,' Tomo XC. The text, with a literal translation into Spanish, covers 22 pages, and is the first specimen we have, not only in this dialect but in Araucanian, proceeding from the unconstrained lips of a native. It is a model of the manner in which such a piece of work should be accomplished and presented.

The question of the Catamarcan language is again attacked by S. A. Lafone Quevedo in the Anales de la Sociedad Cientifica Argentina, Tom. XXXIX. in an article of 35 pages. He aims to demonstrate from proper names that it is not Kechuan in its affinities. His arguments are drawn from a full investigation of existing fragments of the tongue, and though not conclusive, make an able plea.

A careful vocabulary of the Guaná, from two independent sources, is published by the Reale Academia die Lincei (Rome), this year, the memoir being from the pen of the artist traveler, Guido Boggiani.

A short vocabulary of the Angagueda dialect of the Choco obtained in June last by Mr. H. G. Granger is edited with comparative words by me in the Proceedings of the American Philosophical Society for November.

To these must be added a valuable contribution on the language of the Akua (Chavantes, Cherentes), by Dr. Paul Ehrenreich in the Zeitschrift für Ethnologie, 1895, Heft IV: and several vocabularies from the Orinoco district, published by Dr. A. Ernst, of Caracas, in the American Anthropologist for October, 1895.

THE ANTHROPOLOGY OF WOMAN.

AT the August meeting of the German Society of Anthropology, at Cassel, the opening address was by Dr. Waldeyer, of Berlin, on 'the somatic differences of the two sexes.' Its aim was particularly to bring out the contrasts between woman and man, with the purpose of applying the results to the education and 'sphere' of woman. He argued that since a wide collation of measurements and statistics proves that she has a smaller brain, has less physical strength, preserves more traits of infancy and childhood in adult life, and has practically in all times and places held a position inferior to the man, that in our schemes of social improvement these undeniable facts should be respected. The efforts of social democrats and society leaders to establish entire equality between the two sexes and to throw open to woman all the avenues of activity enjoyed by man, he intimates, are mistaken, and will prove failures; and quotes with approval the opinion

of Bartels, who maintains that the education, physical and mental, of woman, however high it may be, should be always aimed to fit her for the duties of the family circle only.

This conclusion will not be in the least acceptable to the 'advanced' women of the day, nor to those sociologists who see in woman's present condition, not the model of the future, but a survival from a barbaric past.

D. G. Brinton.

SCIENTIFIC NOTES AND NEWS.

EXPERIMENT STATIONS FOR ENGINEERING.

A movement is in progress looking to the development at the 'land-grant colleges' of the several States, of a system of mechanical engineering 'experiment stations,' on much the same basis as the existing agricultural experiment stations organized under the Hatch bill of 1887. It is anticipated that the outcome will be the organization of such stations in all the agricultural and mechanical colleges of the country, in which the agricultural experiment stations have been successfully organized and operated. The purpose of the movement is to secure the promotion of engineering research, and of the development of the scientific facts and principles which are of most value to the mechanic arts and to the profession of engineering. The headquarters of the central office to which all will report is thought likely to be the Bureau of Steam Engineering of the Navy Department; that being the largest, most important and most generally suitable of the government bureaux to take cognizance of such work as is comtemplated. A Department of Mechanic Arts was proposed years ago, probably earlier than the Department of Agriculture, but the importance of the former has not been as promptly or as fully recognized as that of the latter, and nothing has yet been done in that direction. Should such a department be founded, it will naturally become the center of the work of mechanical engineering experiment stations. The present movement has its origin among Southern colleges, and members of the engineering profession who desire to see the encouragement of Southern industries through scientific method, and its earliest expressions is found in the papers of Prof. Aldrich of the West Virginia University, on engineering research.

THE BRITISH MUSEUM.

Natural Science states that the changes at the British Museum (Natural History) on the retirement of the Keeper of Zoölogy, Dr. A. Günther, are as follows: Prof. Sir W. Flower assumes the office of Keeper of Zoölogy in addition to his post as Director, without addition of salary; Dr. Bowdler Sharpe becomes Assistant Keeper of Vertebrata, his department consisting of Messrs. Thomas Boulenger, and Grant; Mr. Edgar A. Smith, Assistant Keeper of Invertebrata, associated with Prof. Jeffrey Bell, Mr. Pocock and Mr. Kirkpatrick; Dr. A. G. Butler, the head of the Entomological Department, with his juniors, Messrs. Waterhouse, Kirby, Gahan Heron, Austen, Hampson, and a new Assistant appointed to fill the vacancy. Mr. Pocock becomes a first-class Assistant. Changes have also been begun in the galleries. The larger fishes will be slung up to the roof, so as not to cumber the valuable floor space, and a more definite arrangement will be made of fishes; similar alterations are contemplated in the reptile gallery, where seventeen crocodiles have for many years enjoyed palatial quarters on the floor. The public gallery of birds will gradually be improved on the plan adopted already is one of the bays, and in the mammalian gallery certain arrangements are contemplated which will show the finer specimens to great advantage. The Trustees have recently purchased for the Department of Geology important series of fossils selected from the collections of the Rev. P. B. Brodie, Rowington, Warwick, and of the late Mr. James W. Davis, Chevinedge, Halifax. Mr. Brodie's collection includes a large number of type specimens described by various authors; and all of these are included in the British Museum selection except those in his unique cabinet of fossil insects, which he still retains. The collection of the late Mr. Davis contains some very fine fishes from the Lower Lias of Lyme Regis and a large number of fragmentary

CURRENT NOTES ON ANTHROPOLOGY.

SOUTH AMERICAN ETHNOGRAPHY.

THE praiseworthy industry of linguists in South America is rapidly dispelling the uncertainty which has so long hung over the affiliations of tribes in that continent. Their recent labors merit a much fuller notice than can here be given, but they must at least be named.

Two articles by Samuel A. Lafone Quevedo deserve especial mention. One is, indeed, a volume of nearly 400 pages, with map, etc., on the tongue of the Abipones (in the Boletin of the National Academy of Cordoba, Vol. XV.); the other is on the dialects of the Chanases and their neighbors (in the Boletin of the Geog. Inst., Tom. XVIII.). Both are excellent pieces of work.

Dr. Rodolfo Lenz has continued his thorough investigations of the Araucanian idiom by a series of pieces in the Pehuenche and a number of songs in that and the Moluche dialects (in the Anales of the University of Chile, Tom. XCVII.); and an instructive popular lecture on Araucanian literature, printed in the *Revista del Sur*.

A very fine monograph, ethnographic and linguistic, is that on the Matacos by Juan Pelleschi (pp. 248, with two maps, printed in the Boletin of the Geographical Institute, Buenos Aires). It is accurate, original and exhaustive.

Science, NS, VII, 312, Mar. 4, 1898.

AMERICAN SCIENCE

SINCE returning to India two and a half years ago I have had many opportunities of discussing American achievements in science, especially in the domain of biology and agriculture with several Indian men of science. Many of these men, who have been to Great Britain and Germany for advanced training, are connected with the universities, colleges, agricultural or scientific institutions. The opinion expressed by a majority of them relative to American scientific work was that much of it was "spurious," "no scientific value," "will have to be carefully repeated," "take with a ton of salt all that comes from the New World," etc. Having worked in or visited many of the best scientific institutions in the United States, I was not only surprised but pained to hear such disparaging remarks. When I have pressed these men to point out instances of spurious work or when I have brought under their notice some of the fine researches that have definitely advanced knowledge, I have found that the prejudice in several cases was not based on any facts. Indeed some of these men, when a new problem turns up for solution, especially in the field of the agricultural sciences, go to American literature for guidance, while some others are busy investigating problems which have long ago been successfully solved in America.

I think that much of the prejudice is because the people here can not realize the extent of facilities and funds available for scientific work in America. An American scientist, interested in a problem, works all day and far into the night. He subscribes liberally to journals in which he is interested and reads a great deal not only in his own but collateral sciences. He very frequently attends scientific association or academy meetings so as to meet and exchange thoughts with others working along similar lines. He is ever on the alert to advance in the subject of his choice, and on his achievements depends his future. In India things are different. Funds and facilities are meager. The scientist is appointed to hold a "permanent position," which he relinquishes only after he reaches a certain age. If he is in a particular "cadre" he gets his annual salary increment irrespective of meagerness of scientific output. Those in the lower rungs of service who may be doing well have few chances of advancement because of rules of service and various other causes.

Scientific societies are few and the annual meetings are not well attended unless the universities or the government departments meet the "traveling allowances" of these men of science. Personal subscriptions to science journals is a luxury indulged by very, very few, indeed.

A third reason for the belief that American science is cheap is, perhaps, the American generosity in distributing "literature." Some of the experiment stations and other institutions send their bulletins, memoirs, etc., for the mere asking. The spirit behind this, in several cases that I know of, is an honest desire to help and for the spread and dissemination of knowledge. This is mistaken here for American "boosting." Many of the distributed bulletins have only local value, such as those reporting varietal trials or manurial tests or, say, those reporting the trend of prices of hogs as correlated to corn yields. Some stations send not one or two but four or five of the same bulletins. No wonder files of these in library corners come to be known as American trash. It is only when a publication is extremely inaccessible or rare that its value advances. It is the duty of an investigator to search and find out literature, rather than for an experiment station to bring it to the notice of workers the world over.

It is time for the experiment stations to revise their free distribution policy, especially in these depression days, and help also in acquiring proper recognition for American science.

"TAXILA"

INDIA

SPECIAL CORRESPONDENCE

MALNUTRITION IN THE AMAZON BASIN

ONE of the very interesting observations made during the recent magnetic expedition, August, 1931, to January, 1933, in South America, by the writer for the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, concerns the distribution of malnutrition in the Amazon Basin. While this matter has nothing to do with the prime purpose of the expedition, attention is called to it, since it may be of great interest to organizations that are concerned with the study of human life and settlement in the tropics.

It has long been pointed out by Stefansson and a number of other Arctic men that the civilizing influence of missions and Hudson's Bay Company stations is not entirely beneficial to the Eskimo. The reason is that malnutrition and deficiency diseases, which seem never to be found among these people as long as they live by their own hunting mode of existence, generally make their appearance as soon as

the Eskimos begin to barter furs, etc., for the food supplies brought north by the white men. In this connection, Dr. William A. Thomas, working with the 1926 MacMillan expedition, made a health survey of the Eskimos of Greenland and Labrador. His report, published by the American Medical Association, states that those Eskimos who have close contact with traders, "whose meat is cooked and whose diet includes many prepared, dried, and canned articles," are very subject to both scurvy and rickets, while those Eskimos who live their native life of hunting and fishing, with a carnivorous diet, mainly raw, show no tendency toward either of these diseases.

A somewhat analogous condition was observed on this recent field-trip, but has never, as far as I am aware, been reported by any other observer.

In this memorandum, reference is entirely to the "white" settlers in the regions concerned, meaning by that the non-Indian inhabitants, who generally lead a life far different from that of their Indian neighbors.

The Alexander Hamilton Rice Expedition to the Rio Branco, 1924–25, made a medical survey of that region, and reported malnutrition, due to the lack of fresh food in the diet of the settlers, as being one of the greatest fundamental detriments to health. This was confirmed by the writer, as far as a non-medical observer may dare to confirm the reports of a medical expedition. I believe, however, that even a lay traveler is justified in linking the almost universal lethargy of the inhabitants of a region with his own lethargy and his own inability to obtain fresh food.

The same condition was seen on the Brazilian Rio Negro, where health conditions were bad, the white settlers nearly always obviously listless and whining, and where there was the greatest trouble in getting anything to eat except beans, rice, dried meat and dried fish.

One curious fact, however, was very noticeable. The Venezuelan-Brazilian border on the Rio Negro seemed to draw a sharp line of division between two "health regions." On the Venezuelan Rio Negro and on the Orinoco as far as Puerto Ayacucho, the settlers were evidently much more active and much more inclined to laugh and "get a kick out of life" than on the Brazilian side. At the same time, while I also had difficulty in getting food on the Orinoco and upper Rio Negro, it was almost impossible there to obtain any kind of dried or preserved food such as beans, rice or dried meat. The only articles obtainable that were not fresh were mandioca and cassava bread. Everything else was invariably fresh, such as corn, bananas, pineapples, live chickens, yucca and live turtles.

It seems reasonable, therefore, to conclude that the settlers on the Venezuelan side of the border owe their better health conditions to better nutrition, and the corresponding absence of deficiency diseases.

This condition can in no way, however, be ascribed to a difference in personal tastes between the Venezuelan and the Brazilian settlers. It must, I believe, be ascribed to the fact that the Brazilian government shows a greater amount of concern for its "out-of-the-way" regions than does the Venezuelan government for those in Venezuela.

The Venezuelan Orinoco and Rio Negro are entirely abandoned to-day as far as regular commercial transport is concerned. Commerce in these regions is dead, except for a small amount of balata and some few Tonka beans. The result is that most of the settlers here export nothing and can import nothing. Most of those who lived there a few years ago have emigrated by now, but the few remaining ones are forced to plant, hunt and fish in order to stay alive. Agriculture among the white settlers is far more prevalent to-day than it was in the days of the rubber boom and is a direct result of the withdrawal of "civilization."

On the Brazilian Rio Negro, however, there is at least one steamer or launch every month, between Manaos and the garrison-town of Cucuhy, on the border. This makes commerce possible, and most of the settlers on the river still engage in trade—in balata, Brazil nuts and palm fibers. They pay almost no attention to agriculture, getting the major part of their food from Manaos in dried and preserved form, since no ice is to be found anywhere on the river. The result is malnutrition.

In justice to the Brazilian government, however, it must be said that the seriousness of the situation is fully realized. A great deal of money has lately been spent at Barcellos, in clearing land for an enormous plantation, to be run in sections by the local inhabitants under government supervision. The ultimate success of this, however, depends on the price of rubber. If the latter rises a few cents, it is probable that the citizens of Barcellos will abandon their plantation and run into the jungles for rubber.

The sub-prefect of Barcellos, a medical student, recognizes the seriousness of malnutrition among his people. At the time of my visit he had applied to the government at Manaos for permission to import three live steers a month, to be butchered at Barcellos, so the inhabitants can have some fresh meat. I had some interesting discussions with him about this, since in my opinion the method was hardly adequate. The probable result of such a step would be that the people would obtain their precious meat, dry it and hoard it for Sunday use. However, the importation of foods by the government would hardly tend to stabilize the population. It would have seemed much

better to import a number of the Indian water-buffalo that do so well in the jungle regions of the lower Amazon, and get the inhabitants to breed the animals themselves.

However, any such step would have to be accompanied by education in the desirability of fresh meat against dried. It is noticeable that on the ranches of the great fertile cattle plains of Brazilian Guiana, where over 200,000 head of cattle are grazing to-day, fresh meat is almost unobtainable, and the problem of malnutrition is every bit as serious as on the jungle rivers. Vegetables seem never to be planted. Meat is very seldom eaten fresh. The reasons for the latter are threefold. In the first place, the ranchers are used to dried meat and possibly prefer it to fresh. Their diet is extremely limited in scope. This would probably make it all the more difficult to induce them to change and enlarge it—Stefansson has very forcibly pointed out that men as well as dogs who are used to a limited diet find it much more difficult to take to any change than those who are already used to a great variety. In the second place, the absence of ice makes it impossible to preserve meat in a fresh state after a steer has been killed, and would result in a large amount of wastage unless the meat were dried. In the third place, the population in these regions is so scattered that any "community" solution of the problem would be impossible. Every ranch is a small and self-contained community in itself, and the butcher-shops that are found in the town of Boa Vista can not exist in the cattle plains.

The river turtles and fish that give the inhabitants of the river settlements a certain amount of fresh food in units small enough to prevent wastage are, of course, lacking on the cattle plains. Whether or not chickens are cultivated in the cattle lands to any extent is something I am not able to say. On the two ranches that I visited, they were not to be found.

One other matter, that may be of interest in connection with the problem of diet and dental caries, might well be mentioned here. In Manaos I met Mr. Desmond Holdridge, of the Brooklyn Museum, who had with him a Makuxi Indian boy called Moi-i. This boy had lived for some fifteen years with his tribe, living the usual native tribal life. Here he had never known or seen any signs of dental decay. He had found it necessary, however, at the age of fifteen, to leave his tribe and to establish himself as a hired hand on the Brazilian National Ranch in the cattle plains. After a year and a half there, he came to Manaos with Holdridge, where the latter found it necessary to take him to the dentist to repair the ravages of a bad case of caries. This was told to me by Moi-i, and confirmed by Holdridge, who had known the boy well when he first left his tribe.

Inquring about the changes of diet, etc., that had accompanied this change in dental health, I found the following to have taken place. While living with his own people, Moi-i had eaten a great many fresh vegetables of various kinds, a good deal of hard cassava bread, little meat and almost no salt. On the ranch, living with white men, he had eaten a great deal of meat, mainly dried and salted, also milk, cheese, etc., almost no vegetables and a great deal of salt. The point about salt is interesting in view of the fact that the Indians of Southern Venezuela seem to believe that the white men have bad teeth because they eat so much salt. Moreover, while living with his own people, Moi-i had had the habit of constantly cleaning his teeth with charcoal, a habit that he had dropped when he went to live with the white man.

The matter throws an interesting light on the widespread modern idea that our teeth are bad because our soft foods do not give them enough exercise. While with his own people, Moi-i had found plenty of exercise for his teeth, in chewing the hard cassava bread. Here they stayed healthy. But later, when he lived with the white man, he had to chew still harder in order to get down the quantities of dried meat. If exercise is the determining factor, his teeth should have improved instead of deteriorating.

EARL HANSON

WASHINGTON, D. C.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

SAVINGS IN LABORATORY EXPENDITURES WITHOUT LOSS OF EFFICIENCY

WITH the present decreases in budgetary appropriations it has become a necessity for investigators to secure results with cheaper equipment. Notable savings can be accomplished by simple adaptations of common marketable supplies which are used for domestic purposes.

Operating tables for animal work can be readily adapted from kitchenware departments at a cost which is one tenth of the fancy professional models. Operating lamps, 110 volt, (particularly of the large Zeiss or Leitz types) can be equipped with 100 watt Mazda, instead of the costly filament types, without great loss of efficiency. Six volt lighting equipment can readily be modified to take automobile lamps, sometimes at an increased efficiency and generally at one tenth of the cost.

Sterilization can be secured just as readily with a

better to import a number of the Indian water-buffalo that do so well in the jungle regions of the lower Amazon, and get the inhabitants to breed the animals themselves.

However, any such step would have to be accompanied by education in the desirability of fresh meat against dried. It is noticeable that on the ranches of the great fertile cattle plains of Brazilian Guiana, where over 200,000 head of cattle are grazing to-day, fresh meat is almost unobtainable, and the problem of malnutrition is every bit as serious as on the jungle rivers. Vegetables seem never to be planted. Meat is very seldom eaten fresh. The reasons for the latter are threefold. In the first place, the ranchers are used to dried meat and possibly prefer it to fresh. Their diet is extremely limited in scope. This would probably make it all the more difficult to induce them to change and enlarge it—Stefansson has very forcibly pointed out that men as well as dogs who are used to a limited diet find it much more difficult to take to any change than those who are already used to a great variety. In the second place, the absence of ice makes it impossible to preserve meat in a fresh state after a steer has been killed, and would result in a large amount of wastage unless the meat were dried. In the third place, the population in these regions is so scattered that any "community" solution of the problem would be impossible. Every ranch is a small and self-contained community in itself, and the butcher-shops that are found in the town of Boa Vista can not exist in the cattle plains.

The river turtles and fish that give the inhabitants of the river settlements a certain amount of fresh food in units small enough to prevent wastage are, of course, lacking on the cattle plains. Whether or not chickens are cultivated in the cattle lands to any extent is something I am not able to say. On the two ranches that I visited, they were not to be found.

One other matter, that may be of interest in connection with the problem of diet and dental caries, might well be mentioned here. In Manaos I met Mr. Desmond Holdridge, of the Brooklyn Museum, who had with him a Makuxi Indian boy called Moi-i. This boy had lived for some fifteen years with his tribe, living the usual native tribal life. Here he had never known or seen any signs of dental decay. He had found it necessary, however, at the age of fifteen, to leave his tribe and to establish himself as a hired hand on the Brazilian National Ranch in the cattle plains. After a year and a half there, he came to Manaos with Holdridge, where the latter found it necessary to take him to the dentist to repair the ravages of a bad case of caries. This was told to me by Moi-i, and confirmed by Holdridge, who had known the boy well when he first left his tribe.

Inquring about the changes of diet, etc., that had accompanied this change in dental health, I found the following to have taken place. While living with his own people, Moi-i had eaten a great many fresh vegetables of various kinds, a good deal of hard cassava bread, little meat and almost no salt. On the ranch, living with white men, he had eaten a great deal of meat, mainly dried and salted, also milk, cheese, etc., almost no vegetables and a great deal of salt. The point about salt is interesting in view of the fact that the Indians of Southern Venezuela seem to believe that the white men have bad teeth because they eat so much salt. Moreover, while living with his own people, Moi-i had had the habit of constantly cleaning his teeth with charcoal, a habit that he had dropped when he went to live with the white man.

The matter throws an interesting light on the widespread modern idea that our teeth are bad because our soft foods do not give them enough exercise. While with his own people, Moi-i had found plenty of exercise for his teeth, in chewing the hard cassava bread. Here they stayed healthy. But later, when he lived with the white man, he had to chew still harder in order to get down the quantities of dried meat. If exercise is the determining factor, his teeth should have improved instead of deteriorating.

EARL HANSON

WASHINGTON, D. C.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

SAVINGS IN LABORATORY EXPENDITURES WITHOUT LOSS OF EFFICIENCY

WITH the present decreases in budgetary appropriations it has become a necessity for investigators to secure results with cheaper equipment. Notable savings can be accomplished by simple adaptations of common marketable supplies which are used for domestic purposes.

Operating tables for animal work can be readily adapted from kitchenware departments at a cost which is one tenth of the fancy professional models. Operating lamps, 110 volt, (particularly of the large Zeiss or Leitz types) can be equipped with 100 watt Mazda, instead of the costly filament types, without great loss of efficiency. Six volt lighting equipment can readily be modified to take automobile lamps, sometimes at an increased efficiency and generally at one tenth of the cost.

Sterilization can be secured just as readily with a

THE INDOOR EXPLORER

By D. R. BARTON

TEN HUMAN HEADS shrunk to the size of tennis balls is one of the sights that attracts the interest of many an "indoor explorer" roaming the halls of the American Museum. Who can gaze at these blackened features protruding from the long raven tresses of original hair without wondering what story they might tell of violent death and jungle ritual? The writer for one was prompted to inquire into the subject. But you cannot delve far into the literature without discovering that the information is not always dependable. One account stated that shrinking heads is a fiendish practice of a South American tribe of Indians known as Jivaros (pronounce this he-var-o) who often take white men's heads as well as those of rival aborigines. It maintained that the process is perfectly simple. After the head has been severed from the victim's trunk it is thoroughly pounded with a heavy club in such manner that the skull is reduced to fragments which are forced down and out through the neck, leaving a boneless head which shrinks in drying to about one-quarter its original size!

True, the head becomes approximately one-quarter its original size, as a glance at the specimens in the Museum proves, and appears to have become thoroughly dried; but even the more gullible inquirer may question how it maintains its shape so well during the process of dessication, and to others there will occur some mechanical difficulty in forcing skull fragments out through neck-tissue which has not been softened by boiling or by some other process.

In his effort to ferret out the truth of the matter, the Indoor Explorer was encouraged to learn that Dr. Harvey Bassler on the Museum staff, had long resided on the far Upper Amazon and had knowledge of the art of head shrinking; and he set off at once to pay him a visit.

"You do know about them, do you not?" I asked.

"Yes," he replied. "As a matter of fact I have several of them." He got up and took down from a shelf a tightly sealed tin box. The lid was removed with some difficulty. An odor of camphor filled the room. Reaching within he pulled forth the open end of a long cotton sack.

"Reach in and see what you can find," he invited with a hospitable gesture. With some reluctance I gingerly thrust in a hand that trembled in spite of myself. Groping cautiously, the image of your Indoor Explorer which I chanced to see in a mirror

across the room shamed me, for its deathly pallor. My hand closed on a mass of hair.

"Pull it out," commanded my host.

When I withdrew my hand from this gruesome grab-bag it held luxuriant locks of dank black hair from which dangled something that looked like a burnt potato.

"That is the head of Matapa, a good friend of mine," said my host gravely.

I swallowed hard. "Not really," I said faintly.

"Yes. Enemy Jivaros from the far interior raided his home and carried away with them his head which I recovered from them later. Years ago in a successful raid into that very region from whence came the warriors who finally slew him, he was grazed by a spear which partly tore from its attachment the

In all this research the motive has been an earnest endeavor to learn scientific facts—the *truth* regarding these little-known reptiles. Never has the author for one moment entertained the thought, or had the desire to "show off." It has only been a great pride to demonstrate how truly wonderful were these greatly feared creatures that I had learned to trust and love, just as one likes to show off one's own dog that has learned a new trick or lesson.

Other snakes

I am speechless at the revelations manifested so many times in my close association with poisonous snakes. Not one have I found to be vicious or mean, but only afraid, panicky, terror-stricken, like a frightened bird, or mammal at first. The king cobra, Egyptian cobra, puff adder, Gaboon viper, Australian black snake, Australian tiger snake, the sea snake and the coral snake, as well as the fer-de-lance, the moccasin, copperhead, and thirteen species of rattlesnakes that I have tamed, have all responded to my gesture of sympathy and understanding.

Somehow they know very, very soon that I am friendly, and that I like them. They appear to listen intently when I stand quietly at their open door and talk to them in a low soothing voice. In some unknown manner my idea of sympathy is conveyed to them. Kearton* was also convinced that there was some means of silent communication among penguins in a case of sympathy, although there was no audible conversation at the time. He says, "What is the secret of communication between animals? Giraffes are known to be absolutely silent. No one has ever heard them utter a sound, yet if one giraffe is separated by a hill from the sight of the herd to which he belongs, and that herd takes alarm, the single giraffe knows instantly and gallops to join the others. I do not think we can account for this by suggesting the existence of a sound vibration to which our ears are not attuned; we seem compelled to fall back upon some wave of thought which is used by certain of the lower animals, although unknown to ourselves. . . . It may be that these birds can convey ideas of sympathy and of love merely by expression, I do not know. Indeed as the years go by and my studies of animal life continue, I am more and more impressed at the number of things of which the causes, though not the facts, are utterly unknown, either to me or anyone else. One may study and observe and know a great many facts; but when it comes to the how and the why, one finds one has little knowledge and a great deal of won derment."

———

"Island of Penguins".

Forthcoming Articles

Hendrik Willem Van Loon in **The Story of Salt** will trace the important part played by this simple commodity in the making of history with the lucidity which has earned for this writer the high popular esteem that he enjoys.

In South Africa's Wonderland by **Mary L. Jobe Akeley**, author of the recent book "Restless Jungle," will give a magnificent description of her latest visit to Kruger National Park and the story of how that greatest of game preserves has saved the wild life of South Africa from extinction.

The Death-Throes of the Aztec Nation by **George C. Vaillant** disclose a curious note of modernity in this defeat of a native people by professional European soldiers. Lively contemporary drawings by Aztec artists take the place of our modern snapshots of war scenes and add a naive vividness to the article.

The Insect Lore of the Aztecs by **C. H. Curran**, illustrated like the above-mentioned article with contemporary drawings, proves that there was a fundamental interest in natural history in America even before the white man came. The article demonstrates that the Indians were well acquainted with many of our agricultural pests, used other insects extensively as food, and had derived a remedy for the bite of so currently prominent a creature as the black widow spider.

In **What to Expect of a Volcano**, **Frank A. Perret**, founder of the Volcanological Museum at the foot of the notorious Mt. Pelee, will tell about some of the extraordinary things a volcano can do.

Amelia Earhart in a fascinating article on the subject of **Speed** will present an interpretive study of the fastest speeds attained in Nature in comparison with the mechanical achievements of Man.

SCIENCE NEWS--DEC. 1928

29. THE EARLY PATAGONIANS AND THEIR RELATION TO THE GREAT PATAGONIAN LAKES

RUDOLF HAUTHAL

Western Patagonia is a region of great glacial lakes. To the west, in the Cordilleras, the country is rugged and broken, while to the east of this section and extending to the Mesas, it is broad, flat and basinlike. For a long time it was the bed of glaciers.

Along this eastern end of the lakes from north to south ran the old migration highways of the early inhabitants. Here are found remains of both early and later camping grounds, (Aiken) some of their burials (Chenque), and apparently also places of worship.

This western highway first became passable after the glacial period, when the glaciers of the Cordilleras had advanced farther to the east. It is, therefore, of the greatest importance to search for traces of interglacial occupation in this region.

Other routes passing farther to the east near the Atlantic coast are marked by many prehistoric sites.

The pathways running east and west show the wanderings of the Guanacos.

SCIENCE NEWS--DEC. 1929

39. AXE HEAD FROM VILLAVICENCIO

J. IMBELLONI

Description of an axe of polished black basalt found more than 35 years ago in Mendoza Cordilara, probably near the town of Villavicencio. Various authors who have seen the piece recognize it as belonging to a well known Polynesian type, known as *mere,* and also as a common Peruvian type.

The number of similar morphological characters rules out the suspicion of an analogy due to chance, or of independent invention among the American Indians. The object can be classified, with all regard for ethnological method, as an example of the *mere,* the spatular form of Polynesian axe, or more exactly, the basalt axe of New Zealand, or *mere onewa.*

Therefore this piece is worthy of the attention of archaeologists, since the problems which it presents cannot lightly be dismissed. In the solution of these problems we must bear in mind the fact that this case is by no means unique and isolated. Indeed, the axe of Villavicencio gives new unity to the list of *meres* found in the two Americas.

SCIENCE NEWS--DEC. 1928

56. THE CULTURE AREAS OF SOUTH AMERICA

WILLIAM MONTGOMERY MCGOVERN

Graebner and Schmidt have endeavored to establish culture areas in South America on the basis of general principles; Kroeber and Wissler on the basis of empirical facts. In the light of recent investigations, the conclusions of both schools are open to correction. The following scheme of nineteen areas, while highly tentative, and undoubtedly containing too many subdivisions, is offered as a basis for future discussion.

I. *Areas of Primitive Culture.* Absence of agriculture and pottery; use of primitive shelters and skin clothing. Confined to the area south of the Amazon basin and mostly east of the Andes. Five subdivisions: Fuegian, Patagonian, Pampa, Chaco, Uruguay.

II. *Transitional Area.* Low culture, little or no agriculture, little or no pottery; probably once belonged to group I, and influenced by contact with higher forest tribes. Two subdivisions: Brazilian Highlands, Isolated Forest Tribes.

III. *Areas of Intermediate Culture.* Beginnings of agriculture; pottery, basketry, weaving. East coast of Brazil, Amazon and Orinoco basins. Five subdivisions: Southwest Amazon, Northwest Amazon, Sub-Andean, East Brazilian, Orinoco-Guiana.

IV. *Transitional Areas.* Probably influenced by Central America. Two subdivisions: Antillean, Colombian.

V. *Areas of high culture.* The barren highlands and western slopes of the Andes. Five subdivisions: Coastal, Ecuadorian, Peruvian, Calchaquian, Araukanian.

SCIENCE NEWS--DEC. 1928

83. THE CULTURES OF NORTHWESTERN SOUTH AMERICA AND THEIR RELATION TO CENTRAL AMERICA

MARSHALL H. SAVILLE

The South American continent was peopled from the north by two possible lines of migrations, namely, along the Pacific coast of Central America, and along the Mosquito coast of the Caribbean Sea, but the narrow Isthmus of Panama made it possible for either of these two route migrations to radiate in three streams after entering the southern continent. The line of least resistance was the Pacific coast, for it is possible for frail crafts to navigate from Central America southward almost to the Equator without entering the ocean except at rare intervals, due to the inland waterways created by the almost continuous stretch of mangrove swamps and small islets. The other southern route was through the inter-Andean valleys, while another line of migration was eastward along the northern coast of the continent.

The little explored culture areas of the northwestern Pacific coast present types of artifacts quite similar in character to those of Central America. Attention is drawn to this point in light of discoveries made by the author in his numerous archaeological expeditions to the Pacific coast of Colombia and Ecuador. Many features of the archaeology of the region show decided Mayan and Chorotegan influences. Here the cultural relations are much closer to Central America than to the widely extended Peruvian complex to the south. One culture merges into another as we proceed southward from the Isthmus of Panama. The same is true of the cultures found in the inter-Andean valleys. At present there is pressing need for archaeological investigation of the region between the bay of Panama southward to the vicinity of the island of Gorgona, for it is now terra incognita to the archaeologist.

TOBACCO plants as tall as trees are among the strange vegetation of the lower Andean country now being investigated by an expedition from the University of California, under Professor T. H. Goodspeed. One of the tremendous tobacco growths measured by Professor Goodspeed was sixty feet high. The expedition is engaged primarily in a search for wild relatives of the common cultivated tobaccos, to be used in hybridization experiments. Seeds of many other kinds of plants, however, are being collected.

--Science, Dec. 20, 1935

Argentina

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method of keeping the initial displacement small under a disturbing force be devised, but it is equally undesirable that the moment of inertia be materially increased by the introduction of the stabilizing device. This consideration alone would serve to discard all methods of stabilization making use of heavy masses, such as heavy gyroscopes or pendulums, and an effective stabilizing device would have to call into play the stabilizing surface by means of a mechanism of transmission operated by a light mass sensitive to light disturbing forces, such as a small but rapidly rotating gyroscope. Direct stabilization by a heavy pendular mass, for instance, is a purely chimerical procedure.

G. O. James
Washington University

EARLY MAN IN SOUTH AMERICA

Five years ago the Bureau of American Ethnology published a bulletin on Skeletal Remains Suggesting, or Attributed to, Early Man in North America, based on the researches of Dr. Ales Hrdlička, Curator of Physical Anthropology in the U. S. National Museum. There is to appear shortly in similar form, under the title of Early Man in South America, a résumé of the investigations of Dr. Hrdlička, in collaboration with Mr. W. H. Holmes, head curator of the Department of Anthropology in the U. S. National Museum, Mr. Bailey Willis, of the U. S. Geological Survey, and Messrs. Fred. Eugene Wright and Clarence E. Fenner, of the Geophysical Laboratory of the Carnegie Institution of Washington.

Even before the completion of his report on ancient man in North America, Dr. Hrdlička became interested in the evidence bearing on the corresponding problem in South America, and subsequently, at the suggestion of Mr. W. H. Holmes, he was sent by the secretary of the Smithsonian Institution to visit Argentina for the purpose of making a study at first hand of the available material and an investigation of the most promising regions.

In view of the important position occupied by geology in studies of this nature, Mr. Bailey Willis of the U. S. Geological Survey was chosen to accompany Dr. Hrdlička.

The chief objects of the expedition were: the examination of the skeletal remains relating to early man, in Brazil and Argentina; the study of the principal localities and deposits from which these finds came; and, if possible, the collection of osseous, archeologic and other specimens bearing on the subject of man's antiquity. It was hoped that thorough investigation on the ground would enable the explorers to form more definite conclusions concerning the finds than the literature relating to them warranted, and that possibly by means of new discoveries additional light would be thrown on the whole subject of early man in South America, especially in Argentina.

The party reached Argentina early in May, 1910. Dr. Hrdlička spent two months in that country, while Mr. Willis remained somewhat longer, nearly all of this time being given to the researches recorded in the report. The work was greatly facilitated by several of the local men of science, and the authors express warm appreciation for the valuable assistance thus rendered. During the first part of the stay in Argentina, Dr. Hrdlička devoted his time to the study of the available skeletal material attributed to ancient man, found in the various local museums, while Mr. Willis examined the various samples of baked earth, and other objects believed to have been associated with the activities of prehistoric man. Several localities in Buenos Aires where local exposures could be studied, including the drydock where the "Diprothomo" skull had been found some time before, were carefully examined. On May 24 the party set out for the coast where important specimens had been discovered, and a few days later were joined at Mar del Plata, by the late Professor Florentino Ameghino and his brother Carlos, who assisted the expedition materially, accompanying Dr. Hrdlička and Mr. Willis for more than three weeks from place to place on the coast, and to several inland points of interest.

After the completion of this general survey, Dr. Hrdlička visited the valley of the Rio Negro whence came several fossil crania many years ago, while Mr. Willis proceeded to

Arroyo Siasgo and Alvear, to study the geology of these territories and several specimens of baked earth supposed to be the product of ancient human industry. Early in July, both explorers met again in Buenos Aires, and after finishing their work in that region started for Ovejero, a locality in northwestern Argentina that has come into prominence in the last few years through its yield of human bones; they also visited Tacuman, San Juan and Mendoza. Dr. Hrdlička then proceeded to Peru while Mr. Willis returned to Buenos Aires.

The researches occupied nearly three months. Every specimen relating to ancient man that could be found was examined and every important locality was investigated. Unfortunately the general results of the inquiry are not in harmony with claims previously made by the various authors who reported the several finds. On the contrary, the conclusion was reached that to the present time the evidence is unfavorable to the hypothesis of man's great antiquity, especially as to the existence of very early predecessors of the Indian in South America; nor does it sustain the theories of the evolution of man in general, or even that of an American race alone, in the southern continent. The facts gathered attest everywhere merely the presence of the already differentiated and relatively modern American Indian. This should not be taken as a categorical denial of the existence of early man in South America, however improbable such a conclusion may now appear; but the position is maintained that the final acceptance of the evidence on this subject can not be justified until there is accumulated a mass of strictly scientific observations, requisite in kind and volume, to establish a proposition of so great importance.

The expedition secured numerous geological, paleontological and anthropological specimens, some of which throw light on the question under investigation. All these specimens have been deposited in the United States National Museum for further study and exhibition.

THE NEW ALLEGHENY OBSERVATORY

THE new Allegheny Observatory, situated in Riverview Park, Pittsburgh, was dedicated on the afternoon of Wednesday, August 28, in the presence of the members of the Astronomical and Astrophysical Society of America, and of many of the Pittsburgh friends of the institution. The principal instruments of the new observatory are a 13-inch visual refractor, a 30-inch reflector (a memorial to James Edward Keeler), and a 30-inch photographic refractor (a memorial to William Thaw and his son, William Thaw, Junior). The last of these telescopes is not quite completed, as the objective remains to be supplied. Addresses were made by Dr. John A. Brashear, chairman of the observatory committee; by Dr. Samuel Black McCormick, chancellor of the University of Pittsburgh, of which the observatory forms the astronomical department; by Dr. Frank Schlesinger, director of the Allegheny Observatory, and by Professor E. C. Pickering, director of the Harvard College Observatory. Mrs. William Reed Thompson, the daughter of William Thaw and the sister of William Thaw Junior, closed the exercises with the unveiling of the memorial tablet on the Thaw telescope.

SCIENTIFIC NOTES AND NEWS

DR. W J MCGEE, known for his contributions to geology, anthropology and the conservation of natural resources, died at Washington on September 5, aged fifty-nine years.

DR. M. PLANCK, professor of theoretical physics in the University of Berlin, has been elected permanent secretary of the mathematical and physical section of the Berlin Academy of Sciences.

DR. JEAN MASCART, of the Paris Observatory, has been appointed director of the Lyons Observatory in succession to M. André.

IT was stated in last week's issue of SCIENCE that the friends and former students of Professor Wilhelm Wundt had presented to him on his eightieth birthday a foundation for the University of Leipzig. The disposition of the foundation was left to Professor Wundt, who

Repeated sterility tests indicate the complete absence of bacteria and show that this species is capable of growth under such conditions. The zoochlorella which the ciliate ordinarily harbors has been cultured independently on agar slants. Further studies on the symbiotic relationship of these forms are in progress.

JOHN B. LOEFER

NEW YORK UNIVERSITY

SPECIAL CORRESPONDENCE

THE SCARRITT EXPEDITIONS OF THE AMERICAN MUSEUM OF NATURAL HISTORY, 1930–34

THE Scarritt Expeditions have now completed their fourth year of continuous work, and a preliminary account of progress made is here presented. Sponsored by Mr. H. S. Scarritt, of New York, the purpose of the expeditions has been to collect and to study early Tertiary fossil mammals, especially those of South America. This work continues the program of early Tertiary exploration initiated at the American Museum by Professor H. F. Osborn more than forty years ago, continuously and vigorously pursued in many parts of the world by Wortman, Granger, Matthew, Andrews, and many others. Such exploration had not previously been done by this institution in South America, and the first aim of the Scarritt Expeditions was to fill this gap in our exhibition and study series, and to cast needed light on the most neglected part of the world problem of early mammalian evolution.

The American personnel has consisted of G. G. Simpson, leader, and C. S. Williams, assistant, throughout the period now completed. In the field in Patagonia a number of local assistants have been employed at various times. Of these Justino Hernández is worthy of special mention.

The first Patagonian Expedition, 1930–31, left New York on August 8, 1930, and sailed direct to Buenos Aires by the east coast of South America. Negotiations for permits to explore were delayed by the Argentine revolution of September 6, 1930, but the expedition arrived at its principal base, Comodoro Rivadavia in southern Chubut (central Patagonia) on September 28. Until December 2 we worked in the general region south of Lake Colhué Huapí, then after a reconnaissance west of the Sierra San Bernardo spent eight days north of the lake. On December 18 a base camp was established in Cañadón Vaca, north of the Río Chico, which forms the drainage from Lakes Musters and Colhué-Huapí into the Chubut River. Here a remarkably rich deposit of the oldest of Ameghino's faunas, the so-called *Notostylops* fauna, was discovered and worked with great success for two months. From February 18 to March 22 work was continued in Cañadón Hondo, opposite Cañadón Vaca south of the Rio Chico. Thereafter work was principally stratigraphic and geological reconnaissance, with no attempt at intensive collecting. Our route took us to Cabeza Blanca, made famous by the Amherst Expedition under Loomis, then to the northern coast of the great Gulf of San Jorge at Bustamante, and southward along the whole coast-line to Puerto Deseado. On April 23 we returned to Comodoro on our way north, and after shipping most of the collections by sea to Buenos Aires drove overland to that city, which was reached on May 12.

The collection was cleared for export and Williams returned with it to New York, sailing on June 6, and there began the unpacking and preparation which occupied him for most of the following two years. Simpson remained in the Argentine until October 10, 1931, studying the great Ameghino Collection in the Museo Argentino de Ciencias Naturales[1] in Buenos Aires and the Roth Collection in the Museo de La Plata.

The end of 1931, all of 1932 and the first half of 1933 were occupied by the preparation, illustration and study of the collections of the first expedition.

The Scarritt Expedition of 1933–34 was also directed to Patagonia, with the purpose of completing the collections of the first expedition and particularly of investigating rumors of a rich fossil field in central Chubut, north of the area of most intensive previous work. Simpson and Williams sailed from New York on September 9, 1933, through the Panama Canal, and down the west coast of South America to Valparaiso, thence by rail to Santiago de Chile and by air to Buenos Aires. Preliminary negotiations occupied two weeks, and the party left Buenos Aires by motor truck on October 17. The route followed was westward through Buenos Aires Province into the Territory of La Pampa, thence south across the Río Colorado at Balsa la Japonesa, a brief visit to the Cretaceous strata of eastern Neuquén, a week working on the Cretaceous-Tertiary contact opposite (south of) Roca, and then cross-country to Trelew on the Río Chubut. Here Justino Hernández joined the party and junction was effected with Sr. Alejandro Bordas, working on behalf of the Argentine Museum of Buenos Aires, with whom we collaborated here and also later in the Colhué-Huapí region. After seventeen days near Trelew and Gaiman, the Scarritt Expedition went up the Chubut Valley to Paso de los Indios, a traverse

[1] Its present name. At that time still called the Museo Nacional de Historia Natural.

in which reports by Roth and others of mammal beds proved to be incorrect, and then southward into unmapped central Chubut. After much searching, the richest strike of the expedition was made here on December 5, 1933, in a large amphitheater known locally as the Rinconada de los Lopez. Work on this discovery continued until February 4, 1934, and after a period spent in carting and packing fossils and repairing damage done to the car by the extremely difficult traveling conditions, a short time was spent rechecking and adding to observations made by the first expedition south of Lake Colhué-Huapí. The field season was closed and the party moved to Comodoro Rivadavia on February 27. The collection was shipped by government tanker, and we proceeded to Buenos Aires by land, picking up the Trelew collection at that town and following the same route as in 1931.

After lengthy negotiations and with some difficulties which need not be detailed at this time, the second collection was also cleared and is now in New York.

In the course of the two Patagonian expeditions, the party traveled over 12,000 miles in the field and made a reconnaissance, from the view-point of its special aims, of an area of over 30,000 square miles. Detailed studies were made at twenty-five different localities. Fifty-four detailed geologic sections were measured, and many others sketched or estimated. Almost every known exposure of the early Tertiary in Patagonia was examined, including several hitherto unknown, and detailed observations on their stratigraphy and structural geology made. These stratigraphic results will considerably alter the present conception of the Cretaceous-Tertiary transition in South America. Aside from a series of rock samples from all the principal exposures and horizons and a few small miscellaneous collections, the Scarritt Collection consists of fossil vertebrates. Many fish, frogs, birds, crocodiles, turtles and snakes are included, giving a remarkably complete picture of the early Tertiary life of the region. Some of the members of these hitherto neglected or undiscovered groups prove to be of extraordinary interest and value. Mammals, the principal aim of the expeditions, are still better represented, with fine typical collections from all the known pre-Patagonian (*i.e.*, Paleocene through Oligocene) mammal-bearing formations, including the oldest, the Río Chico Formation, first recognized and defined by us, as well as the Casamayor, Musters, Deseado and Colhué-Huapí, from which, respectively, came the *Notostylus, Astraponotus, Pyrotherium* and *Colpodon* faunas of Ameghino. A number of new forms are included, but it is considered still more important that many relatively complete specimens were discovered of animals previously named on the basis of scraps and single teeth and hitherto more confusing than helpful.

Work on this great collection of data and specimens will not be completed for several years, but is being pushed as rapidly as possible. Twenty-one preliminary papers have been published, and several others are in preparation. A book, "Attending Marvels: a Patagonian Journal," gives a popular narrative of the first expedition. An extensive memoir on the stratigraphy and faunas of the Cretaceous-Tertiary transition and the Río Chico, Casamayor and Musters Formations is about one third completed. A shorter résumé and revision of the Roth Collection is completed and will be published by the Museo de La Plata. A detailed descriptive catalogue of the *Notostylops* and *Astraponotus* faunas in the Ameghino Collection is nearly completed and will be published by the Museo Argentino de Ciencias Naturales.

Aside from the completion of this research, future plans for the Scarritt Expedition include the extension of its collecting activities into other fields, and negotiations toward this end have already been started, but an announcement of definite plans would now be premature.

GEORGE GAYLORD SIMPSON

THE AMERICAN MUSEUM
OF NATURAL HISTORY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE OBSERVATION OF MITOSIS IN THE LIVING CELL IN AMOEBA PROTEUS

DURING the past few years *A. proteus* has been used in this laboratory as material for the study of cell division. It has proven excellent material, except that, due to the great number of granules, food vacuoles, etc., in the cell and the transparency of the nucleus at mitosis, direct observation of nuclear fission was impracticable. Recently the following method has been devised which permits mitosis to be quite readily followed in the living cell:

Two or three drops of hot .65 per cent. agar agar made up in saline[1] are placed on a thin microscope slide and allowed to set. Then a dividing amoeba, selected according to the criteria given by Chalkley and Daniel,[2] is placed on the agar in a small drop of culture fluid and immediatly covered with a cover glass. Fifteen mm square No. 1 is satisfactory. The cell is thus flattened but is not damaged, as the

[1] H. W. Chalkley, SCIENCE, 71: 442, 1930.
[2] H. W. Chalkley and George E. Daniel, *Physiol. Zool.*, 6: 592–619, 1933.

the practical declaration from the interpreter and others that the enemy's tribe were now so reduced and so far away as to preclude further danger. Even the mixed-blood interpreter dwelt on the evident fidelity of the history and the inherent corroboration found in the fact that the bowl had been mysteriously preserved from loss or destruction, or even the slightest injury, for more than a hundred years; and he especially called attention to the facial characteristics which were of the Sioux and not of the Muskwaki, to the eyes closed and dead, and especially to the scalped heads of the effigies at either end of the bowl.

To the Indian mystic this simple utensil is fraught with a mysterious potentiality rendering it an object of veneration, almost of worship; to the Caucasian student it is a pregnant record of primitive industry and primitive faith.

NOTES AND NEWS

LANGUAGES OF ARGENTINA. — Publications on South American Indian languages are not very numerous, and hence the *American Anthropologist* is always glad to notify its readers whenever special activity is manifested in that field. Mr Samuel A. Lafone-Quevedo is one of the busy men in that line, most of his researches having appeared in the transactions of the Argentina scientific bodies. In 1897 he published a good-sized octavo volume on the Abiponian language, spoken by the Abipón Indians, who during the course of two centuries appear at many different places, as they were wandering along the main rivers of the Gran Chaco. Lafone's publication is founded on the writings (1) of the well-known Jesuit missionary, Dobrizhoffer, who was the first to study them, and embodied his observations in a Latin report, "de Abiponibus," after the middle of the eighteenth century; (2) of the padre J. Brigniel, S. J.; (3) upon the sketches contained in A. d'Orbigny, Azara, Barcena, Techo, Lozana, Jolis, etc. After an ethnographic introduction of 59 pages, the author presents the Abipón morphology in all its details, which shows its language to be rich in grammatic forms. The noun appears to have special forms for the feminine gender, and the plurals are formed from the singulars in many different ways. The inflection of the verb is effected by pronominal prefixes. There

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are two vocabularies of the language, one Abipón-Spanish, showing the derivations of the Indian terms from their stems or bases, and another, Spanish-Abipón, by J. Brigniel. Abipón belongs to the Guaicurú or Mbaya stock of languages, and has most affinity with the Mocoví, which forms the object of a previous publication by Lafone. The present volume was first printed in the fifteenth volume of the Academia Nacional de Ciencias de Cordoba, and now appears separately printed as "*Idioma Abipón*," Buenos Aires; imprenta de Coni y hijos, 1897, 8vo, pp. 368, with map.

The same author also issued in 1897 a monograph on the Chaná Indians, with the title *Los Indios Chanases y su lengua*, con apuntes sobre los Querandies, Yarós, Boanes, Guenoas ó Minuanes, y un mapa etnico. (Reprint from "Boletin del Instituto Geografico," tomo 18; Buenos Aires, octavo.) On the accompanying map the Chanases are located south of the outlet of the Paraná river, the Querandies west and northwest of the Chaná, and the Yarós east and west of the mouth of Uruguay river, the Charruás, now extinct, having dwelt north of the Yarós. Although all the above tribes have been christianized for two centuries, the information presented as to their languages is not ample, but it proves at least that the Chanases did not speak a Guarani dialect.

The Mataco or *Mataguayo* Indians inhabit the lands west of the Paraguay river, Argentina, which extend between its two affluents, the Salado and the Pilcomayo. Therefore their seats are on both sides of the Rio Bermejo. The Abipónes and some of the Tobas live south of them, the latter being the most warlike tribe of the Chaco. North of them live the Chiriguanos, and nearer to the Pilcomayo, the Chorotis.

We have before us an interesting book of ethnographic as well as linguistic scope, entitled "*Los Indios Matácos y su lengua*, por Juan Pelleschi, ingeniero civil; con una introduccion por S. A. Lafone-Quevedo, M. A." Two maps, one of great historical interest, being extracted from Jolis' "Saggio," 1789. Pelleschi's work with Lafone's introduction was first published in the "Boletin del Instituto Geografico," tomo 17, and its present reprint, dated Buenos Aires, 1897, is a splendid octavo volume of 248 pages, the second or linguistic part (ensayo de arte) beginning on page 127. The language belongs to the Guaicurú family,

of which quite a number of dialects have been made known during the last twenty years, especially by Lafone. The Spanish-Mataco vocabulary covers pages 172 to 197, followed by its Mataco-Spanish complement, with some dialogues and stories.

A. S. GATSCHET.

GEOGRAPHICAL DISTRIBUTION OF THE MUSICAL BOW.—Prof. Otis T. Mason's article on the musical bow (*American Anthropologist*, vol. x, No. 11) induces me to add a few remarks.

Another area to the distribution of the musical bow is found in Patagonia. In August, 1896, I had the opportunity to meet at the La Plata Museum a few Indians from western central Patagonia. One of them, a youth of mixed Tehuelche and Araucanian blood, had a curious musical instrument, which hitherto I had never seen. It consisted of a very simple wooden bow, about 30 cm. long, with a single string made of a tuft of horse hair. When the Indian played upon the instrument one end of the bow was held between the teeth, the other end was grasped with the left hand. The string was struck with one of the long bones of the condor, in a manner similar to the use of a fiddle stick, and which was held with the right hand. See the accompanying figure.

PATAGONIAN PLAYING THE KOH'-LO

The tune produced, although weird and melancholy, was not unpleasing. It had a peculiarly wild charm, characteristic of the lonely plains and silent lakes of western Patagonia. This instrument is called *koh'lo* in Tehuelche, which name, it is curious to state, has a certain resemblance to the Maya name for the musical bow, *hool*, and the name *kolove*, given by the natives of Florida, in the Solomon islands, to the same instrument.

This *koh'lo* was bought from the Indian for the La Plata Museum, where it is now kept in the ethnographical section of that institution.

As to Professor Mason's opinion "that stringed musical instruments were not known to any of the aborigines of the Western Hemisphere before Columbus," I cannot accept it under the present evidence. I think, on the contrary, that the musical bow in its various forms is a primitive and therefore very old instrument, not only in America but all over the world, wherever it is found. I think the invention originated in a number of localities remote from one another, and that it did not necessarily spring from one center.

Professor Mason does not mention Hindustan as an area where the musical bow is found. I will therefore state that according to a great authority on music, Rajah Sourindro Mohun Tagore ("Short Notices of Hindu Musical Instruments," p. 77, and "Universal History of Music," p. 50), the Hindu name for the musical bow is *pináka*. It is a one-string instrument played with the tips of the fingers. The *pináka* is believed to be the father of all stringed instruments, and to have been invented by Shiva (Mahádeva, the Destroyer).

In conclusion I will remark that so far as New Guinea is concerned, the musical bow has not been found as yet in the western (Dutch) part of the island. Thus it would seem that the *pagola*, mentioned by Professor Mason, refers to eastern (German or English) New Guinea.

H. TEN KATE.

Batavia, Java, January 15, 1898.

I AM GRATEFUL to Dr ten Kate for giving us two or three new localities for the "musical bow." The Patagonian area is entirely new to me. Surely the horse-hair string of the bow would not be attributed to pre-Columbian America by the most zealous advocate of the similarity theory.

With reference to the "pináka" Mr Hawley tells me that he is not sure about its being a musical bow in the sense here in mind. Dr ten Kate has quoted correctly from the Rajah's "Short Notices," but it does not appear, from his definition, that the one-stringed instrument played with the tips of the fingers is a musical bow at all. If Dr ten Kate is sure that this "pináka" is a musical bow we should be very glad to know it, because there is no example of it in the United States National Museum nor in the Brussels Museum Catalogue.

SCIENCE NEWS--DEC. 1928

21. COMECHINGON POTTERY

G. A. Gardner

The Comechingon of the northwest of the province of Córdoba are long extinct. At four sites pottery, stone and other remains of the Comechingon were obtained at relatively shallow depths from ground and river bank deposits. Most of the pottery found was in fragments rarely possible of reconstruction though reasonable inferences may be made regarding the technique of manufacture and the shapes of the vessels.

The bases of the plain pots vary greatly in size and shape. A small number of handles of modern type were found; some pots lacking handles had perforations for a suspension cord. Sherds were found that had been rubbed and converted secondarily into spindle whorls. There are examples of pots showing impressions of three different kinds of basketry; such examples are more often bases of pots, not walls; there are many sherds showing moulding on baskets or frames of wickerwork covered with netting; all such network impressions are internal. Pottery bearing textile impressions has a wide distribution in Argentina and is found elsewhere in South and North America. Tools of varied shapes were used for incising the pots with border ornamentation; the incising resembles in design finds from other parts of Argentina. Black and red painted sherds were found. Rudimentary figurines of human figure were found, modeled in a conventional style, resembling earlier finds of other Andean Argentine sites. The probable technique of manufacture and the materials used are matters discussed in detail; the technique of the modern potters of the region is probably very much the same as that of the extinct Comechingons.

SCIENCE NEWS--DEC.1928

23. VOCABULARIO CHICHIMECA

Pablo Gonzales-Casanova

SCIENCE NEWS--DEC. 1928

24. LA ANTIGUEDAD DEL HOMBRE EN LA REGION DE SAYAPE, PROVINCIA DE SAN LUIS, REPUBLICA ARGENTINA

Hector Greslebin

Finds suggesting the presence of man during the Pampean period, contemporaneous with Megatherium.

the creation of men from feathers (pp. 84, 149, 203); the conception of Skunk as a powerful public enemy, ultimately overcome by a ruse (pp. 117–120); the existence of a gigantic bird (Yellokin) carrying off children, and, like the corresponding Nü'neyunc bird of the Shoshone, slain while drinking (p. 164); and the familiar tale of the Bear and the Fawns (pp. 103–109; 111–112).

In many of the myths, Coyote figures as one of the principal personages. Dr Merriam characterizes him, not quite felicitously, as "the Creator, a divinity of unknown origin and fabulous 'magic,' whose influence was always good"; the less favorable picture presented of him by the Wipa and Northern Mewuk is explained away as due to the influence of neighboring stocks (p. 18). To avoid misconstruction it should be noted that even in the myths of other tribes Coyote's ends are attained by trickery (p. 39, 84) and that the Middle Mewuk also emphasize his selfishness (p. 63).

Part 2, purporting to deal with "Present Day Myths," contains a mass of miscellaneous folk-lore, including beliefs concerning animals, ghosts, and fabulous beings. Of the latter, the Rock Giant (pp. 231 ff.) recalls the Shoshone cannibal that used to lie in ambush to catch women, carried them off on his back, and ate them up. The gigantic Dzō'avits of Shoshone mythology, besides picking up people and tossing them into their bags, are said to have lived in stone houses, and may thus be even more closely related to the Mewan giants.

A number of illustrations—mostly from original paintings by Mr E. W. Deming—form a pleasing feature of the book. The composition of some of them is naturally influenced by the somewhat nebulous character of the personages portrayed in the myths. The pictures of the Fawn and the Bear and of the flute-player putting the valley people to sleep bear the distinctive charm of the quaintly humorous.

ROBERT H. LOWIE.

Las Viejas Razas Argentinas: Seis Cuadros Murales: Texto explicativo. By FÉLIX F. OUTES Y CARLOS BRUCH. Buenos Aires, 1910. Pp. 114, with 6 accompanying charts.

These six excellent charts, each of which contains illustrations of the natural environment, archeological remains, material life, psychic expression, family life, social organization, etc., of the people concerned, with portraits of natives and a map showing the position and extent of their habitat, etc., are intended for educational purposes, having been approved by the National Council of Education, as giving in graphic form the necessary information concerning the primitive peoples of the Republic. The six groups of Indians considered are: (1) *Peoples of the mountain-regions of the Northeast* (the

Diaguitas principally,—Atacamas, Omaguacas, Quilmes, Acalanios, etc.; also the Tonocotés, Sanavirones and Comechingones); (2) *Peoples of the selvas of the Chaco* (Mataco-Mataguayas, Chorotes, Tobas, Chiriguanos); (3) *Peoples of the littoral of the great rivers* (Charrúas, Cainguás, etc.); (4) *Peoples of the pampas and llanuras* (Querandíes, Puelches, Araucanos); (5) *Peoples of Patagonia;* (6) *Peoples of Tierra del Fuego* (Onas, Yamanas or Yahgans). Each chart contains from 17 to 28 illustrations. The "explanatory text" is for the teacher and consists of a *résumé* of the ethnology of the peoples treated of with brief bibliographies for more detailed information. The illustrations in the charts are listed and explained by number in the text. This is something we might well copy in North America, for, if revolutions are so frequent to the South, more than one of the Latin Republics has always something to teach us in the way of scientific discoveries or their practical application from a pedagogical point of view. The authors are to be congratulated on what seems to be a good piece of work.

ALEXANDER F. CHAMBERLAIN.

Sumarios de las Conferencías y Memorias presentadas al XVII Congreso Internacional de los Americanistas, sesión de Buenos Aires 16 al 21 de mayo de 1910. Colección completa reunida por ROBERT LEHMANN-NITSCHE, Secretario General del Congreso. Buenos Aires: Imprenta y Casa editora "Juan A. Alsina," 1910.

Dr R. Lehmann-Nitsche, general secretary of the Seventh International Congress of Americanists, held at Buenos Aires on May, 1910, has gathered together and published (with separate pagination for each) in a volume of more than 100 pages, the abstracts of all papers offered at the Congress. In cases where the abstract was not composed originally in Spanish, it is given both in that and the first language. The papers are distributed as follows: paleoanthropology 3; physical anthropology 5; linguistics 10; ethnology and archeology 31 (Mexico, C. America, and Brazil 3; Peru and Bolivia 6; Calchaquí 8; Chile 9; Chaco and Alto Paraná 5); general ethnology 6; colonial history 6,—a total of 61 communications. Among the authors of papers are Ameghino, Hrdlička, Ambrosetti, Mochi, Belmar, De Charencey, Lafone Quevedo, K. von den Steinen, R. Lenz, R. Lehmann-Nitsche, Adela Breton, H. von Ihering, E. Seler, M. Schmidt, M. Uhle, C. Bruch, T. Guevara, V. Frič, L. M. Torres, J. T. Medina, H. ten Kate, etc. According to F. Belmar the Otomi is not at all a "monosyllabic" tongue; the Comte de Charencey thinks the verb in Tzotzil is more archaic than in Maya proper; S. A. Lafone Quevedo advocates the pronominal method of classifying American languages; K. von den Steinen calls attention to a Ms.

and the area is likely to remain the grazing country for which it is particularly well adapted. North of the watershed, however, shallow valleys drain to a small interior basin, within the drainage area of the Saskatchewan. Here the topography is favorable for farming, and the yield of wheat is above the average for the Prairie Plains. A further stimulus to future progress lies in the mineral deposits recently investigated by the Canadian Geological Survey. The lower Tertiary strata include considerable beds of good-quality lignite and excellent brick clays. The close association of the two materials and their occurrence in a land without timber or water-power resources should render them peculiarly valuable to the fast-growing population of the West.

Acquisition of the Danish West Indies by the United States. Ownership of the Danish West Indies passed from Denmark to the United States on January 17, when the ratifications of the treaty conveying the islands to this government were formally exchanged. The title passed with the exchange of ratifications, but actual physical possession will not take place until the purchase price of $25,000,000 is paid to Denmark.

The Danish West Indies lie immediately east of Porto Rico and consist of the islands of St. Thomas, St. John, and St. Croix (Santa Cruz) and adjacent islets. St. Thomas and St. John form part of the Virgin Islands, which represent the summits of the submerged eastern end of the Antillean mountain chain, of which Cuba, Haiti, and Porto Rico are the most conspicuous members. St. Croix lies somewhat off this structural line about 80 miles south of the other two islands, separated from them by a deep channel. The area of St. Thomas is about 33 square miles; of St. John, 21; and St. Croix, 74; the total area of the group, including the smaller islands, being given by the *Statesman's Year-Book for 1916* as 138 square miles and the population in 1911 as 27,086. The geographic significance of the islands has already been dwelt upon in the *Review* (April, 1916, Vol. 1, p. 299).

With the transfer of the islands, the question of name demands a solution. Possibly the best suggestion so far made is the one reported in press despatches from the islands under date of March 3 to call them the "American Virgin Islands." This would recognize an already existing name (dating from Columbus) and would form an equivalent to the current designation of the remaining islands, which are known as the British Virgin Islands. Besides, it would follow the precedent of the similar case of the Samoan Islands, the American members of which, since the division of the group between the United States and Germany, have been known as American Samoa.

SOUTH AMERICA

Indian Reservations in Argentina. Argentina, where European settlement more nearly resembled that of the North than in any other Spanish colony, is today the only Latin-American country confronted by an Indian problem comparable with that of the United States. The uncivilized Indians with whom the Argentine government is concerned occupy the territorial extremes of the country. They include various tribes of the Gran Chaco—best known among them the Tobas—and the Tehuelches and Onas of Santa Cruz and Tierra del Fuego.

The southern tribes present the less serious problem. Their numbers are small and diminishing. According to the Ministry of the Interior (*Memoria del Ministerio del Interior, 1912-1913*, pp. 99-120, Buenos Aires, 1913), the Tehuelches are estimated at 700 and the Onas at less than 300 (compare the table on p. 175 in the article by C. W. Furlong at the beginning of this number of the *Review*). The government has founded an *estancia* for their benefit, and others are under the protection of various missions.

These two means of caring for the native, the civil *reducción* and the religious *misión*, are also found in the north. The ancient civilizing force of the mission still flourishes with the support of government aid. In 1914, for instance, the Franciscans of Salta were granted 20,000 acres on the Rio Bermejo, with authority for exploitation of the forests and various subsidies (*Commerce Repts.*, 1914, No. 247). The first civil reservation was founded by decree of 1911 under military authority at Napalpí in the Chaco. In 1912 it was taken over by the Department of the Interior. The first fruits of the venture appear promising. The Indians have small cultivations of vegetables, corn, and cotton and work in the *quebracho* forests. The forest products are sold on the Buenos Aires market, proceeds going to the reservation funds. The government has lately decreed the formation of two more colonies for the Tobas and Pilagas (*South American Journ.*, Vol. 81, 1916, No. 12). The one, of 53,000 hectares (131,000 acres), is to be located on the banks of the Bermejo, and the other, of 85,000 hectares (210,000 acres), between the Bermejo and the Pilcomayo.

Bolivia

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A Chiriguano Canteen

The Chiriguano Indians (Tupi Stock) of Bolivia formerly had the custom of wearing on journeys a pottery canteen fitting over the wrist. The custom has been obsolete about 50 years, and specimens of the canteen are now very rare. A specimen has been given the National Museum by Senor Ignacio Arana, of Pipi, Province of Santa Cruz, Bolivia, through Dr. Edwin Kirk, who has returned lately from Bolivia. The vessel is a hollow ring, 6 inches in diameter, with an opening large enough to allow slipping on the wrist or forearm, and has the mouth with neck on the upper side. The paste is dark brown and has been washed with buff on which is painted the design.

In drinking, the canteen is brought up to the mouth by flexing the arm. The specimen is not only an unique canteen but represents extreme skill in its manufacture. Vessels of this shape, but small, are sometimes found in the ancient Pueblo ruins.

Walter Hough

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Brazil

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C

still cling about it. Seen in the largest telescopes as merely a faint star it is probable that we shall never gain any considerable knowledge of its physical constitution.

Doubtful if Life Exists

It is clear from this outline of some of the conclusions regarding physical conditions upon the planets that only two of them, Venus and Mars, can by any stretch of the imagination be regarded as possible abodes of life. Of these Venus must, so far as we can judge, remain largely a subject for speculation.

We can not see its surface or analyze its lower atmosphere, and although the absence of oxygen in its upper atmosphere and the apparently long period of rotation are unfavorable factors, it is quite impossible to state definitely that life may not have developed upon its surface.

With Mars the case against the existence of life appears much stronger. The surface of the planet can be studied directly and the atmosphere examined throughout its entire depth. It appears like a dying world with little or no oxygen and little water, subjected daily to great extremes of temperature as the sun rises and sets upon its surface.

Modern theories of the origin of the system of the planets indicate that the probability of the development of such systems among the myriads of stars is very much lower than we used to believe, and that they may be relatively few in number. Similarly, as our knowledge of the planets increases, we may be led to the conclusion that quite possibly the earth is the only planet which can at the present time support life, and so that in the universe as a whole life is a much rarer and more precious thing than we once realized.

Scientific Monthly
July 1934

A ZOOLOGIST IN THE PANTANAL OF THE UPPER PARAGUAY

By JAMES A. G. REHN

SECRETARY, ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

EVERY zoologist, and probably every botanist, critically studying any part of the Neotropical biota is confronted with numerous historic species described from "Brazil," without further exact locality. Probably no single large area of the world, except the classic "Indes orientales" of the older French workers, has been so frequently and indefinitely given as the habitat of this or that new discovery. The particularly exasperating angle of this indefiniteness is that in but a small percentage of cases can a modern student determine who originally secured the material, or even approximately where. Very frequently the type material has long since disappeared from collections. The many problems raised by modern intensive work can usually be solved in such cases by topotypic specimens, or individuals taken subsequently at the original locality, but this involves definite knowledge of the latter.

The vast extent of Brazil, reaching from 5° N to as far as 33° S, and with an area slightly larger than the United States, exclusive of Alaska or all Europe, as well as a diversity of surface conditions equaled by few other countries, is often unrealized even by otherwise well-informed people.

Virtually every student of the Neotropical biota is involved in the tantalizing indefiniteness of the early literature, as a true knowledge of the character and relationships of the life of southeastern Colombia, eastern Ecuador and Peru and northeastern Bolivia can not be secured without broad consideration of that of Amazonian Brazil, constituting as these areas do but parts of a single great cohesive biotic province, probably the richest in the world in the diversity of its life. The frequent use of "Brazil" as an original locality may thus constitute a taxonomically disconcerting factor when studying the life of any Amazonian area, even outside of the political boundaries of Brazil.

Roughly, the more outstanding biotic areas of Brazil are: (a) the relatively old mountain area to the north, separating that country from Venezuela and the Guianas; (b) humid, usually forested, Amazonia; (c) the ancient eastern and central plateaus and mountain groups which are often in large part semi-arid, as well as treeless "chapadão" over much of the western prolongation of this area in the Amazon-Paraguay divide; (d) the heavily forested belt of the coastal mountains of southeastern Brazil; (e) the relatively high and cool Paraná pine (*Araucaria*) district, in the same general region, and (f) the Paraguay River drainage of Matto Grosso, most of São Paulo and the western part of the other more southern states, which in the immediate vicinity of the Paraguay becomes a "pantanal" or seasonally flooded river plain of broad expanse. Many further subdivisions can be suggested by the student of Brazilian faunistics, but the major ones given will illustrate the fundamental diversity of the basic factors affecting animal and plant life in Brazil.

The Brazilian state of Matto Grosso lies in the south-central part of the country, in contact with Bolivia and Paraguay along its entire western boundary, and embraces within its limits a large

FIG. 1. OX-BOW CUT-OFF OF RIO PARAGUAY AT DESCALVADOS SHOWING FLOATING MATS OF "CAMALOTES," A RELATIVE OF OUR WATER-HYACINTH, AND THE TANGLED, JUNGLY CHARACTER OF RIVERINE SCREEN FOREST. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

part of the Brazilian section of the Paraguay River drainage. The head streams of a number of the chief southern tributaries of the Amazon are similarly included. The plateau which forms so much of the Amazon-Paraguay divide, with its "chapadão," is also largely in Matto Grosso. The state has an area about twice that of Texas, or to be exact 532,683 square miles. Few elevations within its borders reach as much as 3,000 feet above the sea, but what is lacking in contour diversity is made up in other physiographic contrasts. To the northward we have Amazonian forests, particularly along the stream courses, passing into the "chapadão" and open forest country of the plateau divide, succeeded southward by the vast, nearly level, low river plain, elevated but slightly above the river, and during the rainy season, which extends from October to April, and for several months thereafter, is almost entirely flooded to a depth of from a few inches to as much as six feet. This country is the "pantanal" of the Brazilian, in general consisting when dry of open grassy campo-like plains dotted with usually circular islands of tangled forest, known as caapões (pronounced capõns), and with riverine screens of similar jungle forest. Many shallow channels, called "corixos" (corichos), filled with tall sedge and papyrus, wind through the pantanal or spread out in broad sloughs. During the dry season rain may not fall for as much as three and a half months, the campo grass-land bakes dry, the grass sun-cures, the corixos largely dry up, being merely water pockets and not flowing stream courses, and many of the caapões trees become leafless. The native Borero Indian cattlemen then burn off the dry grass, and the smoke of grass fires is much in evidence. While the

temperature may at times be high, the dry season is "winter" in the pantanal, and cold south winds, the backwash of Argentine "pamperos," blow for days at a stretch; the writer has seen the temperature drop from 97° to 40° F. in ten hours.

To the systematist who has worked on the fauna of Matto Grosso the name of one field collector of the past is particularly familiar. Probably his labors placed in the hands of students as great a variety of material from several localities in South America as any one of this group of scientific pioneers. It is pleasing to know that Herbert H. Smith was an American, and that virtually all his vast Brazilian collections are housed in American institutions. In the breadth of his work and its scientific results, his Brazilian efforts place his name in that coterie of zoological trail-breakers in Brazil which includes Spix, Natterer, Bates and Wallace. Of these Natterer was the only other one who touched the state of Matto Grosso, the northern portion of which he crossed on his way to the Rio Madeira, a trail of many perils then and hardly a pleasure stroll to-day.

Smith's work in Matto Grosso was done at two localities: first, the vicinity of the old city of Corumbá on the Rio Paraguay, bordered on the north and east by low pantanal, with the elevated square-cut massif of Urucúm on the south; and second, the town of Santa Anna de Chapada, twenty or more miles northeast of Cuyabá, capital of the state, situated on the Paraguay-Amazon divide and near the characteristic "chapadão" of that area. At these two localities, but especially at Chapada, Smith and the other members of his party collected intensively for several years, and amassed really amazing collections of mammals, birds, reptiles, fishes, insects and other animals, which served as the base for classic studies by Cope, J. A. Allen, Calvert and many others. Considerable portions of these vast collections are yet unreported, while studies on other sections are being made by a number of specialists. My personal interest in Matto Grosso zoology came through work years ago on a portion of Smith's series of Orthoptera.

FIG. 2. DESCALVADOS FROM THE AIR

SHOWING THE SINUOUS COURSE OF THE RIO PARAGUAY, AND THE DIVERSIFIED COVER CONDITIONS OF THE PANTANAL. DESCALVADOS IS THE LARGEST SETTLEMENT ALONG SOME THREE HUNDRED MILES OF THE PARAGUAY BETWEEN CORUMBÁ AND SÃO LUIZ DE CAÇERES. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

FIG. 3. PANTANAL CONDITIONS IN APRIL AND MAY

THE LATTER PART OF THE WET SEASON. THE TERMITES' NESTS ARE SOMETIMES UNDERCUT BY THE WATER AND TOPPLE OVER. THE WHITE BIRDS IN THE DISTANT SLOUGH ARE LARGELY WOOD IBIS, WHICH FIND THESE AREAS PRODUCTIVE FEEDING GROUNDS. WHEN THE SAME COUNTRY WAS LARGELY DRY, WATER BIRDS WERE MUCH LESS IN EVIDENCE. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

In 1930 an expedition was organized in the United States, having as two of its objects the securing of motion pictures of the wild life, human and animal, of parts of Matto Grosso, and the examination of little-known country on the upper Rio Xingú, one of the main southern tributaries of the Amazon. It was known as the Matto Grosso Expedition, and had attached to it as anthropologist and archeologist Mr. Vincent M. Petrullo, of the University Museum of Philadelphia, and subsequently the writer was added to the expedition as zoologist, representing the Academy of Natural Sciences of Philadelphia.

Mr. Petrullo's splendid work among the little known peoples of the upper Rio Xingú (pronounced Shin-gú) has been ably described by him in the publications of the University Museum.[1]

The personnel of the Matto Grosso Expedition other than native help comprised eighteen persons, all but four of whom were American. The main party left New York in December, 1930, and

[1] *Museum Journal*, xxiii: No. 2, 91–173, pls. xix–xxiv, map, 1932.

temperature may at times be high, the dry season is "winter" in the pantanal, and cold south winds, the backwash of Argentine "pamperos," blow for days at a stretch; the writer has seen the temperature drop from 97° to 40° F. in ten hours.

To the systematist who has worked on the fauna of Matto Grosso the name of one field collector of the past is particularly familiar. Probably his labors placed in the hands of students as great a variety of material from several localities in South America as any one of this group of scientific pioneers. It is pleasing to know that Herbert H. Smith was an American, and that virtually all his vast Brazilian collections are housed in American institutions. In the breadth of his work and its scientific results, his Brazilian efforts place his name in that coterie of zoological trail-breakers in Brazil which includes Spix, Natterer, Bates and Wallace. Of these Natterer was the only other one who touched the state of Matto Grosso, the northern portion of which he crossed on his way to the Rio Madeira, a trail of many perils then and hardly a pleasure stroll to-day.

Smith's work in Matto Grosso was done at two localities: first, the vicinity of the old city of Corumbá on the Rio Paraguay, bordered on the north and east by low pantanal, with the elevated square-cut massif of Urucúm on the south; and second, the town of Santa Anna de Chapada, twenty or more miles northeast of Cuyabá, capital of the state, situated on the Paraguay-Amazon divide and near the characteristic "chapadão" of that area. At these two localities, but especially at Chapada, Smith and the other members of his party collected intensively for several years, and amassed really amazing collections of mammals, birds, reptiles, fishes, insects and other animals, which served as the base for classic studies by Cope, J. A. Allen, Calvert and many others. Considerable portions of these vast collections are yet unreported, while studies on other sections are being made by a number of specialists. My personal interest in Matto Grosso zoology came through work years ago on a portion of Smith's series of Orthoptera.

FIG. 2. DESCALVADOS FROM THE AIR

SHOWING THE SINUOUS COURSE OF THE RIO PARAGUAY, AND THE DIVERSIFIED COVER CONDITIONS OF THE PANTANAL. DESCALVADOS IS THE LARGEST SETTLEMENT ALONG SOME THREE HUNDRED MILES OF THE PARAGUAY BETWEEN CORUMBÁ AND SÃO LUIZ DE CAÇERES. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

FIG. 3. PANTANAL CONDITIONS IN APRIL AND MAY

THE LATTER PART OF THE WET SEASON. THE TERMITES' NESTS ARE SOMETIMES UNDERCUT BY THE WATER AND TOPPLE OVER. THE WHITE BIRDS IN THE DISTANT SLOUGH ARE LARGELY WOOD IBIS, WHICH FIND THESE AREAS PRODUCTIVE FEEDING GROUNDS. WHEN THE SAME COUNTRY WAS LARGELY DRY, WATER BIRDS WERE MUCH LESS IN EVIDENCE. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

In 1930 an expedition was organized in the United States, having as two of its objects the securing of motion pictures of the wild life, human and animal, of parts of Matto Grosso, and the examination of little-known country on the upper Rio Xingú, one of the main southern tributaries of the Amazon. It was known as the Matto Grosso Expedition, and had attached to it as anthropologist and archeologist Mr. Vincent M. Petrullo, of the University Museum of Philadelphia, and subsequently the writer was added to the expedition as zoologist, representing the Academy of Natural Sciences of Philadelphia.

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the last members of the expedition returned to the United States about a year later. In order to insure the best possible success in jaguar hunting, a number of hounds trained on puma in the United States were taken. The value of these dogs over the average native one for trailing was beyond question, in spite of declarations by some that imported hounds would not be as useful as native dogs. The expedition was the fortunate possessor of its own short-wave radio equipment and for about five months had the use of an amphibian plane and crew of three. This was of exceptional value in connection with the anthropological reconnaissance of the upper Rio Xingú.

In order to permit the best hunting, the stay of the expedition was planned to cover the entire dry season, when the pantanal country, where the largest type of jaguar known occurs, is driest and trailing has the best chance of success. For other groups of animals than mammals, however, with the possible exception of birds, the dry or winter season, with its very cool spells and its lack of rain was, as in the American tropics as a whole, distinctly less productive than the wet season. While the latter season is the one more trying to the field worker, it is in many ways more productive in results. For anthropological work, with its relative ease of land travel, and for aerial reconnaissance, the dry season is distinctly the better.

FIG. 4. JAGUAR AND PUMA FROM THE PANTANAL

THE LARGE MALE JAGUAR IN THE CENTER WEIGHED 290 POUNDS SOME HOURS AFTER DEATH. THE HEAVY BUILD AND POWERFUL FORELIMBS OF THE JAGUAR ARE HERE WELL CONTRASTED WITH THOSE OF THE MORE SLENDER PUMA. THE KILLING POWER OF THESE MAKES THE JAGUAR A FAR MORE SERIOUS PROBLEM TO THE CATTLEMAN. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

The base of the Matto Grosso Expedition was established at Descalvados, on the upper Rio Paraguay, the station of the Brazil Land and Cattle Company, well over two hundred and fifty miles by stream and about one hundred and seventy-five in an air-line due north of Corumbá. Descalvados is a "xarqui" (pronounced char-kee), or jerked beef, slaughtering and drying plant, and under its now deceased manager, John Gordon Ramsey, it has served in the past two decades as a base for several zoological expeditions, while the Roosevelt-Rondon Expedition visited it on the way to Tapiropoan and on over the chapadão to the descent of the Rio Roosevelt. Ramsey, a former Texas sheriff and cattleman, will always remain an unforgettable figure in the memory of those fortunate enough to have had the friendship of this courageous and generous exemplar of the best in our pioneer days. At Descalvados, under conditions entirely different from those of our West, he had developed in the Borero Indian cattlemen an unusual loyalty on account of his fairness, coupled with the application to the guilty of the justice of our old frontier. In a land where life is still held lightly, he was to the evil-doer a living personification of the maxim that the way of the transgressor is hard.

The Boreros of Descalvados represent a sadly decultured branch of that distinctive people, and have been in contact with white men for many decades, as the upper Paraguay served as part of the route of the Spanish conquistadores on the long trail from Asuncion to Lima, a hard journey to-day and an almost unbelievably arduous one in the sixteenth and seventeenth centuries. The Descalvados Boreros in the past decades have acquired a pronounced Negro admixture, adopted the white man's clothes and largely speak Portuguese, as well as their own tongue. On the Rio São Lourenco, an important eastern tributary of the upper Rio Paraguay, about two hundred miles southeast from Descalvados, one of the branches of the Borero people lives in essentially their primitive condition, having been hostile to whites until a few decades past. Through the cooperation of General Candido Mariano da Silva Rondon, the distinguished Brazilian administrator and explorer, whose interest in the welfare of the aborigines of his country is sincere and understanding, members of our expedition were permitted to visit these interesting people and secure motion pictures and sound records of their dances, songs and mode of life. Brazil, it is pleasing to know, has adopted a policy of protecting its still considerable Indian population from exploitation and pseudo-scientific "racketeering," yet providing for genuine scientific recording and preservation of anthropological and ethnological information before inevitable changing conditions make this impossible.

The scientific members of the Matto Grosso Expedition look back with pleasure on the uniformly cordial cooperation and invaluable assistance received from the Brazilian Government and all its officials with whom they came in contact. No more generous consideration has been extended to the writer in field work involving seven different Latin-

FIG. 5. RED OR MANED WOLF (*CHRYSOCYON BRACHYURUS*)

ONE OF THE MOST STRIKING AND DISTINCTIVE ANIMALS OF THE RIO PARAGUAY BASIN.

American countries. The cooperation of Brazilian scientists was equally generous and helpful, fully in keeping with the extreme cordiality which has marked Brazilian-American relations of all character.

The Rio Paraguay at Descalvados, where the writer spent the four months between May and October, occupied with hunting and zoological collecting, is a stream about two to three hundred yards wide, swift and powerful in spite of its low elevation (approximately six hundred feet) there, about two thousand miles from the sea. The river has many holes, some being over forty feet deep at low stages of the water, although toward the end of the dry season shoals often give trouble to the shallow draught river steamer, which operates between Corumbá and the town of São Luiz de Caçeres, some seventy miles upstream from Descalvados. Caçeres is an old settlement and has figured conspicuously in the past history, and the natural history, of Matto Grosso. In the past it was also called Villa Maria, and is so quoted in some of the older scientific literature.

Some fifty miles or so down stream from Descalvados the Paraguay breaks up into several channels which squirm and twist through forest-bordered pan-

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tanal. The navigation of these tortuous waterways requires skill and experience at the helm of the steamer, particularly with freight barges lashed on the sides, as is the usual custom.

A hundred or more miles above Corumbá the various channels merge into a deep powerful stream, which flows among the eastern ridges of a rugged mountainous area. This uplift, rising out of the pantanal and the ghostly lakes of Uberaba, Guiba and Mandioré, stretches far off westward into Bolivia. The July airplane panorama of these apparently ancient mountains, rising from the flooded pantanal and reaching off toward the setting sun, range beyond range, deep into Bolivia, is something not readily forgotten. Their dry slopes show many candelabra cacti (*Cereus peruvianus*), which are locally called urumbéva in Brazil, and are sometimes as tall as forty-five feet, while the hill slopes are also dotted with the pink and yellow flowers of the peúvas. We know little of these mountains or their animal life. They have never been accurately surveyed and are charted on the best Brazilian maps as just surpassing three hundred meters in elevation. With our plane we cleared the summit of one of the higher peaks by about two hundred feet and found its height was approximately four thousand feet above the level of the Rio Paraguay.

FIG. 7. TREE PORCUPINE (*COENDU*)
(PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

FIG. 6. THE LARGE OTTER OR "ARE-INHA" (*LUTRA BRASILIENSIS*)
THE FLATTENED TAIL IS EVIDENT IN THE PHOTOGRAPH. THE FRINGED LEATHER APRON OF THE BORERÓ CATTLEMAN IS SEEN ON THE FIGURE TO THE LEFT.

To return to the Paraguay at Descalvados, the surface of the river generally bears floating islands or marginal fringes of "camalotes" (*Eichhornia* and *Pontederia*), larger cousins of the water-hyacinth of our southern states. These mats of vegetation often solidly choke the channels of ox-bow cut-offs which lead back from the main stream. Quiet shallow pools or small lagoons with little or no current will shelter the glorious "rainha dos lagos" or queen of the lakes, a species closely related to the *Victoria regia* of more northern South America.

The dense fringe of jungly forest which borders the river, and for long distances forms a screen cutting off the hinterland, is made up of a large number of species of trees. This forest, being more generally inundated during high water than the drier caapões, has a different fascies. It is what might be called more truly tropical in the more frequent palms, of which the carandá palm (*Copernicia cerifera*) is the most abundant, while others are the "auassú" (*Orbignia speciosa*), the burity palm (*Mauritia*) and the great-leaved "acury" (*Attalea*), a near relative of the Central American corozo or manaca palm. Among the many other riverine forest

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The open pantanal of campo character is generally treeless, short-grassed, level, sometimes with an open grove-like tree cover of species of relatively low stature, most of which become completely leafless by the end of the dry season. The dense caapões are scattered like islands over the campo and wetter pantanal, usually elevated a few feet above the general level and thus generally dry most of the year, serving as refuges for many mammals during the flood time. They are generally circular in outline, which is particularly pronounced when the pantanal is seen from a plane, and rise quite sharply from the campo, with no definite transition area. The densely matted tree growth is made up of many kinds, most conspicuous of which are the great-leaved "lixeira" (*Curatella americana*), species of wild fig (*Ficus*), several palms, the giant jatobá (*Hymenaea*), species of *Inga,* called "ingasinho," and lianes of varied and strange type, of which the "cipó de escada" (probably a *Bauhinia*), with its ladder-like convolutions, draws prompt attention. On the few low, rocky hills near Descalvados —apparently isolated remnants of the mountains to the south already mentioned—one finds a more xerophytic vegetation, with candelabra cactus, low spiny agave-like types and the yellow and red flowered peúva trees, locally "peúva amarella" (*Tecoma ochracea*) and "peúva roxa" (*T. ipe*). These beautiful trees in the dry season are mantled with great clusters of golden yellow and purplish pink trumpet-like blooms, although then quite leafless. The wet swales of the pantanal, with their standing water, are densely grown

FIG. 8. FALSE VAMPIRE BAT (*VAMPYRUM SPECTRUM*)
THIS SPECIMEN MEASURED THIRTY INCHES ACROSS THE FULLY EXTENDED WINGS. IT KILLED AND DEVOURED A SMALLER BAT WHICH WAS PLACED IN A CAGE WITH IT. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

FIG. 9. GIANT ARMADILLO (*PRIODONTES GIGANTEUS*)
THIS SPECIMEN, THE FIRST OF THREE CAPTURED ALIVE, DIED IN TRANSIT THE NIGHT BEFORE REACHING OUR HEADQUARTERS. THE GREAT DIGGING CLAWS ARE USED BY THE PRIMITIVE BORERÓS IN ONE OF THEIR DISTINCTIVE NECK PENDANTS. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

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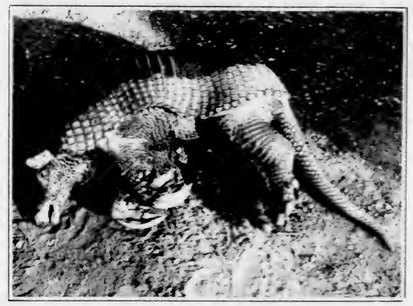

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FIG. 10. WATER BIRD LIFE ON THE PANTANAL AT THE END OF THE WET SEASON

THESE ARE MAINLY EGRETS AND WOOD IBIS. THE STANDING LARGE BIRDS WITH BLACK NECKS ARE JABIRÚS. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

up in a tall coarse sedge, which has much the same cutting propensities as Florida saw-grass. Often these areas occupy many acres, filling every slight depression in the land. In the deepest wet spots are dense eight-foot stands of papyrus. Many shallow lagoons are scattered over the pantanal, bearing great mats of "camalotes" and the "rainha dos lagos" much as embayments of the more truly riverine sections. Until the middle of the dry season the recurrent splashing of water, when crossing the corixos or shallow pools, is the regular accompaniment of pantanal travel in the saddle. This brief picture of the major features of pantanal landscape will give a background for comments on its more evident animal life.

Any mention of the great cats at once brings forward the African lion as the standard of comparison. In reality he is unique among the larger cats in a number of respects and correspondingly non-representative. None of the other large felids are as gregarious as the lion is often found to be, and they are as a whole more forest-loving. One will not find the various forms of jaguars or pumas congregating in fair-sized groups, and their siestas are by preference taken in heavy cover. Consequently, they are far less evident features of the landscape than lions are in Africa. The species or subspecies of the jaguar of the pantanal region (*Felis onca milleri*) is the largest form of this greatest of New World cats. The relationships of the various forms of jaguars have been the subject of recent investigation by Messrs. Nelson and Goldman, and the technical name here used was recently proposed by them for the pantanal subspecies.

It is a common thing, even among otherwise well-informed people, to look upon the jaguar as merely an American counterpart of the leopard. In reality they have no resemblance in habits, much less in size and build. The jaguar is a far heavier animal, with more robust limbs, lower set and thicker body, shorter, heavier tail and more powerful head and neck. No Old World cat has proportionately as heavy fore limbs as the jaguar. The Matto Grosso Expedition secured fifteen jaguars, of which the largest weighed 290 pounds, a number of hours after death. This cat in life undoubtedly would have scaled 300 pounds, or equal in weight to a small African lion. The relative size of this huge male, as compared with a fair-sized female jaguar and an average puma, is shown in Fig. 4.

When cattle are not available or not particularly sought, the pantanal jaguar preys upon tapir, deer, capybara, rheas and even the alligator-like jacarés or caimans. It has even been known to attack the great ant-eater, with fatal results to both, and doubtless will eat armadillos and various of the larger birds. Although he is an almost omnivorous feeder, tapir and capybara seem to be particularly liked. The hides of tapir often show deep claw marks where jaguars have attacked and been swept off by the tapir's headlong rush through dense brush, usually for the relative security of deep water. Nevertheless, the jaguar swims well and crosses large or swift bodies of water without difficulty. During the inundation of the wet season jacarés become more widely spread over the vast extent of the pantanal. As the flood sheet recedes these unprepossessing saurians are encountered wandering over dry land considerable distances from any water. In hunting one often finds the mummified remains of jacarés, always on their backs with the lower surface torn away, showing where some hungry jaguar stalked and slew.

The jaguar's hunting is generally done at night, while the day is usually spent in the depth of some dense caapõe. To these places the cats generally retire in the early morning, often taking a preliminary roll in a bed of grass or sedge. These beds are easily recognized. The sleeping place may at times be some distance from the "kill," if one has been made, or the cat will sleep near the kill, feeding again later. The position of the kill is generally evident from the attendant group of black vultures or "urubús." Apparently long distances are covered by jaguars in search of food, and in hunting them with hounds cold trails are sometimes followed for many miles before the spoor becomes fresh enough for the younger, "hot-trail" dogs. In one case we followed a trail for twelve miles before the cat came to bay.

Naturally cattlemen are deeply interested in the spotted killer, which takes a considerable toll of calves, cows and

FIG. 11. WOOD IBIS FLYING OVER FLOODED PANTANAL

THE SHRUB IN THE FOREGROUND IS KNOWN LOCALLY AS "CANUDO" OR "ALGODÃO DO PANTANAL" (WILD COTTON) (*Ipomoea fistulosa*) AND OCCUPIES A DEFINITE BELT IN THE DESCALVADOS PANTANAL. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

FIG. 10. WATER BIRD LIFE ON THE PANTANAL AT THE END OF THE WET SEASON

THESE ARE MAINLY EGRETS AND WOOD IBIS. THE STANDING LARGE BIRDS WITH BLACK NECKS ARE JABIRÚS. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

up in a tall coarse sedge, which has much the same cutting propensities as Florida saw-grass. Often these areas occupy many acres, filling every slight depression in the land. In the deepest wet spots are dense eight-foot stands of papyrus. Many shallow lagoons are scattered over the pantanal, bearing great mats of "camalotes" and the "rainha dos lagos" much as embayments of the more truly riverine sections. Until the middle of the dry season the recurrent splashing of water, when crossing the corixos or shallow pools, is the regular accompaniment of pantanal travel in the saddle. This brief picture of the major features of pantanal landscape will give a background for comments on its more evident animal life.

Any mention of the great cats at once brings forward the African lion as the standard of comparison. In reality he is unique among the larger cats in a number of respects and correspondingly non-representative. None of the other large felids are as gregarious as the lion is often found to be, and they are as a whole more forest-loving. One will not find the various forms of jaguars or pumas congregating in fair-sized groups, and their siestas are by preference taken in heavy cover. Consequently, they are far less evident features of the landscape than lions are in Africa. The species or subspecies of the jaguar of the pantanal region (*Felis onca milleri*) is the largest form of this greatest of New World cats. The relationships of the various forms of jaguars have been the subject of recent investigation by Messrs. Nelson and Goldman, and the technical name here used was recently proposed by them for the pantanal subspecies.

It is a common thing, even among otherwise well-informed people, to look upon the jaguar as merely an American counterpart of the leopard. In reality they have no resemblance in habits, much less in size and build. The jaguar is a far heavier animal, with more robust limbs, lower set and thicker body, shorter, heavier tail and more powerful head and neck. No Old World cat has proportionately as heavy fore limbs as the jaguar. The Matto Grosso Expedition secured fifteen jaguars, of which the largest weighed 290 pounds, a number of hours after death. This cat in life undoubtedly would have scaled 300 pounds, or equal in weight to a small African lion. The relative size of this huge male, as compared with a fair-sized female jaguar and an average puma, is shown in Fig. 4.

When cattle are not available or not particularly sought, the pantanal jaguar preys upon tapir, deer, capybara, rheas and even the alligator-like jacarés or caimans. It has even been known to attack the great ant-eater, with fatal results to both, and doubtless will eat armadillos and various of the larger birds. Although he is an almost omnivorous feeder, tapir and capybara seem to be particularly liked. The hides of tapir often show deep claw marks where jaguars have attacked and been swept off by the tapir's headlong rush through dense brush, usually for the relative security of deep water. Nevertheless, the jaguar swims well and crosses large or swift bodies of water without difficulty. During the inundation of the wet season jacarés become more widely spread over the vast extent of the pantanal. As the flood sheet recedes these unprepossessing saurians are encountered wandering over dry land considerable distances from any water. In hunting one often finds the mummified remains of jacarés, always on their backs with the lower surface torn away, showing where some hungry jaguar stalked and slew.

The jaguar's hunting is generally done at night, while the day is usually spent in the depth of some dense caapõe. To these places the cats generally retire in the early morning, often taking a preliminary roll in a bed of grass or sedge. These beds are easily recognized. The sleeping place may at times be some distance from the "kill," if one has been made, or the cat will sleep near the kill, feeding again later. The position of the kill is generally evident from the attendant group of black vultures or "urubús." Apparently long distances are covered by jaguars in search of food, and in hunting them with hounds cold trails are sometimes followed for many miles before the spoor becomes fresh enough for the younger, "hot-trail" dogs. In one case we followed a trail for twelve miles before the cat came to bay.

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FIG. 12. JAWS OF THE WOLF FISH (*RHAMPHIODON*)
ONE OF THE HIGHLY SPECIALIZED MEMBERS OF THE GREAT FAMILY CHARACINIDAE. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

steers, while much more rarely a bull, taken off guard, may be attacked. Native hunters kill a considerable number for their hides, the ranchers sometimes systematically endeavor to wipe out a particularly persistent cattle killer, yet jaguars remain in considerable numbers, unseen and usually unheard.

Pumas (*Felis concolor osgoodi*) are probably less numerous than jaguars in the pantanal, seem more partial to the drier areas and, being smaller, play a less important part. Occasionally a family group of as many as three will be encountered. Such a trio one day furnished us with two study specimens and a live individual. When closely pressed by hounds, they invariably tree, while jaguars may elect to bay on the ground, as I saw them do on two occasions. In dense growth a large jaguar at bay on the ground is a serious opponent for man or dog, as visibility may extend but a few yards, and a charging jaguar has speed all out of proportion to his build. The wise dog gives plenty of room, the careful hunter takes no chance of merely wounding the jaguar by a hasty shot. As elsewhere, pumas are less likely to attack cattle, and probably proportionately kill more deer and smaller mammals than do jaguars. The range of body color in the puma at Descalvados was from a rather dark grayish brown to a decidedly red brown tone.

The ocelot or "jaguaterica" (*Felis pardalis brasiliensis*) is probably the most persistent hunter of the smaller mammal and birds of the pantanal. It is at least partly diurnal in its hunting, as trails picked up any time in the day were fresh and soon led to this most beautiful of the smaller cats, which climbs with the greatest facility.

We did not encounter the interesting dichromatic yaguarundi cat (*Felis yagouaroundi*) or the very rare bush cat (*Felis pajeros braccatus*), which latter was described by Cope from H. H. Smith's collection and still remains one of the scarcest cats in scientific collections. Both species are known to occur in the pantanal.

The common wild dog of the Rio Paraguay campo is one of the forms of the crab-eating dog or "lobito," which is widely distributed over much of Brazil and adjacent countries to the south and southwest. It is a short-legged, dark, fox-like dog, which runs with great speed. The most unusual of the wild dogs of this portion of South America and one of the most distinctive in the world is the red or maned wolf (*Chrysocyon brachyurus*), the "lobo vermelho" of the Brazilians. This long-legged, great-eared animal suggests a gigantic, stilt-legged, short-tailed edition of the red fox. The very slender legs are black, as is the muzzle, while the general body color is a fox red. The hair along the back is rather long, suggesting a mane, and the short, poorly brushed tail gives an impression that the job of constructing a very striking animal was left unfinished. An interesting parallelism is that the marked coloration of this species and that of the large swamp

deer, living in the same territory, are very similar. However, this strange dog apparently feeds on small mammals and to some extent on wild fruit, such as the small figs of the figueiras. The experience of our party with the single one collected shows that the red wolf is a savage fighter when brought to bay, fully able to hold its own against hounds.

Two species of otter occur in the Rio Paraguay at Descalvados, the smaller (*Lutra paranensis*), called "lontra," the larger (*L. brasiliensis*), the "areinha." The latter species has been considered to be generically distinct, as it has the tail distinctly flattened, with a ridge on each side. It is one of the largest otters known, and in total length is sometimes but little short of six feet. This giant species, which ranges through much of South America to the Rio de la Plata, will sometimes be found in the Rio Paraguay in small family groups, engaged in the graceful gambols for which otters are noted.

The Procyonidae is represented by the red coati (*Nasua nasua solitaris*) and the crab-eating raccoon (*Procyon cancrivorus nigripes*). The former is more likely to be encountered in the forest areas, while the raccoon is probably more partial to the truly riverine section. Both are often tamed and make interesting pets. Dogs find the coati a formidable opponent on account of its triangular canines, which are capable of serious injury to a dog as large as a foxhound, as one of our animals learned.

A black species of howling monkey (*Allouatta caraya*) and a capuchin (*Cebus azarae*) are frequent in the forested areas, particularly along the river. The howlers, which show sex-correlated dichromatism, are often heard at night, or even on gray days. The members of the expedition made a brave effort to rear several half-grown howlers, but with the failure usually encountered in such attempts with these delicate monkeys. They were thoroughly tame and most likable and interesting pets, with their quiet, dignified manners and solemn mien, so in contrast to the rowdy capuchins in our menagerie. The howlers were never mischievous and could be allowed to roam free, returning at night, from their diurnal wanderings over paling fences and compound trees, to the comfort of their open cage. They soon made friends, and would confide their face-wrinkling worries in low but deep and throaty complaints. The slower action of the howlers was always evident when they came within reach of the chained capuchins, and a rough-and-tumble immediately developed.

The tapir (*Tapirus terrestris*) is usually considered to prefer the general neighborhood of water, and will often spend part of his time in it, while in such situations water plants form at least part of his food. In the Descalvados area, however, tapirs are some-

FIG. 13. JABIRUS (*JABIRU MYCTERIA*) ON NEST
THIS NEST WAS LOCATED IN THE RIVERINE FOREST AND A SERIES OF MOTION PICTURES OF THESE BIRDS WAS TAKEN FROM A VANTAGE POINT IN ANOTHER TREE. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

times met considerable distances from permanent water, feeding on wild fruit. An adult female secured by the expedition in the riverine forest weighed 459 pounds. While the Brazilian tapir is undoubtedly an ancient type, it has retained its specific characters unchanged over a considerable territory, as it ranges from Colombia and the Guianas to southern Brazil, Paraguay and northern Argentina. Why this species, or a near relative of it, should occur in the North American Pleistocene, and not the Central American genus *Tapirella*, where *Tapirus* does not occur, is not known, but is one of the many instances in which the differentiation of the life of Central America from that of the continents to the north and south of it is marked.

Of the deer of the pantanal the most conspicuous are the "veado" or pampas deer (*Blastocerus bezoarticus campestris*) and the "ciervo" or swamp deer (*Blastocerus dichotomus*). The first of these is distinctly smaller than our eastern Virginia deer, the buck with light, graceful antlers, and both sexes capable of speed and agility which suggests a jack rabbit, with the "sky hop" of the latter, probably for better observation. It is abundant and partial to the open grassy or park-like campo, while the "ciervo" is more truly a species of the wet pantanal. In size the latter is large and heavy bodied, equalling a large mule deer, in the male with symmetrical, well-spread antlers of the *Odocoileus* type, while the striking body color has been mentioned under the red wolf. In contrast with the active little veado, the ciervo is slow and confiding. Only when thoroughly frightened does it seem to realize that another neighborhood may be safer. In consequence, it is killed in numbers for its hide, which, however, brings but a pittance. Apparently this beautiful species will soon disappear from lands where it is to-day the largest deer and one of the most beautiful members of its family.

Both types of peccaries are encountered in the Descalvados area, the larger white-lipped species or "teschado" occurring in herds of up to a hundred or more, while the smaller collared species is usually in groups of from three to a dozen or so. The larger white-lipped peccary is always treated with caution, as it is a truculent pig, prone to charge if pressed too closely and capable of seriously injuring the hunter. Native dogs respect it and Indian hunters are careful in approaching the fortunately infrequent larger herds. The smaller collared species when pursued often takes refuge under partially uprooted trees or in similar places. When running for cover it can make surprising speed, bouncing along in a rabbit-like bolt. At bay, if pressed too closely, it can use its triangular canines with deadly effect, as many dogs have discovered. The collared peccary is more frequently seen than the white-lipped peccary, and is closely related to the forms found in Texas, New Mexico and Arizona.

FIG. 14. JACARES (*CAIMAN*) ON THE BANK OF THE RIO PARAGUAY
THIS PICTURE ALSO GIVES AN IDEA OF THE DENSITY OF THE RIVERINE FRINGE FOREST. (PHOTOGRAPH BY MATTO GROSSO EXPEDITION.)

Of the numerous rodents the capybara (*Hydrochoerus capybara*) is the most evident and interesting. This largest of the gnawing animals seldom wanders far from permanent water and is frequently found in groups, peacefully feeding or taking a sun-bath, close to the relative haven of the river or a corixo. The jaguar seems fond of capybara, while jacarés probably account for a number, but the modern demand for hides is apparently a greater factor in steadily reducing the number of these quaint and highly specialized rodents. Few of these are as truly water-loving as the capybara, which, with his truncate muzzle, small eyes and ears, deep body and pig-like bristles, seems to have been constructed of odds and ends. Agoutis (*Dasyprocta*), those slender-legged and active relatives of the guinea-pigs, were occasionally located by the dogs, but seldom seen otherwise, as they are chiefly nocturnal and exceedingly swift in their movements as they dash for safer cover. The tree porcupine (*Coendou*), the tropical American counterpart of our Canada porcupine, is infrequently encountered in the forest areas along the river, its prehensile tail added evidence that this feature has been a survival factor in many of the Neotropical mammalia.

Of the bats of the Rio Paraguay one proved of particular interest. The great false vampire (*Vampyrum spectrum*), the largest American bat, has a wing spread of over two feet. It apparently is not a common species and is also relatively rare in collections, although it has been known since before the days of Linnaeus. For many years it was considered to be a blood-sucker, and its technical name was given under this misapprehension. The true vampires belong to the distinct family Desmodontidae, and are much smaller species with highly specialized lancet-like incisor teeth. While several forms of the false vampire are now recognized, the species ranges from southern Mexico to Brazil. Nothing definite appears in the literature regarding the habits or food of this species. From my first acquaintance with museum specimens of the species its strongly developed canines always seemed out of place in a bat of frugivorous habits, such as those of many of its phyllostomatine relatives. A live specimen of this bat, which spread thirty inches across the wings, was captured by our party and placed in a cage. After it had eaten some finely cut beef, a smaller bat was placed with it. The false vampire promptly seized the smaller bat and, holding it with its wings, proceeded to devour it. Further experiments with *Vampyrum* were prevented by the death of the bat. Carnivorous habits have recently been reported as occurring in the related genus *Phyllostomus*, and the observations of our party show that at least two genera of

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American bats share such habits with the Old World genus *Megaderma*. While the work of the true vampires was occasionally evident on our horses, no specimens of them were seen or taken.

No living edentates are more interesting and peculiar than the armadillos, of which three species, representing as many genera, were found by our party. The most outstanding of these, as well as the rarest, is the giant armadillo (*Priodontes giganteus*), or "tatu canestra." This, the largest of all living armadillos, measures as much as four feet, nine inches from nose to tip of tail, of which the powerful, tapering tail occupies over twenty inches. The largest digging claws of the front limbs are more than four inches in length. Its very large tunnel-like burrows are occasionally seen, but the animal is considered rare by all the native hunters. We managed to secure three, two alive, hoping to bring them to the United States in that condition, which I believe has never been done. Unfortunately, one escaped and the other, after feeding satisfactorily for a month, refused food and starved itself to death. One of these captives gave us an excellent illustration of the speed with which this most powerful of all American digging animals can bury itself out of sight. When but a few feet in its tunnel, the efforts of several men pulling on its tail were not sufficient to dislodge it or even seriously slow up its excavation work. This glyptodont-like genus is known to range from north central Argentina northward across eastern Bolivia and adjacent south central Brazil. Any promising young mammalogist, who wishes a unique experience in the preparation of material, should skin and skeletonize a giant armadillo. He will learn that for the size it can supply an unbelievable amount of hard work and tax his resourcefulness to an unequalled degree. The primitive Borero Indians prize the largest digging claws, which are used in pairs to make one of their most distinctive types of neck pendants.

Two ant-eaters are regularly encountered in the Descalvados area, the great ant-eater or ant-bear (*Myrmecophaga tridactyla*), the tamandua bandeira of the Brazilians, and the smaller tamandua ant-eater (*Tamandua chapadensis*). The former, with its strange build, very elongate head and broad brush-like tail, is not rare in the pantanal, living largely on termites, the hills of which it is able to open with its powerful fore claws. When frightened it lopes away with a peculiar rocking-horse gait, its great bushy tail going high with each drop of the fore quarters. Jaguars occasionally kill the great ant-eater, but the latter can defend itself most valiantly. Settling back on its hind quarters it delivers slashing blows with its fore limbs, which are armed with four-inch claws that cut like scythes. Probably only a jaguar hard pressed by hunger takes such risks, as these combats have been known to end fatally for the cat as well as the ant-eater.

The smaller tamandua is arboreal, its prehensile tail making it quite at home in that habitat. It is not uncommon and was brought to us alive by natives a number of times. One half-grown one became a most likable pet, with complete freedom of all our quarters, but radio battery acid proved too much for its innocently inquiring tongue. It fed most contentedly on the termites in chunks of their structures which were demolished for the purpose. Assiduously the pieces were gone over, and few termites escaped attention. This peaceful animal was never known to make a sound, until one day a captive young crab-eating dog nipped it; then our placid pet reared on its haunches, and with several lightning-like slashes drove the dog away, while in a high-pitched squealing voice it bid defiance to its assailant.

One of my unforgettable memories is

of the water birds on the Rio Paraguay at the end of the wet season. For variety and abundance they far surpassed anything I had previously experienced. Later in the dry season, when the completion of other work enabled me to turn my attention more to water birds, the abundance and variety was by no means so great. The local explanation is that the birds follow the receding water down the Paraguay. How true this is I do not know, but the abundance of early June was greatly depleted by early September.

The vast flocks were made up of many species, chief of which were wood ibis (*Mycteria americana*), egrets, group of roseate spoonbills (*Ajaja ajaja*), crying ibis (*Molydophanes caerulescens*), and most conspicuous and noteworthy of all the jabirú (*Jabiru mycteria*) or "tuyuyu" of the Boreros. This, the largest of American storks, stands as much as four feet high, snow white with the bare skin of the neck and head black, except for a collar of red or pink at its base, this color covering a gular pouch capable of marked inflation, particularly on the sides of the neck. The crown of the head bears a thin tuft of white hair-like feathers, which at close quarters adds to the ancient and dignified appearance of the bird. The bill of the jabirú curves up slightly in the end half. The jabirú nests in tall trees in the caapões or in an occasionally isolated one in the campo, constructing a huge structure, which is apparently added to year after year. Occasionally the community nesting "catita" parrots (*Myiopsitta monachus cotorra*) use the lower part of the jabirú's nest for one of their colonies. The young jabirú number two, and were still in the nest in August, solicitously tended by their devoted parents, although they were of quite fair size.

Wood ibis (*Mycteria americana*) were in very great numbers, as late as September often feeding by dozens in wet spots in the pantanal. The great cocoi heron (*Ardea cocoi*) frequented the riverine areas, along with the boat-billed heron (*Cochlearius cochlearius*), the night heron (*Nycticorax n. naevius*) and the most beautiful of the Paraguay herons—*Pilherodius*. Along the waterways anhingas or snake birds (*Anhinga anhinga*) were abundant, and the Brazilian cormorant (*Phalacrocorax olivaceus*) or "vigua" quite general, while the strange jacanas were much in evidence, running over river vegetation. The wild Muscovy duck (*Cairina moschata*) and several species of tree duck (*Dendrocygna*) were in numbers, the former particularly on the wet pantanal, flying up into trees when disturbed, but apparently passing much of their time in such situations. As the river sandbars became exposed a wealth of sandpipers, plovers and many skimmers (*Rhynchops nigra intercedens*) tenanted them temporarily.

On the dry pantanal the rhea or American ostrich was clearly the most interesting bird. It was usually met in small groups, generally in open treeless campo. It is to be hoped that the fate which in Argentina has overtaken this interesting genus of ratite birds will be prevented in southern Brazil, and that there it may be protected from the devastation of the feather-duster trade. Perhaps vacuum cleaners may be the rhea's salvation. Rheas can hardly be considered attractive from the standpoint of food, as their natural muskiness alone is unpleasant in the extreme. Their eggs are used as food by the natives and make a most acceptable omelet. The anomalous seriama (*Cariama cristata*), the sole representative of a family of debated relationship, is another most interesting campo inhabitant, as much an enemy of snakes as is the African secretary bird, which the seriama so much resembles. The turkey-sized screamer (*Anhima cristata*) perches on the top of some conspicuous tree and vocally advertises its presence.

The most brilliant of the conspicuous

land birds of the pantanal is the great hyacinthine macaw (*Anodorhynchus hyacinthinus*), the largest of American parrots, which, always in pairs and in groups of up to sixteen, raucously defies you and warns the entire district of your presence in their territory, as flying quite low, within gun shot, they circle above you again and again, until apparently tired they retire to some tall caapõe tree to talk it over among themselves.

Several other species of macaws, three of Amazon-type parrots and four species of parrakeets of several genera are regular in the pantanal, and all but one were seen by our party. Toucans of two genera (*Rhamphastos* and *Pteroglossus*), woodhewers of many types and ant thrushes of varied character, the glorious-voiced oven birds (*Furnarius*), and tanagers, finches, orioles and flycatchers of many genera made up a large part of the marked variety of the smaller land birds. A robin-like *Planesticus* suggested home, while at the next turn a gorgeous manakin dispelled that allusion. Contingas, however, were not seen, while swallows were not numerous in species. Woodpeckers were infrequent, but three species of kingfishers were abundant on the river, and a beautiful jacamar (*Galbula rufo-viridis*), very tame and confiding, was common in the open dry scrub forest.

The curassows were represented by quite a few species, one a great turkey-like *Crax,* while but two species of owl were seen, one a *Bubo,* the other a tiny *Glaucidium.* Of the hawks and the caracaras the variety was large and ranged from a tiny falcon smaller than a sparrow hawk to great brick-red hawks, but little smaller than some eagles. The everglade kite (*Rostrhamus sociabilis*), with its snail-eating habits, found much to feed upon in the literally millions of stranded *Pomacea* snails, left on every hand by the retreating flood waters.

About our headquarters the beautiful red-headed Brazilian cardinals of the genus *Paroaria* were abundant and trustful, while barn owls (*Tyto alba tuidara*) nested in the roof of the church at Descalvados.

The most abundant and evident large animal along the Rio Paraguay is the jacaré or caiman of that district (*Caiman* species). While not reaching the great dimensions of some of the species of Old World crocodilians, it makes up in numbers for its mediocrity in size. While the average adult is probably about eight to nine feet in length, they occasionally reach as much as twelve feet or even more. Doubtless jacarés are exceedingly destructive to all wild life as a whole, and are also responsible for the death of many cattle, particularly calves. Humans are not immune to their attacks, although they are not as generally dangerous to man as the African crocodile. Many men, however, have been maimed by them, and one of our party was seriously bitten in the foot by a jacaré while tramping in flooded pantanal. With them and piranhas as abundant as they are, swimming in the Rio Paraguay, or for that matter venturing in the larger areas of water any more than necessary, is not without perils.

Jacarés like crocodiles use sand-bars as sunning places, but also pull out on narrow bank shelves in the river forest. Often as many as a dozen will be found distributed along a short piece of river bank, but a foot or two above the water level. They are then quite sluggish and frequently several shots can be fired before the last survivors slide into the water. When in repose on land the head is kept raised, while in walking they raise themselves upon their legs and carry the body clear. Above in discussing the jaguar I have mentioned the extent to which jacarés spread over the pantanal when the latter is flooded. The Boreros eat the tail of the jacaré after removing several long tendonous muscles.

Almost no lizards were seen at Descalvados during the dry season, and no chelonians except the great Brazilian land tortoise (*Testudo tabulata*), which was often encountered when hunting. The Boreros insist there are two species, one of which is very rare and much larger than the other. These animals, like armadillos, are regularly eaten by them. Armadillos are roasted whole, usually on a spit across the fire.

Of snakes the one most frequently brought to our attention was the rattlesnake or "cascavel" (*Crotalus durissus*). This is not at all scarce in the drier campo areas. The *Lachesis* type of pit vipers are also well represented, apparently by several species. We saw but few of these, possibly on account of the season. One of our hounds was bitten in the jowl by a poisonous snake, which was not seen. The two oozing punctures were soon surrounded by a rapidly augmented swelling, while the animal whined in pain. A prompt application of polyvalent antivenin had marked effect in ten hours, and the dog fully recovered in several days.

Few non-venomous snakes were seen except the anaconda, which locally is known as the sucuré. In size it does not reach Amazonian dimensions, the average individuals being not over ten feet in length. One large all black snake, possibly the famous mussurama, the foe of Brazilian venomous snakes, at Santa Rosa, not far from Descalvados, made an entirely unprovoked attack, coming for a considerable distance directly toward me, carrying the anterior part of the body well elevated. Just as I felt it would be necessary to stop the attack with a load of shot, the snake suddenly swerved, and sweeping about me disappeared in a hole in the ground. Two Indian boys who were with me fled, but returned to help locate the attacker, who, however, declined to leave his retreat. This snake was not less than eight feet in length. It reminded one, of course on a far larger scale, of the way our black snake will occasionally attack, but the Santa Rosa charge was without incentive, and my first knowledge of the snake's presence was its swift advance.

The fishes of the Rio Paraguay have furnished the subject for a number of the classical papers of Cope, Eigenmann and others. Needless to say, this fauna is tremendously rich in species, particularly of the highly specialized Characinidae. Even with all the previous work which had been done, the modest series of fishes taken by the expedition added four new species to science. Many of the fishes of the Rio Paraguay would be extolled in the highest terms for their angling qualities if they were better known and their habitat more readily accessible. Members of our party who were proficient with rod and reel had many experiences which would have made a salmon fisherman envious. The beautiful "dorado" (*Brycon hilari*), which is colored somewhat like, but far more brilliantly than, our striped bass, and fights with all the ability of a salmon, is common and runs from about six to nearly twenty pounds. The deep-bodied pacus (*Myleus*), which run to even greater weight, are just as powerful. The strange wolf fish (*Rhaphiodon typicus*), like the others a highly specialized characinid, possesses a pair of needle-like teeth at the end of the lower jaw, which lay over the face when the jaws are closed. In appearance and actions the wolf fish makes one think of a barracuda. The jaws of these fishes treat the angler's tackle much as a steel trap might, but if the leader and hook hold the fisherman will have all the thrills he can ask. The omnipresent piranhas (*Serrosalmus, Pygocentrus* and *Pygopristis*) are the fish menace to vertebrate life in Neotropical rivers. Much

has been written about them, probably many overstatements made, but they are undoubtedly the most justly feared existing fresh-water fishes. Whether their attacks are diverted or encouraged by agitation of the water remains unsettled, but there can be no question that a wounded or disabled man or beast falling into their home waters is frequently attacked and, unless able to get out of their reach, soon devoured or at least seriously injured. The taste of blood in the water seems to be the chief cause of their prompt concentration at any given point. I often have set afloat the skinned bodies of birds, and generally in an incredibly short time the piranhas were at them. In the ferocity of their attack they would sometimes leap clear of the water. In but a few minutes bones alone remained, when the bodies were moored so that results could be noted.

Piranhas do not readily take a hook, but when they do their triangular interlocking teeth play havoc with tackle. We trapped many in a cage trap, and used them for food. Captive young jaguars were frequently fed on them, and it is probable that, under certain circumstances, they may constitute part of the varied natural food of these cats. Piranhas must be stunned or killed by a blow before being handled. They are very tenacious of life, and if laid in the bottom of a canoe, without this precaution, they are able to vault their bodies into the air, and snapping teeth are thus a constant menace as long as life lasts.

The two most striking fresh-water mollusks of the Paraguay at Descalvados are *Pomacea insularum* and *Marisa planogyra,* the latter described from the expedition's collections. The dead shells of both literally pave great areas of the pantanal, particularly those sections which are more deeply inundated during the flood period. I have seen few living ones of either, stranded or in very shallow water, and it is difficult to secure living material, at least in the dry season. Most of the dead *Pomacea* have been punctured, apparently by the Everglade kite, which feeds upon mollusks. Few more remarkable resemblances exist than that between the adult *Marisa planogyra* and our well-known fresh-water genus *Planorbis.* I presumed I was collecting a very large *Planorbis,* which genus I know in our home streams. My colleague, Dr. Pilsbry, soon pointed out my error and showed me the ampullaroid type young. The flattened spirals of the adults may be nearly an inch and a half across. The bivalve mollusks were represented by the genera *Anodontites* and *Diplodon,* while doubtless numerous others would have been secured if time had permitted extensive search. Few land mollusks were noticed in the dry season, except for the large pink-lipped, white *Strophocheilus intertextus,* which was found dead in dense dry caapões. Living adults were probably safely hidden from the withering effect of many weeks of sizzling drought.

The dry season insect life was very scanty, being but an infinitesimal fraction of that I have found elsewhere in the American tropical and subtropics in the wet season. That the pantanal is rich in the wet season we know from the work of H. H. Smith at Corumbá. In the dry season there was not a single night producing the rich and varied flights of moths so frequently seen during the rains, but an occasional lone individual coming to our electric lights, the only illumination for many miles. Diurnal insects were inconspicuous and few, except for a limited number of small beetles and bugs. Wasps and bees were rare, except for colonies of the interesting black stingless bees *Trigona.*

Ants and termites were, of course, as generally evident as elsewhere in the tropics. The structures of the termites dotted many parts of the pantanal, particularly the campo areas. In height they reached as much as twelve feet, and in such cases were always slenderly conical and never domed.

The stridulating Orthoptera were little evident, although certain Acrididae were to be found in the dry campo, in open woods and the tall cover of wet pantanal—in the latter of the elongate type adopted for clinging close to a stem. A rough and shagreenous grasshopper of the genus *Ommexecha* preferred the dry ground of roads and trails, while equally protectively colored *Diedronotus* hopped among the fallen twigs of bush cover. The strange proscopid grasshopper *Cephalocoema,* which in its elongate form superficially suggests the walking-stick phasmids, was occasionally encountered in low bush, which also is the preferred habitat of many of its near relatives.

We have heard of the plan for keeping parts of Africa as permanent preserves to show the future what Africa was when white men came—how truly it is the Pleistocene carried on into our day. There is no fauna, except possibly that of Australia, more unique and distinctive than that of the Neotropical region. There are few places where this strange and ancient life remains as little disturbed and as readily seen as on the pantanal of the upper Paraguay. It is perhaps hoping too much that efforts may be made to conserve some of this wild land before the interesting mammals and birds, as well as other forms of the more conspicuous life, have been reduced to the vanishing point.

In the pantanal of the Paraguay we truly have the Neotropical vertebrate fauna more fully and abundantly represented, and by its most distinctive types, than in any single area of the lowland forests of South America.

SCIENCE NEWS--DEC. 1928

91. THE EXPEDITION OF G. J. LANGSDORFF TO BRAZIL IN 1821-1829

J. D. STRELNIKOV

G. J. Langsdorff's expedition, arranged by the Academy of Sciences of Russia, was planned on a large scale and carried out a prodigious amount of work, but it has remained hitherto practically unknown. G. J. Langsdorff, the leader of the expedition, became mentally deranged, owing to an illness contracted during the journey. His notes and diaries went astray.

Recently, however, there were found in the archives of the Academy of Sciences some of Langsdorff's letters and a few reports referring to his life in Brazil (1812-1820), to the studies of his own and also to the work of the expedition (1821-1829).

In the same archives were found also more than three hundred sketches and drawings made by the three painters (H. Florance, Rugendas, A. Taunay) of the expedition, many of them colored. These remarkable drawings, richly illustrating the ethnographical and the zoological conditions of Brazil of that time, remain unpublished.

Ethnographical, zoological, and botanical collections (the last of 100,000 specimens) that reached their destination in Petersburg, were so rich, that for quite a long time they formed a principal part of the tropical exhibits in the Museums at the Academy, and in the herbarium of the Botanical Gardens.

Letters, reports, labels of specimens of the collections, and sketches and drawings made it possible to trace the progress of work carried out by the expedition and to ascertain the fate of all its members.

The Academy of Russia is about to publish in the next year a detailed account of the expedition and of its scientific results.

Some of the drawings are represented in lantern slides.

SCIENCE NEWS--DEC. 1928

92. MUSIC AND DANCE OF THE INDIAN TRIBES KAÁ-IHWUÁ (GUARANI), CAINGANG AND BOTOKUDO

J. D. STRELNIKOV

Dance, song, and music represent an expression of every kind of emotion of primitive people. The life of primitive man is altogether kinetic—he lives in moving. His pursuits of life are literally "pursuits." Therefore their usual expression is dance and music, which among the most primitive tribes consists merely of various kinds of noise, performed either with instruments (musical) or with a human voice (song).

We have observed dances connected with hunting pursuits, burials, incantations for rain, etc. They were accompanied with music and song. Musical instruments were of the simplest kind: small calabash rattles, hollow bamboo sticks, bamboo pipes etc.

The song was usually a repetition of a single word, such as *iponá*—"all right," *Jhwaimbé*—name of the dead man, *Okia*—the name of a large bird—Palamedea cornuta. More songs were like this: "The jaguar is angry", "The churn-owl is perched looking upward", etc.

In dances connected with burials and other ceremonials the shaman of the village was usually leading. The shamans are usually male.

The assisting spirits of the shaman are mostly birds, such as the toucan and various kinds of parrots. The rattle is adorned with tufts of feathers of the corresponding bird species.

The christianized Kaa-ihwuá in São Paulo perform ceremonials of a similar kind in a special temple or church with an altar and images of saints. Men and women take part in the dance. The shaman is leading, having in each hand a maraka rattle.

Among the Botokudos of the village Pancas (São Paulo), H. Maniser observed that the leaders of ceremonial dances were the chief of the village and his brother. Bows and fire-brands full of smoke and sparks served for wands. The people also held bows, snapping rhythmically the string. The dances were chiefly connected with hunting.

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87. A MOSQUITO NET OF THE INDIANS GUATÓS (BRAZIL)

SIMOENS DA SILVA

Among the various Indian Tribes of the State of Matto Grosso, the second largest state of Brazil, is one named Guatós, living in more or less primitive state of civilization on the banks of the rivers Cuyabá, São Lourenço, Jaurú and Cabaçal.

These Indians manufacture strong mosquito nets very seldom obtainable by civilized men. These nets are very rare in the great museums of the world. The specimen in the Museum Simoens da Silva in Rio de Janeiro is made out with fibres of a palm tree named *tucum*. It is not woven but fashioned of braided threads resulting in the fabric illustrated on the Plates No. I and II.

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88. A LARGE CRESCENT-SHAPED AX OF THE BRAZILIAN INDIANS

SIMOENS DA SILVA

The crescent-shaped ax in the Museum Simoens da Silva is the largest known stone implement of this type. It was found on the right bank of the Tocantins River, State of Pará, in the north of Brazil. It was used by the Gaviœs (Hawks) Indians, descendants from the old Brazilian Indian Nation (Gê.)

They used this stone implement, which was made in prehistoric times, adapting to it a handle of very strong wood, called in the Indian Language *muirapinima*. The handle was tightly attached to the head by means of palm-tree fibres, called *tucum*. One end of the handle exhibits a very interesting ornamental straw-work in colour, black and white in a checkered design.

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129. THE CAINGANG OF SÃO PAULO

H. H. MANISER

The late H. H. Maniser was a member of the Russian expedition to South America in the years 1914-1915. The other members of that expedition were Th. A. Fielstrup, S. W. Geiman, J. D. Strelnikov, and N. P. Tanassitchuk.

The expedition went through Argentina, Paraguay, Brazil and Bolivia and worked chiefly in the Matto Grosso and in Paraguay. After the war broke out the members of the expedition left their work unfinished and went back to Russia. H. H. Maniser died on the western front from typhoid fever. He left several works illustrated with his own drawings and fully prepared for printing. The one referring to the Caingang is being presented here.

The material for this was collected in the Caingang villages; "Villa Caingang" and "Villa Sophia."

The paper contains a description of the natural conditions of the country and in particular of the two stations for Indian inspection, arranged by the State of São Paulo. A detailed account of the procuring and preparation of food, hunting, agriculture, pottery, ornaments and clothing, of the social and religious conditions, marriage and burial, special ceremonials for the commemoration of the dead,—the feast of *kiki,*—is given.

Most interesting are the descriptions of suicide, which is often committed by the Caingang (male and female), mostly on account of family dissension. Suicide is connected with the idea of inflicting vengeance of the dead on the offending member of the family.

The dead are carried away on the back of a distant relative to the special burial grounds, arranged in the middle of the forest.

In the morning the whole property of the deceased, including the lodge, is destroyed; the corn in the field is also cut down and burnt. The village is abandoned by all the inhabitants.

The feast of the *kiki* is likewise organized by distant relatives. For this a special hut is constructed in a part of the village. For three days the women prepare the liquors, made of honey, with fermenting corn, with some flowers of the palm bocayuva. Meanwhile the participants of the ceremonial walk around the hut singing funeral songs. A party of men go to the grave, setting everything around the grave in good order and then offer a libation for the dead.

At the same time most of the people remaining near the hut drink until they are intoxicated.

The faces of the people are painted black. The patterns are given in lantern slides.

SCIENCE NEWS--DEC. 1928

78. THE EXPLORATION AND MAPPING OF BRAZILIAN GUAYANA WITH HYDROPLANE AND WIRELESS AND THE RELATION OF THE TWO LATTER TO GEOGRAPHICAL AND EXPLORATORY SURVEY IN GENERAL

A. Hamilton Rice

Outline of work carried on during the past quarter of a century in the Colombian Caqueta and the Guayana of Venezuela and Brazil. Objects of the seventh expedition. The Rio Branco-Uraricuera-Parima of Brazilian Guayana. The geology and hydrography of the region. Black and white water rivers. The Rio Negro. Method of mapping river, traverse by compass, time and distance scale augmented by aerial reconnaissances, photographs and sketches. Comparison of the so-called official map and the map made up from the combined data of ground traverses and aerial photography. The necessary supplements to modern geographical exploration, the aeroplane and wireless. The seaplane and the short wave low power wireless apparatus of the expedition. The Amazon forest, the campo or range lands and the Guayana forests. The natives, their place in the economic and commercial development of Brazil. The São Gabriel experiment. Elementary education vs. temporal peonage, the old struggle of reducciones and encommendas. The campo, river and forest Indians of the Uraricuera. The Parima River and the Parima Serra.

IN AMAZONIA: THE OCAINAS INDIANS OF THE IGARA-PARANA, BRAZIL, EXECUTING THE TRIBAL DANCE. THE WOMEN ARE JUST COMPLETING THEIR PORTION OF THE CEREMONY.

THE WILDS OF AMAZONIA

By C. W. DOMVILLE-FIFE

Author of "Submarines and Sea Power," "States of South America," "Wild Tribes of the Amazons," etc., etc.

THERE can be few more beautiful sights than the Amazon forest when seen at close quarters. From the broad rivers, — the Amazon proper, the Tapajos, Madeira, or Ucayali, — it appears to be an almost continuous and very monotonous wall of misty green, just a chaos of vegetation. Closer acquaintance, however, reveals its exquisite beauty. Spreading out over the river, with its reflection of a million leaves, are palms of innumerable varieties: the tall mirity, with large fan-shaped fronds and clusters of scarlet fruit, often 50 feet high; the delicate carana, with spines on its trunk and foliage; the jupati, with its masses of feathery blossom dimming even the daylight of the river clearing, and the climbing jacitara clinging, lichen-like, to the trunk of almost every leviathan of the forest. Massive silver-white trunks rise up against the wall of dark leaves, and high above the amazing sea of foliage spread out their branches like gigantic umbrellas, both green and red. The *assai*, reed-like and moving in the faintest breeze, stands side by side with the tucuma, solid and aged. Ropes of green fibre hang in loops from the tallest branches; orchids, common, cattleya, and varied, peep from their moist, exuberant beds, and when the sun sinks in the Occident the forest changes from green and gold to red, russet, purple and then to ghostly black.

All who have lived or travelled in these tropical forests will agree with the statement that an army of explorers ten times as numerous as those who have in the past visited the Amazon could not have laid bare all the secrets of this semi-dark, barbarous, impenetrable and incomprehensibly vast region of Equatorial forest, river and swamp. No sooner are the waterways left and the jungle entered, no matter in what latitude or longitude, than one stands on the threshold of the unknown, the "edge of beyond." So it is after months of wandering, hacking through primeval growth, where vision is limited to the green walls and roof: there is ever the unknown and unattainable beyond. Far fewer and less systematic efforts have been made to subdue this immense wilderness of tropic forest than has been the case in East, West or Central Africa. In the dead heart of South America, between the fifth parallel north and the twenty-fifth south of the Equator there are over 2,000,000 square miles of unknown or little-known territory, with hundreds of unheard-of native tribes.

Absence of international competition has caused a lack of initiative which has left this vast area of the world's surface uncared for and unknown. This Montana Grande begins at timber line on the continental slope of the Andes, and figuratively, extends for about 3000 miles across the wide northern

In Amazonia: The Ocainas Indians of the Igara-Parana, Brazil, executing the tribal dance. The women are just completing their portion of the ceremony.

The Wilds Of Amazonia

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or tropical portion of the lost continent to the narrow civilized littoral of Brazil, and from the great Guiana forests to El Gran Chaco, a distance, north and south, of 2200 miles. Here and there in this vast lone land is a tiny oasis of civilization amid a sea of barbarism. Here and there is the blazed trail of the isolated pioneer who emerges racked with fever, and dazed by the dim light of the forest; but still a terra incognita and the home of unknown races of mankind.

The explorers, traders and half-caste rubber gatherers, who have penetrated into the forests from the maze of navigable rivers, have all discovered something of material value to the outside world; gold, silver, precious stones, timbers, new medicinal essences and drugs, unique curios, relics of extinct races and beasts, open campos and cattle-breeding prairies, gums and varnishes, inland seas, queer natives and a soil of wonderful fertility, with vegetation reaching its maximum point. It can be easily understood, therefore, why the nations within whose vaguely defined frontiers this huge territory is nominally situated have, from time to time, offered to the explorers and nation-makers of the civilized world, generous assistance and wonderful inducements for its exploration and development.

The immense unexploited area of forest, campos, river and swamp known by the comprehensive name of Amazonia, although owned very largely by Brazil (over 1,000,000 square miles unmapped and all but unknown) also extend far beyond the frontiers of that nation into the states of Paraguay, Bolivia, Peru, Ecuador, Colombia, and Venezuela, to say nothing of the three Guianas, adding another million square miles of unknown, and making what has been aptly termed the "Lost Continent," a region as large as the whole of Europe. Having spent much time travelling on the highways and in the byways of South and Central America in quest of information for the insatiable Anglo-Saxon Press of two continents, I was approached regarding a reconnaissance in Amazonia. This, then, was the reason for my entry into this field of exploration.

There are three zones in Amazonia: the known, the little known and the unknown. The first includes the lands, albeit tropical forests bordering the delta and Lower Amazon, with its numerous islands, which have the city of Para as their emporium; also the very numerous plantations and small settlements on both banks of the main stream, and at certain points on its principal tributaries. Within the category of the little-known are those more or less accessible forests visited by the gatherers of wild rubber. These are principally confined to strips of jungle bordering reaches of river navigable by launches and shallow-draught steamers. To gain access to the unexplored the traveller has to pass through the two foregoing belts of territory, often a distance of several hundred miles, and enter the vast areas of forest situated around the head-waters of almost every Amazonian river, or between these thread-like fluvial highways.

No arbitrary line can possibly be drawn that would adequately indicate the limit reached by the outposts of civilization, which seldom extend more than a few miles beyond the immediate vicinity of the numerous small settlements. Although this applies to the primeval forest, with its fevers, beasts, birds, reptiles, insects, and swamps, it does not always apply to the native tribes. For the really savage specimens many of whom have scarcely reached the Stone Age, one has to seek far afield in this vast land. Those Indian families who dwell on the banks of the rivers navigated by launches usually exhibit certain signs of civilization. On the upper reaches of the remote Amazons, however, and in the heart of the great semi-dark forests many savage tribes live in complete

(Continued on page 470)

THIS FRAIL CRAFT IS A HOLLOW TREE TRUNK WITH OPEN ENDS. A FAMILY OF CARIPUNA INDIANS IS STARTING A JOURNEY ON THE MUTUM-PANARA.

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N. Y. EV. MAIL

1 April 1916

mmediately embarked on another
rip to South America, and as f
as Dr. Merriam knows has
been heard from since.

Head Hunters of Brazil Smoked Trophies and Used Them to Decorate Their Homes

National Museum Acquires Sample of Parentintin's Art from the Rubber Zone of South America.

Dr. C. Hart Merriam, of Washington, has just presented the United States National Museum with a smoke-dried head of a Brazilian Indian, secured on the headwaters of the Tapajos river in 1877 or 1878.

This grewsome object is one of the few specimens in this country of these rare human trophies collected and prepared by the Parentintin tribe of the Tapajos river in Para, Brazil.

It is the head of another tribesman, killed and preserved by the Parentintins. The dried skin is yellow and stretched tightly over the skull. The black hair hangs loose in bobbed style. The eyes are covered by wax cones ornamented by two small rodents' teeth, to imitate the pupils of the eyes, and the ears are still decorated with the cord insertions and tufts of red and yellow parrot feathers worn by the Indian in life. Originally, when used as a trophy, it was suspended by a cord, which still emerges from the mouth, but now it is arranged on a stand in the museum and may be examined.

Smoked Heads.

Unlike the better known Jibaros of the upper Amazon, who preserve the heads of their enemies by removing the skull bones and shrinking and drying the skin until the head is much reduced in size, the Parentintins leave the head in its normal form. They first remove the brain, then smoke the head by use of an aromatic wood until it is thoroughly dried and hang it up to decorate their houses.

Dr. Merriam says that about forty years ago, while he was in New York city, Ernest T. Morris, a young South American explorer, came to him with this head and several others which he desired to dispose of as soon as possible, being badly in need of funds. In relating his experiences Mr. Morris stated that while he was traveling near the headwaters of the Tapajos river he was captured by the Indians and kept prisoner for several years.

In attempting to make their captive into an Indian like themselves they tattooed his cheeks and lower jaw with native pigments, which he found he could not remove. For a long time he was in fear for his life, as they threatened to kill him for his head, so to speak, which they would have hung from the lodge poles as a trophy. But for some reason he was spared, although he mentioned one instance when an Indian with whom he was talking was shot by an arrow and killed—his head going into the collection.

Escaped.

After two or three years of imprisonment his captors became a little lax in their watch, and one night in 1877-78 Morris escaped in a small boat. He took eight of the trophy heads with him, knowing that they would be valuable objects to museums of this country. By traveling only in the night and hiding in the day, he succeeded in descending the Tapajos river and reaching the Amazon, and finally the city of Para, where he secured passage to New York.

Arriving there he found himself stranded, with nothing but his ghastly heads as assets, and at the same time much embarrassed by the very noticeable tattooing with which his Indian captors had decorated his face. Unfortunately, he could not raise a beard, and he would not appear in public as he was. Finding that Dr. Merriam was in the city, and knowing him to be a scientist, he decided to approach him in an endeavor to raise some money on the heads. Dr. Merriam says that they found no difficulty in doing so, the American Museum of Natural History taking two and himself one. He does not remember where the others went, but recalls that all of them were sold at $75 each, netting the explorer about $600.

With the receipt of the money Morris' spirits rose again, but having no place where he could seek seclusion from the public eye, he

From Tribune

Address New York City

Date MAY 28 1916

SMOKE-DRIED HEAD PRESENTED MUSEUM

Rare Human Trophy of Wild Brazilian Tribe.

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Wash'n Star - April 1, 1916

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National Repository Here Presented With Smoke-Dried Head of Indian.

IS GHASTLY TROPHY OF THE PARENTINTIN TRIBE

Purchased by Dr. C. H. Merriam, the Donor, From South American Explorer, Many Years Ago.

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Ghastly Heads Only Assets.

Arriving in that great metropolis, he found himself stranded financially, with nothing but his ghastly heads as assets, and at the same time much embarrassed by the very noticeable tattooing with which his Indian captors had decorated his face. Unfortunately, he could not raise a beard, and he would not appear in public as he was. Finding that Dr. Merriam was in the city, and knowing him to be a scientist, he decided to approach him in an endeavor to raise some money on the heads.

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British Guiana

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Am. Anthropologist, Vol. 30, No. 2, April-June 1928.

RECENT ARCHAEOLOGICAL expeditions of Soviet investigators are reported to be working under Professor S. Rykov in Kuznetsk on remains of old Finnish culture of the 9th to the 11th centuries; under Professor Smirnov in Izhesk district on Votyak sites of the 10th to 12th centuries; and the completion of the Ukrainian Archaeological Expedition is reported resulting in the discovery of late stone age and early bronze age remains. (Weekly News Bulletin VSSR).

UNDER THE GENERAL editorship of Professor G. Elliot Smith, a new series has been initiated, entitled "The Beginning of Things." The publisher is Gerald Howe, Ltd., London. Each volume will be sold at 2s, 6d. The first volumes published in September 1927, are: "Corn from Egypt," by M. Gompertz; "New Year's Day," by S. H. Hooke; "The Golden Age," by H. J. Massingham.

WALTER MCCLINTOCK has been appointed to a research fellowship in ethnology at the Southwest Museum in Los Angeles. *Science.*

DR. MILO HELLMAN, research associate in physical anthropology at the American Museum of Natural History has been appointed professor of comparative dental morphology at the New York University College of Dentistry. *Science.*

DR. KNUD RASMUSSEN, the Danish Arctic explorer, had conferred upon him the doctorate of laws, by the University of St. Andrews on October 7. *Science.*

DR. LOUIS SHOTRIDGE, Chilkat Indian and assistant in the American section of the University of Pennsylvania Museum, has returned to Philadelphia after five years of ethnological research work in Alaska. *Science.*

DR. WALTER E. ROTH of the Christianburg Magistrate's Office, Demerara River, writing on June 8th, 1927, encloses an article from *The Daily Argosy* (Georgetown, British Guiana) of May 22, 1927, in which he challenges Mr. A. Hyatt Verrill's article on the Wai Wai in the *Wide World Magazine* of May 1926. According to Dr. Roth the only approach to this people is by water and the sole difficulty is that of finding appropriate timber for suitable boats, the Wai Wai living on the uppermost reach of the Essequibo, a twelve days' boat trip from the head of the Kuyuwinni in country belonging to the Wapishana, their nearest neighbors to the north and west. Ac-

cording to Dr. Roth, Mr. Hyatt erroneously describes the women, not the men, as manufacturing hammocks, and a chief as wearing a loin cloth of bark instead of finely woven and dyed cotton. Dr. Roth mentions other inaccuracies and arrives at the conclusion that "Mr. A. Hyatt Verrill has never been to the Wai Wai country or seen its people."

THE SECOND NASHVILLE MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—Section H (Anthropology) held sessions from December 27 to 30. Dr. George L. Collie, director of the Beloit-Logan North African Expedition, exhibited artifacts and skeletons taken from Aurignacian deposits in Algeria and presented the results of recent explorations in that region. The subject of "Race Crossing, Group and Individual Changes," occupied one day, while topics of general anthropological interest were also presented. A session was devoted to the evidences of human occupation of the caves of the Nashville region and to other questions of local archaeology. The dinner for anthropologists was planned for Tuesday evening. The Tulane Hotel, Church St. and Eighth Ave., was the headquarters for anthropologists. *Science.*

PROFESSOR OTTO AICHEL, head of the department of anthropology at the University of Kiel, has undertaken a research expedition to Chile. Later he will go to Peru and Bolivia.

—*Science*

J. ERIC THOMPSON, of the Field Museum of Natural History, has left for British Honduras, as the head of an expedition which will investigate the civilization of the ancient Maya Indians.

—*The Museum News*

J. WALTER FEWKES retired as chief of the Bureau of American Ethnology of the Smithsonian Institution on January 15. Dr. Fewkes first came to the Institution in 1895 and was appointed chief of the Bureau in 1918.

—*The Museum News*

THE CENTRAL SECTION of the American Anthropological Association held its 1928 meeting at Beloit, Wisconsin. on March 2 and 3.

TULANE UNIVERSITY is planning an expedition to unexplored regions of Central America and Mexico, according to an announce-

Photograph by Tom Gill

The landscape beauty of the hinterland country is exquisite. This shows a native Indian hut along a placid stretch of the Demerara,—one of the intricate network of rivers.

THE FORESTS OF BRITISH GUIANA

By K. H. CREGAN

Am. Forests - Nov. 1935

BRITISH GUIANA, the only British colony on the mainland of South America, lies in the northeastern portion of that continent. Of its total area of 89,480 sportsman, artist and nature lover as well. It is no exaggeration to say that the hinterland scenery of the country is unexcelled by any other part of the world. One finds here an intricate network of rivers containing numberless waterfalls, cataracts and rapids of surpassing beauty, extensive mountain ranges, vast expanses of grass-clad savannah lands, rampart-like forest mirrored in placid vistas of water, and a profusion of animals, birds, insects and flowers.

It is an unfortunate fact, principally owing to a dearth of capital and population, that British Guiana is practically undeveloped, most of its inhabitants being concentrated on the narrow coastal belt washed by the Atlantic Ocean. Excepting the recently completed Bartica-Potaro road and a 240-mile cattle trail to the Rupununi district, there are no roads or railways in the interior. The huge timber resources of the country have therefore been little more than scratched, accessibility to waterways leading to the coast being, at present, the deciding factor of exploitation. It is calculated

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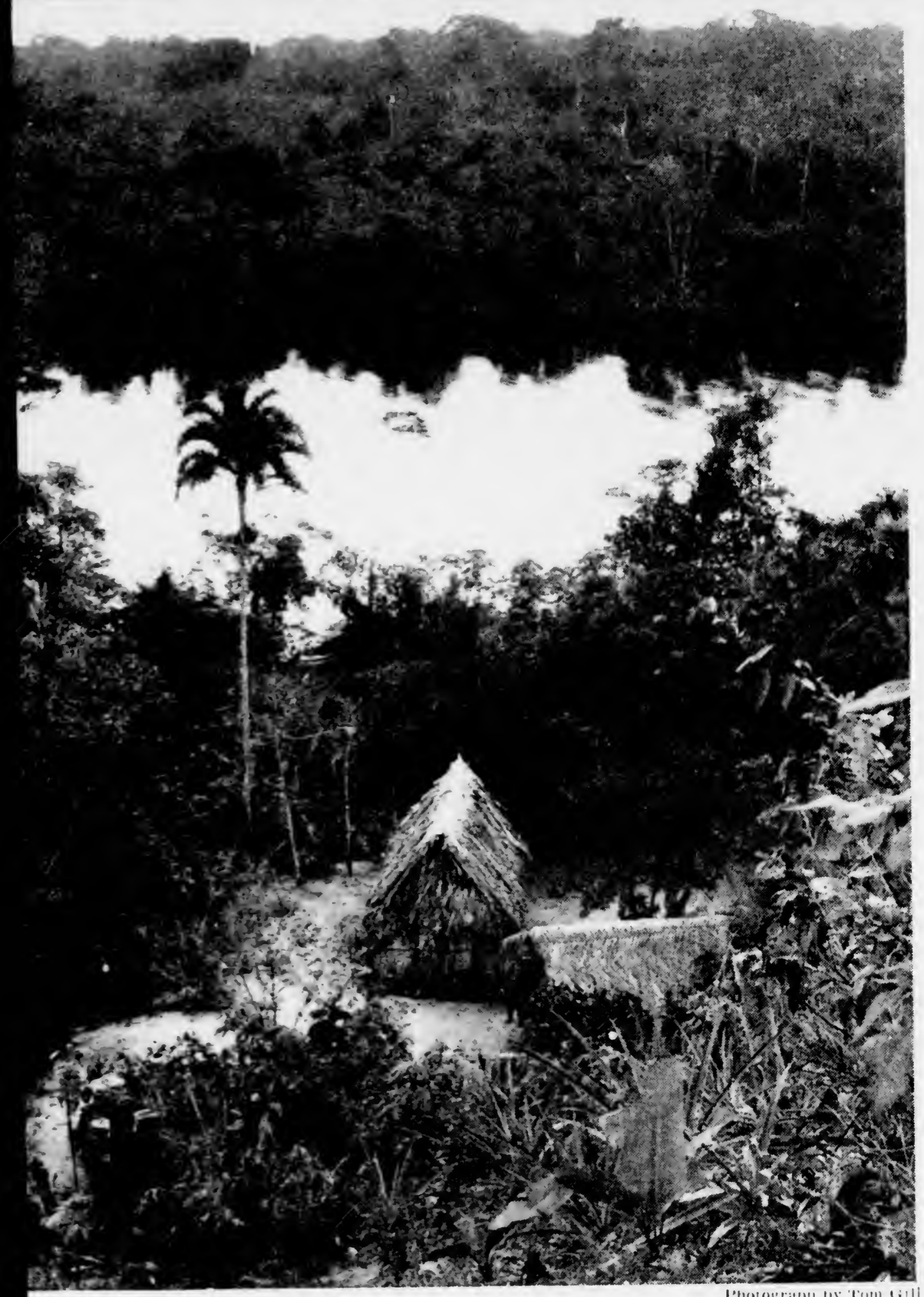

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Retake of Preceding Frame

Preparation Feast of the Waikas at Manaia

(Found among Dr E. Palmer's Notes - for Schaudinn)

Dawn of Feast day Preperation
Feast of the Waikas at manaia
What a lively spectacle did
the breaking day present to us.
The first glance towards the
Open huts showed us that more
than half of the inhabitants of
the settlement was busiey making
their toilett, Mothers painted
their offsprings and Dads.
especially amused by the little
impatient boys who showed by
every look that the operation
robbed them of too much time,
which they might have spent
with their playmates already
running about in front of the

hurts, and it was only the short and strict call of admonition of their mothers which could make them stand still for a minute, at last the tormenting minutes had passed, and followed by the approving looks of the proud mother, they ran to their playmates

R pretty little girl had to pacify another impatient creature namely her pet monkey, which was unwilling to have the stripes made on his face as her brother was when the mother painted his, which

the sister tried to copy on the
mon Reys visage and the
mon Rey tried to prevent by droll
bites and trampling. What
wonder that these loud and short
exclamations uttered by the Mo-
ther had to be repeated ten times
oftner by the little girl. at last
the difficult task of painting
was accomplished done & strings
of glass beads finished the
dress of the impatient animal

The oldergirls smoothed and
anointed their luxuriant
black hair before small looking
glasses which they had suc-
ceeded. while the men were
sitting in their hammocks

combing their hair, the wives
kneeling before them and pain-
ting their feet up to their ankles
with red color, which gave the
feet the appearance as if they
had red buskins on. Other groups
of girls again strung the glass
beads which we had presented
them on threads to wear round their
necks. Old mothers tripped
from one pot to another tasted the
beverage covered it close with
leaves while others increased the
supply of Cassava bread, or
cleaned and put to the fire
the venison which had to be
prepared for the guests.

The rivers being the means

of communication in the
primitive forest the guests
arrived in their canoes and
announced their arrival at the
landing place of the village
by a loud shout, when they
approached the village under
the conduct of their Chief at a
slow pace. He was a fine
manly figure dressed in a
colored shirt, the head covered
with a felt hat, in his hand
his Chieftain staff. Close to him
followed his retainers mostly
fine men, their heads covered
with fantastic feather caps,
the faces marked with a
number, of white and red lines

running in right angles and
paralled while the whole body
to the feet was covered with angles
figures - the feet below the
ankle were painted red.
The necks were ornamented
with necklaces made of the
teeth of monkeys and peckaries
from which were suspended down
their backs large tassels made
from the skins of the Toucans
and other bird skins
× The Ankles were entwined
with strings of hollow seeds of the
Thevetia nerifolia fruit which
at every step produced a
strange bell like sound. The
simple head ornaments, but

proposely painted the the
women leading the Children
on their hands closed the procession
on. Although our large boats at
the landing place must have
excited the curiosity of the guests
at their arrival in a high degree
and the appearance of so many
strangers black and white, who
filled the village must have in-
creased their astonishment, the
procession passed us stern and
solemn, without ~~without~~
taking the least notice of us.
Only the Children who most
probably had never seen white
or black man, before cast
timid and clandestine looks

towards us, and clung fright-
ened to their mothers.

As soon as the procession had arrived at the hut of the Chieftain mutual greetings were exchanged and the Chief sat down on a stool provided for him whilst his subjects surrounded him standing in a circle. The form of salutation among the A Kaibais is short Guest I come - Host Good Sir hast thou arrived guest Yes I am here, As soon as the guest has spoken the last word, the wife of the chief of Manari handed him a calabash with Kaiwari wile another put a dish

with meat before him, after he had drank he hands the cal abash to his neighbour to the right and then begin to eat of the meat. when the host excuses himself that he is unable to treat him with anything better An excuse which is set aside by the answer it is good.

All the other men were now provided with paiwari and meat, whilst the women who are not permitted to eat at the same time as the men cast cu rious glances towards us As soon as the men had finished eating and drinking they approached one or the other of the

inhabitants; not before
the women were permitted to
quench their thirst and satisfy
their hunger.

In this manner came one
procession after another and
at each the form of reception
were repeated.

At the whole number our assem
bly I could not find two indi
viduals whose painted figures
or faces were similar

Every guest provides him
self with his own hammock
which is immediately fetched
by the women from their can
oes and slung in one of the huts
and taken possession of by their

owners, who then continually circulated, the kalabashes which of course enlivened the conversation more and more

That the master of ceremonies had a grand day was shown by his richly ornamented vestments,

Shortly after sundown he took in his hand his long bamboo cane Ornamented with long strings of seeds of the Jetica, which which produces a rattling noise by every movement of the staff and with it he gave the sign to begin the dance, Several torches made of thick cotton threads dipped repeatedly in melted wax illuminated the hut and the trough

Containing the hairwari
on a given sign of the master
of ceremonies all the men jum
ped out of their hammocks
and placed themselves in a cir
cle around the hairwari tro
ugh. The master of ceremonies
then moved in a stooped po
sition slowly around the
same when he advanced two
paces towards the trough and
then again retreated two steps
which was imitated by the whole
line of dancers the left hand
resting on the right shoulder
of the next man, not in a stoo
ping position but quite erect.
This slow and measured

procession Kept time with a
monotonous tone
about the sense of the words
uttered at the time we could
get no information, because
the present generation of the
Hawaiis do not understand
them themselves. The words
of the song had been inheri
ted from father to son but the
language seemed to have al
tered so much in the course
of time that at present the
form the expression of the
thoughts, the words but not
the understanding of the same
sense has been preserved

The master of ceremonies always
led the song with a few words which

were repeated by the choir and that with such a precision and exactness that it appeared to be one voice.. Of the women none had joined but the wife of the Chief and an old matron whom I considered the oldest member of the whole female community.

The procession having moved round the trough several times the master of ceremonies suddenly stood still. The dancers drew new breath, then broke out in a fearful yell. The women and

girls now hasten to the trough with calabashes, filled them and presented to the men, and supplied every one who showed a desire to refresh himself, after a short pause the line of dancers moved on again to the accompaniment of a new song.

During the pause those who were exhausted were replaced by other dancers and the more they imbibed the oftner the pauses were repeated, the movements began to be more irregular — the songs became louder and at last degenerated into a wild roaring. But what are our

notorious drinking bouts
compared with such a
festival of the Indians.
I saw men empty the cal-
abashes containing at
least half a gallon at one
draught, they then hurried
towards a tree pressed aga-
inst their stomachs to dis-cha-
rge the beverage, and to take
from the waiting gay maid
another filled Calabash, to
discharge it in the same way.
In the enjoyment of the pas-
sari the Indian is never sati-
sfied and also hear the da-
nce and singing if the con-
fused roaring could be called
singing, until the last drop

of the intoxicating beverage had been finished.

The old proverb in vino veri tas is also applicable to the forests of Louisiana only with the alteration in fainiwari veritas. With every calabash emptied the true state of mind showe itself more openly, animosity, hatred, and offenses which the offended seemed to have forgotten for years came to light again. And were expressed in reproaches" You are the son of him who killed my father or has seduced my wife; thou hast

poisoned my wife, thou
hast slain my son, utter
ances which would have been
avoide with cunning precaution
had the Indian been sober.

Such reproaches without
doubt would have been fol
lowed by taking the most san
guinary revenge, had not
the prudent and experienced
wives removed all the weapons
at the first shade of intoxica
tion. Besides this, they allured
their noisy husbands into their
hammocks where they were
well secured by them.

Our Warraus also whose

talent in drinking I had
often had the opportunity
to admire, had made full
use of the occasion and in
such a manner, that on the
following morning when we
intended to leave Manari
they were lying about sense-
less in all directions and like
the a Rawais did not wake
up from their wild intoxication
until late in the afternoon
according to the effect caused
by that beverage, it must be
a great deal more stupe-
fying than that caused by
spirits. (British Boundary Expedition
of Guiana by Richard Schomburgk

Native Life in the Amazon Wilderness

Travel-Sept.1915.

[These photographs are from the official collection of the Amazon Expedition of the University of Pennsylvania, which for two years has been investigating and exploring various regions of the Amazon basin with marked success. Some of the aboriginal tribes encountered were never before seen by white men. The Expedition is still in the field under the direction of Dr. Farabee. The photographs are reproduced herewith by courtesy of Dr. G. B. Gordon, Director of The University Museum, Philadelphia.—EDITOR]

A Mapidian man shooting fish. He belongs to one of the tribes of southern British Guiana, where this method of taking fish is the common one. Needless to say it requires great dexterity and quickness. As may be seen, the bows are fully five feet long. Another method of taking fish is by throwing into the streams the juices of certain plants which stupefy the fish and bring them to the surface

On the left is Ufono, chief of the Parikutu tribe, one of the most intelligent native chiefs encountered by the expedition

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oncord. But to little avail. Colonial troops guarded their treasures erywhere; guns were hidden in plowed fields, powder was stored in barrels supposedly containing flour. The Yankee the the world that his wits would win where strength

Strength was not lacking at Concord, as at L hundred minute-men had assembled on the far Bridge, about three-fourths of a mile from th searching detachment came to the bridge trou after company of Colonials charged and ther in the cause of liberty—a shot, it has been s the world. The British withdrew, leavi where they fell; their nameless grave is The Colonials did not press hard; it w the king's troops, for failure meant value of a success probably never oc day. But press the Colonials did, retreat by his worn-out soldiers—called a wild goose chase.

Two monuments mark the site people it is not "the Battle of C man statue is an excellent memo Its figure, carved from many r strong in the men who founde little dreamed, and no one ev is to mark where the redcoats in honor to men who merely the left, across the fields, two centuries. At the tim living there; nearly a hu his young bride. It is th in his first great book, " house, too, that Emerso

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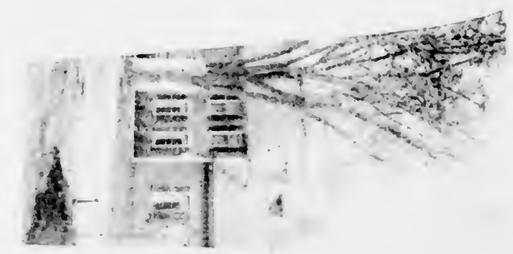

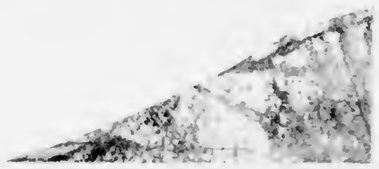

A warrior of the Waiwai tribe dressed for the dance. This tribe is one of the most primitive that were visited by Dr. Farabee. They live far in the interior, a ten or twelve days' journey over rough mountains and on forest streams. The expedition lived on wild turkeys, black monkeys and birds' eggs for most of this time

On the right is a back view of the Waiwai dancer, showing the ornaments which are chiefly the feathers of tropical birds. The health of these natives is excellent. It would seem that none of the diseases familiar to civilized peoples have reached them

A scene in a Taruma Indian village. Dr. Farabee was the first white man that ever visited this village and the other villages of this tribe. He was hospitably received wherever he went and a special hut was built for him during his stay. The huts are built of poles thatched with palm leaves

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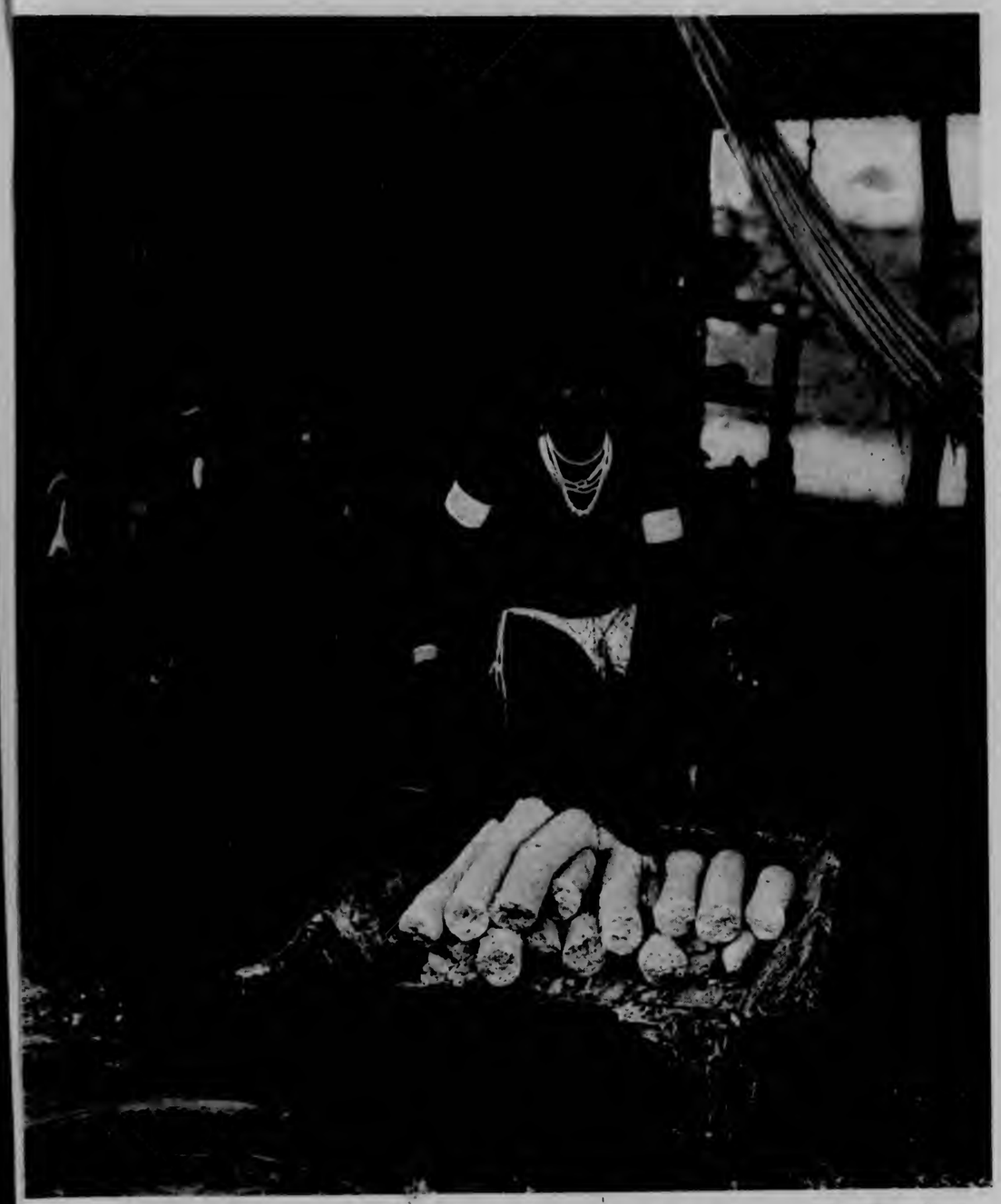
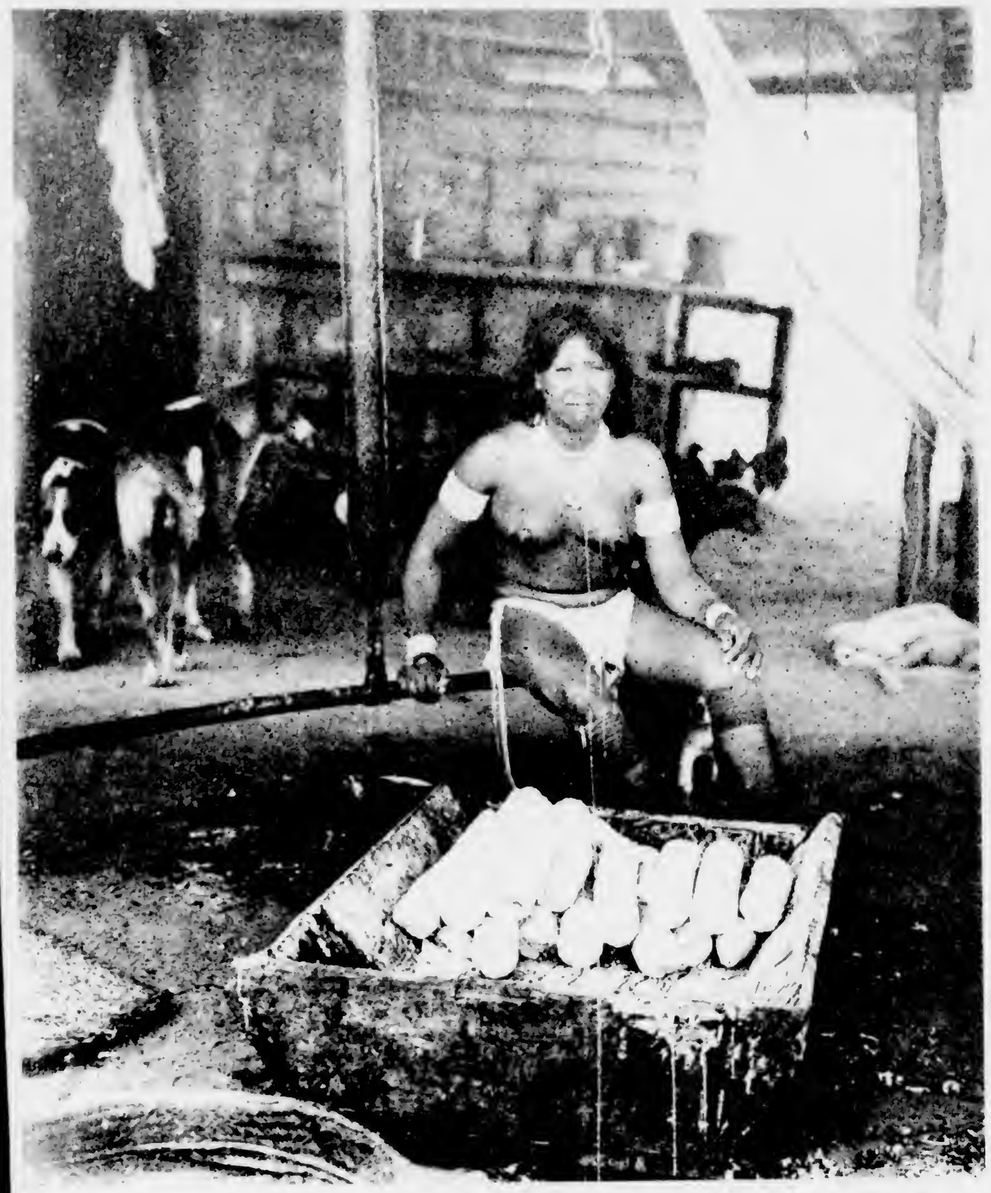


Native woman preparing cassava. In the foreground are the pressed rolls of cassava, which have just been removed from the press, which is seen at her side suspended from the roof

Indian women grating cassava preparatory to making the rolls. Cassava is the stable food product of all these tribes and the only article which is cultivated. This diet is supplemented by hunting and fishing

A Waiwai Indian family in their sleeping apartment. The wife occupies the place of honor in the lower hammock, the man next and the child in the upper hammock. This arrangement allows more space in the room itself. Note the dog seated on the shelf and the man in the background, who was evidently surprised from slumber by the camera



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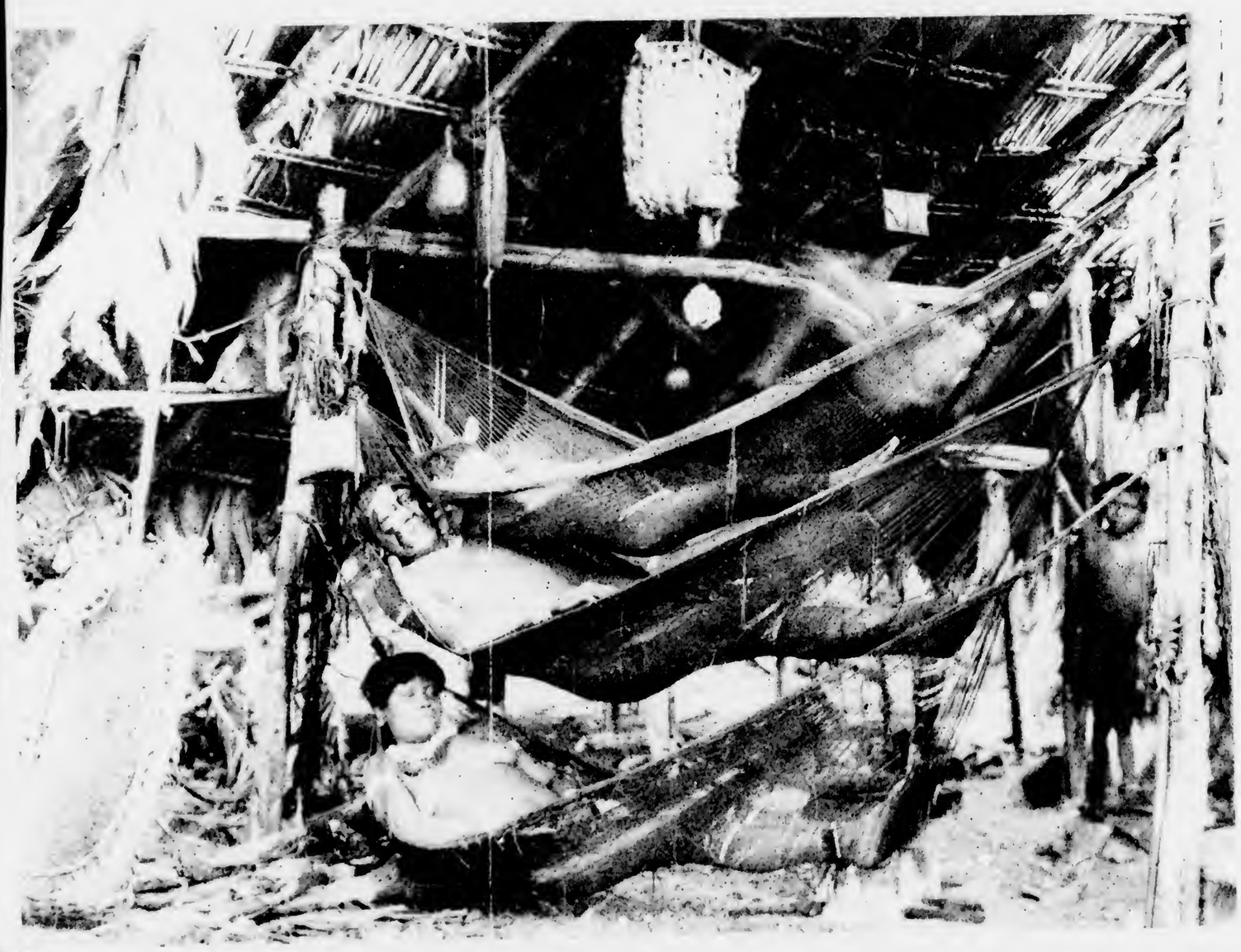

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The interior of a Macusi Indian house, showing a woman using a mortar and pestle for pounding fruit. The sides of the house are made of lattice and the roof of palm leaves. The primitive utensils here seen are of wood or gourds, and in the corner is a flat basket made of woven grasses

Two brothers of the Parikutu tribe, with the characteristic head and feather ornaments. These people are very cleanly, the men and women bathing two and three times a day and using bamboo scrapers instead of towels after the bath

Women of the Macusi tribe near the house of the British Magistrate in southern British Guiana. The photograph shows how the women carry their infants as well as the burdens connected with their labor in the fields

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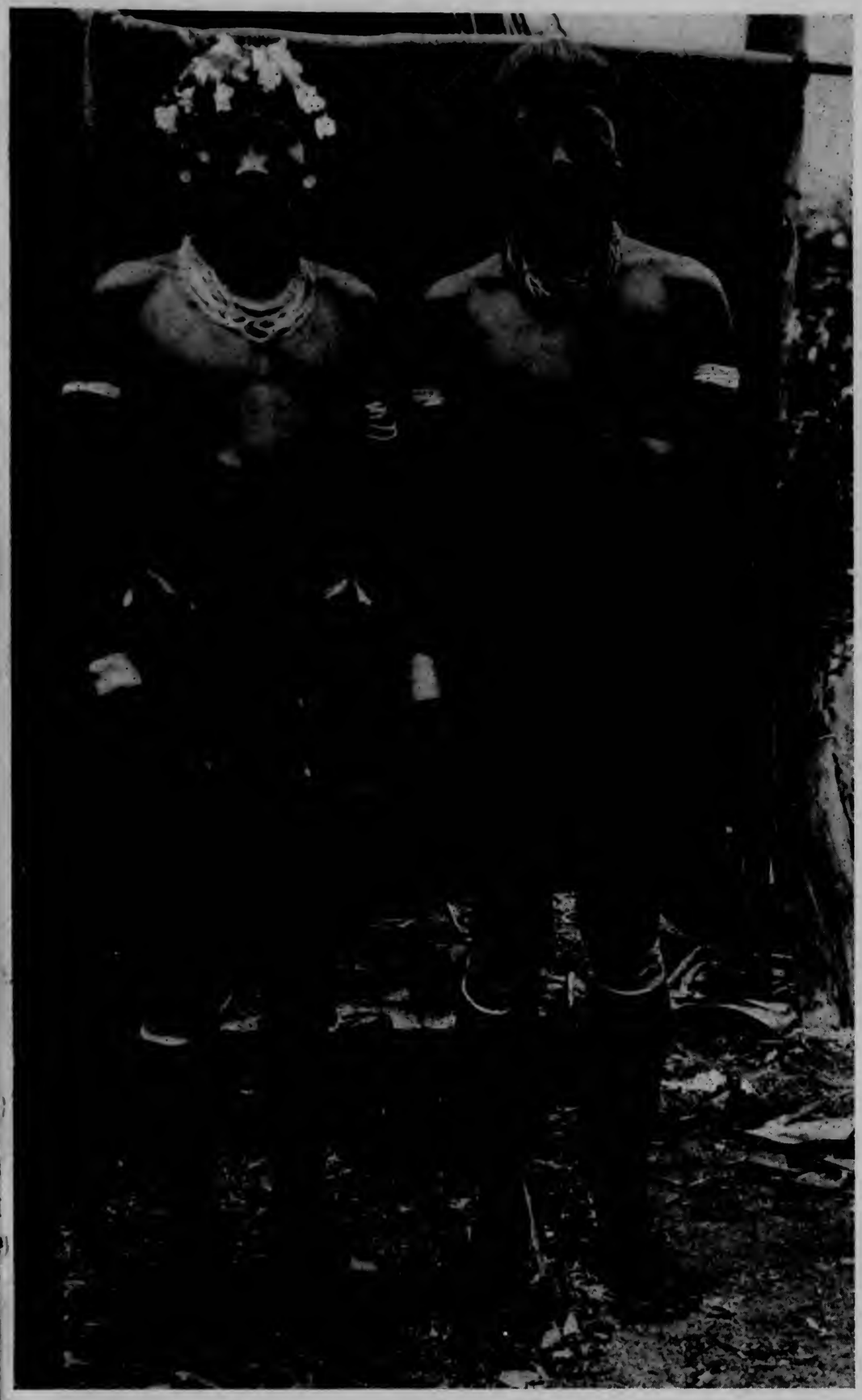

Two brothers of the Waiwai tribe. Among this tribe, as among several others, the curious custom of the couvade prevails; that is, when a child is born, the father takes to his hammock and remains there for a month. During this time he refrains from all strong food and the women wait upon him as an invalid. Meantime the mother of the child goes about her work

Two girls of the Waiwai tribe decorated for the dance. The costume of the women on ordinary occasions consists of a woven cotton apron embroidered with beads, together with bands for ornament and necklaces. When prepared for the dance their bodies are further decorated with paint of different colors applied in stripes and patterns

An anaconda on the river bank. These huge snakes, which are very plentiful in the Amazon forests, are regarded as sacred by certain tribes. Dr. Farabee has recorded several myths current among these people which bear a marked resemblance to the stories of the Creation and the Flood as related in the Old Testament

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Indian women kneading and baking cassava cakes. The natural healthful life which these tribes lead is shown in their physical condition and freedom from disease. Among certain of them inter-marriage is practiced. It is customary, for instance, for first cousins to inter-marry

An Indian girl in southern British Guiana spinning cotton by hand. This cotton is a wild variety which grows abundantly in the forest

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THE MISUNDERSTOOD ESKIMO

WHAT THE WHITE MAN HAS DONE AND LEFT UNDONE FOR THIS PEOPLE OF THE FAR NORTH

DR. WILFRED T. GRENFELL

[Dr. Grenfell speaks with authority on the question of the Eskimo. For many years he has maintained and directed a medical mission in North Labrador, and has devoted his life to the betterment of the condition of the natives.—EDITOR]

FEW people realize what a tremendous debt the white man owes to the native race of the far north. Without so much as by your leave we have annexed all the countries belonging for ages to the Eskimo and in return have done nothing.

Nansen, Peary and practically all Northern explorers have testified how very little the Eskimo derive from our unsolicited appropriation of them and their country—in fact, plenty of them are still entirely ignorant of the benefits they gain from being British subjects. Dr. Nansen has protested that the the only way to save a possible permanent population for these immense and ever increasingly valuable wilds is never to go near them. The Danes, for the same reason, have made Greenland a country in which no white man may land except in distress, or by permission—and no trader in any condition. For years I have been trying to obtain one of the inimitable eiderdown blankets made in that country. They are light and portable as feathers, and as beautiful as Chinese silk, and as warm as any known substance. But in spite of having sent round by way of Copenhagen, I have as yet not been able to acquire one.

(c) Underwood & Underwood

AN ESKIMO AND HIS WIFE

It would seem from statistics that the Eskimos are rapidly diminishing in numbers. Those who know them best declare that they are an unusually sturdy, gentle and trustworthy people

This is not the place to discuss the question whether this particular or any other aboriginal race can survive contact with us white men, or whether they have sufficient capacity to adapt themselves to an entirely new environment. The fact remains that white men are not, and I question if they can be, prevented from going among them. So the problem is far from being solved, even if Dr. Nansen's thesis is well grounded. But one thing is certain, and that is, we are not discharging what appears to me to be the primary duty of any civilized country annexing that belonging to another race—to take, first of all, every possible precaution that we do not do them more injury than we can help.

In Baffin's Land trading stations are growing up, and trading enterprises, giving the Eskimo our diseases, and depleting very materially their means of earning a livelihood by the importation of modern weapons. Yet there is not a single medical officer in the country to whom a man can go to find out what the new trouble is, or how to avoid dying from it. We are now in correspondence with the Canadian Government in the hope that their excellent Indian Department may grant the expenses of at least one such medical officer.

In the peninsula of Labrador many hundreds of these charming little Eskimo still maintain an existence, and among them the Moravian Brethren have been working for over a hundred years. Though the district in which they live is north of our northernmost hospital, and though our own work lies among the fishermen and white settlers of the country, still it is my privilege each year on my summer trips on the hospital steamer *Strathcona* to see and treat as many of the "Innuit," or "the men," as they call themselves, as have the doubtful good fortune to be ill at the psychological moment when the steamer calls.

In the year 1800 they were still numerous as far south as the Straits of Belle Isle, and some five hundred were spread along the northern side of the Gulf and on both sides of the Straits. By 1900, however, not one remained south of Hamilton Inlet, which is two hundred miles north of the Straits. From there to Nain, which is two hundred miles still further on, only a sorry remnant still remain, interspersed with white settlers and half-breeds, who are gradually displacing them.

Unlike the replacing of the Red Indian, the process has been an entirely peaceful one so far as the Eskimo are concerned. For in spite of the stories of their bloodthirstiness and ferocity, diligently circulated by their visitors as an excuse for destroying them—a practice dating from the time of Eric the Red, when the first Christians visited them—the opinions of all northern explorers and men of science who have been personally among them are unanimous in

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Chile

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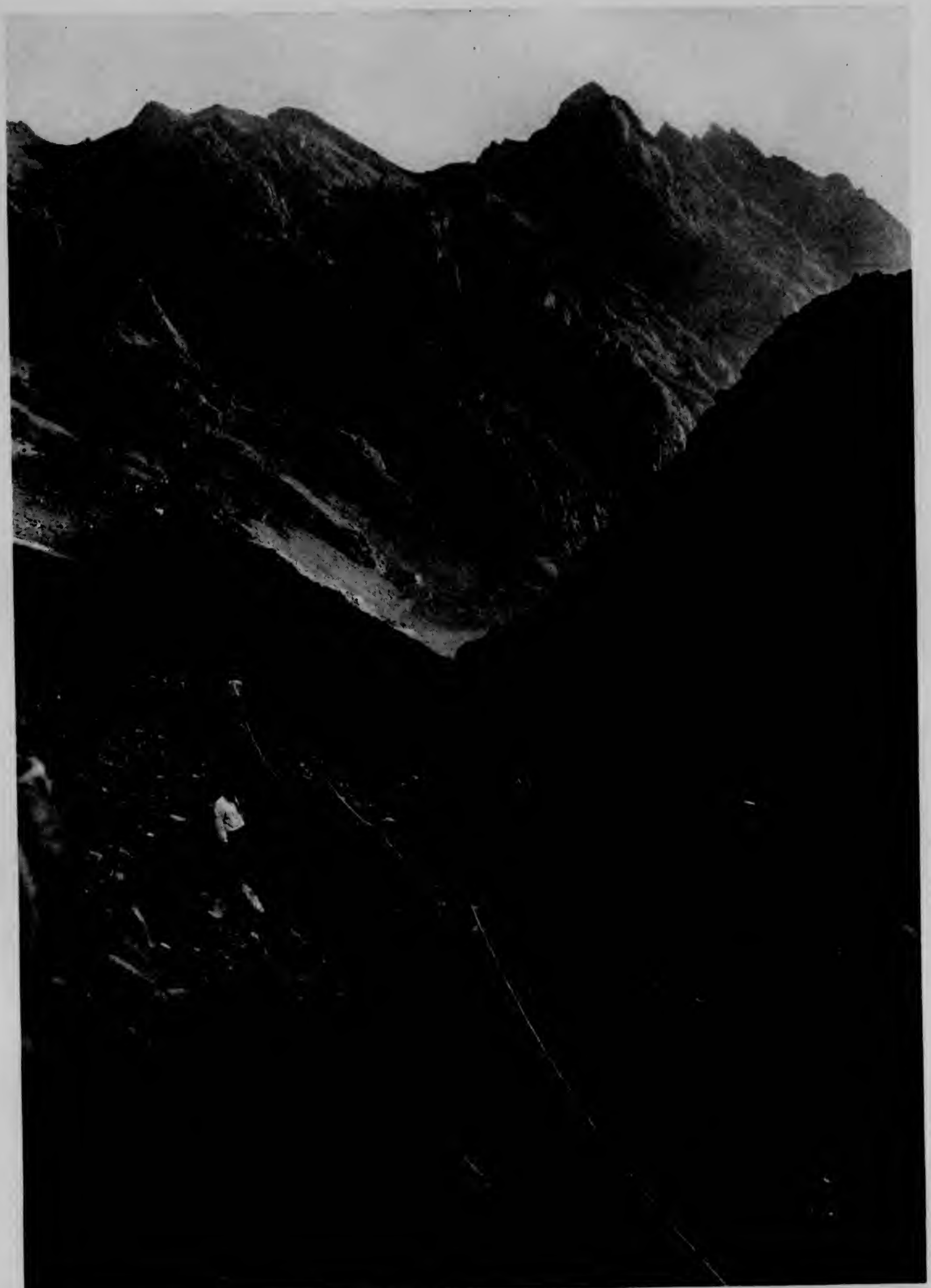
Andes. Nat. Geog. Magazine - Dec. 1930



Photograph by Gomez

NOW CHILE MAY TALK OVER THE ANDES WITH NORTH AMERICA AND EUROPE

Incas, shouting up these valleys, were heard only a few rods. Now, over this earthquake- and avalanche-proof armored cable, Chile not only talks easily with Argentina, but by submarine extension with Uruguay, and thence by radio telephone with Europe, the British Isles, and North America.

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Retake of Preceding Frame

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HIGH ON THE ROOF OF THE NEW WORLD RISES THIS FIGURE OF CHRIST, THE REDEEMER

Dedicated more than 25 years ago, the monument stands as a symbol of peace on the boundary line between Chile and Argentina, more than 12,000 feet above the sea and on the very ridge of the watershed between two great oceans. The two-mile tunnel of the Transandine Railway runs underneath this ridge and the telephone cable is laid over it.

Photograph courtesy of I. T. & T. Co.

IN THE HIGHER PASSES OF THE ANDES NO LARGE PLANT OR ANIMAL LIFE EXISTS

Between the statue of Christ and the old shelter hut a long line of workers is seen carrying the heavy telephone cable over the great divide. The loops of roadway at the left are switch-backs on the motor highway which is being developed over the Andes to connect Santiago de Chile with Mendoza and other Argentine cities. The road leading down to the left descends into Chilean territory.

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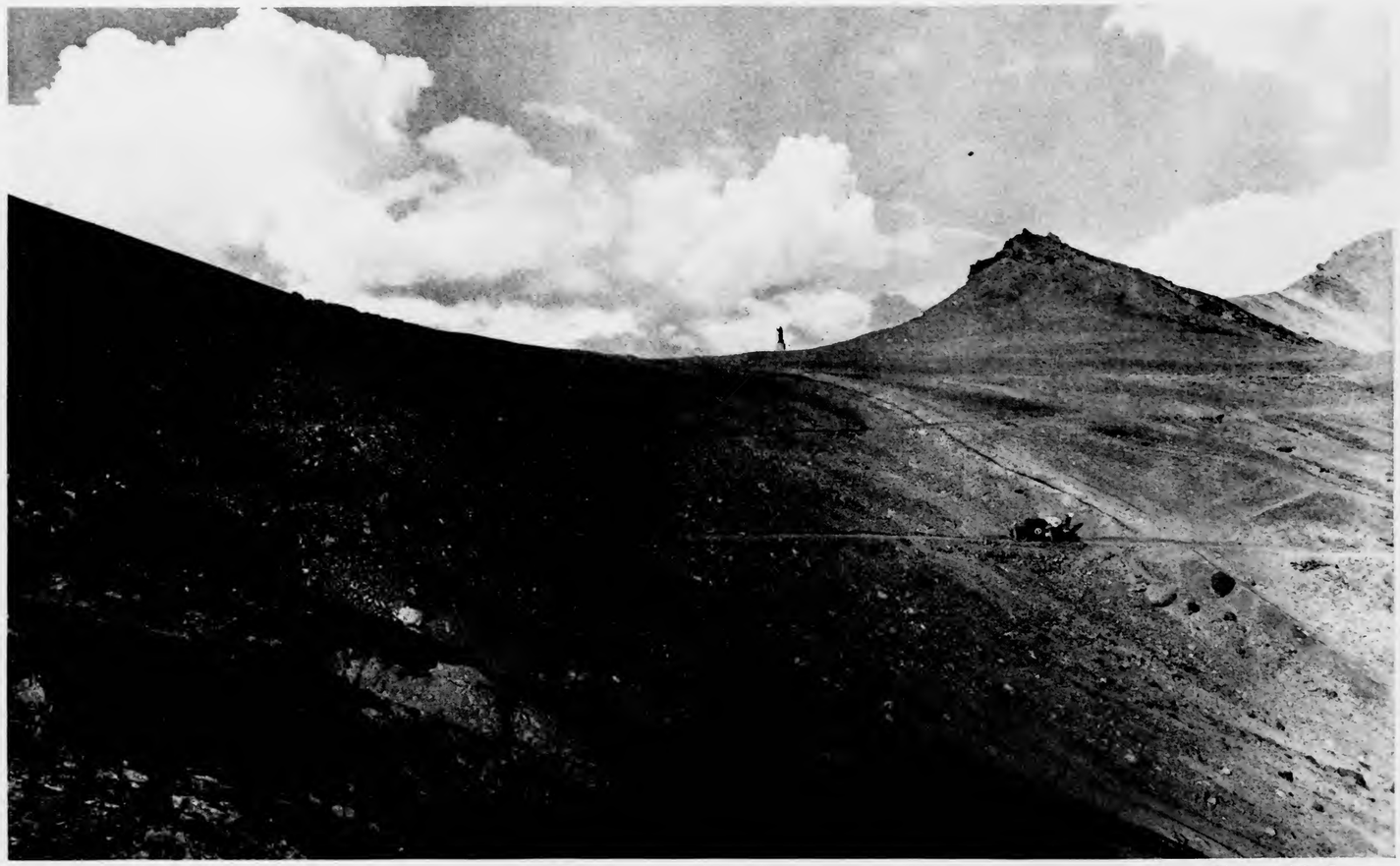
BY TRAIN, BY TRUCK, AND THEN ON MEN'S SHOULDERS, THE CABLE WAS CARRIED OVER THE HIGH, COLD, EMPTY PASSES OF THE ANDES

At this point on the roadway, more than two miles above sea level, giant spools holding sections of the heavy cable, weighing 1½ tons, were taken from trucks, the cable unrolled, and then carried on men's backs over the great transcontinental divide.

Photograph by Gomez

TESTING A SPLICE IN THE GREAT CABLE

The core is covered with two bands of special steel wrapped in opposite directions and separated by a layer of impregnated fabric. Many delicate scientific instruments had to be carried along to test each section of cable before it was spliced. The top of Mount Tolosa in the background.



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FOR 2,700 MILES THE ANDES RISE ALONG THE COAST OF CHILE

. Leaving fertile green valleys, the motor highway zigzags higher and higher into this cold, windy region. The picture was made in February, which is midsummer in far southern latitudes. From May to August deep snows fall here and often all traffic is blocked. Up this pass runs the telephone cable.

Photograph courtesy of I. T. & T. Co.

AN ABANDONED HUT FORMERLY USED BY TRANSANDINE MAIL CARRIERS

In high passes, where deep drifts, blizzards, and avalanches are most frequent, these huts often stood only a few hundred yards apart. They saved the lives of many weary horsemen and pedestrians before the railroad came. Aided by snowsheds, tunnels, and snowplows, and an army of shovel men, the railway is kept open now, except during storms of unusual severity.

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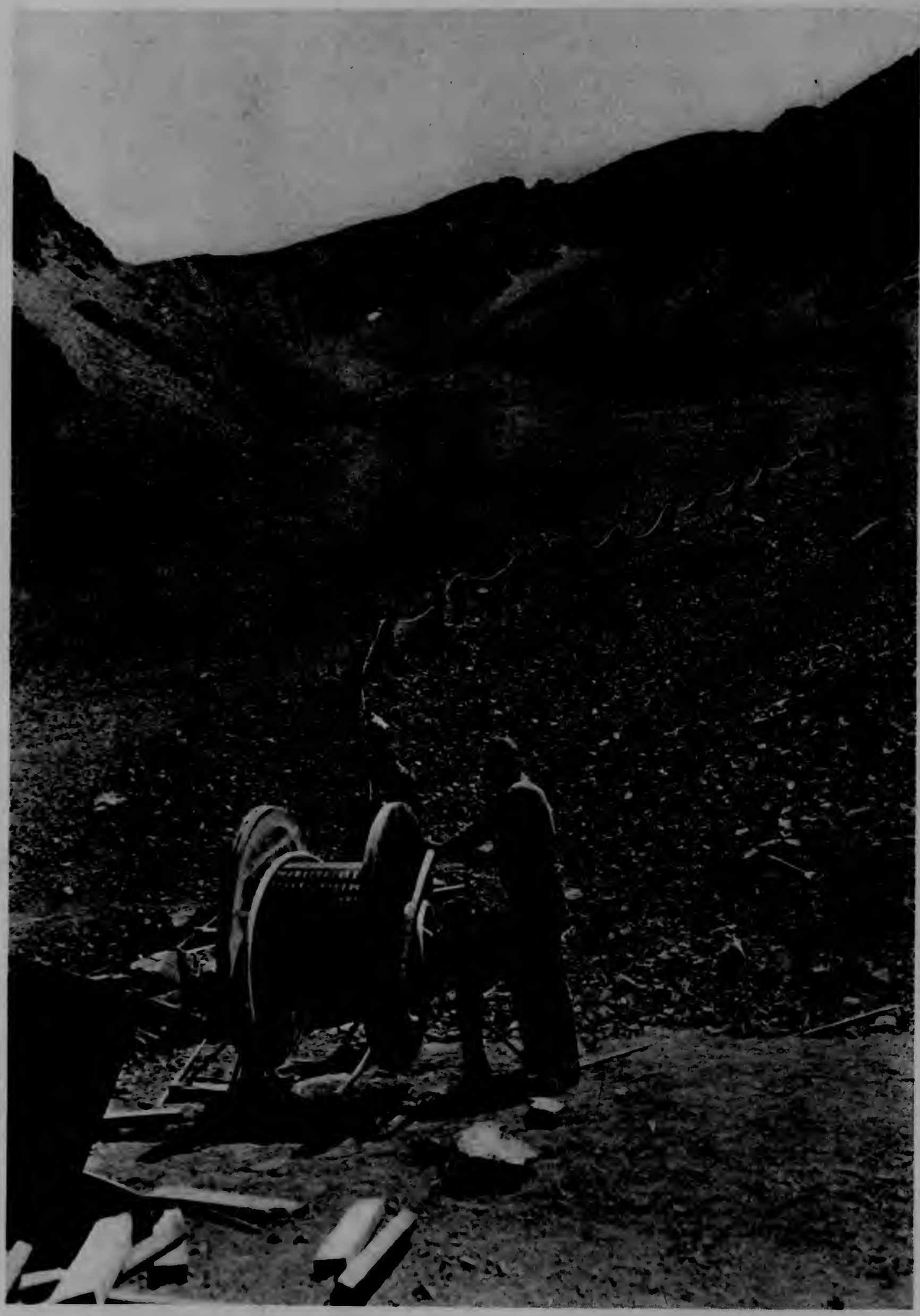

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UNWINDING A SECTION OF HEAVY CABLE FROM THE BIG SPOOL

Work here is being carried on at an elevation of 10,000 feet. In places the cable was carried nearly half a mile higher. Only men specially trained for mountain work could stand the severe physical strain of this activity.

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Retake of Preceding Frame

Colombia

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BOLETIN DE ARQVEOLOGIA

VOLUMEN I — MAYO - JUNIO

NUMERO 3 — BOGOTA - COLOMBIA — DE 1945

Director del Instituto Etnológico Nacional y del Servicio de Arqueología:
LUIS DUQUE GOMEZ

SUMARIO

Para canjes: Apartado Nacional 407. Teléfono Nº 637 Capitolio. Bogotá — Colombia

EL MUSEO ARQUEOLOGICO DE LA UNIVERSIDAD DEL CAUCA EN POPAYAN

POR HENRI LEHMANN

Las colecciones de que se compone este museo, son muy especializadas, pues provienen todas de una región que puede ser delimitada en el Norte por el Valle del Cauca y en el Sur por los límites con el Ecuador; es decir, comprenden el Suroeste de la República de Colombia, entre la Cordillera Oriental y la Costa del Pacífico. La más septentrional de las regiones representadas es la de Corinto, que administrativamente pertenece todavía al Departamento del Cauca, pero geográficamnte está en el Valle del Cauca. Las regiones más meridionales son los alrededores de Ipiales, al oriente de la altiplanicie de Túquerres, y las inmediaciones de Tumaco, en la Costa del Pacífico.

La mayoría de los objetos provienen de exploraciones y excavaciones personales; pero gran número de ellos han sido adquiridos, sea por compra, sea por donaciones. Muy pocos son los objetos cuyo origen es dudoso. Entre los adquiridos hay muchos que fueron comprados "al pie de la guaca", es decir, al guaquero que trabajó en lugares por donde hemos pasado. Si el origen de estos objetos no es dudoso, les falta, por desgracia, la descripción y las circunstancias del hallazgo. Los guaqueros en general no se dan el trabajo de distinguir entre objetos procedentes de guaca Nº 1, 2, 3, por ejemplo; conservan todos los objetos juntos; rara vez les es posible dar los detalles necesarios que permitan distinguir entre costumbres funerarias de tal o cual pueblo.

El museo fue fundado por nosotros a fines de 1942, bajo la rectoría del doctor Alfredo Caballero Escovar. Su sucesor, el doctor Antonio Lemos Guzmán, siguió con el mismo interés los esfuerzos que se hicieron para enriquecer las colecciones.

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Retake of Preceding Frame

Las colecciones de Tierradentro, registradas bajo los números 42.1 y 42.2 ya hacían parte de la Universidad del Cauca antes de mi llegada a ese Instituto. Las otras entraron al Museo entre diciembre de 1942 y febrero de 1945.

POBLACIONES EN EL SUROESTE COLOMBIANO ANTES DE LA LLEGADA DE LOS ESPAÑOLES

Los primeros cronistas que llegaron al país y que escribieron sobre estas regiones fueron Pedro Cieza de León y el Adelantado Pascual de Andagoya (1). Fueron ellos los que nos dejaron una descripción bastante buena sobre los indios que en el siglo XVI poblaban el Suroeste colombiano. Gracias a sus relatos podemos ubicar a los indios que hablaban la lengua de Popayán, lengua que se ha conservado hasta hoy entre los Guambiano, los Ambaló, los Totoró y unos pocos Polindara. Sus vecinos, por el Norte, fueron los indios del Valle del Cauca, que seguramente pertenecían a los Quimbaya, por lo menos los que vivían en las estribaciones de la Cordillera Central. Por el Sur, colindaron con los Quilla y los Quillacinga; estos últimos se extendieron hasta la región vecina de Pasto. Los Indios Patía formaban el puente entre los indios de Popayán (grupo Guambiano-Kokonuko) y los Quillacinga. Sus límites septentrionales en la Cordillera Occidental han sido probablemente las regiones llamadas Las Juntas por Cieza de León, que puede identificarse con la confluencia de la quebrada de Las Juntas con el río Jejenes, en el Municipio de El Tambo (Cauca). Puede ser que estos indios hayan pertenecido a los Quillacinga.

Las tribus orientales eran las de Tierradentro y de Moscopán. Es probable que ya en el momento de la Conquista la región de Moscopán estuviera despoblada. Los Indios de Tierradentro fueron los Páez, que todavía tienen su centro en los mismos parajes. Pero las industrias de los Páez actuales se distinguen tánto de las industrias encontradas en excavaciones, que surge el problema de si acaso no fueron tribus diferentes de las actuales las que poblaron Tierradentro antes de la llegada de los Páez.

En el Occidente encontramos tribus del grupo Guambiano-Kokonuko hasta la cima de la Cordillera Occidental. Son los Chisquío, probablemente los mismos "Cochesquio" de Cieza de León. En la vertiente de la Costa de la misma Cordillera vivían los Cholo, como hoy día, grupos pertenecientes a los Chocó, los cuales forman parte de la gran

familia lingüística Karib, según los últimos estudios de Paul Rivet (2). El Padre Marcelino de Castellví habla de especies de "kjökkenmöddings", montones de conchas, encontrados por el Padre Gómez en la región costera del Cauca, pertenecientes posiblemente a civilizaciones mucho más primitivas. Desgraciadamente no pudimos encontrar los vestigios de estos hallazgos, que han sido depositados en las colecciones del Seminario de Popayán.

LAS COLECCIONES DEL MUSEO ARQUEOLOGICO

1.—El Parque Arqueológico.

Seis esculturas de piedra se hallan en el gran patio de la Universidad, de las cuales la del centro es, sin duda ninguna, la más importante. Está registrada bajo el número 43.12.1. Fue excavada por nosotros en 1943, en trabajos arqueológicos realizados en la finca del señor Cosme Fernández, en La Candelaria (región de Moscopán). Representa el tipo más realista de todas las esculturas hasta ahora conocidas en Colombia y en América del Sur. Las proporciones muy típicas —una cabeza grande en comparación con el cuerpo entero— la clasifican entre el arte de San Agustín. El gran realismo de los detalles como los ojos, las mejillas, los labios, las manos y los pies, hace pensar que los indios figuraron en ella a un dignatario civil, cacique o cacica, más bien que a una divinidad. El vestido consiste en un taparrabo fijado al cuerpo por una huasca torcida (3).

Otra estatua, procedente del mismo lugar, pero encontrada en superficie, es la pequeña Nº 43.12.2., que se encuentra en la esquina derecha del patio. El hecho de que hubiera sido expuesta durante siglos a la intemperie del clima, explica su mala conservación.

Dos estatuas más provienen de la región de Moscopán. La que se encuentra colocada en el lado derecho del patio, detrás de la pequeña estatua de La Candelaria, proviene de la hoya del río Quebradón, del punto Yarumalito, donde la vimos en 1943. Está trabajada en un esquisto, lo que dificultó su ejecución. Representa un personaje humano vestido solamente con un taparrabo. La ejecución es bastante sumaria; sin embargo se destacan bien los diferentes rasgos. Parece que tiene colgado en la cadera un objeto redondo. Su mala conservación no permite distinguir detalles; pero no me parece imposible la hipótesis de que este objeto redondo pueda ser la figuración de una cabeza reducida. Sabemos que muchos pueblos indígenas hicieron sus guerras con

el único fin de hacer prisioneros para poder reducir sus cabezas, que colgaban de su cintura como cabezas-trofeos. Representaciones análogas se encuentran desde Costa Rica hasta el Perú. La estatua está registrada bajo el número 45.3.1.

La otra estatua es una de las más importantes que la estatuaria agustiniana nos ha dejado. Está trabajada en un andesita. Reúne rasgos antropomorfos y zoomorfos. Representa talvez una divinidad, pues las combinaciones hombre-animal son muy frecuentes en todas las culturas americanas. Quetzalcoatl, por ejemplo, el gran dios de los Toltecas, está figurado como serpiente de sonajas con plumas de ave quetzal y con cara humana. En San Agustín las representaciones del "segundo yo" tienen mezclados motivos humanos con motivos de animal. Nuestra estatua tiene nariz y boca de felino; desgraciadamente la boca está dañada, pero todavía se distinguen bien unas líneas horizontales, seguramente pertenecientes al bigote de un puma. Representaciones del puma son muy frecuentes en el arte peruano, ante todo en pintura sobre vasijas de Nazca. Los ojos, las orejas con zarcillos y la posición de los pies, son de un hombre, pero el pene bien desarrollado y los 4 dedos o uñas de los pies en vez de 5, son más bien zoomorfos. Hasta ahora es la primera representación conocida de este tipo en toda la estatuaria agustiniana. Está en el registro bajo el número 45.2.1.

La estatua de la esquina izquierda, registrada bajo el número 43.5.1. proviene de la hoya del río Cauca. Fue conservada durante largo tiempo en el caserío de El Rosario (municipio de Cajibío), de donde la llevaron a la Universidad. El estilo es muy distinto de las anteriormente descritas; más sencillo, las manos puestas sobre el vientre en ángulo recto, completamente desnudo con indicación del sexo. En la proporción también se distingue de las estatuas de San Agustín (4).

Del mismo tipo es el torso de un personaje masculino, procedente de Las Botas (Municipio de El Tambo). Le faltan la cabeza y las piernas; no obstante puede también apreciarse la alta calidad de la obra. Como en la estatua precedente, las dimensiones son alargadas, en comparación con las estatuas de Moscopán de tipo agustiniano. Está registrada bajo el número 43.10.6.

2.—El Museo.

Las colecciones se hallan en tres salones contiguos del segundo piso de la Universidad: dos salones para la colección pública y uno para la reserva, la sala de trabajo y el laboratorio.

La colección pública

Varias esculturas están en exhibición. Como en las del patio, se destacan claramente dos estilos: uno, el de Popayán y de la Cordillera Occidental, caracterizado por bloques de piedra sobre los cuales los detalles de las personas están esculpidos en relieve como sobre una columna. Los brazos están generalmente colocados sobre el vientre, en ángulo recto. De este tipo son los números 43.10.7. y 42.1. Aparecen decapitadas, sin duda por buscadores de oro. Al mismo grupo pertenecen el fragmento 43.4.1. del río Seguengue y la cabeza Nº 44.6.1., encontrada en los cimientos de la casa del doctor Castellanos, a proximidad de la Galería. Se caracteriza por la oreja en forma de media luna.

El otro estilo está representado por dos esculturas de Tierradentro (42.1.45 y 46) y dos de Moscopán-San José (43.6.1. y 2.). Entre estas últimas, de trabajo más rústico, una está esculpida en micaesquisto, la otra en contacto de roca eruptiva con el esquisto. Pero no obstante la diferencia del material —las dos esculturas de Tierradentro son de andesita—, estas cuatro pertenecen a una misma área de civilización y se distinguen, ante todo por sus proporciones, de los objetos antes examinados de la región de Popayán y de la hoya del río Cauca.

Una piedra de moler, Nº 43.6.3., demuestra el tipo más frecuente y conocido en toda la zona del maíz hasta los Estados Unidos. Es un elemento cultural de un gran número de tribus indígenas. Generalmente no tienen estas piedras decoración alguna; por eso la piedra Nº 44.9.21, encontrada en la región de El Carmen (Municipio de San Lorenzo, Nariño) y en la cual está esculpido un relieve, es sumamente rara. El animal representado con una cola larga y una cabeza doblada recuerda, con sus dos largas patas, un animal prehistórico. si es que no es la estilización de un tapir.

La primera vitrina contiene una pequeña sección antropológica, con unos cráneos encontrados en Tierradentro, El Tambo y Corinto. Varios de éstos tienen la deformación artificial del tipo tabular erecta de Imbelloni (5). Una gran urna encontrada en los alrededores inmediatos de esta ciudad, contiene los restos de un niño de 3 a 4 años; se encontró en una bóveda especialmente construída con este propósito. (43.7.1. y 2.). El entierro en urnas es muy frecuente en Colombia, especialmente en la hoya del río Magdalena. Más raro es el entierro de niños en urnas, sobre todo conocido entre los Diaguita (Argentina), donde se encontraron grandes cementerios para los niños. En Popayán es hasta ahora la única urna conocida de este género.

La industria de los indios Pubenés, que vivían en toda la región de Popayán, está representada por ollas con y sin grabados, torteros semiesféricos, hachas, anzuelos y algunas narigueras de oro o tumbaga. En el cementerio de El Chirimoyo, en la finca de La María, los Indios distinguían entre tumbas de hombres y tumbas de mujeres, pues nunca han sido encontrados elementos típicos de hombres, como hachas de piedra, mezclados con instrumentos típicos de mujeres, como torteros, con los cuales las indias suelen hilar sus fibras. Dos asientos de madera (Nº 44.7.1. y 2.), encontrados en tumbas, completan los elementos típicos de los antiguos habitantes de la región. El mismo tipo de banco trabajado en un solo tronco todavía se encuentra en casi la totalidad de las casas indígenas de los Guambiano, Totoró, Polindara y Páez.

La cerámica de Tierradentro se distingue por la sencillez de sus formas y la calidad de la arcilla. La loza de este tipo, que tiene su centro de divulgación de El Pedregal, es generalmente negra, de formas muy variables y a veces con decoración incisa. Muy frecuente es la vasija trípode, cuyo centro de repartición es San Agustín, Moscopán y Tierradentro, otro ejemplo del parentesco de estas tres regiones vecinas.

Otro tipo de la cerámica de Tierradentro son los fragmentos que fueron encontrados por Jorge Burg en el sepulcro 9 de la necrópolis de San Andrés, y que figuran bajo el número 42.1. (6). Estos fragmentos representan cabezas antropomorfas y zoomorfas, caras cuyo rostro demuestra un tatuaje a veces vertical, a veces horizontal; cabezas de felinos, serpientes y animales marinos; pedazos de ollas de formas muy distintas. Nunca han sido encontradas vasijas completas de este género, lo que hace suponer que los indios las quebraban antes de depositarlas en la tumba. La cerámica de Moscopán tiene mucha semejanza con la de Tierradentro, pero hasta ahora, en las pocas excavaciones que se han verificado allí, no se ha encontrado loza tan fina como la de Pedregal.

Dos vitrinas contienen objetos procedentes de la región del Patía. La mayor parte proviene de excavaciones hechas en la hoya del río Guachicono. Las grandes ollas tapaban en general la entrada a la bóveda y se encontraban en el fondo del pozo: la boca dentro de la bóveda, la panza y el asiento afuera. Estas piezas estaban pegadas con barro crudo contra la pared de entrada, en posición ligeramente diagonal, con el cuello inclinado hacia abajo. Es probable que esta posición tenga una significación simbólica. La decoración que aparece en varias ollas, es geométrica: motivos muy distintos, casi siempre en rojo sobre fondo claro o

en crema sobre fondo rojo. La cerámica del río Guachicono se destaca por sus pinturas, mientras la del Valle del Patía tiene decoración grabada. Entre la loza del Guachicono se distinguen dos tipos: uno muy fino y liviano (ejemplo Nº 44.4.35.) y otro más tosco y muy pesado (ejemplo Nº 44.4.12 y 23.). Ambos se hallan frecuentemente mezclados en la misma tumba. En la región del Valle del Patía y en la Cordillera Occidental, en las vertientes que bajan hacia el valle, no se ha encontrado sino un tipo pesado.

La cerámica del Patía forma un puente entre la cerámica de los indios de Popayán y la de los indios que vivían cerca de Pasto. Forma en cierto sentido una avanzada de estos indios, que probablemente pertenecían al grupo de los Quillacinga.

Del sitio de El Carmen (Municipio de San Lorenzo) provienen dos ollas globulares con decoración pintada (44.9.23 y 24.); tienen la misma forma que las ollas del río Guachicono. La región donde fueron encontradas, está situada entre La Unión y Taminango; se cree que hasta allí llegaban los Quillacinga (7).

La colección que proviene de Cuaspud (Municipio de Potosí, Nariño) fue comprada a un guaquero. Esta región está situada en las inmediaciones de Las Lajas cerca de la frontera con el Ecuador; ha sido y es todavía poblada por Indios Pastos. La colección se compone de unas 60 cerámicas, la mayor parte de una loza muy fina. El mismo estilo se encuentra en el Ecuador, en las provincias del Carchi, tanto en las formas como en la decoración. Una olla en forma de tortuga, pequeños patos en relieve, culebras y motivos geométricos en pintura, comprueba el alto sentido artístico de los que las trabajaron. La preferencia por los detalles, el gran número de animales que se encuentra en estas cerámicas, se deben seguramente a influencias procedentes del Sur, de las civilizaciones del Perú.

Muy distinto es el estilo de los objetos que provienen de la Costa del Pacífico, de la región de Tumaco. Gracias a la amabilidad del señor Max Seidel, rector del Colegio de esa ciudad, quien nos regaló una pequeña colección, el Museo Arqueológico posee algunos objetos de este tipo. La colección, registrada bajo el número 44.2., se compone en su mayor parte de pequeñas cabezas de barro, de tipos muy distintos. Mientras la influencia en las regiones de la montaña proviene del Sur, no hay duda que el movimiento de la Costa va en sentido opuesto. Estudiando atentamente estas piezas encontramos muchas semejanzas con cabezas de México y de regiones habitadas por los Maya. Muchas tie-

nen deformación artificial del cráneo. El mismo estilo se extiende en el Sur, por la Costa, hasta la región de Esmeraldas. No queda duda de que los Indios de la Costa estaban en constante intercambio comercial con los indios de Centro América. Puede ser que éstos hubieran llevado consigo algunas de estas cabezas, que se encuentran en gran número en toda la zona centroamericana y mexicana; puede ser también que se hubiera formado una industria local, influenciada por los aportes traídos desde el Norte. En general se han conservado solamente las cabezas; figuras enteras son bastante raras. Como parte de las regiones que influenciaron estas cerámicas están situadas sobre la Costa del Golfo de México, podemos suponer que los indios se servían del estrecho de Panamá para transitar del Atlántico al Pacífico.

La cerámica de Corinto está muy bien representada en el Museo. La misión llevada a cabo en 1943 trajo más de 350 objetos de la región. La cerámica pertenece a los dos tipos designados por Ford como "Quebrada Seca Complex" y "Río Bolo Complex" (9). Todas las piezas traídas del Salado y de la Hacienda de las Guacas pertenecen al "Quebrada Seca Complex". Los tipos más frecuentes son copas de pie, ollas globulares de pie, ollas globulares con asiento en punta, escudillas y platos con asiento abombado, pequeñas vasijas cilindroides de pie o con asiento abombado. La decoración es un relieve o un grabado. Muy frecuente es la utilización de la cara humana, cuyo desarrollo puede estudiarse en varios ejemplares que van de lo más realista hasta lo más estilizado. Ciertas escudillas tienen decoración geométrica, obtenida por grabados y engobes. Muy raras son las ollas del tipo "dos en una" y que no figuran en la colección Ford. Pertenecen seguramente al "Quebrada Seca Complex". El Museo posee tres vasijas de este tipo, dos copas de pie en las cuales está hundida una olla globular en posición diagonal (43.3.71 y 72) y una olla con asiento en punta, sobre la cual está superpuesta otra sin fondo, con estilización de la cara humana en relieve (43.3. 165). El tortero no tiene sino una sola forma, pero se distingue del tortero de los Pubenés. La cerámica de El Salado, fue comprada a un guaquero; la de Las Guacas, excavada, pero no se hallaba en posición original, pues las tumbas habían sido robadas, sin duda en época de la Colonia. Eso explica también el que muchas piezas se encuentren quebradas.

Las excavaciones realizadas en el "Alto de la Quebrada de las Guacas" (Potrero Kanas) y en la "Capilla del Río Negro" hicieron aparecer una cerámica distinta, sin duda perteneciente al "Río Bolo Com-

plex". Es de tamaño reducido y se caracteriza por un gran número de pequeñas asas. En ninguna de las tumbas del potrero Kanas o de la Capilla del Río Negro han sido encontrados objetos de oro, lo que probablemente es una característica de esta civilización, pues el oro se encuentra frecuentemente en tumbas del "Quebrada Seca Complex".

Las tumbas de la región de Corinto son muy ricas en cerámicas; generalmente se encuentran unos 15 objetos en cada bóveda, pero han sido excavadas hasta 300 cerámicas en una sola tumba. Varios cadáveres están colocados en la misma bóveda. Durante las excavaciones en la Capilla del Río Negro se encontró una olla con osamenta incinerada (43.3.216), tipo del segundo entierro, y dos con decoración grabada, que contenían un líquido que, analizado en el Laboratorio del Profesor Cuatrecasas en Cali, resultó ser agua. Otra olla (43.3.187 y 191), servía sin duda para ser cargada; tiene dos pequeñas asas perforadas, simétricas y correspondientes a la misma altura dos pequeñas protuberancias con incisiones en forma de canales. El tamaño relativamente reducido de la olla hace pensar que se trata de un modelo (43.3.211).

La colección de estudio

Esta colección se halla en un salón que sirve al mismo tiempo de sala de trabajo. Está colocada en estantes y clasificada según las civilizaciones, y, dentro de las civilizaciones, según los tipos. Se compone de series repetidas que no hay necesidad de mostrar en su totalidad en la colección pública, pero que son importantes para el estudio de la repartición de los elementos culturales. Encontramos aquí los mismos tipos que en la colección pública, cerámicas de la región de Popayán, de Tierradentro, de Corinto, del Patía y de Cuaspud, para no citar sino las más importantes.

En el mismo salón se preparan también las colecciones que entran al Museo. Aquí se limpian los objetos, se numeran y registran; se reparan, si llegan rotos; aquí se hace el catálogo (10).

En la numeración se sigue el sistema recomendado por el Instituto Etnológico de París. Cada objeto tiene tres números en cifras arábigas, el primero correspondiente al año durante el cual entró al museo; el segundo es el número de la colección en su año determinado y el tercero es el de orden en la misma. 44.4.35, quiere decir que el objeto con este número es el 35 de la cuarta colección que entró al Museo Ar-

queológico en 1944. Los mismos números figuran en el registro y en el catálogo. El registro es un libro, en el cual figuran todos los objetos desde que entraron al museo, con una descripción muy sumaria. El catálogo se hace sobre fichas. Cada ficha de catálogo se compone de 10 puntos, así como en el Musée de l'Home de París. El Nº 1 indica el lugar de donde viene el objeto. Se comienza por lo más general y se termina por lo detallado. El 2 dice lo que es el objeto. El 3 da una descripción muy detallada con todas las medidas necesarias. El 4 indica el uso, la fabricación, todos los detalles técnicos. El 5 da el nombre de la tribu que fabricó el objeto y, si posible, el nombre de la persona. Este último se aplica casi exclusivamente para objetos de factura reciente. El 6 indica la persona que lo encontró. Los números 7 a 10 son ante todo de importancia interna. El 7 describe cómo entró el objeto al museo. El 8 da la referencia fotográfica, en caso de que un negativo del objeto exista en el museo. El 9 indica el lugar, en dónde ha sido mostrado fuéra del museo, en una exposición, etc., por ejemplo. El 10 hace la bibliografía y menciona todas las publicaciones en donde éste aparece.

COLECCIONES DEL MUSEO ARQUEOLOGICO

42.1. Misión Jorge Burg. Objetos de Tierradentro. 1936 (44 objetos).
42.2. Colección Ricaurte Hurtado y José Vidal. Objetos de Tierradentro. 1939 (35 objetos).
42.3. Colección Gonzalo Lemos Velasco. Objetos de Tumaco. 1940. (7 objetos).
42.4. Colección Julio Montenegro. Estatua de Seguengue. (1 objeto).
42.5. Donación Alva Negret. Cerámica de Corinto. (1 objeto).
43.1. Colección José María Carvajal. Patenas de cobre de El Troje, cerca a Timbío. (20 objetos).
43.2. Misión Henri Lehmann. Excavaciones en la loma de El Chirimoyo, Popayán —Los Sauces— Finca de La María. (39 objetos).
43.3. Misión Henri Lehmann a la región de Corinto. (61 objetos).
43.4. Donación Eduardo Lorsch. Objetos de la región de Corinto. (17 objetos).
43.5. Colección Museo Arqueológico. Estatua del río Cauca, Rosario. (1 objeto).
43.6. Misión Henri Lehmann a Moscopán. (3 objetos).
43.7. Excavación Henri Lehmann de un cementerio indígena. Popayán. Loma de la fábrica de licores. (5 objetos).
43.8. Donación Ismael Velasco. Hacha de Puelenje. (1 objeto).
43.9. Donación Manuel Mosquera. Cerámica de la vega del río Guachicono. (26 objetos).
43.10. Excavación Henri Lehmann en la región de El Tambo. (7 objetos).
43.11. Colección Benjamín Iragorri Díez. Cerámica de Ispala —Puracé—. (3 objetos).

43.12. Misión Henri Lehmann a Moscopán. Estatua de piedra. (2 objetos).
44.1. Donación H. L. Cerámica de la región de Popayán. (3 objetos).
44.2. Colección Max Seidel. Cerámica de la región de Tumaco. (55 objetos).
44.3. Colección Pablo Emilio Echeverri. Cerámica de la hoya del río Plata. El Congreso. Moscopán. (36 objetos).

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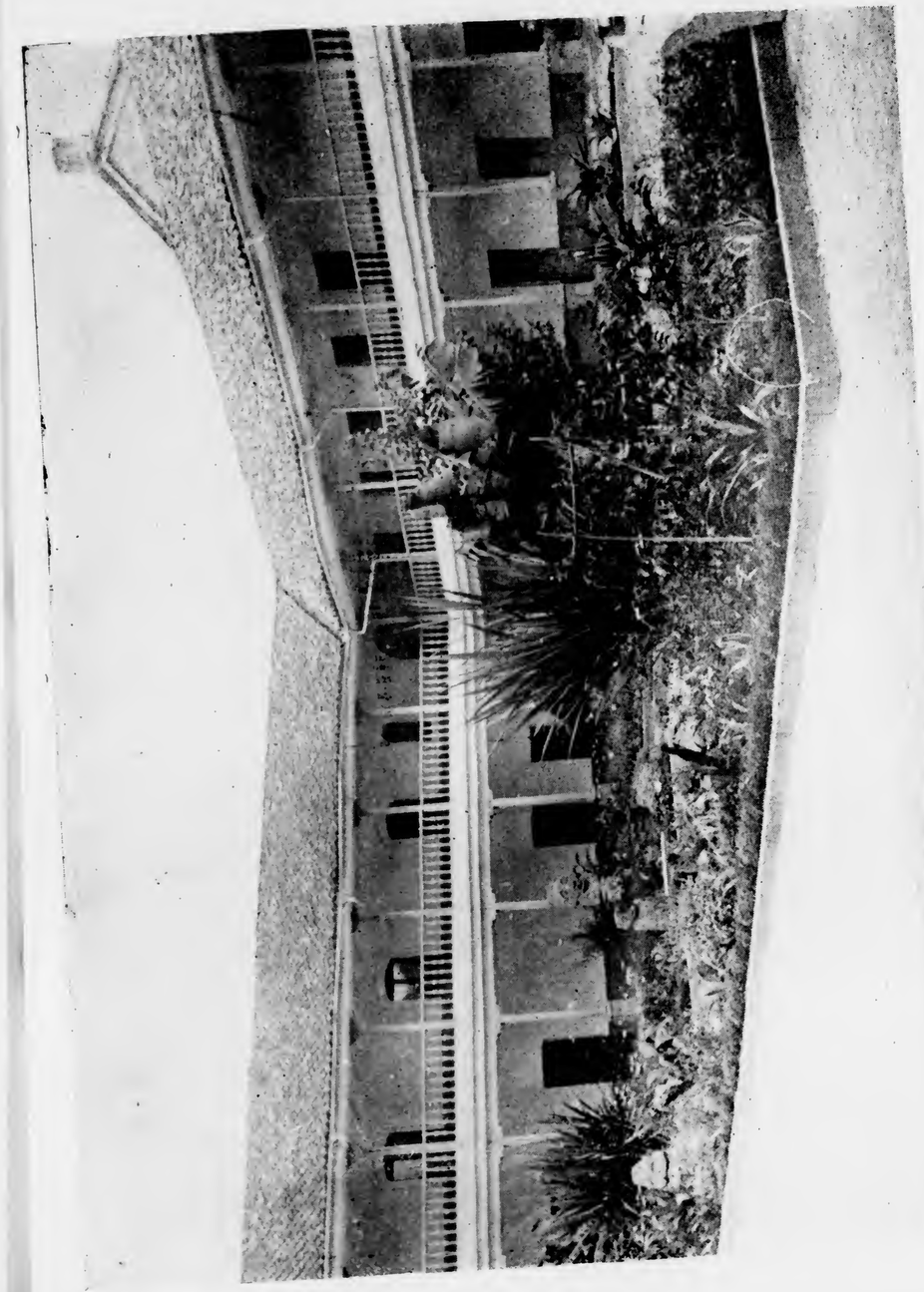
LAMINA I

Parque Arqueológico de la Universidad del Cauca
Foto, J. C. Cubillos

LAMINA I



Parque Arqueológico de la Universidad del Cauca
Foto. J. C. Cubillos

Retake of Preceding Frame

Estatua de Moscopán (Cauca)

Foto. J. C. Cubillos

Estatua de Moscopán (Cauca)

Foto. J. C. Cubillos

73. RADIATIONS OF THE CULTURE OF SAN AGUSTIN (COLOMBIA) IN AMERICA

TH. PREUSS

The excavations of the ancient site of San Agustin, near the source of the Magdalena have been completed and indicate important relations not only along the Pacific coast to Mexico and Southern Peru, but also towards the East to the mouth of the Rio Trombeta in the Amazon basin. Because of the number and variety of the large statues and the circumstance that altars or temples have been found superimposed upon others, we may conclude that many centuries must have passed before the culture developed, which had already reached its close at the time of the presence of the Spaniards in 1538. We may also conclude distinct individuality and great antiquity from the archaic architecture of the Temples, the monolithic sarcophagi with covers, the like of which have been found only in the culture of Chavin in Northern Peru, and from the primitive ceramics. Above all the representations of a second head, for the most part with a serpent body on the head and back of the column-like figures, bear a close resemblance to figures found near Lake Nicaragua, to the Maya and ancient Mexico, to the culture of Chavin, and to the paintings of cat-like demons with human or serpent bodies on vessels from Nasca, and to little stone figures from the middle Amazon.

A figure with hanging head was found near Lake Nicaragua. A Moon Goddess—the form of a crouching jaguar,—recalls the so-called "earth toad" of the Mexicans. Figures of Sun Gods with vertical frames about the face, one with two clubs in the hand, are related to the relief on the Monolith Raimondi from Chavin, and to the principal relief in the Sun gate at Tiahuanaco. A figure projecting from the mouth of a human form corresponds with a vessel with figures which also belongs to the Chavin culture. In this culture belong also demons of the Chimu culture. Canine teeth projecting upwards and downwards are found in most of the statues of St. Agustin. Striking also is the three-stepped ornament on the head of several figures from St. Agustin which appears also on the head of a stone figure from Peru. Other designs, for example on fragments of clay figures and in ceramics, point to the Cauca valley and Ecuador. Finally might be mentioned the relationship of concepts which can be shown between certain notable statues from St. Agustin and texts which I have recorded from the Uitoto. These concern the representation of the origin of the new crescent moon and the "Second Self" as the Uitoto call it.

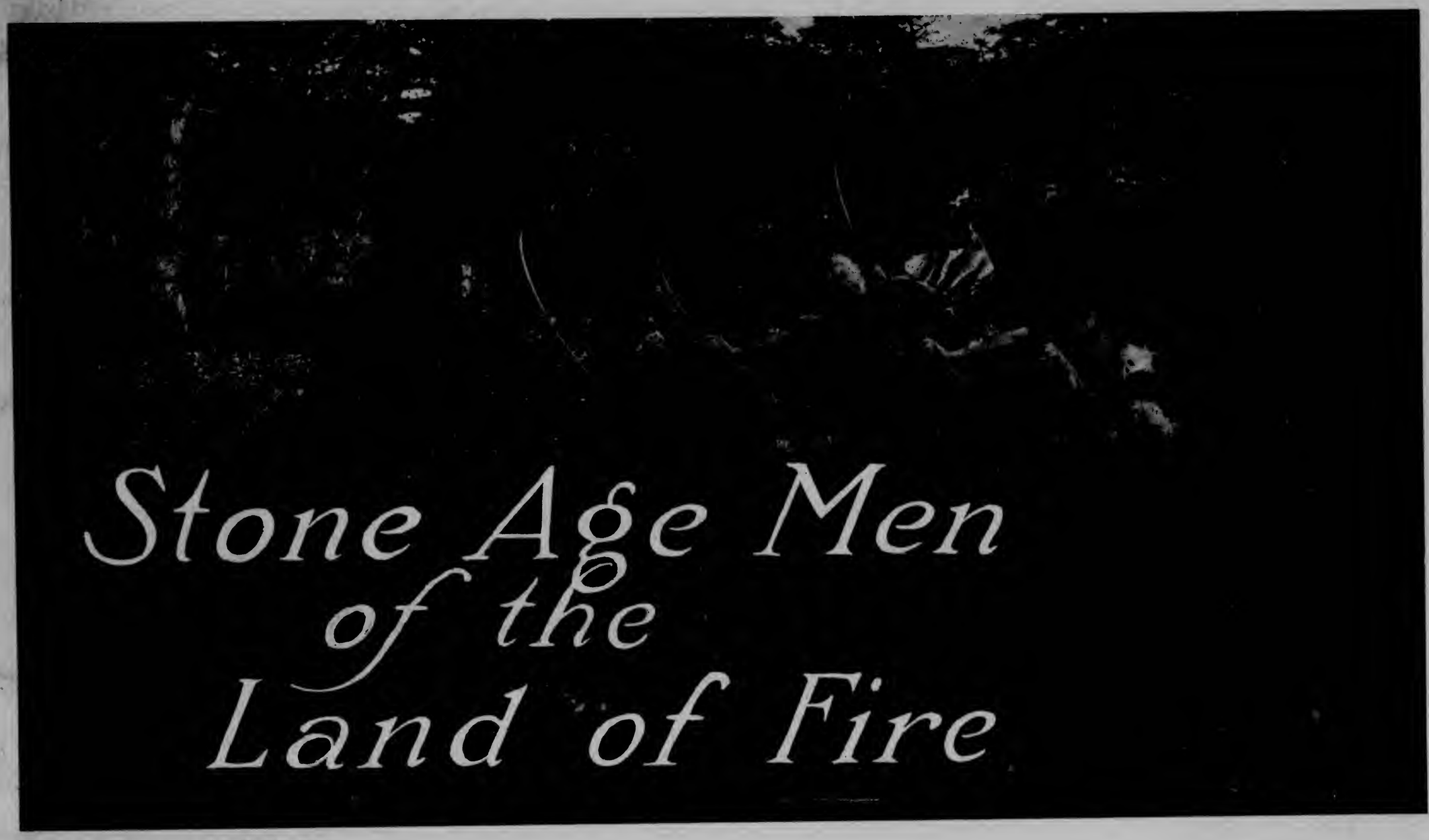
Tierra del Fuego

72/56

TRAVEL

REGISTERED IN U. S. PATENT OFFICE

VOLUME XXV OCTOBER, 1915 NUMBER 6



Stone Age Men of the Land of Fire

Ona Indians at home in the forests

LIFE AMONG THE PRIMITIVE INDIANS OF TIERRA-DEL-FUEGO—A PEOPLE STILL IN THE STONE AGE IN THEIR ARTS AND CRAFTS

CHARLES WELLINGTON FURLONG, F.R.G.S.

Photographs by permission of the Author

IN this time when millions of men of the great civilized nations of the world are springing at one another's throats and devastating the precious up-build of centuries of thought and progress; when the veneer of paternal regulations and effete conventionalities of a certain artificialdom is rubbed off and crude primitive barbarism shellaced with certain methods and form is rampant, we may indeed wonder what great biological forces move men to such savagery.

From the germinal idea resulting from the simple sustaining of life, by looking and finding, to later selecting and classifying and knowing more intimately about those things, have developed the natural sciences and later their application to life, involving a complexity which we now know as modern progress—civilization. In this development we have the mental growth which has enabled man to improve his weapons of warfare and has brought about tremendous changes since the times of the picking up of "sticks and stones" to throw to "break your bones" to the present day of the Krupp gun and the mitrailleuse which rend human anatomies asunder—finesse, indeed.

We may well question, "What is civilization?" and turn for comparison to man as he lived in pristine days. To see him as such it is not necessary to go back in imagination over the long reach of ages. We have but to shape our course to the regions of the Horn to find men living to-day in the Stone Age.

In the time of Magellan and for over two hundred years after, the entire region south of the Strait of Magellan was known as Tierra-del-Fuégo, Land of Fire, being considered by many as the northern extremity of another continent still further south. Of the few adventurous mariners who made attempts to pass the Strait or round "The Horn," still fewer ventured to deviate from these two routes to explore the indented coasts of Tierra-del-Fuégo. But eventually Tierra-del-Fuégo was found to be a vast and intricate archipelago composed of in-

They display marvelous skill with the long bow

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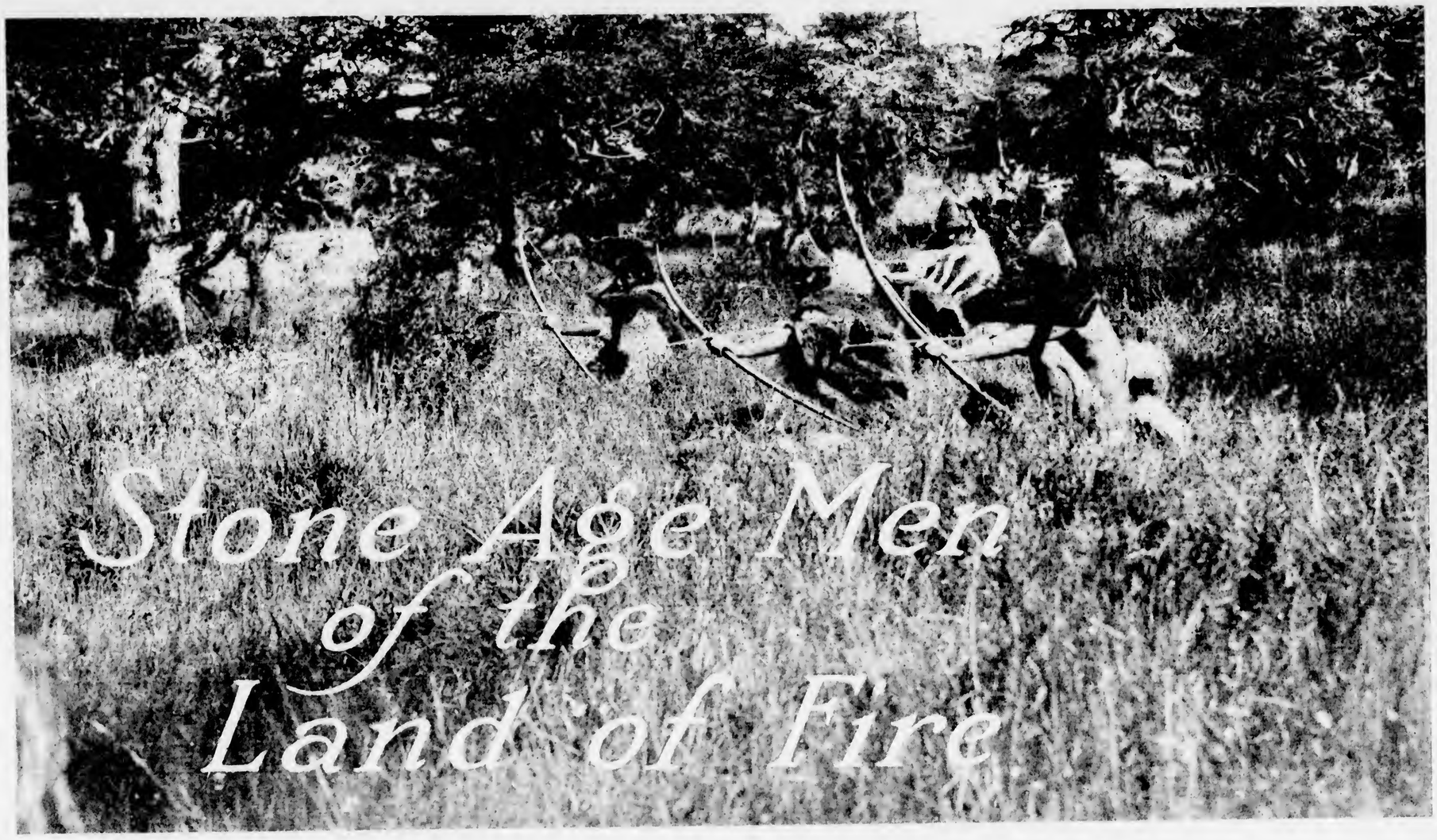

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numerable islands terminating two hundred miles further south in Cape Horn, and so to-day it is known as the Fuégian archipelago, the largest island as Tierra-del-Fuégo.

The Yahgan or Canoe Indians inhabit the channelways from the southern coast of Tierra-del-Fuégo to Cape Horn. Their no less interesting primitive neighbors, the Onas, foot Indians, inhabit the dense forests of the island of Tierra-del-Fuégo.

To speak of Tierra-del-Fuégo as "The Cold Land of Fire" may seem a somewhat paradoxical appellation, but here in a corresponding latitude to central Labrador (between 52° 29′ and 54° 58′ south) is a large triangular-shaped island, as large as New Hampshire and Vermont. Here is a sub-Anarctic climate where grains do not ripen and where even in its northern part only the hardiest bulbous vegetables can be counted on to stand the frosts. This condition is not due so much to extreme cold or length of winter as to lack of heat in summer, for even in December, which is the Fuégian midsummer, gales

A WRESTLING MATCH AMONG THE ONAS

Their primitive games have all an element of savagery. Sometimes they wrestle for sport, but more frequently it is a battle to the death, by jerking a man's head forward and at the same time crushing him to the earth with a blow on the chest with the knee. This display of strength is not surprising when one considers that few Onas are under five feet nine inches in height and correspondingly powerful

of sleet and snow are often of daily occurrence, and the winds are the most bitter cold of any I have experienced.

The northern half of Tierra-del-Fuégo is a more or less open, undulating country with a few ranges of low mountains and patched with copse-like areas of woodlands. The southern half is a rugged, mountainous country where the southern Andes send their pinnacled snow-crowned shafts into the clouds and shunt great glaciers down the valleyways and into the channels and inlets of the indented coast. Except on the extreme western storm-beaten end of the island, the lowland mountain slopes and valleys are clothed with a thick, wet verdure of forests and covering of ferns, mosses and shrubs which spring from the reeking wetness of decayed vegetation and boggy soil, due to the tremendous rainfall. In many places the forests are so dense and the bog so treacherous that it is impassable to anyone but Ona Indians, and in some places even to them.

But this difference between the northern and southern half of their island has probably saved them from extinction, for the northern open lands upon which thousands of *guanaco* (a large wild llama) which gives the Ona his food and material for covering and shelter, roamed and fed in countless numbers, proved equally good land for sheep. Then came the sheep rancher. The Ona, with his primitive bow and arrows, could not stand before the modern repeating firearms of the white man; then, too, he found that the "white guanaco," as he called the sheep, were easier to catch and more tasteful to the palate than the wild guanaco. Consequently he stole the sheep from the men who had first stolen his land. He raided the range by night, and one rancher told me that once Onas drove off an entire flock of many hundreds of newly shorn sheep, drowning many in a cold mountain torrent, the dead serving as a bridge over which the surviving sheep were driven. After taking them far up the mountain valleys, they were slaughtered and weighted down with rocks in the glacial mountain streams and thus preserved for future wants.

Then began a warfare in which the white man sought the Onas' extermination and well-mounted rangers rode the ranges and were paid a bounty on every head and every bow they brought in. Then the Onas retreated permanently to the deep forest lands of the southern half of their island, where the white man dared not follow, from which they made occasional sallies. Now here dwells the remnant of this primitive and unconquered people which in less than thirty years have shrunk from perhaps three thousand to three hundred, and all because they possessed land the white man coveted for his sheep and had an inborn courage and ferocity strong enough to oppose him. Thus it will be seen that, by reason of the character of the southern half of his island, the Ona has been saved from extinction.

So bitter has been the feud that little attention has been given to studying the life of these people, and I was warned both at Punta Arenas and even by an occasional settler on the coast of Tierra-del-Fuégo that it was not possible to pass through the heart of Tierra-del-Fuégo—the Onas were cannibals, they used poisoned arrows, they would shoot from ambush without being seen, and, besides, it was impossible for a white man to find his way. Such were the none too reassuring comments proffered me.

But I went, entering from the far south instead of from the white man's country and traveled from the start with none but Onas for my companions, and lived, hunted, traveled and slept in their wigwams in the heart of the great Fuégian forests. Had I entered from the northern frontier or entered the domain of certain other Onas unfriendly to those I was with, some of the aforementioned predictions

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In the hollow of the left arm, when on the march, they carry a long bow and a quiver of sea-otter skin or seal, filled with arrows. When in action, however, either hunting or fighting, they let the skin fall from their bodies. Their marksmanship is remarkably accurate, and at forty yards they will pierce an object the size of a hat three times out of five and fire with wonderful rapidity, occasionally being able to launch three arrows in flight before the first has struck.

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The men begin from early boyhood to practice with the bow and arrows and to learn the arts of the chase. At about fourteen they go through a long initiation, lasting a year or more, during which the Ona boys are kept from any association with the camp and live away in a wigwam under the surveillance of a man or two. They undergo tremendous handships and are sent long distances into the deep forests and across treacherous bog lands in rain and snow and bitter cold to hunt alone with a guanaco-hound only for a companion. Even when at last they bring down their quarry and drag the dead weight of a heavy guanaco through the forest tangle over rocky crag and miry swamp, they must leave it at last on the outskirts of the camp, afterwards partaking of a scant portion of the leanest and toughest parts. The men try to scare them in the night, waking them from sleep and in other ways harden them against fear and fatigue. Under such a training it is not strange that in the Onas we have a powerful, fighting, courageous people.

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A TYPICAL GROUP OF ONAS

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Retake of Preceding Frame

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also fish in pools when the tide is out, to find birds' eggs and gather mussels, fungi and berries for food. They soon acquire the art of primitive cooking. As with the Yahgans (canoe Indians) to the south and the Tehuelches (Patagonians) to the north, they roast meat from a stick stuck obliquely into the ground, inclining over the fire, while mussels and shellfish are generally roasted in the shells.

Their life, as is that of any people, is tremendously influenced by the land in which they live and its products, and, as in the case of the Onas, not only determines their character and mode of life, but is responsible for their survival against aggressive enemies. The possibility of growing grains, cotton and flax, and maintaining herds of domestic, wool-bearing animals, mitigates the necessity of roving, develops settled communities and agriculture, and this enables them to spin, to weave and to develop industries. In a country in which metals abound and are easily attainable, the arts and crafts, involving metal working and manufacture, advance. The art and science of fire-making and the use of heat is developed and applied, and perhaps through the use and observance of fire and its results more than to any other element of nature, man has added to his comforts and his scientific knowledge. By it he achieves force to drive his tremendous vehicles of transportation on land and sea, warms his body and cooks his food, extracts and transforms otherwise unworkable substances into things pliable and moldable, and changes chemical constituents. Through its agency he is enabled to see at night and to even indulge in the pyrotechnics of fireworks for his visual stimulation of pleasure and so on, ad infinitum. Not a race of the human family has been found without some knowledge of the use of fire and at least a primitive way of producing it.

They obtain fire by striking flint against a kind of iron stone which they have told me was obtained from one particular mountain in the interior to the west. They strike the spark into a dried fungus or moss from which some wood scrapings are ignited and the fire started. Their fires when in camp are carefully watched and not permitted to entirely die out over night.

One unique use to which fire is put by them is in the making of arrows. The heads are sometimes of flint, but more often of glass secured from wrecks of vessels bound round "The Horn." They are winged with the feathers of upland geese and the shafts are made of yellow caliphate wood. These shafts before being finished have to be straightened, so the Ona, selecting a certain kind of sandstone, heats this in his fire and then straightens and rubs down the shaft by running it back and forth in long grooves, which are soon worn into the stone, meantime flexing and bending the shaft as he straightens and dries it out through the agency of heat.

The Onas, like the Yahgans, too, have no chiefs, but they have their magicians or medicine people, whom they call *'j'oh'n*. Their main method of curing sickness is by making horrible sounds and shaking and squeezing the poor patient, considering that by so doing they force the evil thing out of the sick one's body, and Onas have told me that they have seen a *'j'oh'n* take a kitten, mouse and an arrow head out. This method naturally is often followed by disastrous consequences.

The Onas are split up into family groups and clans and consider certain territory their own, resenting fiercely the intrusion of other clans, mainly on account of the great dearth of food supply through the decimating of the great herds of guanaco by the sheep ranchers to prevent their feeding on the grass of the open sheep lands in northern half of the island.

These people are undoubtedly as primitive as any people in the world, still living in the Stone Age, yet they have many noble as well as ferocious characteristics, but in the extreme prove themselves more barbaric than the unscrupulous white man who has shot them on sight and poisoned their food supply, the blubber of stranded whale. So it is little to be wondered at that these people resent intrusion of white men into their domain.

Scarcity of food forces upon them a nomadic existence, although the various clans have certain recognized places of rendezvous, where at times a hundred or so may be gathered together in a certain vicinity. On the march practically all their possessions are rolled up into the guanaco skin tents and carried on the backs of the women. The baby is often added a heavy burden, ensconced in a fold of the mother's guanaco skin cloak, high at the back of her neck. The men carry only their weapons and a guanaco skin food bag worn about their necks, for it is most essential that in the thick forests in particular the men are not encumbered with camp luggage in order that they may be in constant readiness to hunt or to fight.

The author digging for Ona skeletons—not for gold, as one might suppose at first glance—on the bleak shores of Tierra-del-Fuego

Mount Sarmiento, the queen mountain of Fuegia. This peak, rising over 7000 feet, has never been ascended and is rarely seen as clearly as here, for most of the year it is clouded in fog and mist

During my expedition through the heart of the island an immense meteor fell to earth one night, illuminating the heavens over Tierra-del-Fuégo for many miles. Some Onas told me they heard a tremendous report, but, at any rate, the Onas rushed from their wigwams at the remarkable phenomenon, for such a light. of the heavens in this far away land must have been most weird and strange to these primitive people, whose only portable light at night is a crude torch formed of a number of long pieces of bark from the Antarctic beech, held together in the hand. These pieces are previously thoroughly dried and often partially scorched in the fires in order to make them easily inflammable. It is a weird sight to see their big figures wrapped in their guanaco skins traveling at night through the forest or scaling the precipitous cliffs of the coasts in search of roosting sea birds by the light of their torches. Sometimes these are used in their ceremonies, in some of which they disguise themselves in hideous skin masks and paint their bodies white.

Ona warriors are trained from boyhood in the use of the bow, which is their sole weapon

How long these interesting but little known people will survive is a question. When the guanacos are all killed off they will be forced to make further raids on the white men's sheep or live in subjugated contact with him and take from him his ills, his rum, his clothes; and so, when eventually he forsakes his mountain and forest fastnesses to either continue his feud with the white man or go to him in peace, the contact will be fatal to his survival.

Even those who have passed through the Strait of Magellan have little conception of the grandeur, desolation, danger and cold of these labyrinthian channelways which flow and swirl through that maze of mountain islands known as the Fuégian Archipelago, lying to the south of the Strait of Magellan and terminating in Cape Horn; for these travelers go comfortably housed. Their huge craft, driven by that powerful energy—steam—is independent of wind and current. When these travelers are slightly chilled by the cold blasts which rip and tear down upon them they can seek the leeward side of their floating palace or the comfortable temperature of a temperate climate which every modern liner carries about with it, made possible by a single man's thoughtful observance of a boiling kettle of water.

Throughout this entire archipelago a neighboring race of the Onas, known as Canoe Indians, once paddled their canoes, but since the growth of the Strait settlement known as Punta Arenas (Sandy Point), whose development was made possible by steam navigation, these Indians, following the habits of all aborigines, shrunk back and away from the blighting wedge of civilization. And when one knows this region first hand, studies and experiences it as nearly as possible from the viewpoint, mental and physical, of these Canoe Indians, one cannot but marvel at the persistence and success with which they have conquered their environment.

The name Tierra-del-Fuego, or Land of Fire, is in a sense a misnomer, for the country has the same relative latitude as Labrador

For me, it is not a region of first impressions, but a region of continuous impressions. Great mountains, one of which, Mt. Sarmiento, towers to the height of 7,000 feet, rose sheer and precipitous from narrow channelways through which I cruised. On the western and southern edges of the Archipelago, where the mountainous islands are exposed to the lashing fury of the Pacific and Antarctic respectively, their great massive sides of granite and greenstone have been carved by the fury of the gales, while in other parts their mountainous sides are clothed with a thick verdure, in many places impenetrable and reeking with moisture. This melts down from the perpetual snows of snow-crowned peaks or sifts through the forest leaves to the dank, soggy wetness of mosses and ferns which lie beneath their forest coverings. Over these mountains terrific storms constantly sweep the cold moisture-laden winds of the Antarctic, where they are condensed into mists, fogs, rain, hail and snow, brought down in small cyclones known as *williwaws*, are often things of the hour. The only sign one sometimes gets of an approaching williwaw is the falling trees high up on the mountain side, which go down like ninepins before it, and *"Qien sabe?"* (Who knows?), as they say down there, where it may strike the water, which it then picks up and whirls in a veritable whirlpool of spray along its surface. When I have been cruising in a small cutter or in canoes it was only with the utmost alertness and judgment that williwaws could be dodged, particularly when there were perhaps a half dozen or more within a radius of two miles.

A striking photograph of an Ona chieftain. Physical perfection and courage are their chief characteristics

Though these mountainous islands are thickly wooded, there are only four kinds of trees, two of which are beeches. On land there is a great dearth of food, for besides scurvy grass, wild celery, sweet mucilaginous fungi, there is only a limited number of tasteless, undersized berries. At certain times of the year and in many places not even these things can be found. The Yahgans depend mainly upon sea food, such as mussels, whale blubber, seal and sea birds, as well as birds' eggs, which they often obtain at great risk from the rookeries on the barren islands of the Archipelago. Thus, to obtain food, the Yahgans have naturally followed the paths of least resistance, the channels themselves, and have, perforce, become Canoe Indians.

This habitual living in canoes, exposed constantly to storm, danger and starvation, and spending the greater part of their lives squatting on their haunches at their paddles, have stunted the lower half of their bodies, caused them to walk with a waddle, and to often be most unprepossessing in appearance. This is emphasized by their being clothed scantily, their dark, keen eyes peering out from their Mongol cast of features partly overhung by lank, wet strands of black hair. It was undoubtedly this unprepossessing aspect which at first prejudiced Darwin against their mental attributes.

also fish in pools when the tide is out, to find birds' eggs and gather mussels, fungi and berries for food. They soon acquire the art of primitive cooking. As with the Yahgans (canoe Indians) to the south and the Tehuelches (Patagonians) to the north, they roast meat from a stick stuck obliquely into the ground, inclining over the fire, while mussels and shellfish are generally roasted in the shells.

Their life, as is that of any people, is tremendously influenced by the land in which they live and its products, and, as in the case of the Onas, not only determines their character and mode of life, but is responsible for their survival against aggressive enemies. The possibility of growing grains, cotton and flax, and maintaining herds of domestic, wool-bearing animals, mitigates the necessity of roving, develops settled communities and agriculture, and this enables them to spin, to weave and to develop industries. In a country in which metals abound and are easily attainable, the arts and crafts, involving metal working and manufacture, advance. The art and science of fire-making and the use of heat is developed and applied, and perhaps through the use and observance of fire and its results more than to any other element of nature, man has added to his comforts and his scientific knowledge. By it he achieves force to drive his tremendous vehicles of transportation on land and sea, warms his body and cooks his food, extracts and transforms otherwise unworkable substances into things pliable and moldable, and changes chemical constituents. Through its agency he is enabled to see at night and to even indulge in the pyrotechnics of fireworks for his visual stimulation of pleasure and so on, ad infinitum. Not a race of the human family has been found without some knowledge of the use of fire and at least a primitive way of producing it.

They obtain fire by striking flint against a kind of iron stone which they have told me was obtained from one particular mountain in the interior to the west. They strike the spark into a dried fungus or moss from which some wood scrapings are ignited and the fire started. Their fires when in camp are carefully watched and not permitted to entirely die out over night.

One unique use to which fire is put by them is in the making of arrows. The heads are sometimes of flint, but more often of glass secured from wrecks of vessels bound round "The Horn." They are winged with the feathers of upland geese and the shafts are made of yellow caliphate wood. These shafts before being finished have to be straightened, so the Ona, selecting a certain kind of sandstone, heats this in his fire and then straightens and rubs down the shaft by running it back and forth in long grooves, which are soon worn into the stone, meantime flexing and bending the shaft as he straightens and dries it out through the agency of heat.

The Onas, like the Yahgans, too, have no chiefs, but they have their magicians or medicine people, whom they call *'j'oh'n*. Their main method of curing sickness is by making horrible sounds and shaking and squeezing the poor patient, considering that by so doing they force the evil thing out of the sick one's body, and Onas have told me that they have seen a *'j'oh'n* take a kitten, mouse and an arrow head out. This method naturally is often followed by disastrous consequences.

The Onas are split up into family groups and clans and consider certain territory their own, resenting fiercely the intrusion of other clans, mainly on account of the great dearth of food supply through the decimating of the great herds of guanaco by the sheep ranch- to prevent their feeding on the grass of the open sheep lands in northern half of the island.

These people are undoubtedly as primitive as any people in t world, still living in the Stone Age, yet they have many noble as w as ferocious characteristics, but in the extreme prove themselves more barbaric than the unscrupulous white man who has shot th on sight and poisoned their food supply, the blubber of strand whale. So it is little to be wondered at that these people resent intrusion of white men into their domain.

Scarcity of food forces upon them a nomadic existence, altho the various clans have certain recognized places of rendezvous, w at times a hundred or so may be gathered together in a certain v ity. On the march pra ally all their possession rolled up into the gu skin tents and carried backs of the women. T is often added a heavy ensconced in a fold mother's guanaco skin at the back of her neck. men carry only their ons and a guanaco ski bag worn about their for it is most essentia in the thick forests in ticular the men are not cumbered with camp lugga in order that they may b constant readiness to hun to fight.

During my expediti through the heart of island an immense met fell to earth one night, il minating the heavens Tierra-del-Fuégo for ma miles. Some Onas told they heard a tremendous port, but, at any rate, Onas rushed from their w wams at the remarkable p nomenon, for such a light of the heavens in this fa away land must have bee most weird and strange t these primitive people, whos only portable light at nigh is a crude torch formed of number of long pieces bark from the Antarcti beech, held together in th hand. These pieces are pre viously thoroughly dried an often partially scorched the fires in order to mak them easily inflammable. It is a weird sight to see their big figure wrapped in their guanaco skins traveling at night through the forest or scaling the precipitous cliffs of the coasts in search of roostin sea birds by the light of their torches. Sometimes these are used i their ceremonies, in some of which they disguise themselves in hid ous skin masks and paint their bodies white.

The author digging for Ona skeletons—not for gold, as one might suppose at first glance—on the bleak shores of Tierra-del-Fuego

Mount Sarmiento, the queen mountain of Fuegia. This peak, rising over 7000 feet, has never been ascended and is rarely seen as clearly as here, for most of the year it is clouded in fog and mist

Ona warriors are trained from boyhood in the use of the bow, which is their sole weapon

How long these interesting but little known people will survive is a question. When the guanacos are all killed off they will be forced to make further raids on the white men's sheep or live in subjugated contact with him and take from him his ills, his rum, his clothes; and so, when eventually he forsakes his mountain and forest fastnesses to either continue his feud with the white man or go to him in peace, the contact will be fatal to his survival.

Even those who have passed through the Strait of Magellan have little conception of the grandeur, desolation and spending the greater part of their lives squatting on their haunches at their paddles, have stunted the lower half of their bodies, caused them to walk with a waddle, and to often be most unprepossessing in appearance. This is emphasized by their being clothed scantily, their dark, keen eyes peering out from their Mongol cast of features partly overhung by lank, wet strands of black hair. It was undoubtedly this unprepossessing aspect which at first prejudiced Darwin against their mental attributes.

A striking photograph of an Ona chieftain. Physical perfection and courage are their chief characteristics

sides are clothed with a thick verdure, in many places impenetrable and reeking with moisture. This melts down from the perpetual snows of snow-crowned peaks or sifts through the forest leaves to the dank, soggy wetness of mosses and ferns which lie beneath their forest coverings. Over these mountains terrific storms constantly sweep the cold moisture-laden winds of the Antarctic, where they are condensed into mists, fogs, rain, hail and snow, brought down in small cyclones known as *williwaws*, are often things of the hour. The only sign one sometimes gets of an approaching williwaw is the falling trees high up on the mountain side, which go down like ninepins before it, and *"Qien sabe?"* (Who knows?), as they say down there, where it may strike the water, which it then picks up and whirls in a veritable whirlpool of spray along its surface. When I have been cruising in a small cutter or in canoes it was only with the utmost alertness and judgment that williwaws could be dodged, particularly when there were perhaps a half dozen or more within a radius of two miles.

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danger and cold of these labyrinthian channelways which flow wirl through that maze of mountain islands known as the Fué- Archipelago, lying to the south of the Strait of Magellan and ating in Cape Horn; for these travelers go comfortably housed. ir huge craft, driven by that powerful energy—steam—is independ- t of wind and current. When these elers are slightly chilled by the cold ts which rip and tear down upon n they can seek the leeward side of r floating palace or the comfortable perature of a temperate climate ch every modern liner carries about n it, made possible by a single man's ughtful observance of a boiling kettle water.

Throughout this entire archipelago a ghboring race of the Onas, known as noe Indians, once paddled their ca- s, but since the growth of the Strait lement known as Punta Arenas ndy Point), whose development was le possible by steam navigation, these dians, following the habits of all abor- ines, shrunk back and away from the tering wedge of civilization. And hen one knows this region first hand, ees and experiences it as nearly as pos- ble from the viewpoint, mental and hysical, of these Canoe Indians, one annot but marvel at the persistence and ccess with which they have conquered heir environment.

For me, it is not a region of first impressions, but a region of con- nuous impressions. Great mountains, one of which, Mt. Sarmiento, owers to the height of 7,000 feet, rose sheer and precipitous from arrow channelways through which I cruised. On the western and uthern edges of the Archipelago, where the mountainous islands re exposed to the lashing fury of the Pacific and Antarctic respec- ared by the fury of the gales, while in other parts their mountainous

The name Tierra-del-Fuego, or Land of Fire, is in a sense a misnomer, for the country has the same relative latitude as Labrador

Retake of Preceding Frame

SCIENCE NEWS--DEC. 1928

47. THE PROBLEM OF ANCIENT CULTURAL RELATIONS BETWEEN THE MOST SOUTHERN PART OF SOUTH AMERICA AND SOUTHEASTERN AUSTRALIA

WILHELM KOPPERS

Researches concerning the cultural relations between the Old and New Worlds have been diligently pursued during the last decade. Ordinarily the elements of higher and richer cultures are involved. For these relationships transmission over a sea route may, at least in most cases, well be assumed.

But we have also to deal with relations of an older and more primitive kind. Graebner already saw a common basis in old Australian and Tierra del Fuegian culture. Only the land route over Bering Straits can be considered as the presumable path of travel for these traits. The question here involved is a methodological one and of fundamental importance for ethnology as a historical science.

The course of the investigation is clear. First, what correspondences can be seen in the cultures of Tierra del Fuego and ancient South Australia; second, how are we to interpret these correspondences and similarities.

Correspondences exist in industry, family, society, and in isolated traits, especially in a peculiar form of adolescent rites for both sexes.

The principal criteria of form and quantity are strengthened by subsidiary criteria of position.

Differences between the two regions are by no means lacking but there yet remains a relatively strong common basis.

Conclusions arrived at ethnologically are strengthened by anthropometric and linguistic data.

The common basis of old Australian and Tierra del Fuegian culture requires a single point of origin somewhere in southern or southeastern Asia. Related traits (adolescent rites) among the Andaman pygmies. Further relationships in recent times in North Central California, which, according to Kroeber, Schmidt and others, show a resemblance to Tierra del Fuego that cannot possibly be the result of mere chance.

The results are not without meaning in regard to content. But the methodological value is still greater. The historical (Graebnerian) method is by no means an unrestricted, unsystematic comparison. On the contrary, each step which one would take must be carefully considered.

Travel and Emigration.

ARMS AND CUSTOMS OF ANCIENT AND UNCIVILIZED PEOPLES—NO. 9.

Peoples of Lower South America.

The Fuegians, inhabitants of a rugged and sterile land which lies so near to the Southern pole that even in the middle of Summer its cold will freeze to death an unprotected visitor, present the unpleasant picture of a race of human beings of apparently no intellect, no physical excellence, no ambition, and not even sagacity or energy sufficient to avail themselves of the scanty advantages afforded by their rude surroundings.

Even in the midst of the snows of Winter—and Winter is severe in Tierra Del Fuego—the natives of this barren land wear no clothing, except a strip of skin less than two feet in width, which they shift from one side of the body to the other, according to the direction of the wind. Why they are not frozen is a mystery. Yet a naked Fuegian mother, holding her young child to her bosom, from which the infant is separated by a sifting drift of snow, displays no signs of concern for either herself or child.

Of houses, the Fuegian has none, his nearest approach to a domicile being a rude hut covered with reeds and skins, and excavated to a depth of perhaps two feet below the level of the ground. In this hut he keeps a fire; and indeed at all his hunting camps, and even in his canoe while fishing, he has alight a flame whereat he may warm himself or half cook the food which he is never reluctant to devour.

Fig. 1—FUEGIAN PORTRAITS.

If this depraved being so chose, he could with ease provide himself with the clothing and with the comforts derived from the chase by other savages, even worse situated than himself; for his country, though too desolate to invite agriculture, or even to support many of the larger wild animals, is abundantly frequented by seals and sea lions; occasional foxes are to be found; and of the domesticated dog he has great numbers. If he saw fit, he could clothe himself warmly as an Esquimaux; and he has nearly equal need with the Esquimaux for warm clothing. But he is too apathetic, too listless and stupid to do that, and prefers to endure, rather than to mitigate.

The effect of this manner of life is seen in his stunted, stooped, and almost dwarfed body, his thin limbs, and, if

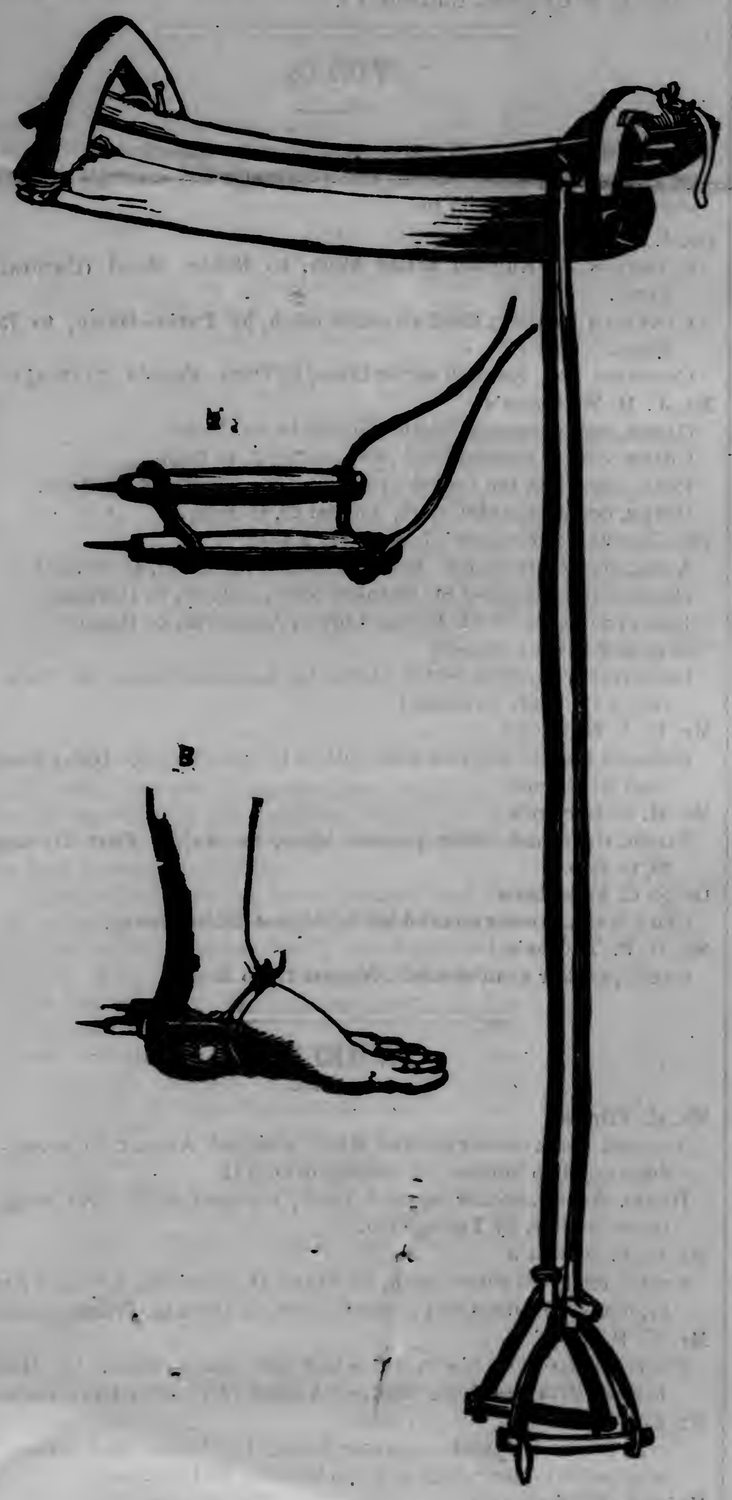

Fig. 2—HORSE ACCOUTREMENTS.

we do not misplace cause for effect, in his vacant, dull, spiritless and repulsive countenance.

The average height of the male Fuegian is not above five feet; that of the women is somewhat less. In color they are of a copper-brown, partaking of something of the reddish hue of the North American Indian. Their hair they do not cut, except to saw off, with the rough edge of a shell, the ragged ends which fall into their eyes.

The Fuegian is low in all his nature. He is not fond of war, and has no idea of military prowess or glory; but he is treacherous and quarrelsome. At hunting he is no expert; but at fishing he cannot be excelled in his own methods. He uses the net and spear usually; he has no fish hooks, but will by careful use of his baited line, lure a fish to the top of the water, allow it to bite, and then with a dextrous movement catch it in his hand as he jerks it above the water.

He depends for food largely upon the shell-fish which abound upon those shores; and also, to some extent, upon the eggs of birds. Great numbers of water-fowl haunt the coast, and these he sometimes trains his dogs to catch, or destroys by means of stones, which he can fling with most wonderful force and accuracy. To increase this force, the Fuegian very often employs a sling, made of hide and sinews, and is in fact rarely seen without one upon his person. In its use he is most proficient.

Beside this weapon, he has the spear, usually about ten feet long, with a head of bone, and a shaft which, instead of being round, is octagonal. He also uses the bow, tipping his arrows loosely with a bit of flint or other stones, which is left in the wound upon the withdrawal of the shaft.

If we should seek an example of the frequent contradictions which Nature delights in putting in juxtaposition upon the face of the earth, we need but cross the Magellan Strait, hardly a stone's throw in width in places, and step into the land of Patagonia.

Here is a race of men of the most prodigious stature almost of any known upon the earth, and in that respect as much above the average of Caucasians as the Fuegians are below it. The Patagonian, if not really twelve or even eight feet in height, as different accounts of early voyages have made him, is doubtless six or seven feet on an average, with many instances of a height very much greater than that.

In color the Patagonian is of a coppery red, when clean, which is rarely. His face is large, his jaws broad and

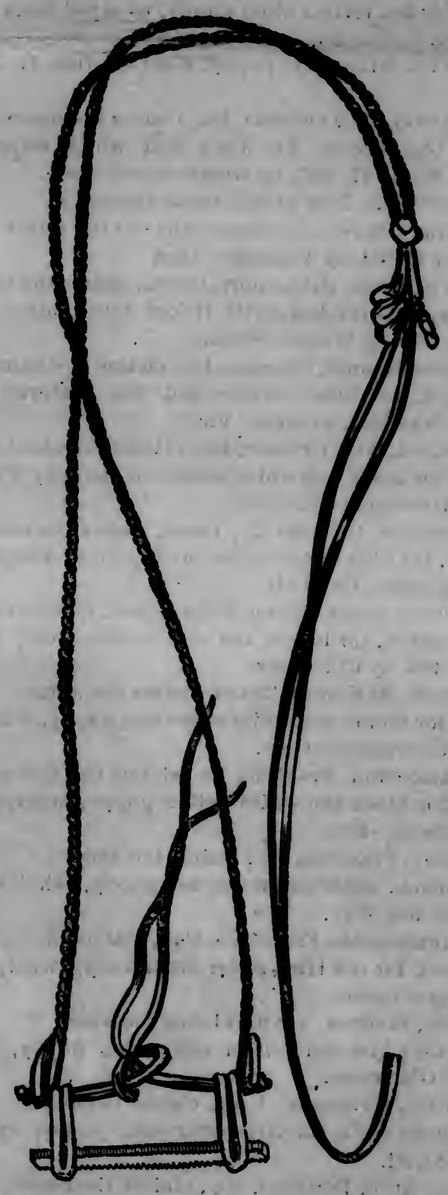

Fig. 3—PATAGONIAN BRIDLE.

heavy, and his whole expression coarse, enduring and strong. The hair, which in both sexes is black, coarse, and very long, is uncut, and unconfined except by a narrow band or fillet of plaited hide or hair. Unlike his naked neighbor, the Fuegian, he is well clad in a long mantle of skin, which comes nearly to his heels; under this he wears a small apron; and upon his feet he wears a kind of boot, or gaiter, from which the forward part of the foot quite projects—he being the first savage yet seen who wears a protection to the leg in one piece with the foot covering.

Although the horse was introduced into this country by the Spaniards, it has so multiplied in its native condition upon these plains as to abound in large herds. So that the Patagonian, who seems to have considerable enterprise in his disposition, may be called a mounted savage. Indeed, much of his life is spent upon horseback; and much of his ingenuity is lavished upon the accoutrements and trappings of his horse. In *Fig.* 2 are shown the Patagonian saddle, stirrup, and spur, and in *Fig.* 3, the bit and bridle. It will be seen that his saddle resembles that made by our North American mounted tribes; and that in the matter of working leather, or raw-hide, the Southern savage even surpasses his red brother of our plains. Although not very graceful, the Patagonian is a bold and fearless rider, and employs the horse upon all journeys, upon the chase, and in his raids against other tribes.

Throughout Patagonia, the guanaco (a small variety of the llama, with long, shaggy coat), is very plentiful; and upon this animal the Patagonian is quite dependent for the luxuries and even the necessities of his daily life. He lives largely upon his flesh, clothes himself from its skin, and also uses the hide for the different purposes embraced in the manufacture of his equipments, his utensils, or his weapons.

These weapons are unique of themselves, and altogether different from any that have yet come before our notice. But we should say rather, weapon; for aside from the long spear which he occasionally uses at close quarters upon the chase, the Patagonian has but one weapon, and one which well indicates the strength, energy and rugged force of his disposition. This is the one called the "bolas," or balls, consisting simply of two, or more often three, hide-covered balls of stone, iron or copper (sometimes one ball is made of wood), attached to each other by strong thongs of leather, five or six feet in length These balls weigh each nearly a pound and a half; so that the total weight indicates a weapon of a most formidable nature.

The construction of the bolas is well shown in *Fig.* 4, and the manner of use is self-evident. Grasping the thongs at their point of connection, the Patagonian (usually mounted and at full speed) whirls the bolas swiftly about his head, and dispatches them with tremendous force at the object of his aim. Still wildly extended and whirling as they fly, should any portion of their flying circle strike an obstacle, at once with lightning-like rapidity, the balls twist about the centre thus formed, and with a combination of the lasso, the slung-shot, and the anaconda-hug at once smite, entangle, and

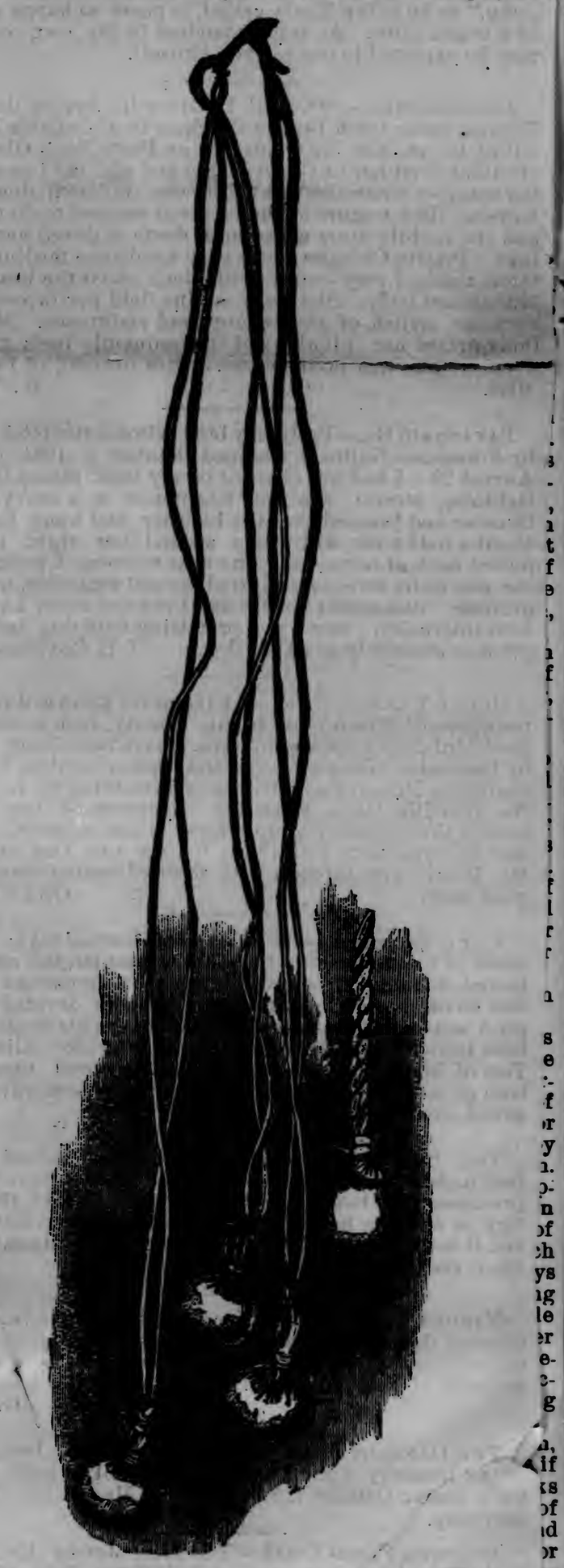

Fig. 4—PATAGONIAN BOLAS.

embrace, at the instant of their contact. A man's skull has a small chance of escape if his neck be touched by one of these gyrating thongs; and laying aside the force of the blow itself, the grip of the coiling hide is such as to some-

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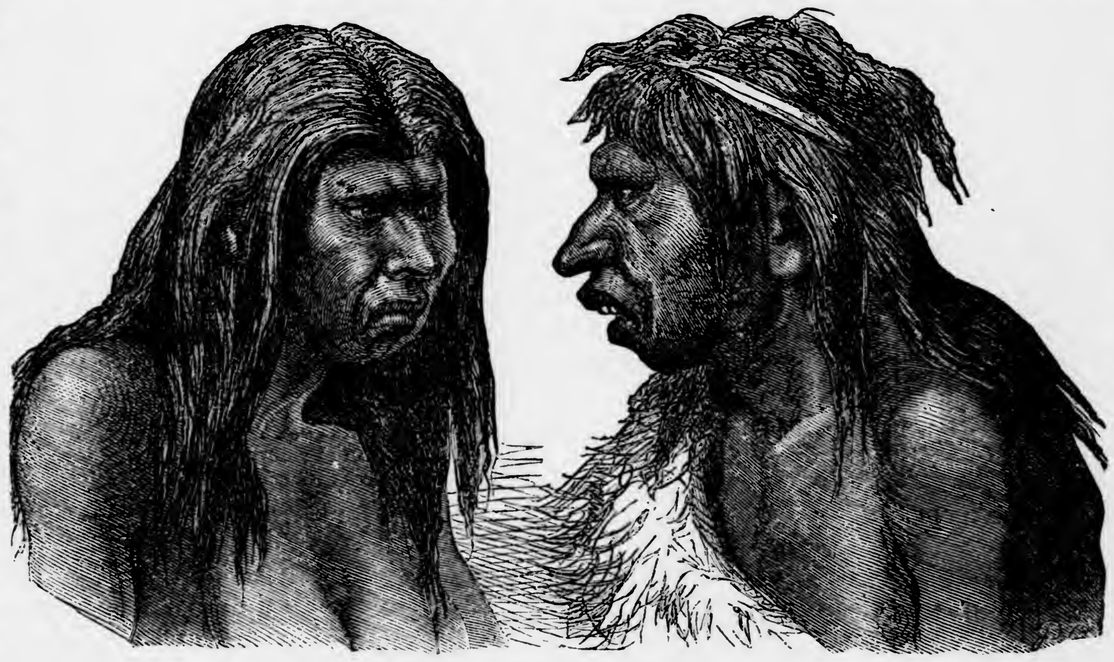

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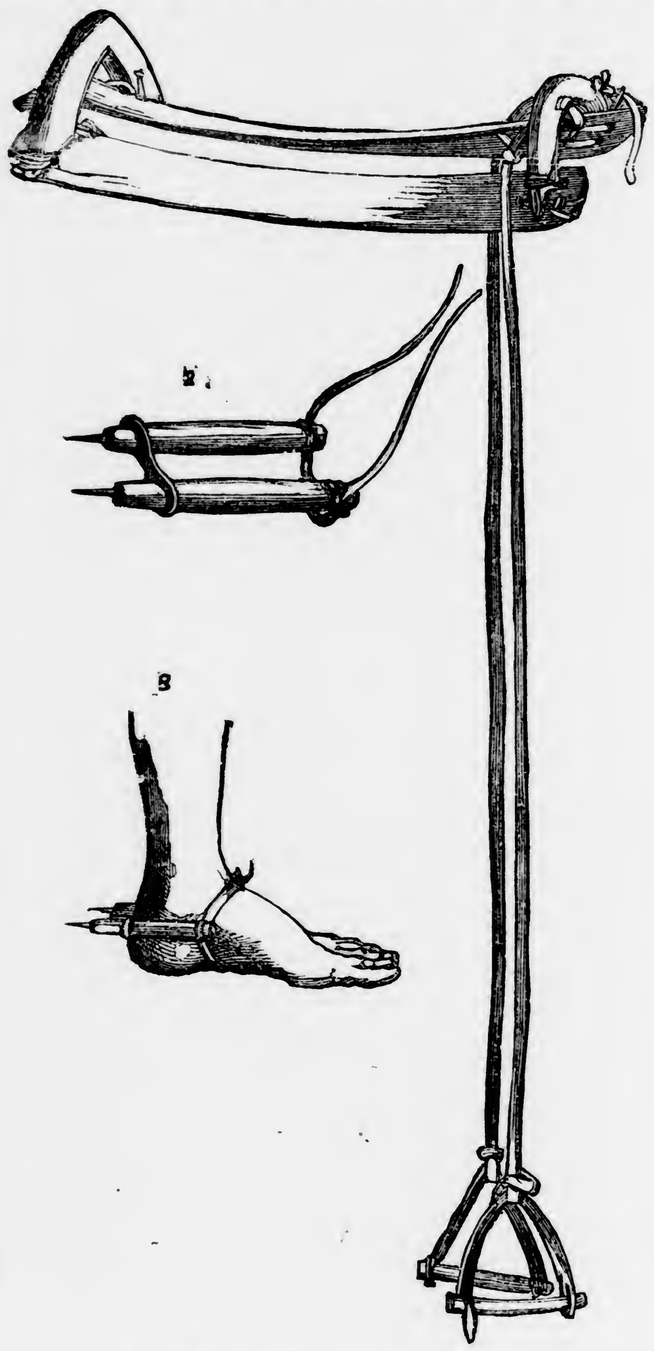

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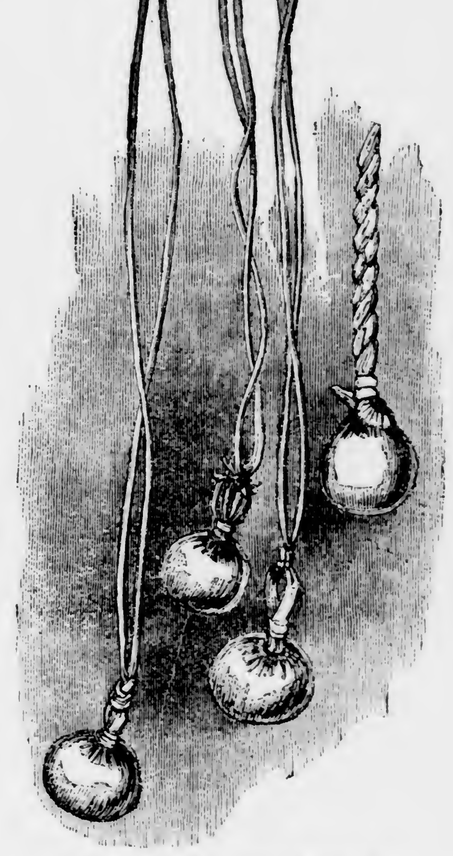

Fig. 4—PATAGONIAN BOLAS.

embrace, at the instant of their contact. A man's skull has small chance of escape if his neck be touched by one of these gyrating thongs; and laying aside the force of the blow itself, the grip of the coiling hide is such as to some-

times cut into the skin and flesh of the victim. Thus armed, and mounted upon his small, but agile horse, which he rides confidently, though inserting only his great toe into the tiny triangular stirrup, the hunter dashes into a herd of guanacos, and does not fail to bring down such number as he chooses.

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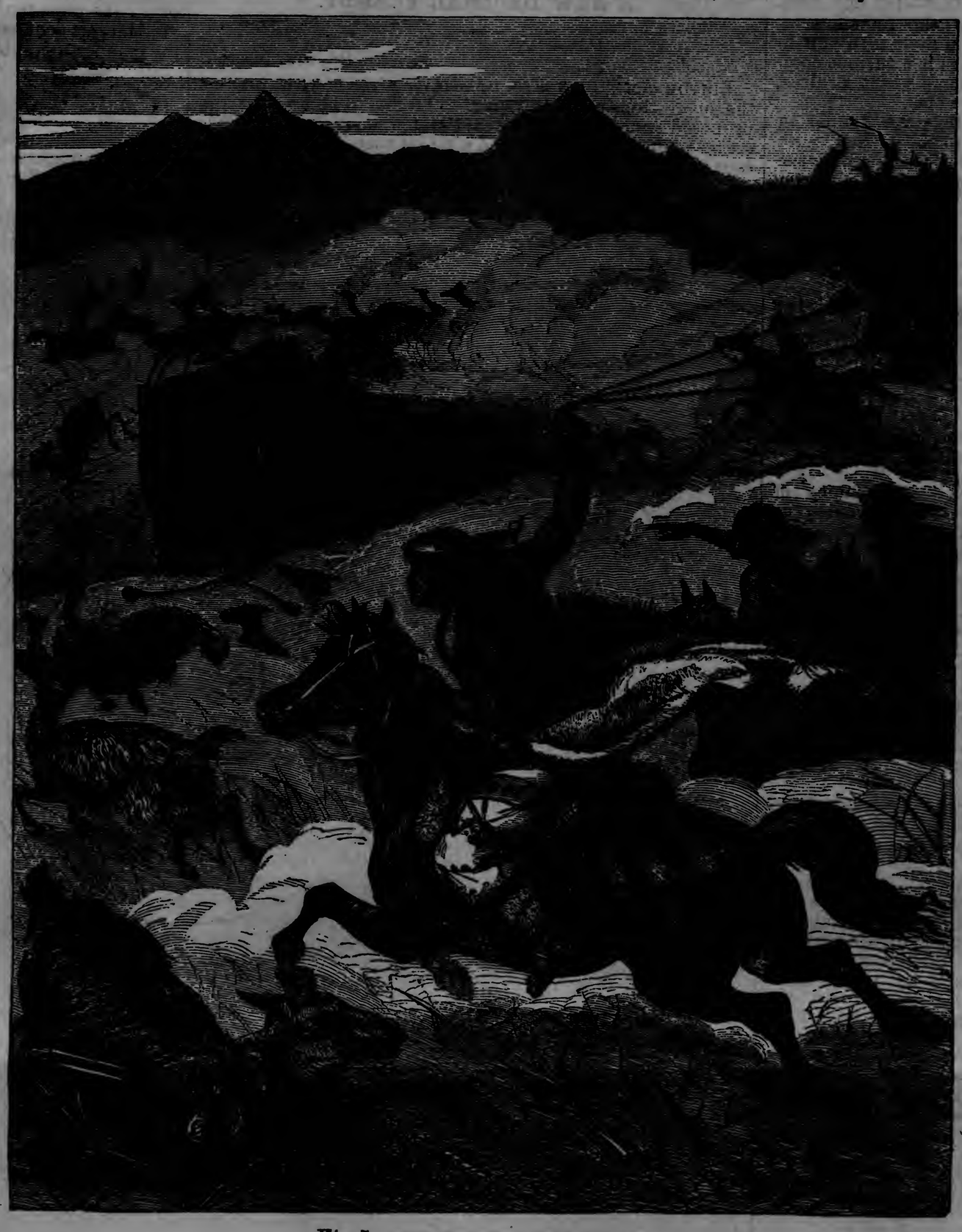

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Let us consider the raiment of almost any well-clad gentleman who of almost any cold and rainy day steps from the street-car of almost any city. This gentleman, if he should be suddenly smitten by death, and have no further need for his clothing, would be found, by those who disrobed him, to be possessed of an inventory somewhat like the following: One umbrella, one rubber coat, one hat, one hat-cover, one overcoat, one coat, one waist-coat, one pair of trousers, one pair of shoes, one pair of over-shoes, seven articles for underwear and their adjustments, one collar, one pair of cuffs, one pair of cuff-buttons, one pair of small cuff-buttons, one pair of cuff-adjusters, two collar-buttons, two studs, one scarf, one scarf-pin, one watch, one chain, one seal, one pair of gloves, one handkerchief, one pair of ear-muffs, one wire contrivance to hold the scarf down in front, one ditto to hold it down behind. Of buttons upon his garments he has well-nigh two dozen; and in his pockets, of which he must have a full dozen, he perhaps—if he has been trained in a hotel or boarding house—carries a whole arsenal of toilet articles, and if he be very young, possibly a small mirror. If he be an American, he, of course, carries also a bowie-knife and a very large revolver; and if he be an Englishman, he wears a pocket pistol.

Thus it will be seen that we shall find, upon the person of an ordinary gentleman, scarcely less than fifty articles of dress. And if he comes away from home in the morning, and leaves behind him any one or two of these, he is subjected to an inconvenience for the day.

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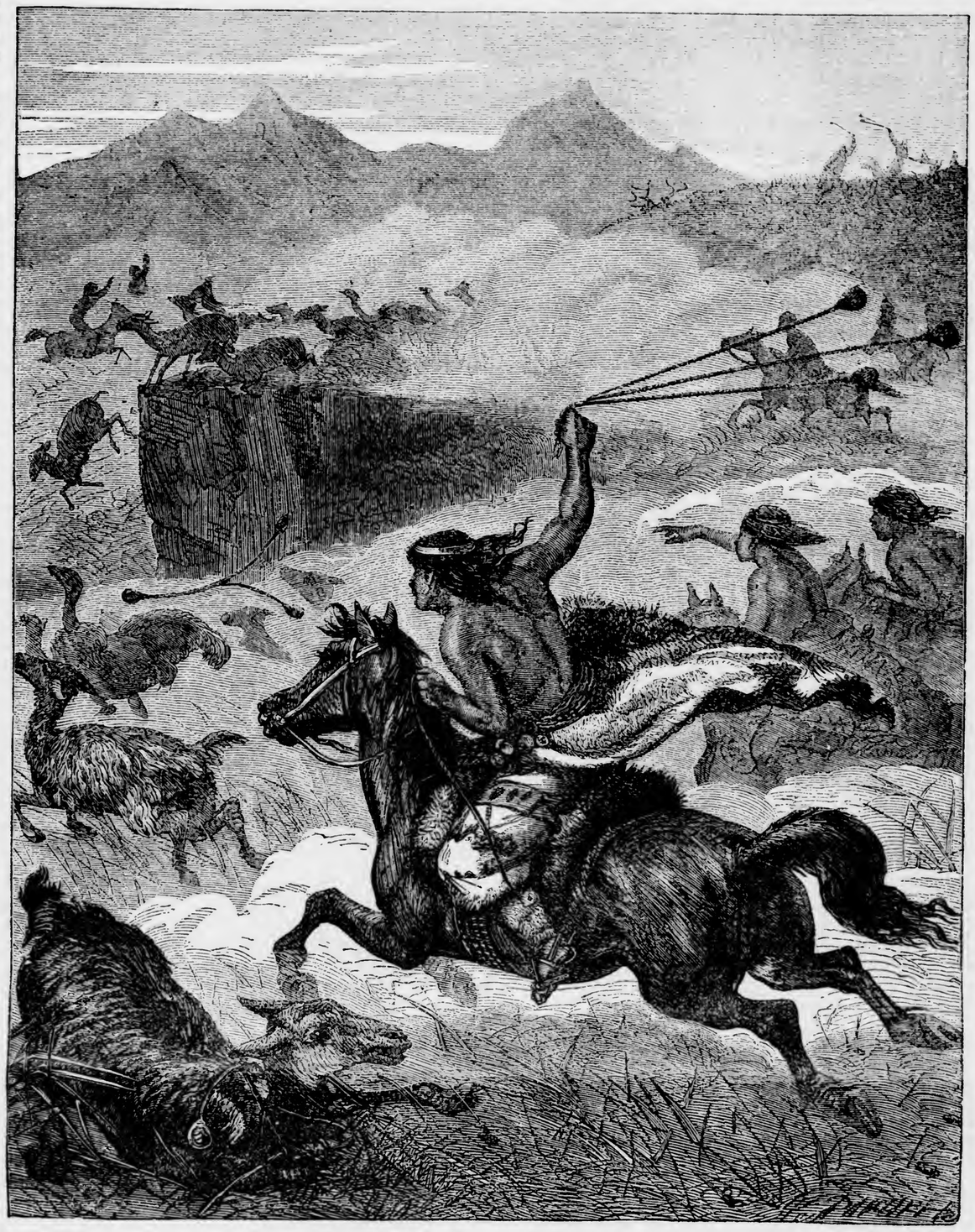

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will to the careful observer appear still more striking.

"The friends of the young man assemble, all mounted on their best horses, and proceed to the house of the girl's father"—with us the 'residence of the bride'—"and as soon as the young man discovers the girl, he seizes and drags her to the door; while on her part she screams and shrieks for protection. At the sound of her voice, all the women turn out, armed with sticks, stones, and any other weapons which come to hand, and rush to her help."—In our ceremony this is the period for the tears of the female relatives—"The friends of the bridegroom in their turn run to help their friend, and for some time there is a furious combat, none of the men escaping without some slight bruises, and the girl screaming at the top of her voice."

The rest of the ceremony almost parallels the manner in which, with us, the lady friends sally forth, armed with nothing more formidable than handfuls of rice, or with the familiar old shoe (because—shall we not see? the shoe is the most convenient missile weapon at hand) and salute the retiring bridal carriage.

"At last the bridegroom dashes at the girl, seizes her as he can, by the hand, by the hair, or the heels, as the case may be, drags her to his horse, leaps on its back, pulls her up after him, and dashes off at full speed, followed by his friends. The relatives of the girl go off in pursuit, but are constantly checked by the friends of the bridegroom, who keep them back until he has dashed into the forest with his bride. They halt at the skirts of the forest, wait until the sounds of the girl's screams and the galloping of the horse have died away, and then disperse. The young couple are now left alone until they emerge from the wood on the second day after the abduction, when they are supposed to be man and wife."

Nothing better than this wild and spirited ceremony of the Aracaunian marriage and honeymoon can furnish us with an example of the frequency with which savage and civilized customs can be traced to a common source. We develope and soften the ceremony; we purify and dignify, and ennoble the idea back of the ceremony itself; but the vivid resemblance which occasionally crops out should at least afford us the strange reflection that while we apparently forget the ceremony in the idea, it is to the savage we owe both the idea and its embodiment.

But lest we should be accused of too much leniency in approaching the peculiarities of these wild people, let us add, taken from the same writer we have quoted, a description of another of their customs—the preparation of the dish called "nachi"; which will serve to move nothing but our unmitigated horror.

"A live sheep is hung up by the fore-legs; a quantity of cayenne pepper and salt is mixed in a bowl, and the throat of the sheep is cut so as to open the wind-pipe, down which the operator stuffs the salt and pepper as fast as he can. He then draws out the jugular vein, cuts it and turns the end into the severed wind-pipe, down which the blood flows, so as to mix with the pepper and salt, and carry them into the lungs. The unfortunate sheep swells up and dies in horrible agony, which is totally disregarded by the spectators, not from intentional cruelty, but from utter want of thought. The sheep is then opened, and the lungs are found distended with a mixture of salt, pepper, and blood. This is the "nachi," which is served up by being cut in slices, and handed to the guests while still warm."

The account of this frightful epicurean accomplishment will quite serve to satisfy us with this tribe.

Rifle.

Fixtures.

Fall meeting of the National Rifle Association, Creedmoor, L. I., September 16, *et seq.*

PROPORTIONATE CHARGES FOR LARGE AND SMALL CALIBERS.

MINNEAPOLIS, MINN.

EDITOR AMERICAN FIELD:—I believe no one will have any difficulty whatever in comprehending my figures in the AMERICAN FIELD of August 8. The difference between C. M. Sutluf, M. D., and myself is simply one of getting terms mixed. It appears that he, in his computation of the areas of calibers, used for his unit of measurement a square, each side of which is one-tenth of an inch long, and there are 100 of such in a square inch; while I used one, each side of which is one-hundredth of an inch, and there are 10,000 of such in a square inch, 880 in a .22 caliber rifle, and 490.6 in a .25 caliber rifle; therefore, the difference between the areas of a .22 caliber and .25 caliber rifle is more than 110 hundredths of an inch. Perhaps I should have said hundredth inches or hundredths inches instead of hundredths of an inch.

I, with Corncracker and others, believe that a .25 caliber, with about seventy grains of lead and enough powder to give the highest possible trajectory consistent with accuracy, would be the best all around small game rifle. It would not be too large for the smallest game, and would have sufficient power for wild geese or turkeys. The Maynard .22-10-45 rifle is very accurate at two hundred yards for so small a calibre; and a .25 caliber, with twice the quantity of powder, and nearly twice the weight of lead, would be more accurate, and certainly give good results up to three hundred yards. I hope that the best manufacturers and others interested will commence experimenting at once, with a view of producing a .25 caliber rifle in its highest development.

My object in giving my experiment in August was to try to bring out others better qualified in such matters. Dr. Sutluf may be right in saying that the bullet used is too tight for the .22 caliber rifle, as I can not push it through the barrel. The same is true of the bullets, both naked and patched, furnished for their .32-35 rifle by the same company; but I presume they use what they have found to give the best results. I should like to try looser bullets if I knew where to get them.

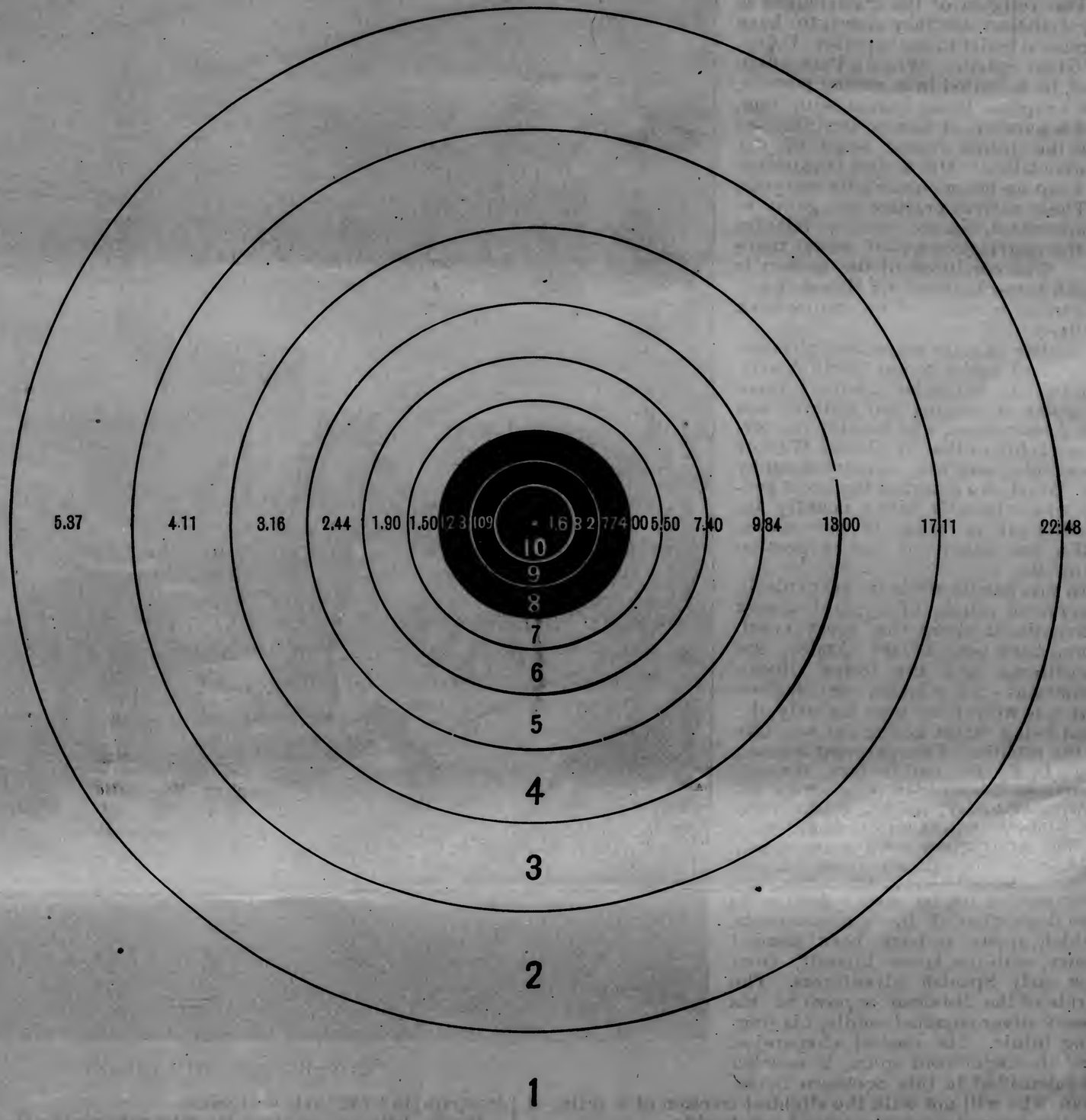
I was surprised yesterday when making a target with my .32-35 Maynard, to find that the patched bullet with the same elevation and powder charge, struck the two-hundred-yard target several inches higher than the naked one, although the patched bullet weighs one-hundred-and-sixty-five grains, and the naked bullet about one hundred-and-fifty-two grains. I supposed the lighter bullet would give the flatter trajectory at that distance. What is the cause of this? Is it true generally of patched bullets, or is it because the rifle is better adapted to the patched bullet? What difference should there be if any, between a rifle for patched bullets and one for naked bullets?

A. L. MAHAFFEY, M. D.

A NEW DECIMAL TARGET.

BOSTON, MASS.

EDITOR AMERICAN FIELD:—Having read with interest the suggestions made in regard to targets to be used in the proposed American Field Team Match, and as one of your correspondents has suggested a target that has dimensions four by six feet, I would suggest that the new decimal target designed by Mr. C. W. Hinman might be used. It is a



new target and one that has never been used by any club and is equally fair for all.

At a meeting of the directors of the Massachusetts Rifle Association they indorsed this design and would no doubt accept it as a standard if it finds favor with other associations. Mr. James Duane has voluntarily indorsed it most cordially, and it would be a fine opportunity to introduce it for trial.

EDWARDS.

MUZZLE LOADER TO DR. SUTLIEF.

SYRACUSE, N. Y.

EDITOR AMERICAN FIELD:—In your issue of August 22, I noticed Dr. Sutlief's reply to my proposition for a rifle match, muzzle-loader against breech-loader, for five hundred dollars a side.

He says that he cannot shoot such a match before May or June of next year, as he has no suitable gun for such a contest and will have to get one made. Further on he says that his first proposition to match any muzzle-loader was based upon the condition that some manufacturer of breech-loading guns would furnish him one free of charge for that purpose. But, he "guesses he can get one," etc.

Taken as a whole, his response is not very encouraging to an old man anxious to get a match against a breech-loader before he dies. But, inasmuch as the doctor has expressed his willingness, and, named a time when he thinks he may be prepared for the contest, I will try to be resigned and live until the appointed time.

Fearing, however, that he may be unable to find a gun-maker willing to provide him with a gun upon the terms he desires, I have another proposition to make, namely: that he and I, each deposit with the AMERICAN FIELD one hundred dollars as a pledge, that we have agreed upon the terms of a match, and, to be a forfeit in case either of us change our minds. Then the Doctor may select his gun-maker, order a gun made just to his liking, and when done, the one hundred dollars I have deposited shall be at his disposal to pay for the gun, provided he first deposits with the AMERICAN FIELD the five hundred dollars which we are to shoot for, and signs articles of agreement with me to shoot the match not later than June, 1886, or, failing to do so, to forfeit two hundred dollars of the money so put up. I will then put up my five hundred dollars, meet him on his own range at the appointed time, and shoot the match of fifty shots, upon his own terms and conditions, as stated in his communication of August 22. If I beat him I win the stake and the gun; if he beats me he can afford to pay for the gun, and, as I shall probably need money to get home with, I shall expect him to do so.

MUZZLE LOADER.

THE AMERICAN FIELD TELEGRAPH MATCHES.

SPRINGFIELD, MASS.

EDITOR AMERICAN FIELD:—The AMERICAN FIELD is again to the front in its endeavor to promote the interest in rifle shooting by the liberal offer to provide three medals to be competed for by telegraph. The rule not to allow state or national organizations to compete is a very good one. We hope the AMERICAN FIELD will select and provide targets stamped "American Field" at the expense of the competing clubs. We shall select a team to compete.

T. T. CARTWRIGHT,
Sect'y Rod and Gun Rifle Club.

COLUMBUS JUNCTION, IOWA.

EDITOR AMERICAN FIELD:—As suggestions are in order, permit me to offer one: That the teams entering for the AMERICAN FIELD Telegraph Matches consist of six members. This will secure more entries, as it will be impossible for many of the clubs to furnish more than six men. Should you decide on this number, or less, you can put the Wapello Club down for a team. Our choice of target would be Massachusetts.

D. S. COLE.

THE WESTERN RIFLE ASSOCIATION TOURNAMENT.—Chicago, Ill.—*Editor American Field*:—Please allow me to correct some errors which appear in the report of the tournament of the Western Rifle Association, as published; the scores in two matches in particular are misleading. Match No. 4. Individual Revolver, ten shots, Massachusetts target, at thirty yards. Owing to the rain this match was called first and was shot on a common iron ring target with about one and one-eighth-inch bullseye, counting twelve; it was ten shots each in a possible 120, and was won with a three and one-half-inch barrel Smith & Wesson .32 caliber. Match No. 10, individual revolver, was shot on a third-class target, or, in other words, on a two-hundred-yard Creedmoor target and was fifteen shots each, possible 75. It was shot at one hundred and twenty-five yards to prevent standing in several inches of water. This was also won with a Smith & Wesson five-inch barrel .38 caliber.

GOOSE EGG.

NOTES.

THE NATIONAL RIFLE ASSOCIATION FALL MEETING.—The following is the supplementary programme of the Thirteenth Annual Fall Prize Meeting National Rifle Association of America. The matches will be shot as nearly as possible upon the following days, though the right is reserved after entries are made to change the order of shooting. Wednesday, September 16, matches Nos. 1, 2, 6, 7, 8, 11, 18, 19. Thursday, September 17, matches Nos. 1, 2, 6, 7, 8, 11, 18, 19. Friday, September 18, matches Nos. 1, 6, 7, 8, 9, 11, 14, 15, 16, 18, 19. Saturday, September 19, matches Nos. 1, 6, 7, 8, 10, 11, 12, 18, 19. Monday, September 21, matches Nos. 1, 5, 6, 7, 8, 11, 18, 19. Tuesday, September 22, matches Nos. 1, 3, 4, 6, 7, 8, 11, 13, 18, 19. Wednesday, September 23, matches Nos. 1, 6, 7, 8, 11, 18, 19. Thursday, September 24, matches Nos. 1, 6, 7, 8, 11, 17, 18, 19.

THE AMERICAN FIELD MATCHES.—Presidents or secretaries of clubs which intend to compete in the American Field Telegraph Rifle Matches are requested to send us the name and location of the club at as early a date as possible. The conditions and dates of each of the three matches will be announced in our last issue of September or first issue of October.

Bull.Am.Geographical Soc.,Vol.3,No.28,
pp.281-282,1896.

STRUGGLE OF THE ONA INDIANS FOR FOOD.—The commission sent by the Chilian Government to report upon the condition and prospects of its possessions in Tierra del Fuego has reported that the main food resource of the nomadic Onas, who live in the northern half of the main island, is disappearing. In the Chilian territory the Onas subsisted almost wholly upon a small rodent, the cururo, which breeds rapidly, and was found in large numbers on the plains. It does not thrive in wooded regions. These plains have been appropriated by the sheep farmers, and it is a peculiarity of the cururo that it disappears entirely from the districts where sheep are introduced. The result is that the Onas, deprived of their usual means of existence, have been hunting sheep instead of cururos. They like mutton even better than cururo flesh, and have quickly learned to value the sheep pelt; but the farmers and the natives have become enemies in consequence, and the government is engaged upon the problem of adjusting the grievances of both parties.

The cururo is the Spalacopus fuscifrigi of Waterh.
See Waterhouse, Radentia, 269+, 1848.

Furlong, C.W. - Fuegians

and Athabaska valleys, across the divide by the proposed route of the Grand Trunk Pacific and, with fine views of Mount Robson, to the Tête Jaune Cache on the Frazer River. In addition to those of lake and mountain, interesting pictures of mountain sheep, goats and flowers were thrown upon the screen.

February 2. — Special Meeting, held at the Club Rooms.

Mr. George N. Whipple, Corresponding Secretary, in the chair.

The audience numbered forty-five.

Mr. Ralph Lawson, a new member, gave an interesting account of a camping trip taken by himself with Mr. Harold Rowlands and another friend last September. They carried their own equipment and supplies, pitching their tent eight nights and occupying several different camps, the trip covering about two weeks.

February 7. — Two hundred and ninety-sixth Corporate Meeting, held in Huntington Hall.

President W. H. Pickering in the chair.

The audience numbered about four hundred and fifty.

Professor Herschel C. Parker, of Columbia University, gave an illustrated account of "The 1910 Expedition to Mt. McKinley," carried out by himself and Mr. Belmore Brown during June and July. (For further details see Report of Councillor of Exploration and Forestry, pp. 307–308.)

About one hundred beautifully colored views and several maps were thrown on the screen, of which the following deserve especial mention: Mt. Hubbard, Mt. Huntington, and Mt. McKinley at sunrise and as seen from Explorers Peak. A number of instructive detailed views of glaciers near Valdez introduced the series.

February 28, 1911. — Special Meeting, held in Huntington Hall.

President Pickering in the chair.

The audience numbered one thousand.

Professor Charles E. Fay announced the publication by the Club of the "Bibliography of the White Mountains," prepared by Allen H. Bent.

Mr. Herbert W. Gleason gave an illustrated lecture entitled "Luther Burbank's Experiments with Flowers, Fruits, and Forest Trees." The illustrations were from original photographs taken with Mr. Burbank's special permission, at his Experimental Farms at Santa Rosa, California, the slides being carefully colored from nature by Mrs. Gleason.

Among the many illustrations were the thornless blackberry; white, crimson, and blue poppies; seedless grapes and pitless plums; also the spineless cacti, with which the desert may be made to bloom and arid wastes may be reclaimed for the raising of cattle.

Mr. Gleason closed with his fine series of panoramas presenting the Grand Canyon of Arizona.

March 15, 1911. — Two hundred and ninety-seventh Corporate Meeting, held in Huntington Hall.

President W. H. Pickering in the chair.

The audience numbered two hundred and ten.

Miss Dora Keen, of Philadelphia, gave an illustrated talk entitled "Climbing Mt. Blanc and the Aiguilles at Chamonix."

After some preliminary climbs Miss Keen ascended Mt. Blanc by the usual route, descending to Courmayeur on the Italian side in nineteen and a half hours from the Grands Mulets. Even more interesting were her climbs of the Dent du Géant, the Grands Charmoz and the Dent du Requin. Of her seven climbs four were of the first class. The talk was illustrated with a profusion of views, nearly all taken by herself.

Miss Keen emphasized the safety of Alpine climbing when accompanied by first class guides. She spoke of the qualities cultivated by it, — courage, endurance, foresight, judgment, discipline and indifference to bodily comfort, and dwelt upon the stimulation and inspiration experienced on the mountain peaks.

March 22, 1911. — Special Meeting, held in Huntington Hall.

President Pickering in the chair.

The audience numbered one hundred and fifty.

Dr. Alfred M. Tozzer, of the Division of Anthropology, Harvard University, gave an illustrated talk entitled "Guatemala, its People and its Ruins."

The progress of the study of Central American archæology was first outlined. The country under investigation is in northern Yucatan, southeastern Mexico and northern Guatemala and Honduras. It is a limestone region with many sink-holes, and the ruins, made of concrete, take the form of pyramid temples and government houses. Fine pictures of these and of their frescoes and bas-reliefs and, especially interesting, the inscriptions showing the development from picture writing and the rebus to the phonetic method were thrown upon the screen.

April 12, 1911. — Two hundred and ninety-eighth Corporate Meeting, held in Huntington Hall.

Vice-President Larrabee in the chair.

The attendance was one hundred and eighty-five.

Mr. Charles W. Furlong gave an illustrated talk entitled "The Fuegian Archipelago, its Mountains, Channels, and Primitive Inhabitants."

After a short introduction illustrated with political and physiographical maps of South America, the speaker gave an extended description of the regions of the Straits of Magellan, Tierra del Fuego, and Cape Horn. The flat shores of the eastern straits contrasted with the mountainous portion west of Cape Froward. Here glaciers fall into the sea and Mount Sarmiento rises to 7000 feet.

Appalachia, XII, 324-325, July 1911

Mr. Furlong made a special study of the Yahgan and Ona Indians. The former, now reduced to 175, are degenerates, but only so on account of their environment. In the southern half of Tierra del Fuego he travelled among the Onas, of whom there are now left only 300, the remnant of a fine, virile, brave race. It is impossible to cultivate the soil in this sub-Antarctic region, and therefore the continued existence of these tribes, for which the speaker made a strong appeal, depends upon hunting the guanaco, which is fast disappearing before the sheep herders. The lecture was remarkably interesting and profusely illustrated.

May 2, 1911. — Special Meeting, held in Huntington Hall.

Vice-President Larrabee in the chair.

The attendance was one hundred and eighty.

Mr. W. S. C. Russell, of the Springfield High School, gave an illustrated talk entitled "Across Iceland."

Starting from Akreyri, a hamlet at the head of a fjord on the north coast, the speaker and his wife visited Myvatten, a lake with volcanic islands; then rode, thirty days in the saddle, across the great desert and over the Eyricksjokull, 5868 feet above the sea, to the Saga-land and Reikiavik. Cliffs 1500 to 3000 feet high, glaciers, lakes and waterfalls, boiling springs, steam jets and ancient lava tubes, birch trees four hundred years old and myriads of beautiful flowers were among the many interesting things observed.

May 10, 1911. — Two hundred and ninety-ninth Corporate Meeting, held in Huntington Hall.

Ex-President Alexis H. French in the chair.

The attendance was one hundred and twenty.

Rev. William R. Lord gave a lecture entitled "The Ministry of Birds."

The speaker cited the various interests which contribute to the destruction of birds: hunting, due to an instinct which has survived from man's savage ancestors; the use of feathers for decoration; and the "collecting" interest. He then referred to those which should impel to their conservation: the economic interest, for their destruction of noxious insects; the æsthetic interest, inspiring our appreciation of form, color, motion and sound; and the sympathetic interest, for birds become attached to human beings who love them.

A large variety of views were shown, with numerous interesting stories.

July 4, 1911, 8.30 A. M. — Forty-sixth Field Meeting, held at Waterbury Inn, Waterbury, Vermont.

President Pickering in the chair.

Professor George H. Perkins, State Geologist, addressed the meeting on the Geological History of Vermont.

Though a small State, this history is as great as that of any part of the world. North of the St. Lawrence exist patches of rock which probably were the first to be raised above the sea. It is thought that the Adirondacks contain the next oldest formations, the third and fourth being respect-

IN THE REGION OF CAPE HORN

The waves of the South Atlantic breaking against the rocks of Punta Pajaros on Staten Island

THE PEOPLE OF TIERRA DEL FUEGO

THE LIFE OF THE SOUTHERNMOST INHABITANTS OF THE WORLD

CHARLES WELLINGTON FURLONG, F.R.G.S.

Photographs by the Author

A crude type of the Canoe Indians of Tierra del Fuego, a race rapidly becoming extinct

A camera study of a Yahgan householder, showing the Mongolian features of these people

A Yahgan woman dressed in clothes obtained from a missionary. These Indians have adopted white men's clothing

WHEN that great, kite-shaped continent, South America, lying mostly south of "the line," is mentioned, we of the North are likely to draw a snapshot conclusion and picture a tropical continent—south, heat, tropics, malaria, and what not, for we are prone to think it from our own little habitual viewpoint about which our own little world revolves, forgetting that our southern brother, south of the Equator, looks north for *his* heat and shivers in the biting cold winds which sweep up from the Antarctic, and that in that great 6,000-mile range of continent from twelve degrees north latitude to fifty-six degrees south one has every sort of climate, from the heat-soaked Amazonian selvas, through the beautiful temperate climates of Chile and Argentina, to the frigid regions of Cape Horn.

Except for the hazy recollection that an old explorer named Magellan, way back in 1520, discovered the strait which bears his name; that Darwin and Fitzroy, of the Beagle Expedition, found primitive savages who aroused the curiosity of the world; that Slocum in his little boat, *The Spray,* played his trick with tacks on these aborigines, and that the fleet passed through on its famous world voyage, few save those who have passed through the Strait of Magellan know anything of this wonderful section of our world.

Even those who have passed through the Strait of Magellan have little conception of the grandeur, desolation, danger and cold of these labyrinthine channels which flow and swirl through that maze of mountain islands known as the Fuegian Archipelago, lying to the south of the Strait of Magellan and terminating in Cape Horn, for these travelers go comfortably housed; their huge craft, driven by that powerful force, steam, is independent of wind and current. When these travelers are slightly chilled by the cold blasts which rip and tear down upon them, they can seek the leeward side of their floating palace or the comfortable temperature of a temperate climate which every modern liner carries about with it, made possible by a single man's thoughtful observance of a boiling kettle of water.

Throughout this entire archipelago a race of the Onas, known as

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Retake of Preceding Frame

A YAHGAN FAMILY

Their primitive dwelling is made of beech boughs. Owing to the necessity of separating in search of food, these people live in small family groups without tribal organization

A DUGOUT CANOE

The Yahgans are called Canoe Indians from the fact that they live almost entirely on the water, hunting and fishing from their craft, and paddling from camp to camp

which lie beneath their forest coverings. Terrific storms constantly sweep the cold, moisture-laden winds of the Antarctic over these mountains, where they are condensed into mists, fogs, rain, hail and snow, brought down in small cyclones known as *williwaws*. The only sign one sometimes gets of an approaching *williwaw* is the falling trees high up on the mountain side, which go down like ninepins before it, and *quien sabe,* as they say down there, where it may strike the water, which it picks up and twists in a veritable whirlpool of spray along its surface. When I have been cruising in a small cutter or in a canoe, it was only with the utmost alertness and judgment that *williwaws* could be dodged, particularly when there were perhaps a half-dozen or more within a radius of two miles.

Though these islands are thickly wooded, there are only four kinds of trees, two of which are beeches. On land there is a great dearth of food, for besides scurvy grass, wild celery, sweet mucilaginous fungi, there is only a limited number of tasteless, undersized berries. At certain times of the year and in many places not even these things can be found. The Yahgans depend mainly upon sea food, such as mussels, whale blubber, seal and sea birds, as well as birds' eggs, which they often obtain at great risk from the rookeries on the barren outlying islands of the archipelago. Thus, to obtain food, the Yahgans have naturally followed the paths of least resistance, the channels themselves, and have perforce become Canoe Indians.

This habitual living in canoes, exposed constantly to storm, danger and starvation, and spending the greater part of their lives squatting on their haunches at their paddles, has stunted the lower parts of their bodies, caused them to walk with a waddle, and to be in general most unprepossessing in appearance. This is emphasized by their scant clothing and their dark, keen eyes peering out from a Mongol cast of features, partly overhung by lank, wet strands of black hair. It was undoubtedly this unprepossessing aspect which at first prejudiced Darwin against their mental attributes; but they are a people who under comfortable conditions would be comely and who are in my opinion inherently intelligent. In the past decade most of them have affected white men's clothes, obtained from sealers, whalers, a missionary, and from the shipwrecked crews and the Argentine penal colony at Ushuaia.

There are two tribes of the Canoe people, the Alaculoofs, who inhabit the western or Patagonian channels north of the Strait, and the Yahgans, who inhabit the immediate regions of the Horn. It was with this latter tribe that I became acquainted. I have slept in their wigwams, eaten with them around their camp fires, hunted, fished and traveled with them in their canoes. Most of them I found tractable, though reticent, a few proved treacherous, but all were interesting.

Two things which place these Yahgans among the most primitive people of the world are the facts that they have in the common sense no religion and no chiefs. The dearth of food forces them to separate to obtain it, consequently they are divided into small family groups, generally one family to a canoe, in which they carry all their belongings. These canoes formerly consisted of three big slabs of heavy bark, two for the sides and one for the bottom, sewn together with whalebone and calked with moss, clay and other substances.

Among the Yahgans, as with all peoples, the agency of fire has played an important part for heating, cooking and signaling. It was the great columns of blue smoke from the signal fires of the Fuegians rolling up against the mountain sides which gave its name to Tierra del Fuego—Land of Fire. These signal smokes are generally used by Yahgans to apprise others of the stranding of a whale, of the approach of strangers, or for the gathering of the clans.

They choose their camp sites on the shores of protected bays where the mussel supply is good, or in little inlets or coves, and these camp sites can always be detected through the accumulations of large shell heaps scientifically known as "kitchen middens."

Mussels are obtainable in many of the sheltered recesses of this most indented coast of the world. Storms often prevent the Yahgans venturing from land to fish, to spear seals or secure birds' eggs on the rookeries, while in many parts of the islands they are prevented by the bogs, cliffs and impenetrable forests from traveling far by land. Consequently, mussels become their staple food supply, so the importance of selecting a protected camp site with an abundant supply of mussels is evident. Mussels and other shellfish are gathered by hand from the rocks at low tide or are obtained by long poles split open at one end, into which they are wedged and brought up; but one of their most interesting ways of obtaining food, such as limpets and sea eggs, is by diving. This is done by the women, all of whom are expert swimmers and who with stoical courage dive deep into the cold, briny waters and then reappear like great amphibious creatures, the salt brine streaming from their long, black hair down their cinnamon-colored bodies.

These shellfish are usually cooked, and I have often sat about the fire in the wigwam where the only food was the simmering mussels cooking in the shell. Puff! Now and again one would burst and send a jet of steam mingling with the smoke of the fire which filled the wigwam. At times the smoke becomes unbearable and causes even among the Yahgans watery and inflamed eyes. Sometimes the meal would be consumed in absolute silence; or again, amid gales of laughter, the shells would be flipped out of the entrance or through the sides of the wigwam, adding already to the mound

Canoe Indians, once paddled their canoes; but since the growth of the Strait settlement known as Punta Arenas (Sandy Point), whose development was made possible by steam navigation, these Indians, following the habits of all aborigines, have shrunk back and away from the entering wedge of civilization. And when one knows this region at first hand, sees and experiences it as nearly as possible from the viewpoint, mental and physical, of these Canoe Indians, one cannot but marvel at the persistence and success with which they have conquered their environment.

For me it is not a region of first impressions, but a region of continuous impressions. Great mountains, one of which, Mt. Sarmiento, towers to the height of 7,000 feet, rose sheer and precipitous from narrow channels through which I cruised. On the western and southern edges of the archipelago, where the mountainous islands are exposed to the lashing fury of the Pacific and Antarctic respectively, their great, massive sides of granite and greenstone have been bared by the fury of the gales, while in other parts their steep sides are clothed with a thick verdure, in many places impenetrable and reeking with moisture. This melts down from the perpetual snows of the peaks, and sifts through the forest leaves to the dank, soggy mosses and ferns

BESIDE AN INDIAN DWELLING

A Yahgan woman showing the author how to make a basket of reeds. In spite of primitive customs and lack of social organization, these Yahgan Indians are inherently intelligent

PADDLING AMONG THE ISLANDS

Most of the paddling is done by the women, whose duty it is, also, to dive for limpets and other sea food. A fire, set upon a sod of clay, is kept constantly burning in the canoes

IN THE FUEGIAN ARCHIPELAGO

Only those who have visited this remote region can conceive of the grandeur and desolation of these labyrinthine channels that wind through a maze of mountain islands

THE WRECKED CANOE OF A DEAD YAGHAN

The owner of the canoe was murdered, and, according to custom, his property was destroyed and punishment meted out to the slayer by the women of the camp

A YAHGAN FAMILY

Of primitive wattle-and-thatch huts made of beech boughs. Owing to the necessity of separating in search of food, these people live in small family groups without tribal organization

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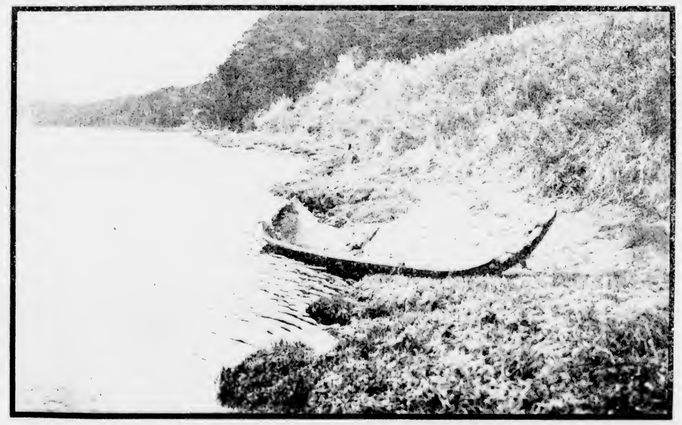

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Retake of Preceding Frame

which, perchance, represented the accumulations from generations of Yahgans camping on these same sites.

When a whale is sighted stranded in a shallow bay, the discoverers send up a big smudge of smoke, canoes generally paddled by the women put out from unexpected hidden coves and inlets, and come from many directions for miles away in their frail barks. With shouts and splashings of paddles, they often succeed in driving the whale aground and then attack him with their primitive spears and knives. The feast on whale blubber lasts for days and weeks. Chunks of this, like penguin, guanaco meat, and other nitrogenous food, are put on a stick which is stuck in the ground and inclined over the fire. The oily grease which drips and sputters from a piece of blubber is caught in a big mussel shell and downed with relish. These primitive shell saucers also serve to stew a few wild berries in.

There is an interesting specimen of the sea lion to be found on these islands. They are called seals, but are not fur seals. Having no knowledge of zoology, the only thing I can do is to mention a few of their characteristics. They are very combative, and when on shore in the breeding season the males are always fighting, and every one of them is more or less injured. When tired they lie down to rest, then start afresh. They have great muscular strength. We succeeded once in throwing a lasso around the neck of a good-sized sea lion, and, although nine men held on to the rope, the animal slowly walked away with lasso and all into the water. In the stomachs of these animals have been found from five to ten kilos of stones from the beach, generally the size of a hen's egg, but sometimes as large as a man's fist.

A SEA LION ON NEW YEAR ISLAND

The strength of these animals can be estimated when it is told that with a lasso about its neck held by nine men, one sea lion was able to pull away from its captors and plunge into the sea

The Yahgan numerical system consists of *cocawali, cumbibi* and *muttan*—one, two and three. This is as far as they count. Beyond this they use the fingers of the hands, or *wooroo,* which means many. Being accustomed to scatter in search of food, and having no other possessions than those within immediate grasp, they have no chiefs or organized government; and as the seasons are reckoned by the time certain berries or fungi are ripe or flowers in blossom, counting is of little importance and these numbers seem to have answered their needs.

The main use to which their numerals are put is to express the number of wives (for they are polygamous) a man possesses, which rarely reaches the number of three, or to indicate the number of families, which generally are computed by the number of canoes; more than three canoes is expressed by the fingers of the hands.

These people have at times befriended shipwrecked crews, particularly when the crews were in good condition and able to defend themselves. They have often proved treacherous in cases of running across defenseless and isolated sailors, and are not altogether to be trusted, but they have good reason to act aggressively in retaliation for the many barbarous atrocities heaped upon them by unprincipled adventurers, sailors, sealers, miners and whalers who have occasionally touched the shores.

The night before I arrived at one of the camps down near the Horn, one Yahgan had killed two others in a canoe and the camp was consequently in a state of unrest. The women, after their custom, led by the wives of the murdered men, attacked the killer with long, heavy poles, buffeted him about on the ground like a bundle of rags until there was scarce a vestige of life left in him, and even with this he was lucky to escape. Then, after their custom, followed the destruction of the dead men's property. They split their dugout canoes from stem to stern, drowned their dogs and burned their wigwams. I have evidence, too, that the Yahgans sometimes follow the old Hindu custom of cremating the dead on a funeral pyre.

There is one custom which, though not limited to the Yahgans and Alaculoofs alone, is interesting; that is, the maintenance of their fires, for, slightly aft in the central part of every canoe, on a sod of clay a fire is kept perpetually smoldering and curling up its wreath of smoke. Just as the civilized white man maintains his galley fires and radiators respectively to cook his food and give him comfort in his great steel leviathans of the sea, so these Eskimos of the South, these most primitive inhabitants of the world, economize their labor and in principle cater in the same way to their physical needs. The careful preservation of the flame is also doubtless due in a measure to the difficulty attendant upon building a new fire, for storms and wet weather are frequent in the archipelago and dry kindling wood not always to be had.

This hopelessly inhospitable region, spurned as a possession even by England, has within recent years been apportioned between Argentine and Chile. The meridian of longitude 68 degrees 30 minutes west divides the area of Tierra del Fuego almost in half. The eastern half and the islands to the east were allotted to Argentina, the western part and all islands to the south and west to Chile.

Only Argentina makes any use of this black and storm-bound territory. Here, midway along the southern coast of the mainland, 300 miles to the southeast of Punta Arenas, where once glistened the village shell heaps of the Yahgans, is now to be found Argentina's penal colony. It is the southernmost town in the world, located on the site of a former Yahgan village. Ushuaia (Oo-shoo-wia), "Mouth of the Bay," the wild Yahgans named their village, and Ushuaia it still remains.

THE PENAL COLONY OF USHUAIA

Tierra del Fuego is owned by Chile and Argentina, but only the latter country has made use of its desolate possession and established a penal colony on the site of a former Yahgan village

A roadway runs the length of the town. The bay laps it on one side; on the other front a church, a schoolhouse, the official buildings, a few shops and saloons. A hundred houses or so make up the rest of the town. To the north lie the impassable ranges of the Andes, to the south the inhospitable channels inhabited by the Yahgans, whose numbers, since the advent of the white man, have dwindled from more than two thousand to less than a hundred and seventy.

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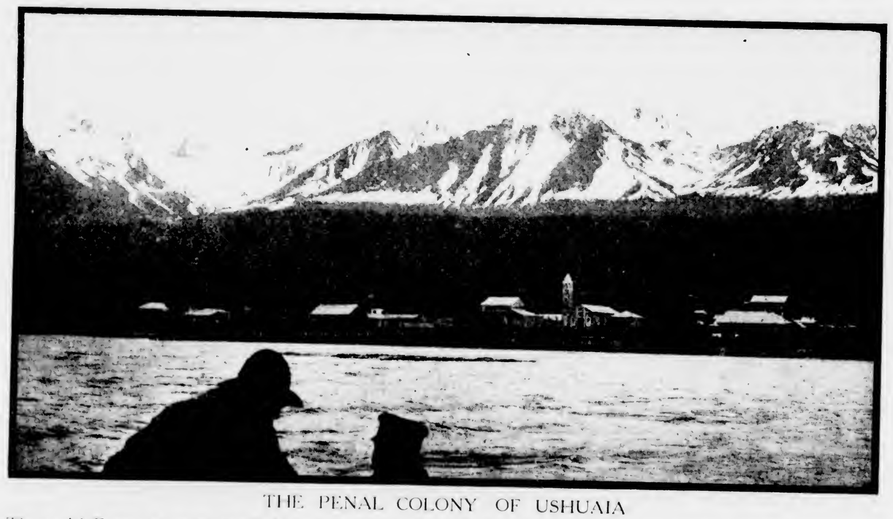

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Retake of Preceding Frame

Venezuela

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Natural History - Sept. 1938.

A NEW "LOST WORLD"—*In one of the least known sections of South America, the Phelps Venezuela Expedition ascends a sheer 8000-foot tableland to search for evolutionary changes in a biological "isolation zone"*

By G. H. H. TATE*

Assistant Curator of South American Mammals, American Museum

FOR forty minutes the Lockheed flew over the low rolling country of southern Venezuela, past savannas, past forests. Then through the pilot's window the goal of our expedition, Mt. Auyan-tepui and its outliers, loomed gigantic in the distant haze. So rapid was the plane's speed on its course of 155° E that a few minutes later the northeast cliffs of this biologically unexplored tableland spread across the entire view from our right-hand window. Making a brain-spinning bank our pilot slipped down through a hole in the cloud field a thousand feet over the runway (earlier inspected and flagged), and brought the shining ship smoothly to earth. A little group of Indians clad in loin-cloths of red calico or vari-colored cloths hurried across the savanna grass to meet us.

It was a romantic setting, and stepping out we felt a tingle of excitement as the red and white cliffs of Mt. Auyan-tepui filled our northern horizon. At the base, rock walls hundreds of feet in height alternated with steep stopes of talus matted with the trunks of burned forests. Above towered nearly a quarter of a mile of vertical sandstone walls. But if we felt any apprehension as we gauged the ascent which appeared by no means easy, it was quickly subordinated to the realization that for the first time we were visibly within reach of the summit of this romantic tableland. And what new light this interesting region might throw on biological and geological history was naturally the one question that filled all our minds.

A hundred and fifty miles to the east lay Mt. Roraima, the supposed setting of "The Lost World," Conan Doyle's celebrated romance of book and screen, and 300 miles away, Mt. Duida formed the extreme southwest outpost of the Guiana highlands, to both of which mountains the American Museum has earlier sponsored expeditions. Like those two mountains when they were first being explored, Auyan-tepui now promised to yield the unusual animals and plants which generally characterize elevated areas where contact with the surrounding country has long been interrupted. All clues tending to illuminate the dark places in the evolutionary picture are avidly seized upon by scientific "detectives." Rarely, however, does such an opportunity occur as the discovery of the 300 square miles of Auyan-tepui with its attendant fauna and flora. The discovery of Roraima and Duida (though not their zoological exploration) dates from the days of the Schomburgk and from early Spanish colonization. But the vast plateau of Auyan-tepui stands in a region which even on modern maps is shown as having only rolling hills a few thousand feet above sea-level.

After the expedition had settled down a grand display of trade goods was staged. Colored calico, thread, needles, machetes, fish-hooks, gun-powder, shot, salt, hats, belts, shirts, cigarettes also a series of trinkets brought from America: rings, necklaces, earrings, mirrors, colored combs, lipstick, harmonicas—all these and many other items were put on

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*DESPITE his youth Dr. G. H. H. Tate has long been one of the more active field workers among American Museum mammalogists, and reports of his expeditionary exploits have appeared over a number of years in these pages as well as those of the more technical journals. Professionally most interested in South America, and in particular the biologically isolated highlands of Guiana, he has told in his article above the story of his third scientific investigation of that region. His first collecting work in Guiana was conducted in 1927 on the famed eminence of Mt. Roraima, believed to be the locale of Conan Doyle's "Lost World." The following year he scaled nearby Mt. Duida and now, ten years later, the exploration of Auyan-tepui, most recently discovered of these tablelands, is added to his list. Prior to the work in Guiana, he collected in Venezuela, Bolivia, Equador, and last year was mammalogist for the Archbold Expedition to Fly River, New Guinea.
—THE EDITOR.

show. The use of many of the articles had to be demonstrated: earrings and necklaces and bracelets actually put on, and lipstick tastefully applied to faces with delightfully appalling results. Then came the council board to determine prices, a matter requiring much discussion and deliberation, for quite a number of the Arecuna Indians know the value of the Bolivar. At length, however, the cash value of each article was agreed upon and almost all the Indians down to quite small children undertook to carry on the morrow.

A horrid chattering from the alarm clock of our Chinese cook brought reality at 5:30 each morning —the reality of a world of cold gray mist with the daylight only beginning to grow. Our cook who gloried in the name Napoleon Ramon Wong—Nap for short—got his Primus stove to work on early coffee (he was allowed the luxury of kerosene for cooking only at that hour), and presently, too, the smell of frying bacon assured us that the real breakfast was in course of preparation.

Radio communication

As soon as possible we moved the entire party westward to an upper base 3700 feet above sea-level (2200 feet higher than Urullen, the native village on the savanna), whence the way led directly to the huge slanting crevice in the 1000-foot cliffs that gave on the plateau. The camp functioned as principal base from early December until the end of February; and there a field radio set, built by our transport man, Cardona, and sold to us by him when he was unfortunately forced to leave, served to maintain communication with few interruptions every other day with Ciudad Bolivar, the expedition's main base.

Each afternoon a long line of Indian carriers, male and female, could be distinguished by their bright colored clothes winding along a gently inclined ridge, as they brought a relay of equipment from the old base eight miles away. When they arrived our camp boys assisted them by raising their loads while the Indians twisted themselves free of the shoulder straps. They showed little sign of fatigue and a few minutes later were chatting happily together in groups. The women, though given lighter burdens than the men, often carried more weight; for in addition to the actual cargo, they strapped on a hammock, some bananas and cassave, and often gave the youngest member of the family a ride on top of all.

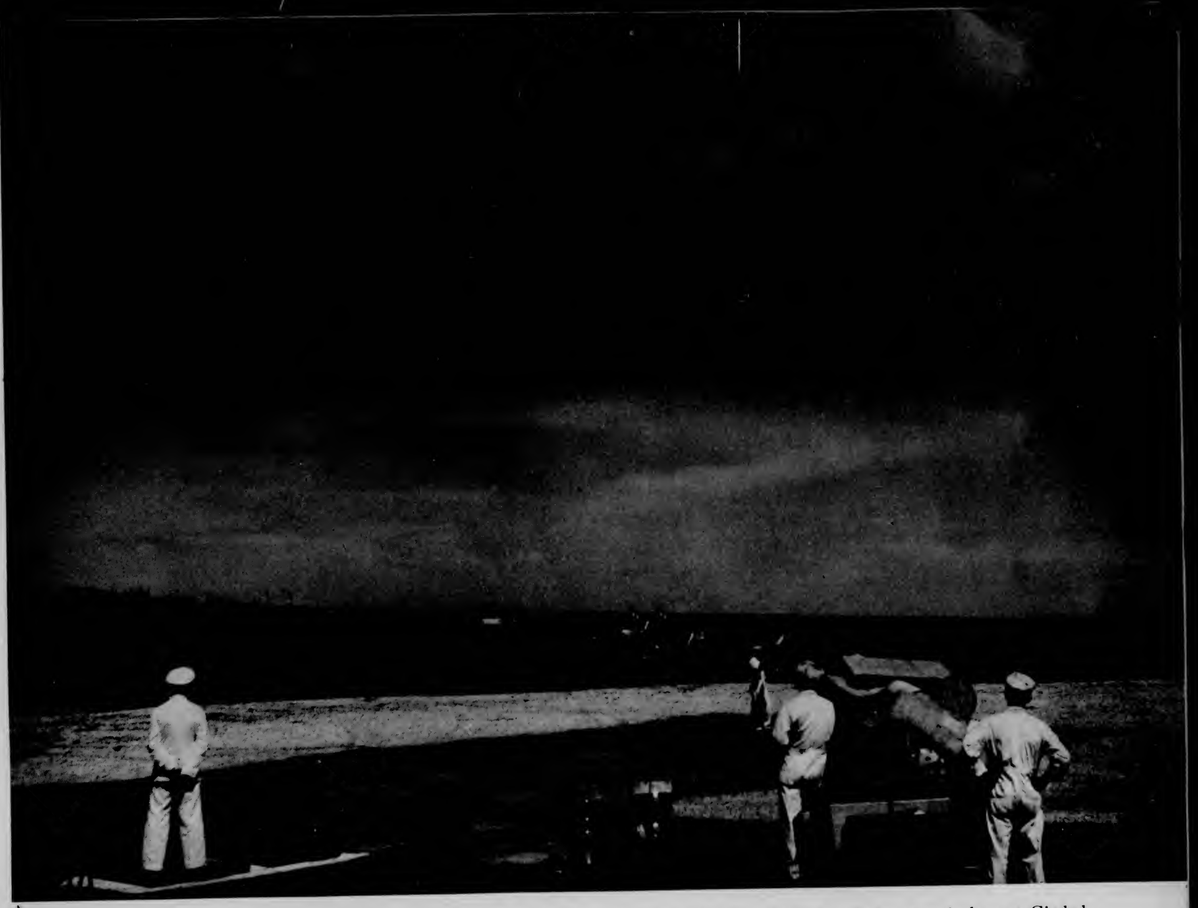
Toward evening cumulus clouds welled up over the southeast shoulder of Auyan-tepui and drifted across the face of the towering cliffs, blotting them out in a few moments. No rain fell that day however. And as daylight faded food for the carriers was given out, fires were lighted, and our incandescent lamps spread their radiance widely. From here and there on the savanna where the Arecunas rested in their palm leaf shelters, voices reached us faintly. In another hour the heavy clouds had melted away leaving Auyan-tepui mistily outlined under a moon-lit sky.

Outside the store-tent, members of a little group of Indians, tempted to labor by the attractiveness of the trade goods brought from New York, were tying loads securely into their carrying baskets, the latter fitted with shoulder straps and head loops; for today we would make our initial attack on the giant mountain.

Minutes later the last of the carriers vanished into the forests. Steep, slippery climbing became the order of the day. And at one bad spot—a cliff nearly 30 feet high—a rope hung loose for one to help himself up. Five hours' climbing brought us to the base of the cliffs which at that spot remained dust-dry on account of the overhang of the rocks. From there we entered a giant cleft in the sandstone—a weathered joint in the quartzite, littered with huge boulders, half burned trees and rotting timber—while the white mist gathered like a warm wet wrap around us. The tiny track ambled crazily among huge rocks; and we heard between our rapid heart beats the slow drip of water from hanging mosses and the drooping fronds of tree ferns. At length the fissure ahead became closed to the very top with debris and we scrambled up onto a world of gigantic rocks, scores of feet in height and thousands of tons in weight, composed of a stone so hard that the fragments through which we walked chinked and clattered like broken chinaware. Over all, great puffs of mist surged and billowed.

The summit

After a well-earned rest our Arecunas, keeping closely to the scarcely visible trail, led us clear of rocks and mist to a view of a vast rocky interior basin sloping gently away—the top of Auyan-tepui. We beheld a surface edged to right and left several miles apart by vast and fantastically eroded blocks of rock and cliff. Between us and the more level portion, however, a series of stone ridges stood directly across the path, separated one from another by troughs the size of the Panama Canal locks, filled with an indescribable tangle of partly recumbent trees. In the open at last, we passed mats of pitcher plants, broad-leaved Xyrids and occasionally beautiful yellow, white or pink orchids



BOUND for a zoologically unexplored tableland similar in structure and animal life to nearby Mt. Roraima (scene of Conan Doyle's "Lost World"), G. H. H. Tate, leader of the Phelps Venezuela Expedition landed at the airfield *(above)* of the city of Caracas. After a 300-mile motor trip the entire expedition boarded a second plane at Ciudad Bolivar. From this base three and a half months of thorough investigation was conducted by Museum scientists into the birds, mammals, reptiles and plants of a southern Venezuelan mountain still uncharted on most modern maps

EN ROUTE, the big Lockheed plane drones over the meandering Carao River *(below)* that threads its way through the rough forested country surrounding precipitous Mt. Auyan-tepui, goal of the expedition. The northern outliers of this sheer 8000-foot mountain, long cut off from the encircling country, are visible beyond the Lockheed's tail-rudder

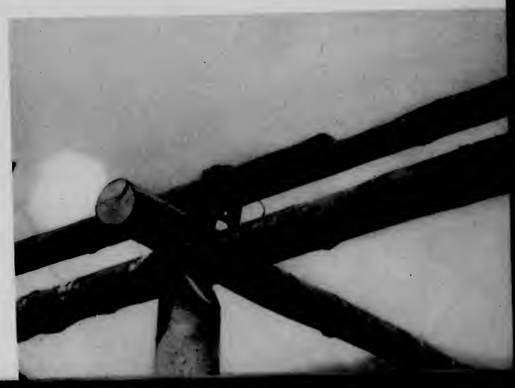
(Left) THE "PROMISED LAND" of the Camarata valley is brought into focus by taxidermist Dillon's field glasses from the edge of Auyan-tepui's 8000-foot cliffs. It took two weeks to move the entire party to a base camp 3700 feet up the mountain. From this point small parties climbed higher, scouring the summit and adjacent peaks for significant data on the newly discovered biological isolation zone

(Above) FLANKED by Auyan-tepui's lower cliffs the Indian-inhabited Camarata valley *(above)* has its river source in the mountain; thus its grassy savannas are developed out of sandstone deposits carried down to the valley by cascading streams

(Left) STAFF PICTURES are secured with difficulty. Some member is always off in the bush or too busy with specimens to be photographed. However, just after lunch they are more compliant. From left to right, front row: W. H. Phelps, Jr., J. A. Dillon, W. H. Phelps, Sr., G. H. H. Tate, W. F. Coultas, E. T. Gilliard

INDIAN CARRIERS of the Arecuna tribe became friends of the Chinese cook Napoleon who wanted a kitchen commensurate with his talents. The pictures along right border show the spacious Indian-built structure at various stages in its development

DETAILS in the kitchen's construction: posts were set deeply in the soil, holes having been gouged out with machetes; cross pieces meeting at the apex were tapered and grooved, while horizontal poles were notched, spliced and lashed securely with "bush ropes." *(Below)* One of the base camps in the Camarata valley showing a finished Arecuna building thatched with palm leaves



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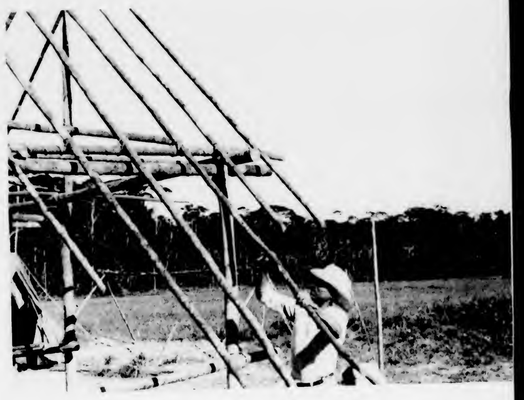

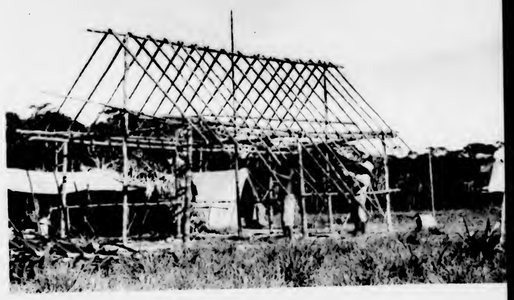

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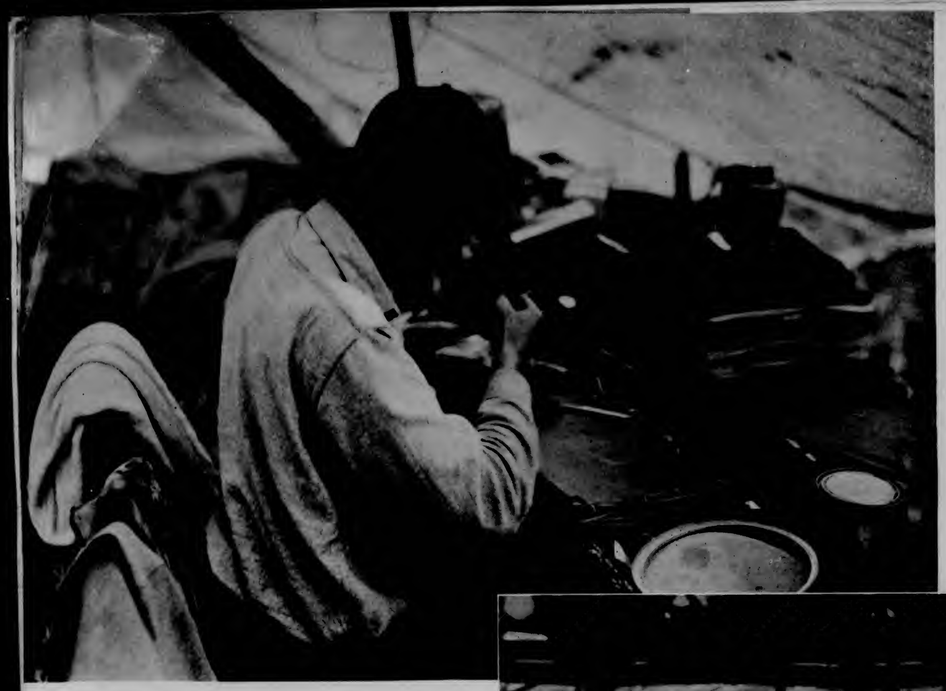

(Above) TAXIDERMY IN A TENT: perhaps the least attractive but most necessary side of expeditioning. Author Tate is shown sewing up a carefully stuffed specimen of one of the mammals collected on a mountain whose creatures have been isolated from the evolutionary process for centuries. Though no dinosaurs were found on Auyan-tepui, the collections were of great interest to South American mammal specialists

(Above) IDEAL ARRANGEMENT of an expeditionary camp. Living and working quarters set in long clear rows give the triple assurance of equipment accessibility, ventilation and cleanliness

(Above) EXPEDITION SPONSOR W. H. Phelps takes the hide off a red and blue macaw. These huge raucous-voiced birds are among the wiliest forest denizens. And tough? After six hours boiling, their flesh retains the consistency of an automobile tire

(Right) TAXIDERMIST DILLON stayed his professional hand while befriending the expedition pets. The two birds, hatched from wild eggs by a domestic hen, lived peacefully with the young fawn "Pepe"

(Right) HIS REAL NAME WAS MAICA-BIMA but the expedition called him Joe. He is shown staggering into camp under the weight of a wild pig that had just been shot for scientific purposes

(Left) YOUNG GIRLS also carried burdens. Almost an entire Arecuna tribe was pressed into general transport service although only the men made the dangerous climb to Mt. Auyan-tepui's upper regions

(Below) NATIVE WORKERS chat during a breathing spell. Though lured by novelties, the Indians had some sound economic values. Their chief has regimented the population to pan gold for him in mountain streams, and judged by the yellow glitter in his teeth the return is considerable

(Left) JUNIOR GETS A RIDE. Children are carried mile after mile in this manner without ill effect from the scorching sun. But even tots like this one are perfectly capable of walking several miles by themselves, and when they are only a little older are given light loads to carry in tiny *guayares* of their own. A hardy, resilient people, these Indians tirelessly lugged their packs over brittle, tortuous trails in return for an allotment of trade goods that included gun powder, salt, cigarettes, harmonicas and lipstick

(Below) FORDING one of the lowland rivers which are fringed with forests having all the apparent density of impenetrable jungles. But they are only a few yards wide, the trees soon giving place to the tall grass of broad savannas which were often found burned over by Indian-lit fires

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Retake of Preceding Frame

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FIRST CAMP of the expedition was thrown up hurriedly on the savanna as soon as the airship *(right)* landed. A line of Indian carriers are shown toting supplies from plane to tent

(Right below) THE SAME VIEW but snapped from the Haicha cliffs, 1500 feet higher than the first picture

(Below) EXPEDITION MASCOT: the fawn "Pepe" was cared for by the Indians after the death of his mother. He became civilized to the extent of developing a taste for condensed milk

(Below) JABIRU STORK with wings spread by ornithologist Gilliard. Though not extremely rare, this stork is difficult to approach because of its height and consequent vision, since it chooses to stand knee deep in swamps where it can have an uninterrupted view of 1000 yards

(Above) A TRUE CORAL SNAKE. These reptiles like all other poisonous snakes were relatively rare in the valley. Readers should note that there are also "false" coral snakes, distinguishable to the eye by a somewhat different arrangement of the colored pattern and to the feelings by being completely harmless. (See cover and more detailed explanation on page 155)

(Below) GIANT SPIDERS abound in the forests about Auyan-tepui where they live in holes among roots of trees, emerging at night to creep slowly through the undergrowth in search of prey

(Right) THE ONLY WAY to Auyan-tepui's summit is shown between these two perpendiculars of sheer laminated sandstone. Often lost to sight in a pearly mist, the summit towers 8000 feet above sea-level. Although defiant of extensive collecting work, such rugged cliffs offered interesting material for the geologist

(Right) BANDS OF SHEEREST precipice occur intermittently at almost any level of Auyan-tepui's approach slopes. The inserted photograph shows a section of cliff 30 feet high which could only be scaled by the use of ropes. But how did the ropes get there? Arecuna Indian boys, if they wish to, can outclimb any ordinary "human fly"

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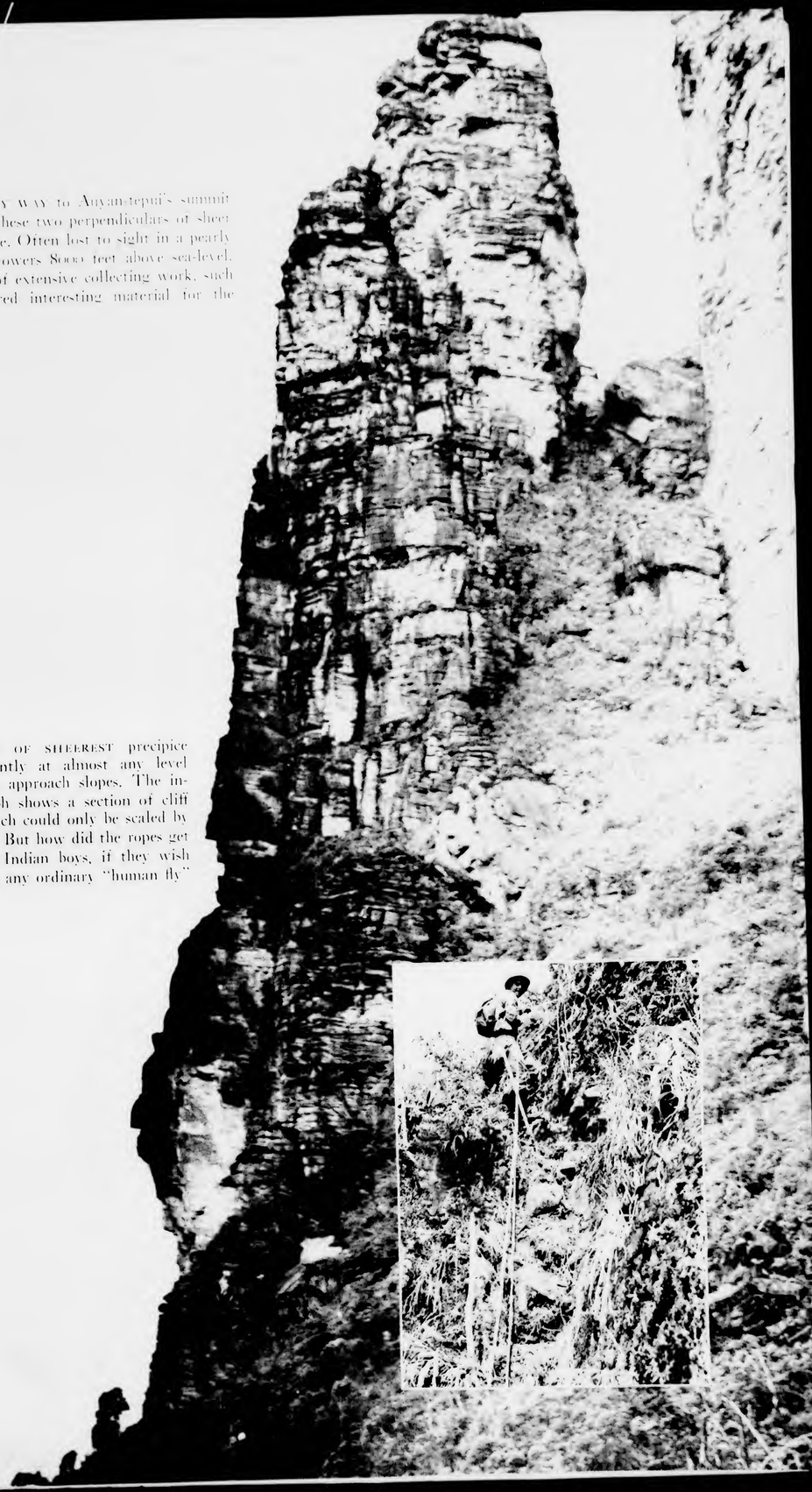

Retake of Preceding Frame

(Above) THIS PANORAMA shows the spread and ruggedness of what the expedition called the "first wall." An irregular line of huge quartzite blocks, this barrier proved impassable because of the broken nature of the ground

(Below) A SECTION of the first wall with the second wall, an even more formidable barrier, showing three miles away in the right quarter of the picture. Base camp for collecting parties stands in foreground, 2200 meters above sea level

(Above) THE "SANJON" or big gully, whose mist-shrouded path offered the only access to the plateau, gives on a scene of unimaginable desolation. Everywhere huge rifts, through which the white mist works its way, cut the weather-fretted sandstone. And an almost total lack of soil precludes growth of all but the tiniest shrubs on the exposed surfaces

(Left) RIVER ACTION ON THE PLATEAU. Due to the unfolded though slightly tilted position of the strata and their extreme hardness, the rivers cut chiefly against their sides and along lines of vertical jointing. In that way blocks of rock are loosened, broken down into smaller pieces and gradually conveyed along the course of the stream

(Right) AS THE DEPARTING PLANE roared across the savanna three and a half months after its arrival, the Phelps Venezuela Expedition gazed back on the forbidding terrain of this new "lost world." Etched and sculptured to a thousand shapes by all weathers, the isolated table-land whose treasures and secrets they had rifled, looked down indifferently upon the leave-taking of its conquerors

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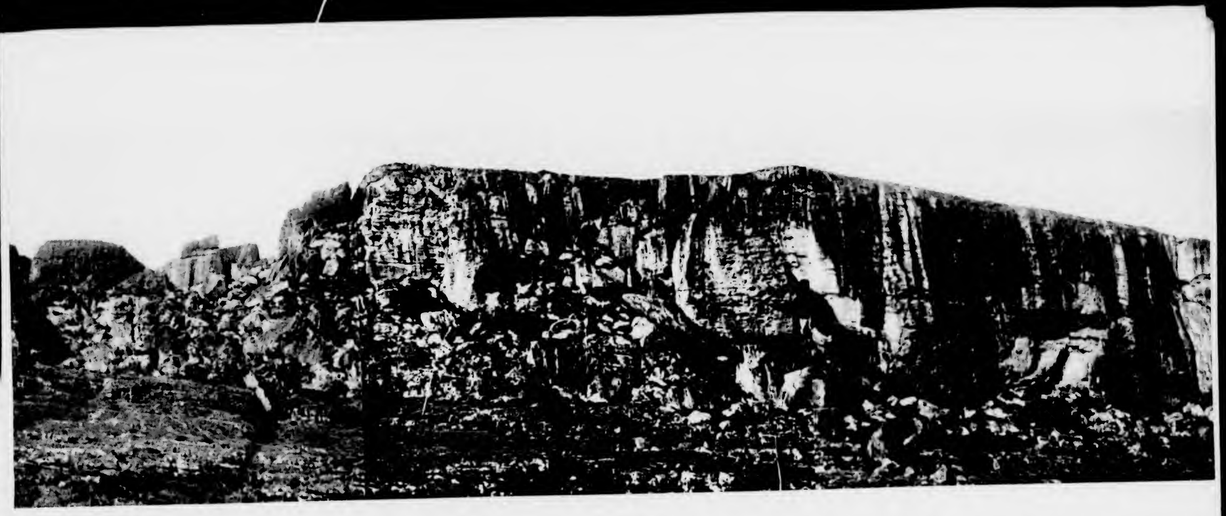

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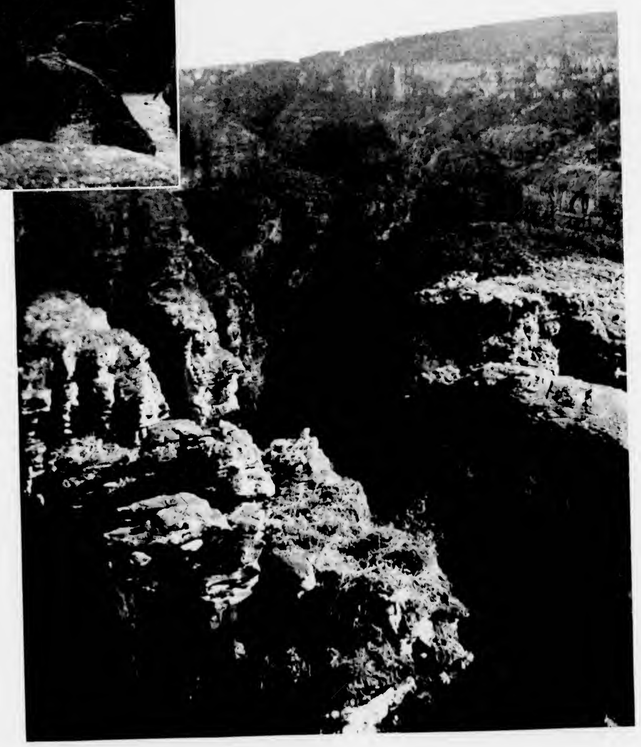

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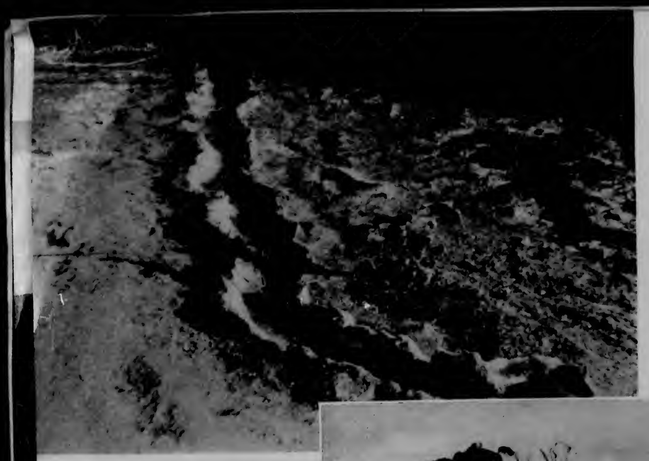

(Left) A WATER RUNNEL trickles over the sandstone surface while building up its own banks with deposits of silica which it carries in solution. The shot-gun bridge shows the smallness of this errant stream, but don't think it insignificant, for the Grand Canyon was probably started by a stream of similar size

(Above) SOLUTION ACTION along joint lines in the rocks followed by collapse of part of the beds. No one knows the rate of disintegration of sandstone mountains in the tropics, but it seems to be rapid and some day the majestic height of Auyan-tepui will be washed away to a minor hillock in a vast sweep of savanna grass

THE FLOWERS OF AUYAN-TEPUI and indeed of the Guiana uplands as a whole are strikingly beautiful. Few of them are known to horticulturists and new species are still plentiful in every collection brought out

on our way to the little forest of bronze-tipped *Bonnetia* trees beside which camp was placed.

How resilient is the temperament of the Indians! After two days of most arduous labor and five minutes after slipping off their heavy packs (they carried 35 pounds each), they squatted on the tops of nearby rocks laughing and talking as though the matter were an everyday occurrence.

These sturdily built Arecunas of Carib stock are likable, intelligent and tractable. Lately, however, the advent of civilization in its various forms has had its effect. The present chief of the clan, Alejo, whose teeth gleam with gold fillings acquired during a visit to Ciudad Bolivar, exercises an unusual degree of influence among his comrades and has regimented the whole population to wash gold for him. "Colors" occur in many stream beds, so Alejo is able to accumulate ounces of the metal by working his Indians for the three dry months of the year from January to March.

Though the supply of dry fuel within a few yards of our summit camp was almost unlimited, the cook boy exhibited the frugality customary among natives in regard to firewood. After a good though simple meal and before climbing into our blankets, we looked about us once more. Cliffs faced us to east and west. Southward were the rock walls past which we came that day; to the north apparently nothing but vast chasms into which all the water of Auyan-tepui falls. Overhead the half moon picked out here and there a weird figure sculptured by Nature, and a chill breeze crept over the plateau.

Collecting

Some weeks were spent on the plateau trapping animals, collecting birds and plants, lizards and insects. Fifty acres of forest whose dominant kind of tree is *Bonnetia* contained peculiarly specialized plants and creatures but proved to be relatively poor in species. Meanwhile, exploration had been actively pursued elsewhere on the summit, especially away from the rim of cliffs. It became clear very soon that owing to the development of long lines of rifts and cracks running southeast and northwest much time was lost in attempting to journey in other directions. Efforts were, therefore, made to penetrate the plateau to the north-northwest and to reach the highest cliffs to southeast, from which both lowland camps (the base at 3700 feet and the level savannas on which the Lockheed had landed us) could be observed.

In one part we had to burrow like moles beneath unimaginable quantities of tumbled rocks—rocks of such gigantic size that travel over their surface was utterly impossible—and sometimes we crawled beneath smaller blocks on which 1000-ton pieces rested. Another trip induced us to cut track through what looked like acres but in practice proved to be miles of burned forest overgrown with new vegetation—a hideous tangle in which we sweated in vain for hours. Again, an attempt to cross the great rocky wall just west of camp led to ultimate defeat: hours spent scrambling among huge sharp-edged boulders and rotting logs and stumps were rendered fruitless when we came finally to some impassable chasm or cliff.

Two exploring trips, however, proved highly successful. One, made in several stages, resulted in the establishment of a second camp beside a good-sized stream flowing through a tall forest three or four miles in from the margin of the cliffs, and a comparatively good trail leading to it was discovered. The other trip brought us with unexpected ease to a giant split in the cliffs from which the bearing of our 3700-foot camp could be taken, and farther along to the southern promontory of the mountain. From here a magnificient view was had not only of the air field and the 3700-foot camp, but also of the vast panorama of huge flat-topped sandstone mountains and plateaus so characteristic of this region.

Comparisons

Compared with Mts. Roraima and Duida, Auyan-tepui shows characteristics of its own. In its geological structure it most nearly matches Roraima, as it does in its animal life, but the latter as well as the plant life is several times richer on Auyan-tepui, corresponding to its much greater size. The most striking geological difference between Roraima and Auyan-tepui, apart from size, is that the sandstone cap is much thicker on Auyan-tepui, resting on intrusive rocks which reach an altitude of only 1500 to 3000 feet, as against 6000-7000 feet in the case of Roraima. On both mountains, the sandstone layers are scarcely disturbed from the horizontal, and there is an accompanying paucity of soil, with huge areas of bare rocks on which little vegetation grows.

The sandstone of Duida, on the contrary, is thrown into strong folds, some of which are sheared and partly overturned, and this sharply undulating surface carries a deep cover of nearly pure humus upon which the strange and specialized forests of that mountain grow.

Auyan-tepui displays a further difference from Roraima in the consistent slight dip of its sandstone beds amounting to four degrees toward the north-northwest and resulting in increased erosional effects.

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Both Auyan-tepui and Duida on account of their great size (both approach 300 square miles in area) have developed extensive river systems. Caño Negro on Duida varied from 15 to 20 feet in width; and the stream flowing past our interior camp on Auyan-tepui was about 30 feet across. Roraima, with only 20 to 25 square miles, had no large stream on its surface.

The slight dip of the strata of Auyan-tepui has resulted in dissection of the northern parts of the plateau on an enormous scale, as shown on a recently published map*. Falling into the largest of the gorges, cutting back nearly to the center of the mountain, is the waterfall photographed from the air by James Angel and shown recently in many newspapers.

The three mountains just discussed, which have all been visited by American Museum expeditions, are but a sampling of literally scores of giant mesas dotting this little known section of Venezuelan Guiana. The height of land is so disposed that a ridge carrying other huge masses of sandstone and nowhere less than 3000 feet above sea-level connects Auyan-tepui with Roraima. From Roraima the water parting trends south and then westward for about 350 miles, to terminate in the huge mountains of the upper Caura River and the Duida area. In the lowlands enclosed by this great divide, whose shape is more or less that of a great question mark lying on its back, the Rivers Caroni, Paragua, and Caura are born, all flowing northward into the Orinoco. The first of these flows within a short distance of the west side of Auyan-tepui, where it has attained a width of nearly an eighth of a mile.

Lower zones

While several of the members of our party worked on the plateau, the remainder, more than half a mile below, devoted their efforts to securing a complete representation of the birds and mammals of that level. That station proved to be by far the richest faunal area tapped by the collectors of the expedition. It included three chief types of environment: savanna, rain forest, and relatively bare, gently sloping rocky plain. Each type contributed substantially to the total of the collections made.

Meanwhile, the Arecunas, though they showed marked disinclination to carry supplies to the party above, quite got over what little mistrust (if any) they may have had at the beginning. Some, particularly little boys, collected birds for us with their blow-guns and split-palm darts, with which they are marvelously expert; the men shot deer and wild pigs, women brought quantities of yams, sweet potatoes, platanos, bananas, and even wild honey in their *guayares* for sale; and one Indian with his wife took service in the kitchen with Napoleon the cook. Nap it may be said, though unfaltering in his determination to have nothing to do with mountain climbing, never failed to provide bountifully and richly for the table.

Nicely settled here, and with the expeditionary work going smoothly, it was hard to realize that the very existence of a mountain such as Auyan-tepui was unknown at the American Museum a few months before our arrival at its foot. The discovery of its potentialities must be credited to Mr. W. H. Phelps of Caracas, a keen student of Venezuelan ornithology and sponsor of our expedition. He learned many particulars of Auyan-tepui from Mr. Gustavo Heny, Capt. Felix Cardona and Mr. and Mrs. James Angel, who for many months had been exploring thereabouts with a small plane and who underwent a very arduous experience on the plateau. The descriptions and photographs they brought out so fired Mr. Phelps' imagination that he at once wrote a series of letters to the American Museum offering to support an expedition to ascend the plateau for the purpose of studying and collecting its bird, animal and plant life.

Personnel

Mr. Phelps' suggestion, made in June, was promptly acted upon. Four members of the American Museum staff were selected for the work; W. F. Coultas, ornithologist, formerly in charge of the Whitney South Sea Expedition; E. T. Gilliard, ornithologist; J. A. Dillon, taxidermist; and the author as mammalogist, in charge. Quantities of stores and food supplies were assembled; moreover every possible consideration was given the expedition by the State Department in Washington and by the Government of Venezuela.

In that country Mr. Phelps actively prepared for the expedition's arrival. At Cuidad Bolivar, the main base of operations, he assembled quantities of additional stores and made arrangements with the Venezuelan Government to fly the entire expedition with all its supplies to the large savanna at the base of Auyan-tepui and from that point back to Cuidad Bolivar when the expeditionary work had been completed.

A supplementary plane-load of stores was arranged for the middle of January. The ship, though delayed for a few days by bad weather, brought every item ordered. A few weeks later, our work at an end, the orderly retreat from the plateau began—first down to the 1100 meter base, and after-

Continued on page 153

Geographical Review, July, 1938.

Easter Island

Indians of South America

Easter Island's Mystery Draws Scientists

Two Expeditions, One From Europe and Other From America, Will Study Huge Relics of a Lost Civilization in South Pacific

The tiny speck of land in the South Pacific known as Easter Island will be host this coming season (its summer) to a distinguished gathering of scientists, arriving to study once more the unique and puzzling remains of a lost civilization which specialized in giant statuary, and left behind it little to identify it except indecipherable pictographs.

The first of the scientific explorers, Prof. Alfred Metraux, of Switzerland, already has landed on the island, where he was conveyed by the French sloop *Rigault-de-Genduilly* about three weeks ago. He expects to pass six months there in research.

The others, making up a scientific group led by members of the staff of the American Museum of Natural History (New York), will sail soon from San Francisco, aboard the seagoing yacht *Zaca*, owned and commanded by Templeton Crocker, wealthy San Franciscan. One of the objectives of the Crocker Expedition will be to bring back material for four bird-habitat groups for the Whitney Memorial Hall of the Museum, but the staff of experts will include (in addition to an ornithologist and an artist) an anthropologist, who will make a study of the natives of Polynesia, as well as of the relics of Easter Island.

Some of the monuments on Easter Island

Magnet for Anthropologists

Easter Island has been a magnet for anthropologists and archeologists, and the starting-point of many theories concerning the ancient races of the South Seas, for more than 200 years. It first was explored by Roggeveen, a Dutch admiral, who landed on Easter morning, April 6, 1722; hence the island's name.

The speck of land, only forty-five square miles in area, is of volcanic origin, and is triangular, with an extinct crater at each angle. It is approximately 2,000 miles from the Coast of Chile, to which country it belongs, and nearly 1,000 miles from Pitcairn, nearest inhabited island to the west.

The most striking things about the island are its "megaliths," or huge stone prehistoric monuments. These are of three types, all gigantic. Upon the bluffs and in other sites commanding a view of the sea great platforms called *ahu* have been built. More than 100 have been counted, the longest, 150 feet in length to-day, originally was 540 feet in length.

Near these platforms are stone enclosures sunk into the ground, often called houses, tho their purpose is unknown. They are built of stone, and, in many cases, are decorated with pictographs, either painted on the walls by rubbing with colored tufa, or carved.

Most conspicuous of all are the large statues representing human torsos and heads rudely carved, with exaggerated ears and retroussé noses. Nearly 600 of these statues have been found, the largest seventy feet long, still lying unfinished in the quarry which occupies the crater of the largest volcano. All of the statues are overthrown, or partly sunk in the ground, but at the time of the first exploration of the island many were standing in solemn rows along the *ahu*, their backs to the sea. Others lined the ceremonial roads leading to the quarry in the crater.

They averaged from thirty to forty feet tall, and weighed about fifty tons. How these huge blocks were moved from the quarry never has been explained.

"Anti-Hormones" End Drea

During the last ten years it has been frequently predicted that the human race some day would be remade by endocrine therapy —the use of hormones extracted from or secreted by the still mysterious "ductless glands." It is known that improper functioning of these glands produces giantism and dwarfism, overweight or underweight, and many types of disease. Some physicians have been confident that such conditions readily could be overcome by administering gland substance to make up for that apparently lacking.

But, it now has been pointed out by *The Journal of the American Medical Association*, they have reckoned without the body's resistance to assaults upon its glandular equilibrium. It has been demonstrated by Prof. J. B. Collip and his associates of McGill University that when foreign-gland substances are injected into it, the body manufactures "anti-hormones."

 Sept. 8, 1934

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Science News Letter - Feb. 8, 1936.

FROM EASTER ISLAND

of useful coughs: the light cough, the loose cough, and the insufficient cough.

A doctor is very loath to condemn a cough as useless. A cough is useless when it fails to bring up any secretion because there is none to bring up. The useless cough is harmful for the reason that coughing begets coughing. Violent coughing irritates the bronchial tissue and such irritation leads to further coughing.

The nervous cougher furnishes an example of the useless type of cough. He coughs when there is an embarrassing pause in the conversation or when some one inquires about his health.

All chronic coughs, according to Dr. Fantus, are due to "irritation plus," "nutrition minus," or a combination of the two.

Science News Letter, February 8, 1936

ARCHAEOLOGY

Cast of Easter Island Head Placed in American Museum

AN ALICE in Wonderland dream. A human head ten feet tall, with a neck but no body. This is the gigantic trophy an expedition has brought back from mysterious Easter Island to show Americans what the famed great stone faces of that Pacific isle are like.

The giant head is greeting strangers with a scowl, in the entrance hall to New

Lover

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FROM EASTER ISLAND

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A doctor is very loath to condemn a cough as useless. A cough is useless when it fails to bring up any secretion because there is none to bring up. The useless cough is harmful for the reason that coughing begets coughing. Violent coughing irritates the bronchial tissue and such irritation leads to further coughing.

The nervous cougher furnishes an example of the useless type of cough. He coughs when there is an embarrassing pause in the conversation or when some one inquires about his health.

All chronic coughs, according to Dr. Fantus, are due to "irritation plus," "nutrition minus," or a combination of the two.

Science News Letter, February 8, 1936

ARCHAEOLOGY

Cast of Easter Island Head Placed in American Museum

AN ALICE in Wonderland dream. A human head ten feet tall, with a neck but no body. This is the gigantic trophy an expedition has brought back from mysterious Easter Island to show Americans what the famed great stone faces of that Pacific isle are like.

The giant head is greeting strangers with a scowl, in the entrance hall to New

OVER

Retake of Preceding Frame

ture."

The attractive appearance of the viscous oil, while suggestive of hot biscuits and pancakes, is quite deceptive. Not only is the oil tasteless and odorless, but it is totally indigestible. Perhaps its most promising application will be in the role just opposite to that of a lubricant—a medium which will retard motion instead of assisting it.

Science News Letter, February 8, 1936

THE EARTH IS AN ONION

"The results indicate that a saving of 20 per cent. in the seasonal fuel consumption could be reasonably attributed to the installation of storm doors and windows," concluded the scientists.

Other results include:

1. Storm sashes practically eliminate the entrance of soot.

2. Higher relative humidity can be maintained indoors before condensation appears on the glass.

3. Storm windows reduce the draft of cold air down the windows and thus increase the temperature of air near the floor.

Science News Letter, February 8, 1936

GEOPHYSICS

Model Shows Layered Interior of Earth

THE earth is not simply a round lump of stone, uniform from core to circumference, as the more enlightened among the ancients thought it. Neither is it a thin-crusted ball of liquid fire, as more recent notions would have it. It is a series of concentric shells, laid onion-fashion over a solid core that seems to be made of nickel-iron.

This doctrine, largely the product of studies of earthquake waves that have passed through the earth, is given concrete illustration in the built-up sectioned globe shown at the recent meeting of the American Association for the Advance-

York's American Museum of Natural History. When Dr. Harry L. Shapiro, anthropologist of the American Museum-Crocker Pacific Expedition, stands beside his strange trophy, his eyes are on a level with the Mystery Man's nose—that is, just the tip of the nose—and his hand rests comfortably at the Mystery Man's pouting mouth.

The head is a plaster cast, made with great difficulty under broiling sun and amid clouds of insects, by Toshio Aseida of the expedition staff.

The expedition could have chosen a head 30 or 40 feet tall to cast, but chose a conservative size, as being enough of a technical problem. The museum might have been embarrassed by a 40 foot head to take care of, Dr. Shapiro figured.

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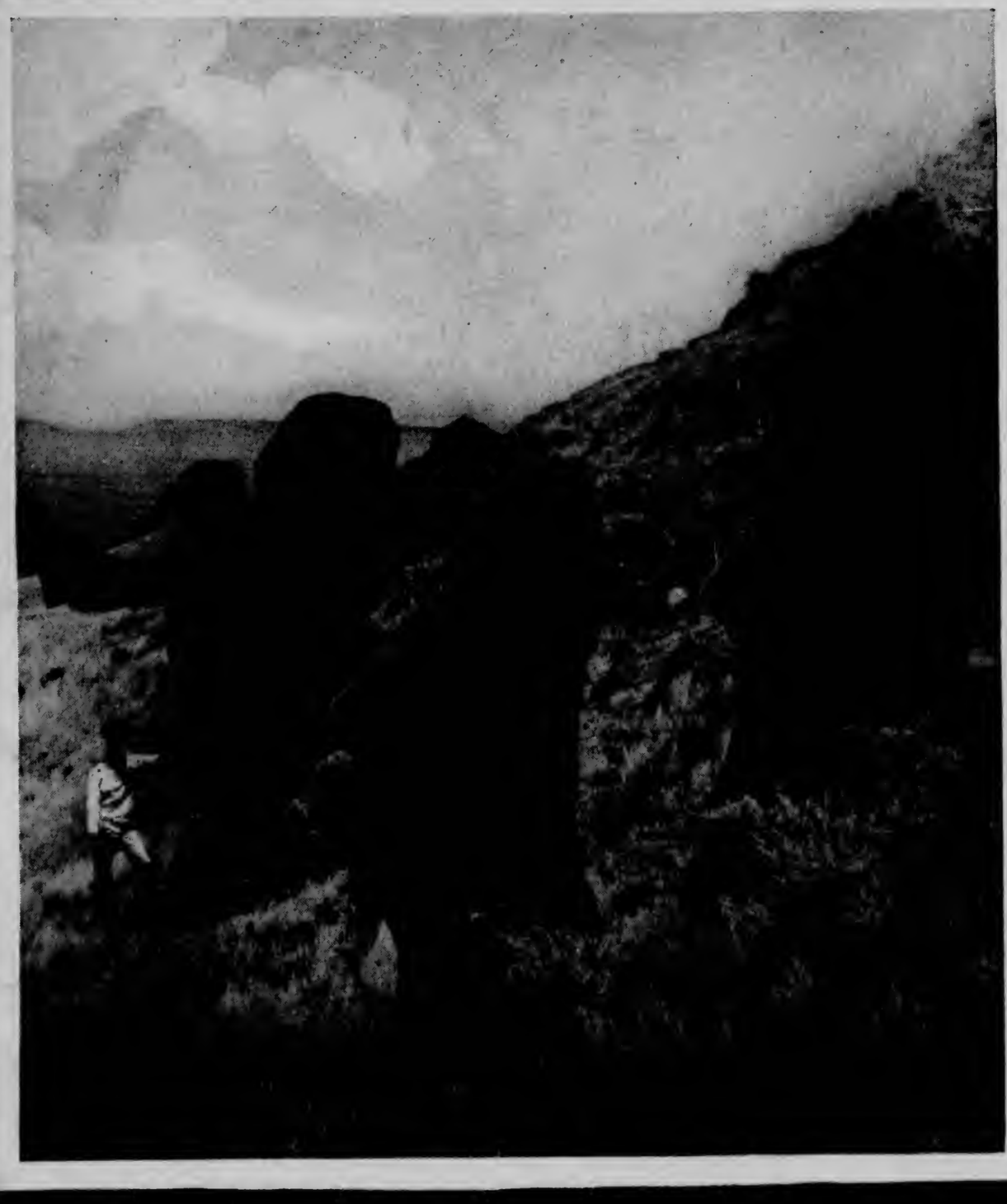
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



NOVEMBER 17, 1934

Sphinxes of the Pacific

See Page 314

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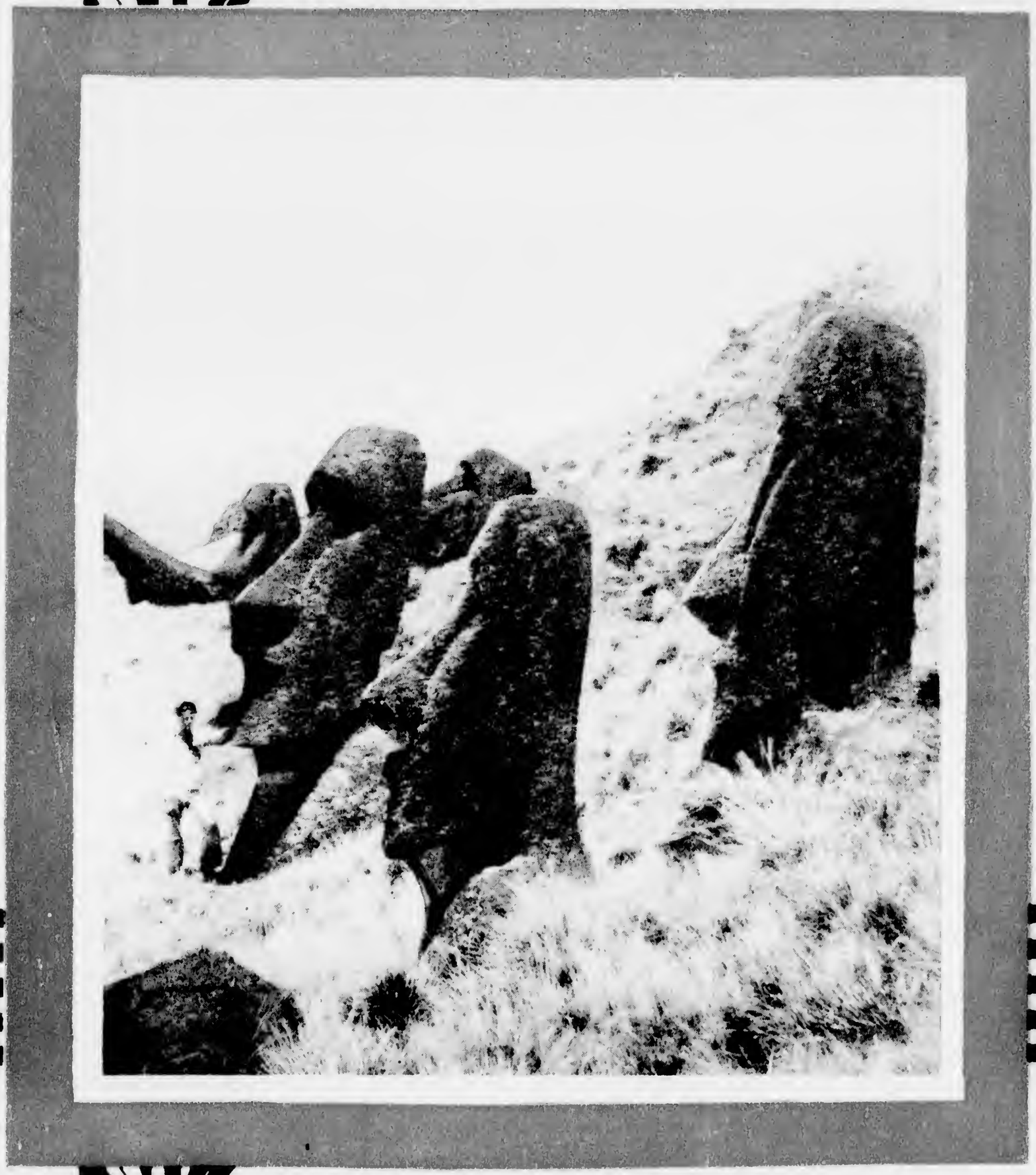

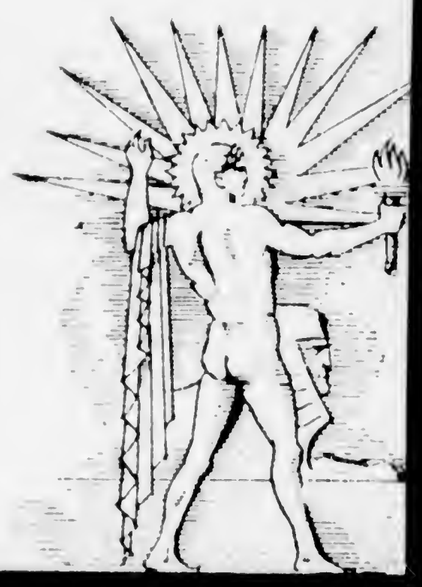

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SCIENCE STRIVES to SOLVE

The RIDDLE of the GREAT STONE FACES

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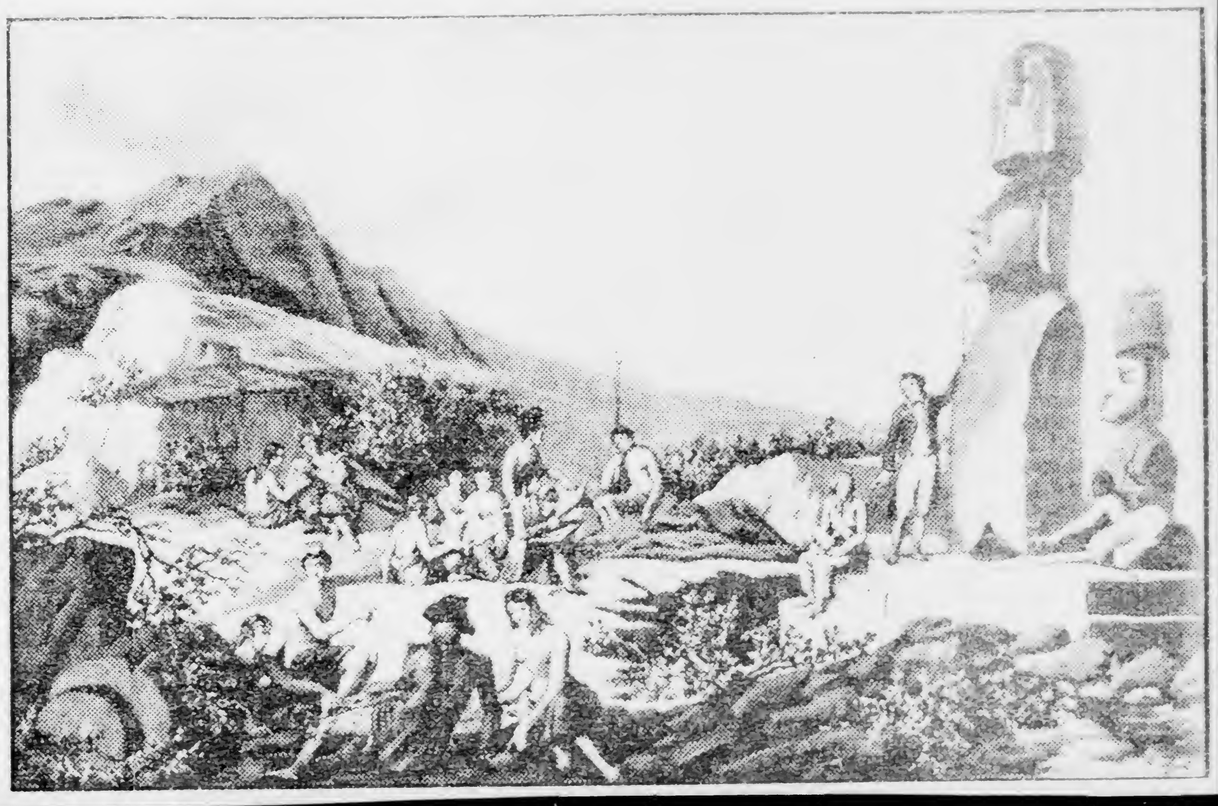
By the time the scientific importance of the island was attracting attention many changes had taken place. Some tribes carried off the cream of the population, habitat tribes, priests and craftsmen, to work in guano fields of Peru. Smallpox and tuberculosis joined on the depopulating program, reducing the number from several thousand to several hundred. Missionaries came, civilizing influences and discovering that the island once had the dignity of learning, some men who could read ancient records and write down statements in pictures. There remains on Easter Island, for science to study only a memory or so natives who work by a short cut on the island.



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ARCHAEOLOGY

Easter Id.

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WRITTEN WORDS

The National Museum at Washington has several rare pieces of Easter Island writing, on wooden slabs. How the islanders came to have a written language is one of the island mysteries, yet to be solved.

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LONG AGO

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Can't Read the Characters

There remained on Easter Island, for science to study, only a hundred or so natives whose chief duty is to work for a Chilean sheep ranch on the island. Some proudly claim ability to read the old wooden tablets cherished in a few homes. But skeptical scientists have found that these natives are merely reciting, as a child points to any page in a book and glibly reels off Little Bo Peep.

Confused traditions and ideas gleaned from much quizzing of the modern islanders shed little light on one of the really remarkable cultures of the past.

Some years ago, a theory was advanced that only civilized men could have handled the problem of moving and placing the stone statues, or have evolved the Easter Island writing. This theory assumed that Easter Island must be the remaining tip of a continent that sank beneath the sea in some frightful disaster.

Fantastic, is the reply of scientists to

ARCHAEOLOGY

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More Than 600

The world's strangest art gallery came to have over 600 of the images. And then one day the workers dropped their crude stone tools in the workshops and never came back. Their masterpiece, a giant that would have stood 70 feet tall, lies unfinished there among other partly carved work to this day.

Every one who sees the images of the island, or pictures of them, thinks of questions to ask:

Were the images meant for idols, or portraits of ancestors, or guardians of the dead?

Did important men get big statues, and plain citizens smaller statues?

What catastrophe put an end to the business?

And who were these artists of a forgotten school of sculpture anyway?

The last question can be answered, to an extent. The others haven't been answered yet, nor many more that you can think of.

The natives of the island today are of a mixed type, some dark, some light. It is realized that the Pacific in prehistoric times was ably navigated by Polynesians who could make voyages of a thousand miles or so in their large canoes. They had bamboo charts on which they marked the courses of guiding stars. So, it is not hard to understand how Easter Island could have been reached by adventurous expeditions, and a settlement made there. The modern natives have traditions about the stone figures and other island antiquities. The memories have worn thin, and fact and fiction are confused. But it is generally supposed that the ancestors of these natives were indeed the possessors of Easter Island's famous old culture.

Mystery Not Solved

Accepting that, however, does not begin to solve the mystery. The problems that scientists want to have explained are harder:

Did the first settlers come to the island from South America, or from the west from other islands? That is, was this island an offshoot of America's ancient history, perhaps linked with the Indians of Peru who were adepts at feats of handling tons of stone? Or was the island's past rooted in some Asiatic homeland?

And did the first settlers bring their uncanny knowledge of stone work and other advanced cultural ideas to the island? Or did they make their own inventions on the spot after they arrived?

If an American anthropologist can show how the giant statues and their makers fit into the world's ancient history, he will win an international contest of wits that has been going on for years.

Easter Island has come to be known as the explorers' delight. The cloud-scraping mountain peaks of the world may be climbed one by one, and checked off the "things to be done" list. The poles may be flown over and photographed, and that's finished. But Easter Island goes on forever. Almost every year, recently, has seen some restless explorer sailing for Easter Island, two thousand miles from the shores of Chile and over a thousand from the nearest island neighbors. Presently the restless explorer is back with strange and entertaining things to tell. But he hasn't spoiled the mystery to any marked extent for the next man to follow him.

A double-barreled attack in one year, however, looks serious. The Europeans have come half way round the world to spend seven months concentrating on the stone faces and the island's other chief evidence from the past, its ancient picture writing.

In all the isles of Polynesia this speck of an island was the one place where aboriginal people could read and write. That written language, consisting of rows of birds, humans, and less obvious designs, is a forgotten system. But language experts refuse to give up. Some signs they have translated.

WRITTEN WORDS

The National Museum at Washington has several rare pieces of Easter Island writing, on wooden slabs. How the islanders came to have a written language is one of the island mysteries, yet to be solved.

A few years ago, the British Royal Anthropological Institute appointed a committee to see what it could do about the Easter Island writings. The committee came back in 1932 with its opinion that the wooden slabs contain, not connected narratives, but notes such as an orator might use to remind him of facts and points in a discourse.

Whence the Language?

Still, the writings continue to attract scholars, who want particularly to know whether the islanders got their language from some distant points, or made it up themselves. A written language is a great achievement for men to produce without outside inspiration. One language specialist thought he could find significant clues in the writing, pointing to a link with ancient India.

The present European expedition to Easter Island is handicapped by the recent death of Prof. Luis Wathelin, specialist on inscriptions, who was to have checked on such points as this.

The American scientists who are turning their faces toward the southern Pacific have a more varied program than the French-Belgian-Swiss group of scientists. The Americans are to voyage 13,000 miles through the South Seas, with the primary object of gathering data for four habitat groups of South Sea Island birds for the American Museum of Natural History. Three American Museum scientists are accompanying Templeton Crocker, leader of the expedition.

Easter Island is one of the scheduled stopping places for the expedition, however, and an anthropologist is aboard the yacht. So, at that point, birds must take second place in the expedition's thoughts.

Shortly before the expedition sailed, one member visited the National Museum at Washington to examine the rare specimens of Easter Island writing on wooden slabs in the national collections. The National Museum profited by the trip of the U. S. S. Mohican to the island in 1886, when Paymaster William Thomson of the Navy wrote a scientific report on the place and brought to Washington several of the wooden inscriptions and two of the sorrowful-looking stone images.

Not a Scientist

Had Admiral Jacob Hoggeveen, eighteenth century Dutch explorer, been a man of science, he could have perhaps solved the mystery of Easter Island before it became nearly so mysterious. When he stepped on the island Easter morning 1722 and named the island after the day, the great stone images were not lying flat and neglected as they now are. He saw the images in all their towering dignity, standing on great stone platforms.

But the Admiral's mind was on other matters than scientific inquiry. His sailors had a fine scare when they neared the island and saw the curious excited natives that were milling about the shore. An excited Dutch sailor fired a shot, and there was scuttling. The natives begged for mercy and brought offerings to the strangers. The Dutch party spent the rest of the day on the island in peace, and had a look at the nearby stone images, which they promptly assumed to be extra-big idols.

LONG AGO

French voyagers, in the eighteenth century, measured the stone statues and sang the praises of the belles of Easter Island. But they neglected to question the native maidens about the island's curious and already fading past—unfortunately for science.

Voyagers Gaped

Spanish, English, and French ships adventuring in the Pacific touched upon Easter Island about fifty years after the Dutch visit. They measured the stone images, and gaped at the size. They made friends with the women and the Frenchmen returned home singing the praises of the grace and beauty of these native belles who resembled Europeans in color and feature. But they neglected to question the native maidens about their ancestors, or the cultural aspects of the island's life or its theories about monumental stone art—unfortunately.

By the time the scientific importance of the island was attracting attention, many changes had taken place. Slave raiders carried off the cream of the population, including rulers, priests, and educated men, to work in guano fields of Peru. Smallpox and tuberculosis preyed on the remaining inhabitants, reducing the number from perhaps several thousand to several hundred. Missionaries came, establishing missions and discovering that the island once had the dignity of learning, with men who could read ancient records and write down important happenings.

Can't Read the Characters

There remained on Easter Island, for science to study, only a hundred or so natives whose chief duty is to work for a Chilean sheep ranch on the island. Some proudly claim ability to read the old wooden tablets cherished in a few homes. But skeptical scientists have found that these natives are merely reciting, as a child points to any page in a book and glibly reels off Little Bo Peep.

Confused traditions and ideas gleaned from much quizzing of the modern islanders shed little light on one of the really remarkable cultures of the past.

Some years ago, a theory was advanced that only civilized men could have handled the problem of moving and placing the stone statues, or have evolved the Easter Island writing. This theory assumed that Easter Island must be the remaining tip of a continent that sank beneath the sea in some frightful disaster.

Fantastic, is the reply of scientists to

Retake of Preceding Frame

this theory today. No continent has settled to a watery grave carrying chapters of human history down with it. That is to say, no major change in the world's geography of this sort has happened in man's lifetime.

So far as Easter Island itself is concerned, the sea very near the island drops off sheer 12,000 feet. It has been aptly pointed out that if this terrain were lifted, the whole island would be well above the snow line, and that would mean that sculpture factories flourished in a chilly, rarefied atmosphere, far from suitable for such work.

Science News Letter, November 17, 1934

GEOGRAPHY

Maps of the World Displayed For World Geographers

International Congress at Warsaw Had Largest Exhibit of Maps; Aerial Photography Also Studied

By DR. ISAIAH BOWMAN, **President, International Geographical Congress at Warsaw; Director, American Geographical Society and Chairman, National Research Council.**

THE largest and most diversified map exhibition of its kind in the world was the outstanding feature of the International Geographical Congress at Warsaw from which the American delegates have recently returned.

The map is the symbol of the geographical profession. In the Congress the cartographic papers, discussions and exhibits were naturally most important.

An entire building was devoted to the exhibition, to which 50 institutions from 25 nations contributed maps.

Practically all official cartographic services of the world sent exhibits. About a dozen American universities and research organizations, as well as government bureaus, contributed material for the exhibit. The first exhibit to be inspected by President Moscicki, head of the Polish Republic, when he opened the exhibition, was that of the United States Geological Survey.

There were exhibited archaeological maps made on the one to one-millionth base maps, and the steady progress of this enterprise was encouraging. It consists of putting upon this internationally recognized base map the location of various types of archaeological remains. One map shows Roman Britain, and from it the reader sees at once where the known remaining sites — walls, forts, baths, etc.—may now be found.

There was also a special meeting devoted to an historical account of the development and progress of the one to one-millionth international map of the world. At this meeting it was reported that the compilation of the 102 sheets of Hispanic America now in preparation by the American Geographical Society of New York would be completed by the end of 1934, and that the fair drawing would be completed by the end of 1935.

The Congress paid considerable attention to aerial photography as an aid to mapping. One of the principal publications of the Congress was a report of a Commission on Photogrammetry dealing with progress in this field. This was one of the seven Commissions that have been working during the past three years and which contributed valuable reports to the Congress. A new Commission was appointed at the Warsaw meeting—one on Climatic Variations. It is hoped to give this matter special attention in the next four years during which the Commission is to prepare material for the next Congress.

Honored By President

The Congress was honored at the opening by the presence of President Moscicki, the head of the Republic. Present also were some of the members of the Cabinet and representatives of foreign embassies. The attendance was approximately 1,000. The meeting was held in the Court of the Polytechnic Institute. There were 44 nations represented by about 300 foreign delegates. The total membership of the Congress was about 870.

President Moscicki also received the delegates on the terrace of the Palais Royale, overlooking the Vistula. The members of the Congress were also received by the Prime Minister of Poland and by the Mayor of Warsaw. At the final banquet the Congress was honored by the presence of M. Beck, Minister of Foreign Affairs, and also by the Minister of Culture and Public Education.

Made Excursions

Before and after the Congress excursions were conducted by experienced geographers to various parts of Poland. They were of particular interest to the foreign delegates because of the fact that Poland has so recently been reconstituted. A part of it was formerly under the sovereignty of Austra-Hungary, another part was held by Germany, and the greater part was included in so-called "Congress Poland," a province of former Russia. To put these three parts together into a working political organization, to integrate their economic life, including their transportation systems, and to organize the political machinery and cultural institutions effectively was the first task of the leaders of Poland, and it was of interest to the members of the Congress to see the diversity of the country and the steps taken to make out of that diversity a harmonious whole. The technical or professional aspects of the excursions were also of broad interest because of the fact that few geographers from other countries had visited some of the less accessible parts of Poland and all were eager to see a land situated so far toward the East.

Science News Letter, November 17, 1934

Colossal Statues, the Wo

GIGANTIC stone statues, on the other hand, although often broken up, are almost valueless for other purposes, and have therefore remained undisturbed for scores of centuries, many of them being the only relic of people that have lived upon this earth in remote ages. The gigantic stone statues on Easter Island are a good example, for the present inhabitants know nothing about them, and the people that carved them are

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Written by Chas. A. Brown of Fresno - Alaska Post Office 5-1936

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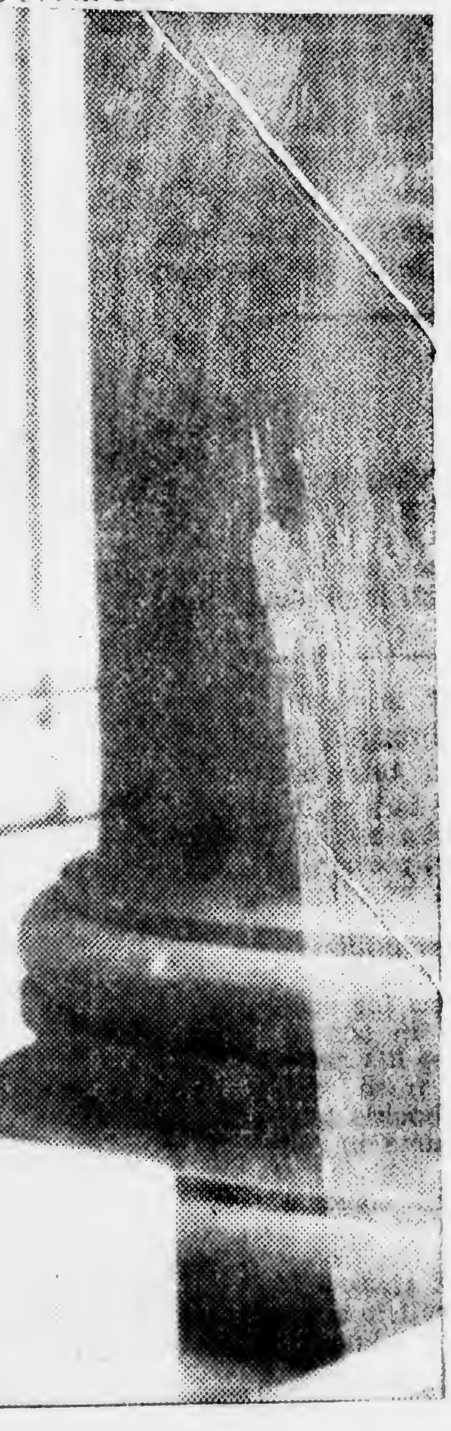


Article by Charles D. Hornung - Wheeling Post Dispatch 5/1936

South America : Peru

Incas Had so Much Gold They Used it For Pins and Nails

Science News Feb. 1, 1936

GREECE had a Golden Age of fable, the Renaissance had its Golden Age of literature, moderns boast of a Golden Age of science. But South America is one of the few spots in the world that ever had a Golden Age of actual gold.

In Ecuador, the golden ornaments of the natives amazed the first Spanish conquerors who came, saw, and took what they wanted back home. What is not so generally known is that the use of gold was so widespread that not only ornaments but such prosaic articles as fish-hooks, sewing needles, safety pins and hooks and eyes were made of the precious metal. Even gold nails have been found.

More than that, the Indians alloyed platinum with gold to produce a whiter metal. How they did it has long been a mystery because no fire which the natives had yielded a flame with sufficient temperature to reach platinum's melting point, 3,224 degrees Fahrenheit.

New discoveries, however, are piercing the gloom of the mystery, according to the Danish scientist Paul Bergsoe of Copenhagen, who describes how articles have been found, fortunately, in all the various stages of fabrication from start to finish. (*Nature*, Jan. 4)

From this cross section of prehistoric South American metallurgy it is possible to reconstruct the method of making the platinum gold alloy objects.

Grains of platinum were mixed with a little gold dust and the two burned with wood charcoal. A blowpipe supplied the needed draft of air to attain the maximum temperature. While the platinum would not melt in the flame the gold did and served as a sort of binding cement to hold the platinum grains.

It is known that melted metal slowly diffuses into the unmelted portion during a long heating. The unmelted metal, in turn, partly dissolves into the melted one. The result is a sinterous mass which under later hammering and cold working becomes so homogeneous that it can be fashioned into plates or other objects.

Gold-platinum wire was also made by drawing small bars down to diameters as little as four one-thousandths of an inch. Such tiny size precludes the use of dies for drawing the wires, states Mr. Bergsoe.

Science News Letter, February 1, 1936

MATHEMATICS

1936, Square of 44, Last "Square" Year Until 2025

IF YOU tire of writing 1936 after dates during the current year you can instead write 44^2. Dr. Donald P. LeGalley, of the physics department of Pennsylvania State College, calls attention to the fact that this is the first time since 1849 that the year has resulted from a perfect square, and it will not happen again until 2025 A.D., according to Dr. LeGalley.

Perfect square years also occurred in 1764 and in 1681.

Science News Letter, February 1, 1936

SCIENCE NEWS--DEC. 1928

65. ANDEAN CIVILIZATION

Some Problems of Peruvian Archaeology

JULIO TELLO

During the past few years, thanks to the aid lent by the Peruvian Government, a museum has been formed in Lima,—El Museo de Arqueologia Peruana,—which contains nearly all of the private collections which existed in the country, amounting to some tens of thousands of pieces. Archaeological explorations and excavations have also been undertaken with a view to studying, classifying and exhibiting these collections, and satisfactory results have been obtained.

In this work of systematizing archaeological data, the investigations have been directed with a view to defining the characteristics of the known cultures, determining their area of diffusion, and establishing their relation one to another,—first within the Peruvian area, in order to compare them later with the neighboring or distant cultures, and to establish the existing differences or links.

The study of the archaeological literature of Peru, and the experience acquired in the Museum and in the explorations realized have afforded the author the opportunity of verifying the existence of three great Epochs in the Pre-Colombian history of Peru, as follows:

1st. The Archaic Andean Epoch, or Megalithic.

2nd. The Epoch of the development and differentiation of the cultures of the Coast.

3rd. The Epoch of the great tribal confederations which culminated in the Inca-Confederation of Tawantinsuyu.

Three great stages which embrace a great variety of cultures and styles corresponding to the development and differentiation of only one civilization nurtured in the Andes; the Andean civilization.

The author studies mainly the general characteristics of the cultures comprised in the first Epoch.

SCIENCE NEWS--DEC. 1928

106. SOME NEW IDEAS ON THE FORMER SHAPE OF THE SUN TEMPLE (CORICANCHA) AT CUZCO

MAX UHLE

Professor Lehmann-Nitsche has discussed the former conditions of this temple, and has developed an interpretation of the representations on its altar. The author discusses this paper and gives his own views regarding the construction of the temple.

Another Great Wall

Ancient Wall in Peru Discovered by Aviator-Explorers Rivals Similar Structures in China and Europe

By EMILY C. DAVIS

See Front Cover

THE GREAT WALL of China, winding like a mighty, protecting serpent along the old northern boundary of the Celestial Kingdom—

Hadrian's Wall, the Great Wall of Britain, built and fortified to shut the barbarians of the north out of southern Britain in Roman days—

And now, added to this small, select list of Great Walls in the world is an American entry—the Great Wall of Peru, which has been discovered by explorers flying over the Andes.

The American Wall was built with hard labor by an Indian people called the Chimu who had an important civilization long ago on the Pacific coast of Peru, until finally they were swallowed up in a terrific struggle by the powerful empire of the Incas.

That a Great Wall, many miles long, should be hidden or lost or forgotten, seems incredible. A Great Wall would seem to be as conspicuous as the proverbial white elephant. But the Great Walls of China and Britain have had a way of fading out of sight for many centuries and coming to light again in modern times. And the new-found Wall of Peru is just like them.

How very, very inconspicuous a Great Wall can be was proved by the Chinese Wall, which was unknown outside of Asia for almost two thousand years. And this is a barricade 1,500 miles long—half the width of the United States. As late as fifty years ago, articles were actually written arguing that the Chinese Wall was a myth.

In England, archaeologists are still discovering Hadrian's Wall, which runs clear across the island, from east to west, for 73 miles. The course of this old Roman Wall, up and down hills and valleys, is pretty thoroughly traced now, but only last year a brand new fort along the wall was unearthed, with much excitement in England. And something new may be dug up along the route of Hadrian's Wall now and again for some years to come.

As for the Great Wall of Peru, it has just gained the world's attention for the first time. The long wall was sighted from the air unexpectedly as the recent Shippee-Johnson Peruvian Expedition flew over the foothills of the Andes.

Never having heard of any barricade of such size in Peru, the surprised explorers, Robert Shippee and George M. Johnson and their party, studied their air photographs and puzzled over them and finally decided to make another flight, to trace the length of this mysterious barricade. This time the flying explorers started from a point near the Pacific coast where ruins of a village lie buried. There the Great Wall springs up.

Runs From Sea To Mountains

The whole Pacific coast of Peru is a desert strip of sand about fifty miles wide, cut across by a number of rivers which make the land habitable. East of that desert, the Andes begin.

The Great Wall crosses this sandy coast and rises into the foothills. It was apparently built to follow the Santa River from sea to mountain. In many places the barricade wanders more than a mile from the river. Occasionally it comes close, even crossing the river's path. Neither hills nor gullies stopped the progress of the Wall.

Like the Chinese Wall and the Wall of Hadrian, the Great Wall of Peru was strengthened by a series of forts. The discoverers sighted fourteen of these forts. They stood on both sides of the Wall and at a short distance from it. Some of the forts are circular, some are rectangular. Most of them were cleverly set in the tops of small hills, where they could be quite invisible from the valley floor.

As the fliers followed the wall up into the Andes, at an elevation of 10,000 feet in the mountains they lost the trail. Weather conditions were against them. The light was failing. But they had succeeded in following the trail for more than forty miles. They had seen enough to convince them that this construction project of ancient America ranks with remarkable feats of the past.

Viewed from an airplane over the Andes, the Great Wall of Peru is a seam, a long, fine scar on the face of the mountains. After the fliers had surveyed it from the air, they set out in an automobile and on foot to examine it at close range.

They found a tall, crumbling rampart of mud-cemented boulders. Where it crosses gullies it rises as high as 20 or even 30 feet. The average height appears to have been 12 to 15 feet. At the base it was about 12 to 15 feet thick. Toward the top of the thickness tapered.

Undoubtedly, this stone barrier has been stumbled over for years by explorers who could not see what it was. To think of anything so large being invisible is a strain on the imagination. But the Great Wall of Peru was just that invisible.

The reason is that Peru is criss-crossed with walls. They run here and there for short distances, enclosing forts, bounding fields. Many of the old barricades are broken lines not easily followed. Peruvian walls in general have been called "mysterious." So, groundling explorers who saw broken portions of the Great Wall would have thought little of it. Not until explorers took wings could its long sweep be detected.

Now that the Great Wall has been revealed by aerial photography, there is real surprise that so big a monument was never mentioned in early historic writings about Peru. The Spanish conqueror Pizarro and his men, who were so curious about all the wonders of the Incan Empire in Peru, seem to have heard nothing about a Great Wall.

Unknown To Spaniards

The Spaniards exclaimed over the long, smooth highways built by the Incas for their armies to march over. They marveled to see Incan temples built of stone and shining in gold and jeweled ornaments. They took the keenest interest in the intricate communist system of the Incan government. And chroniclers who accompanied Pizarro busily wrote down impressions about these things.

Was the Great Wall already a ruin, forgotten, when the Spaniards conquered the Incas in the sixteenth century? That might account for the silence of history on the subject.

A number of archaeologists have been asked their opinions on the Great Wall by the American Geographical Society, and there is virtual agreement on one point. That is that the builders of the

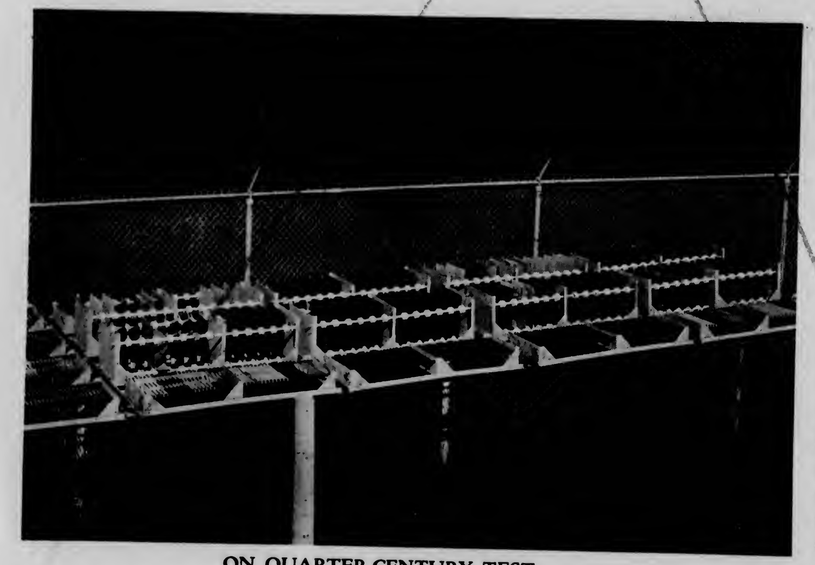
use of about 23,000 test plates of copper, tin, zinc, bronze and similar metals and alloys over a period of 25 years. The Society estimates that during the past five years cooperating companies contributed more than $175,000 to the work as materials, special testing equipment, labor and funds.

The most extensive division of the program, which makes use of the greater part of the 23,000 specimens, studies atmospheric corrosion. Test plates of different metals are exposed to the atmosphere in various parts of the country.

Rural, Salty or Contaminated

The effect of rural atmosphere is being recorded on plates in open fields at State College, Pa., and Phoenix, Ariz. Seacoast air sometimes blows salt spray over the metals at Sandy Hook, N. J., and Key West, Fla. High humidity exerts its effect at Rochester, N. Y., and La Jolla, Calif., while contaminated industrial atmosphere surrounds plates at New York City and Altoona, Pa.

The results of weathering under these conditions are studied at definite intervals during the years of exposure by determining the change in weight of the plates and their loss of strength and ductility. A part of this work is being done at the U. S. Bureau of Standards in Washington under the direction of H. S. Rawdon, chief of the Division of Metallurgy.



ON QUARTER-CENTURY TEST

Scientists are learning from these plates of non-ferrous metals exposed to the weather at State College, Pa, how to save a part of the millions lost each year through the corrosion of such metals in industry.

Two Huge Telescopes Are Planned for United States

80-Inch Reflecting Instrument Will Be Built in Texas by Two Universities; Harvard Prepares For 61-Inch Mirror

A NEW ASTRONOMICAL observatory, equipped with an eighty-inch reflecting telescope, will rise upon the summit of a peak of the Davis mountains in western Texas within the next six years as the joint creation of the University of Chicago and the University of Texas, and the largest telescope in Eastern United States, a sixty-one-inch reflector, will soon be installed in the new Oak Ridge station of the Harvard College Observatory.

The new observing post of the stars in Texas will be one of the world's finest and it will be named the McDonald Observatory after William J. McDonald who left a bequest to the University of Texas. The University of Chicago will staff the observatory, and Dr. Otto Struve of the Yerkes Observatory at Williams Bay, Wis., will divide his time directing both observatories. The University of Texas will erect and maintain the McDonald Observatory.

The Davis mountains where the McDonald Observatory will be located have ideal observing conditions. The University of Chicago is cooperating with the University of Texas in the new observatory because of the need of an observing point in the south companion to the Yerkes Observatory.

Cornerstone for the new Oak Ridge station to house the Harvard instrument was laid as a part of the ceremonies of the International Astronomical Union. It is located twenty-six miles from Cambridge near the town of Harvard, Mass.

To Reach All of Sky

The new telescope will be the fourth largest in the world. It will supplement the sixty-inch reflecting telescope now being erected at the other Harvard observing station in South Africa. The South African telescope will be the largest in the southern hemisphere. With the two instruments, the Harvard astronomers will be able to reach all parts of the sky.

The new eighty-inch reflecting telescope for Texas will be exceeded in size only by the hundred-inch mirror now on Mt. Wilson, Calif., and the projected 200-inch telescope planned for southern California by the California Institute of Technology.

This instrument will be the most powerful in the world for some purposes. Dr. Struve explained that for the photography of faint nebulae and distant universes it will be as powerful as the 100-inch telescope on Mt. Wilson, now the world's largest. For other special tasks it will be even more powerful.

"It is not, however, our intention to surpass the remarkable performance of the Mt. Wilson telescope," Dr. Struve stated, "but rather do we hope to supplement it and to develop such features which, for one reason or another, are omitted at Mt. Wilson. It is our desire to make our work supplementary to that of other institutions and to avoid duplication of any sort."

The concave mirror on which the starlight falls will be 80 inches in diameter, and the beam will be focussed 27 feet above.

(*Turn to Page* 184)

WALL BUILDER

A likeness of one of the prehistoric Indians who built the Great Wall of America—a Chimu Indian, as portrayed on a carving on a Chimu vase.

Great Wall of Peru were the Chimu Indians.

All the circumstantial evidence points to the Chimu. The Great Wall lies within their 400-mile strip of kingdom. They were living in the region when the Great Wall must have been built, for they occupied the coast from very early centuries of the Christian era. If further argument is needed, the Chimu were skillful at construction—they built steep pyramids of sun-dried brick, some taller than modern ten-story buildings. And the Chimu were fierce and aggressive fighters.

There is a famous Chimu vase painting which shows a whole row of hand to hand combats between Chimu warriors and some opponents. Such a scene gives a pretty good idea of what Indian fighting must have been like along the Great Wall of Peru.

In the series of duels painted on this vase, the best dressed contestant, the Chimu warrior, is winning every time. And that is no wonder. For the winners are protected about the head by pointed helmets of wood and cotton with chin straps and ear plates and a flap down the back of the neck. These warriors wear armor jackets, probably made of slats of wood laced together. And they are loaded down with shields, battle axes, wicked-looking maces, and other accessories for close combat. War paint on faces and legs completes the fighting outfits.

Some of the enemy in this fight have helmets to wear. But most of them have only tasseled caps to save their heads from bludgeon blows, and those bobbing tassels are proving bad war psychology. A winning Chimu may simply grab an enemy by the tassel of his cap and drag the captive off, helpless. These enemy soldiers have little or no body protection. And while their shields and maces look like good equipment, still the armored opponents have the best of every contest. By use of dotted lines, the artist shows how blood spouted from the wounded.

The hard question for science to answer about the Great Wall of Peru is: How old is the wall? If archaeologists can dig along the foot of the wall and inside of its forts, they may find tools or pottery lunch dishes and drinking cups belonging to the workmen who built the Great Wall. Or they may dig up some of the war clubs and battle axes of the soldiers who defended and attacked it. Studying the types of such articles would greatly aid in discovering the age of the wall.

From what is known of the Chimu Indians, a Great Wall would have come in handy at almost any period of their busy career. When the Chimu were a young and rising tribe in north coast Peru, they were engaged in fighting civil wars among their own neighbors and as the stronger groups dominated, a kingdom came to be welded into shape, and the borders of the kingdom were pushed out to new limits along the Pacific coast.

Chimu Put Up Big Fight

Later, the Chimu had to defend themselves against Indians from the highland of Peru. And then, somewhere between 1000 A. D. and 1300 A. D., the Chimu had to put up the fight of their lives for their kingdom and its ruler, the Grand Chimu. For the conquering Incas, or "nobles," came marching across the mountains, determined to add Chimuland to their great Indian empire.

Experts on Peruvian archaeology differ in their views as to which age of Chimu fighting brought the Great Wall into existence. Dr. R. L. Olson of the University of California suggests that the Great Wall may have been a defense structure built by the early Chimu, as they extended their territory to north and south.

Prof. Marshall Saville of the Museum of the American Indian, Heye Foundation, theorizes that the wall was built by the Chimu to prevent neighboring Indian tribes from gaining access to the Santa River.

The Santa Valley was densely peopled, he points out. If nearby tribes succeeded in diverting the stream, the Chimu people of the valley would have been in a desperate plight.

One Spanish historian states that the Incas finally conquered the Chimu by cutting off the water supply. And another historian says that it was in the Santa Valley that the Chimu ruler finally surrendered to the Incas. Prof. Saville points out these two historic references, and suggests that possibly the Great Wall was built in the last stand of the Chimu against the victorious Incan siege.

ARCHAEOLOGY

Tomb Wall Built on Dead Man's Chest

A SECOND tomb of Monte Alban, eclipsed when it was discovered by the sensational find of treasure in another, is described as of great scientific importance in an official report being prepared by archaeologists of the Mexican National Museum.

A buried underground chamber lined with stone, entered through a passageway, first revealed remains of two pairs of leg bones. A transverse wall had cut the skeletons at the ribs. When it was removed, it disclosed a second room with the skulls on the other side of the wall, as if the partition had been built upon their chests.

The skulls rested on a pair of large pottery incense burners with long handles like dippers. Between them sat an idol-urn of a god thought to be Quetzalcoatl, the feathered snake, painted red with cinnabar, the Mexican funeral color. His headdress is of plumes, his tongue bifurcated like a serpent's and his upper jaw is like a tiger's. His ornaments are seashell symbols appropriate to Quetzalcoatl.

One door jamb of the tomb has unreadable Zapotecan glyphs, and a great quantity of pottery and other objects was contained in the tomb. A curious thing was a big pottery pipe two feet long and five inches in diameter. Similar tubes were found in other graves. In five out of the six intact tombs explored, plural burials had been made by the ancient people.

SCIENCE NEWS--DEC. 1928

16. ON CERTAIN CHARACTERISTICS OF THE FACIAL SKELETON OF THE ANCIENT PERUVIANS

LIDIO CIPRIANI

This research was conducted on 318 ancient Peruvian skulls, which comprise a portion of the collections of the "Museo Nazionale d'Anthropologia" of the Royal University of Florence. The skulls in question come from various localities, such as the districts about Lima (Ancon and numerous ones from Huaches), Puno and Cuzco, the vicinity of Lake Titicaca, etc.

In a great number of cases, the impossibility of determining, by craniometric examination, the affinities which may have existed for the ancient races of America, is well known. This is certainly true, at least, in the case of the cerebral portion of the skull, since it is frequently deformed. On the other hand, the study of the characteristics of the face, and especially of those of the nasal region, gives results which are not entirely without significance. Yet it must be noted that the deforming action exerted on the cranial receptacle is reflected in the bones of the face as well, and that the pressure brought to bear on the frontal bone has an action on the two ascending branches of the maxillary, producing changes in what should be the normal form of the pyriform aperture. Any classification, therefore, based on measurements of these traits should be made with a due allowance for these changes. The author gives a striking demonstration of such necessity, one which at the same time renders improbable the advisability of adopting in craniometric study certain corrective formulæ covering deformations which some students have quite recently attempted to introduce in anthropology.

Morphological examination seems to give results which are much more satisfactory. This is especially true where the nasal region is concerned, for despite the change already mentioned which is capable of vitiating the nasal index, certain characteristics remain observable, which may be classified. To this end the researches of an Italian anthropologist, Dr. C. Massari, as yet unpublished, have been utilized. According to his results, gained from the study of a great number of crania, there are recognizable among human races two nasal types, which differ profoundly from each other. These are the Negroid and the Australoid, as well as certain others, which are simply modifications or blends of the two preceding ones, such as the Polynesian, the European, the Mongoloid, etc.

Of such types, in the Peruvian series here presented, there have been found the following frequencies: Australo-polynesian, 60%, Negroid, 30%, Mongoloid, 10%.

There seems to exist in the same series a correspondence between the morphology of the nose and the type of deformation. This is certainly true for several groups of crania, but one must, before generalizing, await the results of further study, conducted toward this end, of the remaining cranial collections of prehistoric Peru.

Other researches of the year included:

The third and latest Pithecanthropus skull from Java proved unique in its arched similarity to Peking Man's skull type; also Pithecanthropus was established more definitely as about 500,000 years old and therefore a primitive who lived past his time.

Racial melting pots, and no one superior people, created Old World civilization, it was indicated by study of ancient burials in the Near East and India.

The fundamental type of white men, originating in Iran, had long heads and hooked noses, according to anthropometric data on 3,000 individuals.

Discovery of two thigh bones of Peking Man confirmed the supposition that this early human walked erect.

A new-made restoration model shows what the Sinanthropus woman looked like.

Evidence pointing to presence of early prehistoric Americans was unearthed at Borax Lake, California.

Weapons of the much-sought Folsom hunters of ancient America were found as far north as Saskatchewan and Alberta, Canada.

King Solomon's seaport, Biblical Ezion-Geber on the Red Sea, was excavated.

A Hittite palace found in Syria yielded records and evidence of the little-known "dull" period between the two eras of Hittite expansion.

AMERICAN MUMMY

This American of many centuries ago, a part of the annual exhibit of the Carnegie Institution of Washington, was preserved for modern eyes by a method very different from that of the ancient Egyptians. The Basket-Makers had no art of embalming; their mummies resulted from the natural drying out in the arid air of their caves. Exhibiting the mummy is the archaeologist E. H. Morris.

ANTHROPOLOGY—ARCHAEOLOGY

Egypt and Peru Were Scenes Of Spectacular Discovery

UNSETTLED conditions, particularly in Palestine, prevented a number of archaeological expeditions from taking the field. However, Egypt and Peru, lands associated with glamor, were scenes of spectacular discovery. At Sakkara, a necropolis of 20,000 mummies came to light, as well as a tomb which may have sheltered the mummy of Aha Menes, the first of united Egypt's long line of Pharaohs. In Peru, the gold and silver contents of a prehistoric burial mound were transferred safely to the National Museum at Lima, and the array of images, jewelry, and household articles was

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Retake of Preceding Frame

on January 1.

First definite archaeological evidence that cotton was cultivated in Mexico about 2,000 years ago was found in the form of a textile fragment.

Viking sword and armor unearthed in northern Ontario may prove to be conclusive evidence that Norsemen reached the Canadian interior about 1000 A. D.

New buildings were found at Rome's ancient seaport Ostia, as archaeologists pushed the ambitious project of unearthing the ruins completely by 1942.

The boundary stone of the Athenian Agora was found.

Skeletal remains found in a huge burial mound in the Aleutian Islands, off Alaska, were pronounced probably ancestral in type to some western Indian tribes.

Industrial aspects of aboriginal America were shown by excavation of a trade town in Honduras, where Indians turned out cheap clay wares in quantity.

Some of the strange stone monuments called menhirs left by prehistoric peoples may have memorialized feasting, not funerals, judging by a study of Naga tribes of Assam, the only living people erecting such markers.

ASTRONOMY

Find Two New Satellites Of the Planet Jupiter

THE discovery of two new satellites of the planet Jupiter, its 10th and 11th, was an outstanding achievement of astronomy during 1938. Satellite 10 was found to have direct motion while satellite 11 has retrograde motion.

Other highspots of 1938's astronomical advances included:

Flaming solar prominences, over a million miles high and a new record, were reported.

Total eclipses of the moon occurred in May and November while the sun showed a total eclipse in May, a partial eclipse in November.

Dome and housing for the 200-inch telescope on Mt. Palomar, Calif., was completed.

Gale's comet, absent for eleven years, was rediscovered.

A new solar radiation observatory was begun on an 8,000-foot peak in the Burro Mountains of New Mexico.

Gigantic star clusters, unlike any previously known class of cosmic systems, were discovered in the southern constellations of Sculptor and Fornax.

A glowing mass of luminous hydrogen and oxygen gases was discovered to envelop a large portion of the Milky Way.

A new hypothesis of the origin of the radiant energy of stars, involving the concept of nuclear reactions with resonance energy values, was developed.

A new giant double star of the eclipsing type was discovered in the constellation of Scorpio.

New measurements added seven miles to the diameter of the planet Venus.

found to cause more vigorous life in leaves.

Other advances included:

Living cells can survive freezing in liquid air, if they are first partially dried and then chilled very quickly, it was found.

It was announced that injured cells produce substances that may speed the growth of uninjured cells, a discovery that may contribute to knowledge of cancer and treatment of burns.

Plants were found to thrive better on full sunlight than on any artificial mixture of colored lights.

Tobacco seeds germinated after being dormant for 60 years.

Plant cells separated from their parent tissues were kept alive for more than a year.

Plant hormones were applied in the form of dust to seeds to speed sprouting, the few days thus gained having important economic significance in regions having short growing seasons.

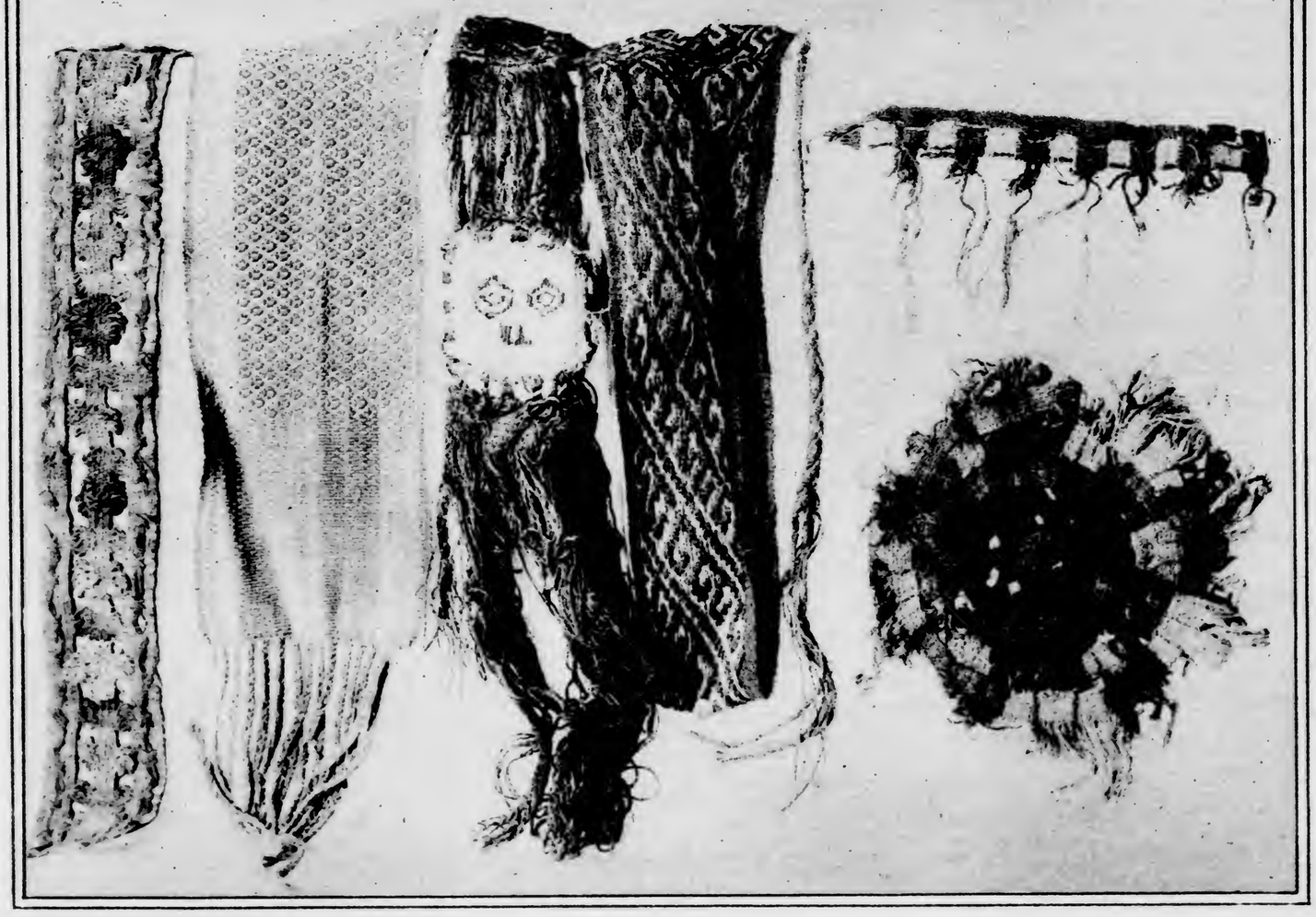
Trimethylamine, naturally present in many plants and animals, was found to have physiological effects like those of a sex hormone.

GUARDIANS OF THE DEPARTED: IMAGES That Were Placed in Tombs by the Ancient Peruvians to Protect the Dead From Evil Spirits; Part of the Interesting Relics of That Remarkable People, Which, With Others Shown on This Page, Were Brought Back by the A. Hyatt Verril Expedition.

At Left—
ONCE CLOTHED ROYALTY:
TUNIC
of a Prince of the Incas, From a Mummy Probably 1,500 Years Old.

DATING FROM THE PRE-INCAN PERIOD:
POTTERY FIGURES
Used for Ceremonial Purposes by the Ancient Moujik People of Peru.

THE INSIGNIA OF A PERUVIAN KING: CROWN OF GOLD AND FEATHERS,
with Bas-Relief of Inti, the Sun-God, and Wira Kocha, the Supreme God. Below Are Gold Breast Ornaments.



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FOR GALA OCCASIONS:
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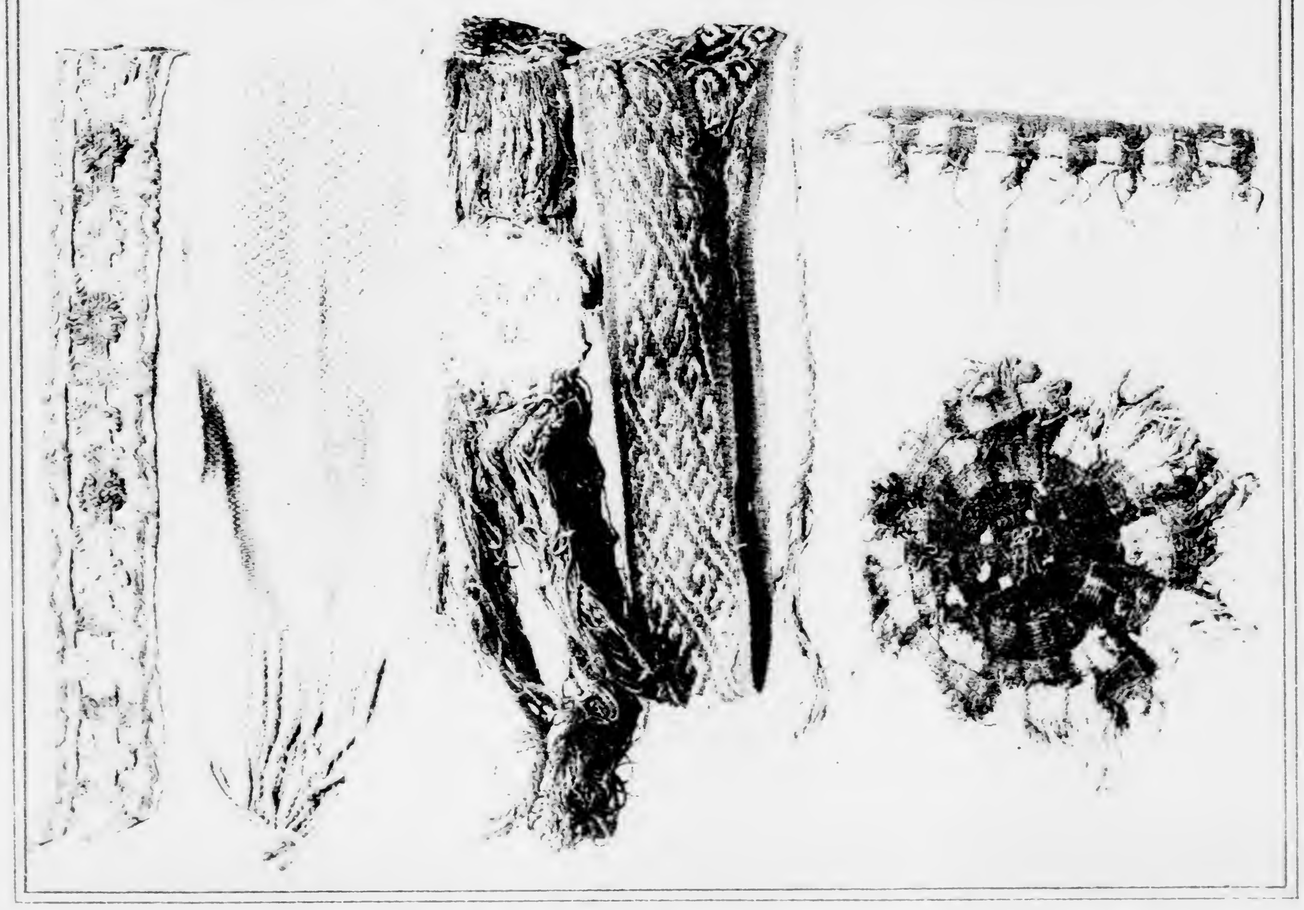


July - Aug. 1945

Tres Grupos Indígenas en el Perú: Yungas, Quechuas y Kollas

El Criterio Isotérmico, Base de la Orientación Política en el Tahuantinsuyo.

Cuando los españoles llegaron al Perú, notaron una diferencia pronunciada entre el color blanco de su piel, y el color cobrizo de la de los indios. Esta diferencia superficial, trajo como resultado una división de los hombres entre blancos o españoles y acanelados o indios.

Por otro lado, entre los aborígenes, existían ciertas ideas sobre agrupaciones raciales que no dependían del color de la piel, puesto que en cuanto a pigmentación había poca diferencia entre ellos. Era preciso aplicar otro criterio de clasificación. En efecto, los amautas "que eran los filósofos" del incanato, desarrollaron un método de agrupar a los pueblos basándose en elementos más importanes y profundos como son las características mentales, el carácter y las costumbres, en íntima relación del hombre con su medio ambiente.

La clasificación empleada por los indígenas era acertada. Si bien en muchos elementos culturales el Imperio de los Incas ocupaba un lugar inferior con respecto a la civilización que los españoles habían traído de Europa y del Oriente, en lo referente a la clasificación racial y organización política, que de ella se desprende, habían logrado un nivel más avanzado. Así como la humanidad adoptó la patata y la quina del mundo peruano, podrá encontrar quizás iguales beneficios aceptando la eficiente organización política que vamos a señalar en la división del Imperio llamado Tahuantinsuyo, o sea, de los cuatro suyos.

Nuestra intención es encontrar el verdadero concepto racial que existía en el mundo intelectual de los amautas, por lo tanto vamos a atender especialmente a la comprensión que tenían de la organización incáica los cronistas mestizos que, si bien pueden ser, en algunos casos, menos precisos que los españoles, tienen por otro lado un punto de vista más cercano, podríamos decir interno, del criterio existente en el incanato. Estos cronistas son Felipe Guamán Poma de Ayala y Garcilazo Inca de la Vega. El primero, que era cacique de Lucanas (Ayacucho), escribió entre 1587 y 1613 su notable obra gráfica **Nueva crónica y buen gobierno.** El segundo, estaba íntimamente vinculado con el Imperio de los Incas; su abuelo era Hualpa Tupac hijo de Tupac Inca Yupanqui y su madre, Chimpu Ocllo, por lo tanto, sobrina de Huayna Capac y prima de Huáscar y Atahuallpa.

De la lectura de los cronistas se deduce que en el mundo del Incanato se distinguían principalmente tres grandes grupos de hombres que podríamos

llamar: yungas, quechuas y kollas. (1)

Vamos a estudiar el primer grupo. El cronista Francisco Cabello de Balboa en su **Historia de la Conquista del Perú** nos informa con las palabras siguientes el significado de la raza yunga: "Dícese de los habitantes de tierra caliente". Todavía en el Cuzco se emplea la palabra **yunga** para referirse a la cuenca cálida del Amazonas. Cuando los incas iniciaron sus conquistas en esta región de "los Antis, al Oriente del Cusco" encontraron allí tribus como la de los chunchos, los musos, y otras, las cuales tenían entre sí ciertas similitudes evidentes como la de usar muy poca vestimenta, emplear el arco y la flecha, y llevar el rostro pintado. Prueba de esto encontramos en varias referencias de los cronistas (2) y también en los dibujos que, sobre los habitantes de esta región, nos ha legado Guamán Poma de Ayala (3). Por esta similitud los incas clasificaron esta región cálida con el nombre general de Antisuyo. Efectivamente así lo observamos en el mapa racial de Alcides D'Orbigny, **L' Amérique Meridionale,** 1838 y últimamente en el **Mapa del Imperio Incáico** de Roberto Levillier, 1942. El Antisuyo, pues, ocupaba la región cálida y arbolada del Oriente. (Ver el mapa que acompaña este número).

La otra región cálida, habitada también por esta raza indígena yunga, era principalmente la costa del centro y del norte peruano. Habitaban aquí un grupo de pueblos muy importantes, poseedores de una cultura refinada y antigua que había ejercido influencia en el Collado; el primero de estos pueblos que encontraron los incas, fué el de los chinchas. De aquí proviene el nombre de Chinchasuyo para la región que se extiende hacia el norte, cubriendo toda la región Chimú, la de los tumpis, y otras, hasta llegar a las comarcas costeñas de los mantas. Los habitantes, de esta región, según los dibujos de Guamán Poma, estaban vestidos y llevaban las plantas de los pies protegidas por sandalias (4). Estos pueblos participaban de características comunes, siendo poco aguerridos y adoleciendo de cierta degeneración que se manifiesta en la sodomía (5). Los "yungas, por la mayor parte, son gente regalada y de poco trabajo" (6).

En Garcilazo encontramos la siguiente definición: "A toda la tierra que es costa de mar y a cualquier otra que sea tierra caliente llaman los indios Yunca, que quiere decir tierra caliente: debajo de este nombre Yunca, que se contiene muchos valles que hay por toda aquella costa" (7). Indicando las divisiones del Tahuantinsuyo, el licenciado Fernando de Santillán escribe: (8) "el uno fué Chinchaysuyo, que comienza desde Vilcaconga, **por los llanos,** hasta Quito;..." (letra gruesa, nuestra).

Existieron en las partes altas de estos valles, en regiones templadas, algunos pueblos que no correspondían propiamente dentro del conjunto costeño, que sin embargo fueron, probablemente, incluídos en el Chinchasuyo por ocupar lugares aislados; se hallaban en esta situación pueblos tales como los huamachucos, los casamarcas, los huancapampas, los de Quitu, los de Pastu y algunos otros. Válganos decir que a pesar de que estos pueblos estaban incluídos en el Chinchasuyo, los incas advertían las diferencias entre estos serranos y los costeños (9).

Pasemos ahora al grupo intermedio que habitaba templadas regiones, ubicadas entre las comarcas cálidas de los yungas y los altiplanos fríos de los kollas: "Entre la sierra y el llano hay la tierra de mediana altura, no llega al calor de la costa ni al destemple de puras sierras" (10). Esta región es el Cuntisuyo, poblada principalmente por los pueblos de los templados valles andinos. Según Garcilazo "Llamaron Cuntisuyo a la parte del Poniente por otra provincia muy pequeña llamada "Cunti". (11).

Vamos a llamar quechuas a todos estos grupos que habitaban el Cuntisuyo, o región templada, por ser el nombre que se dá al idioma que ellos empleaban mayormente; es una denominación cómoda, aunque los quechuas eran propiamente sólo uno de estos pueblos que ocuparon una comarca en el centro del Cuntisuyo (12). También empleamos este nombre, porque en las divisiones linguísticas del Perú, la lengua quechua cubre con bastante precisión las regiones templadas de los Andes, dejando a ambos lados, tanto en la cuenca amazónica como en la costa, zonas lingüísticas diferentes. E. Garro, en su artículo "Northern Kechuan Dialects of Perú", en el **American Anthropologist,** July-September, 1942, página 444, escribe: "Por conveniencia, podemos dividir al Perú en cuatro zonas. La región de los Andes, llamada generalmente sierra o meseta Interandina, es la más característica región quechua. Se la puede dividir en dos zonas:...." Las otras dos regiones las ubica, una en la costa y la otra en la selva amazónica (13).

Habitaban el Cuntisuyo un grupo de pueblos que guardaban entre si relativa semejanza. Clement Markham encuentra cierta vinculación etnológica en estos lugares a los cuales él denomina **Región Inca,** subdividiéndola en 6 tribus: Incas, Canas, Quechuas, Chancas, Huancas, (incluyendo a los Huayllas) y Rucanas (14) En los dibujos de Poma de Ayala los habitantes del Cuntisuyo, si bien llevan un vestuario parecido al de los chinchas, tienen sin embargo los pies más abrigados, empleando una especie de calzado (15). Se les distingue además por el tocado, característica ésta a la cual Garcilazo atribuye capital importancia (16).

La inclusión de regiones templadas dentro del Chinchasuyo, tales como Casamarca, Huancapampa y Quitu, se debe, como hemos dicho, a que estando separadas entre si y no formando parte de un núcleo apreciable, no fué posible unirlas políticamente al Cuntisuyo, aunque este vínculo isotérmico debe haber sido muy poderoso puesto que aun en nuestros días se conserva en estas regiones las costumbres e idioma quechuas, lo cual no sucede en la costa.

En forma semejante estaba también incluído en el Cuntisuyo una pequeña parte de la costa sur del Perú, desde Nazca hasta el río Tambo, por estar adyacente al núcleo quechua principal y también por no existir en él ningún pueblo importante, como lo especifica Garcilazo (17).

Nos ocuparemos ahora del tercer grupo: los habitantes de las regiones frías, que estaban reunidos en la división política llamada Kollasuyo. Los habitantes del Kollasuyo tenían costumbres y características propias que los unían en un grupo homogéneo, facilitando así su reglamentación y su gobierno. En el mapa de R. Levillier que hemos mencionado, observamos que el Kollasuyo cubre, además de la altiplanicie del Collado, las regiones bajas y frías de la costa de Chile y parte de la provincia de Catamarca en la Argentina. Es conveniente notar que muchos habitantes del Collado hablaban la lengua aymara y por este motivo se ha aplicado a ellos este mismo nombre, al punto que algunos escritores unen las dos palabras para formar el nombre **aymara-kolla** (18).

En la manera de vestir, los kollas se caracterizaban por andar muy cubiertos (19); también notamos que llevan los pies especialmente protegidos (20). Poma de Ayala nos informa sobre su aspecto físico: "todos los hombres o mujeres grandotes, gordos, sebosos..." (folio 178). Es interesante notar en el tipo kolla la influencia de la ley de Bergmann, o sea, el aumento de la corpulencia del individuo al disminuir la temperatura de su medio ambiente. Sabemos por el Padre Lizárraga de las calidades de los indios de Chile, que "exceden a los del Perú en ser más a-

rimosos, más soberbios, **más fornidos, de mayores cuerpos**, y más belicosos, y son mucho más bárbaros y más temerarios,....'' (21) (letra gruesa, nuestra).

De los cronistas sacamos la conclusión que los kollas eran una raza evidentemente belicosa. Los ayaviris ''estuvieron tan duros y rebeldes.... que obstinadamente quisieron morir todos defendiendo su libertad...'' ''Se mostraban de día en día más duros en reducirse y más feroces en la pelea y llegaban hasta entrarse por los reales del Inca'' (22). Los kollas, ''como gente bestial, se metían por las armas contrarias'' lo cual les causaba muchas bajas (23). ''Pelearon con gran pertinacia y ceguera, particularmente los kollas, que como insensibles se metían por las armas de los Incas, y como bárbaros obstinados en su rebeldía, peleaban como desesperados sin órden ni concierto'' (24). Sería monótono continuar las citas que se refieren al espíritu belicoso de los kollas, cuya importancia decisiva se puede observar tanto en la estrategia como en la misma batalla del Cuzco, entre Huáscar y Atahualpa; este último hizo un ataque sorpresivo para que los kollas no pudiesen ''venir a tiempo que fuese de provecho'' y Huáscar a su vez perdió la batalla ''por la falta de kollas'' (25). Aun después de la llegada de los españoles la tropa kolla ''fué la única que opuso alguna resistencia, del Desaguadero a Chuquisaca, poniendo en aprietos a las valerosas mesnadas de Hernando y Gonzalo Pizarro, durante aquellos nefastos días en que el vasto Imperio se rendía inopinadamente a los nuevos amos'' (26).

También se puede observar en el carácter de los kollas cierta ingenuidad y credulidad lo cual los hacía fácil presa de las estratagemas de los generales quechuas. Por un interesante engaño, pudieron los Incas someter a los aguerridos soldados yamparas en el valle de Oroncota (27). Fué además la división de los grupos kollas la que hizo posible la conquista del Collado por los incas (28). Hablando de los kollas, Garcilazo nos informa que ''la gente de aquella región se mostraba más simple y dócil'' (29). En cierta ocasión el Inca hizo creer a los kollas que habían sido atacados por su padre el sol y ''los indios, como tan simples creyeron que era así, pues los incas, que eran tenidos por hijos del sol, lo afirmaban'' (30).

El espíritu cooperativo era también un sentimiento generalizado en el Kollasuyo. Los curacas de una tribu kolla después de ser vencidos ''recogieron toda su gente, y en cuadrillas fueron a pedir misericordia'' (31). Garcilazo nos informa que los curacas de Umasuyo, para responder al Inca, se juntaron ''para consultar la respuesta porque fuese común...'' (32). Este espíritu lo observa también José María Camacho, en su obra **Los Aimaras**, añadiendo que el auxilio entre ellos ''venía a ser un **ayni** colectivo que sus pactos y el honor militar no les permitía rehuir''. Más que todo es en las labores agrícolas colectivas en las que se observa el espíritu cooperativo de los kollas.

La división del Tahuantinsuyo no era meramente geográfica o económica, sino que reunía en cada parte a pueblos biológicamente semejantes, que estaban ligados por gustos y costumbres que corresponden al mismo medio ambiente. Esto lo confirma Poma de Ayala cuando nos presenta, separadamente, las fiestas, funerales e ídolos de cada uno de los cuatro suyos (33).

Había observado Garcilazo que las diferencias térmicas en el Perú no dependían tanto de la latitud, o sea, de la proximidad a la zona ecuatorial, sino más bien de la altura sobre el nivel del mar (34).

En muchos valles de la región andina central, se puede observar que en las partes altas se cultiva la quinua, el oyuco, el trigo, notándose la presencia

de la llama y la alpaca; mientras que a pocos kilómetros, en los valles bajos, se produce la caña de azúcar y el algodón. Son regiones cercanas, pero tienen problemas y vida muy diferentes. A menudo encontramos referencias en los cronistas a ciertos animales y plantas propios de lugares fríos y otros de temple cálido (35). Por esta diferencia en el ambiente, se dividían las regiones durante el incanato, en altas **hanan** y **urin** bajas (36). Es interesante añadir que en la actualidad, en ciertas regiones del Norte, como en el departamento de Amazonas, se clasifican las tierras según el ambiente térmico de la región; asi, pues, se dividen en **temple** o tierras cálidas, **quichua** o intermedias y **jalca**, frías. Para los incas este criterio era tan evidente que jamás ocurrióseles que constituía la base de una eficiente filosofía política desconocida por los conquistadores europeos.

Después de habernos ocupado separadamente de los yungas, quechuas y kollas, podemos hacer algunas comparaciones ilustrativas. Entre los kollas encontramos cierta preferencia por el color negro y blanco, como en otras regiones frías del mundo; sabemos que sacrificaban preferentemente carneros negros o blancos (37). En cambio, entre los quechuas y especialmente entre los yungas, había un gusto especial por el rojo, el cabritilla y el amarillo.

Notemos que en las referencias de los cronistas que tratan de la región kolla, encontramos generalmente nombres de pueblos, tribus, clanes, etc., mostrando siempre la preponderancia del grupo; en cambio es el individuo el que adquiere importancia en las regiones yungas, tal como se revela en los caudillos Chuquimanco, Cuismanco, el Curaca Chincha, Hasto Capac, Cayochaguay, el Gran Chimú y Tumpaya.

Naturalmente, es mucho más notable la diferencia entre los grupos extremos: yungas y kollas. En contraposición a la manera de pensar amplia de los habitantes de comarcas cálidas, que Spengler entendía como **alma mágica**, está el pensamiento preciso y agresivo del hombre de las regiones frías —**alma faústica**. Posnansky, muy familiarizado con estos pueblos, había observado cierta diferencia entre los habitantes del Collado y los de la hoya amazónica. Escribe lo siguiente: ''Hay intelectualmente razas superiores e inferiores entre los que llamamos indios, pues los del tipo **kholla** piensan y obran concretamente mientras que los del tipo **aruwak** lo hacen en forma abstracta''. (38). Estamos de acuerdo que existen diferencias mentales, pero discrepamos con respecto a la superioridad de cualquiera de ellas, tratándose solamente de adaptación mental al medio ambiente (39).

En oposición a la credulidad y fidelidad de los kollas encontramos la astucia y las mañas de los yungas que en el Imperio prestaban sus servicios como farsantes (40); hasta se podría decir que la degeneración en los pueblos yungas era mayor en las regiones más cálidas. Garcilazo nos dice: ''Los de Tumpiz era gente más regalada y viciosa que toda la demás que por la costa de la mar hasta allí habían conquistado los Incas:...'' (41).

Es *digno de observar* el papel intermedio que juegan los quechuas entre los kollas y los yungas. Mientras los primeros engañaron varias veces a los kollas, fueron a su vez engañados por los yungas. Compárense los casos en que las artimañas de los quechuas fueron empleadas con éxito contra los cacyaviris y yamparas por una parte; y por la otra los obstáculos encontrados por los quechuas en los pueblos yungas: ''las mañas y astucias'' de Chuquimancu (42), la estrategia empleada por el gran Chimú que contaba con el factor climático para agotar las fuerzas de sus enemigos y con las pasiones amorosas que inducirían a los incas a regresar a sus hogares (43), finalmente, fueron engañados por los

tumpiz quienes al lograr la confianza de los quechuas prepararon un ardid para aniquilar a un grupo de ellos. (44).

Es interesante añadir que, según el P. Cobo, la desorganización del cooperativismo andino se inició al penetrar en esta organización elementos diferentes, de la región yunga norteña: "Comenzó a viciarse el régimen comunista o igualitario incáico con la incorporación al Imperio de pueblos del norte ajenos a este sistema" (45).

Las divisiones del Imperio que hemos estudiado son de una naturaleza biológica tan profunda que, aun los investigadores contemporáneos encuentran diferencias anatómicas en sus partes. "Los quechuas se distinguen por su menor robustez, el color oscuro, piernas más largas, perímetro torácico menor y braquicefalía acentuada. Los Kollas-Aimaráes son ligeramente más dolicocéfalos y altos que sus vecinos, manifiestan una mayor frecuencia del pliegue mongólico en el ojo" (46). Otro investigador escribe: "Dolicocefalía se nota entre los Aimaras, los Uros y en el Sur extremo de la costa; la braquicefalía se distingue sobre todo entre los quechuas y en la costa norteña, por lo menos en los cráneos de los Chimús; aunque el establecimiento de la demarcación perfecta del Indice Cefálico de las poblaciones diferentes, está dificultada por la costumbre de la deformación artificial" (47).

Un especialista de bio-climatología, Robert J. Stone de la Universidad de Harvard, ha observado la diferencia racial entre los indios de regiones frías y los de regiones cálidas y húmedas, mostrando la similitud que existe entre los indios andinos y los blancos, que son ambos refractarios a climas cálidos (48).

También en nuestros días persisten ciertas diferencias entre las manifestaciones culturales de las diversas regiones en que estaba dividido el Imperio. Ante el impacto de la cultura española, durante la conquista, podemos apreciar visiblemente las diferentes reacciones de cada una de las partes del incanato. Consideramos conveniente mostrar esta diferencia que nos habla bien claro de la profunda significancia de estas divisiones. La región yunga reacciona indiferentemente y acepta la cultura española. La región quechua, que estaba en un período evolutivo dominante, se fusiona íntimamente con la cultura española de clima semejante y surge con fuerza un estilo mestizo. Por último el kolla, de ambiente excesivamente frío, reacciona en forma distinta, rechazando el barroquismo español y conservando su estilo severo, cúbico, rigurosamente geométrico (49). Esto lo observamos bien elocuentemente en ciudades como Lima, Trujillo, Lambayeque y Loreto de la región yunga; Arequipa, Ayacucho, Cajamarca y Quito en el mundo quechua; y en la región kolla, Puno y Tiahuanacu. En las tres regiones encontramos reacciones diferentes. J. R. Respaldiza, del Museo Nacional de Arqueología, había observado que la difusión de la cultura española pasa de Lima a Huamanga pero deja en su camino a la ciudad de Huancayo sin ser influenciada; esta ciudad situada en las cumbres andinas, ha resistido el barroco español y conserva aun hoy en sus alrededores el sistema comunal indígena. Parece que todavía espera una influencia con equivalencia ecológica, probablemente eslava, para despertar su entusiasmo y expresar sus pensamientos profundos, en un nuevo mestizaje de tipo más frío.

Consideramos de interés añadir que así como se ha encontrado, en las otras regiones del globo, que de la música melódica de regiones templadas se pasa a la música armónica de regiones frías, también sucede esto en el mundo del Incanato.

Veamos que nos dice al respecto el Profesor Sánchez Málaga, director de la Academia Bach, de Lima, en el **Anuario General del Perú**, 1938: "Los

instrumentos que usaron los quechuas tienen la afinación perfecta de la escala pentafónica. Sus antaras y quenas construídas de cañas tienen una dulzura opuesta a la dinámica y ruda expresión de los instrumentos aymaras. Los pueblos de la planicie del Collado comenzaron ya a desarrollar su sentido polifónico en los **sicus** y **tarkas**".

La división política empleada por los indígenas no fué resultado de la casualidad; ellos estaban conscientes de las influencias climáticas, las mencionaban a menudo y las empleaban deliberadamente. Garcilazo, aun cuando negara autenticidad a los datos que poseía (50), tenía conocimiento "que de las cinco partes del mundo que llaman Zonas, no son habitables más de las dos templadas, y que la del medio, por su excesivo calor, y las dos de los cabos, por el demasiado frío, son inhabitables, y que de la una Zona habitable no se puede pasar a la otra habitable,..." (51). De lo expuesto se deduce el profundo criterio isotérmico que poseía Garcilazo.

En los cronistas encontramos muchas citas referentes a la poderosa influencia que la temperatura ejerce sobre los pueblos (52). Los conocimientos climáticos fueron empleados deliberadamente por los incas para debilitar o destruir a sus enemigos. Nos relata Garcilazo que "Cuando habían conquistado alguna provincia belicosa, de quien se temía que por estar lejos del Cusco y por ser gente feroz y brava no había de ser leal, ni había de querer servir en buena paz: entonces sacaban parte de la gente de aquella tal provincia; y muchas veces la sacaban toda, y la pasaban a otra provincia..." (53). Por ejemplo, el Collado que siendo muy poblado por gente animosa constituía un peligro para el Imperio, fué debilitado aplicándole este sistema llamado de los **mitimaes**. El mismo autor hablando del Collado nos informa que: "De todas aquellas provincias frías sacaron por su cuenta y razón muchos indios, y los llevaron al Oriente de ellas, que es a los Antis y al Poniente, que es la costa del mar...." (54).

Finalmente, como otra demostración de que aplicaban en forma deliberada, un criterio isotérmico en la administración de los pueblos bajo su dominio, damos la siguiente cita: "Los incas, yendo conquistando, hallaban algunas provincias fértiles y abundantes de suyo, pero mal pobladas y mal cultivadas por falta de moradores; a estas tales provincias, porque no estuviesen perdidas, llevaban indios de otras, de la misma calidad y temple fría o caliente, porque no les hiciese mal la diferencia de temperamento...." (55). Un caso análogo encontramos cuando el Inca transfiere un grupo de indios de Nanasca al Río Apurimac en cuyo caso había orden que "se cotejasen las regiones que fuesen de un mismo temple de tierra,, porque no se les hiciese de mal la diferencia destemplada, pasándolos de tierra fría a tierra caliente, o al contrario, porque luego mueren; y por esto era prohibido bajar los indios de la sierra a los llanos, porque es muy cierto morir luego dentro de pocos días. El Inca, teniendo atención a este peligro, llevó indios a tierra caliente para poblar en tierra caliente..." (56).

Así pues, hemos estudiado las cuatro partes en que estaba dividido el Tahuantinsuyo, habiendo encontrado que cada una guarda características particulares de acuerdo con la región climática que ocupa. Estas divisiones se acomodan a una clasificación racial—yungas, quechuas y kollas—basada en un criterio isotérmico que trasciende de la mera consideración del color de la piel, profundizándose hasta llegar a los fundamentos de la personalidad, a las características mentales (57). No escapa al lector la necesidad de conseguir, para un gobierno eficiente, unidades políticas homogéneas, las que se pueden ob-

tener de dos maneras: una, en forma casual, mediante la formación de departamentos o estados políticos pequeños; y la otra, utilizando los conocimientos isotérmicos del Incanato, donde se consigue el máximum de eficiencia política con un mínimum de divisiones gubernamentales. Repetimos pues que el criterio isotérmico de los amautas aplicado a la clasificación racial y organización política en el mundo, será quizá una contribución mayor a la civilización que la que fué la papa en la economía o la quinina para la medicina.

NOTAS

(1) En esta tesis se ha tratado de emplear los nombres más generalizados y adecuados. El profesor A. L. Kroeber, en la conferencia sustentada en la Universidad de San Marcos, en el año 1943, advirtió que existía una tendencia ególatra de inventar, cada autor, un nombre distinto para la misma cultura, lo cual complicaba la materia y confundía a los estudiantes.

(2) **Comentarios Reales,** parte I, libro VII, capítulo XIV.

(3) Ver folios 147, 151, 169, 177, 270, 293, 324, etc.

(4) Ver folios 165, 173, 266, 289, 320, etc.

(5) Garcilazo de la Vega, obra citada, parte I, libro III, capítulo XIII, titulado "Por la costa de la mar reducen muchos valles. Castigan los sodomitas", también el capítulo XVIII; véase además los capítulos XVII y XVIII del libro VI, así como el primer párrafo del capítulo VI del libro IX.

(6) Obra citada, parte I, libro VI, capítulo XIX.

(7) Obra citada, parte I, libro III, capítulo XIII, primer párrafo.

(8) **Relación de Gobierno,** párrafo noveno.

(9) Obra citada, parte I, libro VI, capítulo XI, penúltimo párrafo y libro IX, capítulo VIII, segundo párrafo.

(10) **Historia Natural y Moral de las Indias,** por José de Acosta, edición Fondo de Cultura Económica, Méjico, 1940, pág. 194.

(11) Obra citada, parte I, libro II, capítulo XI.

(12) L. Pericot. **La América Indígena,** parte II, cap. 3, pág. 606.

(13) "En la zona del Este, en la región de los bosques tropicales de la Cuenca Amazónica, encontramos un número de lenguas primitivas habladas por tribus herrantes que habitaban las riveras de los ríos". Más adelante leemos: "En la zona del Oeste, o sea, la costa, encontramos muchos valles que se extienden desde los Andes al Océano y que están separados el uno del otro por desiertos arenosos. Esta zona no nos interesa porque en esta región donde ahora encontramos importantes ciudades tales como Lima, Trujillo e Ica, los lenguajes y las culturas lugareñas han sido alteradas profundamente por el contacto europeo" (E. Garro, traducción nuestra).

(14) **Las Posesiones Geográficas de las Tribus que formaban el Imperio de los Incas,** Colección de Libros y Documentos Referentes a la Historia del Perú, tomo VII, 2ª serie, págs. 118 al 121, Lima, 1923.

(15) Poma de Ayala, folios 171, 179, 295 y 326.

(16) Garcilazo, obra citada, parte I, libro VIII, capítulo IV, penúltimo párrafo.

(17) "Los llevaron..... al Poniente, que es la costa de la mar en las cuales regiones había grandes valles.... las cuales tierras y valles antes de los Incas no se habitaban, estaban desamparadas como desiertos...." (Obra citada, parte I, libro VII, capítulo I, primer párrafo). Creemos que al referirse al Poniente el Inca Historiador se refería a esta parte de la costa, entre Nazca y el Río Tambo, donde hasta la fecha no se han encontrado huellas arqueológicas de pueblos preincaicos importantes como los de la región yunga, de la costa central y del norte. Los chinchas, habitantes de la región yunga, habían informado a los incas que en un pasado lejano, habían sido poderosos y agueridos, habiendo llegado sus huestes hasta la provincia kolla. (Obra citada, parte I, libro VI, capítulo XIX, párrafo tercero). Estas citas y los capítulos referentes a la conquista de la costa, nos hace pensar que Garcilazo no ignoraba la existencia de importantes pueblos yungas en la costa central y del norte y que conocía la poca importancia de la parte costeña del Cuntisuyo.

(18) Kollasuyo, según Garcilazo, se deriba del nombre **kolla,** que era el de una grandísima provincia del Collado. En esta región el idioma kolla estaba muy extendido. El nombre Aymara, que fué dado a la lengua kolla por el ascerdote italiano Bertonio en el año 1670, corresponde al de una tribu quechua del Cuntisuyo. Como a menudo se acostumbra dar el nombre del idioma, al pueblo que lo emplea, así se llama en la actualidad **región aymara,** a las comarcas que emplean el idioma de los kollas.

(19) Poma de Ayala, folios 177 y 270.

(20) Poma de Ayala, folios 169, 293, 324, etc.

(21) Fray Reginaldo de Lizárraga, (1540—1612) **La descripción y población de las** Indias, libro II, capítulo LXXII.

(22) Garcilazo, obra citada, parte I, libro II, capítulo XVIII, párrafo segundo.

(23) Obra citada, parte I, libro III, capítulo II, párrafo tercero.

Ver Relación de las Antigüedades de este Reyno del Perú, por Juan de Santacruz Pachecuti Yamqui, capítulo "Huaina Capac, 10º Inca", párrafos 13 al 17 y capítulo "Dupac Inca Yupanqui", párrafos 11 al 13.

(24) Obra citada, parte II, libro III, capítulo V, último párrafo.

(25) Obra citada, parte II, libro IX, capítulos xxxiv y xxxv y libro vii, capítulos xix y xx.

(26) José María Camacho, "Los Aymaras", **Boletín de la Sociedad Geográfica** de La Paz, Junio 1943. pág. 21.

(27) P. Barba, **Arte de los Metales,** libro I, capítulo XVII, y P. Cobo, **Historia** del Nuevo Mundo, libro XII, capítulo XIV.

(28) **Boletín de la Sociedad Geográfica de La Paz,** Junio 1943, página 18.

(29) Obra citada, parte I, libro III, capítulo V, párrafo segundo.

(30) Obra citada, parte I, libro III, capítulo III, párrafo segundo.

(31) Garcilazo, obra citada, parte I, libro III, capítulo II, último párrafo.

(32) Obra citada, parte I, libro III, capítulo XI, primer párrafo.

(33) **Nueva crónica y buen gobierno,** folios 267 al 273, 288 al 296 y 321 al 327.

(34) Garcilazo. obra citada, parte I, libro I, capítulo I.

(35) Garcilazo, obra citada, parte I, libro IX, capítulo XXIII (Sobre la esterilidad de las gallinas en el Cuzco), penúltimo párrafo; y capítulo XXVIII, último párrafo.

(36) Garcilazo, obra citada, parte I, libro I, capítulo XVI; también se encuentra en las **Relaciones** de Juan de Santacruz Pachacuti.

(37) Poma de Ayala, folios 270 y 271.

(38) América Indígena, vol. V, Nº 1, Enero 1945.

(39) **M. M. Valle, Observaciones sobre Geografía,** Parte I, La Influencia del Clima sobre las Características Mentales.

(40) Poma de Ayala, folio 330.

(41) Obra citada, parte I, libro IX, capítulo II, párrafo segundo.

(42) Garcilazo, obra citada, parte I, libro VI, capítulo XXIX, párrafo cuarto.

(43) Garcilazo, obra citada, parte I, libro VI, capítulo XXII, párrafo último.

(44) Garcilazo, obra citada, parte I, libro IX, capítulo IV y V.

(45) P. Cobo, **Historia del Nuevo Mundo,** libro XII, capítulo XVIII.

(46) L. Periot, **La América Indígena,** parte II, capítulo III, pág. 613.

(47) Hans Horkhimer, **Generalidades Anatómicas Pre-Hispánicas,** pág. 62.

(48) Robert J. Stone, Investigador en el Observatorio Meteorológico de la Universidad de Harvard y especialista en Bioclimatología, en el **Yearbook of Agriculture,** 1941, artículo "Health in Tropical

Climates''; pág. 255, dice: "el origen y la significación de la pigmentación de las razas es un misterio, se ha observado sin embargo, que las razas oscuras están considerablemente más adaptadas a los trópicos, aun los italianos, los portugueses y los españoles tienen una ventaja sobre los rubios en las altas latitudes. Tenemos que tener cuidado con este raciocinio, por cuanto el grupo maya-azteca-inca, de indios pertenecientes a Centro y Sud América, no florecen en las cálidas y húmedas tierras bajas, tal como tampoco pueden hacerlo los blancos".

(49) Ver **Redescubrimiento de América en el Arte**, págs. 90-92.

(50) Las objeciones de Garcilazo, ambas erradas, eran las siguientes: Una de índole personal basada en el hecho de que él, de zona templada había pasado por "la tórrida zona" lo cual le hacía suponer que era habitable, confundiendo una breve estada personal, con la verdad antropológica que pueblos de una zona no pueden pasar y colonizar regiones de una temperatura muy diferente (Ver **Observaciones sobre Geografía**, parte III, Las Zonas Térmicas y las Migraciones Humanas). La otra, de órden religioso, es la siguiente: "que partes tan grandes del mundo las hiciese Dios inútiles habiéndolo criado todo para que lo habitasen los hombres....." (Garcilazo, obra citada, libro I, capítulo I). Aquí Garcilazo desconoce que hay hombres especialmente adaptados para habitar estas regiones y que es en la misma Biblia donde se menciona "los límites de la habitación de cada pueblo". (Hech. 17-26).

(51) Obra citada, parte I, libro I, capítulo I.

(52) Poma de Ayala, folio 575.

Garcilazo, parte I, libro IX, capítulo II.

Garcilazo, parte I, libro VI. capítulo XVII.

Garcilazo, parte I, libro VII, capítulo I.

Garcilazo, parte I, libro VII, capítulo XIV.

Fernando de Santillán, **Relación de Gobierno**, párrafo 115.

(53) Obra citada, parte I, libro VII, capítulo I, párrafo tercero.

(54) Obra citada, parte I, libro VII, capítulo I, párrafo primero.

(55) Obra citada, parte I, libro VII, capítulo I, párrafo primero.

(56) Obra citada, parte I, libro III, capítulo XIX, párrafo primero.

(57) Yungas, quechuas y kollas, concuerdan con los tipos camíticos, semíticos y jaféticos del viejo mundo. (Ver "Las Razas Humanas" **El Comercio**, octubre 15, 1943).

M. M. VALLE. — Apartado 1255. — Lima, Perú — Julio, 1945.

LE QUIPU PÉRUVIEN DU MUSÉE DU TROCADÉRO

A la mémoire du grand savant E. T. Hamy.

Parmi les trésors émanant du Pérou, que possède le Musée du Trocadéro, se trouve un magnifique quipu (n° 24899) qui a déjà été décrit par M. E. T. Hamy, fondateur du Musée, dans son éminent ouvrage *Galerie Américaine*.

J'essaierai ici de déchiffrer les nombres de ce quipu. Il se compose d'un cordon principal blanc-gris et brun enroulé de deux cordelettes, une blanc-gris et l'autre bleue. A ce cordon pendent 48 cordelettes secondaires ou cordelettes H, divisées en cinq groupes comprenant 1, 9, 15, 10 et 13 cordelettes. Appelons ces groupes I, II, III, IV, V. A quelques-unes de ces cordelettes H sont fixées des cordelettes auxiliaires ou cordelettes B. Dans le groupe I, il n'y en a pas; dans le groupe II, 6; dans le III, 7; dans le IV, 10; et dans le V, 16. En tout et pour tout le quipu a, outre le cordon principal, 87 cordelettes; il est donc vraisemblablement complet, ce qui nous donne la possibilité de l'étudier avec la perspective de quelque succès.

Ce quipu appartient au genre de quipu basé sur le système décimal. Ce dernier, comme l'a démontré Leland Locke, était employé en règle générale, mais pas d'une façon constante cependant. La série de nœuds, en commençant par l'extrémité inférieure de la cordelette, représente les unités, la seconde, en remontant, les dizaines et la troisième, les centaines. — Outre ceux-là, le quipu comprend quelques nœuds supplémentaires placés sous ceux représentant les unités. Ce quipu est un peu négligemment conçu en ce sens que les nœuds représentant les unités dans les différents groupes ne sont pas placés régulièrement à la même hauteur. Il en est de même pour ce qui concerne les dizaines. Il n'y a cependant aucun doute possible lorsqu'il s'agit de reconnaître les nœuds représentant les unités, les dizaines et les centaines. Il est évident que ces nœuds supplémentaires doivent être regardés comme des unités, vu que ceux-ci sont identiques aux autres nœuds représentant les unités.

Les cordelettes H comme les cordelettes B existent en plusieurs couleurs. Elles sont en partie unies. Les couleurs les plus courantes sont, comme ordinairement dans les quipus, le blanc et le brun dans différents tons. Les cordelettes de couleurs différentes

ne sont pas groupées d'après un système défini, de sorte que la même couleur revienne à intervalles réguliers.

Quelques cordelettes sont bicolores, l'une d'elles est même tricolore, chose qui a été obtenue en tordant ensemble des fils de différentes couleurs. En additionnant les nombres sur les cordelettes de même couleur, des résultats remarquables ont été obtenus dans l'étude d'autres quipus. Je renonce cependant à un tel examen ici, étant donné que plusieurs couleurs des cordelettes dans le quipu du Trocadéro sont difficiles à définir parce qu'elles ont probablement changé à la suite du long séjour du quipu dans la terre.

Les gravures nous indiqueront plus facilement la manière de déchiffrer les nœuds (1).

Si nous commençons par la gauche, nous aurons :

GROUPE I.

Le nombre sur la cordelette H est. 12

GROUPE II.

Les nombres sur les cordelettes H sont. . . .	226, 49, 17, 12, 23, 15, 5, 7, 11 = **365**
Les nombres sur les cordelettes B sont. . . .	30 30 4 6 3 — 3

Ce groupe est particulièrement intéressant. Le nombre sur les cordelettes H est 365, soit une année solaire. La dernière cordelette H porte 11 :

365 — 11 = **354** = 12 × **29,5** soit une année lunaire.

La quatrième cordelette de ce groupe est bleue. Les cordelettes bleues qui sont plutôt rares semblent souvent désigner une limite. Si nous additionnons les nombres des groupes (voir le dessin) se trouvant à gauche de la cordelette bleue, en y comprenant les nombres sur les cordelettes B, nous arrivons à un total de **365** :

226	
30 30 4 6 3	cordelettes B sur la cordelette qui porte le nombre 226 = 73
49	
17	
Total. **365**	

(1) Voir aussi Erland Nordenskiöld, *Le calcul des années et des mois dans les quipus péruviens.* (*Journal de la Société des Américanistes de Paris*, Nouvelle série, t. XVIII, 1926.)

GROUPE III.

Les nombres sur les cordelettes H sont.	5, 4, 4, 0, 1, 16, 23, 6, 10, 23, 0, 106, 11, 13, 4
Les nombres sur les cordelettes B sont	2, 2, 2 — 2 — 22 — 5 6
Plus un nœud supplémentaire	2

Le total des nombres sur les cordelettes H de ce groupe est 226 et celui des cordelettes B 41 : 226 + 41 = 267.

Le total des nombres sur les cordelettes H de groupe II est 365 et celui des cordelettes B 76 : 365 + 76 = 441.

441 + 267 = 708 = 24 × **29,5** soit deux années lunaires.

GROUPE IV.

Les nombres sur les cordelettes H sont	209, 7, 0, 6, 17, 8, 3, 4, 4, 21
Les nombres sur les cordelettes B sont	20, 2, 17, 12, 6, 2, 3, 7. — 2 — 9
Plus un nœud supplémentaire	4

Le total des nombres sur les cordelettes H de ce groupe est 279 et celui des cordelettes B 80.

279 + 80 = 359, soit une année lunaire et cinq jours.

GROUPE V.

Les nombres sur les cordelettes H sont.	3, 3, 1, 2, 0, 1, 7, 8, 0, 13, 6, 16, 105
Les nombres sur les cordelettes B sont.	2, 2, 1, 1, 2, 3, 8, 1, 4, 7 — 7 — 3, 3, 13, 5 — 3
Nœuds supplémentaires. . .	1 — 1 — 1, 5

Le total des nombres sur les cordelettes H est de 165.
Le total des nombres sur les cordelettes B est de 65.
Soit 165 + 65 = 230.

Le total des nombres sur les cordelettes H et B de groupe IV et 359. 359 + 230 = 589 = 20 × **29,5** — 1 soit 20 mois moins un jour. Le total des nombres sur les cordelettes H et B dans les groupes II, III, IV et V = 1.297 = 44 × 29,5 — 1 soit 44 mois moins un jour.

Si nous additionnons tous les nombres du quipu, nous arrivons à :

	Cordelettes H.	Nœuds supplémentaires.	Cordelettes B.	Nœuds supplémentaires.
Groupe I.	12			
Groupe II	365		76	
Groupe III	226	2	41	
Groupe IV	279		80	4
Groupe V.	165	7	65	1
Totaux	1.047	9	262	5

1.047
262

1.309 = **365** + 944. 944 = 32 × **29,5**

1.309 = Une année solaire plus 32 mois. 1.309 fait aussi 187 × **7**.

En additionnant tous les nombres de ce quipu — en faisant abstraction des nœuds supplémentaires placés çà et là — nous obtenons donc 1.309 lequel nombre forme une année solaire plus 32 mois.

Il est évident que dans ce quipu, on a calculé avec des années solaires de 365 jours et des mois de 29 jours $\frac{1}{2}$.

Dans le quipu du Trocadéro, le total des nombres sur les cordelettes H du groupe II = 365.

Au Musée d'Ethnographie de Berlin, se trouve un quipu non publié (V. A. 37870) originaire de Lima. Il se compose d'un cordon principal auquel sont fixées 27 cordelettes H réunies en trois groupes, lesquelles portent 9 cordelettes B.

Nous constatons que le total de tous les nombres du quipu est de 6.461 soit 219 × **29,5** + 0,5 = 923 × **7**.

Le quipu comprend donc 219 mois de 29,5 plus une erreur d' $\frac{1}{2}$jour. Nous ignorons si les Indiens possédaient un signe exprimant $\frac{1}{2}$.

Les cordelettes H du quipu sont, comme il a été dit, divisées en groupes que nous appellerons I, II, III.

Le total des nombres du groupe I 1.155
Le total des nombres du groupe II 4.321
Le total des nombres du groupe III. 985
Le total des nombres des groupes I + II = 5.476 = 15 × **365** + 1
Le total des nombres des groupes I + II + III = 6.461 = 219 × **29,5** + 0.5.

Dans ce cas, c'est le total de tous les nombres de deux groupes, qui est divisible par 365, avec un reste très insignifiant. Dans le quipu du Trocadéro, c'est le total des nombres des cordelettes H d'un groupe qui forme 365.

Une chose est particulièrement remarquable dans les quipus :

Il n'y a que les sommes qui résultent d'additions des nombres de tout le quipu ou d'un ou de plusieurs de ses groupes, ou encore de toutes les cordelettes de certaines couleurs, qui sont divisibles par 365 ou par 29 $\frac{1}{2}$. Alors que ce n'est pas le cas pour les nombres qui sont effectivement désignés sur les cordelettes. Jusqu'à présent, je n'ai rencontré qu'une seule exception qui figure dans le quipu publié par moi, et dans lequel on peut remarquer des nombres extraordinairement élevés sur les cordelettes, comme 3.285 = 9 × 365 et 35.577 = 1.206 × 29,5. Ce quipu

me semble former une liste de nombres élevés, peut-être représente-t-il les totaux d'autres quipus.

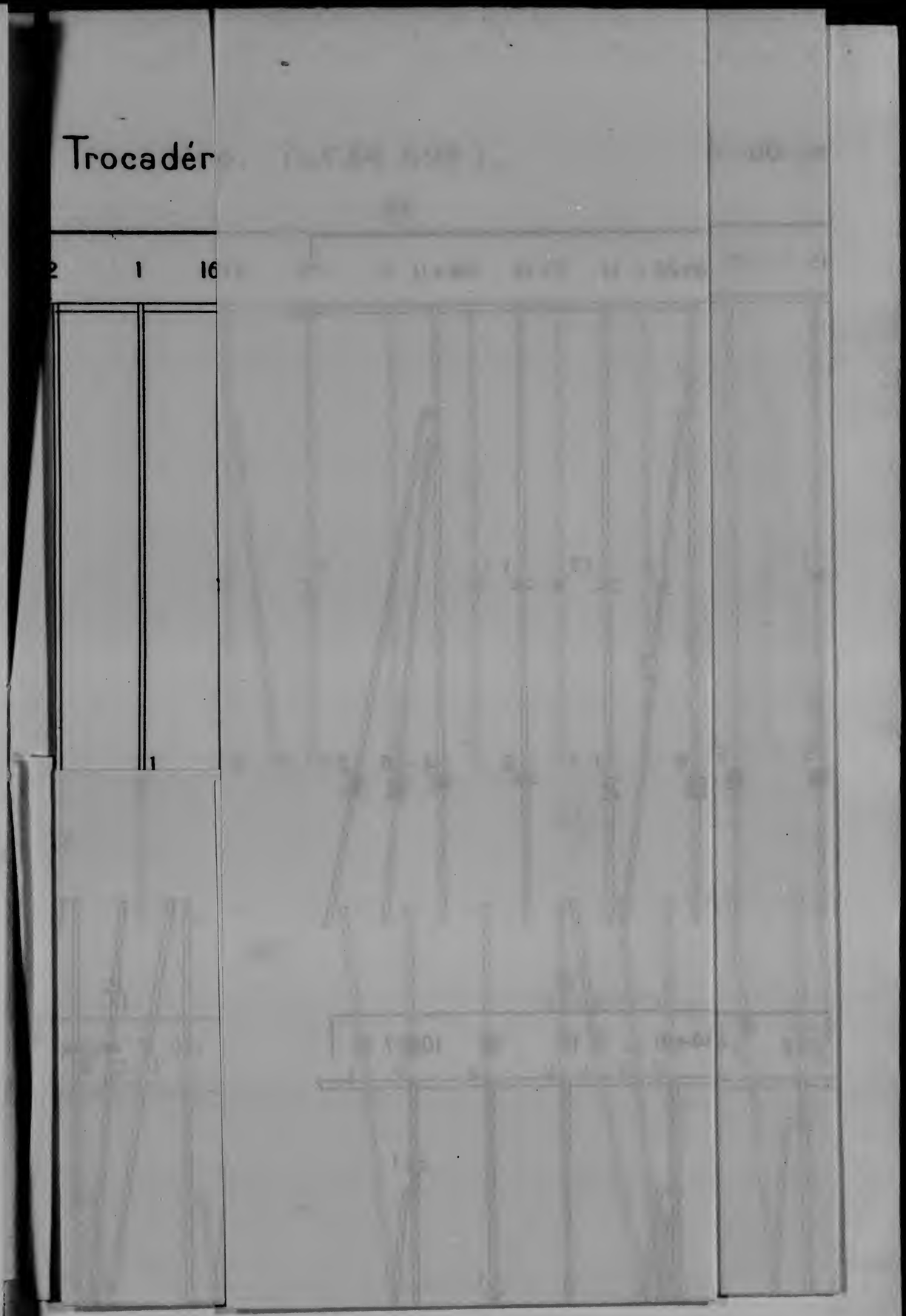
Pour résumer, il me semble plausible que les Indiens ont pris comme point de départ des nombres que nous avons obtenus par l'addition de toutes les sommes d'un quipu et qu'ensuite ils auraient divisé le total en sommes moindres qui, à leur tour, étaient réparties sur les différentes cordelettes du quipu.

En ce qui concerne le quipu du Trocadéro, on a probablement pris comme point de départ le chiffre 1.309 (c'est-à-dire le total des nombres indiqués par les nœuds ordinaires). Ce chiffre a ensuite été décomposé en **365** et **944** (32 × **29,5**). Pour rendre divisible par 365 le total des nombres de certaines couleurs, on a ajouté quelques nœuds supplémentaires correspondant aux nombres des cordelettes B dans le susdit quipu 9. Il est moins probable qu'on ait pris comme point de départ les chiffres 1.323 c'est-à-dire le total de tous les nombres ordinaires plus la somme des nombres représentés par les nœuds supplémentaires.

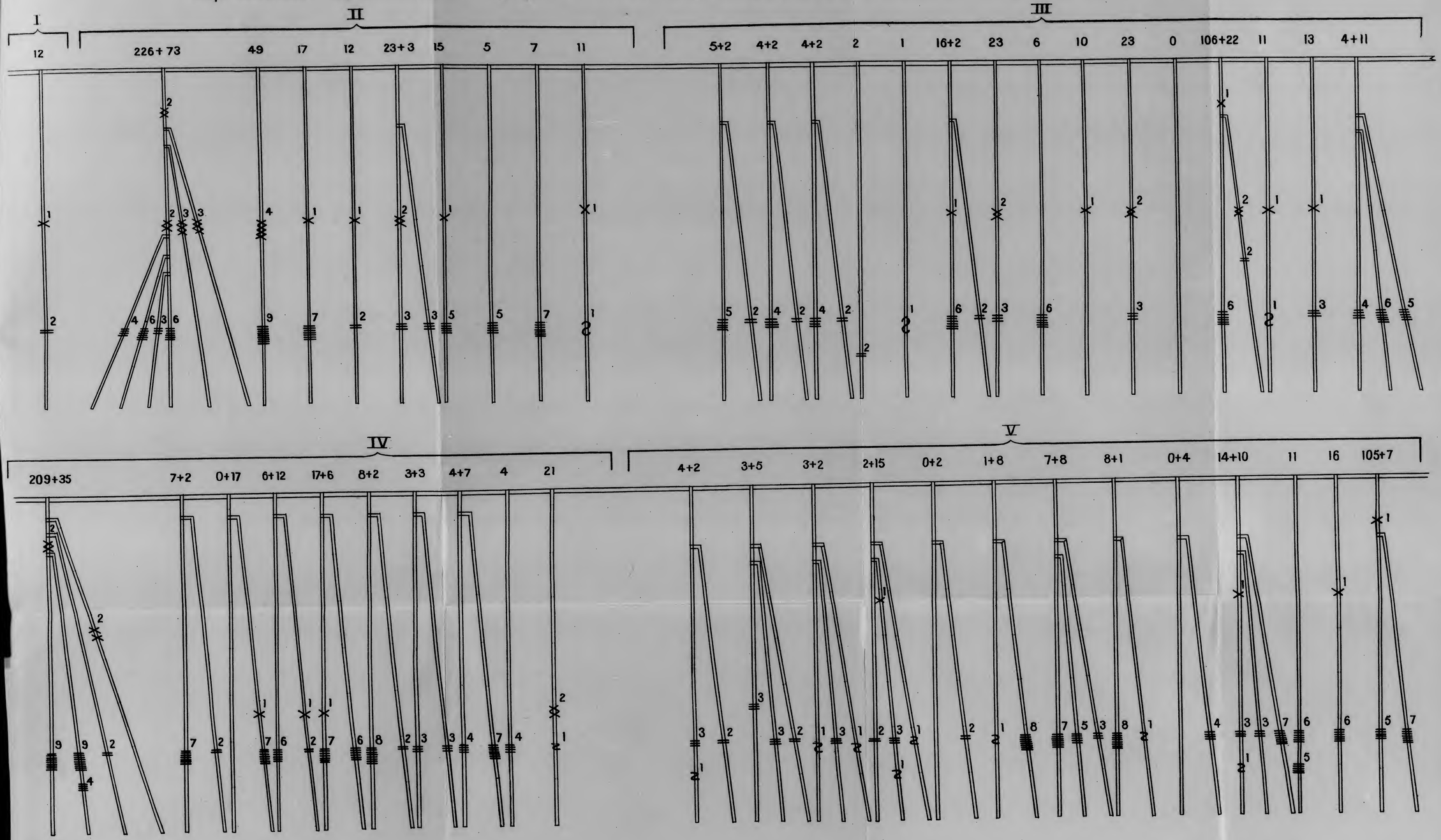
Ici se pose une question du plus haut intérêt : Comment a-t-on obtenu les nombres, qui, suivant moi, auraient été le *point de départ* pour l'établissement des quipus? C'est un problème réservé aux savants de demain. Quoi qu'il en soit, nous sommes à l'heure actuelle, grâce aux quipus, en voie de pénétrer plus avant les connaissances astronomiques des Indiens du Pérou et le quipu du Trocadéro est, à cet effet, un des plus intéressant que nous connaissions.

ERLAND NORDENSKIÖLD.

ERRATUM. — Lire sur le schéma, groupe V, 1ro ligne, au-dessus de la 3e cordelette : 1 + 4 et non 3 + 2.



Représentation schématique du Quipu du Musée d'Ethnographie du Trocadéro. (nº 24.899).



ETABTS GAILLAC-MONROCQ - PARIS.

WITH THE COMPLIMENTS

OF

GÖTEBORGS MUSEUM

SWEDEN

VOLUME XXIV NUMBER FOUR

THE NATIONAL GEOGRAPHIC MAGAZINE

APRIL, 1913

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CONTENTS

IN THE WONDERLAND OF PERU

The Work Accomplished by the Peruvian Expedition of 1912, Under the Auspices of Yale University and the National Geographic Society

By HIRAM BINGHAM, Director of the Expedition

With 244 Illustrations

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To carry out the purpose for which it was founded twenty-three years ago, namely, "the increase and diffusion of geographic knowledge," the National Geographic Society publishes this Magazine. All receipts from the publication are invested in the Magazine itself or expended directly to promote geographic knowledge and the study of geography. Articles or photographs from members of the Society, or other friends, are desired. Contributions should be accompanied by an addressed return envelope and postage, and be addressed:

GILBERT H. GROSVENOR, EDITOR

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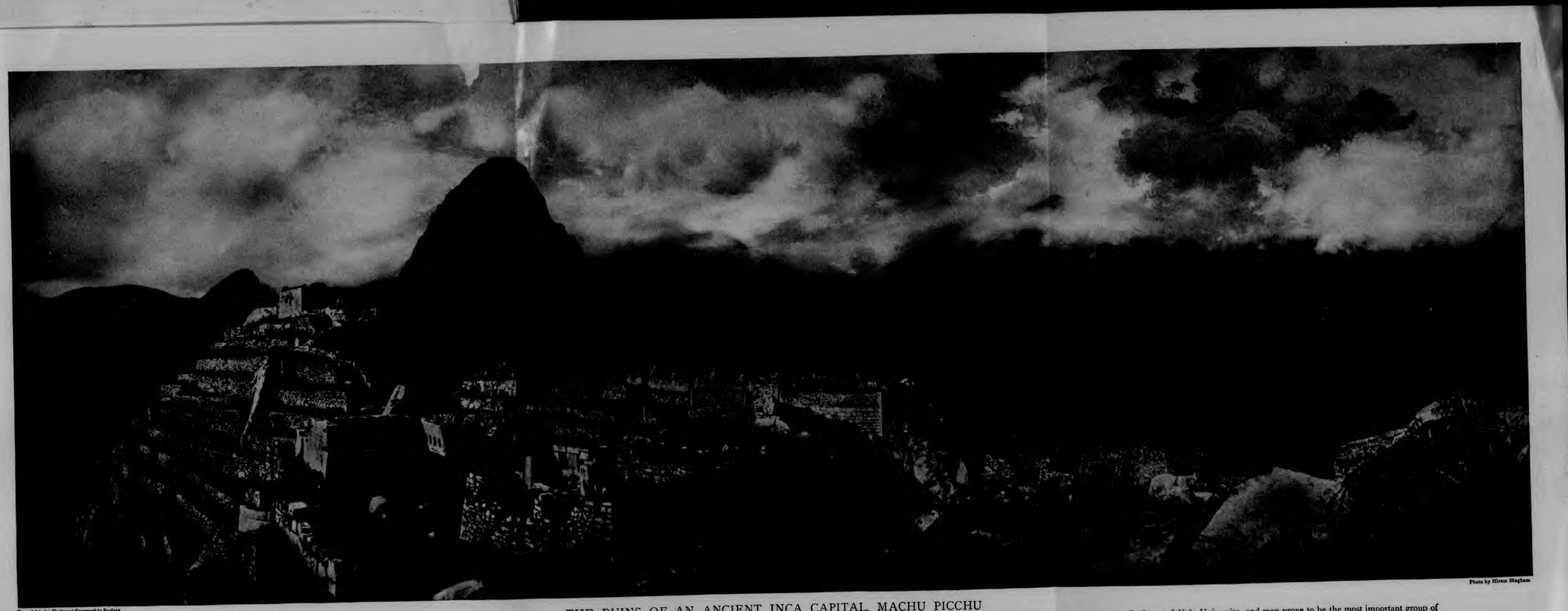

Photo by Hiram Bingham

THE RUINS OF AN ANCIENT INCA CAPITAL, MACHU PICCHU

This wonderful city, which was built by the Incas probably 2,000 years ago, was discovered in 1911 by Professor Hiram Bingham, of Yale University, and uncovered and excavated under his direction in 1912, under the auspices of the National Geographic Society and Yale University, and may prove to be the most important group of ruins discovered in South America since the conquest of Peru. The city is situated on a narrow, precipitous ridge, two thousand feet above the river and seven thousand feet above the sea, in the grand canyon of the Urubamba, one of the most inaccessible parts of the Andes, sixty miles north of Cuzco, Peru. It contains about two hundred edifices built of white granite, and including palaces, temples, shrines, baths, fountains, and many stairways. The city does not appear to have been known to the Spaniards. For further information, see Dr. Bingham's article in this number of the National Geographic Magazine.

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Retake of Preceding Frame

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HYBRIDS IN PERU

THE age-old effort of the Incas to interbreed different species of their native wool-bearing animals and thus obtain types combining several desirable qualities seems at last to have met with success—at the hands of the white man, however. Two hybrids have been produced at the experimental farm at Puno, Peru, under the direction of Colonel R. J. Stordy, director.

One of these newcomers is the "huarizo," a cross between the llama and the alpaca, the other the "paco-vicuna," a cross between the domestic alpaca and the wild vicuna. Whether these animals will be fertile and reproduce is not yet known, according to Wilson Popenoe, agricultural explorer, who has recently returned to Washington from Peru.

The llama, one of the ancestors of the new "huarizo," has for centuries been the cow and the horse and the "ship of the Andes" to the people of Peru, Bolivia and Ecuador. It is the largest of the four cameloid types of wool-bearing animals native to this region. It is said that centuries before the European conquest it had been domesticated from the wild huanaco by the Indians who prized it as a gift from the gods, without which there would be no existence, trade or travel.

Huge numbers of these animals were said to have existed at one time. Spanish chroniclers say that 300,000 of them were used to carry the gold and silver from the mines of San Luis Potosi to the waiting galleons of the Spaniards. To-day the number is not so great, but these animals, nevertheless, are the only means of transportation, and sources of food and clothing to the large part of the population.

Although it is the largest of these animals, the llama's flesh is not exactly a delicacy, and its coat of wool is coarse and rough. The alpaca, the other parent of the "huarizo," is smaller and has a wool whose quality is prized in commerce. By interbreeding these two it was hoped to obtain wool that was finer than that of the llama and in quantity greater than that of the small alpaca.

But the rarest of all the small humpless camel-like animals of the Andes is the vicuna. Graceful as a gazelle, it is still wild or half wild and inhabits the high mountain ranges and inaccessible places bordering the region of perpetual snow. It was a prize to the hunters seeking it among the rocky precipices of Ecuador, Peru and Bolivia. Its wool and skin have always been considered of special value, a poncho of vicuna being worth a mint of money to-day. This and the fact that it had to be killed to obtain its wool have nearly caused its extinction. There are now stringent regulations for its protection.

This graceful animal, although wild, has an amount of curiosity that often made it the victim of the hunter. It can be captured and tamed and even domesticated to some extent. By crossing this animal with the alpaca it is hoped to obtain a type that will be easily domesticated and propagated in large numbers. The wool if obtainable in quantities should have a great commercial value, for that of the alpaca is noted for its lightness and strength and its ability to take dye, while that of the vicuna is unsurpassed in softness and beauty.

Science News, Science Supplement, XII June 5, 1920.

Aside from the wonderful technique of Peruvian tapestry, the richness of its color is a marvel to the modern expert. Interment for a millennium in no way dims the colors, which are mostly from vegetable dyes, and, although intense, are never displeasing to the eye. The above design, which is typically Peruvian, consists of a repetition of the same geometrical motive arranged in different quarters of a series of truncated rhombs. The preservation of the cloth for such a great length of time is due to the fact that it was buried in the dry, nitrous sand of the Peruvian desert coast where rain seldom falls. This piece is from the collection of Sr. F. G. Estrada, recently purchased for the American Museum

A Prehistoric Poncho from Nazca, Peru

THE American Museum's series of prehistoric objects from graves in Nazca, Peru, has just been augmented by the purchase of Sr. F. G. Estrada's collection consisting of 130 specimens, mostly textiles. These comprise broad and narrow ribbons, coca bags, belts, slings, etc. The prize piece of the collection is a tapestry poncho. The warp is of cotton, covered by the weft of vicuña wool yarns.

Aside from the beauty of the Nazca webs their technique never fails to interest and astonish textile manufacturers and experts. A careful examination of one piece of tapestry in the collection brought to light the fact that it contained 330 vicuña weft yarns over 42 cotton warps to the inch. Experts tell me that we seldom put in as many as 100 weft yarns of wool to the inch.

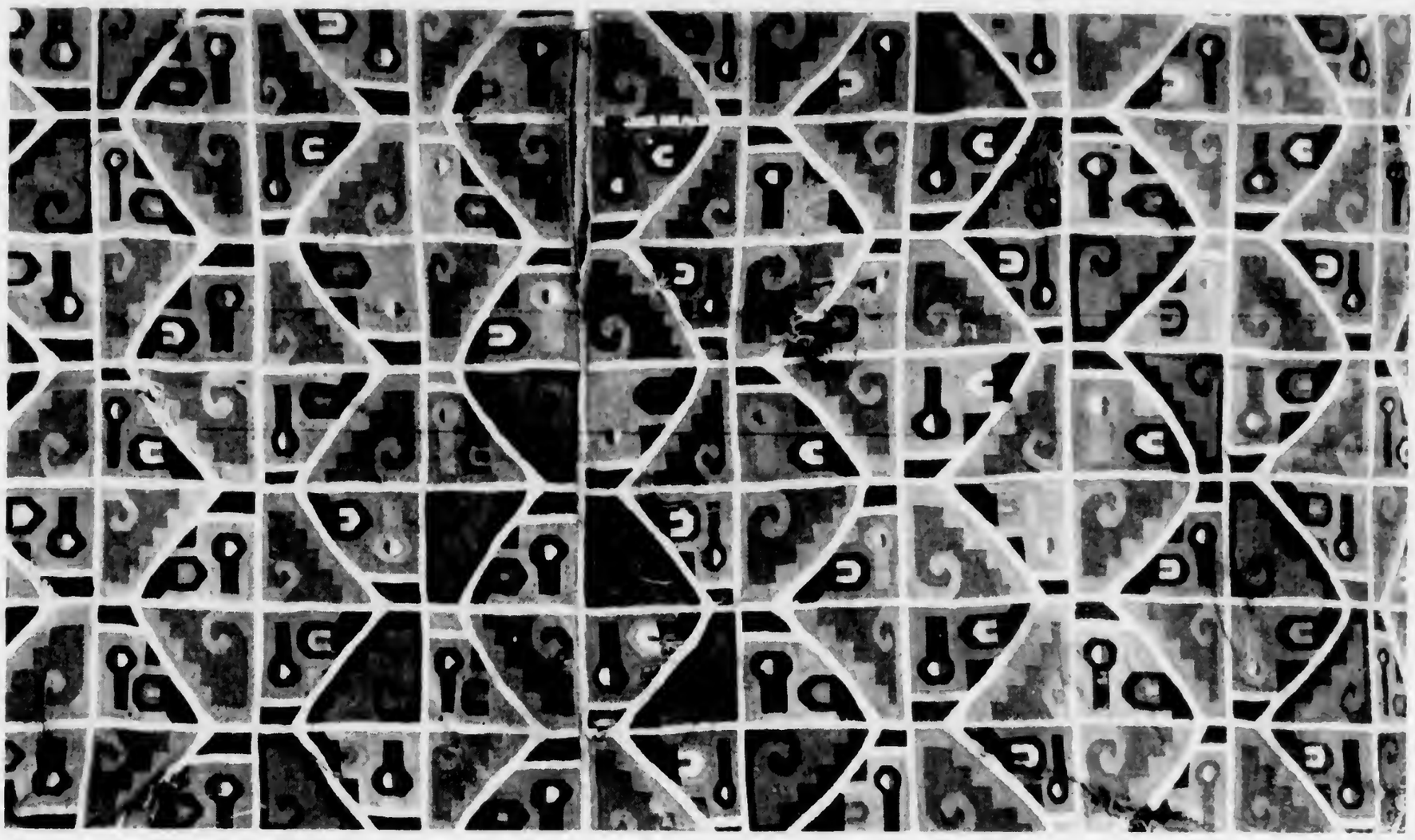
Tapestry has been defined as darning on bare warps. As many bobbins are required as there are to be colors in the fabric. Selecting the required color for the first few warps on one side of the loom, the weaver laces it in, then takes another bobbin, and so on across to the other side. In this way the designs are built up, a pick at a time, and not each formed separately. When two areas of different colors come together on parallel warps we see the slit characteristic of tapestry.

In this poncho, as in other prehistoric Peruvian textiles, the great charm lies in color schemes. In these there is never found an arrangement of colors that offends the artistic eye. The whole scheme of the decoration is taken in a high key, but the various shades of red and yellow are so soft and pleasing that we do not at first realize how intense they are.

The colors used by these ancient people were mostly made from vegetable substances, and our modern color boxes contain few that match them, as thousands of artists and design students who have worked from these textiles can testify.

To copy the poncho under consideration is, in a way, like painting a brilliant sunset from nature. The result probably will be disappointing while in presence of the original, but will seem to look much better the next day when removed from its proximity.

The design is a sort of diamond-shaped figure (truncated rhomb) enclosed in white lines, and by other white lines divided into quarters. Each quarter contains a number of figures which never change in form, although their positions and colors and those



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Retake of Preceding Frame

of the quarter in which they occur vary in each succeeding design. This repetition of a design in different color schemes is a characteristic of Peruvian decorative art. The colors used in the poncho are yellow, greenish yellow, dark buff, carmine-red, dull red, brown, old rose, magenta, purple, green, black, and white.

The greater part of the Peruvian coast region is a desert where rain is all but unknown, and textiles buried in the dry, nitrous sand suffer little or no deterioration. After a lapse of one thousand years or more they come from these graves as strong in texture and with the colors as bright as the day they were buried with the dead. They are found on the mummy or beside it, with such objects as were prized by the individual in life and such as it was thought would be useful in a future state.

Nazca lies about 220 miles to the south of Lima. The whole valley in which it is situated is hot and dry. The only water is from a small river that is dry part of the year, and sometimes contains no water at all for several years. About the only indigenous vegetation to be seen is algarroba trees and cotton plants. Notwithstanding these conditions there is abundant evidence that the Nazca Valley supported a large population in prehistoric times. How was food enough obtained to support so many people? This is one of the Peruvian puzzles that has never been solved. There is not the least evidence that conditions have changed in this region, yet here flourished one of the three great culture centers, the others being at Tiahuanaco and Trujillo.—CHARLES W. MEAD, Assistant Curator in Anthropology, American Museum.

LOAN IN CLASSICAL ART

Head of a girl, Greek, fourth century B.C

That the Fiftieth Anniversary Exhibition of the Metropolitan Museum brought such richness of loans in Gothic, Renaissance, eighteenth century, and modern art, and but few in classi al art, emphasizes that the art collections of America, contrasted with those of England, for instance, are not strong in the classical line—owing to the difficulty there has been in recent times to obtain Greek and Roman works of first quality. This marble head expresses the spirit of Praxiteles in Greek contemporary art, reflecting his style and carrying much of the delicate beauty of his work. The head was evidently part of a statue trimmed to its present shape in recent years

---

"And what should be the policies of the Metropolitan Museum in the future, so that our successors, when they come to celebrate its hundredth anniversary, may do so with the same satisfaction with which we celebrate its fiftieth? Strict adherence, in my judgment, to the policies of the past, with difference of emphasis, perhaps, and an open-minded readiness to meet changes in the public sentiment of the future."—*From address by President Robert W. de Forest*

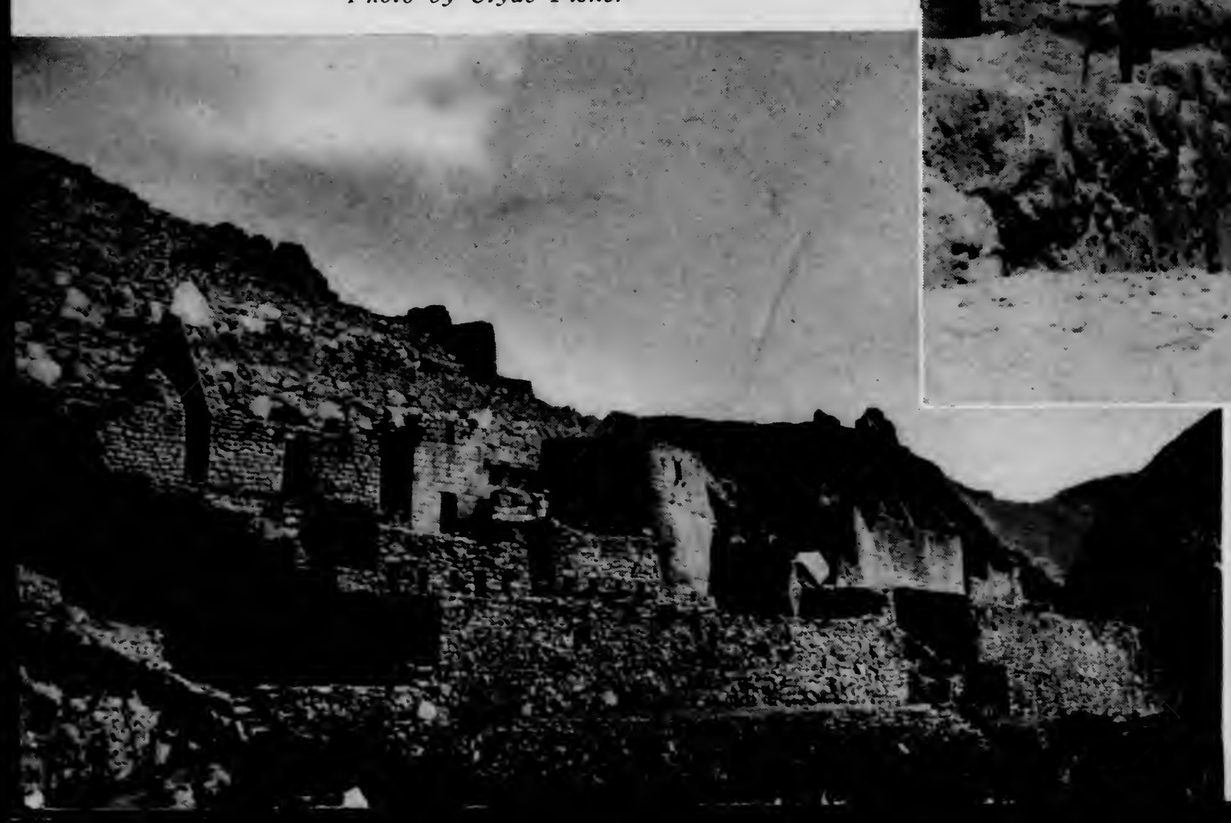
Photo by Clyde Fisher

(Top) LLAMAS at Cerro de Pasco, Peru: an animal domesticated before the European conquest and used as a beast of burden

(Center above) SURF-BOARDS: Indian boys with their *caballitos* for surf-riding, at Huanchaco, Peru

(Right) CHAN-CHAN: Great ancient city of the coastal (Chimu) civilization at Trujillo, Peru

Photo by Clyde Fisher



(Left) MANCHU PICCHU: magnificent ruins of th
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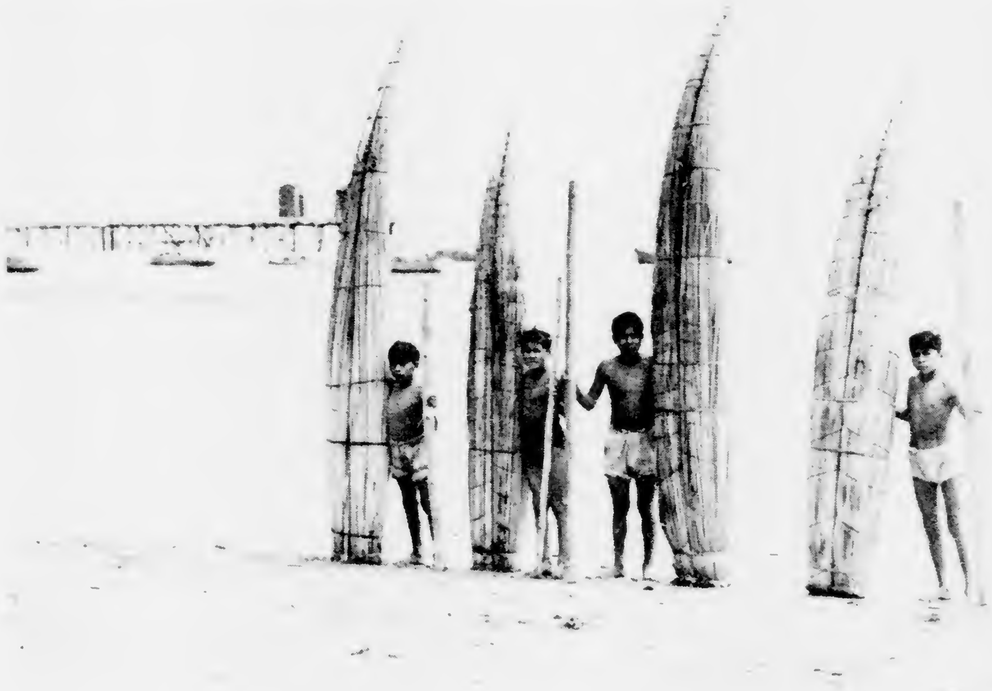

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Left: MACHU PICCHU: magnificent ruins of the Inca Empire

MOTOR LAND
October 1927.
p. 42.

The Lost Road of the Incas

Great Highway of Ancient American Civilization Built Across Andes to the Sea

by EDWIN MERRY

Photographs by the Author

Stone pavement on this thoroughfare of a past era has lasted for untold ages.

FOR centuries before Christopher Columbus made his memorable transatlantic passage, there lived a mighty nation of people among the plateaus and valleys of the Andes in South America. These were the Incas and their domain was a veritable empire extending, roughly, from where the city of Quito, the capital of Ecuador, now stands to what is at the present time the northern boundary of Chile.

The Incas were industrious and possessed a high degree of intelligence. As artisans and masters of the stone-cutting and building arts they are entitled to be classed with those who built the pyramids of Egypt and the marvelous stone work of the old Roman Empire.

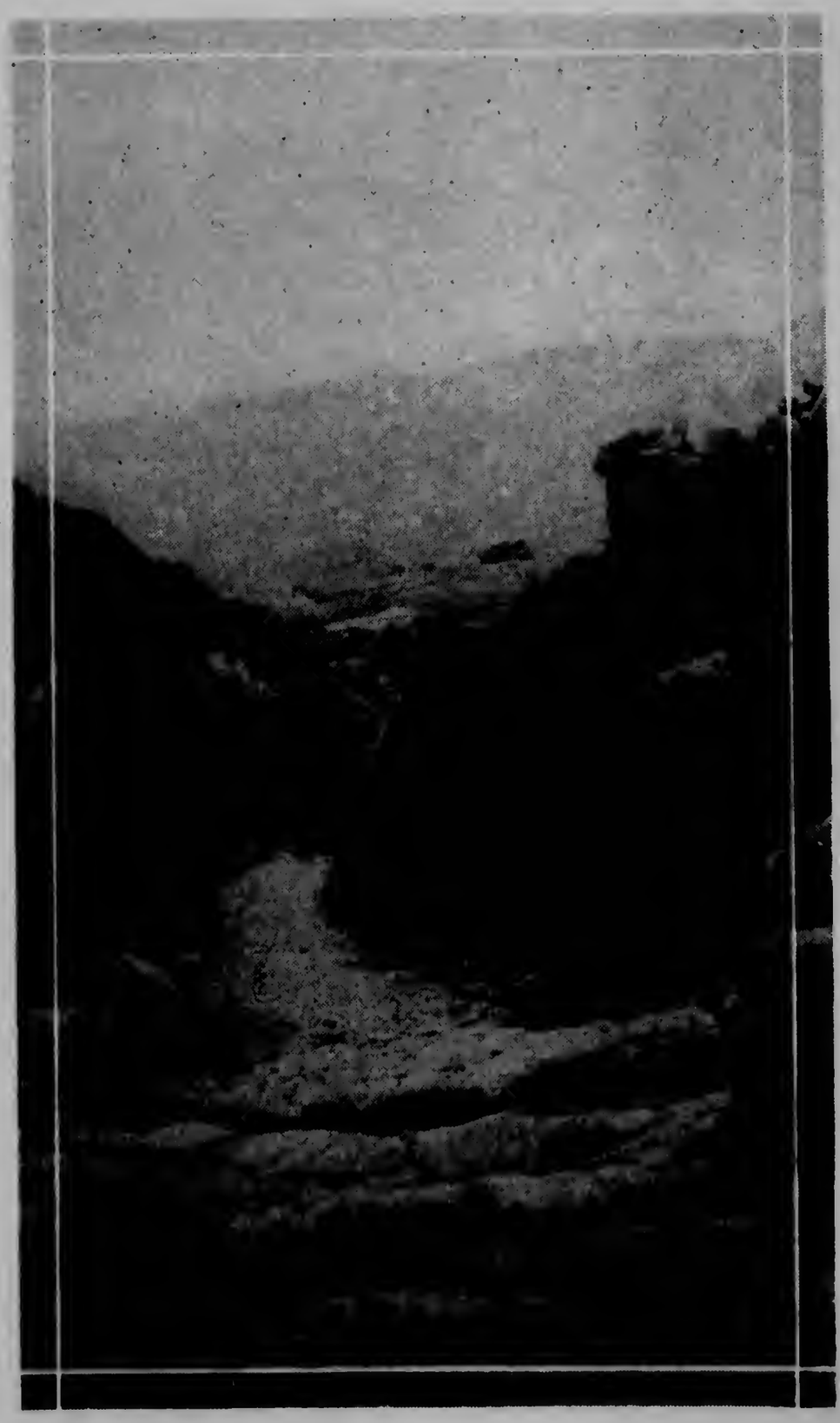
The Inca capital was the city of Cuzco, situated in a little valley, circular in shape, and surrounded by the walls and peaks of the mighty Andes. Cuzco was a well-laid-out city with regular streets and massive arches. The Temple of the Sun was a gigantic building of great architectural beauty.

In the center of the valley there is a hill, round in shape and about seven hundred feet high. On the summit of the hill the Incas built a mammoth stone fortress. The outside walls of this fortress were over thirty feet high and surrounded an area of about twenty-five acres. There were two inner walls with numerous cross sections. From a military and strategic point of view the fortress was a remarkable piece of work and ranks on a par with any fortification of past ages.

To the north is a small plateau on which was the out-of-door throne, cut entirely from solid rock. Back of this was a small amphitheater and on one side were rows of seats in the form of chairs with arm rests, also hewn from the solid rock.

History states that a system of highways covered the Inca empire and that one great road ran from the present city of Quito across the summit of the Andes to Cuzco and thence to the coast, ending somewhere near the port of Callao. Here the Inca lived, cultivated the soil and indulged his taste for doing marvelous things with stone.

Then America was discovered and the early Spanish explorers, when they reached the Isthmus of Panama, found many articles of gold. They had the natural desire to find the land from whence it came. In the early part of the sixteenth century a Spanish expedition reached the site where the present city of Lima now stands. Pizarro, with an army of less than two hundred men, started inland with the purpose in view of locating the mines which produced gold so abundantly and in due course reached the land of the Incas. Pizarro led his little band in an attack on Cuzco, whose defenders, while brave soldiers, could not withstand muskets and



Where centuries ago congestion of trains of llamas was the traffic problem.

Retake of Preceding Frame

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In the center of the valley there is a hill, round in shape and about seven hundred feet high. On the summit of the hill the Incas built a mammoth stone fortress. The outside walls of this fortress were over thirty feet high and surrounded an area of about twenty-five acres. There were two inner walls with numerous cross sections. From a military and strategic point of view the fortress was a remarkable piece of work and ranks on a par with any fortification of past ages.

To the north is a small plateau on which was the out-of-door throne, cut entirely from solid rock. Back of this was a small amphitheater and on one side were rows of seats in the form of chairs with arm rests, also hewn from the solid rock.

History states that a system of highways covered the Inca empire and that one great road ran from the present city of Quito across the summit of the Andes to Cuzco and thence to the coast, ending somewhere near the port of Callao. Here the Inca lived, cultivated the soil and indulged his taste for doing marvelous things with stone.

Then America was discovered and the early Spanish explorers, when they reached the Isthmus of Panama, found many articles of gold. They had the natural desire to find the land from whence it came. In the early part of the sixteenth century a Spanish expedition reached the site where the present city of Lima now stands. Pizarro, with an army of less than two hundred men, started inland with the purpose in view of locating the mines which produced gold so abundantly and in due course reached the land of the Incas. Pizarro led his little band in an attack on Cuzco, whose defenders, while brave soldiers, could not withstand muskets and

Where centuries ago congestion of trains of llamas was the traffic problem.

artillery. In the year 1533 the city fell into his hands.

Then followed a period of destruction of all this wonderful civilization similar to that carried on by Cortez in his conquest of Mexico. All the gold and other articles of value were seized, the buildings and other works of the so-called "heathen" were, as far as possible, destroyed. However, some of the walls and arches were too massive and defied the efforts of the conquerors and stand today as mute evidence of this wonderful race of five centuries ago.

IT WOULD seem that retribution was at hand, for when Pizarro returned to Lima, shortly after his conquest of Cuzco, there rose a dispute among his followers over the spoils and Pizarro was stabbed to death by one of his own men. His body was embalmed and now lies in a glass case inside the cathedral at Lima.

When the writer was in Cuzco he heard of the great road and endeavored to ascertain if any part of it still existed. After consulting many people and getting a clue here and there he was taken to a hill back of Cuzco and there found the old stone highway.

FROM the summit of a little ridge, which the road crossed, two views of the road were had. One was in the direction of the sea while the other revealed it winding in the direction of Quito.

The road is about twelve feet wide and at this point was paved with flat slabs of stone which have defied the ravages of the elements for centuries.

It is not a road which the automobile could travel over, but it was undoubtedly a great thoroughfare of another epoch. The congestion of the trains of llamas may have been the traffic problem of the Incas.

operators will find themselves governed by a new code of traffic regulations when the new McClintock traffic ordinance adopted recently by the Board of Supervisors is put into operation.

As a matter of law, the ordinance went into effect last month, but as a matter of enforcement it will not go into actual operation until such time as signs and signals have been erected and curb lines and street surfaces marked or painted in accordance with the provisions of the ordinance. Authorities have announced a policy of educational enforcement as the work of erecting the required signs and signals progresses.

The ordinance was drafted by Dr. Miller McClintock, traffic consultant for the San Francisco Traffic Survey Committee, and is based on data collected in a year's study of street traffic conditions.

The new ordinance conforms in all essential respects with the Uniform Traffic Ordinance for California cities, drafted by the legal departments of the California State Automobile Association and the Automobile Club of Southern California. The details, of course, are adapted to San Francisco's own peculiar traffic requirements.

Among the major provisions of the ordinance are the following:

WITHIN the central traffic district or any business district pedestrians must not cross the street except by a crosswalk, and if the intersection is controlled by a police officer or traffic signals pedestrians must obey signals, crossing only with released traffic.

Outside of the central traffic district or business districts, pedestrians crossing a street other than at crosswalks must follow a course at right angles to the curb and yield the right of way to all vehicles on the street. They cannot stand in the street other than in safety zones and must not

motorists are prohibited from driving into any marked crosswalk while a pedestrian is crossing on the half of the roadway upon which the vehicle is traveling until the pedestrian has passed beyond the path of the vehicle. At unmarked crosswalks a pedestrian may secure a similar right of way by holding up his hand, palm out, toward approaching traffic. These provisions, of course, do not apply where traffic is being directed by an officer or signals. Both pedestrians and vehicles must obey signals at such intersections.

LEFT turns are prohibited onto or off of Market Street between the Embarcadero and Van Ness Avenue except such turns into Market from north side intersections which have no connecting south side streets between 7 A. M. and 6 P. M. on business days. Turning around at intersections i. e., complete left turns or "U" turns, are prohibited in the central traffic district and in business districts during the same hours.

Use of the so-called "four button" system of marking intersections is required on streets less than sixty feet in width and permitted on other streets.

Passenger and merchandise unloading zones where brief stops may be made will be provided in the down town district to eliminate the necessity for double parking which is prohibited.

The arterial stop system is extended to give San Francisco a complete network of main traffic arteries.

Although the ordinance now adopted does not specifically provide for it, the McClintock report recommends the installation of a co-ordinated system of automatic traffic signals and lays down specifications for installation of timing which will make possible practically a continuous movement of traffic over the principal traffic streets, particularly Market Street.

1907.

PRECOLUMBIAN WATER BOTTLE FROM PACHACAMAC GRAVEYARD, PERU, SHOWING DISEASE OF SOLE AND DISEASED UPPER LIP

In American Museum of Natural History, New York.

(Jesse Fewkes -

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Retake of Preceding Frame

Cancris lateralis (*Pulvinulina lateralis*) may be noted in this connection. The Pegididae are very closely related to this particular branch of the Rotalidae, but the relationship to the Globigerinidae mentioned by Heron-Allen and Earland seems much more remote. It is true that *Candeina* has rows of pores along the sutures, but it is not through a special plate as in these groups. The Pegididae have evidently become specialized in another direction, and instead of becoming thin, large-apertured, with delicate spines and fitted for pelagic life, have adopted a very heavy, thick test, with a reduction of the aperture to a minimum, adapting themselves thus to the rough treatment received in rather swift currents and coarse bottom sediments.

The genus *Physalidea* with two species, each described from single specimens, needs more material to show its exact relationship to the other genera included in the Pegididae.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ANTHROPOLOGICAL SOCIETY

On February 21, 1928, Mr. O. F. Cook, of the United States Department of Agriculture, addressed the Society on the subject: *Peru as a primitive center of agriculture*. The ancient Peruvians may be said to have attained the highest development of the art of agriculture, in their system of terracing and artificial placement of the soil. The cost in labor was enormous, but the improvements were permanent. The fertility of the soil was not lost by erosion, and may even have increased with the lapse of time. The terraced lands of the valleys of the eastern Andes undoubtedly have been cultivated continuously for many centuries and still are highly productive. The very specialized forms of agriculture and attendant arts in Peru indicate a very long period of development, and the indigenous character of the development is shown by facts of domestication.

The agriculture of the table-lands certainly was indigenous, since it was based entirely on the domestication of endemic high-altitude plants and animals, but there is nothing to indicate that the agriculture of the tropical valleys was derived from other regions. Primitive people who took refuge in these narrow, shut-in valleys of the eastern slopes of the Andes were under the greatest pressure to adopt a settled existence and to make every possible use of any local plants that could furnish food. The textile arts were carried to high degrees of perfection with cotton and other plant fibers, and with the wool of llamas, alpacas and vicuñas. As the higher elevations were attained, accurate knowledge of the motions of the sun became necessary, to determine the season for planting crops. The series of plant and animal domestications covered the entire range of habitable conditions, from the tropical lowlands, through the temperate valleys to the arctic climate of the high plateaus, where agriculture was carried above 14,000 feet.

The number of species of plants and animals that were domesticated and used in Peru was much greater than in Mexico or other parts of America. A list of 91 native Peruvian plant names was published in the Journal of Heredity for March, 1925, including all of the more prominent cultivated species. Most of the plants that were cultivated in other regions were also known in Peru, and may have been domesticated originally in the eastern valleys of the Andes. The ancient Peruvians had every plant that was of first-rank importance in other parts of tropical America. Many degrees of agricultural specialization are still represented in Peru among very primitive people, and may afford the best surviving pictures of early stages of human progress. Having recognized that Peru was a center of domestication, this fact may enable us to follow and interpret the development of agriculture and civilization in other parts of America.

On October 16, 1928, Dr. JOHN M. COOPER, of the Catholic University, addressed the Society on the subject: *Field Notes on the Ojibwa of northern Ontario*. He gave a short account of the results of visits made in September, 1928, to the Ojibwa bands living around Lake of the Woods and Rainy Lake in Ontario. The purpose of the trip was to trace the western distribution of a number of traits previously determined as existing in Quebec, James Bay, and Albany River areas. He found that the culture traits characteristic of the eastern Algonkian region extend to the Rainy River and Lake of the Woods district. Following are some of the features of the Rainy River and Lake of the Woods culture. The typical family hunting-ground complex obtains. There were formerly no chiefs. Pagak, Memegwecio, and the northern "fairies" are well known. Among the types of divination common are scapulimancy, scrying, and the beaver haunch, and bear kneecap methods. Among the common types of magic are the use of the bezoar, of the foetal inclusion, and of singing and drumming, to bring luck in hunting; the use of the buzzer, the bull roarer, the singed rabbit skin, and feather plucking, to bring cold and wind; the use of caribou teeth, duck head feathers, bit of the navel string, miniature nets, and the shoulder blade of the mudturtle, as cradle charms.

At least six different types of medicine men are distinguished. The Midewiwin is still in fairly full force as well as the cylindrical tent conjuring. Disease is cured by the herbalists and by medicine men, the latter sucking out the disease by the use of hollow goose bones.

At death the soul crosses a river on a pole to the village of the dead. Infants are carried over by a swan. Kijé Manitu appears to be very much more clearly envisoned by the Rainy Lake and Lake of the Woods pagans than by the Cree and Montagnais tribes farther north and east. He is supposed to be good and benevolent, and to be, as one Indian expressed it, "boss of the whole thing."

On Tuesday, November 20, 1928, Dr. MATTHEW W. STIRLING, Chief of the Bureau of American Ethnology, spoke to the Society on *The Acoma Origin and Migration Legend*. This legend tells the story of two girls, children of the Sun, who were nurtured in the darkness within the earth. They were given by their father two baskets containing miniature images by means of which they were to create all living things on earth. On their emergence into the light they began this work, creating also the gods which were to be of use to the people. One of the sisters gave birth to twins, sons of the Rainbow.

Journal Heredity - Nov. 1925.

BONES OF THE ANCIENT PERUVIANS

A Review

THE July-September number of the *American Journal of Physical Anthropology* is devoted to a treatise on "Human Skeletal Remains from the Highlands of Peru," by George Grant McCurdy. The material was secured in 1914 and 1915 by the Peruvian Expedition of Yale University and the National Geographic Society, conducted by Professor Hiram Bingham, and was mostly from caves in the upper Urubamba Valley, the principal seat of the Inca civilization.

The ancient burials were largely in caves where the mummies were placed in a sitting posture wound with braided grass rope and supported by "seat-rings" of withes, twisted together and loosely wrapped with cords or strips of bark.

Of 341 crania examined, 147 showed the so-called "Aymara type" of deformation, "produced by circular constriction and compensatory elongation." Skulls of both sexes were deformed and a larger proportion of female skulls, sixty per cent, than of male, forty-three per cent. In cases of very pronounced deformation the foramen magnum may be reduced in size and the spinal cord constricted. Also the cranial capacity was found to be somewhat less in such skulls. Hence the conclusion is drawn that "excessive Aymara deformation has an inhibitory effect on the growth of the brain." It is easy to understand that the growth of the skull may be restricted by the tight-fitting woolen caps that the natives of the Peruvian highlands put on their babies' heads—and apparently leave on indefinitely.

By far the longest chapter is devoted to surgery, and relates mostly to the trephining of the skull, an operation which evidently was popular among the ancient Peruvians. Forty-seven trephined skulls were found in a series of 273 adults and in several cases more than one operation was performed, one of the skulls having five apertures. Of the forty-seven trephined skulls twenty-nine were recognized as males, sixteen as females and two as youths. Twenty-six cases were successful, and partial healing occurred in eleven other cases. The operations were chiefly on the left side of the head, which with other facts is taken to mean that the principal object was to relieve depressed fractures produced by star-shaped stone club-heads, which seem to have been the favorite weapon of the time.

That so many female skulls were trephined makes it seem questionable that the injuries were received in warfare. Did the women fight in war with the men, or was clubbing a neighborhood pastime?

Other injuries and abnormalities of the skull and other bones are also described in detail, including especially the teeth, which were often imperfect or diseased. There were no cases of supernumerary teeth, but milk teeth were often retained and caused irregularities in the permanent teeth. Pyorrhea, alveolar absesses, and other dental diseases were recognized in many cases. "In 12 jaws out of 422, the teeth had all disappeared prior to the decease of the individual."

No comparisons are made in relative frequency of the abnormalities or diseased conditions in other parts of the world. Though the colonizing policy of the Incas may be supposed to have resulted in a great deal of mixing of tribal stocks in some of the outlying regions, there probably was a general condition of inbreeding and congestion with resulting pressure upon the means

of subsistence. This is indicated by the very specialized systems of agriculture that were developed, as well as by the precautions that the Incas are reported to have taken against famines, which are confirmed by the discovery of many ancient storehouses. With the ancient precautions neglected, many districts that were terraced with stone-work, and no doubt were cultivated very intensely in ancient times, have been abandoned.

The Diseases of Children

SAEUGLINGSKRANKHEITEN, by DR. WALTER BIRK, Vorstand d. Univ.-Kinderklinik zu Tuebingen. 5. und 6. umgearbeitete Auflage, 10-17 Tausend. Pp. 282, with 26 illustrations. Price $1.40. Bonn, 1922, A. Marcus & E. Webers Verlag.

Dr. Birk presents a clear, comprehensive and well-organized discussion of the diseases of infancy in this volume, which forms part I of his "Leitfaden der Kinderheilkunde," a second volume being given over to "Kinderkrankheiten." He fully recognizes the importance of heredity in the varied problems which the pediatrist meets, although he does not go into this side of the case as fully as some might desire. Speaking of twins, he remarks that they have the most divergent constitutions, in spite of the identity of their surroundings. As to rickets, he declares that eighty per cent of the children in Germany are effected at one time or another, and that inborn predisposition plays an important part. The current theory that rickets is due to lack of vitamines he dismisses as not in accord with the clinical facts. He notes that the negroes in Africa are free from this disease, while it is extremely prevalent among the negroes of North America. The importance of rickets in forming the shape of the female pelvis is often not recognized until the girl becomes a mother. It is in this way of first-rate importance to eugenics. Dr. Birk closes with a brief review of the infant welfare movement. P. P.

Origin of Mongolian Idiocy

Mongolian idiocy is a typical form of amentia, taking its name from the fact that the children born with this condition often have a facial expressiin resembling that of the Mongolian race. Its cause is obscure, but has been set down by various writers as "uterine exhaustion," since the last child in large families seems to be more often affected than others. Statistics on the subject have been fragmentary, however. Available data have been reworked by Hornell Hart, who contributes a note to the *Journal of the American Statistical Association,* XVIII: 900-903, September, 1923. He finds that a Mongolian ament is twenty-three times as likely to be born to a mother forty years old or over, as to a mother between the ages of twenty and twenty-four. It is therefore clear that the condition is correlated with the mother's age; but the data are not sufficient to show whether the mother's age is significant because of a possible deterioration in the quality of the germ-plasm, or merely because the older mothers are likely to have had more children; or for some other reason.

THE FAVORITE OPERATION AMONG THE ANCIENT PERUVIANS

FIGURE 13. Naturally it is not possible to determine by an examination of skeletal remains whether the Incas indulged in the luxury of having their tonsils and appendices removed. Of all the surgical operations of which time has left us any record trephining the skull was by far the most popular in ancient Peru. The owner of this skull appears to have been the holder of the long-distance record for having holes cut in his skull. Not the least remarkable part of this operation was that the patient survived, at least long enough for the bone to show evidences of healing. (Photograph by courtesy of the National Geographic Society.)

RAW MATERIAL FOR THE ANTHROPOLOGIST

FIGURE 14. Some of the bones and mummies discovered by the Yale University-National Geographic Society Expedition in 1915, as they were removed from the burial caves. (Photograph by courtesy of the National Geographic Society.)

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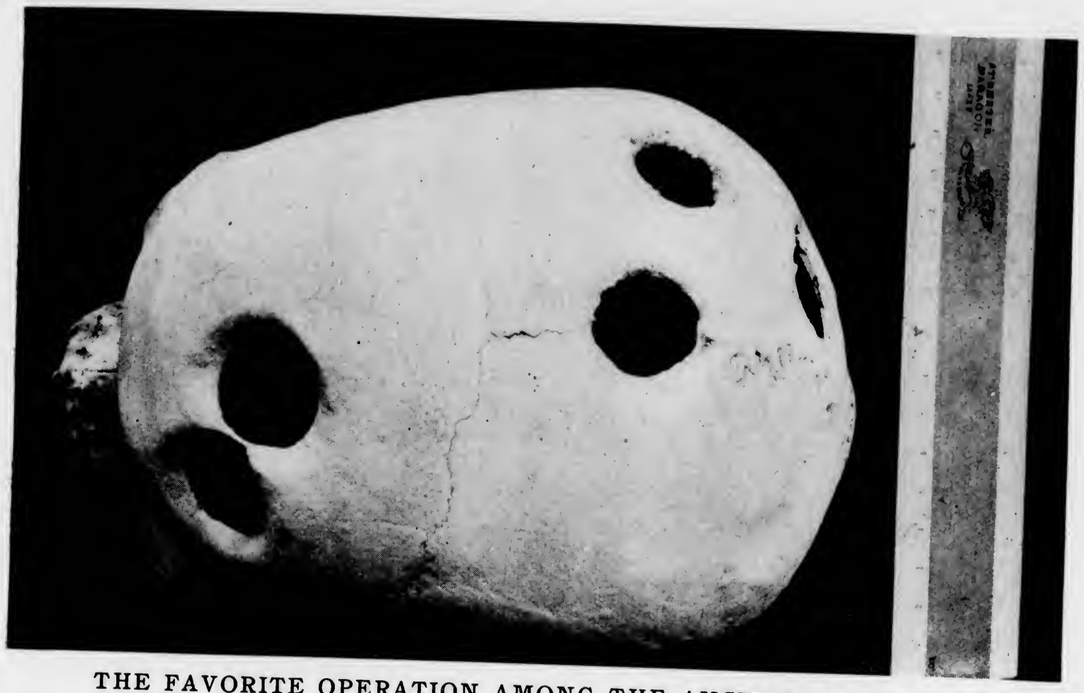

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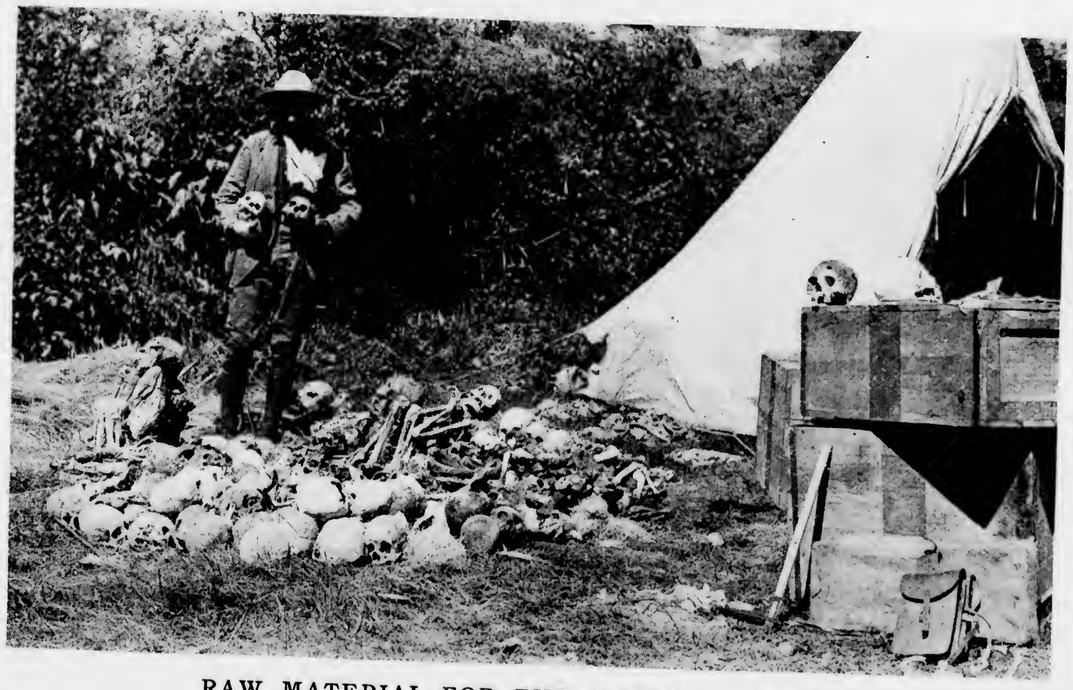

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FIGURE 14. Some of the bones and mummies discovered by the Yale University-National Geographic Society Expedition in 1915, as they were removed from the burial caves. (Photograph by courtesy of the National Geographic Society.)

Retake of Preceding Frame

NEW PERUVIAN COLLECTION.—Last month Mr. George D. Pratt presented a Peruvian collection to the Museum, consisting of 113 pieces of clay, shell, feather, metal, and wooden objects, from the Nazca and Chimu sections of the coast of Peru.

Most noteworthy are the two feather pieces, one of which is illustrated herewith. The headdress consists of a circular cloth hat and mantle completely covered with feathers. A crest of feathers projects upward from the center of the cap. The crest is designed with a step pattern in deep blue feathers on a yellow background

FEATHER HEADDRESS FROM PERU

One of two feather pieces in a good state of preservation recently presented to the American Museum by George D. Pratt

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May 4, 1928

mechanical engineering and Dr. Albin H. Beyer in civil engineering.

At Yale University, Dr. H. L. Seward and W. J. Wohlenberg have been promoted to be professors of mechanical engineering, and Dr. G. A. Baitsell to be professor of biology.

AT Vassar College, Associate Professor C. J. Beckwith has been promoted to professor of zoology and Ruth C. MacDuffie has been appointed instructor in zoology and anthropology. Assistant Professor H. M. Allyn has resigned to become academic dean of Mt. Holyoke College.

DR. JACOB C. GEIGER, executive secretary of the Chicago Health Department under the administration of Dr. Herman N. Bundesen, has accepted a position as professor of bacteriology at the George Hooper foundation of the University of California Medical School.

LARS G. ROMELL, of the Swedish Forestry Experiment Station at Stockholm, assumed his duties on April 1 at Cornell University as first incumbent of the Charles Lathrop Pack research professorship for the study of forest soils. Professor Romell will be associated with Professor T. L. Lyon, head of the department of agronomy and soils, and Professor Ralph Hosmer, of the forestry department. Professor Romell's appointment is for three years.

PROFESSOR J. J. R. MACLEOD, associate dean of the faculty of medicine at the University of Toronto, co-sharer of the Nobel prize in 1923 with Dr. F. G. Banting, the discoverer of insulin, will leave Canada in the autumn to become Regius professor of physiology at the University of Aberdeen, in succession to Professor J. A. MacWilliam, who recently resigned.

DISCUSSION AND CORRESPONDENCE

DEAFNESS IN PRE-COLUMBIAN PERU

THE determination of the causes of deafness in an ancient race of people, such as the pre-Columbian Peruvians, is well worth undertaking. The subject has already received some attention. Burton[1] has given an extremely useful survey of the nature of aural exostoses in general, with a brief account of otosclerosis.

The aural exostoses in the external auditory meatus in pre-Columbian crania from Peru are often definite osteomae with a typical ivory-like luster, and extremely hard and dense. These never grow very large, and I do not know that a single osteoma ever closes the auditory canal, but the presence of three tumors close the canal completely, on one and on both sides. In addition to this the walls of the auditory canal itself often become swollen and sclerotic and close the canal, thus producing deafness.

The assignment of strain, brought on by the mastication of tough food, as a cause of the exostosial growths, and possibly the cause also of otosclerosis in general, requires an anthropological survey for confirmation. Infections played a part in deafness, for I have seen cases of pre-Columbian middle ear infections.

Aided by a grant of $300 from the Committee on Scientific Research, American Medical Association, a more exact investigation of the ancient conditions will be undertaken. Dr. L. C. Kinney, of San Diego, will do the roentgenological work on the pre-Columbian crania, and I have at my disposal scores of roentgenograms of unopened mummy-packs.

ROY L. MOODIE

SANTA MONICA, CALIFORNIA

PRODUCTION OF POTATO TUBER NECROSIS

IN the course of investigations, chiefly histological and cytological, carried on during 1926–27 at the University of Wisconsin, but under the auspices of the Vermont Experiment Station, experiments were conducted by the writer to throw more light on the real relationship existing between leafroll and net necrosis of the Irish potato. Through the use of cages to exclude undesirable insects, potato plants were grown in the field both from healthy and from leafroll tubers and aphids of the species, *Myzus Persicae,* were colonized on leafroll vines under cage and transferred at intervals to the foliage of healthy vines also under cage. Some four or five such transfers were made, each transfer involving the introduction of 25–50 aphids into each of five cages where they were allowed to migrate from the detached leafroll leaves to the foliage of the enclosed healthy plants. Two cages of healthy plants from the same lot of tubers were kept as checks. One cage contained leafroll plants on which aphids were colonized for increase and distribution.

When the harvested tubers from these cages were first examined on October 25, very interesting results were found. Necrosis, of the phloem necrosis type, was found in abundance, even at this early date, in all the treated cages. In one of the five cages practically 100 per cent. of the tubers showed the characteristic discolorations. The necrosis was in early stages of development, that is, not extending far from the stem end of the tubers and not showing as extreme necrotic discolorations as are found in tubers later on in the storage period. Microscopic study of stained sections

[1] Burton, Frank A., 1927, "Some Considerations on Prehistoric Aural, Nasal, Sinus Pathology and Surgery." Santa Fe, N. M., pp. 1–38, Figures 1–17.

South America : Peru

National Geographic Magazine Vol. XXIV, No. 4 Apr 1913

VOL. XXIV, No. 4 WASHINGTON APRIL, 1913

THE NATIONAL GEOGRAPHIC MAGAZINE

IN THE WONDERLAND OF PERU

The Work Accomplished by the Peruvian Expedition of 1912, under the Auspices of Yale University and the National Geographic Society

BY HIRAM BINGHAM, DIRECTOR OF THE EXPEDITION

Prof. Hiram Bingham's explorations in South America, 1906–1911, and particularly his discoveries in 1911, were so important that when he was seeking funds for another Peruvian expedition in 1912, the Research Committee of the National Geographic Society made him a grant of $10,000, Yale University contributing an equal amount. His preliminary report to the National Geographic Society and Yale University of the work done in 1912 is printed herewith, and forms one of the most remarkable stories of exploration in South America in the past 50 years. The members of the Society are extremely gratified at the splendid record which Dr. Bingham and all the members of the expedition have made, and as we study the 250 marvelous pictures which are printed with this report, we also are thrilled by the wonders and mystery of Machu Picchu. What an extraordinary people the builders of Machu Picchu must have been to have constructed, without steel implements, and using only stone hammers and wedges, the wonderful city of refuge on the mountain top.—EDITOR.

INTRODUCTORY

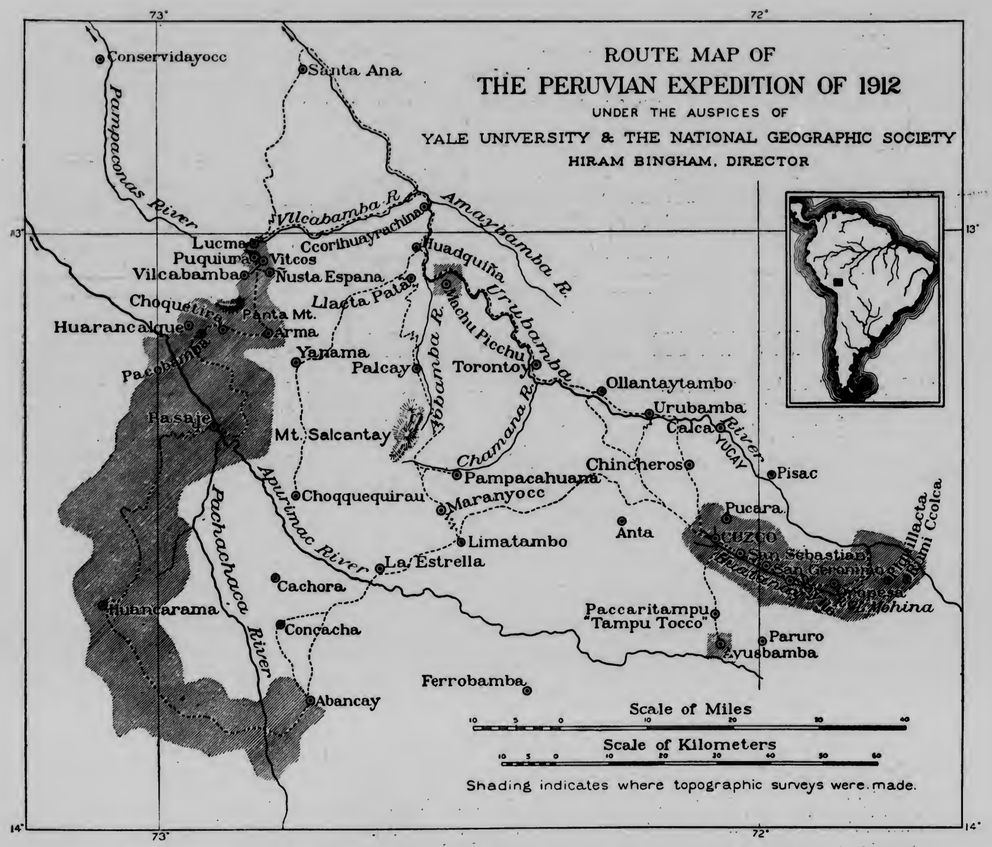
THE Peruvian Expedition of 1912, under the auspices of Yale University and the National Geographic Society, was organized with the specific purpose of carrying on the work begun by the Yale Peruvian Expedition of 1911. It was not intended to cover such a large area as had been done the year before, but to do intensive work in a part of the field where only reconnaissance work had been previously attempted.

The staff of the expedition consisted of the following: Prof. Hiram Bingham, director; Prof. Herbert E. Gregory, geologist; Dr. George F. Eaton, osteologist; Mr. Albert H. Bumstead, chief topographer; Mr. Ellwood C. Erdis, archeological engineer; Dr. Luther T. Nelson, surgeon; Messrs. Kenneth C. Heald and Robert Stephenson, assistant topographers, and Messrs. Paul Bestor, Osgood Hardy, and Joseph Little, assistants.

The director, osteologist, and the two assistant topographers left New York May 16, and were followed three weeks later by most of the others. The geologist was not able to leave until August; but as the plans for his work called for a study of a comparatively small region, the three months that he was able to spend in Peru were sufficient for his needs. Practically the entire party returned to New York in the latter part of December, after an absence of seven months.

With one exception, the members of the expedition enjoyed fairly good health during their stay in the field. An occasional acute gastritis or enteritis resulted from indiscretions in diet. Assistant Hardy and the soldier who accompanied the topographical party suffered a slight attack of malaria, but this was soon overcome by quinine.

In making a reconnaissance of the extremely inaccessible and primitive ruins



MAP OF REGION EXPLORED BY YALE-NATIONAL GEOGRAPHIC SOCIETY EXPEDITION

The dotted lines indicate the routes taken by various members of the expedition and show how thoroughly the country was covered during 1912. The shaded areas indicate the extent of the careful topographical surveys. The black spot on the little map of South America in the corner indicates the location and extent of the route map.

on the mountain of Huayna Picchu, Assistant Topographer Heald was so unfortunate as to lose his foothold on the verge of a precipice, and had a very narrow escape from death. This accident resulted in a rupture of the ligaments of his collar-bone, which later incapacitated him for some time and prevented his accomplishing the reconnaissance work in the Pampaconas Valley which had been planned.

Assistant Bestor had the misfortune to contract amœbic dysentery while on a journey in the interior. Very probably he was infected by drinking unboiled water from the Apurimac River at Pasaje. His condition failed to improve after seven weeks of treatment, and he was obliged to return to the United States. He was kindly received at Ancon Hospital, and was there put on the road to complete recovery.

We found an epidemic of smallpox and typhoid fever raging in the towns of Arma, Puquiura, and Lucma. These towns of 150 to 200 inhabitants had had a death toll of 40 and 50 people each.

There was very little opportunity for medical work among the native Indians, but the more educated Peruvians were extremely glad to come to the free clinics.

There are no physicians in most of the villages of the interior; consequently the owners of the large plantations have to rely entirely on their own efforts at

Photo by Hiram Bingham

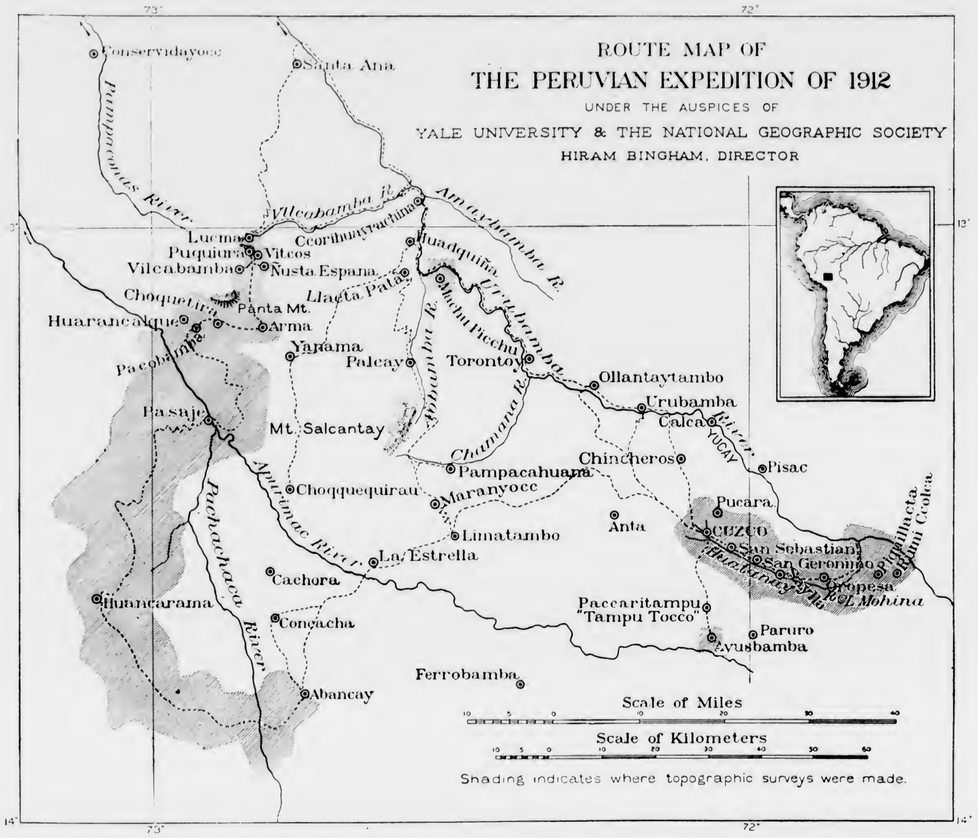
STRAW BOATS ON THE BEACH AT PACASMAYO, PERU

On their way to southern Peru the members of the expedition touched at various ports, including Pacasmayo, where the fishermen use a peculiar form of canoe. These canoes, or *balsas,* are made of rushes and have to be dried out each time they are used. The picture also shows a typical fisherman's hut made of split bamboo.

Photo by Hiram Bingham

A FISHERMAN AND HIS CATCH AT SALAVERRY, PERU

Another port at which the expedition touched was Salaverry. Here they met a fisherman and his *burro* bringing in two large skates, called *rayas,* which they were taking to sell in the Salaverry market.



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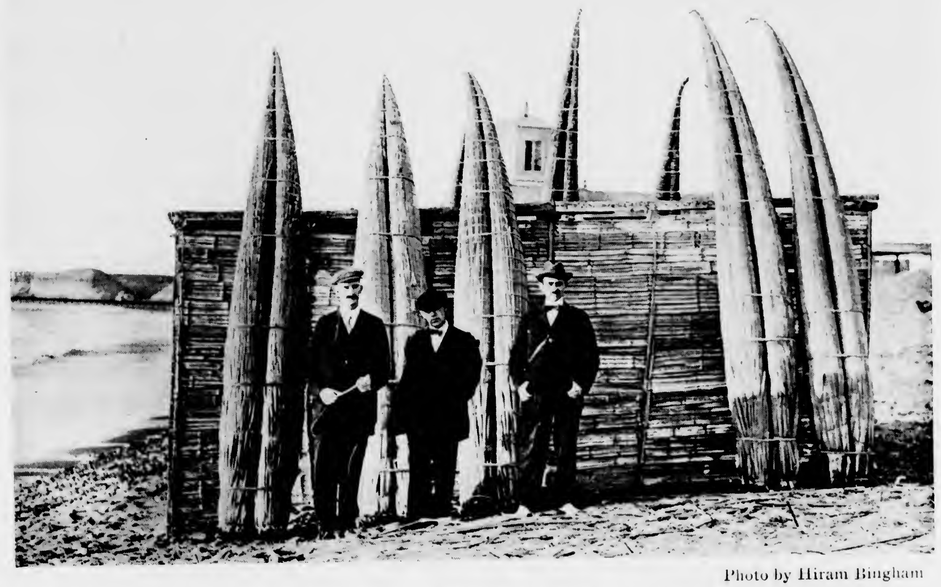

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IN FRONT OF THE CATHEDRAL: LIMA, PERU

The first part of the expedition arrived in Lima just in time to witness the annual procession of Corpus Christi. Starting from the cathedral, shown at the right, the procession, made up largely of little children in attractive costumes, passed around the four sides of the principal plaza and returned to the cathedral. This picture, taken before the procession started, shows the military band and escort, and the carpet of flowers and green leaves over which the procession was to pass.

Photo by Hiram Bingham

CORPUS CHRISTI PROCESSION: LIMA, PERU

On one of the corners of the plaza a temporary altar, elaborately decorated, had been erected, and here the Corpus Christi procession stopped while Benediction was given

curing diseases among the Indians in their employ. Very few Peruvians are properly vaccinated.

STRANGE MODE OF VACCINATION

The Indians believe that vaccination with pus from the lesions of a patient who has died with smallpox confers immunity from the disease. They practice this sort of vaccination, with the result that many who are thus inoculated die from the disease.

There is no attempt made to isolate the smallpox or typhoid patients. Neighbors mingle freely in the huts where the diseases exist, and at the funeral of the dead they have feasts in which every one partakes, many using common cups and dishes. The clothes of the dead are washed in the same stream from which the people in the villages get their drinking water. There are no windows in the highland huts, and there is no attempt at cleanliness in the dark interiors. Of course, fumigation is unknown and vermin abound.

On many of the large plantations conditions are better. There the owners of the estates vaccinate their Indian tenants and laborers. In some of the villages a priest will vaccinate a few during his annual or semi-annual visit, so that some do get the benefit of protection from smallpox. In the cities, on the other hand, while many are vaccinated, there are many who are not, so that even in Cuzco smallpox was raging during our stay; and, furthermore, practically no attempt was being made at isolation or any other measure to prevent the spread of the epidemic.

Notwithstanding many hardships and the presence of a considerable amount of illness in southern Peru, all the members of our party worked hard and faithfully, and the general results of the expedition were highly satisfactory.

Photo by Hiram Bingham

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After Benediction had been given on the corner of the plaza, the procession moved slowly toward the cathedral. The "conflict of old and new" is vividly emphasized in this picture, where the repair wagon of the trolley line is seen at the right only a few feet from this religious procession so redolent of the middle ages. The towers of the cathedral are made of plaster and lath. In this land of earthquakes it was not considered safe to build them of stone.

RESULTS ACHIEVED BY THE EXPEDITION

The work actually accomplished may be grouped under the following heads: (1) Machu Picchu; its archeology and osteology, and the topography and forestration of the surrounding region (see pages 402 to 517).

(2) The Cuzco region; its geology, osteology, and topography, with special reference to the age of its vertebrate remains (see pages 490 to 506).

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LLAMAS AT SANTA ROSA STATION, SOUTHERN PERU

In order to reach the field of operations and Cuzco, the base of supplies, the expedition went from the port of Mollendo by rail to Juliaca near Lake Titicaca and thence north to Cuzco. On the way, near the railroad stations, herds of llamas were frequently seen. Sometimes, as in this case, their packs had just been removed, and may be seen in the lower left-hand corner of the picture. The variegated markings of the different animals bear evidence to the centuries of domestication that this "American camel" has seen.

Photo by Hiram Bingham

ALPACAS AND LLAMAS

On the high upland pastures between Lake Titicaca and Cuzco thousands of alpacas and llamas find their natural feeding grounds. They have been domesticated for centuries, and do not exist in a wild state, but are always attended by shepherds. Alpaca wool is one of the choicest exports of Peru.

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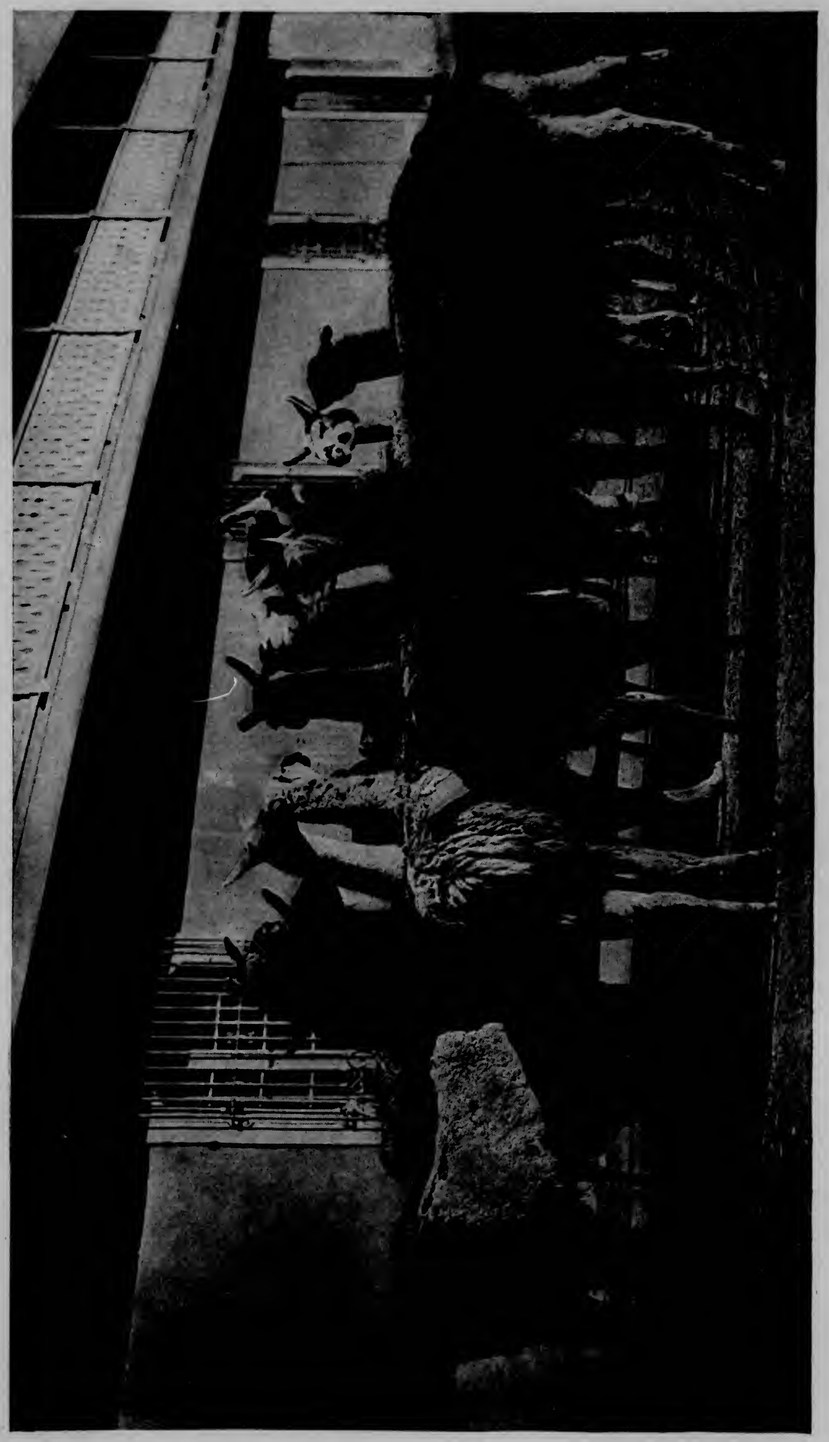

Photo by H. W. Foote

THIS PICTURE ILLUSTRATES HOW LLAMAS ARE TETHERED IN PERU

The llama has so little ordinary intelligence and so great a desire to maintain its proper social standing that a group of llamas may be secured, as is shown in the picture, by a single rope, passed around outside their stiffly erected necks. By merely lowering their heads they could all escape.

Photo by H. L. Tucker

A TYPICAL PERUVIAN PLAZA

The llamas are loaded with rock-salt. The open sewer in the center of the street is characteristic of many mountain towns

(3) A contour map from Abancay to Puquiura, completing the topography of the cross-section from Camaná, on the Pacific Ocean, to canoe navigation on the Urubamba, begun in 1911 (see map, page 388, and pages 506 to 510).

(4) The topography and archeology of Vitcos and vicinity (see pages 511 to 520).

(5) The identification of ancient Inca place names of Vilcabamba that occur in the Spanish chronicles, but do not appear on any known maps (see page 520).

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(7) A reconnaissance of the northern route to Choqquequirau and a brief osteological and archeological reconnaissance of that city (see pages 544 to 561).

(8) An anthropological study of the highland Indians of southern Peru, including the careful anthropometric measurement of 145 individuals (see pages 561 to 564).

(9) The taking of weather observations on the road and in the camps and the establishment at widely different elevations of four meterological stations along the 71st meridian west of Greenwich (see pages 564 and 565).

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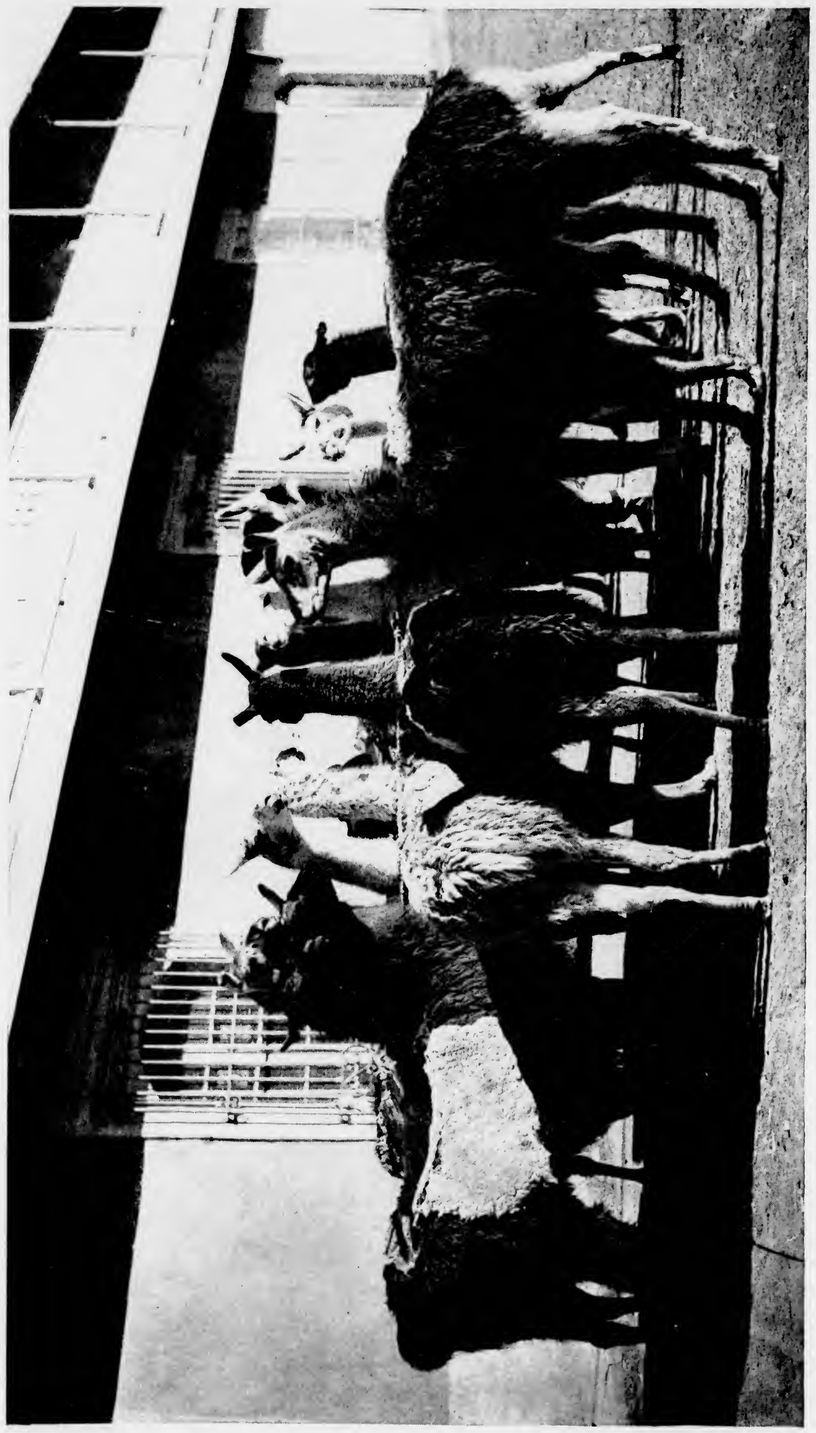

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A LLAMA CARAVAN UNDER FULL SPEED

On long journeys llamas must be driven carefully and very slowly and allowed to take frequent rests. They rarely average more than ten miles a day. No fodder is carried for them. Accordingly they have to nibble by the wayside.

Photo by L. T. Nelson

A GROUP OF INDIAN ALCALDES: SOUTHERN PERU

Near Checcacupe Station was a group of Indian Alcaldes bearing their staffs of office decorated with bands of silver. The Alcalde is the native Indian official who stands between the local government magistrate and the natives of his village, or of his section of a city. They do no manual labor, but frequently have anything but an easy time.

Photo by Hiram Bingham

BRINGING IN THE SHEAVES: CUZCO, PERU

Nearly all of the manual labor in southern Peru is done by native Indians who speak Quichua, the language of the Incas. Here they are seen harvesting a barley crop, taking the sheaves to the threshing floor, where cattle and horses are still used in treading out the corn.

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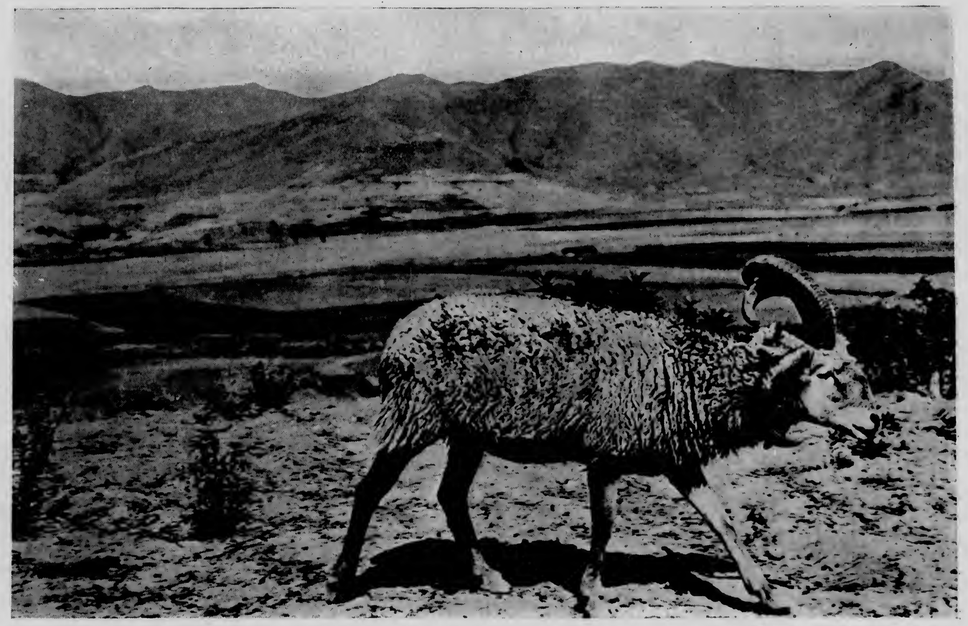
A LLAMA TRAIN ON THE RUN: CUZCO VALLEY

Llamas are still used to a considerable extent by the Peruvian Indians as beasts of burden, but they rarely go as fast as this llama train, which was being hurried to Cuzco at a most unusual speed. Llamas are seldom given more than eighty or ninety pounds to carry

Photo by L. T. Nelson

A SCENE AT SICUANI STATION, SOUTHERN PERU

At the railway stations between Lake Titicaca and Cuzco there were invariably groups of picturesquely clad Indians nearly always wearing a poncho, and sometimes felt hats, but more often the gaudily decorated reversible pancake-hat characteristic of this part of Peru.



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A FOUR-HORNED SHEEP: CUZCO, PERU

In the Cuzco Valley may be seen many flocks of sheep. Most of them are of poor quality and they do not compare favorably with the blooded stock in Argentina. A not uncommon sight in the Cuzco herds is an occasional four-horned ram.

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A TYPICAL MOUNTAINEER'S HUT: SOUTHERN PERU

It was sometimes necessary to camp very close to the Indians' huts, as there was so little available flat land in many of the valleys. In such cases a family group was almost sure to gather and satisfy their curiosity as to the ways of these visiting explorers.

Photo by Hiram Bingham

GROUP OF MOUNTAIN INDIANS: SOUTHERN PERU

The Mountain Indians were always interested in our work and usually were content to silently watch the passage of our caravans, or quietly speculate on the activities of the topographical engineer. Once, however, the chief topographer was attacked by a dozen excited Indians who thought that he and his assistant were working some devilment with their strange instruments. Fortunately by diplomatic means they were dissuaded from doing any harm. Note the bare feet of the women at this great altitude, which is over 14,000 feet.

Photo by Hiram Bingham

CARRYING ADOBE BLOCKS: SOUTHERN PERU

The modern method of building a house in Cuzco and in the uplands of Peru is to begin by making a sufficient number of adobe bricks (sundried mud mixed with straw or rubbish). They are made just about as large as can be conveniently carried by one workman. In this case they were intended for the local magistrate's new house near Choquetira.

Photo by L. T. Nelson

A TYPICAL PERUVIAN INDIAN WOMAN AT QUIQUIJANA, SOUTHERN PERU

Indian women in Peru are never idle. Even when walking along the roads they are almost always engaged in spinning with old-fashioned whirl-bobs and spindles such as their ancestors used over a thousand years ago.

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CROSSING THE APURIMAC RIVER

Among the many hardships encountered by the expedition was the difficulty of fording the rivers under adverse circumstances. In this case, at Pasaje on the Apurimac, there was no wood in the immediate vicinity available for rafts, and it was necessary to wait several hours before the local ferryman, who lived more than a mile away on the wrong side of the river, could be aroused by firing of shots to bring his ancient raft to our assistance.

Photo by Hiram Bingham

TROUBLES WITH THE TRANSPORT: SOUTHERN PERU

Even after we had the raft our troubles were not at an end, for our mules strenuously objected to jumping off the rocks into the deep and rapid current

I.

THE CITY OF MACHU PICCHU, THE CRADLE OF THE INCA EMPIRE

In 1911, while engaged in a search for Vitcos, the last Inca capital, I went down the Urubamba Valley asking for reports as to the whereabouts of ruins.

The first day out from Cuzco saw us in Urubamba, the capital of a province, a modern town charmingly located a few miles below Yucay, which was famous for being the most highly prized winter resort of the Cuzco Incas. The next day brought us to Ollantaytambo, vividly described by Squier in his interesting book on Peru. Its ancient fortress, perched on a rocky eminence that commands a magnificent view up and down the valley, is still one of the most attractive ancient monuments in America.

Continuing on down the valley over a newly constructed government trail, we found ourselves in a wonderful cañon. So lofty are the peaks on either side that although the trail was frequently shadowed by dense tropical jungle, many of the mountains were capped with snow, and some of them had glaciers. There is no valley in South America that has such varied beauties and so many charms.

Not only has it snow-capped peaks, great granite precipices, some of them 2,000 feet sheer, and a dense tropical jungle; it has also many reminders of the architectural achievements of a bygone race. The roaring rapids of the Urubamba are frequently narrowed by skillfully constructed ancient retaining walls. Wherever the encroaching precipices permitted it, the land between them and the river was terraced. With painstaking care the ancient inhabitants rescued every available strip of arable land from the river. On one sightly bend in the river, where there is a particularly good view, and near a foaming waterfall, some ancient chief built a temple whose walls, still standing, only serve to tantalize the traveler, for there is no bridge within two days' journey and the intervening rapids are impassable. On a precipitous and well-nigh impregnable cliff, walls made of stones carefully fitted together had been placed in the weak spots, so that the defenders of the valley, standing on the top of the cliff, might shower rocks on an attacking force without any danger of their enemies being able to scale the cliff (see pages 405 and 419).

The road, following in large part an ancient footpath, is sometimes cut out of the side of sheer precipices, and at others is obliged to run on frail brackets propped against the side of overhanging cliffs. It has been an expensive one to build and will be expensive to maintain. The lack of it prevented earlier explorers from penetrating this cañon. Its existence gave us the chance of discovering Machu Picchu (see pages 405, 420, 421, 423).

On the sixth day out from Cuzco we arrived at a little plantation called Mandorpampa. We camped a few rods away from the owner's grass-thatched hut, and it was not long before he came to visit us and to inquire our business. He turned out to be an Indian rather better than the average, but overfond of "fire-water." His occupation consisted in selling grass and pasturage to passing travelers and in occasionally providing them with ardent spirits. He said that on top of the magnificent precipices near by there were some ruins at a place called Machu Picchu, and that there were others still more inaccessible at Huayna Picchu, on a peak not far distant from our camp. He offered to show me the ruins, which he had once visited, if I would pay him well for his services. His idea of proper payment was 50 cents for his day's labor. This did not seem unreasonable, although it was two and one-half times his usual day's wage.

Leaving camp soon after breakfast I joined the guide, and, accompanied by a soldier that had been kindly loaned me by the Peruvian government, plunged through the jungle to the river bank, and came to a shaky little bridge made of four tree trunks bound together with vines and stretching across a stream only a few inches above the roaring rapids.

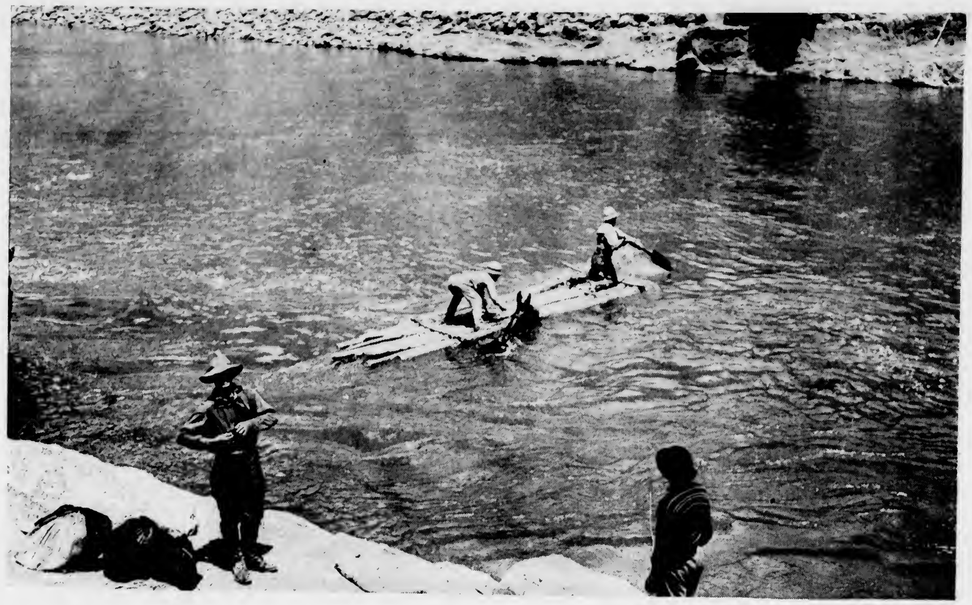

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Photo by Hiram Bingham

TROUBLES WITH THE TRANSPORT: SOUTHERN PERU

Even after we had the raft our troubles were not at an end, for our mules strenuously objected to jumping off the rocks into the deep and rapid current

I.

THE CITY OF MACHU PICCHU, THE CRADLE OF THE INCA EMPIRE

In 1911, while engaged in a search for Vitcos, the last Inca capital, I went down the Urubamba Valley asking for reports as to the whereabouts of ruins.

The first day out from Cuzco saw us in Urubamba, the capital of a province, a modern town charmingly located a few miles below Yucay, which was famous for being the most highly prized winter resort of the Cuzco Incas. The next day brought us to Ollantaytambo, vividly described by Squier in his interesting book on Peru. Its ancient fortress, perched on a rocky eminence that commands a magnificent view up and down the valley, is still one of the most attractive ancient monuments in America.

Continuing on down the valley over a newly constructed government trail, we found ourselves in a wonderful cañon. So lofty are the peaks on either side that although the trail was frequently shadowed by dense tropical jungle, many of the mountains were capped with snow, and some of them had glaciers. There is no valley in South America that has such varied beauties and so many charms.

Not only has it snow-capped peaks, great granite precipices, some of them 2,000 feet sheer, and a dense tropical jungle; it has also many reminders of the architectural achievements of a bygone race. The roaring rapids of the Urubamba are frequently narrowed by skillfully constructed ancient retaining walls. Wherever the encroaching precipices permitted it, the land between them and the river was terraced. With painstaking care the ancient inhabitants rescued every available strip of arable land from the river. On one sightly bend in the river, where there is a particularly good view, and near a foaming waterfall, some ancient chief built a temple whose walls, still standing, only serve to tantalize the traveler, for there is no bridge within two days' journey and the intervening rapids are impassable. On a precipitous and well-nigh impregnable cliff, walls made of stones carefully fitted together had been placed in the weak spots, so that the defenders of the valley, standing on the top of the cliff, might shower rocks on an attacking force without any danger of their enemies being able to scale the cliff (see pages 405 and 419).

The road, following in large part an ancient footpath, is sometimes cut out of the side of sheer precipices, and at others is obliged to run on frail brackets propped against the side of overhanging cliffs. It has been an expensive one to build and will be expensive to maintain. The lack of it prevented earlier explorers from penetrating this cañon. Its existence gave us the chance of discovering Machu Picchu (see pages 405, 420, 421, 423).

On the sixth day out from Cuzco we arrived at a little plantation called Mandorpampa. We camped a few rods away from the owner's grass-thatched hut, and it was not long before he came to visit us and to inquire our business. He turned out to be an Indian rather better than the average, but overfond of "fire-water." His occupation consisted in selling grass and pasturage to passing travelers and in occasionally providing them with ardent spirits. He said that on top of the magnificent precipices near by there were some ruins at a place called Machu Picchu, and that there were others still more inaccessible at Huayna Picchu, on a peak not far distant from our camp. He offered to show me the ruins, which he had once visited, if I would pay him well for his services. His idea of proper payment was 50 cents for his day's labor. This did not seem unreasonable, although it was two and one-half times his usual day's wage.

Leaving camp soon after breakfast I joined the guide, and, accompanied by a soldier that had been kindly loaned me by the Peruvian government, plunged through the jungle to the river bank, and came to a shaky little bridge made of four tree trunks bound together with vines and stretching across a stream only a few inches above the roaring rapids.

Photo by Hiram Bingham

BIRD'S-EYE VIEW OF MACHU PICCHU (DURING CLEARING) AND THE URUBAMBA CAÑON

On top of the ridge at the foot of the hill called Huayna Picchu and on three sides by the rapids of the Urubamba River, the wonderful Inca city of Machu Picchu, discovered in 1911, was one of the principal scenes of action of the Peruvian Expedition of 1912. The mountains in the distance forming the fringe of the Grand Cañon of the Urubamba are from five to seven thousand feet above the river, which at this point is six thousand feet above the sea.

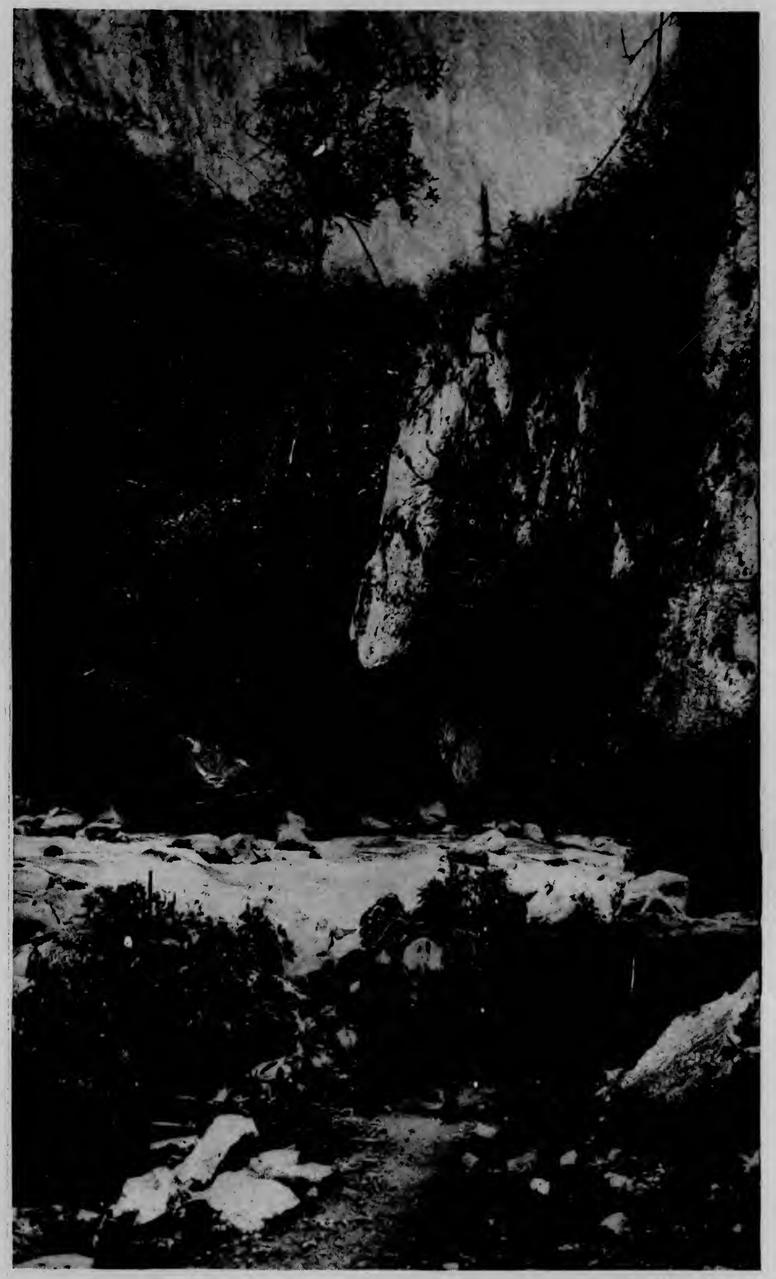
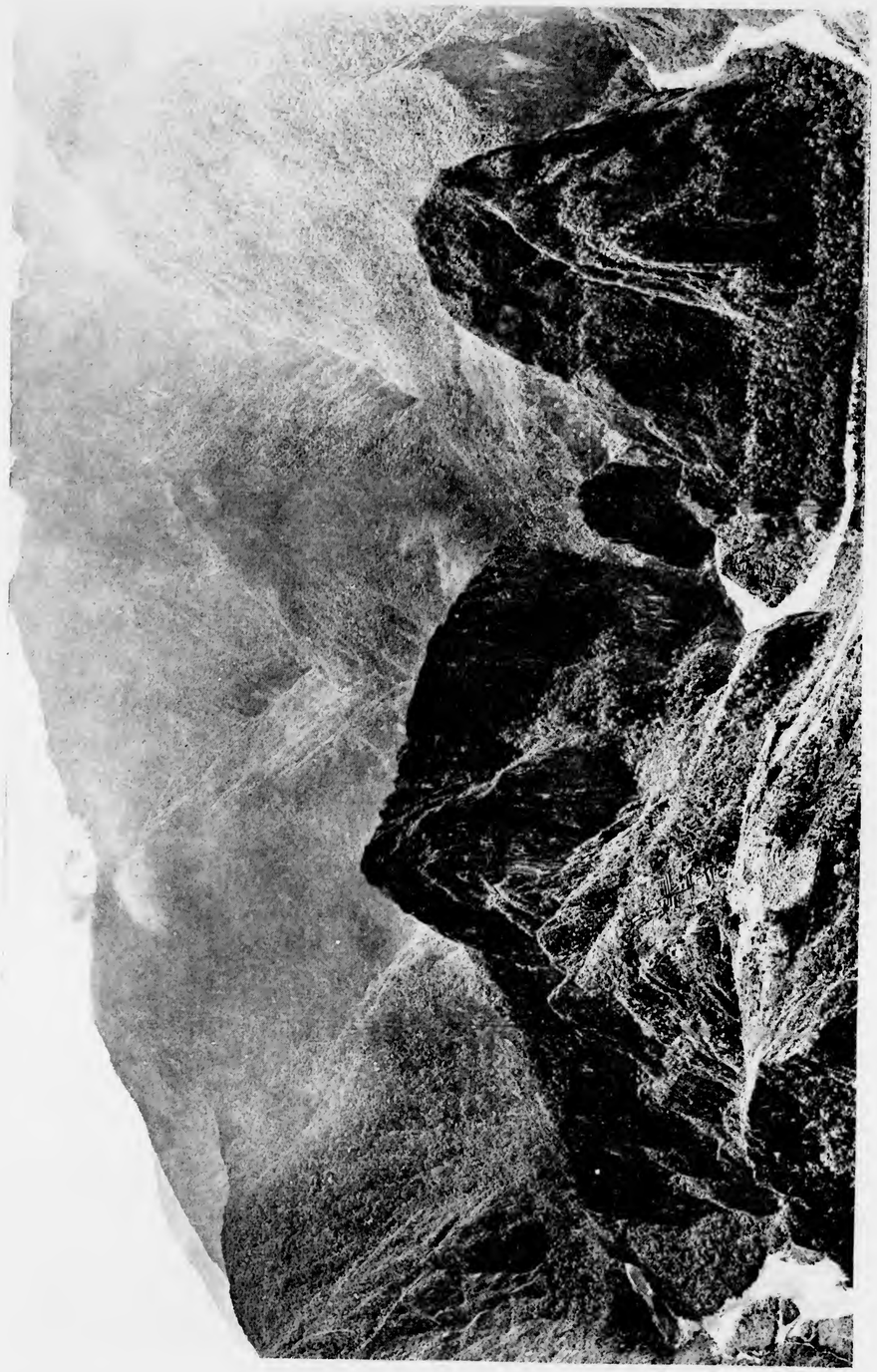


Photo by Hiram Bingham

A BIT OF THE ROAD NEAR MACHU PICCHU: URUBAMBA RIVER

The surroundings of Machu Picchu are remarkably wild and the scenery is inexpressibly beautiful. The city lies above the precipices which show in the distance in this picture. The road in the foreground was constructed a few years ago at great expense by the Peruvian government. Early explorers, being obliged to avoid this portion of the Urubamba Valley by the absence of any road, were unaware of the whereabouts of Machu Picchu, although rumors of its existence had reached the ears of a French explorer forty years ago.



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On top of the ridge at the foot of the hill called Huayna Picchu and protected on all sides by precipices and on three sides by the rapids of the Urubamba River, the wonderful Inca city of Machu Picchu, discovered in 1911, was one of the principal scenes of action of the Peruvian Expedition of 1912. The mountains in the distance forming the fringe of the Grand Cañon of the Urubamba are from five to seven thousand feet above the river which at this point is six thousand feet above the sea.

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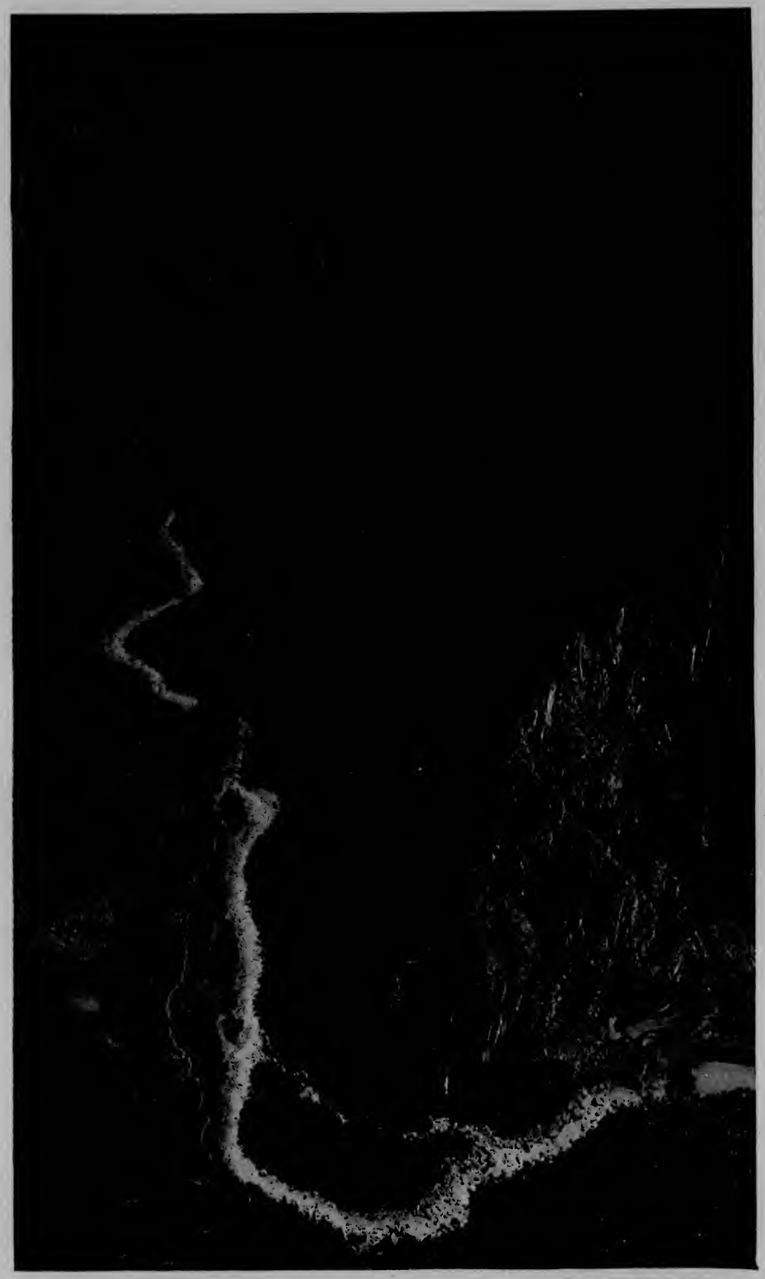
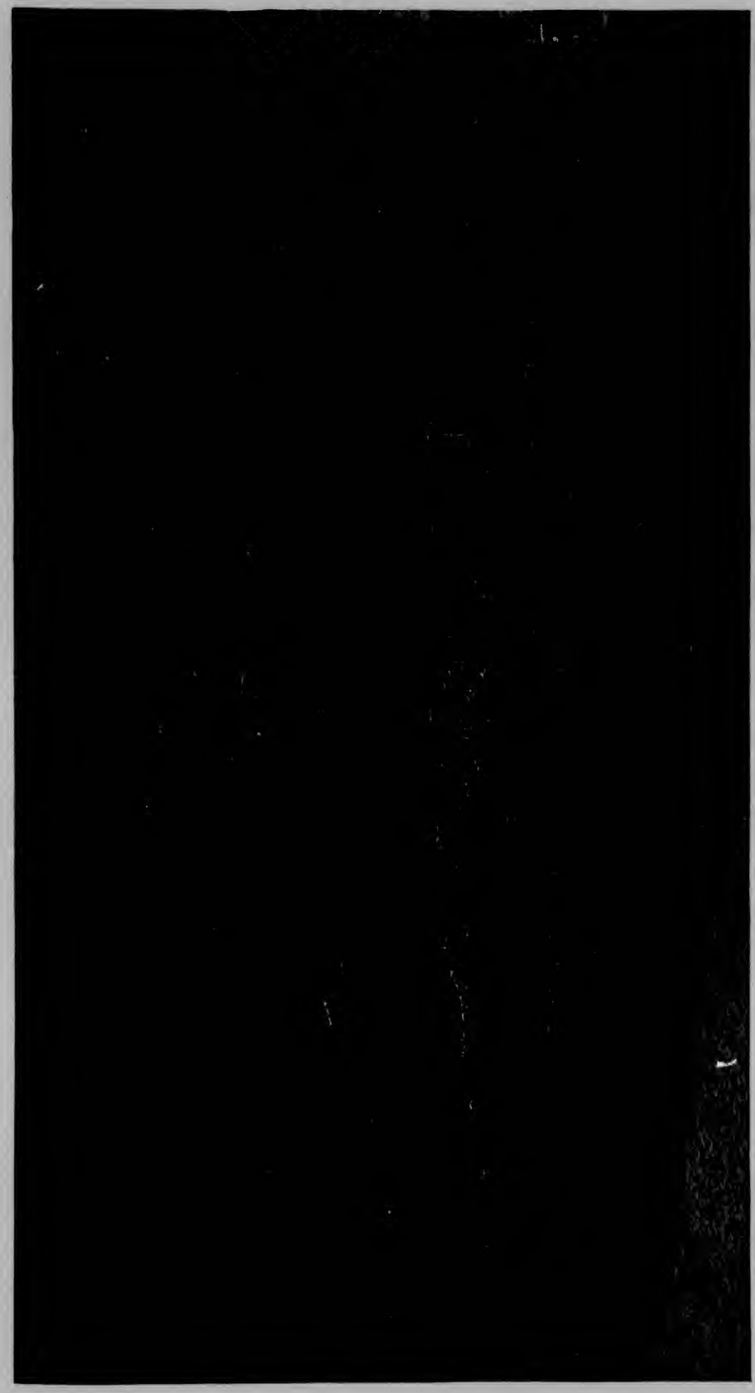


Photo by Hiram Bingham

THE URUBAMBA CAÑON

A part of the Urubamba Cañon as seen from the top of Machu Picchu Mountain, 4,000 feet above the river



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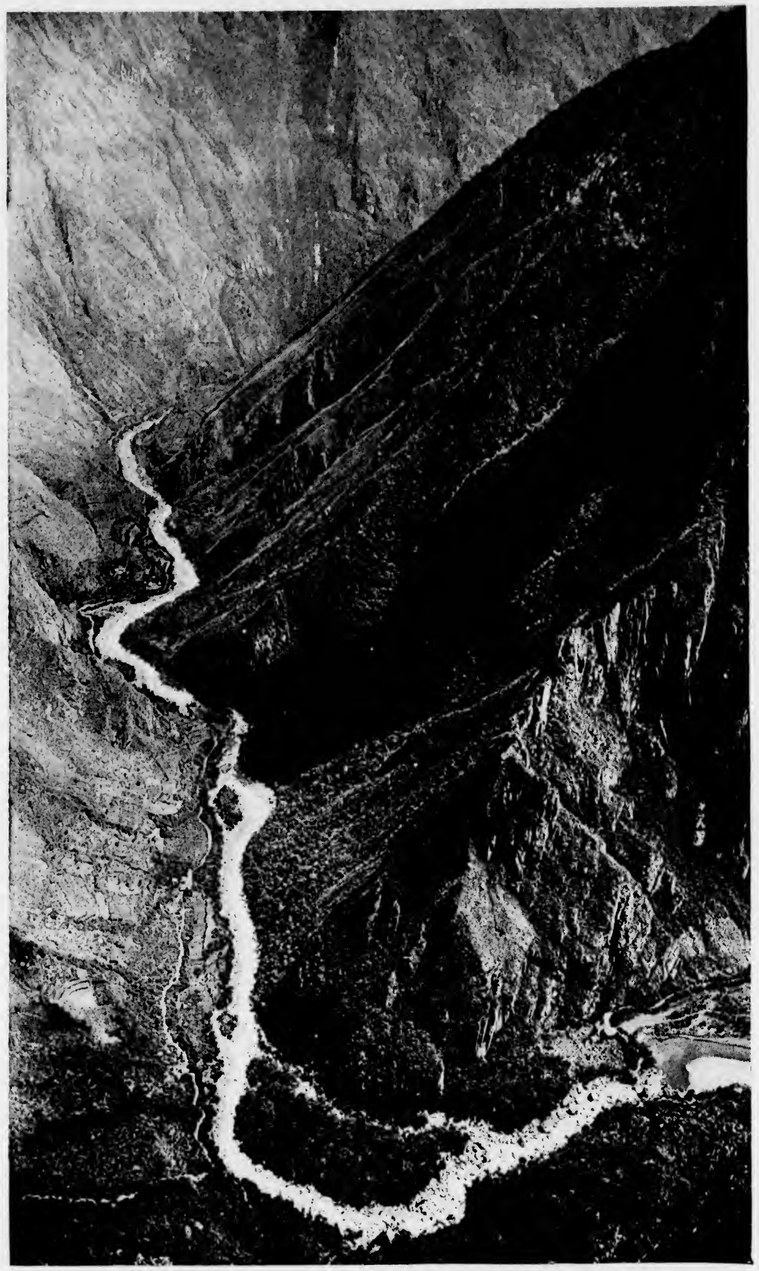
AN ANCIENT FORTRESS NEAR OLLANTAYTAMBO: URUBAMBA VALLEY

The Urubamba Valley contains many remains of Inca architecture. This ancient fortress is on the west side of the Urubamba River near Ollantaytambo, one of the most celebrated Inca towns in the Andes. It was first graphically described in English by the late E. G. Squier, in Chapter XXIV of his "Peru."



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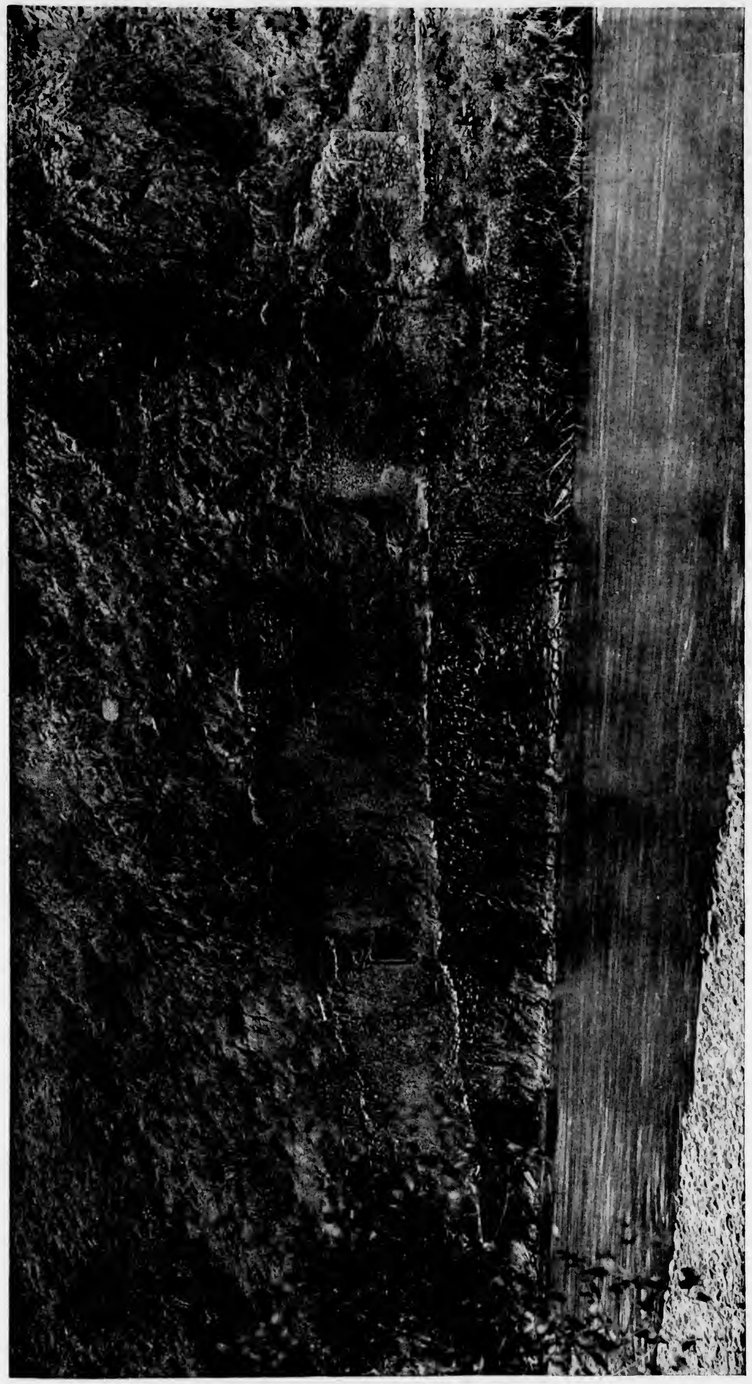

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THE TEMPLE OF THE THREE WINDOWS: MACHU PICCHU

It was this extraordinary temple, whose most characteristic feature is three large windows, a unique occurrence in early Peruvian architecture, that led us to the belief that Machu Picchu might be Tampu Tocco, the mythical place from which the Incas came when they started out to found that great empire which eventually embraced a large part of South America (see also pages 410, 414, 431, and 489).

On the other side we had a hard climb; first through the jungle and later up a very stiff, almost precipitous, slope. About noon we reached a little grass hut, where a good-natured Indian family who had been living here for three or four years gave us welcome and set before us gourds full of cool, delicious water and a few cold boiled sweet potatoes.

Apart from another hut in the vicinity and a few stone-faced terraces, there seemed to be little in the way of ruins, and I began to think that my time had been wasted. However, the view was magnificent, the water was delicious, and the shade of the hut most agreeable. So we rested a while and then went on to the top of the ridge. On all sides of us rose the magnificent peaks of the Urubamba Cañon, while 2,000 feet below us the rushing waters of the noisy river, making a great turn, defended three sides of the ridge, on top of which we were hunting for ruins. On the west side of the ridge the three Indian families who had chosen this eagle's nest for their home had built a little path, part of which consisted of crude ladders of vines and tree trunks tied to the face of the precipice.

Presently we found ourselves in the midst of a tropical forest, beneath the shade of whose trees we could make out a maze of ancient walls, the ruins of buildings made of blocks of granite, some of which were beautifully fitted together in the most refined style of Inca architecture. A few rods farther along we came to a little open space, on which were two splendid temples or palaces. The superior character of the stone work, the presence of these splendid edifices, and of what appeared to be an unusually large number of finely constructed stone dwellings, led me to believe that Machu Picchu might prove to be the largest and most important ruin discovered in South America since the days of the Spanish conquest.

A few weeks later I asked Mr. H. L. Tucker, the engineer of the 1911 Expedition, and Mr. Paul Baxter Lanius, the assistant, to go to Machu Picchu and spend three weeks there in an effort to

partially clear the ruins and make such a map as was possible in the time at their disposal. The result of this work confirmed me in my belief that here lay a unique opportunity for extensive clearing and excavating.

The fact that one of the most important buildings was marked by three large windows, a rare feature in Peruvian architecture, and that many of the other buildings had windows, added to the significant circumstance that the city was located in the most inaccessible part of the Andes, inclined me to feel that there was a chance that Machu Picchu might prove to be Tampu Tocco, that mythical place from which the Incas had come when they started out to found Cuzco and to make the beginnings of that great empire which was to embrace a large part of South America.

AN ANCIENT INCA TRADITION

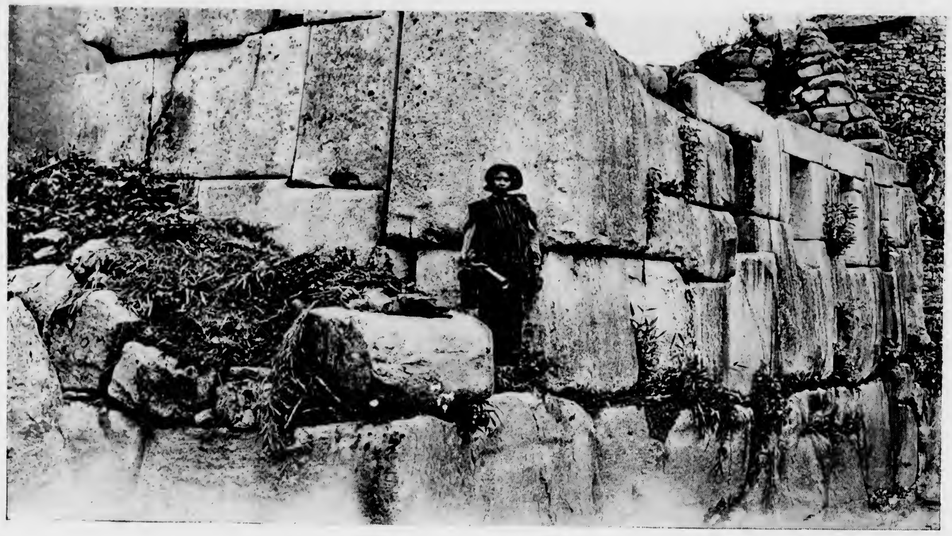
A story told to some of the early Spanish chroniclers in regard to that distant historical event runs somewhat as follows:

Thousands of years ago there lived in the highlands of Peru a megalithic folk who developed a remarkable civili-

Photo by Hiram Bingham

THE SACRED PLAZA: MACHU PICCHU

The presence at Machu Picchu of these splendid temples and palaces, the superior character of the stone work, and the unusually large number of finely constructed stone dwellings, inclines us to believe that Machu Picchu is the largest and most important ruin discovered in South America since the days of the Spanish conquest. This picture shows the Sacred Plaza, the Temple of the Three Windows (behind the man), and, at the left, the Chief Temple, the most imposing structure in the city (see pages 431 and 498).



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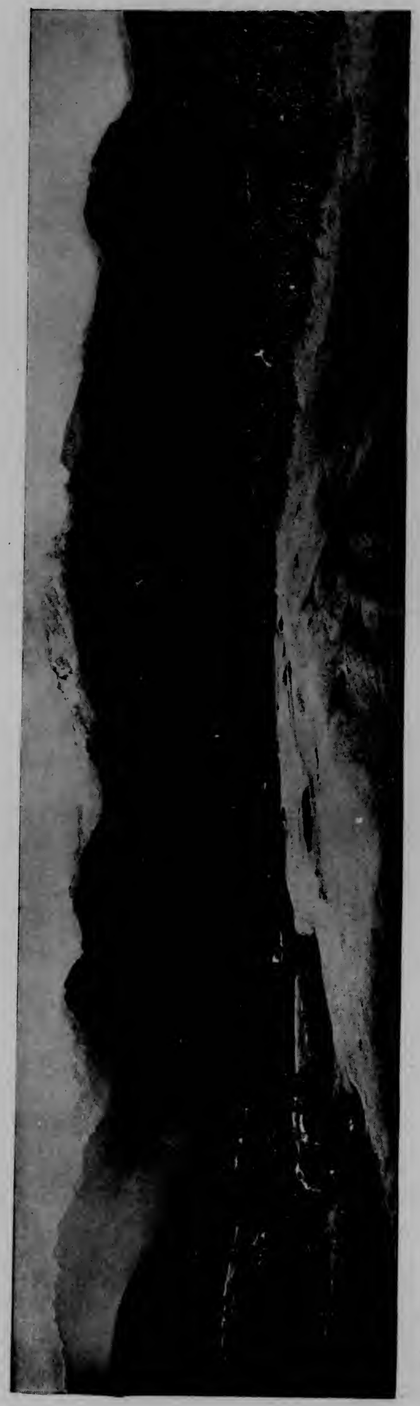

Photo by Hiram Bingham

THE URUBAMBA VALLEY AND THE ROAD TO CUZCO

This part of the Urubamba Valley is sometimes called Yucay. The climate is most delightful, and the scenery as fine as anything in South America

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The migration was slow and deliberate. They eventually reached Cuzco, and there established the Inca kingdom, which through several centuries spread by conquest over the entire plateau, and even as far south as Chile and as far north as Ecuador.

This Inca empire had reached its height when the Spaniards came. The Spaniards were told that Tampu Tocco was at a place called Pacaritampu, a small village a day's journey southwest of Cuzco and in the Apurimac Valley. The chroniclers duly noted this location, and it has been taken for granted ever since that Tampu Tocco was at Pacaritampu.

THE SIGNIFICANCE OF "WINDOWS"

Tampu means "tavern," or "a place of temporary abode." Tocco means "window." The legend is distinctly connected with a place of windows, preferably of three windows, from which the three brothers, the heads of three tribes or clans, started out on the campaign that founded the Inca empire.

So far as I could discover, few travelers have ever taken the trou-

* See Markham's "Incas of Peru," Chapter IV.

Photo by Hiram Bingham

YUCAY, THE LOVELIEST SPOT IN SOUTHERN PERU

The beautiful valley of Yucay was that portion of the Urubamba Valley most favored by the Incas of Cuzco for their country houses. This view is unsurpassed for beauty or grandeur by any in Peru, and by few in the world. There is every gradation of color and depth of shadow from the dense blue of the tropical sky past the glittering crests of the glacier-clad Andes down to the exquisite green terraces of the famous gardens of Yucay. Although the bottom of the valley is 9,000 feet above the sea, it enjoys a climate not unlike that of the south of France. The Incas, ever appreciative of beautiful views, built some of their country houses on the most sightly points of this wonderful valley.

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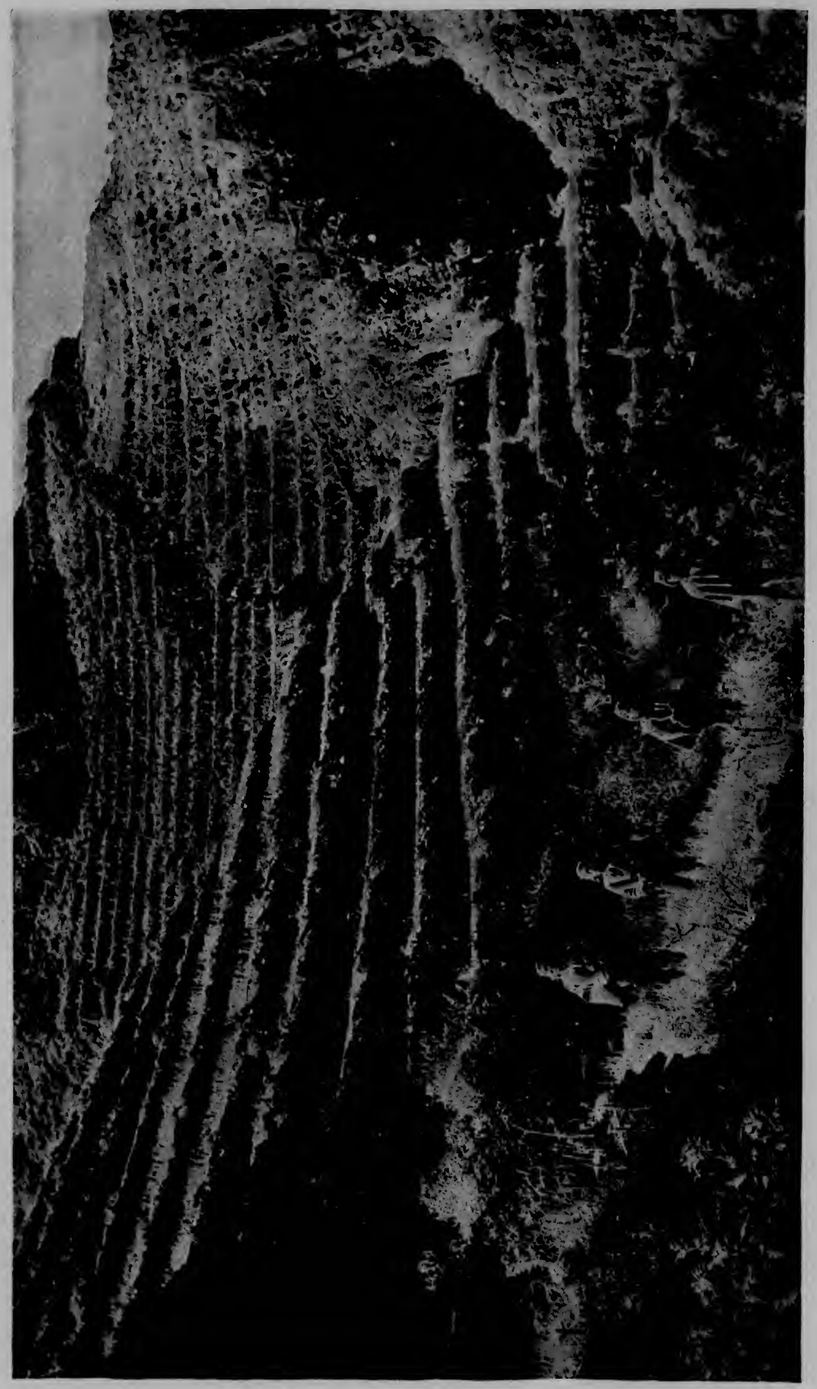

Photo by H. L. Tucker

THE ANCIENT TERRACES AT PISAC

At the upper end of the Yucay Valley are the ruins of a wonderful Inca temple, or citadel, called Pisac. One of the best descriptions of this well known and important place is in Squier's "Peru," Chapter XXV

Photo by H. L. Tucker

THE RUINS OF PISAC

A nearer view of part of these remarkable ruins, which resemble in the care and exquisite finish of the stone-cutting the best ruins at Machu Picchu and in Cuzco

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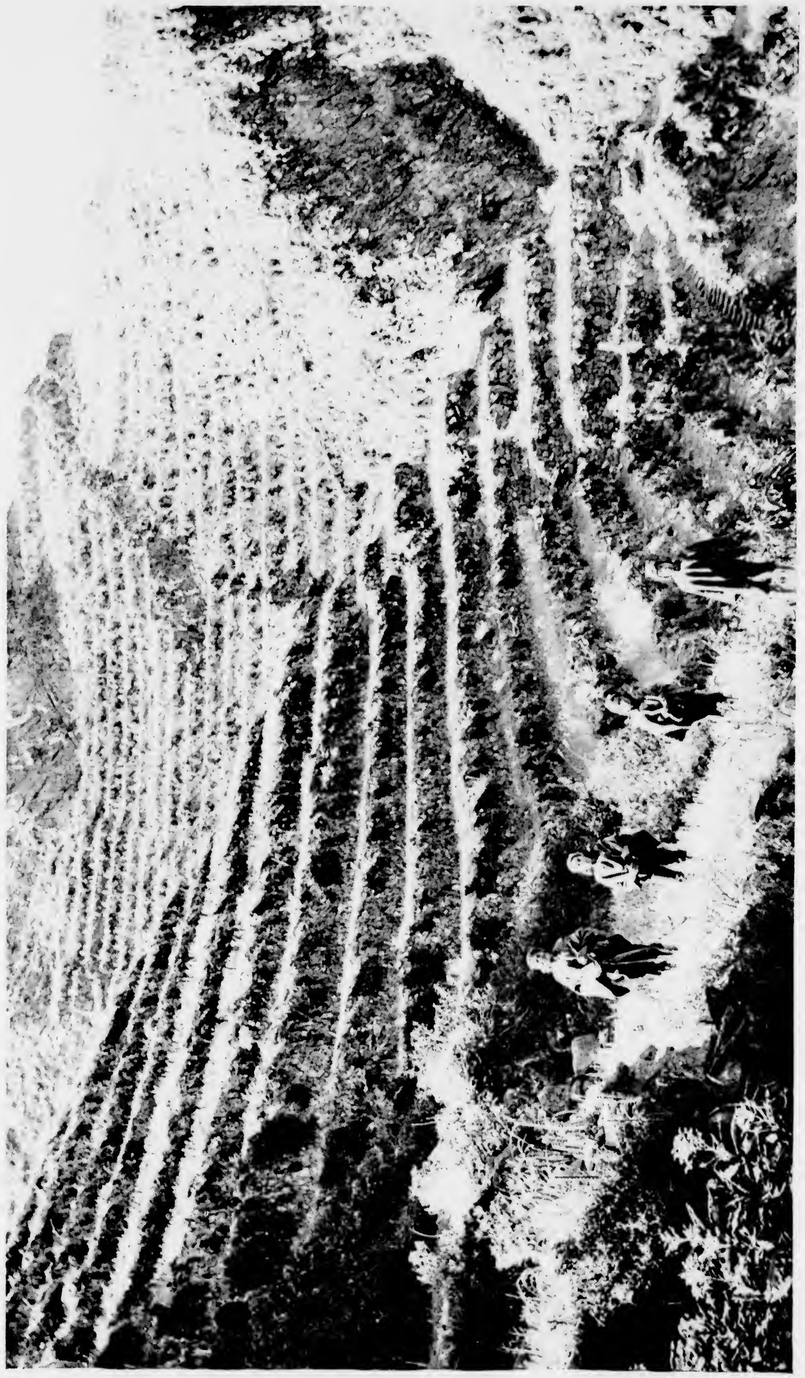
LLAMAS IN THE YUCAY VALLEY

The llamas are carrying bundles of fire-wood. The total cargo of each llama is worth about 20 cents. The llama is valued at about $3.00. Back of the trees on either side of the road are fruit orchards interspersed with acres of strawberry fields. This valley is the garden spot of southern Peru. The climate is like that of California.



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A BIT OF OLLANTAYTAMBO, SOUTHERN PERU

On top of the crag, which overlooks the little village of Ollantaytambo, the Incas and their predecessors built a remarkable fortress. Some of the single stones used in the construction of this fortress weigh over eight tons.

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It was part of our plan to settle this question, and Dr. Eaton undertook the reconnaissance of Pacaritampu. He reports the presence of a small ruin, evidently a kind of rest-house or tavern, pleasantly located in the Apurimac Valley, but not naturally defended by nature and not distinguished by windows. In fact, there are neither windows nor caves in the vicinity, and the general topography does not lend itself to a rational connection with the tradition regarding Tampu Tocco (see page 415).

The presence at Machu Picchu of three large windows in one of the most conspicuous and best-built structures led me to wonder whether it might not be possible that the Incas had purposely deceived the Spaniards in placing Tampu Tocco southwest of Cuzco when it was actually north of Cuzco, at Machu Picchu.

The Incas knew that Machu Picchu, in the most inaccessible part of the Andes, was so safely hidden in tropical jungles on top of gigantic precipices that the Spaniards would not be able to find it unless they were guided to the spot. It was naturally to their advantage to conceal the secret of the actual location of Tampu Tocco, a place which their traditions must have led them to venerate. The topography of the region meets the necessities of the tradition: The presence of windows in the houses might readily give the name Tampu Tocco, or "place of temporary residence where there are windows," to this place, and the three conspicuous windows in the principal temple fits in well with the tradition of the three brothers coming out of three windows.

Photo by G. F. Eaton

THE RUINS OF MAUCALLACTA, NEAR PACARITAMPU

A small ruin pleasantly located in the Apurimac Valley. This is the principal ruin of the little group which the Incas made the Spaniards believe was the home of their ancestors. The surrounding country is not naturally defended and the ruins are not distinguished by windows. In other words, this ruin does not fit in with the traditions as described in the text (see pages 409, 410, and 414).

Photo by G. F. Eaton

ANOTHER VIEW OF MAUCALLACTA

The interior of the principal building at Pacaritampu. Notice the holes cut in the doorposts, to which a bar intended to close the door might be fastened

Photo by Hiram Bingham

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Photo by G. F. Eaton

ANOTHER VIEW OF MAUCALLACTA

The interior of the principal building at Pacaritampu. Notice the holes cut in the door-posts, to which a bar intended to close the door might be fastened

Retake of Preceding Frame

Photo by Hiram Bingham

WONDERFUL MASONRY AT MACHU PICCHU

Two of the windows in the remarkable three-windowed temple at Machu Picchu, which furnishes part of the convincing evidence that Machu Picchu and not Pacaritampu was the home of the ancestors of the Incas (see pages 409, 410, and 414).

The interest in this historical problem, connected with the fact that at Machu Picchu we had a wonderfully picturesque and remarkably large well-preserved city, untouched by Spanish hands, led us to feel that the entire place needed to be cleared of its jungle and carefully studied architecturally and topographically.

DIFFICULTIES OF THE APPROACH TO MACHU PICCHU

We decided to make a thorough hunt for places of burial and to collect as much osteological and ethnological material as could be found. Our task was not an easy one.

The engineers of the 1911 expedition—H. L. Tucker and P. B. Lanius—who had spent three weeks here making a preliminary map, had been unable to use the trail by which I had first visited Machu Picchu, and reported that the trail which they used was so bad as to make it impossible to carry heavy loads over it.

We knew that mule transportation was absolutely impracticable under these conditions, and that it was simply a question of making a foot-path over which Indian bearers could carry reasonably good-sized packs.

The first problem was the construction of a bridge over the Urubamba River to reach the foot of the easier of the two possible trails.

The little foot-bridge of four logs that I had used when visiting Machu Picchu for the first time, in July, 1911, was so badly treated by the early floods of the rainy season that when Mr. Tucker went to Machu Picchu at my request, two months later, to make the reconnaissance map, he found only one log left, and was obliged to use a difficult and more dangerous trail on the other side of the ridge.

Knowing that probably even this log had gone with the later floods, it was with some apprehension that I started Assistant Topographer Heald out from Cuzco early in July, 1912, with instructions to construct a bridge across the Urubamba River opposite Machu Picchu, and make a good trail from the river to the ruins—a trail sufficiently good for Indian bearers to use in carrying our 60-pound food-boxes up to the camp and, later, our 90-pound boxes of potsherds

Photo by Hiram Bingham

PART OF THE SACRED PLAZA: MACHU PICCHU

One of the gable ends of the three-windowed temple. Notice the tremendous size of the granite blocks in the lower part of the wall. The small ventilating window, of which there is one in each end of the building, is not visible when the structure is looked at from below, and does not affect the striking character of the three large windows in the east wall of this building (see pages 408, 431, and 489).

and specimens down to the mule trail near the river.

SOME RAPID BRIDGE BUILDING

At the most feasible point for building a foot-bridge the Urubamba is some 80 feet wide. The roaring rapids are divided into four streams by large boulders in the river at this point. The first reach is 8 feet long, the next nearly 40 feet, the next about 22 feet, and the final one 15 feet.

For material in the construction of the bridge Mr. Heald had hardwood timber growing on the bank of the stream; for tools he had axes, machetes, and picks—all made in Hartford—and a coil of manila rope. For workmen he had 10 unwilling Indians, who had been forced to accompany him by the governor of the nearest town. For "guide, counsellor, and friend" he had an excellent Peruvian soldier, who could be counted on to see to it that the Indians kept faithfully at their task. In describing his work, Mr. Heald says:

"The first step was the felling of the timber for the first two reaches. That was quickly done and the short 8-foot space put in place. Then came the task of getting a stringer to the rock forming the next pier. My first scheme was to lay a log in the water, parallel to the bank and upstream from the bridge, and, fastening the lower end, to let the current swing the upper end around until it lodged on the central boulder. On trying this the timber proved to be so heavy that it sank and was lost.

"We next tried building out over the water as far as we could. Two heavy logs were put in place, with their butts on the shore and their outer ends projecting some 10 feet beyond the first span. The shore ends were weighted with rocks and cross-pieces were lashed on with lianas (sinewy vines), making the bridge about 4½ feet wide, as far as it went. Then a forked upright 10 feet high was lashed and wedged into place at the end of the first pier (see Fig. 1, page 422).

THE CROSSING ACHIEVED

"A long, light stringer was now pushed out on the completed part and the end

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Retake of Preceding Frame

Photo by Hiram Bingham

THE TEMPLE OF THE THREE WINDOWS: MACHU PICCHU

An exterior view of part of the Temple of the Three Windows, showing the location of a former window which was filled up at some time in the past when it was considered suitable to reduce the number of windows in this remarkable structure from five to three. Tradition says that the Incas' ancestors came out of three caves, or windows. (See Markham's "Incas of Peru," Chapter IV.)

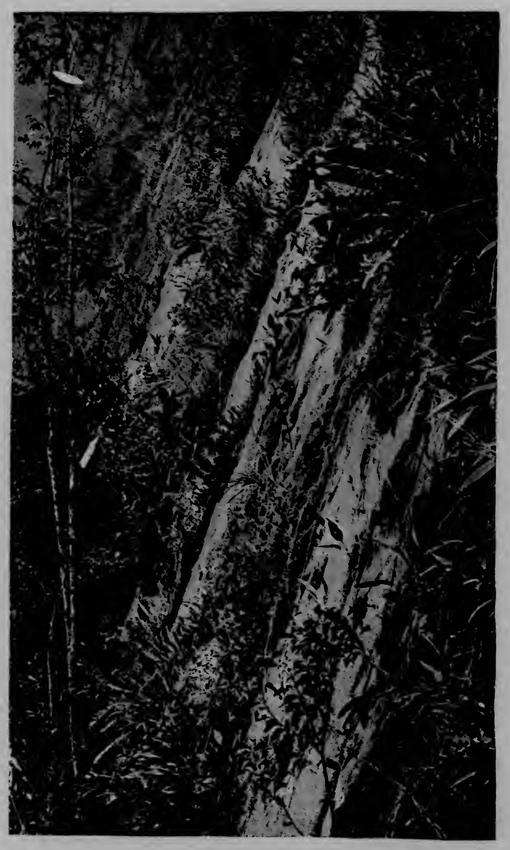


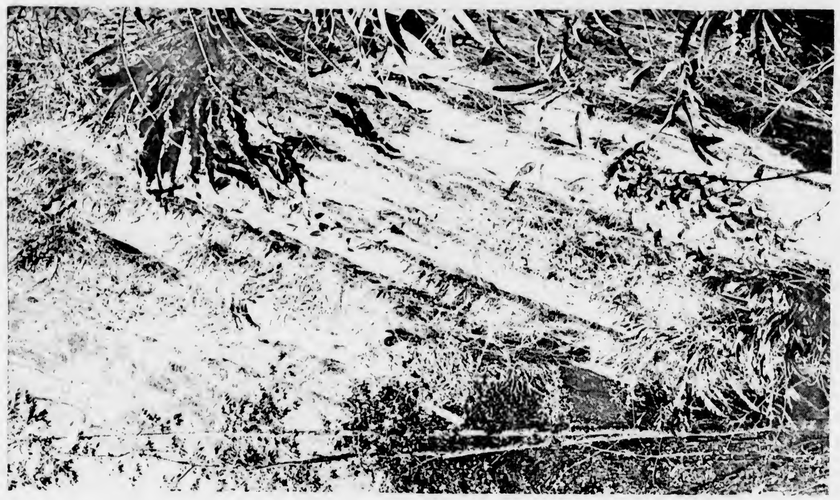
Photo by Hiram Bingham

THE WEST SIDE OF HUAYNA PICCHU: URUBAMBA CAÑON

One of the great precipices surrounding Machu Picchu and tending to make it an impregnable city of refuge. Notice also the extraordinary vigor of the vegetation which can find a footing on the face of a sheer granite precipice under favorable climatic conditions.

Photo by Hiram Bingham

A PICTURESQUE PART OF THE GRAND CAÑON OF THE URUBAMBA ON THE ROAD TO MACHU PICCHU, SOUTHERN PERU (SEE PAGE 403)



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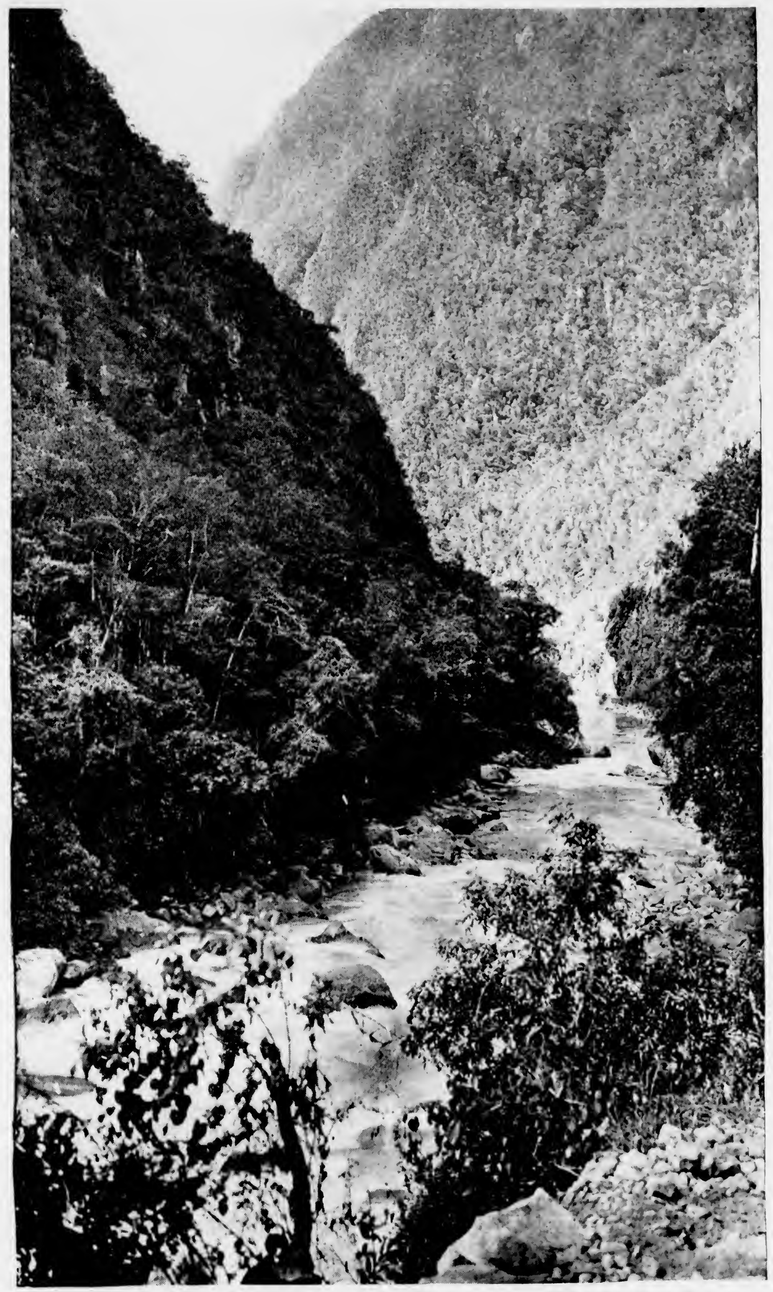

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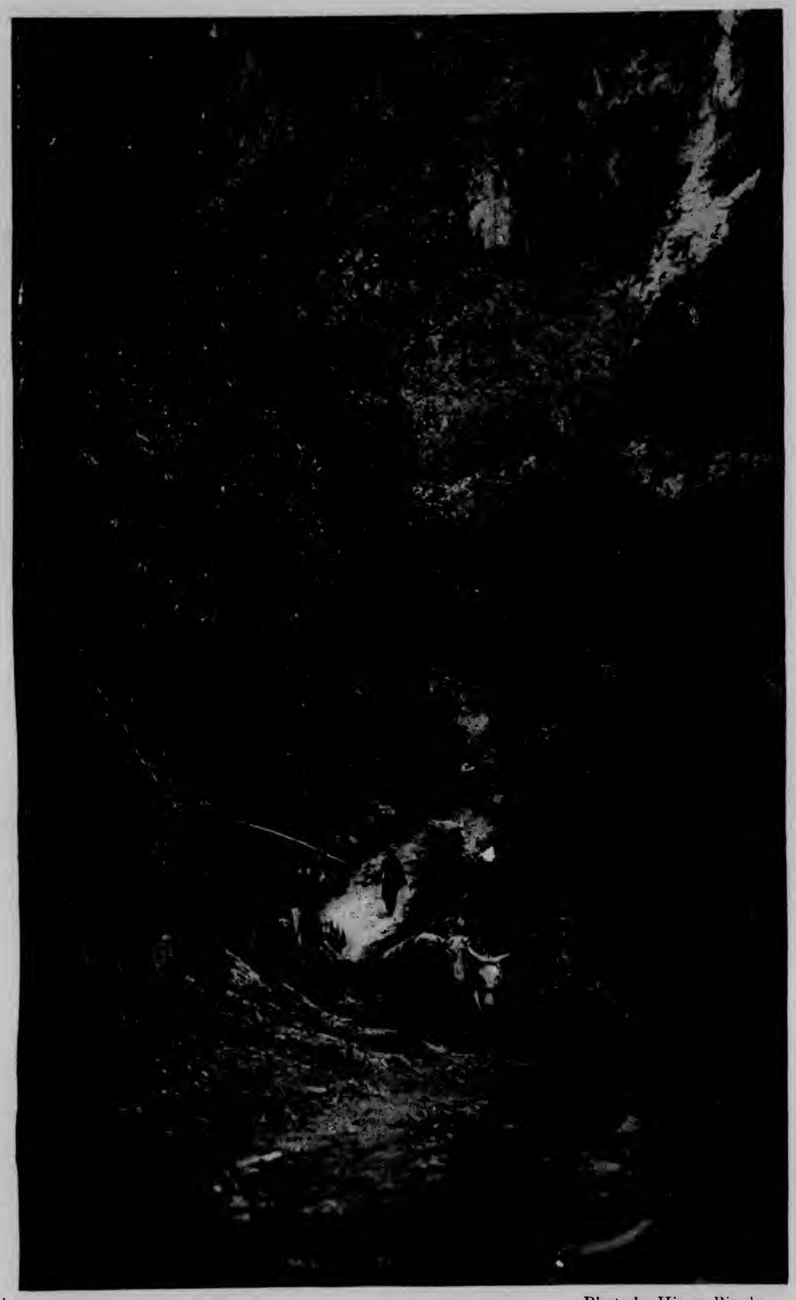

Photo by Hiram Bingha...

A GOOD MULE ROAD IN SOUTHERN PERU

A view of the road in the bottom of the cañon near Machu Picchu (see page 403)

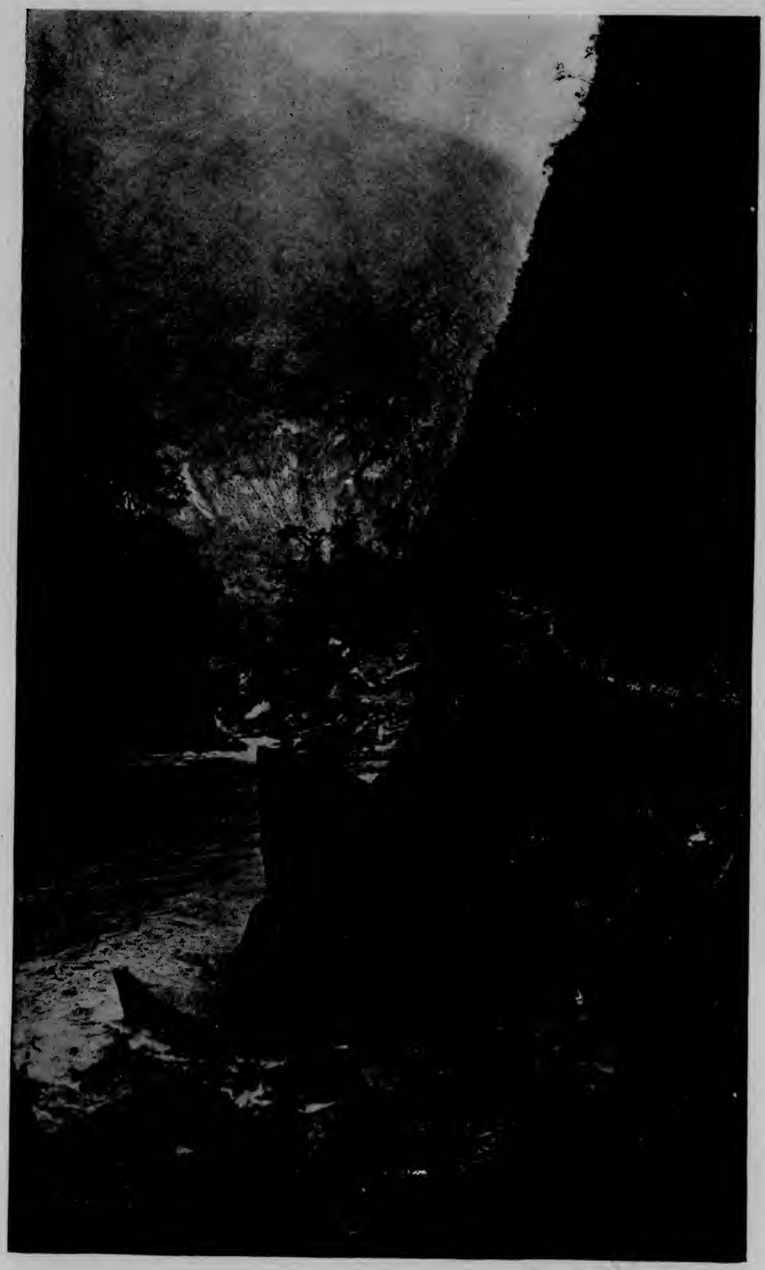

Photo by Hiram Bingham

THE ROAD IN THE URUBAMBA CAÑON NEAR MACHU PICCHU

If it had not been for this new government road cut at great expense in the face of the precipices of the Urubamba Cañon, it would not have been possible for us to have reached the vicinity of Machu Picchu with our mules and supplies. This ancient city is in the heart of a region most wonderfully defended by nature; the most inaccessible part of the Andes (see page 403)

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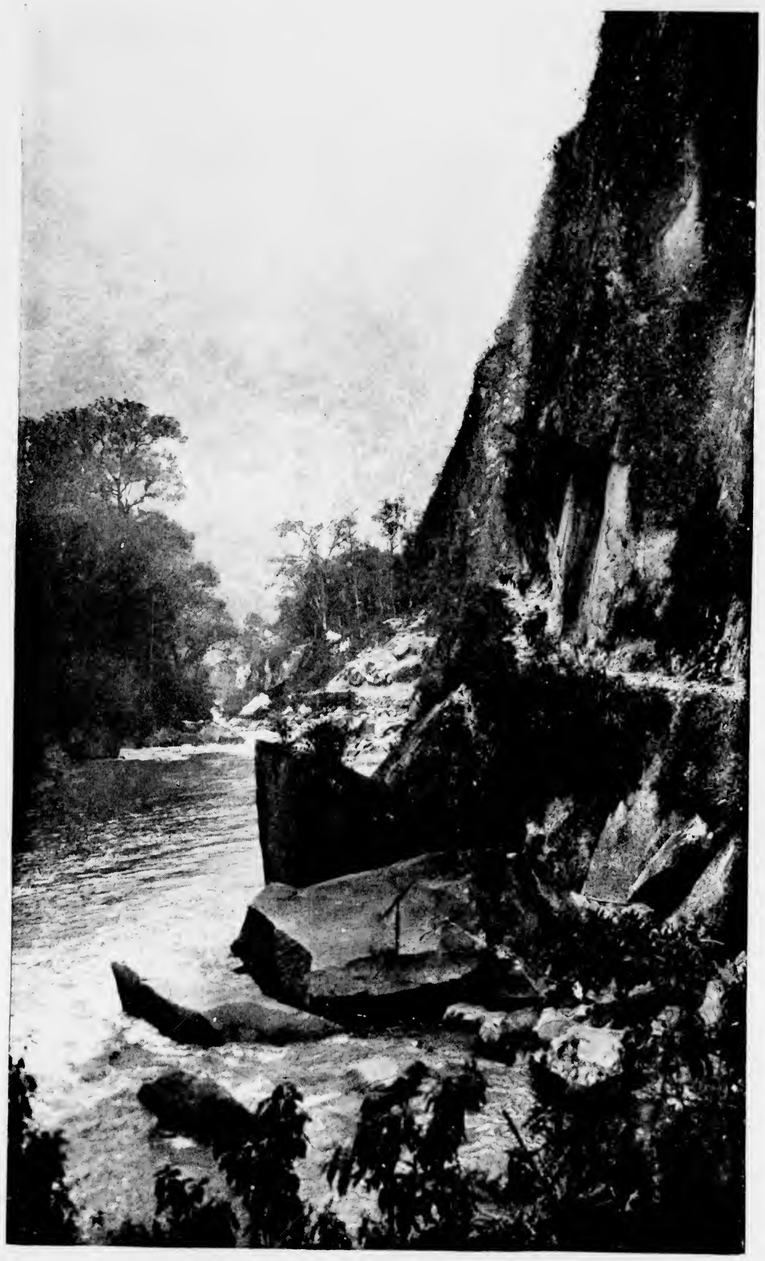

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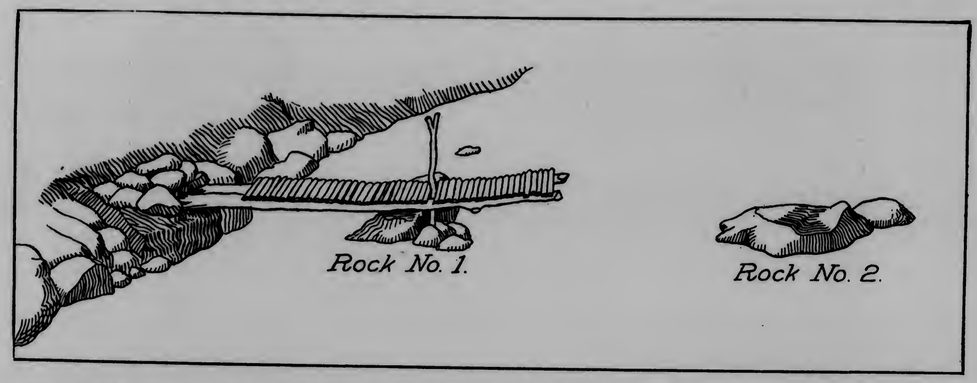


FIGURE 1. THE FIRST STAGE IN MAKING THE BRIDGE BY WHICH WE CROSSED THE URUBAMBA RIVER TO REACH THE FOOT OF THE PRECIPICE NEAR MACHU PICCHU

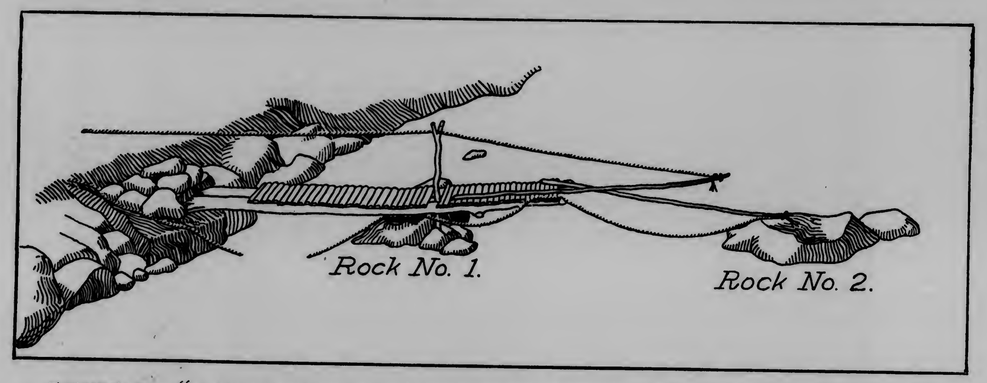


FIGURE 2. "A LONG STRINGER WAS NOW PUSHED OUT ON THE COMPLETED PART AND THE END THRUST OUT OVER THE WATER"

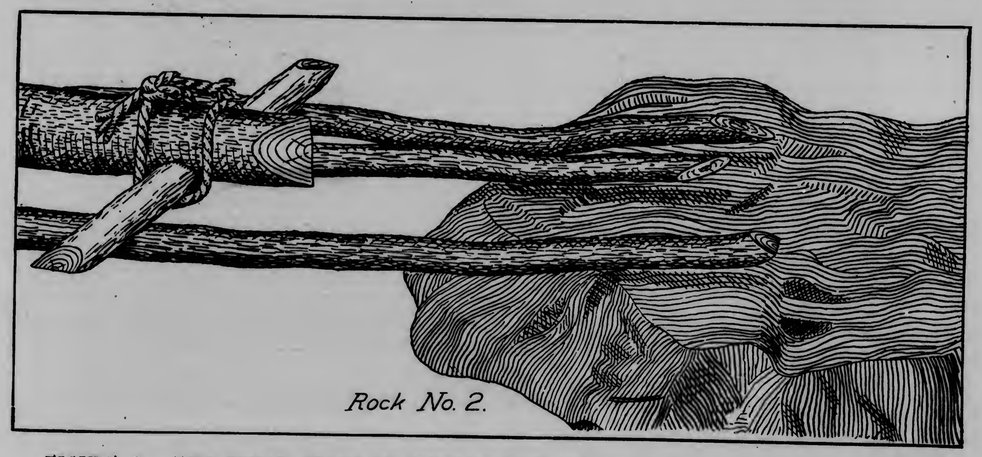


FIGURE 3. THE FINAL STAGE IN GETTING THE HEAVY TIMBER ACROSS THE RAPIDS
(SEE PAGES 417 AND 423)

Photo by Hiram Bingham

HEALD'S BRIDGE: MACHU PICCHU

The completed bridge over the rapids of the Urubamba, showing the forked upright still in place. The great difficulty in building this bridge lay in the fact that the timber was of such density that it would not float.

thrust out over the water toward rock No. 2, the end being held up by a rope fastened around it and passing through the fork of the upright (see Fig. 2, page 422).

"This method proved successful, the timber's end being laid on the rock which formed our second pier. Two more light timbers were put across this way, and then a heavy one was tried, part of its weight being borne by the pieces already across by means of a yoke locked in the end (see Fig. 3). This and another piece were successfully passed over, and after that there was little trouble, crosspieces being used to form the next and shorter span. . . .

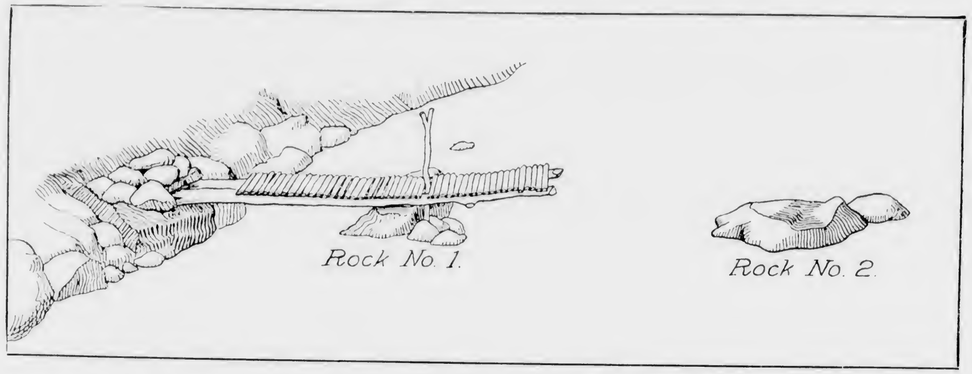
"On the second day of work we finished the bridge about noon and started making a trail up the hill under the guidance of a half-breed who lived in the vicinity. After the first quarter mile the going was very slow. Not only did the steepness of the slope and the tangled condition of the cane jungle retard us, but the men were very much afraid of snakes, a fear which proved itself justified, for one of them was very nearly bitten by a little gray snake about 12 inches long.

"The second day's work on the

Photo by Hiram Bingham

THE EXPEDITION EN ROUTE TO MACHU PICCHU: URUBAMBA CAÑON

A newly repaired part of the government road and a portion of our caravan en route to Machu Picchu.



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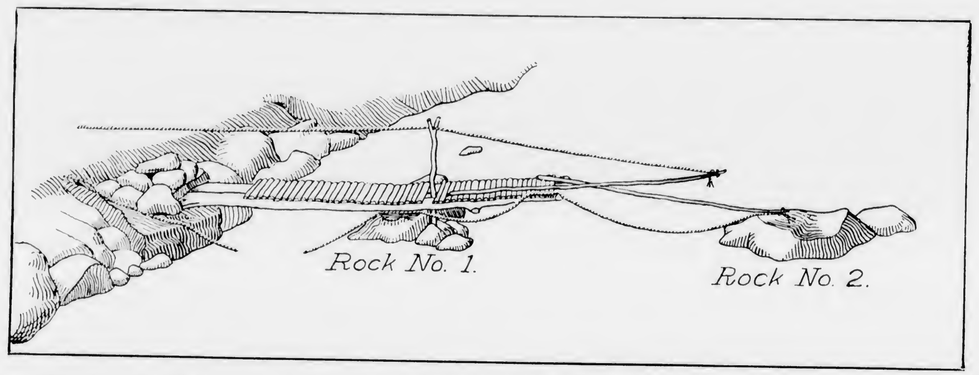

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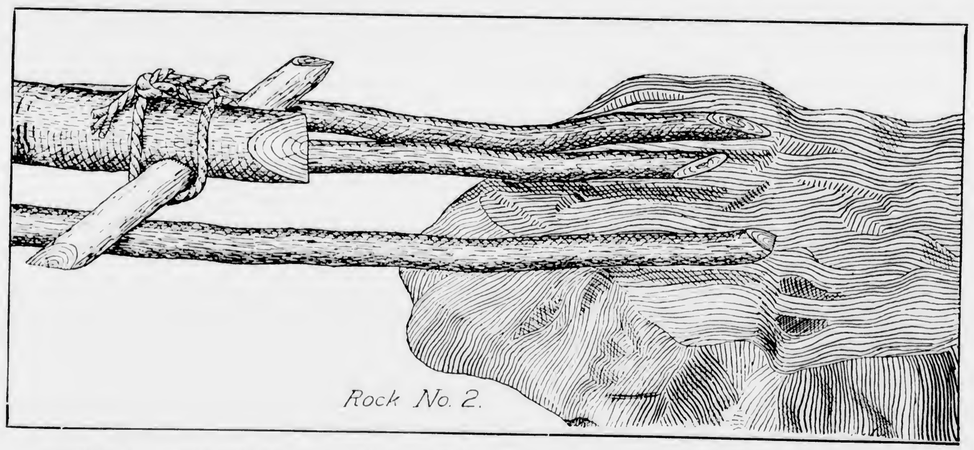

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THE EXPEDITION EN ROUTE TO MACHU PICCHU: URUBAMBA CAÑON

A newly repaired part of the government road and a portion of our caravan en route to Machu Picchu.

Retake of Preceding Frame

Photo by Hiram Bingham

MACHU PICCHU AND THE WONDERFUL URUBAMBA CAÑON

A general view of the east side of Machu Picchu before the clearing of 1912. One of the most serious difficulties in clearing the ruins was the disposal of the great hardwood trees without destroying the walls of the houses. Huayna Picchu, the ascent of which nearly cost the life of Assistant Topographer Heald, is the peak on the extreme left (see pages 427, 431, and 438). Compare with pictures, pages 508 and 511.

trail took us to the city. The path was still far from being finished, though. There were many places which were almost vertical, in which we had to cut steps. Up these places we now made zigzags, so that there was comparatively little difficulty in climbing.

"On the first day I had set fire to the cane in order to clear the trail. This fire did not clear much, however. On the second day I was about a quarter of a mile behind the workmen, or rather above them, when suddenly Tomás (the Peruvian soldier mentioned above), who was with me, said: 'Look, they have fired the cane.' Sure enough, they had started it, and in a minute it had gained headway and was roaring up toward us, the flames reaching 15 or 20 feet into the air.

ESCAPE FROM FIRE IN THE JUNGLE

"There was nothing for us but to run, and we did that, tearing through the jungle down hill in an effort to get around the side of the fire. Suddenly, on one of my jumps, I didn't stop when I expected to, but kept right on through the air. The brush had masked a nice little 8-foot jump-off, and I got beautifully bumped. In a minute there came a thump, and Tomás landed beside me. It amused me so much to watch him that I forgot all about my own jolted bones. There was nothing broken, however, and we made our way without much more trouble around the fire and fell upon the peons, who were gathered in a bunch, speculating as to where we might be."

MAP OF MACHU PICCHU AND VICINITY

This relief map of Machu Picchu and vicinity gives a good general idea of the relative position of Heald's bridge, the ruins, and the two peaks—Machu Picchu and Huayna Picchu. It also shows the location of the two trails up from the Urubamba River and enables one to form some conception of the extent of the ruins. The map is misleading in that the precipices are flattened out as they would be if one were looking down upon them from a balloon.

Three days later I reached Machu Picchu in company with Dr. Eaton, our osteologist, and Mr. Erdis, who, as archeological engineer, was to have charge of the general work of clearing and excavating the ruins.

Mr. Heald was at once relieved from further duty at Machu Picchu, where he had just begun the work of clearing, and was asked to see whether he could get to the top of the neighboring peak, called "Huayna Picchu," and investigate the story that there were magnificent ruins upon its summit. The same Indian who had originally told me about the ruins at Machu Picchu had repeatedly declared

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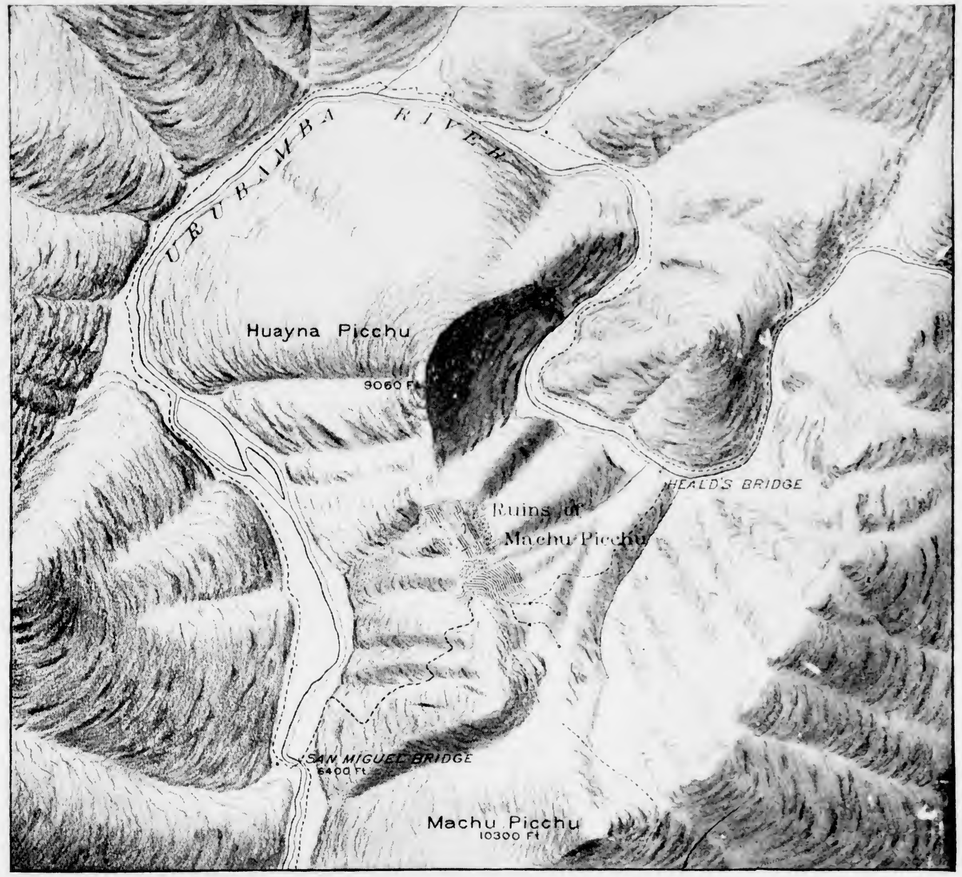

Surveyed by Robert Stephenson
Drawn by Albert H. Bumstead

0 1000 FEET 2000 3000 4000 1 MILE

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Retake of Preceding Frame

Photo by Hiram Bingham

THE BEST TYPE OF INDIAN WORKMAN: SOUTHERN PERU

Portrait of Enrique Porres, one of the most intelligent workmen that we had to assist in excavating Machu Picchu. In his cheek may be observed a swelling, showing the presence of a quid of coca, the leaves of the plant from which cocaine is extracted. Nearly all the Mountain Indians chew the coca leaf. A quid is carefully made up at the beginning of the day's work, during the middle of the morning, at the commencement of the afternoon's work, and in the middle of the afternoon.

Photo by Hiram Bingham

A CHEERFUL WORKMAN FROM CUZCO

Portrait of Alegria, "Mr. Happiness," one of our workmen, who came with us from Cuzco and staid for nearly two months. Most of the workmen were content with what wages they could earn in two weeks, and kept us continually busy trying to replace them.

Photo by Hiram Bingham

EXCAVATING AT MACHU PICCHU

Commencing the work of excavating in the Chief Temple at Machu Picchu. Lieutenant Sotomayor, at the right, in charge of the gang of Indians

that those on Huayna Picchu were only slightly inferior. Mr. Heald's report of his work on Huayna Picchu runs in part as follows:

"Huayna Picchu, lying to the north of Machu Picchu, and connected with it by a narrow neck, rises some 2,500 feet above the Urubamba River, which runs around its base. On one side, the south, this elevation is reached by what is practically one complete precipice. On the other, while there are sheer ascents, there are also slopes, and, according to the account of one Arteaga, who claims to have explored the forests which cover a good deal of it, was once cultivated, the slopes being converted into level fields by low earth terraces (see page 424).

ATTEMPT AT SCALING HUAYNA PICCHU

"This mountain is, like Machu Picchu, cut from medium-grained gray to red granite, which accounts in part for its sharp, craggy outlines. The lower slopes, where there are any, are covered with forest growths of large trees. A peculiar thing in this connection is one solitary palm tree, which rises above the other vegetation. Near the top the large trees give place to cane and mesquite, while many slopes have nothing but grass. This last is due more to steepness and lack of soil than to any peculiarity of elevation or location, however. . . .

"My first trip to reach the summit of Huayna Picchu and to ascertain what ruins, if any, were on it, ended in failure. The only man who had been up (Arteaga), who lives at Mandor Pampa, was drunk, and refused to go with me; so I decided to try to find a way without his help. I knew where his bridge crossed the Urubamba River and where he had started up when he went the year before. With these two things to help me, I thought that I could very likely find as

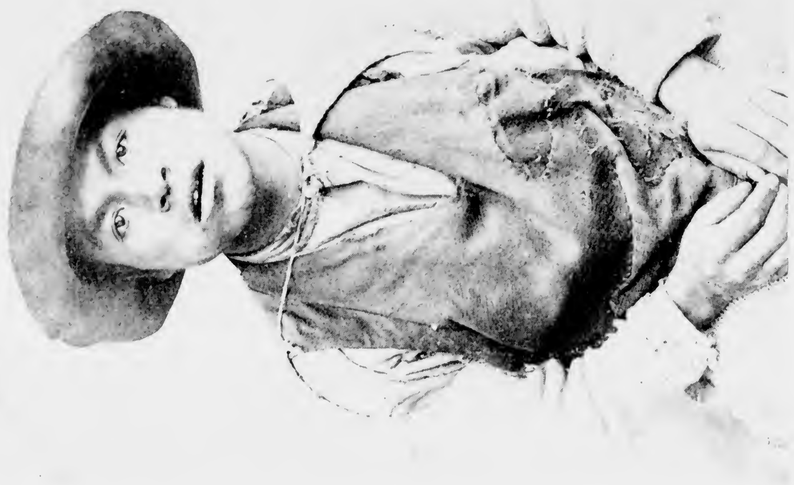

Photo by Hiram Bingham

THE BEST TYPE OF INDIAN WORKMAN: SOUTHERN PERU

Portrait of Enrique Parres, one of the most intelligent workmen that we had to assist in excavating Machu Picchu. In his cheek may be observed a swelling, showing the presence of a quid of coca, the leaves of the plant from which cocaine is extracted. Nearly all the Mountain Indians chew the coca leaf. A quid is carefully made up at the beginning of the day's work, during the middle of the morning, at the commencement of the afternoon's work, and in the middle of the afternoon.

Photo by Hiram Bingham

A CHEERFUL WORKMAN FROM CUZCO

Portrait of Alegria, "Mr. Happiness," one of our workmen, who came with us from Cuzco and staid for nearly two months. Most of the workmen were content with what wages they could earn in two weeks, and kept us continually busy, trying to replace them.

Photo by Hiram Bingham

ENCAVATING AT MACHU PICCHU

Commencing the work of excavating in the Chief Temple at Machu Picchu. Lieutenant Solomayor, at the right, in charge of the gang of Indians

that those on Huayna Picchu were only slightly inferior. Mr. Heald's report of his work on Huayna Picchu runs in part as follows:

"Huayna Picchu, lying to the north of Machu Picchu, and connected with it by a narrow neck, rises some 2,500 feet above the Urubamba River, which runs around its base. On one side, the south, this elevation is reached by what is practically one complete precipice. On the other, while there are sheer ascents, there are also slopes, and, according to the account of one Arteaga, who claims to have explored the forests which cover a good deal of it, was once cultivated, the slopes being converted into level fields by low earth terraces (see page 424).

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Photo by Hiram Bingham

A BURIAL CAVE AT MACHU PICCHU

The first burial cave discovered at Machu Picchu containing a human skull. The picture was taken after partial excavation, showing the skull still in place. In all, more than 100 such caves were opened and a large quantity of skeletal material secured.

Photo by Hiram Bingham

THE SAME CAVE FROM A DISTANCE OF 20 FEET: MACHU PICCHU

It was extremely difficult to find these caves. Here is a picture of cave No. 1 from a distance of only 20 feet. The entrance to the cave is near the center of the picture. It may be imagined that not the least portion of our difficulties was the cutting of paths through this dense tropical jungle and the transportation of material from the caves in which it was found. This cave was on the side of the mountain about 800 feet below the city of Machu Picchu (see pages 446 and 447).

Photo by Hiram Bingham

A LARGE BURIAL CAVE: MACHU PICCHU

A flashlight view of cave No. 9, one of the larger burial caves, in the floor of which a number of skeletons were found. On the ground among the rocks were pieces of beautiful large pots, which may have been destroyed at the time of burial (see pages 446-447).

Photo by Hiram Bingham

COLLECTING THE SKELETAL REMAINS OF THE ANCIENT INHABITANTS: MACHU PICCHU

A flashlight view of the interior of cave No. 11, showing the osteologist, Dr. Eaton, and his Indian helpers during the excavation of a human skeleton. The man at the right is a soldier kindly loaned to us by the Peruvian government to assist us in securing laborers.

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THE LARGEST CAVE AT MACHU PICCHU

A flashlight view of the interior of the largest cave, at the base of one of the great precipices of Huayna Picchu. The cave is nearly 90 feet in length and is partly lined with cut stones. It had long been known to the Indian treasure-hunters of the neighborhood, and consequently yielded no results (see pages 446-447).

Photo by Hiram Bingham

THE CENTER OF THE BEST COLLECTING DISTRICT: MACHU PICCHU

Archeological Engineer Erdis standing near one of the boulders within the city of Machu Picchu, in the vicinity of which he made the discovery that articles of bronze were likely to be found 2 or 3 feet underground (see page 449).

Photo by Hiram Bingham

THE TEMPLE OF THE THREE WINDOWS: MACHU PICCHU

The floors of the principal temples yielded little, but on the terraces beneath the walls of the three-windowed temple, here shown, we found potsherds and artifacts to a depth of four or five feet (see pages 440 and 449).

much as he had. Accordingly, I started with four peons and Tomás Cobines, the soldier, to have a look.

"The river was passed easily on the rather shaky four-pole bridge, and we started up the slope, cutting steps as we went, for it was almost vertical. About 30 feet up it moderated, however, and, after that, while it was steep, we seldom had to cut steps for more than 20 to 30 feet on a stretch. The greatest hindrance was the cane and long grass, through which it was hard to cut a way with the machetes.

"Our progress, slow at first, got absolutely snail-like as the men got tired; so, getting impatient, I resolved to push on alone, telling them to follow the marks of my machete, and charging Tomás to see that they made a good trail and did not loaf.

"I pushed on up the hill, clearing my way with the machete, or down on all fours, following a bear trail (of which there were many), stopping occasionally to open my shirt at the throat and cool off, as it was terribly hot. The brush through which I made my way was in great part mesquite, terribly tough and with heavy, strong thorns. If a branch was not cut through at one blow, it was pretty sure to come whipping back and drive half a dozen spikes into hands, arms, and body. Luckily I had had enough practice to learn how to strike with a heavy shoulder blow, and for the most part made clean strokes, but I didn't get away untouched by any means.

A NARROW ESCAPE

"Finally, about 3 p. m., I had almost gained the top of the lowest part of the ridge, which runs along like the back-plates of some spined dinosaur. The trees had given way to grass or bare rock, the face of the rock being practically vertical. A cliff some 200 feet high stood in my way. By going out to the end of the ridge I thought I could look almost straight down to the river, which looked more like a trout-brook than a river at that distance, though its roar in the rapids came up distinctly.

"I was just climbing out on the top of the lowest 'back-plate' when the grass and soil under my feet let go, and I

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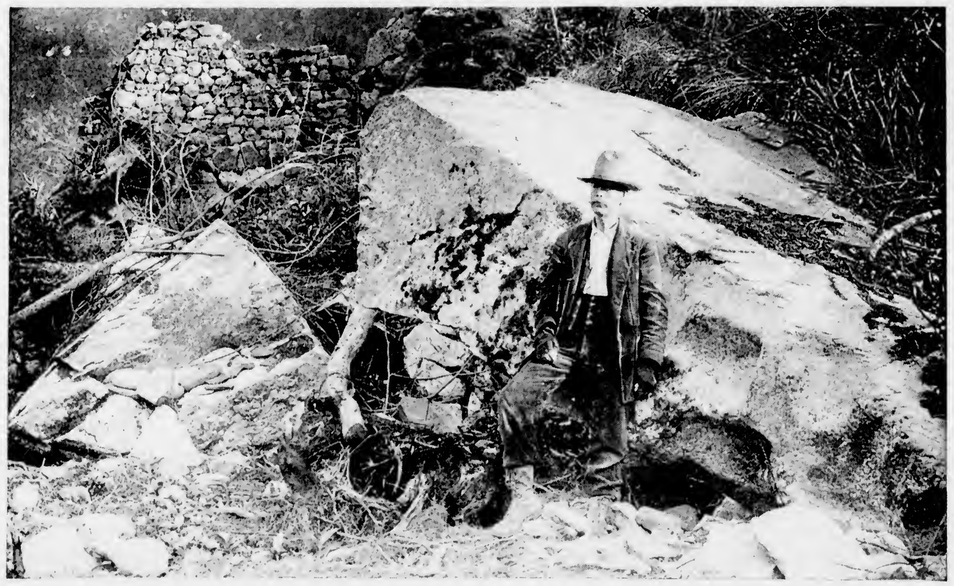

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MACHU PICCHU AFTER TEN DAYS' CLEARING

General view of the west side of Machu Picchu, showing our camp in the upper left-hand corner and a portion of the city after ten days of clearing. Under the old tropical forest was one of the most important portions of the city. The effect of clearing this forest is shown in the next picture.

Photo by Hiram Bingham

MACHU PICCHU A MONTH LATER

A nearer view of the same place one month later, showing the terraces of the upper city and the rows of windowed houses that had been hidden for centuries beneath the tropical forest (see page 449)

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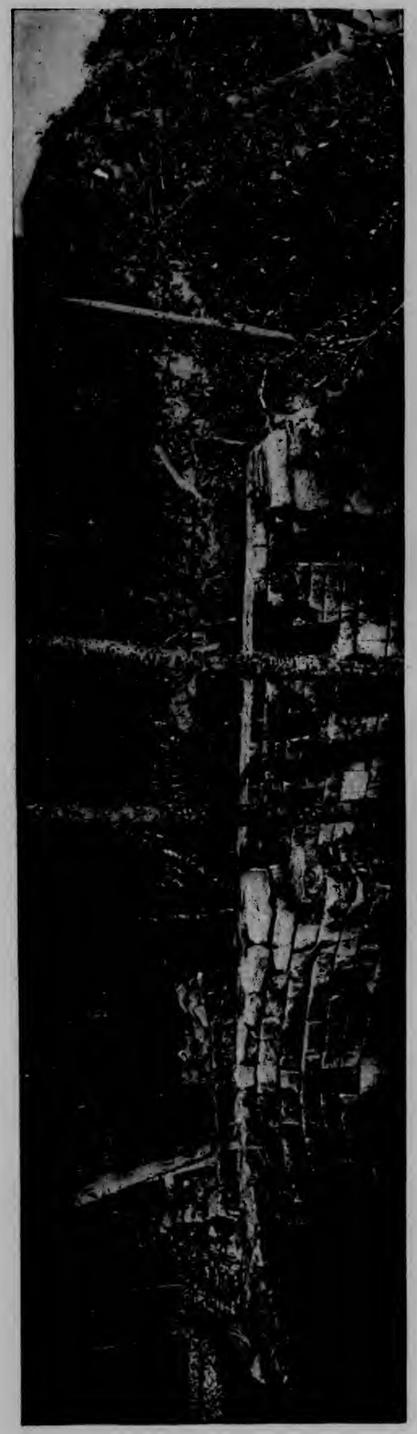

A VIEW OF ONE OF THE MOST INTERESTING PARTS OF MACHU PICCHU AFTER THE PRELIMINARY CLEARING

THE SAME THREE MONTHS LATER

Photos by Hiram Bingham

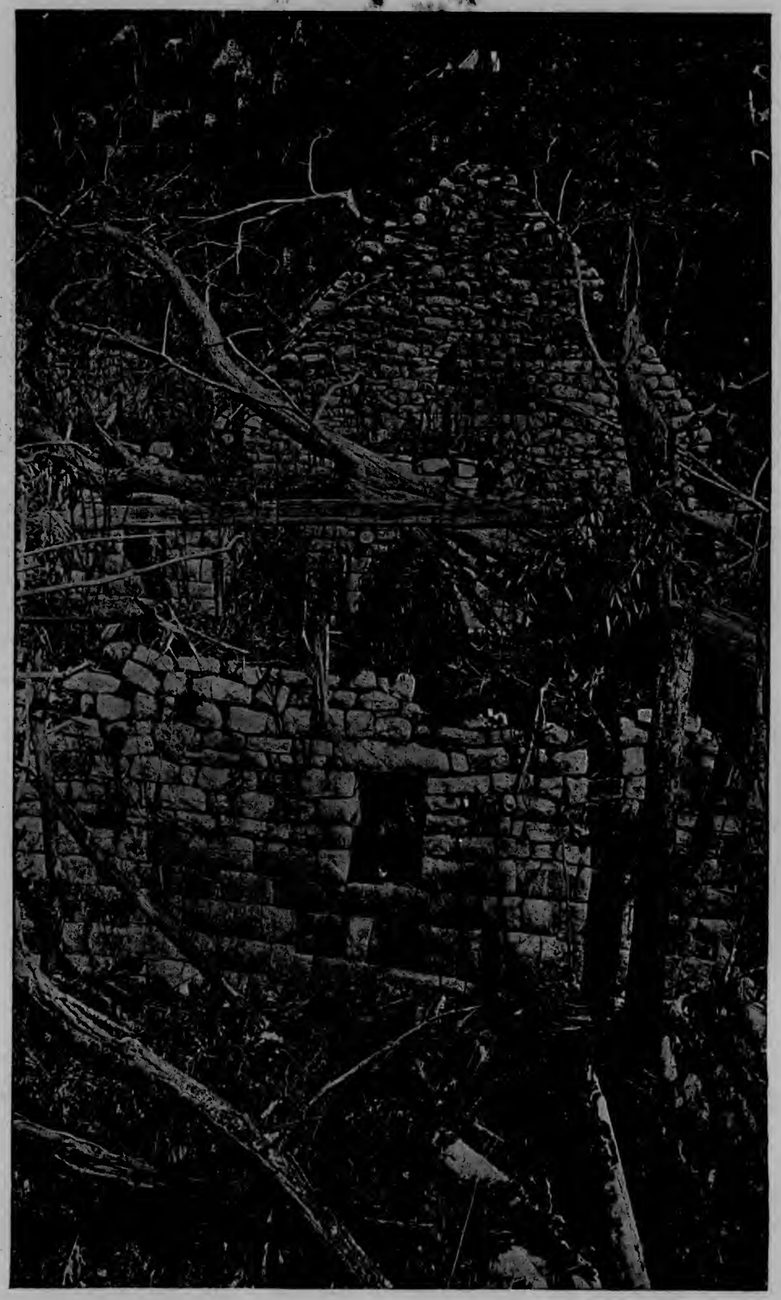

Photo by Hiram Bingham

A STAGE IN THE CLEARING OF MACHU PICCHU

Our first camp is just visible at the top of the picture. The buildings in the foreground belong to what was called the Ingenuity Group. The picture was taken during the preliminary clearing.

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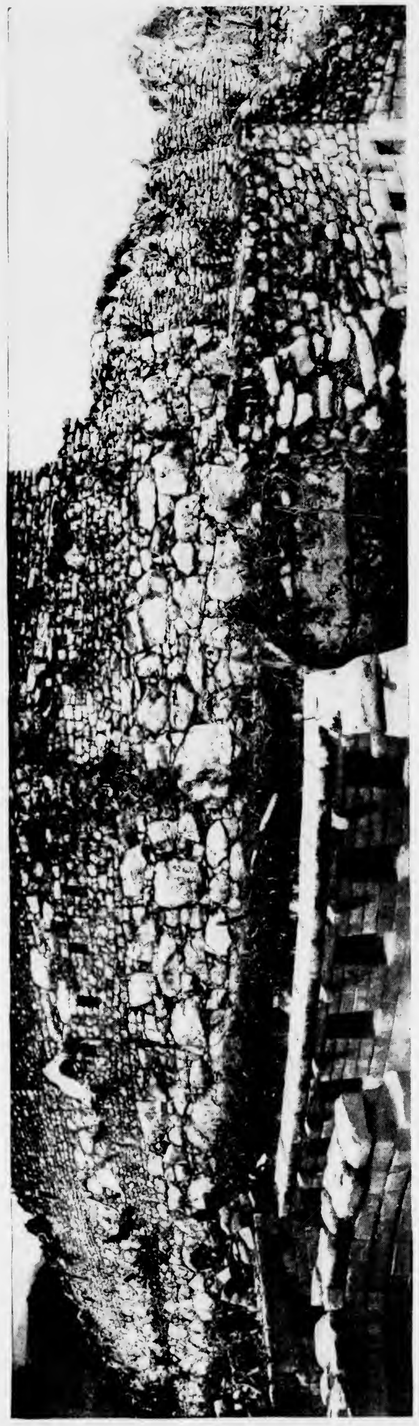

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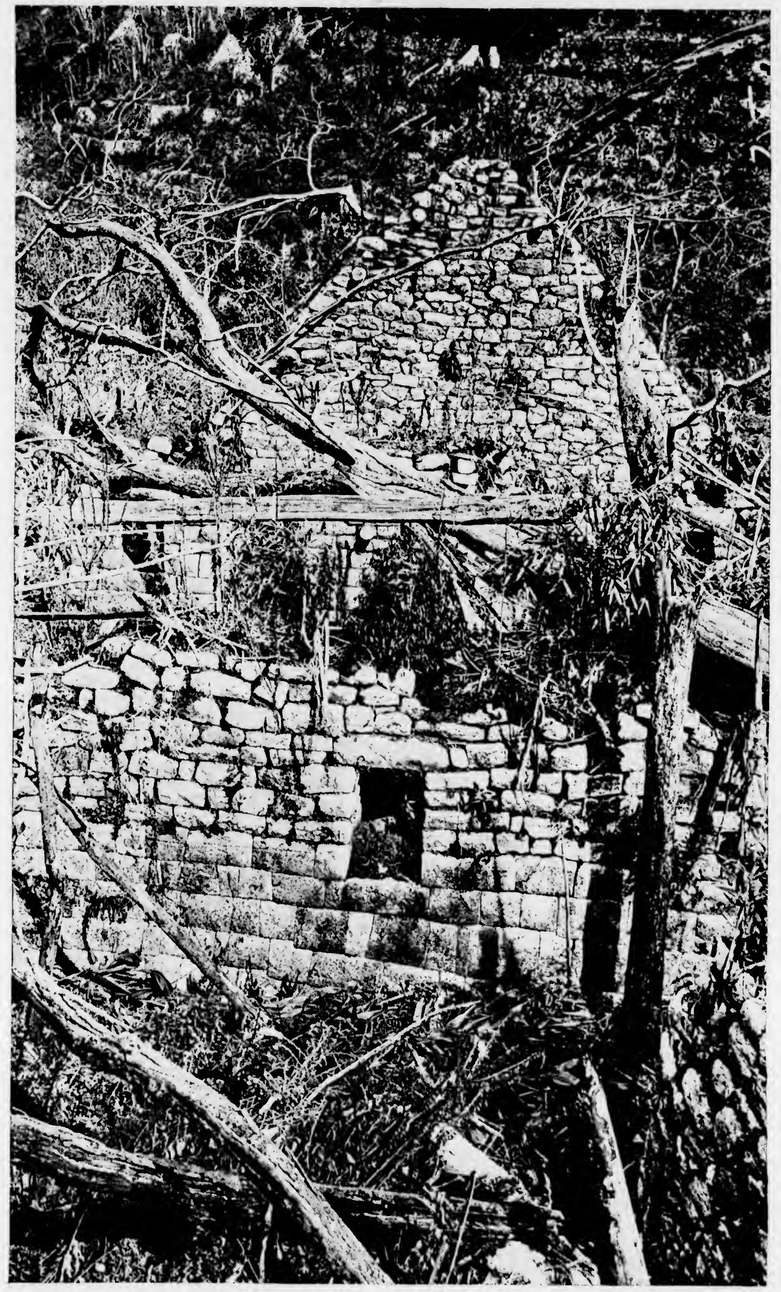

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THE NARROW RIDGE ON WHICH MACHU PICCHU IS SITUATED AND THE MAGNIFICENT URUBAMBA CAÑON

A distant view of Machu Picchu on its narrow ridge, flanked by precipices, in the most inaccessible corner of the Andes in the heart of the Urubamba Cañon. The sharp peak in the right foreground is Machu Picchu Mountain. The lower conical peak at the extreme left is Huayna Picchu. The city of Machu Picchu is on top of the ridge between these two peaks and almost directly underneath the little fleecy cloud which hides part of a distant mountain (see page 453)

Photo by Hiram Bingham

ONE OF THE MAGNIFICENT PRECIPICES WHICH MADE THE CITY OF MACHU PICCHU INVULNERABLE (SEE PAGE 453)

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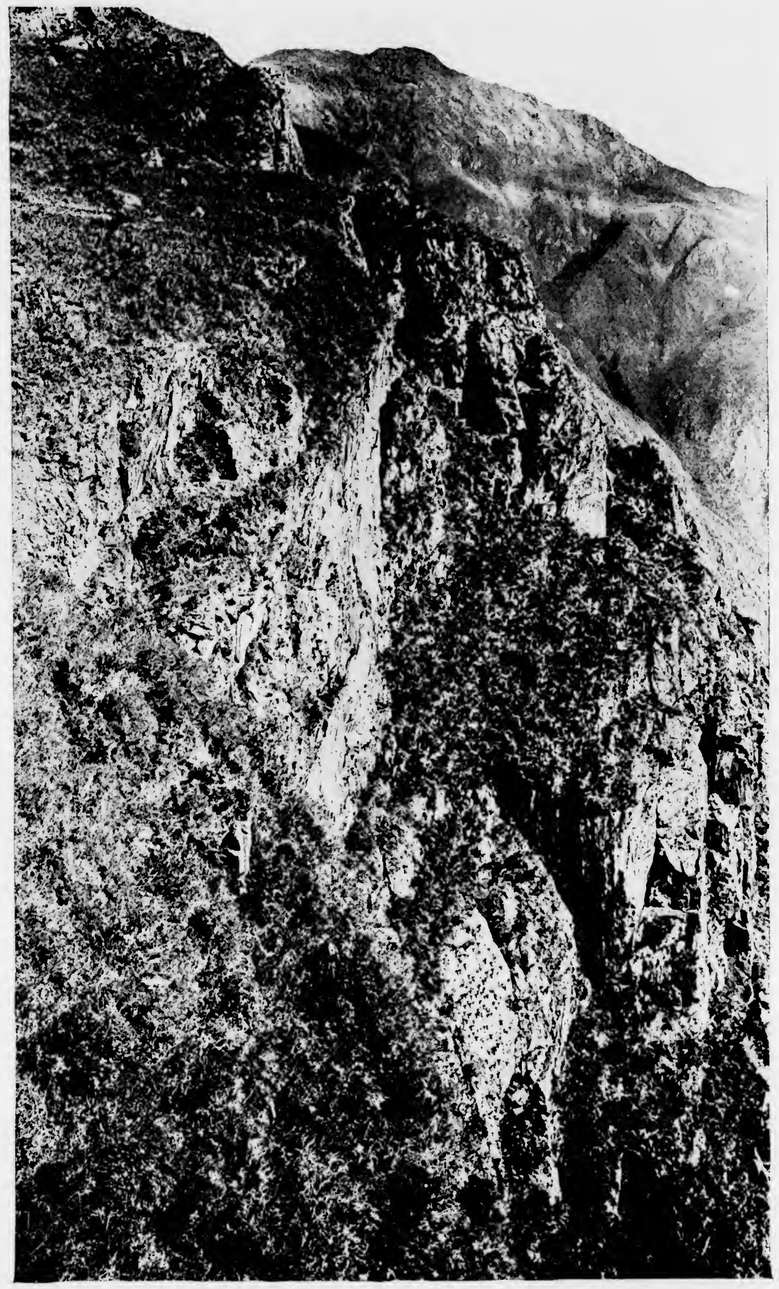

Photo by Hiram Bingham

ONE OF THE MAGNIFICENT PRECIPICES WHICH MADE THE CITY OF MACHU PICCHU INVULNERABLE (SEE PAGE 453)

Retake of Preceding Frame

Photo by Hiram Bingham

THE OUTER CITY WALL: MACHU PICCHU

The defenses of Machu Picchu consisted of two walls and a dry moat running across the ridge from precipice to precipice. In this picture may be seen the outer wall and the ruins of buildings probably used by the soldiers who protected the outer defenses (see page 453)

dropped. For about 20 feet there was a slope of about 70 degrees, and then a jump of about 200 feet, after which it would be bump and repeat down to the river.

"As I shot down the sloping surface I reached out and with my right hand grasped a mesquite bush that was growing in a crack about 5 feet above the jump-off. I was going so fast that it jerked my arm up, and, as my body was turning, pulled me from my side to my face; also, the jerk broke the ligaments holding the outer ends of the clavicle and scapula together. The strength left the arm with the tearing loose of the ligaments, but I had checked enough to give me a chance to get hold of a branch with my left hand.

"After hanging for a moment or two, so as to look everything over, and be sure that I did nothing wrong, I started to work back up. The hardest part was to get my feet on the trunk of the little tree to which I was holding on. The fact that I was wearing moccasins instead of boots helped a great deal here, as they would take hold of the rock. It was distressingly slow work, but after about half an hour I had gotten back to comparatively safe footing. As my right arm was almost useless, I at once made my way down, getting back to camp about 5.30, taking the workmen with me as I went.

"On this trip I saw no sign of Inca work, except one small ruined wall. . . . . ."

SUCCESS AT THE THIRD ATTEMPT

Five days later Mr. Heald judged that his arm was in sufficiently good shape so that he could continue the work, and he very pluckily made another attempt to reach the top of Huayna Picchu. This likewise ended in failure; but on the following day he returned to the attack, followed his old trail up some 1,700 feet, and, guided by the same half-breed who had told us about the ruins, eventually reached the top. His men were obliged to cut steps in the steep slope for a part of the distance, until they came to some of stone stairs, which led them practically to the summit.

The top consisted of a jumbled mass of granite boulders about 2,500 feet above the river. There were no houses, though there were several flights of steps and three little caves. No family could have wished to live there. It might have been a signal station.

After Mr. Heald had left Machu Picchu we set ourselves to work to see whether excavation in the principal structures would lead to discovery of any sherds or artifacts. It did not take us long to discover that there were potsherds outside of and beneath the outer walls of several of the important structures, but our digging inside the walls of the principal temples was almost without any results whatsoever. We did find that the floor of the principal temple had been carefully made of a mixture of granite gravel, sand, and clay, laid on top of small stones, and these again on top of a mass of granite rocks and boulders. When the temple was in use this clean, white floor must have been an attractive feature.

Photo by Hiram Bingham

THE INNER WALL AND THE CITY GATE: MACHU PICCHU (SEE PAGE 453)

By building this wall forward from the gate, it was possible to direct a lateral fire on besiegers. Ammunition consisted of stones—large ones which could be thrown down on the heads of an attacking force, and small cobble stones brought up from the river 2,000 feet below to be used in slings. Piles of this selected ammunition were found in various parts of the defenses.

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Photo by Hiram Bingham

THE WESTERN TERRACES AND THE STEEP WINDING STAIRWAY: MACHU PICCHU

It was difficult to feed the thousands of people who at one time may have occupied Machu Picchu, and every square foot of available land was terraced off to provide a place for the crops of Indian corn and potatoes, which were their chief resource. These terraces were all connected by stairways, sometimes steep, narrow, and winding like the one on the left, at other times consisting of a row of projecting stones in the face of the terrace, as is the case in the second terrace below the lowest line of niches in this picture (pages 454-459).

THE FIRST EXCAVATIONS

Our workmen excavated with a will, for the tests made with a crowbar gave such resounding hollow sounds that they felt sure there was treasure to be found beneath the floor of the ancient temple. In places the excavation was carried to a depth of 8 or 9 feet, and practically the entire floor of the temple was excavated to a depth of 3 or 4 feet; but all this back-breaking work ended only in disappointment. There were many crevices and holes between the boulders under the floor, but nothing in them—not even a bone or potsherd.

Digging in the temple of the Three Windows had a similar negative result, but digging outside on the terrace below the three windows resulted in a large quantity of decorated potsherds. Most

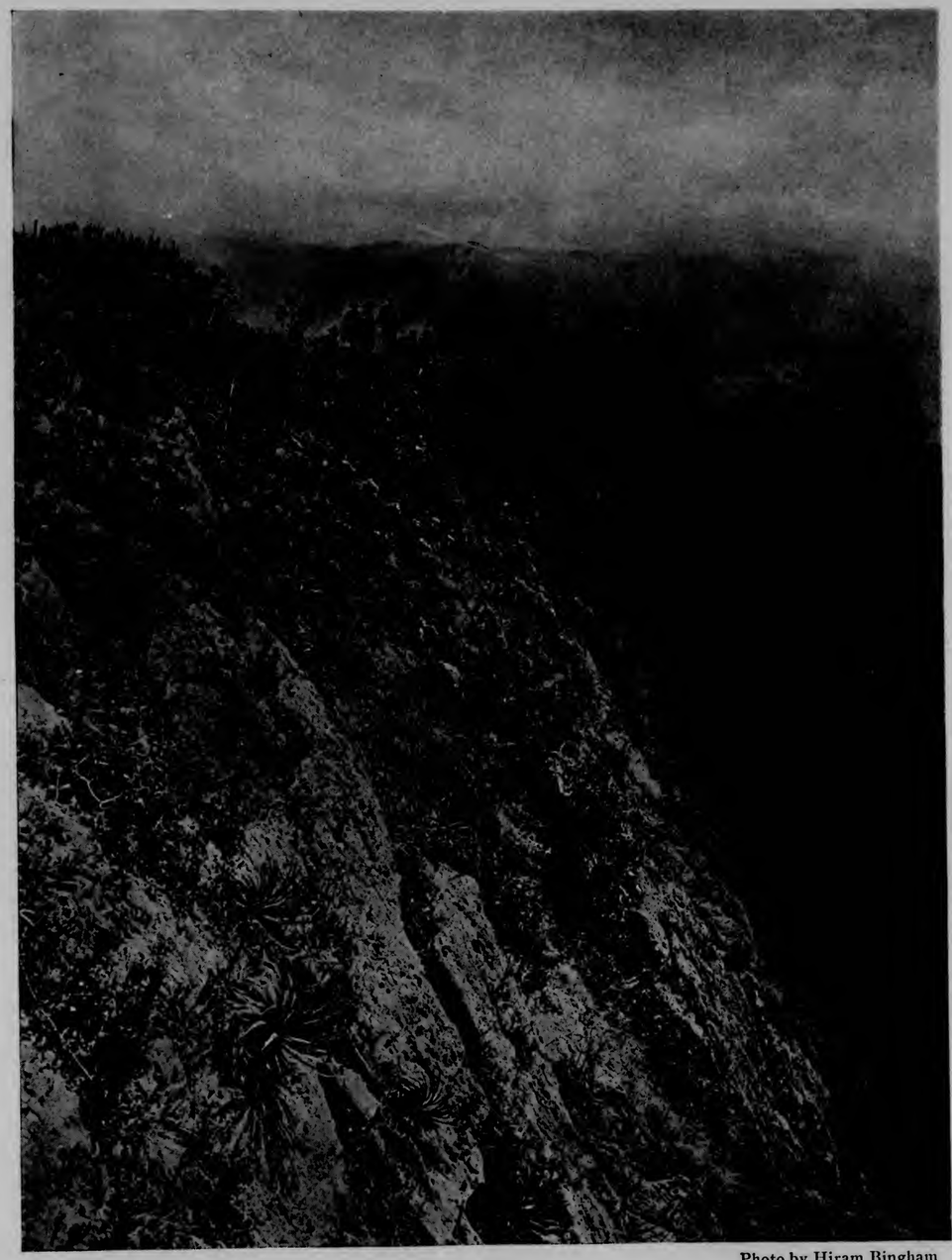

Photo by Hiram Bingham

AN ANCIENT SIGNAL STATION ON MACHU PICCHU MOUNTAIN

On the very summit of one of the most stupendous precipices the Incas constructed a signal station from which the approach of an enemy could be instantly communicated to the city below. By looking very carefully the terraced walls of this signal station may be seen just below the figures who are standing on an artificial platform (see pages 442 and 453).

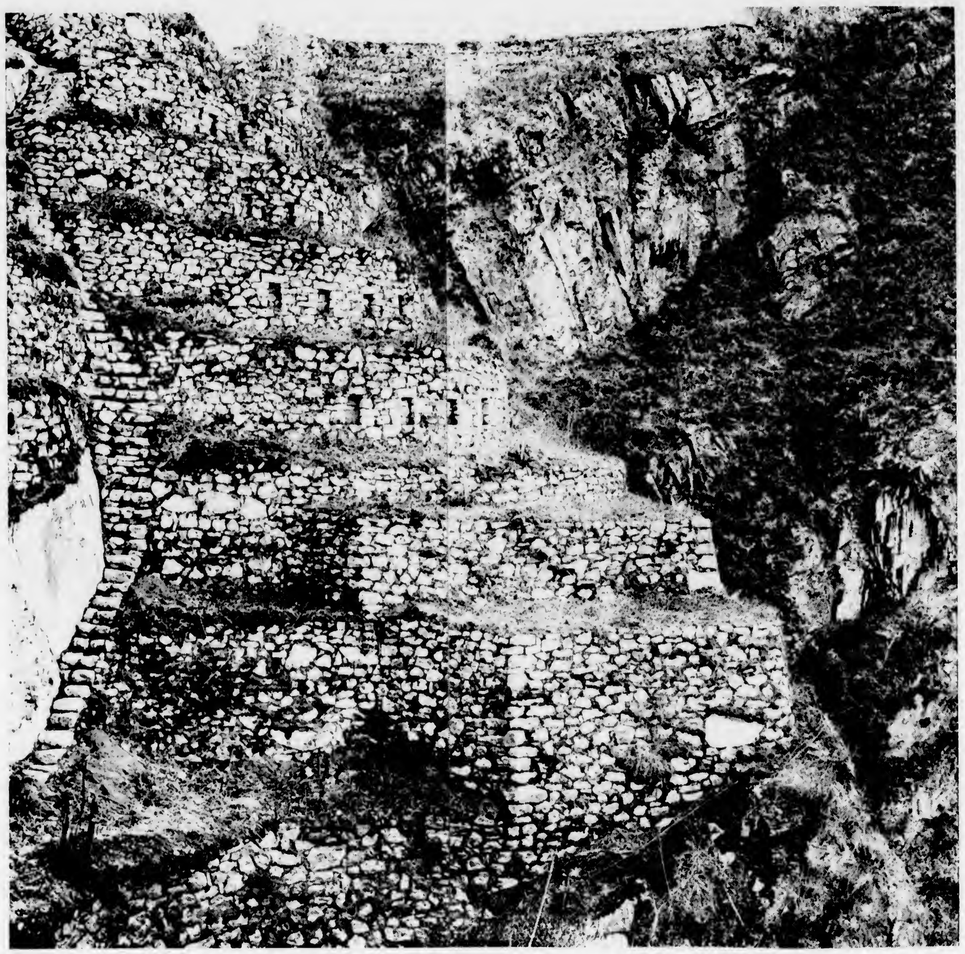

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Photo by Hiram Bingham

A NEARER VIEW OF THE PLATFORM SKILFULLY CONSTRUCTED ON TOP OF MACHU PICCHU MOUNTAIN 4,000 FEET ABOVE THE RIVER IN THE VALLEY BELOW (SEE PAGES 441 AND 453)

Photo by Hiram Bingham

THE TOP OF MACHU PICCHU MOUNTAIN

Another portion of the mountain-top, showing a skilfully laid retaining wall on the very top of a precipice overhanging the cañon. If any of the workmen who built that wall slipped, he must have fallen a thousand feet before striking any portion of the cliff.

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Retake of Preceding Frame

8 8 4 5

Photo by Hiram Bingham

THE DRY MOAT OF THE DEFENSES OF MACHU PICCHU

Just outside the inner walls of Machu Picchu the builders constructed a dry moat which ran directly across the hill. In this picture of the moat the city walls may be seen above on the right and the agricultural terraces on the left (see page 453).

Photo by Hiram Bingham

THE DEFENSES OF MACHU PICCHU: THE INNER WALL

Besides the moat, the inner defenses of Machu Picchu consisted of a high wall strongly built of large, rough boulders. The Incas were good engineers and thoroughly understood the art of drainage. In this picture of the wall may be seen two outlets for water, permitting the terraces within the wall to be properly drained.

Photo by Hiram Bingham

A HUGE ROCK IN THE DEFENSES OF MACHU PICCHU

The moat is still from 6 to 8 feet deep, but has probably been partly filled up by the accumulations of centuries. In places unusually large rocks were used in the construction of the inner wall of the moat (see pages 446 and 453).

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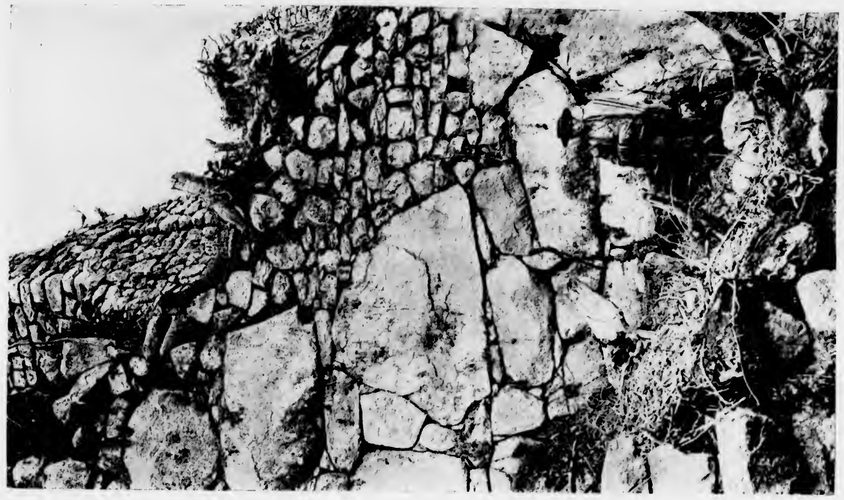

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THE DEFENSES OF MACHU PICCHU: THE INNER WALL AND THE CITY GATE

The main city gate of Machu Picchu was on the very summit of the ridge. Its defense was made easy by bringing the wall out in a salient angle on the left of the gate, so that a perfect shower of stones could be rained on the heads of besiegers. The peak in the distance is Huayna Picchu (see page 453).

of them were 2 to 4 feet under the surface. It seemed as though it had been the custom for a long period of time to throw earthenware out of the windows of this edifice.

At the end of a week of hard and continuous labor we had not succeeded in finding a single skull, a single burial cave, nor any pieces of bronze or pots worth mentioning. We did not like to resort to the giving of prizes at such an early stage. A day or two spent in hunting over the mountain side with the Indians for burial caves yielding no results, we finally offered a prize of one sol (50 cents gold) to any workman who would report the whereabouts of a cave containing a skull, and who would leave the cave exactly as he found it, allowing us to see the skull actually in position.

THE SEARCH FOR BURIAL CAVES

The next day all the workmen were allowed to follow their own devices, and they started out early on a feverish hunt for burial caves. The half dozen worthies whom we had brought with us from Cuzco returned at the end of the day tattered and torn, sadder and no wiser. They had hewed their way through the jungle, one of them had cut open his big toe with his machete, their clothes were in shreds, and they had found nothing.

But the Indians who lived in the vicinity, and who had undoubtedly engaged in treasure-hunting before, responded nobly to the offer of a prize, and came back at the end of the day with the story that they had discovered not one, but eight, burial caves, and desired eight soles.

This was the beginning of a highly successful effort to locate and collect the skeletal remains of the ancient inhabitants of Machu Picchu. Fifty-two graves in and near this ancient city were excavated by Dr. Eaton, our osteologist, and fully as many more were

Photo by Hiram Bingham

ANOTHER VIEW OF THE CITY GATE: MACHU PICCHU

Looking outward from within the city, and showing the graded approach that runs across the agricultural terraces

afterward located and explored under the supervision of Mr. Erdis, the archeological engineer. The greatest number of these graves were in caves under the large boulders and projecting ledges of the mountain side, and the method usually followed by the osteologist in exploring them was, first, to photograph the entrance of the cave from without, after which the grave was opened and its contents carefully removed. Measurements were taken and diagrams were made to show the position of the human skeletons and the arrangement of the accompanying pottery, implements, ornaments, and bones of lower animals.

In a few instances it was possible also to photograph the interiors of graves.

CONTENTS OF THE BURIAL CAVES

In some of the caves only the most fragmentary skeletal remains were found; in others only the larger bones and a skull or two; while others contained not only nearly complete skeletons, but pots in more or less perfect state of preservation, and occasionally pieces of bronze. In this way a large and valuable collection was made of human skeletons, pottery, and other artifacts of various materials, including some of the tools probably used by the Inca or pre-Inca stone-masons in the more intricate parts of their work.

Before dismissing the subject of the ancient graves, it may be noted that the custom seems to have been, whenever possible, to bury the dead in the sitting position, with the knees raised. In a very few instances bodies were interred in crudely fashioned "bottle-shaped graves." While engaged in this work the collec-

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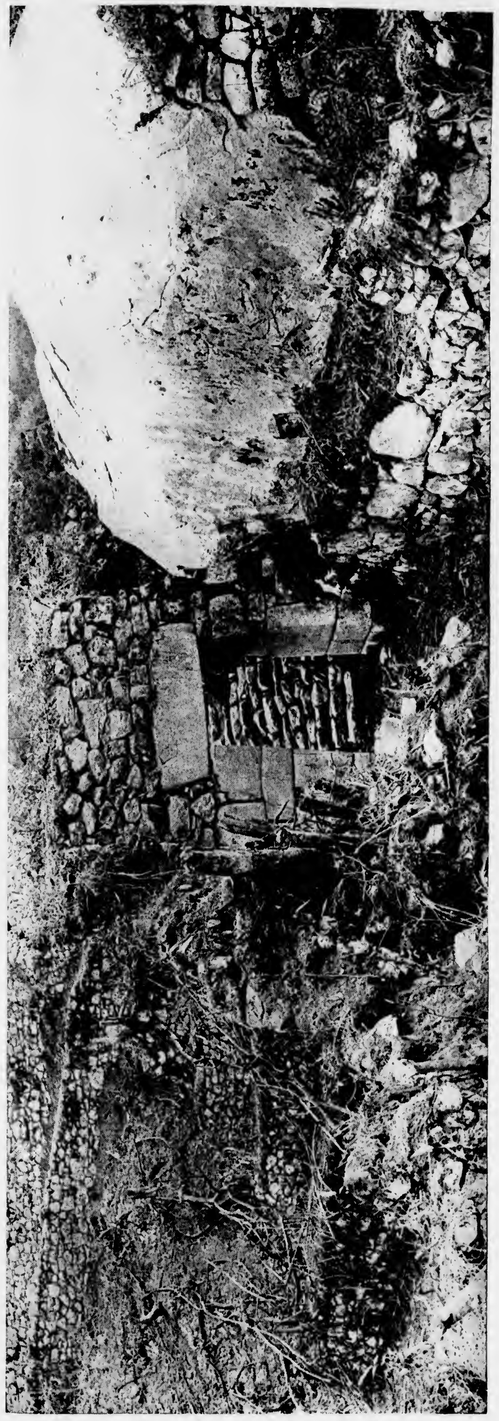

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THE HOUSE BUILT ON A ROCK: MACHU PICCHU

An example of the ingenuity of this ancient race of stone cutters who were able, without the use of mortar or cement, to build their houses on rocks even when the rocks were lying at an angle of nearly 40 degrees.

Photo by Hiram Bingham

A TUNNEL UNDER THE MAIN ROAD: MACHU PICCHU

The road from the outer world to the city of Machu Picchu was a well-made footpath about 4 feet wide. It crosses the agricultural terraces. In the place shown in the picture, the workmen had constructed a tunnel underneath this road, so as to pass more quickly from the upper to the lower terraces.

Photo by Hiram Bingham

THE MAIN ROAD TO MACHU PICCHU

A nearer view of the graded approach to Machu Picchu; part of the principal road which connected the city with the outer world

tors were greatly annoyed by the venomous serpents of the region, and several of these serpents were killed and preserved in alcohol.

The burial caves occur generally on the sides of the mountain below the ruins. As they are in well nigh inaccessible locations and more or less covered with dense tropical jungle, the work of visiting and excavating them was extremely arduous, and it is most highly to the credit of those engaged in it that so many caves were opened and so much material gathered. Practically every square rod of the sides of the ridge was explored. The last caves that were opened were very near the Urubamba River itself, where the ancient laborers may have had their huts.

It is too early as yet to give any generalizations with regard to the anatomical characteristics of the Machu Picchu people as evidenced by their skeletal remains. A few of the skulls show decided marks of artificial deformation, but most of them are normal.

Mr. Erdis eventually made the discovery that by digging at least 18 inches underground, at the mouths of small caves, under large boulders, within 200 yards of the Three Window Temple, he was almost sure to find one or two articles of bronze, either pins, tweezers, pendants, or other ornaments.

Selecting two of the most reliable workmen and offering them a sliding scale of rewards for everything they might find of value, he succeeded, in the course of four months' faithful attention to the details of clearing and excavating, in getting together about 200 little bronzes, a lesser number of pots, and 50 cases of sherds. The nature of the more interesting finds can be better understood by the accompanying photograph (see page 573). This material is now all in New Haven, where it is to be arranged by Dr. Eaton and Mr. Erdis.

WHAT CLEARING THE JUNGLE REVEALED

The change made in the appearance of Machu Picchu by the four months of clearing and excavating is graphically brought out by comparing the pictures on pages 404, 424, 432, and 499 with those on pages 433, 434, 490, 498, and 512, the one set taken either before the work began or early in its stages and the latter taken at the end of the season. It

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Photo by Hiram Bingham

THE DEFENSES OF THE CITY: THE NORTHERN TERRACES, MACHU PICCHU

On the north side of the city there was little danger of attack, but in order to strengthen the nearly impassible cliffs and precipices, narrow terraces that could be used both for agricultural and defensive purposes were constructed (see page 453).

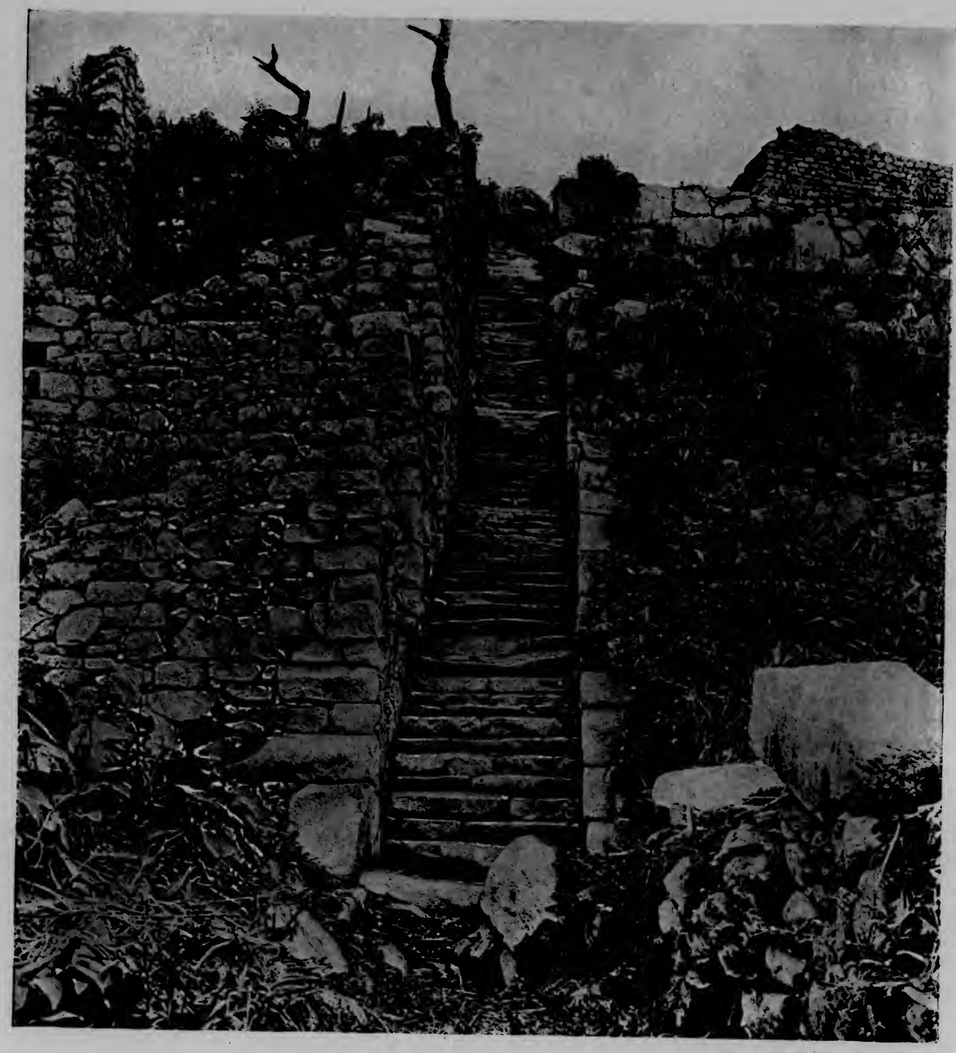


Photo by Hiram Bingham

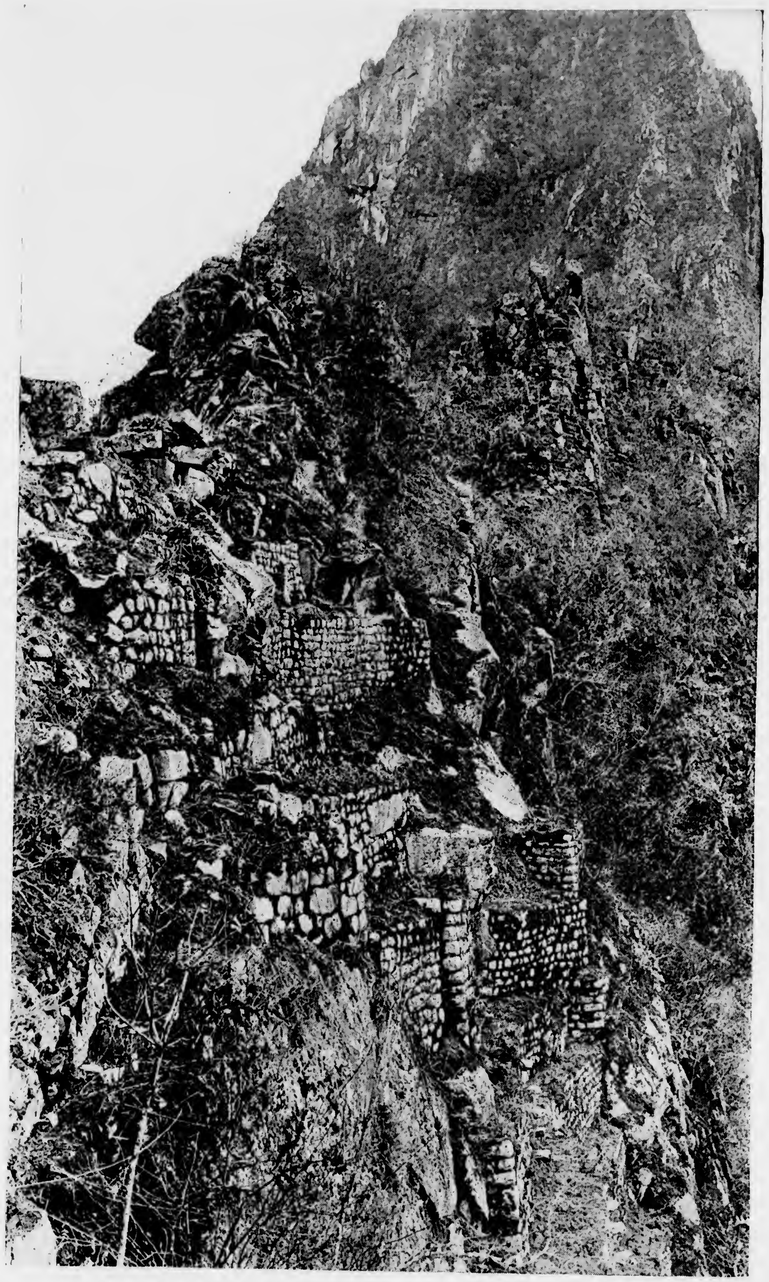
A STAIRWAY ON THE MAIN STREET IN MACHU PICCHU

Within the city an extensive system of narrow streets and granite stairways made intercommunication relatively easy. This stairway is on the main cross street which connects the vicinity of the Sacred Plaza and the chief temples with the east city (see pages 456-459).

is most sincerely to be hoped that the Peruvian government will not allow the ruins to be overgrown with a dense forest, as they have been in the past.

Although the buildings are extremely well built, there is no cement or mortar in the masonry, and there is no means of preventing the roots of forest trees from penetrating the walls and eventually tearing them all down. In several cases we found gigantic trees perched on the very tips of the gable ends of small and beautifully constructed houses. It was not the least difficult part of our work to cut down and get such trees out of the way without seriously damaging the house walls (see pages 452, 453).

Considering all the pains that we took to preserve the ruins from further spoliation by the dense vegetation, it was



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A TYPICAL DWELLING HOUSE OF THE BETTER CLASS: MACHU PICCHU

One of the most striking characteristics of Machu Picchu architecture is that a large majority of the houses are of a story and half in height, with gable ends. These gables are marked by cylindrical projecting stones, carrying out the idea of the wooden rafters, which have disappeared. In the case of these two adjoining houses, the southern gables alone are still standing, the northern gables having been knocked off either by earthquakes or owing to the destructive forest vegetation. Had we not cleared the jungle and cut off the forest trees, the right gable would soon have gone with the weight of the tree that was perched on its peak, and whose roots can still be seen in the picture (see pages 455-456).

with frank and painful surprise that we read in the decree issued by the new Peruvian government, in connection with giving us permission to take out of Peru what we had found, a clause stating that we were not to injure the ruins in the slightest particular, and that we must neither deface nor mutilate them. I could not help being reminded of the fact that we had spent two days of one workman's time in erasing from the beautiful granite walls the crude charcoal autographs of visiting Peruvians, one of whom had taken the pains to scrawl in huge letters his name in thirty-three places in the principal and most attractive buildings.

We were greatly aided in the work of clearing the ruins by having with us for two months Lieutenant Sotomayor, of the Peruvian army, whose presence was due to the courtesy of President Leguia. Lieutenant Sotomayor took personal charge of the gang of Indians engaged in clearing the jungle and drying and burning the rubbish. As long as he was allowed to remain with us he did his work most faithfully and efficiently. It

was with regret that we found he was relieved from duty at Machu Picchu in September.

AN IDEAL PLACE OF REFUGE

Although it is too early to speak definitely in regard to the civilization of Machu Picchu, a short description of the principal characteristics of the city may not be out of place.

Machu Picchu is essentially a city of refuge. It is perched on a mountain top in the most inaccessible corner of the most inaccessible section of the Urubamba River. So far as I know, there is no part of the Andes that has been better defended by nature.

A stupendous cañon, where the principal rock is granite and where the precipices are frequently over 1,000 feet *sheer,* presents difficulties of attack and facilities for defense second to none. Here on a narrow ridge, flanked on all sides by precipitous or nearly precipitous slopes, a highly civilized people—artistic, inventive, and capable of sustained endeavor—at some time in the remote past built themselves a city of refuge (pp. 436, 437).

Since they had no iron or steel tools — only stone hammers — its construction must have cost many generations, if not centuries, of effort.

Across the ridge, and defending the builders from attack on the side of the main mountain range, they constructed two walls. One of them, constituting the outer line of defense, leads from precipice to precipice, utilizing as best it can the natural steepness of the hill (see pages 438 and 439).

Beyond this, and on top of the mountain called Machu Picchu, which overlooks the valley from the very summit of one of the most stupendous precipices in the cañon, is constructed a signal station, from which the approach of an enemy could be instantly communicated to the city below. Within the outer wall they constructed an extensive series of agricultural terraces, stone lined and averaging about 8 feet high. Between these and the city is a steep, dry moat and the inner wall (see pages 441, 442, 444, 450).

Photo by Hiram Bingham

A DECORATED GABLE: MACHU PICCHU

A slightly different view of the gable end of one of the better houses, bringing out the location and size of the projecting cylindrical blocks.

When the members of an attacking force had safely negotiated the precipitous and easily defended sides of the moat, they would still find themselves outside the inner defenses of the city, which consisted of a wall from 15 to 20 feet high, composed of the largest stones that could be found in the vicinity—many of them huge boulders weighing many tons. This wall is carried straight across the ridge from one precipitous side to the other. These defenses are on the south side of the city (pp. 445-447).

THE TOWN WAS INVULNERABLE

On the north side, on the narrow ridge connecting the city with Huayna Picchu, strong defensive terraces have been strategically placed so as to render

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A MONOLITHIC STAIRWAY: MACHU PICCHU

In some cases the smaller stairways are cut partly or entirely out of a single granite boulder. The stairway in this picture leads from the beautifully made houses of what has been termed the Princess Group, by reason of the exquisiteness of the stone work, down to the more roughly made houses probably once occupied by the retainers and the less important members of the family which occupied this section of the city.

Photo by Hiram Bingham

A WELL-BUILT GRANITE STAIRWAY: MACHU PICCHU

Apart from the unusual number of windows in the houses of Machu Picchu, the most remarkable thing is the number of granite stairways, there being over 100, large and small, within the walls of the city. This is a portion of one of the more important stairways on one of the principal streets in the city.

Photo by Hiram Bingham

THE WEST GABLE IN THE BEST HOUSE OF THE KINGS GROUP

Showing the second story window, a small ventilating window above it, the usual projecting cylinders, and the location of four ring-stones to which the rafters were tied. The ring-stones are located at regular distances. The holes in the stones were probably bored by means of pieces of bamboo, sand, water, a pair of good hands, considerable time, and a great deal of patience (see page 456).

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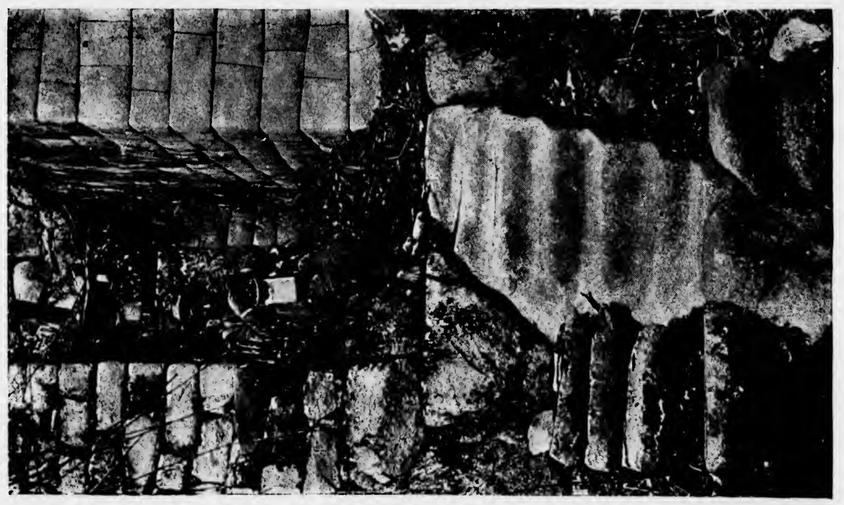

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Photo by Hiram Bingham

THE WEST GABLE IN THE BEST HOUSE OF THE KINGS GROUP

Showing the second story window, a small ventilating window above it, the usual projecting cylinders, and the location of four ring-stones to which the rafters were tied. The ring-stones are located at regular distances. The holes in the stones were probably bored by means of pieces of bamboo, sand, water, a pair of good hands, considerable time, and a great deal of patience (see page 456).

Photo by Hiram Bingham

ANOTHER MONOLITHIC STAIRWAY: MACHU PICCHU

In this case not only the steps of the stairway, but also the balustrades, were cut out of a single stone. Imagine the patience required to do this, when the only tools at hand were hard cobble stones that had to be brought up from the river 2,000 feet below.

nil the danger of an attack on this side. Difficult to reach at best, the city's defenses were still further strengthened by the construction of high, steep walls wherever the precipices did not seem absolutely impassable (see page 450).

Inside the city the houses are crowded close together, but an extensive system of narrow streets and rock-hewn stairways made intercommunication comfortable and easy.

On entering the city, perhaps the first characteristic that strikes one is that a large majority of the houses were a story and a half in height, with gable ends, and that these gable ends are marked by cylindrical blocks projecting out from the house in such a way as to suggest the idea of the ends of the rafters. The wooden rafters have all disappeared, but the ring-stones to which they were tied may still be seen in some of the pictures, notably that on page 455.

These ring-stones consist of a slab of granite, about 2 feet long and 6 inches wide by 2 inches thick, with a hole bored in one end, and were set into the sloping gable wall in such a way as to be flush with the surface, although the hole was readily accessible for lashing the beams of the house to the steep pitch of the gables. There were usually four of these ring-stones on each slope of the wall. Dr. Eaton found this to be also a feature of the Choqquequirau architecture, only in that city the number of ring-stones is larger per gable.

A CITY OF STAIRWAYS

The next most conspicuous feature of Machu Picchu is the quantity of stairways, there being over 100, large and small, within the city. Some of them have more than 150 steps, while others have but 3 or 4. In some cases each step is a single block of stone 3 or 4 feet wide. In others the entire stairway—6, 8, or 10 steps, as the case might be—was cut out of a single granite boulder (see pp. 451, 454, 457-9).

Again, the stairway would seem almost fantastic, being so narrow and wedged in between two boulders so close together that it would have been impossible for a fat man to use the stairway at all. In no case were the stairways intended for ornament. In every case they are useful in getting to a location otherwise difficult of access (page 458).

The largest level space in the city was carefully graded and terraced, so as to be used for agricultural purposes, on the products of which the inhabitants could fall back for a time in case of a siege.

It seems probable that one reason why

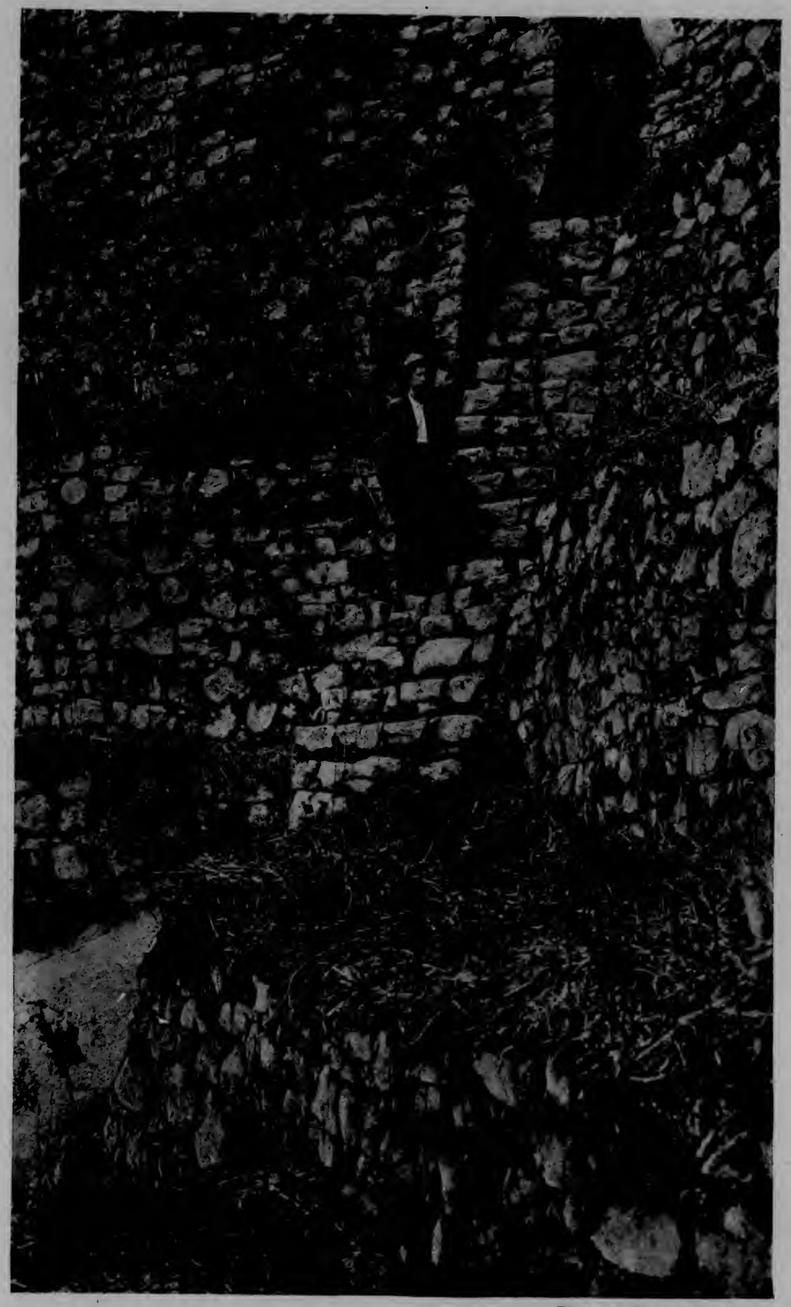
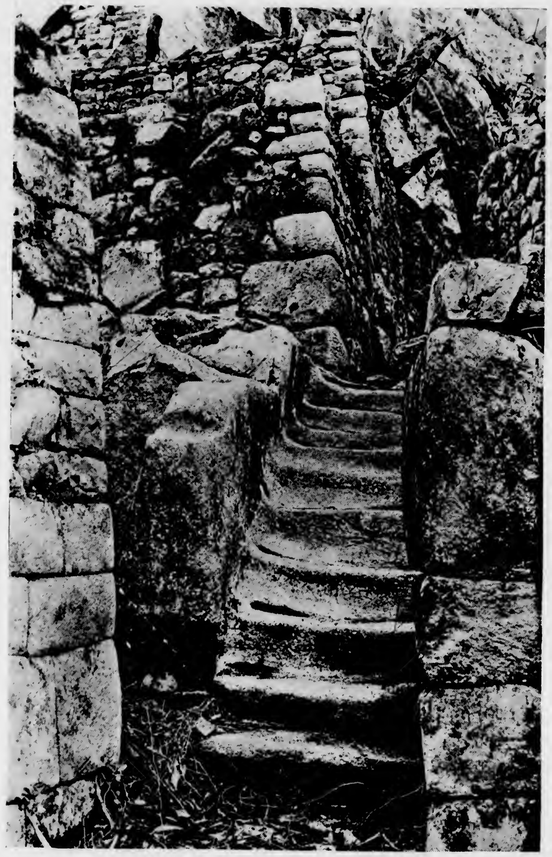


Photo by Hiram Bingham

THE STEEPEST STAIRWAY IN MACHU PICCHU

This stairway is one of those connecting the various agricultural terraces, and as it was in a position where it was not needed to be used for constant traffic, as in the streets of the city, it was left to follow the extremely steep natural declivity of the hill.



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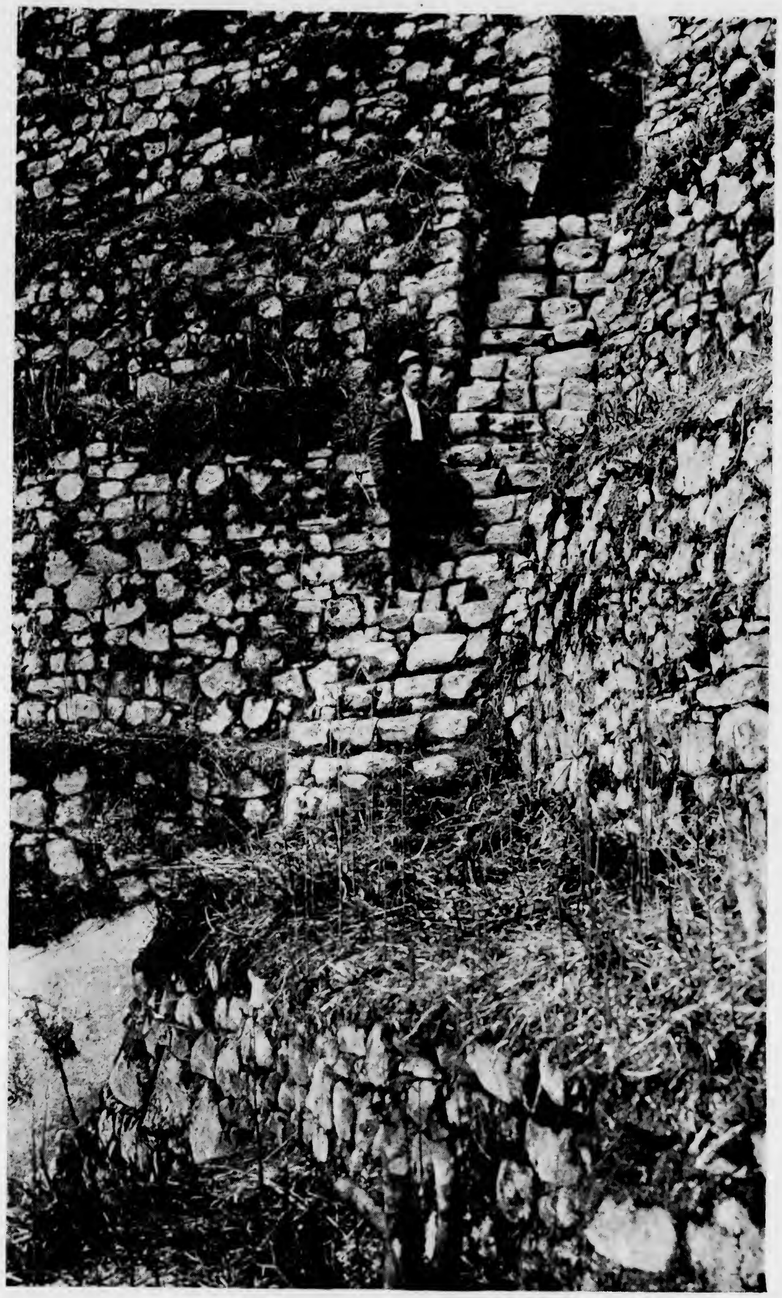

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Photo by Hiram Bingham

A SMALL PRIVATE STAIRWAY IN MACHU PICCHU
Another little stairway ingeniously constructed between two granite ridges in order to make accessible a little garden terrace

Photo by Hiram Bingham

THE NARROWEST STAIRWAY: MACHU PICCHU
Every square foot of ground in the city was utilized for some purpose or other. Sometimes a garden was tucked into a little area not more than 8 feet square behind and above a dwelling-house. To reach these out-of-the-way gardens, narrow, almost fantastic, stairways were constructed. This one could not have been used with comfort by any but a small workman, like the boy in the picture.

the city was deserted was a change in climate, resulting in scarcity of water supply. At the present time there are only three small springs on the mountain-side, and in the dry season these could barely furnish water enough for cooking and drinking purposes for 40 or 50 people. There could never have been very much water here, for the *azequias*, or water channels, are narrower than any we have ever seen anywhere else, being generally less than 4 inches in width.

THE FOUNTAINS ON THE STAIRWAY

We were able to trace the principal ***azequia*** from the vicinity of the springs along the mountain-side for a distance of perhaps a mile, across the dry moat on a slender bridge, then under the city wall, along one of the terraces, and finally to the first of a series of fountains or baths, located on the principal stairway of the city (see picture on this page).

This stairway is divided to admit the entrance of one of the fountains, of which there are 14 or 15 in the series. Each basin is about 2½ feet long by 1½ feet wide and from 5 to 6 inches in depth. In some cases the basin and the floor of the bath-house, or fountain, is made of a single slab of granite. Generally holes were drilled in one of the corners of the basin to permit the water to flow through carefully cut underground channels to the next basin below.

The Peruvians call these fountains "baths." It does not seem to me likely that they were used for this purpose, but rather that, by a careful husbanding in basins of this sort, the water-pots of the inhabitants could the more readily be filled by any one coming to one of the fountains.

Many of the houses are built on terraces on the steep sloping hillsides. In such case their doors face the hill and the windows look out on the view. Most of the houses are well provided with niches, the average size being about 2 feet in height by 1¼ feet in width. In some interiors projecting cylindrical blocks are found alternating between the niches. In a few houses we found evidence of stucco, but in most cases the mud plaster had entirely disappeared (see page 463).

Possibly the most interesting conclusion brought out as a result of our extensive clearing and excavating is that

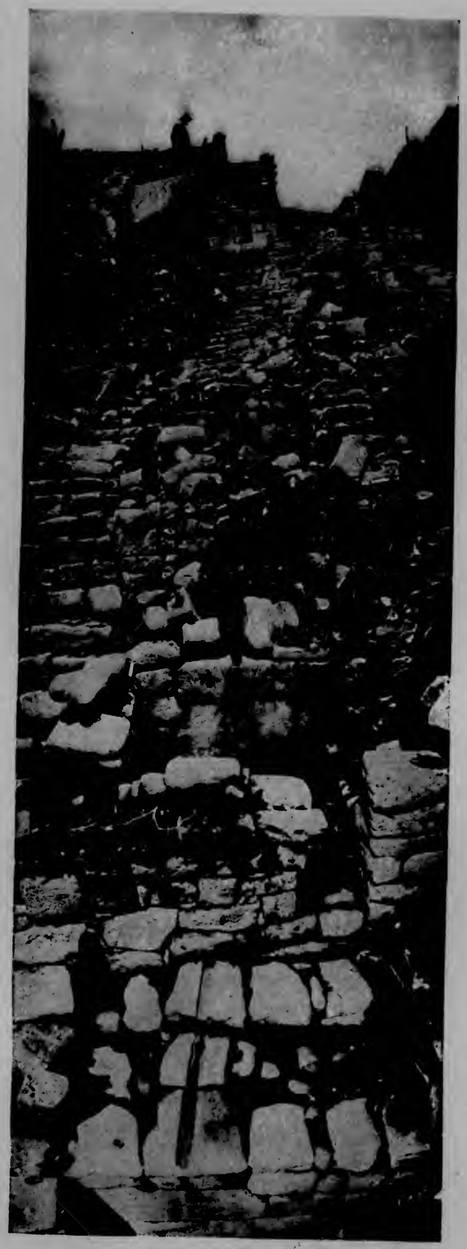
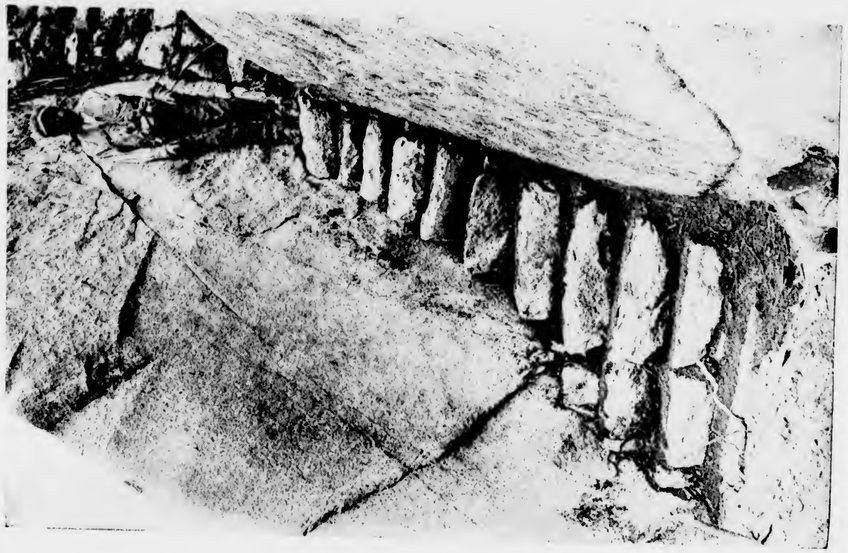


Photo by Hiram Bingham

THE STAIRWAY OF THE FOUNTAINS: MACHU PICCHU
The longest and most important stairway is so arranged as to admit the entrance of fountains, of which there are 14 or 15 in a series. As they had no pipes, the builders conducted the water in skilfully made stone conduits, carrying the stream from basin to basin, sometimes under the stairway and sometimes at its side (see pages 460-461).



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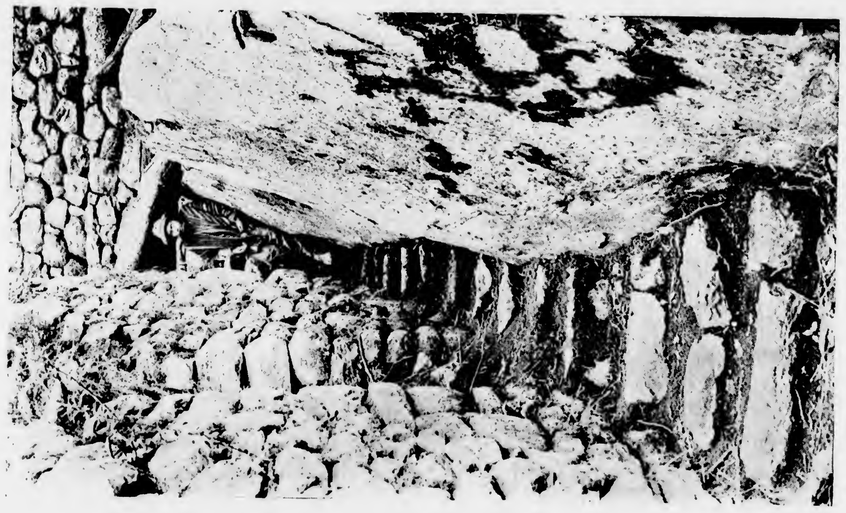

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Retake of Preceding Frame

Photo by Hiram Bingham

THE UPPERMOST FOUNTAIN: MACHU PICCHU

The basins of the fountains are usually cut out of a single block of granite, which forms part of the floor. Frequently, as in the fountain shown in the picture, one or two small niches were constructed in the side walls and a small lip was cut in the stone at the end of the conduit, so as to enable the water to fall clear of the back wall of the fountain (see page 459).

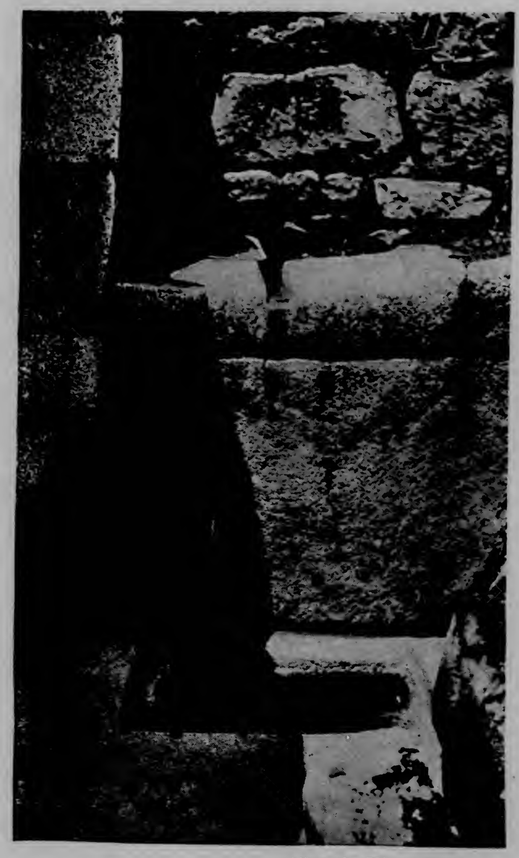

Photo by Hiram Bingham

A FOUNTAIN AT MACHU PICCHU

Another fountain showing the end of the conduit and the monolithic basin. The water passed out of the basin through a hole drilled in one corner and connecting with the underground conduit below.

Photo by Hiram Bingham

A FOUNTAIN AT MACHU PICCHU

Another fountain showing the opening of the conduit. Owing to a change in climate, the springs which formerly fed these fountains are now so small as to give scarcely water enough for three families, except in the wet season.

Photo by Hiram Bingham

INTERIOR OF ONE OF THE BEST HOUSES: MACHU PICCHU

Houses with more than one room were scarce, but where this does occur, the doors, as in the picture, are very small

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TYPICAL INTERIOR OF SMALL CHAMBER IN BETTER CLASS HOUSE: MACHU PICCHU

Most of the houses are well provided with niches, the average size being about 2 feet in height and a foot and a quarter in width. These niches took the place of closets, wardrobes, shelves, and tables. They were usually symmetrically arranged and offered a pleasing break in the dull finish of the solid walls.

Photo by Hiram Bingham

ANOTHER TYPICAL INTERIOR: MACHU PICCHU

In many of the houses there are round or square stones projecting between the niches. In some cases these were used to support an upper story, while in other cases they are either for ornament or merely convenient hooks on which to hang ponchos, slings, ropes, etc.

Photos by Hiram Bingham

STUCCO STILL IN POSITION: MACHU PICCHU

Some of the houses were lined with such beautiful stone work as to require no other finish. In others it seems probable that the roughly finished stones were covered with some kind of mud or plaster. The picture shows the only house in Machu Picchu where considerable portions of this plaster still remain on the walls (see page 471).

Photo by Hiram Bingham

AN UNUSUAL GROUP OF NICHES: MACHU PICCHU

In this house, or temple, the niches are of unusual form. The picture shows three, each one of which contains three little niches, and also has devices whereby it could have been closed by a bar fastened to the corner stones.

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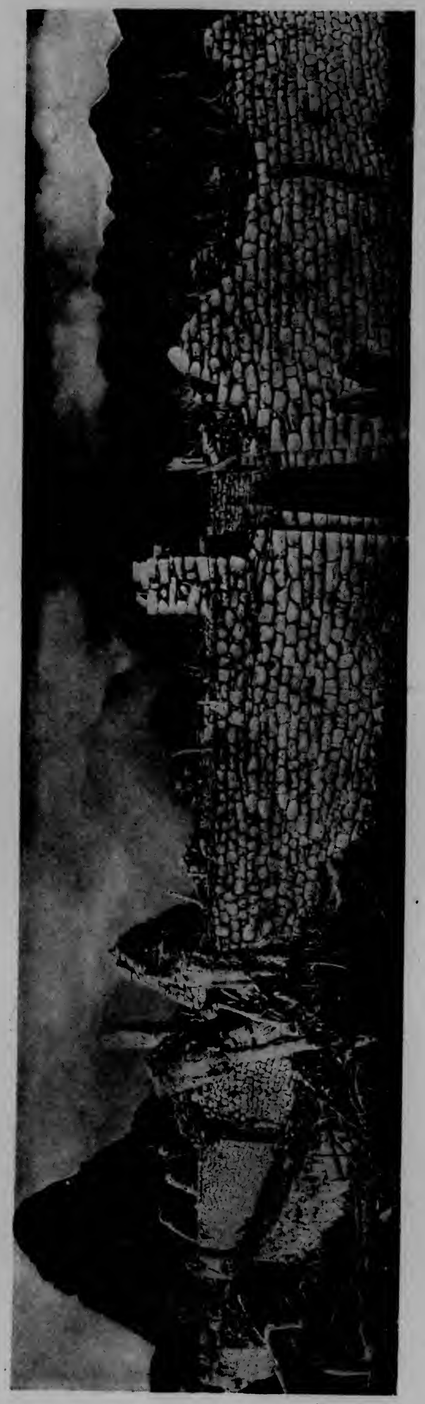

Photo by Hiram Bingham

TYPICAL HOUSES AT MACHU PICCHU

This picture shows a part of the east portion of the city and the entrances to clan groups (see text, pages 459 and 464). One of the principal streets in the city runs along the terrace just outside the walls of the houses

the city was at one time divided into wards or clan groups (see page 468). Each one of these groups has but one entrance, a gateway furnished with the means of being solidly fastened on the inside. None of the doors to houses or temples have this locking device, but all the entrances to the clan groups have it, and the same device occurs in the principal gate to the city.

INGENIOUS BOLTING OF THE GATES TO THE CLAN GROUPS

The doors have disappeared, but probably consisted of rough-hewn logs of hard wood. They seem to have been fastened by two bars crossed at right angles. The upright bar was probably tied at the top to a ring-stone set in the wall and projecting from it above the stone lintel of the doorway (see page 465). It could have been fastened at the bottom by being set into a shallow hole in the ground. The cross-bar was lashed to stone cylinders about 6 inches high and 3 inches in diameter, set into lock-holes in the door-posts (pp. 466-7).

This ingenious device varies in different groups, but in general the principle is the same. The more common method of making these locks was to cut a hole out of the top or corner of one of the larger blocks in the door-posts and set the stone cylinder into saucer-shaped depressions below and above. Thus the cylinder would be so firmly keyed into the wall that it would be able to resist at least as much pressure as the hardwood cross-bar which was lashed to it.

Each one of the clan groups has certain distinctive features. In one of them, characterized by particularly ingenious stone-cutting, the lock-holes were cut in the center of solid granite rectangular blocks (see pages 470, 471). The picture on page 471, taken after the top block had been removed, shows the saucer-shaped depression cut into the upper stone. It also explains how the ingenious architect had carved the cylindrical block and the

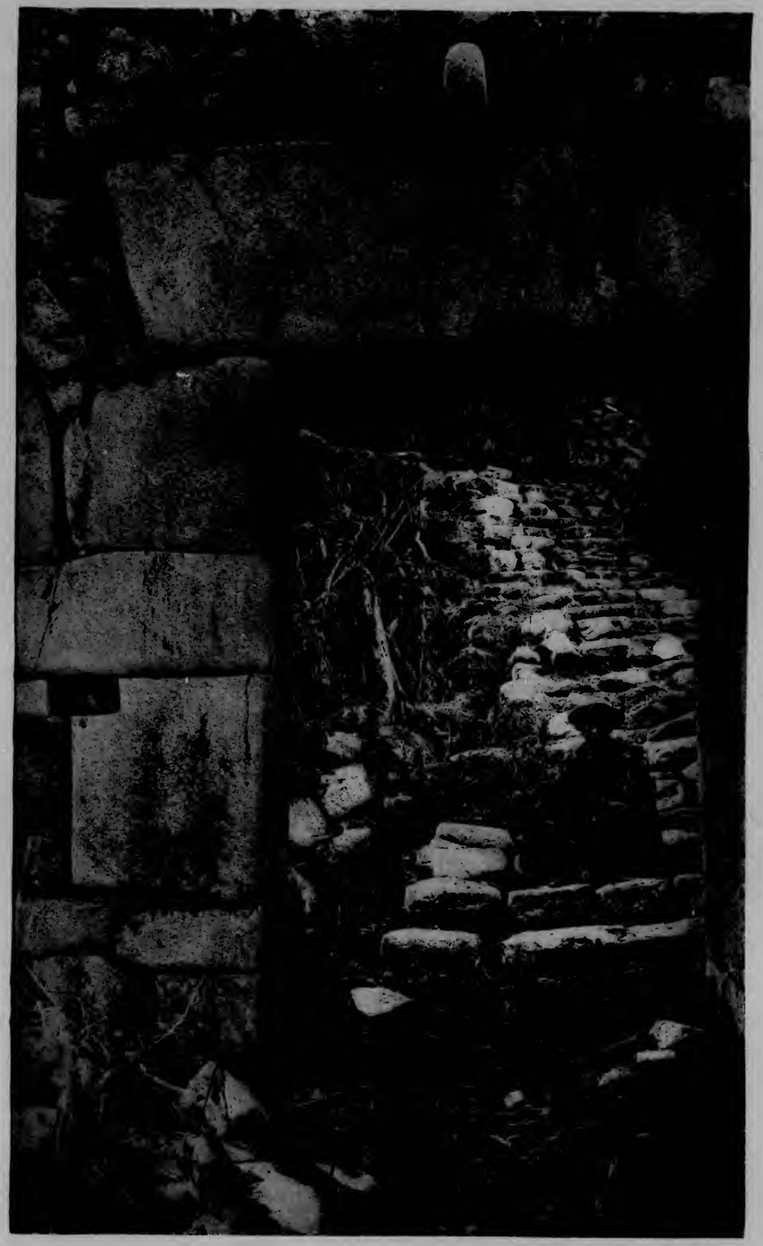

Photo by Hiram Bingham

THE CITY GATE: MACHU PICCHU

The doors to the houses had apparently no means of being fastened, but the entrances to the clan groups and the main city gate, whose interior is here shown, had lock-holes containing granite cylinders to which a strong bar could be fastened back of the gate (see pages 466 and 467). The ring-stone above the stone lintel at the top of the picture was used to secure the upright bar (see pages 464 and 466).

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Photo by Hiram Bingham

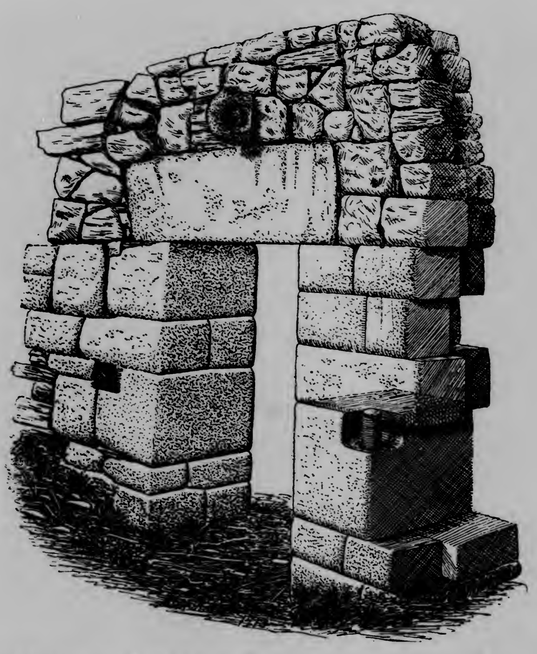
THE LOCK IN THE CITY GATE: MACHU PICCHU

A nearer view of one of the lock-holes in the east door-post of the city gate shown on page 465

Photo by Hiram Bingham

A DETAIL OF THE CITY GATE: MACHU PICCHU

Above the gate and fastened into the wall above the stone lintel was a ring-stone from which the gate might have been swung, or to which one of its fastenings might have been secured.



THIS DRAWING OF A SECTION OF THE CITY WALL AND THE CITY GATE SHOWS HOW THE STONE CYLINDERS (SEE PAGE 466) WERE SET INTO THE GATE-POSTS

AN IMAGINARY DRAWING SHOWING HOW THE CITY GATE MIGHT HAVE BEEN CLOSED (SEE PAGES 464-466)

Photo by Hiram Bingham

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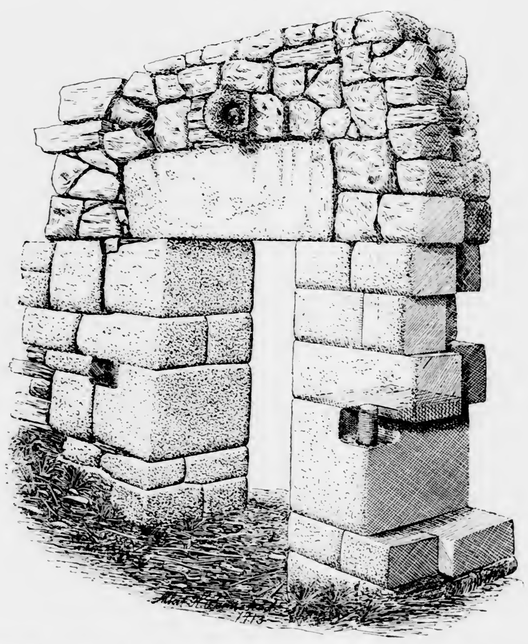

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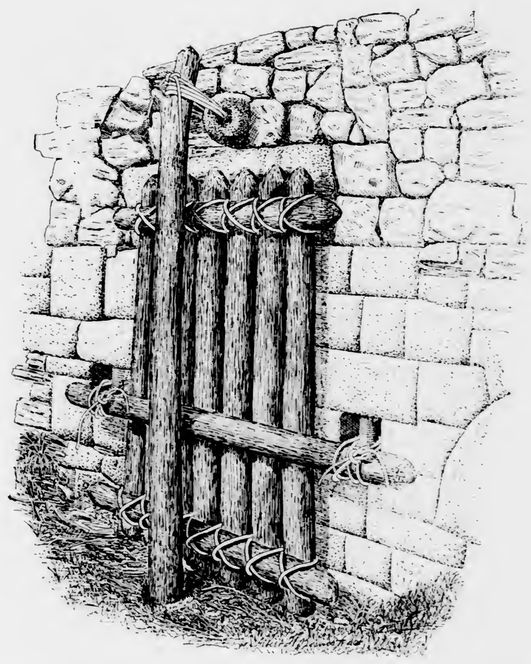

AN IMAGINARY DRAWING SHOWING HOW THE CITY GATE MIGHT HAVE BEEN CLOSED (SEE PAGES 464-466)

Photo by Hiram Bingham

ONE OF THE WARDS OR CLAN GROUPS INTO WHICH THE CITY WAS ONCE DIVIDED (SEE PAGE 464)

The city of Machu Picchu was occupied by various clans or family groups. Each one of them has from six to ten houses, and each group of houses is characterized by some peculiarity. In the case of the group shown in the picture, this peculiarity consists of particularly ingenious stone-cutting, examples of which are shown in the pictures on pages 471, 472, 473, 474, etc.).

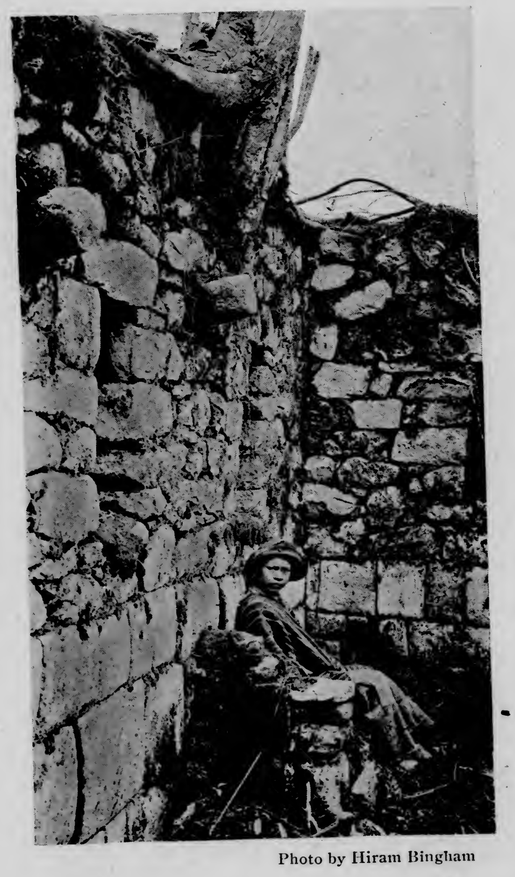

Photo by Hiram Bingham

A STONE SETTEE: MACHU PICCHU

It is not probable that the houses had much furniture, but in some cases there are raised stone platforms which were possibly used for beds, and in a few instances there are stone seats in the corners of the house, as shown in this picture.

Photo by Hiram Bingham

MONOLITHIC KITCHEN UTENSILS: MACHU PICCHU

In the largest house of this "Ingenuity Group," mortars which could be used for grinding corn or frozen potatoes were carved out of boulders in the floor of the room. Lying near one of these was found the original rocking pestle still in use throughout the Andes of Peru. The boy has placed it on the mortar just as he would do if he were starting to make corn meal today.

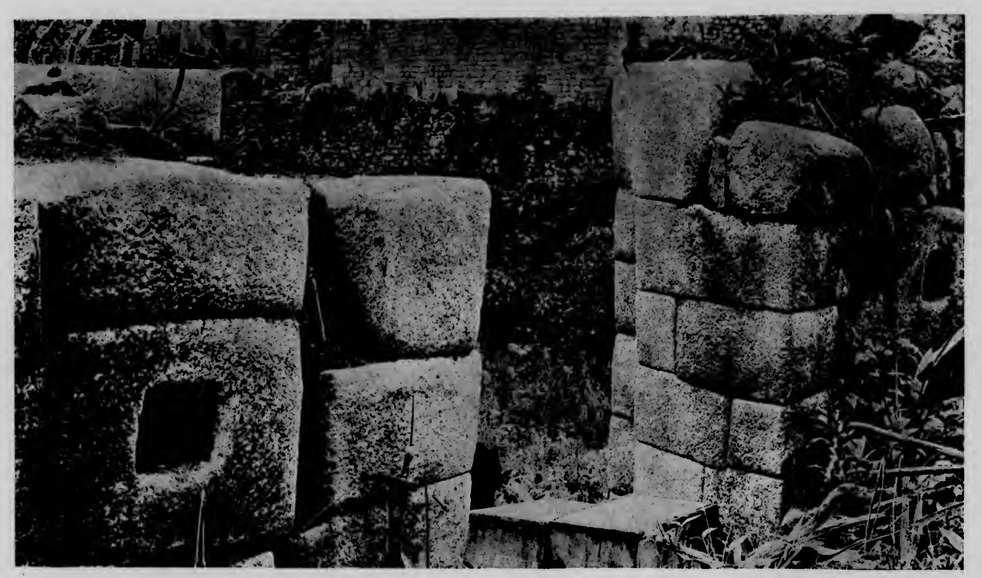

Photo by Hiram Bingham

THE MOST INGENIOUS LOCK IN MACHU PICCHU

The gateway to Ingenuity Group had lock-holes differing from those of other groups (see pp. 464, 466-467), in that they were cut out of single blocks of stone and had the stone cylinder not set into, but forming part of the whole block (see also page 471).

Photo by Hiram Bingham

A TYPICAL HOUSE DOOR: MACHU PICCHU

The doors of the houses were carefully made and are all narrower at the top than at the bottom. The lintels are usually made of two blocks of stone. The Indian boy in the picture is carrying the kodaks and a large map, in ten sheets, on which are shown all the houses.

lock-hole all out of one piece, thus making it much stronger than the average.

Granite boulders in the floor of the principal house in this group had their tops carved into kitchen utensils for grinding corn and frozen potatoes (see page 469). In this group also we found the only case of houses lined with stucco or plaster made of red clay (page 463), and here is the only gabled building divided into two parts by a party wall rising to the peak and pierced by three windows.

SOME EXQUISITE STONEWORK

Another group was distinguished by having its own private gardens on terraces so arranged that access to them could be had only by passing through the small collection of houses constituting this particular clan group. In another case, the entrance to a group notable for its very elaborate and exquisitely finished stonework, the upright cylinder in the lock-hole is brought flush with the surface of the stone and is a part of the block itself (see pages 478 and 479).

Another group is distinguished by having monolithic lintels for the doorways (see page 477). In this group also the gables are unusually steep (see page 478).

Nearly all the groups had what seemed to be a religious center, consisting of a more or less carved granite block in position. In several cases caves had been excavated under these rocks, and in one case the cave was beautifully lined with finely cut stonework (483-485). In this last cave a semicircular tower was constructed on the top of a boulder (485 and 496) and connected with it by the finest example of masonry in Machu Picchu (485 and 496).

This beautiful wall, shown on pages 487 and 488 and also on page 490, was made of specially selected blocks of beautifully grained white granite, and was constructed by a master artist. We grew more fond of this wall the longer we knew it, and every time we saw it it gave us a thrill of joy.

The detailed study (p. 488) of where the wall joins the next house wall shows how ingeniously the blocks were constructed, so as to form a brace which would prevent the house and wall from leaning apart and thus causing cracks to appear in the wall. The precision of line, the symmetrical arrangement of the blocks, and the gradual gradation in the tiers, with the largest at the bottom and the smallest at the top, combine to produce a wonderfully beautiful effect.

Photo by Hiram Bingham

THE MECHANISM OF THE LOCK

The left-hand lock-hole, shown in the upper picture on the preceding page, after its stone covering had been raised, showing the saucer-shaped depression in the capstone, enabling it to strengthen the stone cylinder of the lock. It was not only an ingenious, but a patient and devoted workman, who would take the trouble to make such a contrivance for securing himself and his family against intruders.

Photo by Hiram Bingham

THE ENTRANCE TO A CLAN GROUP: MACHU PICCHU

The exterior of the gateway to Ingenuity Group, showing the steps leading to it and the re-entrant angles in the door-posts, characteristic of nearly all the gateways to clan groups.

THE PROBABLE USE OF SNAKES FOR AUGURY

As will be seen from the photograph (see page 491), the wall is not perpendicular, but inclines inward at the top. This angle is characteristic of nearly all the vertical lines in the ruins. Doors, windows, and niches are all narrower at the top than at the bottom.

In the semicircular tower which connects with this fine wall the ingenious cutting of stones in such a way as to follow a selected curve reaches a perfection equaled only in the celebrated wall of the Temple of the Sun (now the Dominican Monastery), in Cuzco. Like that, it is a flattened curve, not round (p. 485).

One of the windows in this tower (see pages 492-494) has several small holes near the bottom. These were found to connect, by very narrow channels, barely large enough for a snake to crawl through, with circular holes within the wall, where the snakes might have constructed their nests.

There are still many snakes at Machu Picchu. There are also snakes carved on several rocks. (page 497). Lizards are not common, and the holes within the wall are much too large for lizards' nests; but they are of the right size for a comfortable snake's nest—for a small snake. It seems to me possible that in this wall the priest of this clan group kept a few tame snakes and that he used their chance exits out of one hole or another as a means of telling omens and possibly of prophesying.

The so-called *sacred plaza* is the site of two of the finest structures at Machu Picchu. One of these — the Temple of the Three Windows — has already been referred to; the other is a remarkable structure, about 12 feet in height, built around three sides of a rectangle some 30 feet long and 18 feet wide. A description is hardly necessary, as a better idea can be gained from the pictures (pp. 409, 501, 502, 503, and 512) than from any words of mine. Suffice it to say that it is marked by a very pleasing symmetry, by the use of tremendous blocks of granite, three of them being over 12 feet in length, and by the projection in an obtuse angle of the ends of the sides.

"THE PLACE TO WHICH THE SUN IS TIED"

On top of the beautifully terraced hill (pp. 498, 507, 508), behind this temple, is a stone, generally agreed to be an *intihuatana* stone, or sun-dial—the intihuatana being the "place to which the sun is tied." Similar stones were found by the Spanish conquerors in Cuzco, Pisac, and Ollantaytambo. An idea of this stone may be gained from the picture on page 509.

Photo by Hiram Bingham

A REST DURING PRELIMINARY CLEARING: MACHU PICCHU

A corner of Ingenuity Group, showing the entrance on the left to a subsidiary group and on the right to the house that has the stone mortars in its floor (see page 469)

Owing to the location of Machu Picchu in this extremely inaccessible part of the Andes, to its clearly having been a city of refuge, easily defended and suited for defensive purposes; owing to the presence of a large number of windows in the ruins, and particularly to the presence of three large windows in one of the principal temples, I believe it to have been the original Tampu Tocco, from which the Incas came when they started on that migration which led them to conquer Cuzco and to establish the Inca Empire.

The difficulties of life for several centuries in the Vilcabamba region would have been likely to have developed this ingenious and extremely capable race and given them strength of character. The influence of geographical environment is no small factor in developing racial characteristics. I hope at no distant future to prepare an exhaustive report of this wonderful city, whose charm can only dimly be realized from these pictures.

The beautiful blue of the tropical sky, the varying shades of green that clothe the magnificent mountains, and the mysterious charm of the roaring rapids thousands of feet below cannot be portrayed and can with difficulty be imagined.

THE PANORAMIC VIEW

The beautiful panoramic view of Machu Picchu, which accompanies this article as a Supplement, gives a good idea of the grand Cañon of the Urubamba as seen from Machu Picchu, of the sacred Plaza, and Intihuatana Hill, and of the East City.

Unfortunately, it was impossible to take a picture that would also include the other half of Machu Picchu, including the remarkable Upper City, with its rows of houses, each one on a separate terrace, the beautiful buildings of the Princess Group, and the splendid stonework of the King's Group. All of these are behind and to the right of one looking at this panorama. And still further behind are the agricultural terraces, our camp, and Machu Picchu Mountain; but these are all shown in separate views.

The Incas were, undeniably, lovers of beautiful scenery. Many of the ruins of their most important places are located on hill tops, ridges, and mountain shoul-

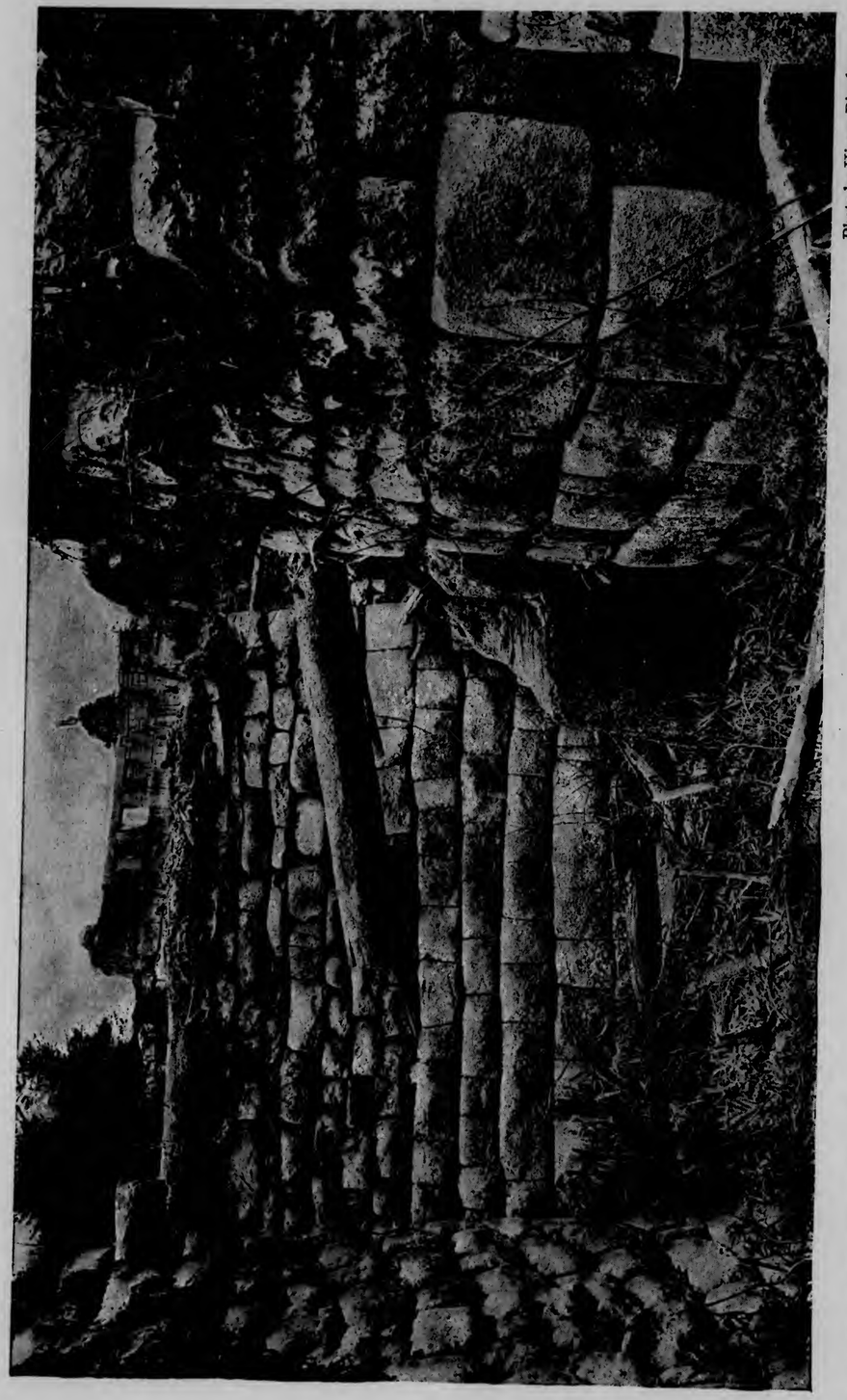

Photo by Hiram Bingham

A VIEW IN THE CENTER OF INGENUITY GROUP LOOKING ACROSS THE GARDENS TOWARD THE SACRED PLAZA AND THE TEMPLE OF THE THREE WINDOWS

Photo by Hiram Bingham

A DISTANT VIEW OF OUR FIRST CAMP: MACHU PICCHU

A view looking over the tops of two of the houses of Ingenuity Group toward our camp and some of the agricultural terraces. The beams on top of one of the houses were placed there recently by one of our Indians, who thought this might make a good modern dwelling, but he found it too large for comfort. The huts of the modern Indians are much smaller than these houses and have no windows. It is possible that this may indicate that the climate has grown colder as well as dryer.

Retake of Preceding Frame

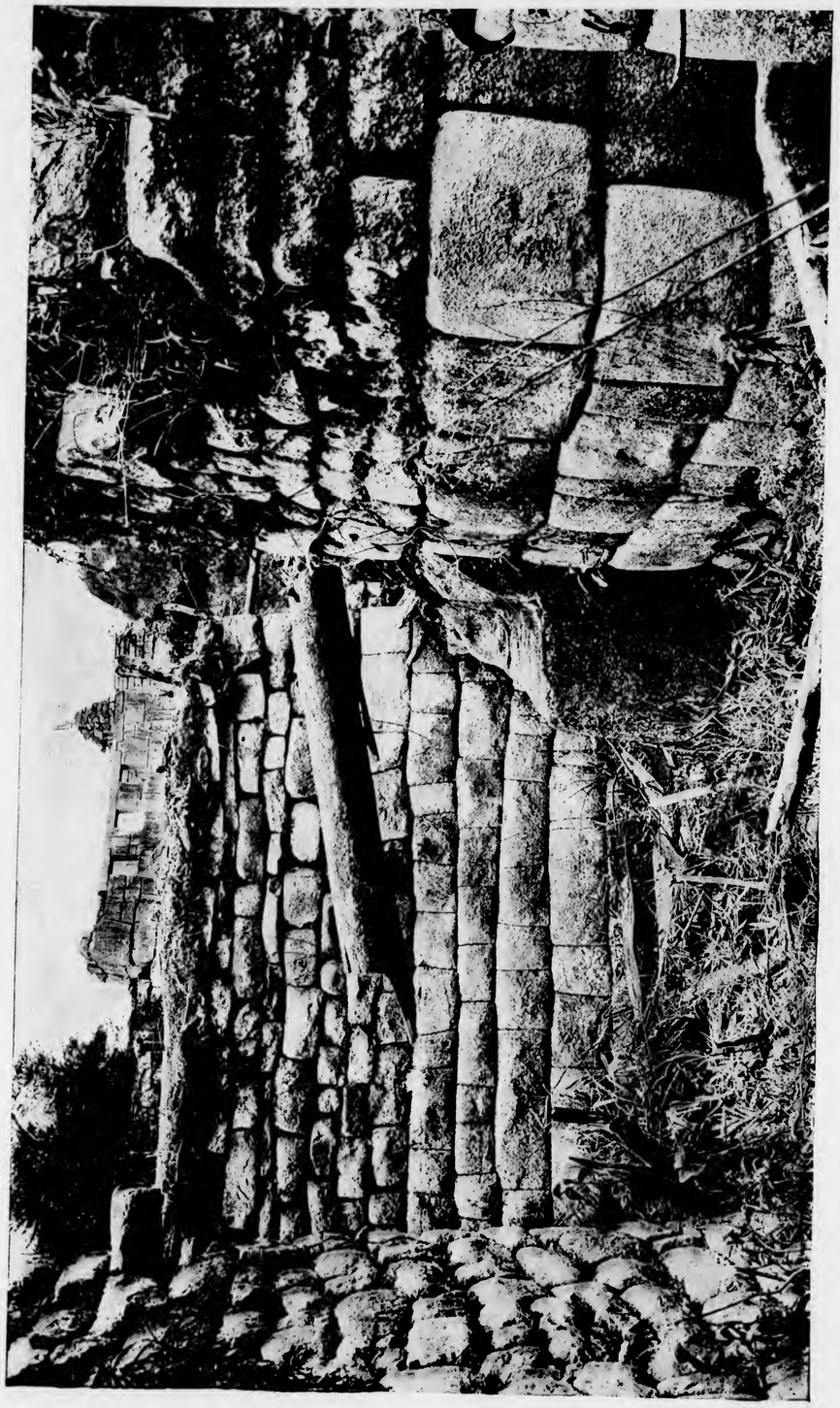

Photo by Hiram Bingham

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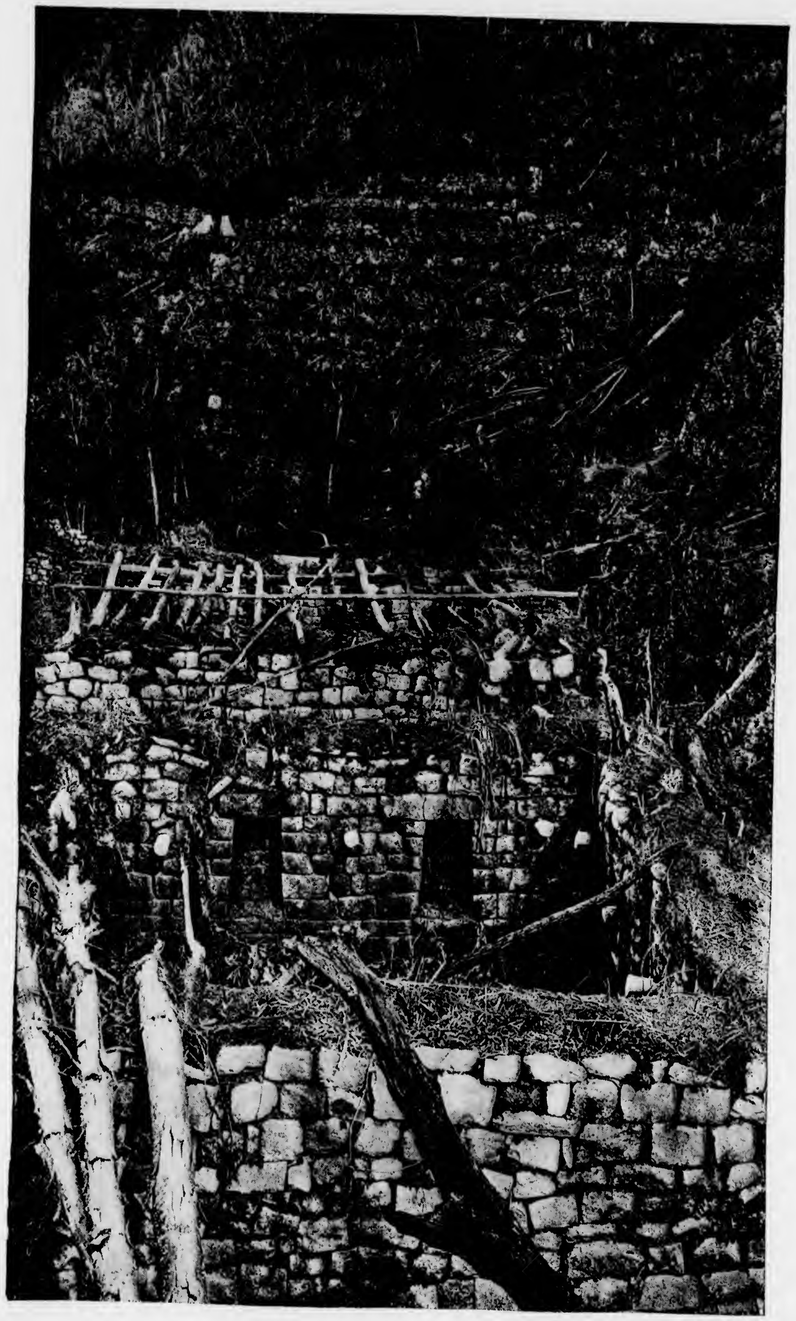

Photo by Hiram Bingham

A DISTANT VIEW OF OUR FIRST CAMP: MACHU PICCHU

A view looking over the tops of two of the houses of Ingenuity Group toward our camp and some of the agricultural terraces. The beams on top of one of the houses were placed there recently by one of our Indians, who thought this might make a good modern dwelling, but he found it too large for comfort. The huts of the modern Indians are much smaller than these houses and have no windows. It is possible that this may indicate that the climate has grown colder as well as dryer.

Photo by Hiram Bingham

HAVING DIFFICULTIES WITH A TRIPOD: MACHU PICCHU

A distant view of Ingenuity Group, with Private Garden Group above it, as seen from the vicinity of the semicircular tower. In taking these pictures, it was frequently necessary to put the tripod on the shaky peak of a ruined gable, a process not always easy.

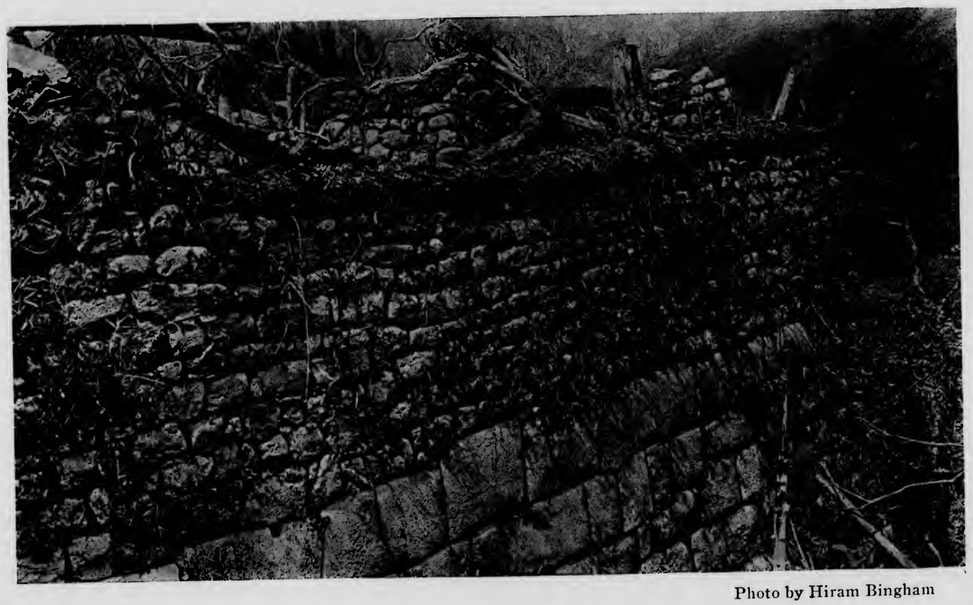

Photo by Hiram Bingham

TYPICAL MASONRY: MACHU PICCHU

The outside wall of another group which was distinguished by having its own private gardens on terraces so arranged that access to them could be had only by passing through the houses of the group. These houses are built on a terrace whose retaining wall consists of large blocks of solid masonry. The smaller wall on top of this is merely a screen for defensive purposes. Notice the end of the stone conduit in the lower left-hand corner, enabling the courtyard of this group to be properly drained.

ders, from which particularly beautiful views can be obtained.

Remarkable as is the architecture of Machu Picchu, and impressive as is the extent of the stone-cutting done by a people who had no steel or iron tools, neither of these things leaves more impression on the mind of the visitor than the inexpressible beauty and grandeur of the surroundings.

A reconnaissance of the forestration of the immediate vicinity and a large scale map of Machu Picchu and its vicinity were made by Assistant Topographer Stephenson. From the map we hope some day to be able to construct a model which will give those not fortunate enough to visit this marvelous place some idea of its character and beauty.

FORESTRATION OF THE REGION

In regard to the forestration of the region, Mr. Stephenson reports that tree-growth begins about midway between the source and the mouth of the Urubamba River. Forests frequently interrupted by open areas occupy the lower half of the valley. The open bottoms are moist, untimbered, and used for agriculture. In these the soil is a deep sandy loam, rich in humus and having abundant moisture.

The valley is very narrow, with many tributaries, and rough precipitous sides frequently broken by cliffs. The lower slopes have fairly rich soil and abundant moisture. They extend for several hundred feet above the river. Above them the soil is regularly dry and poor. Although rainfall is abundant, the sunny north slopes have a dry rocky soil.

The forest in the Machu Picchu region is made up of subtropical hardwoods, with probably more than 30 species in the stand. Good growth is confined to the valley bottoms and the lower slopes. On the shaded slopes the forest sometimes extends to a point 2,000 feet above the river, and in narrow, protected valleys even higher; but on the upper slopes the trees are of poor form, gnarled and stunted.

On the ridges some trees occur, but they are very scrubby and do not form a canopy. Timber-line here is at elevation of about 10,000 feet above sea-level. The elevation of the river near Machu Picchu is about 6,500 feet above sea-level.

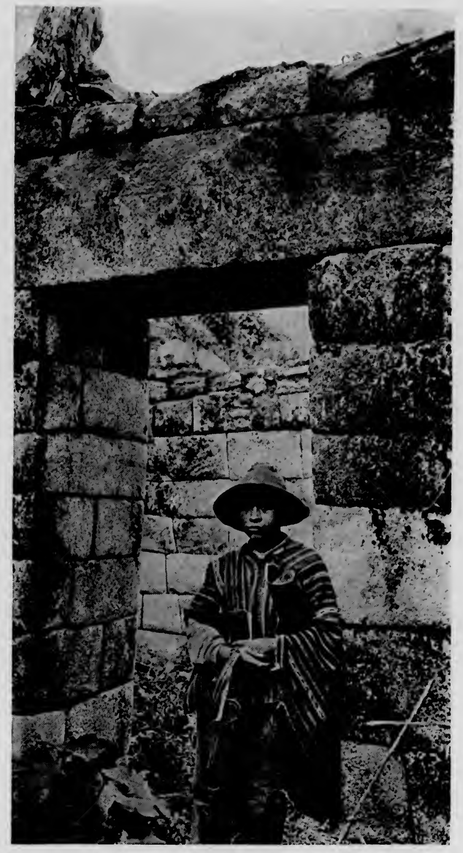

Photo by Hiram Bingham

THE FINEST DOORWAY AT MACHU PICCHU

One of the monolithic lintels in the group distinguished also by having unusually steep gables. In the other groups the houses almost invariably had duolithic lintels, but the chief of this clan determined to overcome the mechanical difficulties involved in placing a solid block weighing three tons on top of his doorpost and fitting it accurately to them. As he had neither cranes nor pulleys, but only levers and inclined planes, it must have required a prodigious amount of patient effort. This group we named the King's Group on account of the extraordinary solidity of the stonework.

Owing to the large number of species, the quality of the timber varies greatly. Many of these species produce hard, durable wood of fine texture that takes good polish. Other quick-growing species produce woods of inferior quality—soft, brittle, quickly decaying, and of little value for anything but rough lumber.

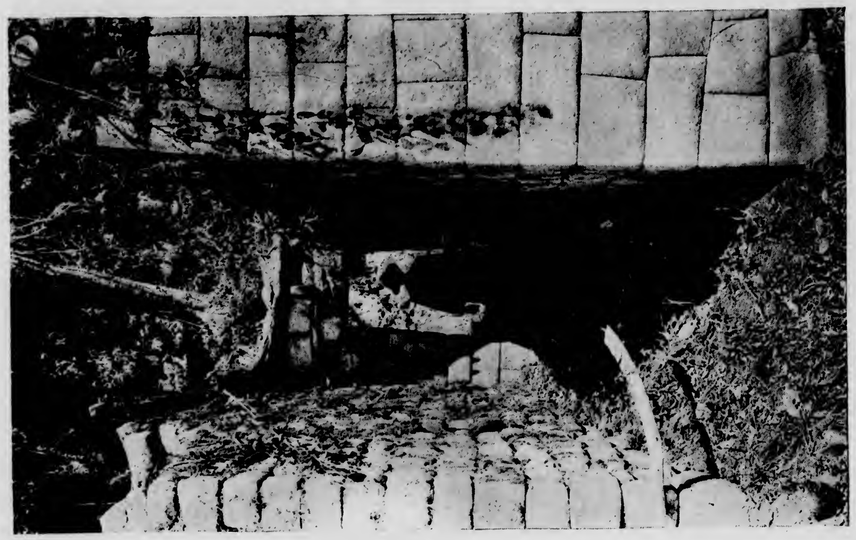

Photo by Hiram Bingham

AN ATTRACTIVE CORNER: MACHU PICCHU

The entrance hallway to the Princess Group, showing the interior of the gateway, where the upright cylinder in the lock-hole is brought flush with the surface of the door-post (see also following page).

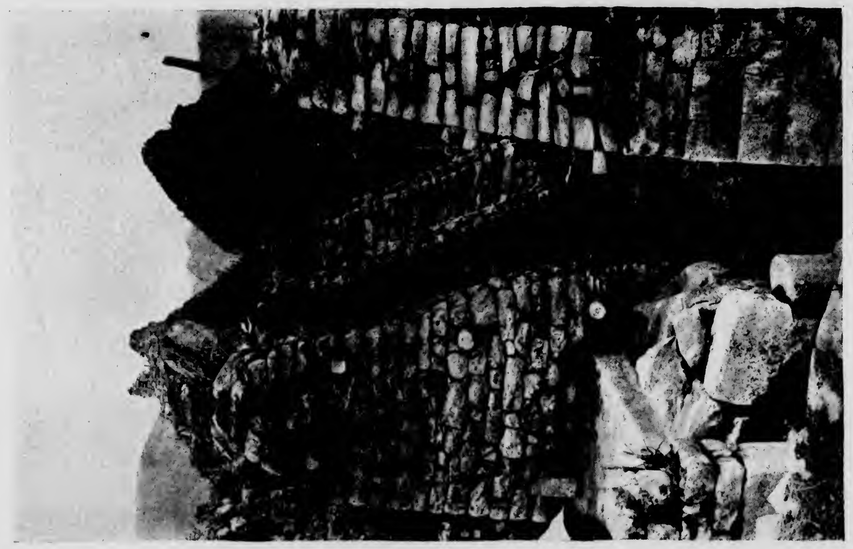

Photo by Hiram Bingham

STEEP GABLES AT MACHU PICCHU

The steep gables of the King's Group are, with the monolithic lintels, the distinguishing characteristic of this collection of houses

Photo by Hiram Bingham

THE SAME AFTER EXCAVATING

Another view of this hallway after excavation had shown a monolithic stairway at the end of it

Photo by Hiram Bingham

IN THE KING'S GROUP: MACHU PICCHU

A portion of the interior of this group, showing the great care exercised in the stone-fitting

NOTES ON THE TIMBER

All species are infected with parasites and all ages of trees seem to be subject to them. The worst damage is done to the fast-growing young trees.

In the bottoms the trees are tall, clean, and straight, running up to over 100 feet in height and 3 feet in diameter. The average is about 18 inches in diameter and 80 feet in height. On the lower slopes the growth is more uniform, with a slightly lower average size. There are a few healthy patches of timber, but they are only of occasional occurrence and limited to a few areas.

The timber in the valley bottoms averages 5,000 board-feet per acre, with a maximum of 10,000 over limited areas. On the slopes the average is 3,000 board-feet, with little variation. These are conservative ocular estimates.

The rugged character of the country makes logging of any but timber in bottoms impracticable. Trails are few and very bad; labor is scarce and uncertain. Should a railroad enter the valley as planned it will be possible to carry on profitable logging operations with portable mills. There is a good supply of timber for ties.

The next thing to be done would be to make a collection of samples, so that the qualities of the various hardwoods might be tested. Such tests would bring out definite facts about their value. Some of them are undoubtedly woods of high technical qualities as well as of beautiful grade and color.

Mr. Stevenson's map of Machu Picchu, the result of a three months' survey, is on a scale of 1 inch = 20 feet, with a contour interval of 10 feet, and consists

Photo by Hiram Bingham

A SACRED ROCK: MACHU PICCHU

Nearly all the clan groups had what seems to have been a religious center, consisting of a granite boulder or ledge carved into seats and platforms

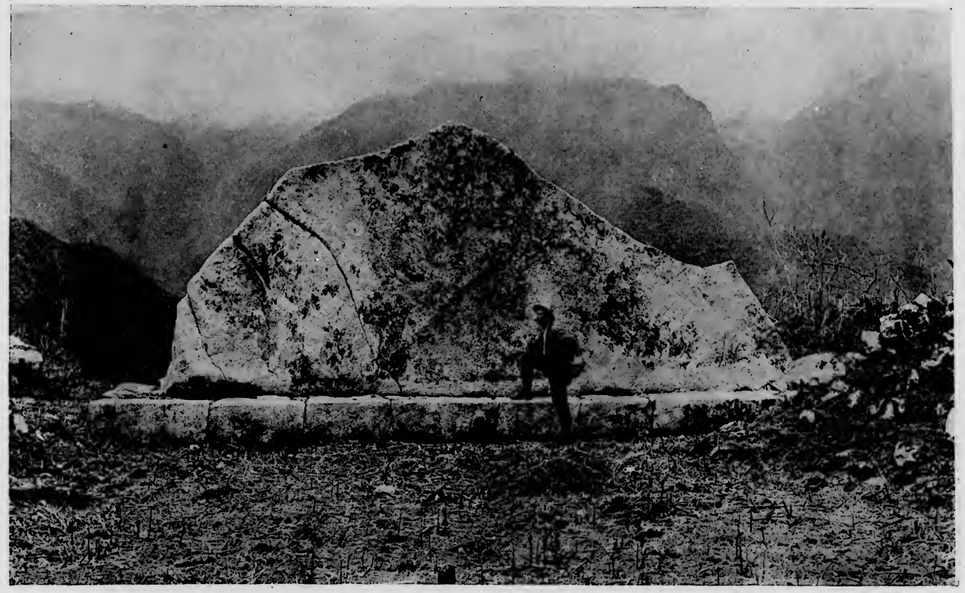

Photo by Hiram Bingham

ANOTHER SACRED ROCK: MACHU PICCHU

One of these sacred rocks is only 2 feet in thickness, although 15 feet high and 30 feet in length (see page 471)

Photo by Hiram Bingham

A SACRED ROCK GROUP SURROUNDED BY TERRACES FACED WITH EXTRAORDINARILY LARGE ROCKS

It must have required a tremendous amount of ingenuity and a small army of laborers to get these huge rocks fitted into place

Photo by Hiram Bingham

THE INTERIOR OF A CAVE UNDER A SACRED STONE: MACHU PICCHU

Under the sacred stones frequently caves were constructed and in some cases lined with beautifully cut stones. This is a flashlight of such a cave underneath the semicircular tower (see page 471, and pictures, pages 484, 485, and 496).

of 16 large sheets. It should prove very useful in helping us to gain a correct idea of this wonderful city, which seems to have escaped the notice of the Spanish conquerors and to have remained practically unknown until it was first visited by the present writer in July, 1911.

OTHER IMPORTANT INCA RUINS

It is still too early to make definite statements in regard to the importance of this discovery; in fact, such opinions can only be passed by archæological experts after the full report of the work at Machu Picchu has been prepared and published. This much, however, can be said in regard to the superiority in extent and interest of Machu Picchu over previously discovered Inca ruins:

The most important Inca ruins heretofore discovered are in the city of Cuzco, the town and fortress of Ollantaytambo, Pisac, and on the islands of Lake Titicaca. There are, besides these, on the coast a number of localities like Pachacamác, Nazca, Ancon, Trujillo, and the country of the Grand Chimu, where the chief interest lies in the extensive findings of mummies, pottery, textiles, and metal ornaments, including gold, silver, bronze, etc. All of these places, however, were known to the Spanish Conquerors, and have been ransacked by treasure hunters from the earliest times.

Cuzco, the most important place of all, was adopted by the Spaniards as their most important city outside of Lima. They entirely remade the city, using large quantities of the ancient Inca walls to build their own palaces and churches. Although the city still has many Inca remains and retains a great charm for the tourist and the archæological student, it is more of a Spanish colonial city than of an Inca city.

The same is partly true of Ollantaytambo. The ruins of Pisac and many others in the vicinity, of which it is not necessary to give an account here, have repeatedly been ransacked by treasure hunters. The long palace at Vitcos, identified in 1911 as the last Inca capital, has been almost completely destroyed by these treasure hunters. Of the 30 beautiful door of cut granite, only two or three remain intact.

Retake of Preceding Frame

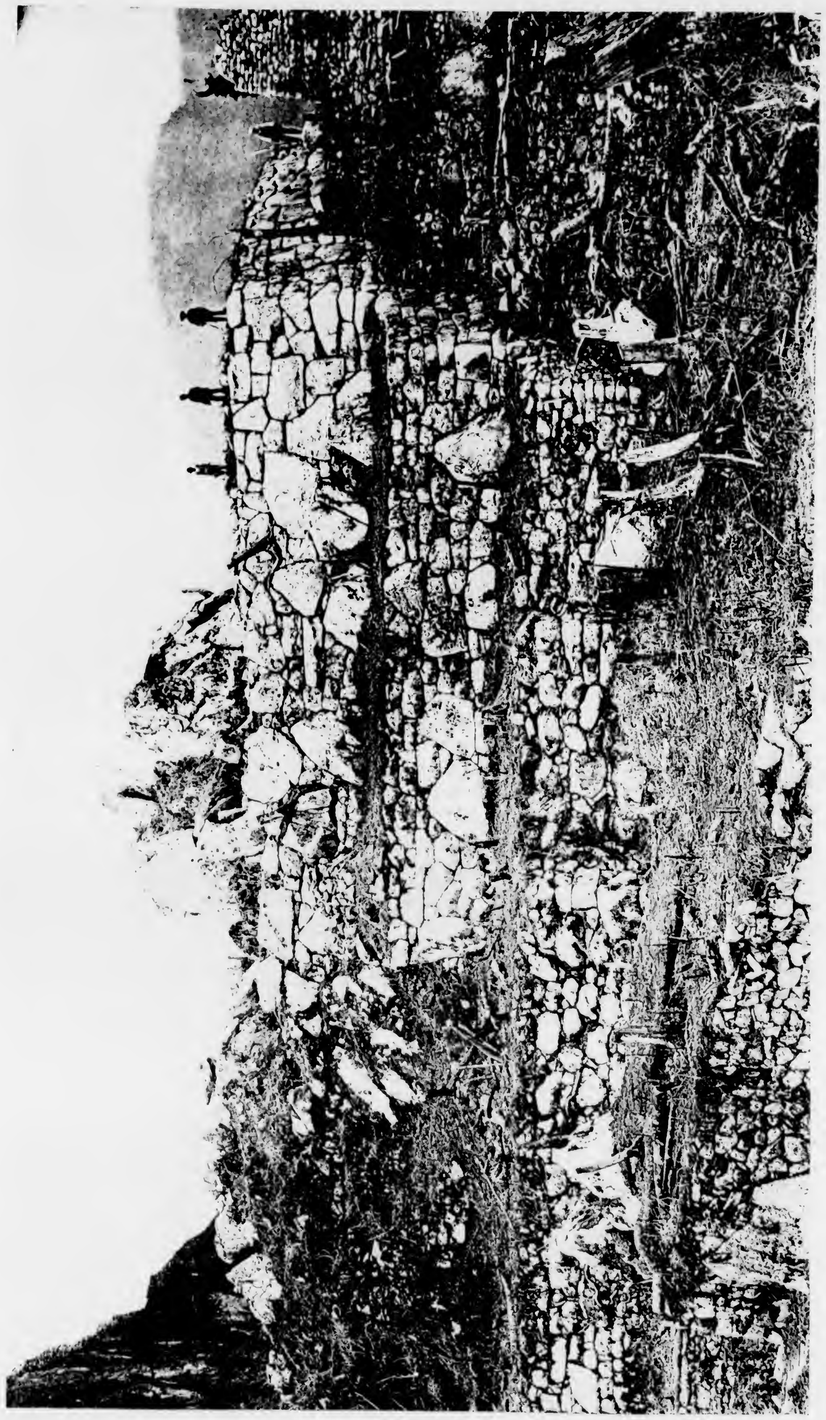

Photo by Hiram Bingham

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Photo by Hiram Bingham

THE CORNER OF THE CAVE

Another flashlight of the interior of the cave under the semicircular tower in the Princess Group

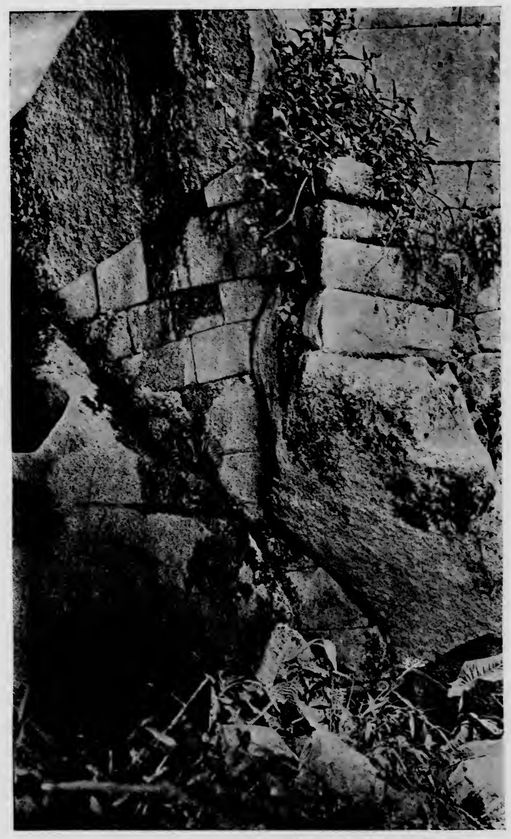

Photo by Hiram Bingham

AN EXTRAORDINARY PIECE OF STONE-FITTING: MACHU PICCHU

The entrance to the cave under the great rock on which rests the semicircular tower (see pages 485 and 496). Notice with what exquisite care and precision the space between the granite ledges has been filled with cut stone.

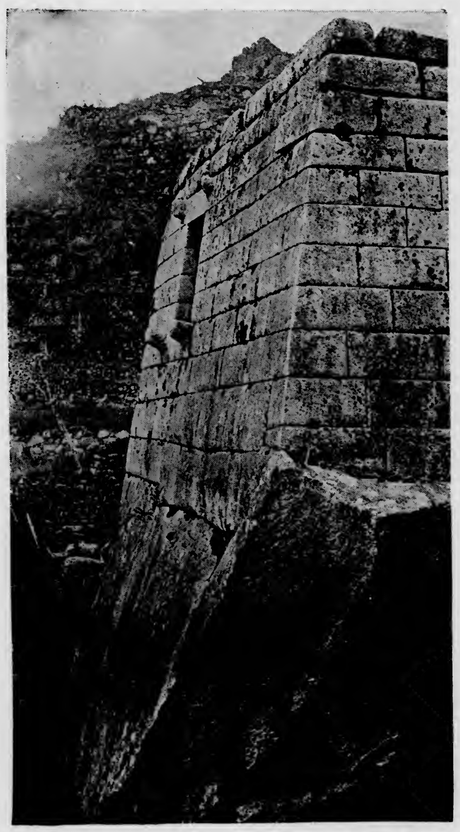

Photo by Hiram Bingham

ART JOINED TO NATURE AT MACHU PICCHU

The semicircular tower of the Princess Group resting on top of and built into a great granite boulder. Notice the precision of the stone-cutting in the little window and the four nubbins that decorate its corners (see text, page 471, and pictures, pages 496 and 484).

Photo by Hiram Bingham

AN EXTRAORDINARY TOWER: MACHU PICCHU

Another view of the semicircular tower of the Princess Group, showing the flattened curve of its architectural plan. The stones were cut with such precision and followed so exactly the selected curve that when they were put together they made a flattened curve whose perfection of detail is equaled only in the celebrated wall of the Temple of the Sun in Cuzco (see also pages 472, 489, and 490).

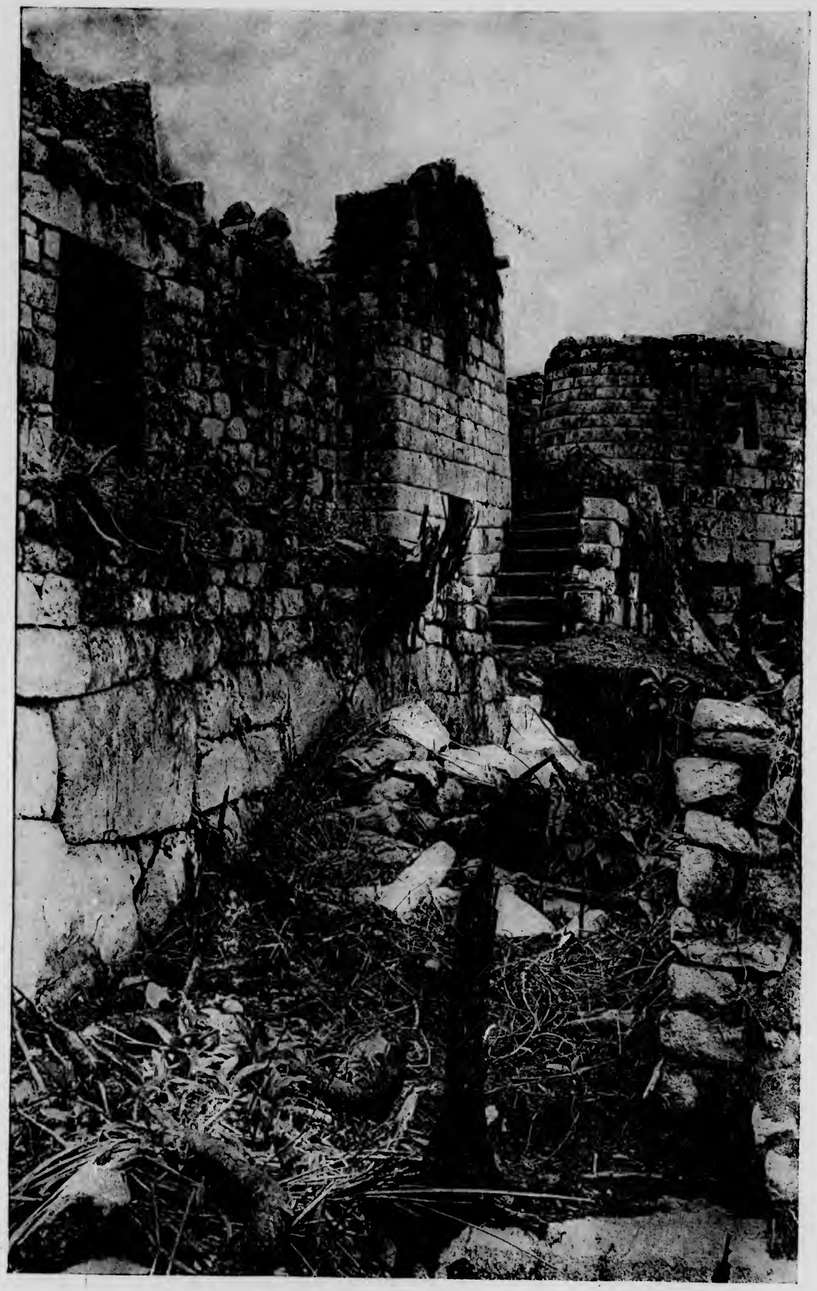

Photo by Hiram Bingham

IN THE PRINCESS GROUP: MACHU PICCHU

A general view of the Princess Group, showing the relation of the semicircular tower (on the right) to the other houses of the group. In the center of the picture is the only house in Machu Picchu consisting of two stories and a half. The stairway shown in the picture connects the first and second stories of this house.

Photo by Hiram Bingham

AN EXAMPLE OF EXTRAORDINARY STONE-CUTTING: MACHU PICCHU

Connected with the semicircular tower is an ornamental wall made of specially selected blocks of beautifully grained white granite. The interior of the wall was ornamented by a series of symmetrical niches, between each one of which is a projecting stone roughly squared (see page 471).

Photo by Hiram Bingham

REMARKABLE NICHES AT MACHU PICCHU

Another portion of the interior of the ornamental wall. Bear in mind that the ancient builders had no T squares nor right lines, and could approach straight lines only by the skill of a trained eye (see also page 488).

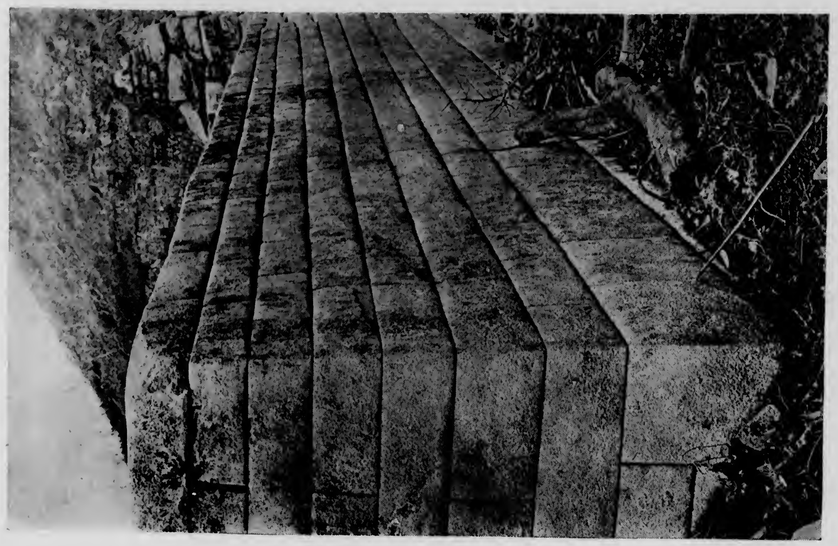

Photo by Hiram Bingham

THE FINEST WALL IN MACHU PICCHU

The exterior of the ornamental wall, the most beautiful wall in Machu Picchu. The tiers of stones gradually decrease in size toward the top of the wall. The utmost care was exercised in selecting the purest white granite, so as to produce an effect like that of the marble temples in the Old World (see page 471).

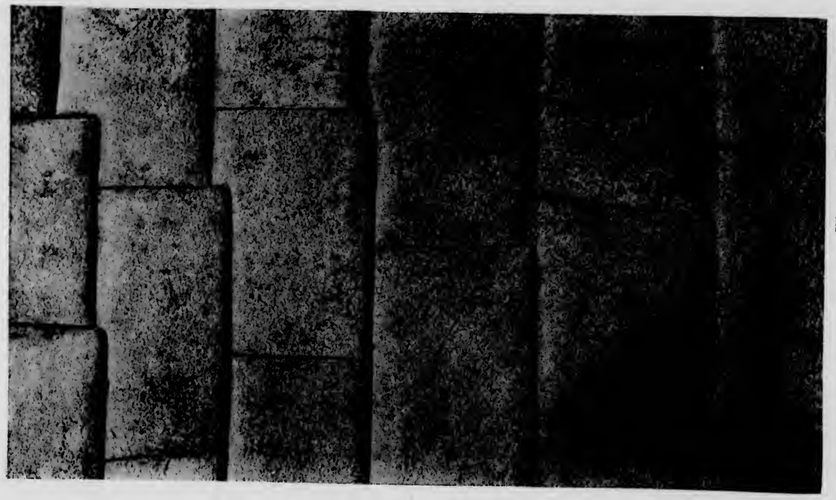

Photo by Hiram Bingham

INGENIOUS STONE-FITTING: MACHU PICCHU

A section of the ornamental wall, showing how ingeniously the joint was made with the next house wall, so as to form a brace which would prevent the house and ornamental wall from leaning apart. Notice the exquisite precision with which each block, after all these centuries in a land where earthquakes are not uncommon, fits snugly into its neighbors. There is no cement nor mortar, and yet there is scarcely a place where a pin can be driven between the stones.

Photo by Hiram Bingham

A SIGHTLY TOWER: MACHU PICCHU

The corner of the Princess Group where the ornamental wall joins the semicircular tower is one of the most sightly spots in the city and commands a magnificent view of the great cañon. Within the tower was a sacred rock, which has been partly destroyed by fire.

WHY MACHU PICCHU IS AN ARCHEOLOGICAL TREASURE

On the other hand, Machu Picchu not only is larger and contains more edifices than any other ruin discovered in Peru (except Cuzco); it has the additional advantage of not having been known to the Spaniards, of not having been occupied by their descendants, and of not having been torn to pieces by treasure hunters seeking within the walls for the gold and silver ornaments that were not to be found in the floors.

In other words, Machu Picchu is not only more extensive than any previously discovered Inca city outside of Cuzco, but it is in a remarkably good state of preservation, and its architecture has not become confused with Spanish efforts to build churches and villas.

If the theory here propounded is correct—that Machu Picchu was the original "Tampu Tocco," from whose "three windows" set out the tribes that eventually founded Cuzco—the importance of Machu Picchu as the cradle of the later Inca race will, of course, be increased.

It is not very profitable to speculate on the habits of these ancient people until we have had more opportunity to study the finds made in the burial caves and to compare these with finds made in other parts of Peru. We know that they were masters of the art of stone-cutting.

We know that they knew how to make bronze, and that they had a considerable artistic sense, as evidenced by their workmanship. One of the bronze pins found at Machu Picchu has for a head a miniature reproduction of the head of a humming-bird, including a long, curved bill. One bronze knife is decorated with the head of a llama; another with an Indian boy, lying on his stomach, with his heels in the air, playing tug-of-war with a large fish on the end of a little bronze rope.

The workmen of Machu Picchu not only had skill, but originality and ingenuity. Their pottery is varied in form and attractive in its ornamentation. They understood how to plan great architectural and engineering works and to carry them to a satisfactory conclusion.

The soil of the terraces is extremely fertile, and the Incas utilized every square yard of available land within a radius of several miles. The two or

Photo by Hiram Bingham

REMARKABLE MASONRY AT MACHU PICCHU

The semicircular tower and the interior of the ornamental wall looking toward the steep gables of the King's Group and the stairway near Private Garden Group (see page 471)

three Indian families who have been living at Machu Picchu for the past four or five years have had no difficulty in raising good crops of sweet potatoes, corn, peppers, onions, tomatoes, and certain native vegetables unknown in this country. The only difficulty they have found is in keeping down the superabundant tropical vegetation, which constantly threatens to suffocate their crops.

As an instance of how rapidly this vegetation grows, terraces covered by bamboo cane which we cleared in September had to be recleared in November, when most of these pictures were taken. In the intervening two months some of the cane had attained a height of five feet.

It is my hope to prepare a special monograph on Machu Picchu for publication by the National Geographic Society.

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DISCOVERY OF THE "CUZCO BONES" IN 1911

Another discovery made in 1911 was of the so-called Cuzco bones. The age of certain human and other bones found interstratified with glacial gravel near Cuzco was provisionally estimated by Prof. Isaiah Bowman, the geologist of the 1911 expedition, as from 20,000 to 40,000 years. These bones were brought to New Haven and submitted for examination to Dr. George F. Eaton, osteologist of the Peabody Museum.

In describing them in an article in the *American Journal of Science* for April, 1912, he says in his conclusion: "It is clear that no proof of great antiquity can be drawn from the characters of the human skeletal parts submitted to me, agreeing, as they do, in all essential respects with the bones of a recent people. Until additional skeletal material is obtained, showing characters more primitive than those already noted, the burden of proof of great antiquity must rest on geological and paleontological evidence."

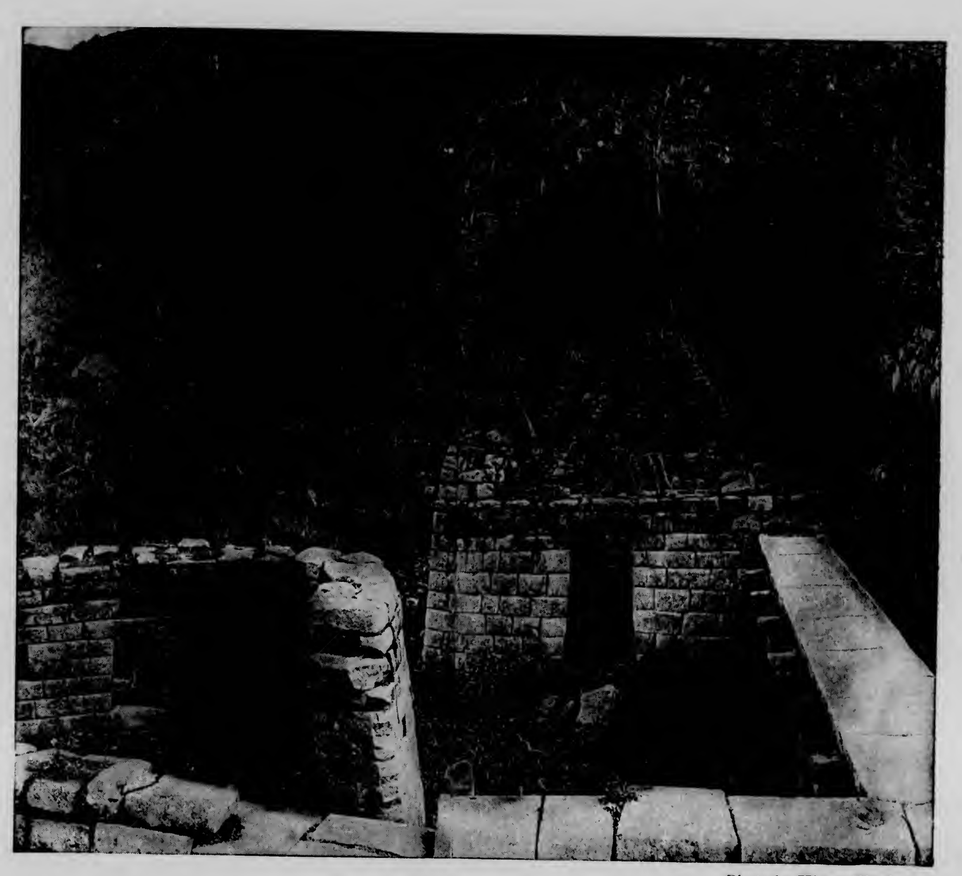


Photo by Hiram Bingham

THE PRINCESS GROUP: MACHU PICCHU

A general view of the ornamental wall and the semicircular tower, together with the second story of the adjoining house, looking toward the principal agricultural terraces and our camp in the distance (see page 471).

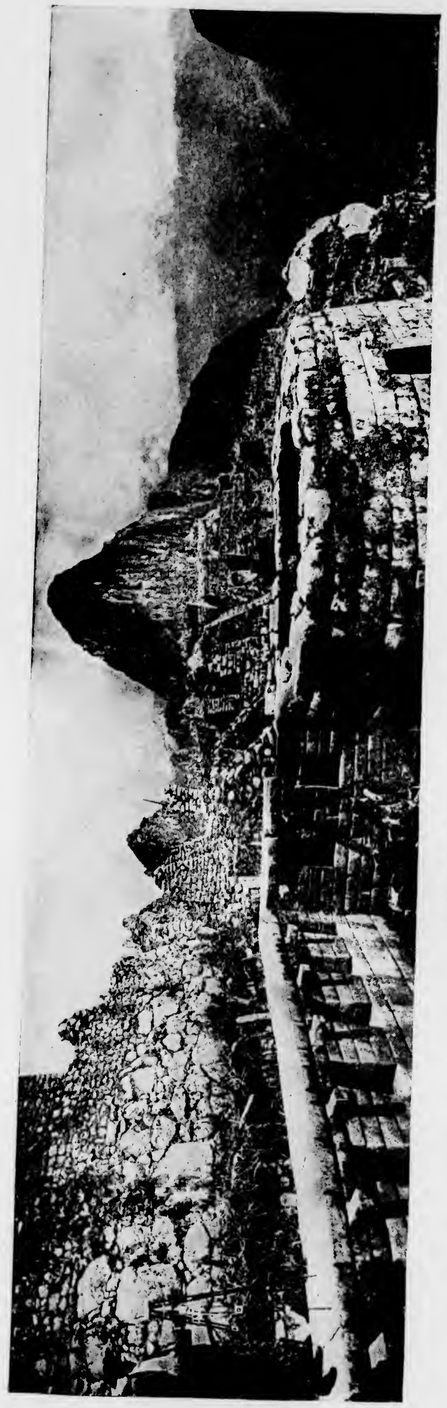
Such geological evidence as we had been able to collect in the limited time at our disposal was presented by Professor Bowman in a paper published at the same time. Professor Bowman had reported several years before finding evidences of man's existence in the central Andes in late Glacial or early post-Glacial times. He was led to believe that the actual remains of man found in the Cuzco basin were embedded in gravels of a still earlier date.

DETERMINING THE AGE OF THESE BONES

In his interpretation of the geological and geographical evidence he reached the conclusion that the beds belonged to a Glacial series, and that the age of the vertebrate remains might be provisionally estimated at from 20 to 40 thousand years.

But he called attention to the weakness of the case, lying in the following facts: (1) that certain of the bones could not be sharply differentiated from those of modern cattle, and (2) that it was within the limits of possibility that the bluff in which the bones were found might be faced by younger gravel, and that therefore the bones had been in gravel veneer deposited during later periods of partial valley-filling.

He experienced grave doubts as to his own conclusions, because we were only



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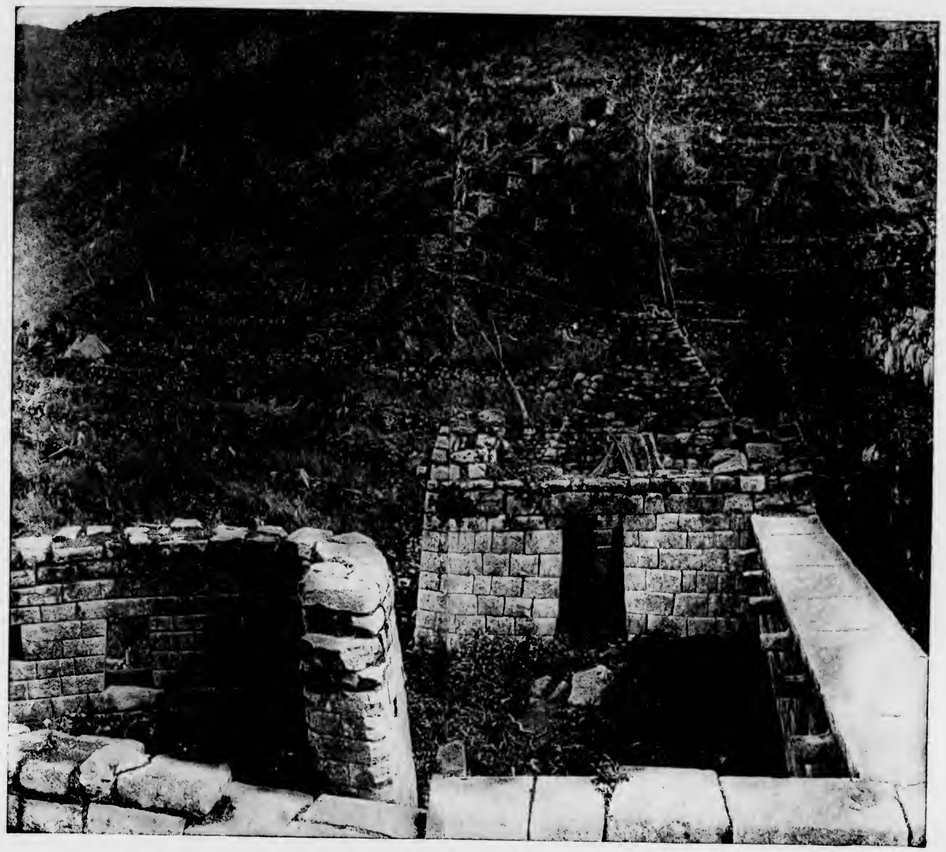

Photo by Hiram Bingham

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Photo by Hiram Bingham

THE SNAKE WINDOW: MACHU PICCHU

In the flat wall of the semicircular tower is a remarkable window containing holes leading to little passages in the wall through which snakes might pass to chambers left inside the wall in which they might have their nests. In the Temple of the Sun, in Cuzco, which is characterized also by having a semicircular building, holes similar to these have also been found, and it is presumable that there are inner chambers also in that wall (see pages 472, 493, and 494).

Photo by Hiram Bingham

WINDOW CLEANING AT MACHU PICCHU

An Indian boy trying to clean the moss off the exterior of the beautifully made semicircular tower

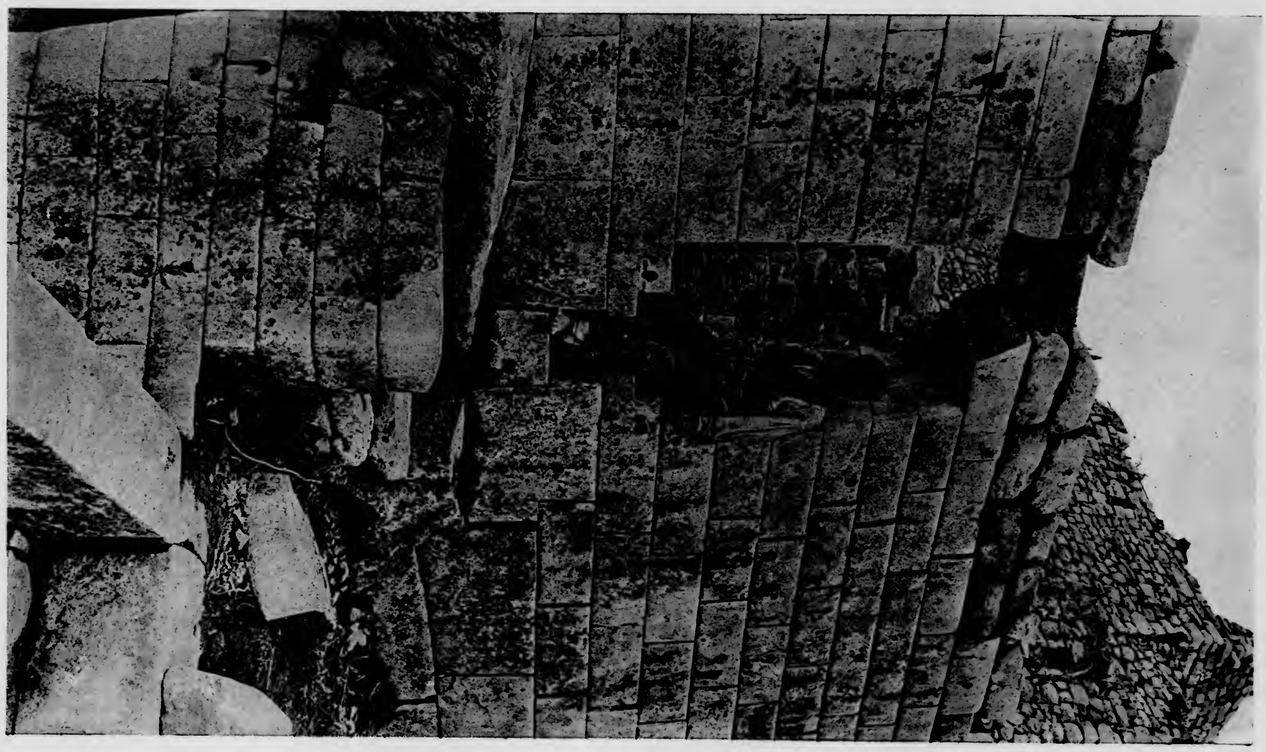

Photo by Hiram Bingham

ANOTHER VIEW OF THE SNAKE WINDOW

Showing very clearly the holes in the wall for the admission of snakes

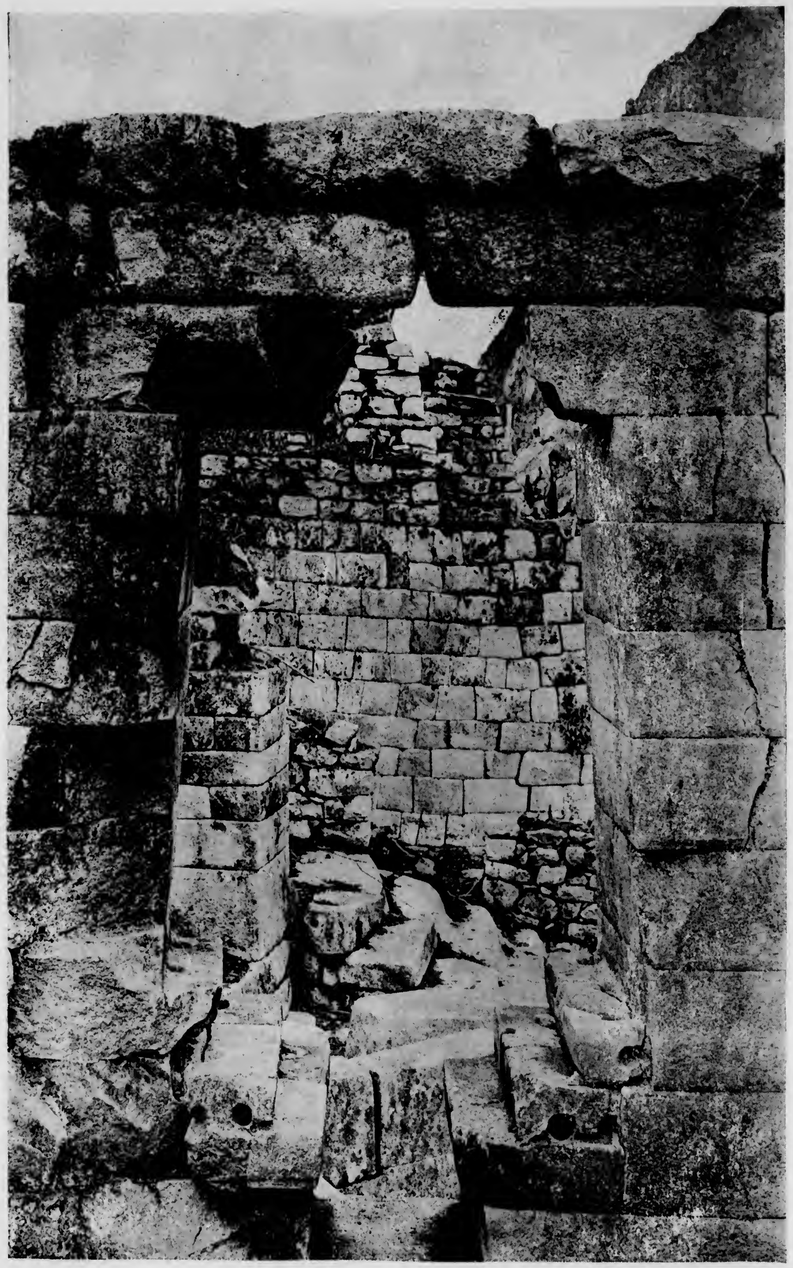

Photo by Hiram Bingham

THE SNAKE WINDOW FROM WITHIN

There were several means of exit from each snake nest, and it is possible that the priest of this temple attempted to fortell the future by noticing from which holes the snakes chanced to come out (see pages 472 and 493).

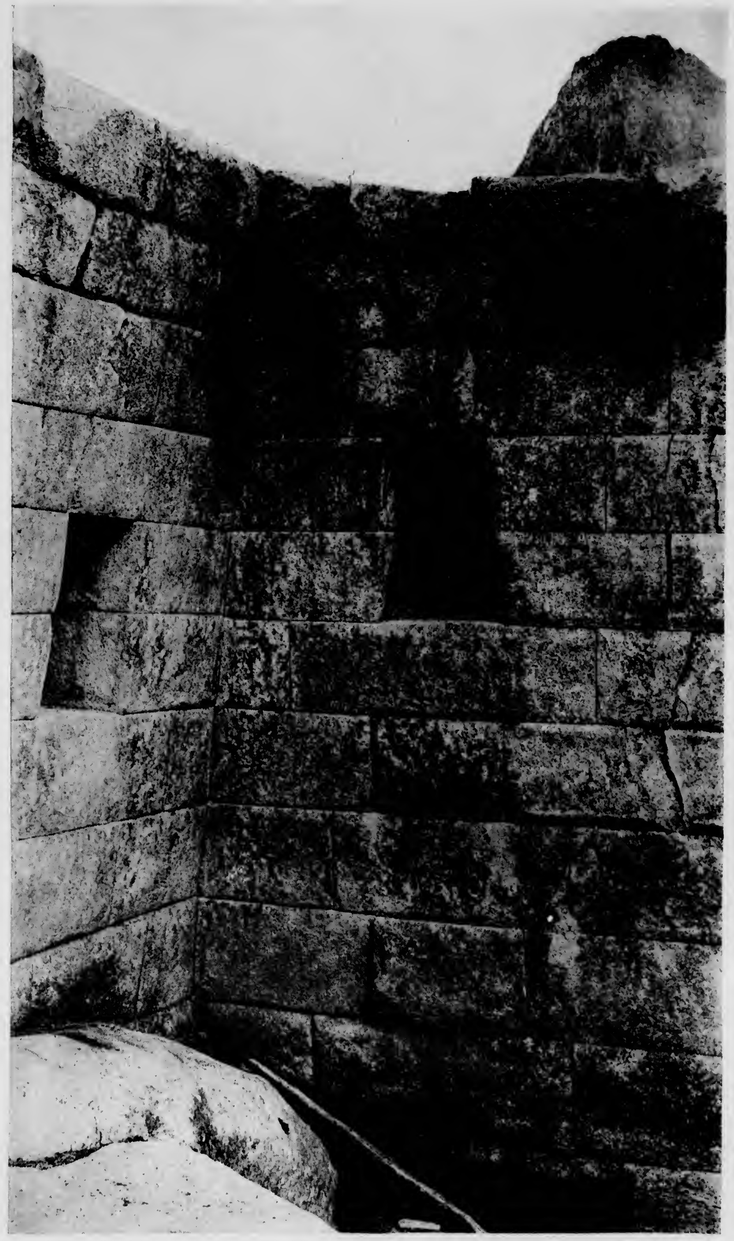

Photo by Hiram Bingham

THE INTERIOR OF THE SEMICIRCULAR TOWER NEAR THE SNAKE WINDOW

The cracks in the walls were probably caused by a great conflagration centuries ago

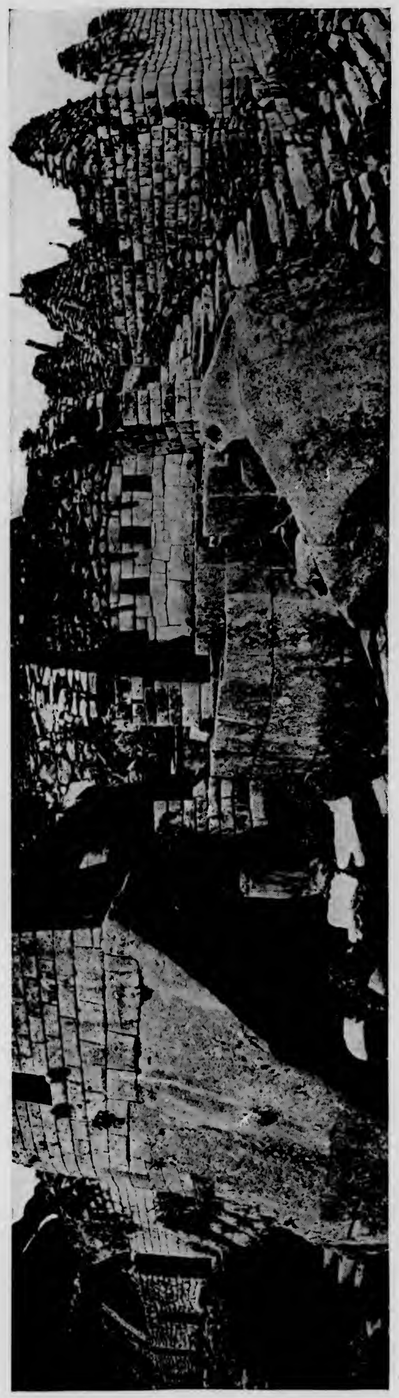

Photo by Hiram Bingham

THE PRINCESS GROUP: MACHU PICCHU

The semicircular tower containing the snake window and its immediate surroundings, showing the principal houses of the Princess Group on the left (see p. 459), the stairway of the fountains on the right (see pp. 486-488), and the King's Group at the extreme right (see pp. 451-453).

able to spend a very few days in Cuzco after the find was made, and concluded his report with these words:

"Further excavation is needed, for the same body of gravels may yield material that will put the conclusions upon a more solid foundation. If later studies should yield evidence in favor of the conclusion that the material belongs to the Spanish period, we shall have still the fact of interstratification as a starting point, and the conclusions based upon that fact will have almost equal interest with the conclusions here stated, as to the Glacial age of the material. Changes of such magnitude indicate a swing of the climatic pendulum but little short of remarkable."

Since further examination of the Cuzco gravel beds and a comprehensive study of their age seemed essential, this was one of the chief objects of the 1912 expedition, and it was with this particular end in view that Professor Gregory and Dr. Eaton were asked to go to Cuzco.

IDENTIFYING THE "BISONIC" BONE

Among the bones Dr. Eaton had noted three fragments of bones belonging either to cattle or bison, whose specific identification was beset with almost insuperable difficulties. After examining skeletal bison remains in various museums and comparing them with these fragments and with similar bones of a number of North American domestic cattle, he found that one of the bones, a fragmentary bovine rib, was of a form which appeared to be characteristic of the bisons and different from the forms seen in North American domestic cattle.

Dr. Eaton had said in his published report: "It cannot be denied that the material examined suggests the possibility that some species of bison is here represented, yet it would hardly be in accordance with conservative methods to differentiate bison from domestic cattle solely by characters obtained from a study of

Photo by Hiram Bingham

SNAKE ROCK: MACHU PICCHU

On top of one of the boulders near the Sacred Plaza there are several snakes carved into the surface of the rock. The carving of snakes on rocks seems to have been common among prehistoric peoples all over the world (see page 472).

Photo by Hiram Bingham

SUN ROCK: MACHU PICCHU

On another curiously broken stone is carved a sun, several small snakes, and a few undecipherable figures

Photo by Hiram Bingham

AN ARCHITECTURAL TRIUMPH: MACHU PICCHU

A general view of the Sacred Plaza, the site of the finest structures at Machu Picchu. In the center is the Chief Temple (see pages 409, 501, 503, and 512), and at the right the Temple of the Three Windows (see pages 408, 409, 416, 417, 418, 431, 474). Above them is the Sacred Hill, on top of which is the Intihuatana stone, or sun dial (see pages 507, 509). Contrast this picture, which was taken in 1912, after months of strenuous work in cleaning the city, with the picture on the following page, which was taken in 1911.

Photo by Hiram Bingham

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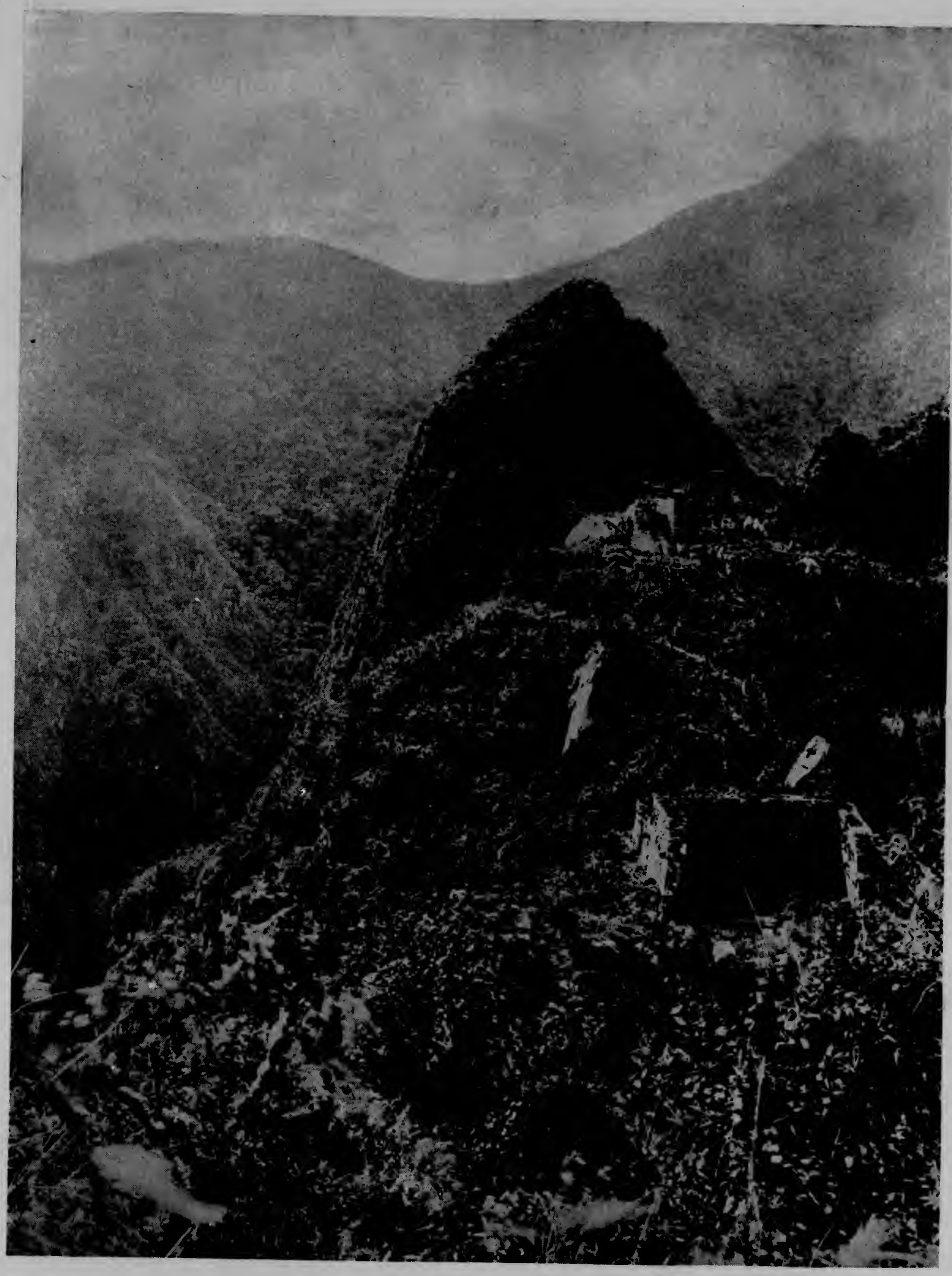

Photo by H. L. Tucker

A PICTURE OF THE SAME PART OF THE CITY OF MACHU PICCHU AS SHOWN IN THE PRECEDING ILLUSTRATION, BUT PHOTOGRAPHED THE YEAR BEFORE

The comparison of these two pictures shows in a very striking manner the immense amount of labor and energy expended by members of the expedition in 1912 in clearing the ruins, so that the members of the National Geographic Society could obtain a good conception of the city (see also page 449).

Retake of Preceding Frame

Photo by H. L. Tucke

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Photo by Hiram Bingham

A CORNER OF THE THREE-WINDOWED TEMPLE

In the walls of the temples on the Sacred Plaza are several extraordinarily large granite blocks. In the hole in the upper left-hand corner of the picture rested one end of the beam which supported the roof on the west side of the Temple of the Three Windows. The women are wives of our workmen. The one on the right was wearing a green skirt with a red waist and blue stripes; the one on the left had on a blue skirt and a red blouse with black dots.

the first ribs of a small number of individuals."

Consequently his first interest on reaching Cuzco was to secure specimen ribs of Cuzco domestic cattle. The very first one that we were able to procure from a local butcher shop told a new story.

Dr. Eaton reports as follows: "The plans for osteological work included the dissection of the carcasses of beef animals reared in the high altitudes of the province of Cuzco. This study revealed the fact that, under the life conditions prevailing in this part of the Andes, and possibly due to the increased action of the respiratory muscles in the rarefied air, domestic cattle can develop first ribs of 'bisonic' form.

There is, therefore, no reason for supposing that the bovine rib found with the human bones in the Ayahuaycco Quebrada in 1911 belongs to some species of bison, and any theory attributing great antiquity to the 'Cuzco man' based on such a supposition is untenable.

VALUABLE SPECIMENS EXCAVATED IN CUZCO VALLEY

"Systematic search in the Cuzco Valley for ethnological and paleontological material was carried on. Laborers were employed and excavations made in the terraces beneath the walls of the Sacsahuaman fortress; in the gardens of the Inca palace near the fortress and among the ruins of the near-by hill called Picchu. Several ancient graves on the hills overlooking the village of San Sebastian were explored. Much valuable material was collected, including human skeletons, belonging presumably to both the historic and prehistoric periods, together with the bones of contemporaneous lower animals, implements and ornaments of stone, bone, metal and shell, and pottery. The so-called "ash deposits" of the city were examined, and specimens were obtained that will probably show that these deposits do not go back of the Hispanic period.

"Two days were spent making a reconnaissance of fossil beds near Ayusbamba [near Paruro], about 30 miles southwest from Cuzco, and the results of this brief visit gave such promise that later in the season another trip was made to this interesting locality in company with the geologist and two topographers. Although the locality had already been visited several times by amateur collecting parties, it was still possible to obtain a considerable amount of vertebrate material that will probably yield very satisfactory results."

GEOLOGICAL INVESTIGATIONS

The geological examination of the Cuzco Valley undertaken by Professor

Photo by Hiram Bingham

THE ALTAR OF THE CHIEF TEMPLE OF MACHU PICCHU

The interior of the Chief Temple on the Sacred Plaza, showing the cracking caused by the settling of the east wall. Notice the care with which the size of the stones is made to decrease gradually in each ascending tier. The main altar stone is 14 feet in length and a little over 5 feet in height.

Gregory consisted, in the first place, of a study of the gravel deposits near Cuzco and the relation in age and position of these gravels to the remains of men and other animals discovered in them, both on the present and on the former expedition. In a preliminary summary of his investigations Professor Gregory says: "The gravels were found to be portions of an extensive alluvial fan of Glacial age, but the human relics embedde l in them are probably of much later date." These deposits will be described fully in a paper on the Cuzco gravels to be published in the near future.

In regard to the other parts of his work, Professor Gregory reports as follows:

It consisted of "an examination of the structure, stratigraphy, and physiography of the Cuzco Valley with a view to securing the data for a geologic map of the area tributary to the Huatanay River. The region was found to consist chiefly of sedimentary rocks of pre-Tertiary, Tertiary, and Pleistocene age. Basic igneous intrusions are present and five intrusive masses of andesite (?) are represented by outcrops. During Glacial times a lake occupied the upper part of the valley. Fossils from Mesozoic and recent strata are sufficient to determine the relations of at least part of the formations. The results of the geologic survey, including stratigraphic and petrographic maps, are to be embodied in a report dealing with the area as a whole."

Professor Gregory also made a survey of Ayusbamba, on the Apurimac River, the locality from which fossil vertebrates were collected by Dr. Eaton. The strata at Ayusbamba are clays and sands deposited in an ancient lake perched high above the valley floors at an altitude of over 11,000 feet.

The Island of the Sun, in Lake Titicaca, Bolivia, was studied by both Professor Gregory and Assistant Topographer Heald, with reference to its coal deposits. A collection of carboniferous fossils was secured.

THE TROUBLES OF A CARTOGRAPHER

Owing to a most unfortunate misunderstanding, occasioned by the difficulty of getting messages transmitted in an un-

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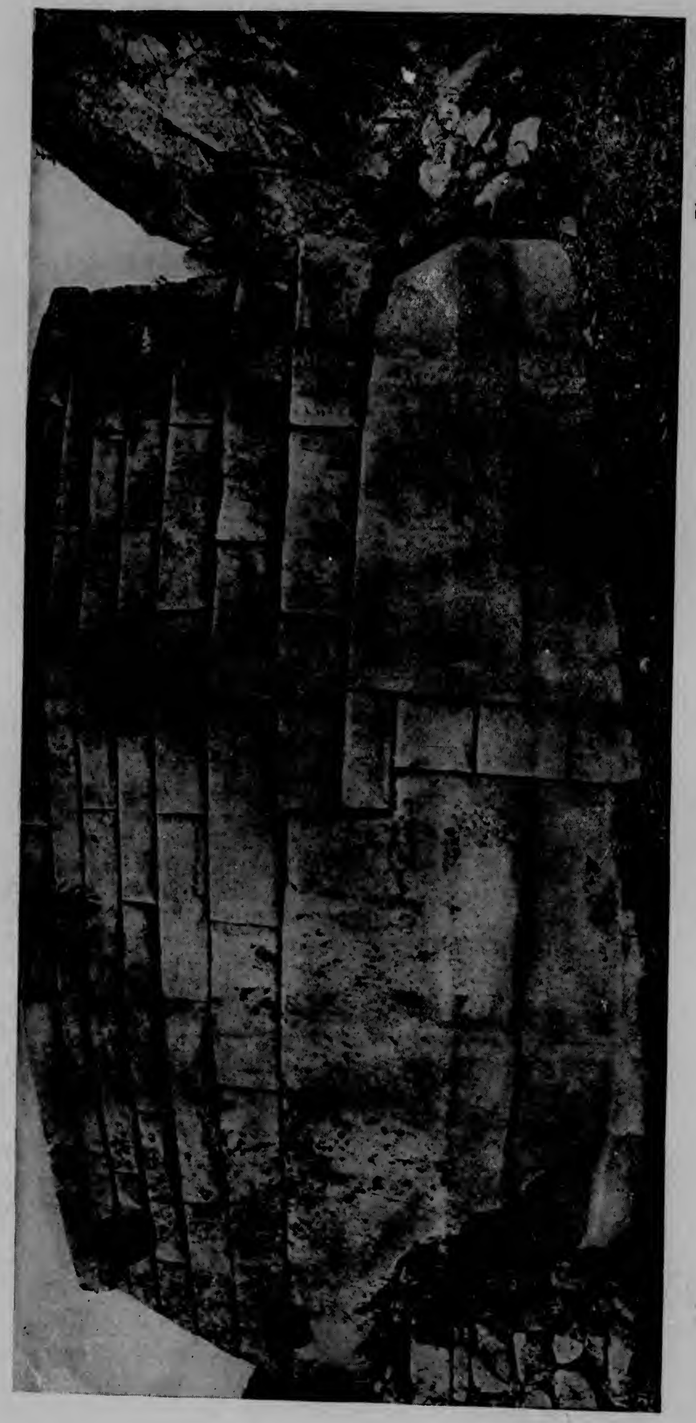


Photo by Hiram Bingham

A MASTERPIECE OF PREHISTORIC CONSTRUCTION

The east wall of the Chief Temple on the Sacred Plaza. The relative size of the large stone in the left-hand corner, which is 13½ feet in length and nearly 8 feet in height, may be gathered better from the next picture

Photo by Hiram Bingham

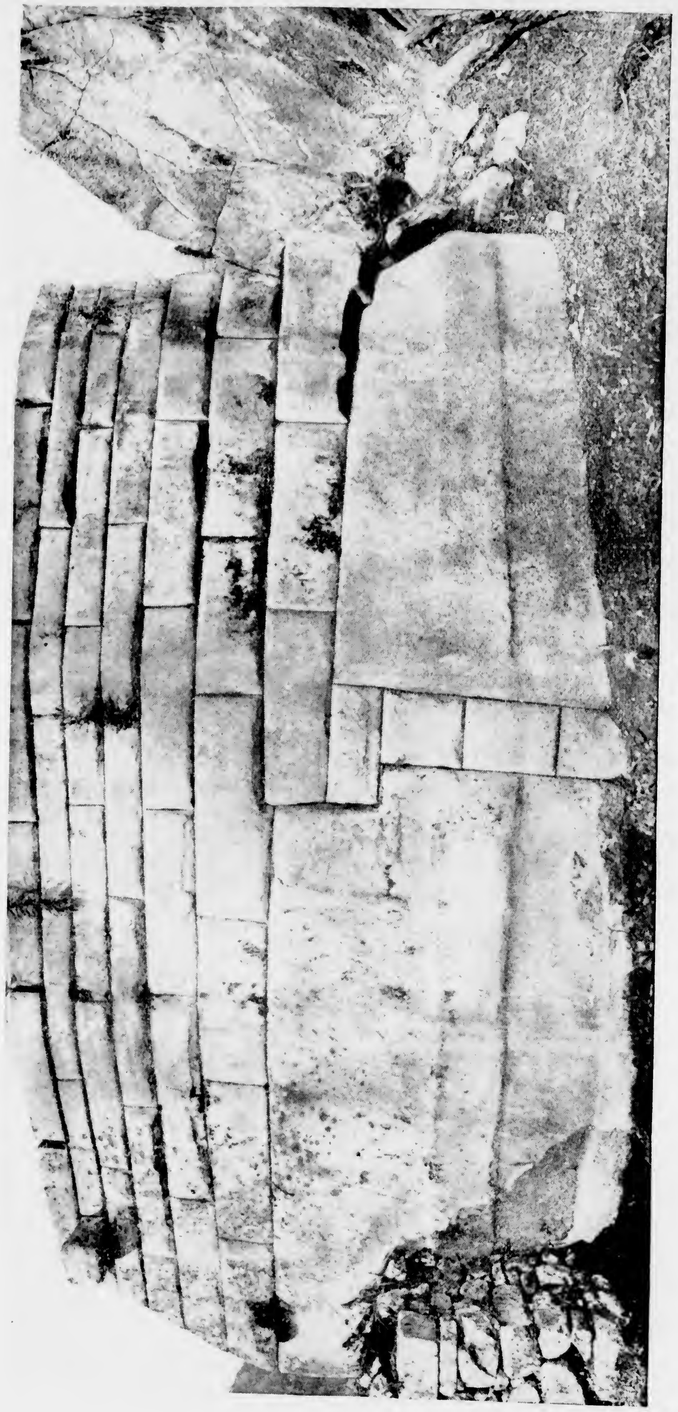
TYPICAL INDIAN WOMEN AT MACHU PICCHU

The largest stone in the east wall of the Chief Temple on the Sacred Plaza and the wives of two workmen

Photo by Hiram Bingham

THE HEAVIEST STONE BLOCK IN A MACHU PICCHU WALL

The interior face of the same stone and the ornamental niches in the east wall of the Chief Temple. The hole in the upper right-hand corner was undoubtedly for the admission of the beam which supported the roof of this temple.



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Retake of Preceding Frame

Photo by Hiram Bingham

AN INTERESTING CORNER: MACHU PICCHU

Back of the Chief Temple and adjoining it are the ruins of a small house probably occupied by the High Priest. The picture shows a portion of the exterior of its western wall. Part of this wall is made of a single stone, which is cut into 32 angles and corners.

inhabited region, quite a little of Mr. Bumstead's work was unintentionally destroyed. It was necessary for him to leave the Cuzco Basin and work on the Andine cross-section before the Cuzco map was completed. This was occasioned by the rapid approach of the rainy season. Arrangements were made with the chief engineer of the Southern railways to have the map photographed. The permanent contour lines were inked in, but all streams, roads, ruins, terraces, plane-table locations, and many geographical names and all elevations were left on the sheet in pencil.

The photographer thought that the map looked rather badly with all these pencil-marks on it, and a telegram was sent to the director, requesting permission to erase all pencil-marks. This telegram was received *six weeks* later, on my return from a difficult journey into the interior.

It was then too late to save Mr. Bumstead's work, for the photographer, impatient at the delay, and not receiving permission to clean the map, had gone ahead on his own responsibility and erased what a month of careful field-work could not replace. As Mr. Bumstead says in his report:

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Photo by Hiram Bingham

THE HIGH PRIEST'S HOUSE: MACHU PICCHU

This picture of the interior of the priest's house gives a better idea of the stone of the 32 angles. Not only were portions of two niches cut out of this stone, but in a spirit of freakish ingenuity the builders carried a small portion of the stone around the corner, so that a part of the corner itself is in this extraordinary block.

Photo by Hiram Bingham

THE HIGH PRIEST'S COUCH

Another view of the interior of the priest's house, showing the long bench, or platform, which was probably used as a couch. Notice the care with which the stones were selected, cut, and symmetrically arranged.

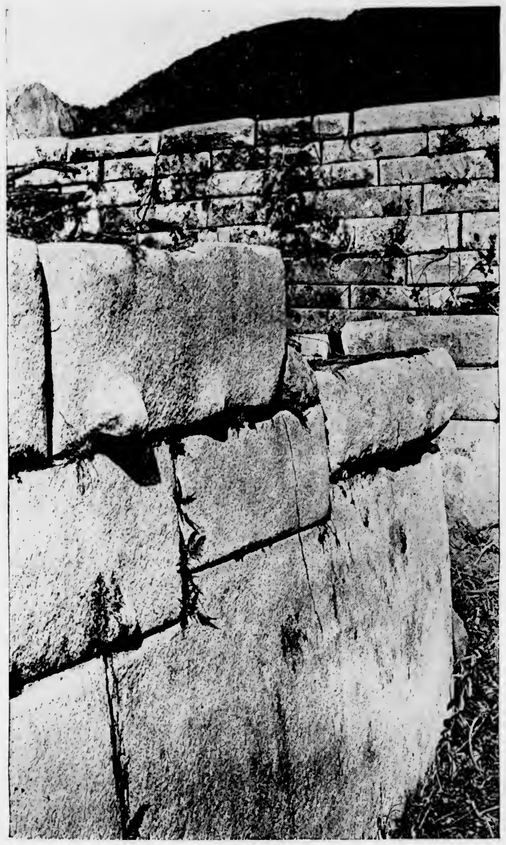

Photo by Hiram Bingham

AN INTERESTING CORNER: MACHU PICCHU

Back of the Chief Temple and adjoining it are the ruins of a small house probably occupied by the High Priest. The picture shows a portion of the exterior of its western wall. Part of this wall is made of a single stone, which is cut into 32 angles and corners.

inhabited region, quite a little of Mr. Bumstead's work was unintentionally destroyed. It was necessary for him to leave the Cuzco Basin and work on the Andine cross-section before the Cuzco map was completed. This was occasioned by the rapid approach of the rainy season. Arrangements were made with the chief engineer of the Southern railways to have the map photographed. The permanent contour lines were inked in, but all streams, roads, ruins, terraces, plane-table locations, and many geographical names and all elevations were left on the sheet in pencil.

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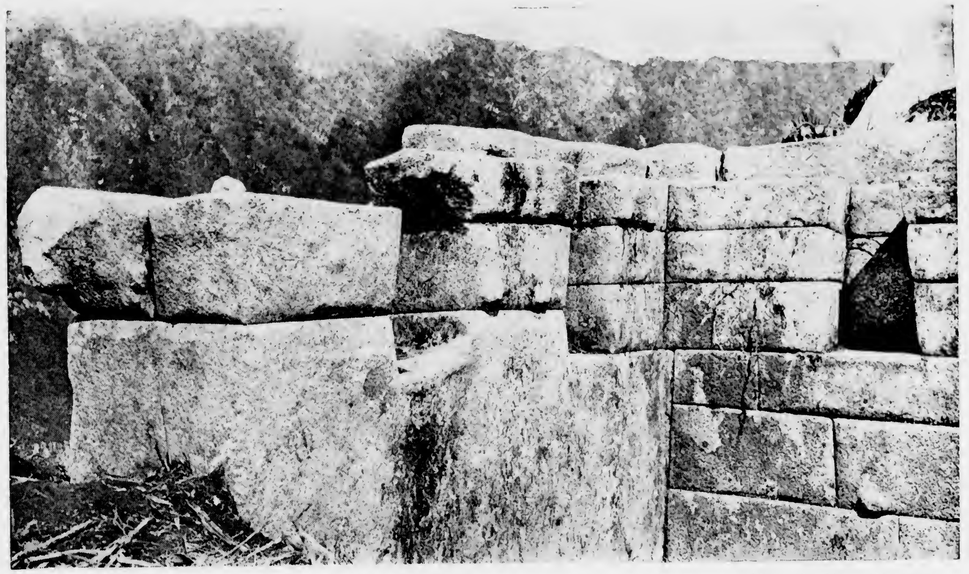

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Retake of Preceding Frame

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AN EXAMPLE OF REMARKABLY SYMMETRICAL MASONRY

Another view of the interior of the priest's house and the sacred rock back of it. Note the steps cut in the rock to enable the priest to get on top of it and salute the rising sun are just visible in the picture.

The scale of the Cuzco Valley map is 1 inch to the mile, and the contour interval is 100 feet. The map covers in all 174 square miles. It includes nearly all the territory that drains into the valley of the River Huatanay, which rises in the mountains back of Cuzco, flows through the city and under part of it between walls constructed by the Incas, crosses the bed of an ancient lake, and finally joins the upper waters of the Urubamba, called at this point the Vilcanota or Vilcamayu.

Peruvian rivers have a habit of changing their names every few miles, and this particular river is no exception. It is called at various times the Vilcanota, the Vilcamayu, the Rio Grande, the Urubamba, the Santa Ana, and finally unites with other rivers to form the Ucayali, one of the great branches of the Amazon.

Mr. Bumstead's map of Cuzco Valley shows the elevations and relative positions of Cuzco, the great cyclopean fortress of Sacsahuaman, and the four historic roads leading out of the ancient Inca capital. It also aims to bring out clearly the chief topographic and physiographic features that are characteristic of the locality. It will be used by Professor Gregory and Dr. Eaton as a basis for their reports on the geology and osteology of this region. If extensive scientific archeological work is ever permitted in this region, this map will be of great service in determining the geographic influences in the location of the ruins.

III

MAP-WORK OF THE EXPEDITION

The map-work was under the direction of Mr. Albert H. Bumstead, for nine years a topographic engineer in the United States Geological Survey. Mr. Bumstead's work was seriously handicapped by the fact that the seasons seem to be changing in Peru, and an unexpectedly large amount of rain was encountered in what is technically known as the "dry season." Furthermore, the difficulties of making maps in a lofty plateau, where, for example, the bottom of the Cuzco Valley is more than twice as high as the top of Mount Washington, can hardly be appreciated except by those who have tried to do field-work at similar elevations.

In 1911, owing to lack of preliminary reconnaissance and excessively hard local conditions, the topographer of the expedition had been unable to do anything on the most difficult part of the cross-section map. This work was now undertaken by

Photo by Hiram Bingham

A WELL-BUILT STAIRWAY: MACHU PICCHU

Near the priest's house is the most carefully constructed stairway at Machu Picchu, each one of whose steps was originally a single block of granite. This leads from the Sacred Plaza up to the top of the Sacred Hill (see pages 472, 508, and 509).

Chief Topographer Bumstead and Assistants Hardy and Little.

A route map was completed along a rarely used trail from Abancay, the capital of the department of Apurimac, across the Apurimac Valley via Pasaje to Lucma, this being the portion of the map not completed in 1911. Mr. Bumstead's map is on a scale of 1 inch to the mile, with a contour interval of 200 feet. It covers approximately 500 square miles. Frequent latitude and azimuth observations were made all along the route, and an occultation of a first-magnitude star was observed in connection with time sights on the moon and Jupiter immediately afterwards (see page 388).

The route covered by this map is about 100 miles in length and passes through a great variety of very heavy mountainous country. The elevations here range from about 4,000 feet up to more than 19,000. The most important features represented on this map are the glaciers of that part of the Vilcabamba Cordillera between Choquetira, Arma, and Lucma. A large part of this country was under glaciation at no very distant date, and great pains were taken to bring out the glacial forms.

This map will be of great value in giving proper understanding of the physiography of the central Andes, and will be published in connection with Profes-

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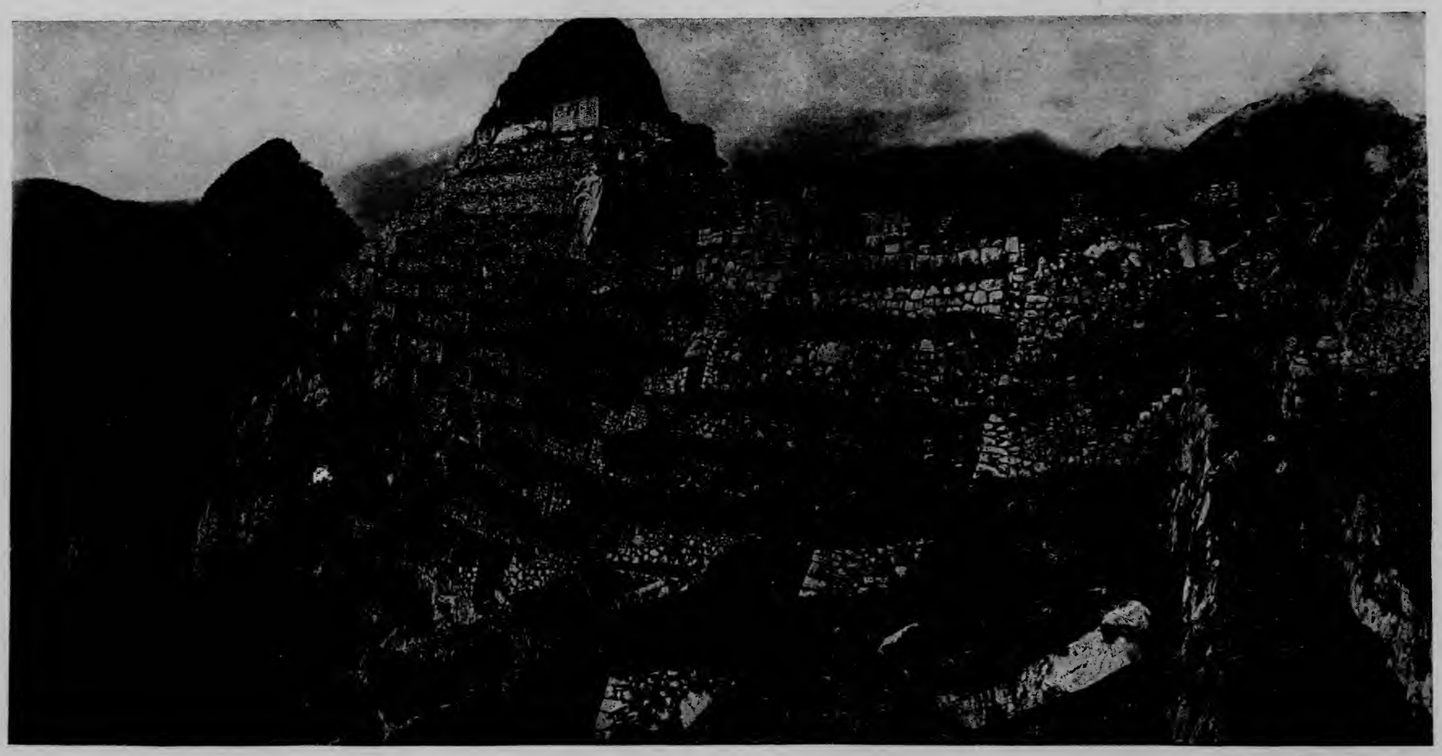

Photo by Hiram Bingham

INTIHUATANA HILL AND THE TERRACES WEST OF THE SACRED PLAZA

On the left may be seen some of the precipices which defended Machu Picchu from attack. In the foreground are a group of the terraces where the ancient inhabitants raised their crops. Rising above these is Intihuatana Hill, crowned by its little temple. Just to the left of the temple may be seen the Sun Dial Rock. To the right of the hill is the Chief Temple and the Sacred Plaza. By comparing this with the view on page 499, the effects of the clearing in 1912 are brought out very clearly.

Photo by Hiram Bingham

THE SUN DIAL: MACHU PICCHU

On top of the sacred hill is a curiously carved stone called an *Intihuatana* stone, or sun dial, or sun circle. *"Inti"* means "sun," and *"huatana"* a "rope," in Quichua, the language of the Incas. *Intihuatana* stones are found also in Cuzco and in Pisac and Ollantaytambo (see pages 472 and 507).

Photo by Hiram Bingham

A GEM OF INCA ARCHITECTURE

The little temple on top of the sacred hill near the Intihuatana stone

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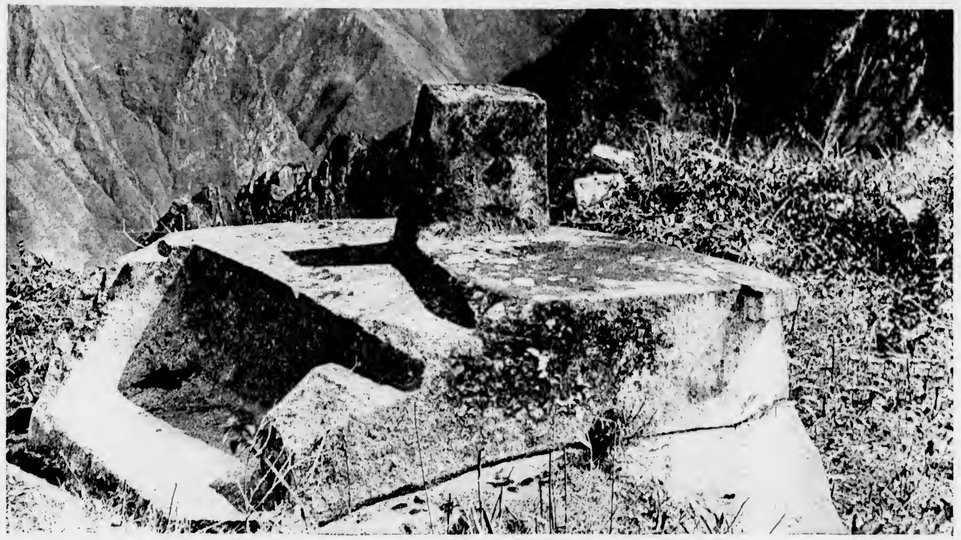

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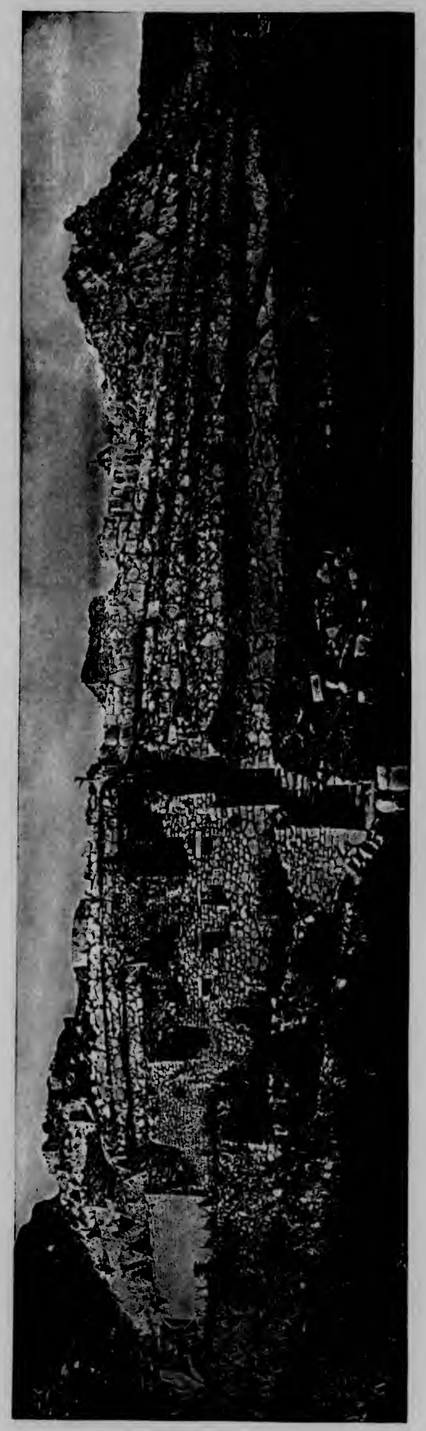

Photo by Hiram Bingham

THE WEST SIDE OF MACHU PICCHU

General view of Machu Picchu, showing (reading from right to left) the sacred hill, the Temple of the Three Windows and the Sacred Plaza, the principal cross street in the city and one of the finest stairways, a group of houses characterized by having four doors in the principal house, the beautiful outer wall of the King's Group, and finally the semicircular tower of the Princess Group.

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In describing his work on this map, Mr. Bumstead says:

"With such meager control as time and bad weather permitted, I endeavored to make a map of as wide a strip of country as possible, that would first of all convey the same impression of the topography upon the person who should use the map as I had at the time that I made it; that is, I wanted my map to accurately describe the character of each mountain and valley shown. This I kept ever in mind, and frequently reached out five or six miles with estimated distances to sketch features as I saw them, knowing that even though their positions and elevations were far from right, the picture brought to mind by the use of the map would be far better than nothing at all.

"In the main, however, the map is fairly well controlled, and in the snow-and-glacier-covered mountains around Choquetira and Arma I took very great pains not only to show a good picture of this wonderful region, but to make an accurate and dependable topographic map as well, and I got good locations and elevations on all the peaks and many other points besides.

"In making this map we followed the route of Professor Bowman in 1911. He expected the work to be done in 21 days. I think it could have been done in 30 days of good weather, and done even better than I did it, though I took three months, as I was hampered by fog and rain and snow almost continually from the time we left Abancay. It was aggravating in the extreme to catch glimpses of the wonderful scenery as the clouds would lift or settle and then have the peaks disappear from view before they could be located and sketched."

It was hoped that Mr. Bumstead would be able to locate and get the elevation of Mount Salcantay while on this trip, but it remained cloudy during the entire time.

Photo by Hiram Bingham

THE NORTH SIDE OF MACHU PICCHU

General view of the north and east side of Machu Picchu, showing (reading from left to right) the Sacred Plaza, the sacred hill, the inner garden terraces, the peak called Huayna Picchu, the Private Garden Group, and a carved stone which commands a magnificent view of the Urubamba Cañon. A comparison of this picture with that on page 424 shows the tremendous work of clearing that the expedition accomplished.

IV

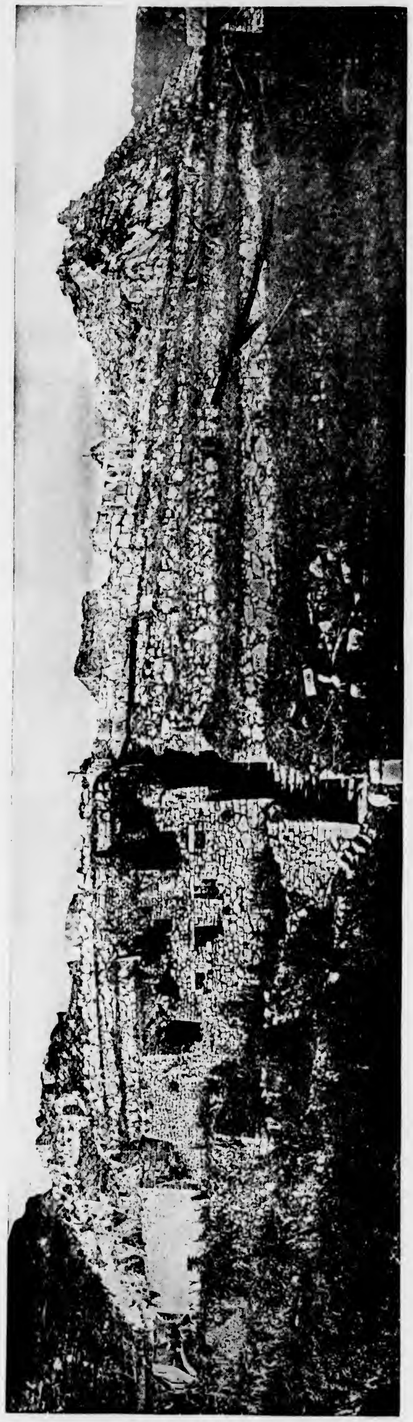
THE LAST INCA CAPITAL—VITCOS

A map of the vicinity of the last Inca capital of Vitcos, including the present-day villages of Puquiura and Vilcabamba, was made on a scale of 3 inches = 1 mile, with 100-foot contours.

This country is of great interest to students of historical geography. It is in the midst of a wonderful labyrinth of tropical valleys and glacier-clad mountains. Readers of Prescott's "Conquest of Peru," a book whose charm is as fresh today as it ever was, will remember that Pizarro selected Manco, a son of a former Inca, as the most available figurehead in whose name the Spaniards could govern Peru. He was crowned Inca in 1534, but he had too much good red blood in his veins to submit to Spanish tutelage, so he escaped, raised an army of faithful Indians, besieged Cuzco unsuccessfully, retreated to Ollantaytambo, and thence made good his escape into the fastnesses of this Andean labyrinth.

He found it easy to defend himself in this practically impregnable region called Vilcabamba, and he was able occasionally to make raids on Spanish caravans bound from Cuzco to Lima. A large part of the road over which he must have passed in making these raids was mapped for the first time by Mr. Bumstead, and is included in the Andean cross-section map referred to above (page 507).

The young Inca Manco lived at a place called Vitcos for 10 years. Here he actually received and entertained Spanish refugees. One of these, a hot-headed fellow, fell out with the Inca over a game



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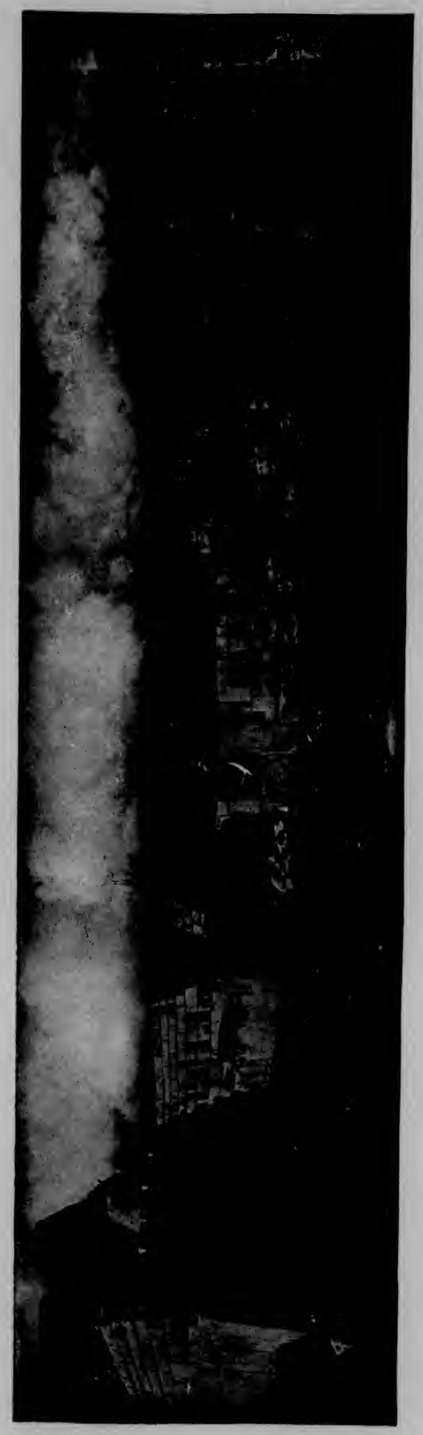

Photo by Hiram Bingham

THE SACRED PLAZA: MACHU PICCHU

This general view of the Sacred Plaza was taken at the conclusion of the season's work after the excavations had been finished and the ground releveled; showing the efforts that were made to leave everything in as good, if not better, condition than when we found it. The structure at the right, built in an entirely different style from the others, was probably originally covered with stucco, so that the general appearance of this plaza was anciently of a more symmetrical appearance than it is at present. In the floor of this building were found several bottle-shaped graves that had been opened many years previously. The structure at the left, the Chief Temple, is unquestionably one of the most remarkable architectural achievements of the Incas. In the center are ruins of what we have called the Temple of the Three Windows. As the windows are far too large for comfort in this cold climate, and are placed in a most conspicuous position, the conclusion reached is that they were symbolical. We believe they are connected with the tradition of the origin of the Incas (see pages 410, 414, 431, 489).

of bowls (some writers say it was chess), and in the quarrel that ensued the Inca was killed.

Two of his sons ruled in turn in his stead, so that for 35 years the country about Vitcos was governed by the Incas, and was all that was left to them of their magnificent South American empire.

PREVIOUS SEARCHES FOR VITCOS

When the famous Peruvian geographer, Raimondi, visited this region about the middle of the 19th century, no one seems to have thought of telling him that there were any ruins hereabouts. He knew that the young Inca Manco had established himself somewhere in this region, and he also knew that interesting ruins had been found at Choqquequirau, and described by the French explorer, Sartiges, in the *Revue des Deux Mondes* in 1851, so Raimondi concluded that the ruins of Choqquequirau must be those of the last Inca's long-lost capital.

Raimondi's proofs of the coincidence of Choqquequirau and the Inca capital are very vague, but as long as the only ruins reported from this region were those of Choqquequirau, nearly all the Peruvian writers, including the eminent geographer, Paz-Soldan, fell in with the idea that this was the refuge of Manco.

The word "Choqquequirau" means "cradle of gold," and this lent color to the story in the ancient chronicles that the Inca

Photo by Hiram Bingham

THE ARCHITECTURAL CENTER OF MACHU PICCHU

Apart from the Sacred Plaza, this is the center of the finest stonework in Machu Picchu. On the right is the beautiful outer wall of the group that is characterized by having the steepest gables and the finest monolithic lintels. In the center is a portion of the longest stairway, the one in which fountains are introduced at various stages. On the extreme left is a portion of the semicircular tower and the window of the snakes.

Manco had carried with him from Cuzco great quantities of gold utensils for use in his new capital.

Personally I did not feel so sure that the case was proven. The ruins did not seem fine enough for the Inca's residence. Consequently I was very glad that it was possible in 1911 to carry an exploring expedition into the Vilcabamba Valley, and still more delighted when we found interesting ruins at a place called Rosaspata.

Near Rosaspata was an extraordinary monolith, called "Ñusta Espana." By reference to the Spanish chroniclers, we found that it was recorded that near Vitcos, the last Inca capital, was a temple of the Sun, in which was a white rock over a spring of water. Furthermore, that Vitcos was on top of a high mountain, from which a large part of the surrounding region could be seen, and, moreover, that in the palace of Vitcos the doors, both ordinary and principal, were of white marble, beautifully carved.

WHY THE ÑUSTA ESPANA IS THE KEY TO THE IDENTIFICATION OF VITCOS

All of these points of description fitted the Rosaspata locality. Within half a mile of Rosaspata are the ruins of an ancient building which might have been the temple of the Sun, and in which is found a huge white rock, overhanging a spring of water (see pictures, pages 550-554). The ruins of Rosaspata are on top of a conspicuously high hill, from which the view in all directions is fine.

Finally the ruins of Rosaspata, unlike those of Machu Picchu and Choqquequirau, are noticeable because there are two kinds of doors, ordinary and principal ones, and that the door-posts are made of stones carefully carved out of white granite. (Strictly speaking, there is no *marble* in

Photo by Hiram Bingham

THE SACRED PLAZA: MACHU PICCHU

This general view of the Sacred Plaza was taken at the conclusion of the season's work after the excavations had been finished and the ground releveled; showing the efforts that were made to leave everything in as good, if not better, condition than when we found it. The structure at the right, built in an entirely different style from the others, was probably originally covered with stucco, so that the general appearance of this plaza was anciently of a more symmetrical appearance than it is at present. In the floor of this building were found several bottle-shaped graves that had been opened many years previously. The structure at the left, the Chief Temple, is unquestionably one of the most remarkable architectural achievements of the Incas. In the center are ruins of what we have called the Temple of the Three Windows. As the windows are far too large for comfort in this cold climate, and are placed in a most conspicuous position, the conclusion reached is that they were symbolical. We believe they are connected with the tradition of the origin of the Incas (see pages 410, 414, 431, 489).

of bowls (some writers say it was chess), and in the quarrel that ensued the Inca was killed.

Two of his sons ruled in turn in his stead, so that for 35 years the country about Vitcos was governed by the Incas, and was all that was left to them of their magnificent South American empire.

PREVIOUS SEARCHES FOR VITCOS

When the famous Peruvian geographer, Raimondi, visited this region about the middle of the 19th century, no one seems to have thought of telling him that there were any ruins hereabouts. He knew that the young Inca Manco had established himself somewhere in this region, and he also knew that interesting ruins had been found at Choqquequirau, and described by the French explorer, Sartiges, in the *Revue des Deux Mondes* in 1851, so Raimondi concluded that the ruins of Choqquequirau must be those of the last Inca's long-lost capital.

Raimondi's proofs of the coincidence of Choqquequirau and the Inca capital are very vague, but as long as the only ruins reported from this region were those of Choqquequirau, nearly all the Peruvian writers, including the eminent geographer, Paz-Soldan, fell in with the idea that this was the refuge of Manco.

The word "Choqquequirau" means "cradle of gold," and this lent color to the story in the ancient chronicles that the Inca

Photo by Hiram Bingham

THE ARCHITECTURAL CENTER OF MACHU PICCHU

Apart from the Sacred Plaza, this is the center of the finest stonework in Machu Picchu. On the right is the beautiful outer wall of the group that is characterized by having the steepest gables and the finest monolithic lintels. In the center is a portion of the longest stairway, the one in which fountains are introduced at various stages. On the extreme left is a portion of the semicircular tower and the window of the snakes.

Manco had carried with him from Cuzco great quantities of gold utensils for use in his new capital.

Personally I did not feel so sure that the case was proven. The ruins did not seem fine enough for the Inca's residence. Consequently I was very glad that it was possible in 1911 to carry an exploring expedition into the Vilcabamba Valley, and still more delighted when we found interesting ruins at a place called Rosaspata.

Near Rosaspata was an extraordinary monolith, called "Ñusta Espana." By reference to the Spanish chroniclers, we found that it was recorded that near Vitcos, the last Inca capital, was a temple of the Sun, in which was a white rock over a spring of water. Furthermore, that Vitcos was on top of a high mountain, from which a large part of the surrounding region could be seen, and, moreover, that in the palace of Vitcos the doors, both ordinary and principal, were of white marble, beautifully carved.

WHY THE ÑUSTA ESPANA IS THE KEY TO THE IDENTIFICATION OF VITCOS

All of these points of description fitted the Rosaspata locality. Within half a mile of Rosaspata are the ruins of an ancient building which might have been the temple of the Sun, and in which is found a huge white rock, overhanging a spring of water (see pictures, pages 550-554). The ruins of Rosaspata are on top of a conspicuously high hill, from which the view in all directions is fine.

Finally the ruins of Rosaspata, unlike those of Machu Picchu and Choqquequirau, are noticeable because there are two kinds of doors, ordinary and principal ones, and that the door-posts are made of stones carefully carved out of white granite. (Strictly speaking, there is no *marble* in

Retake of Preceding Frame

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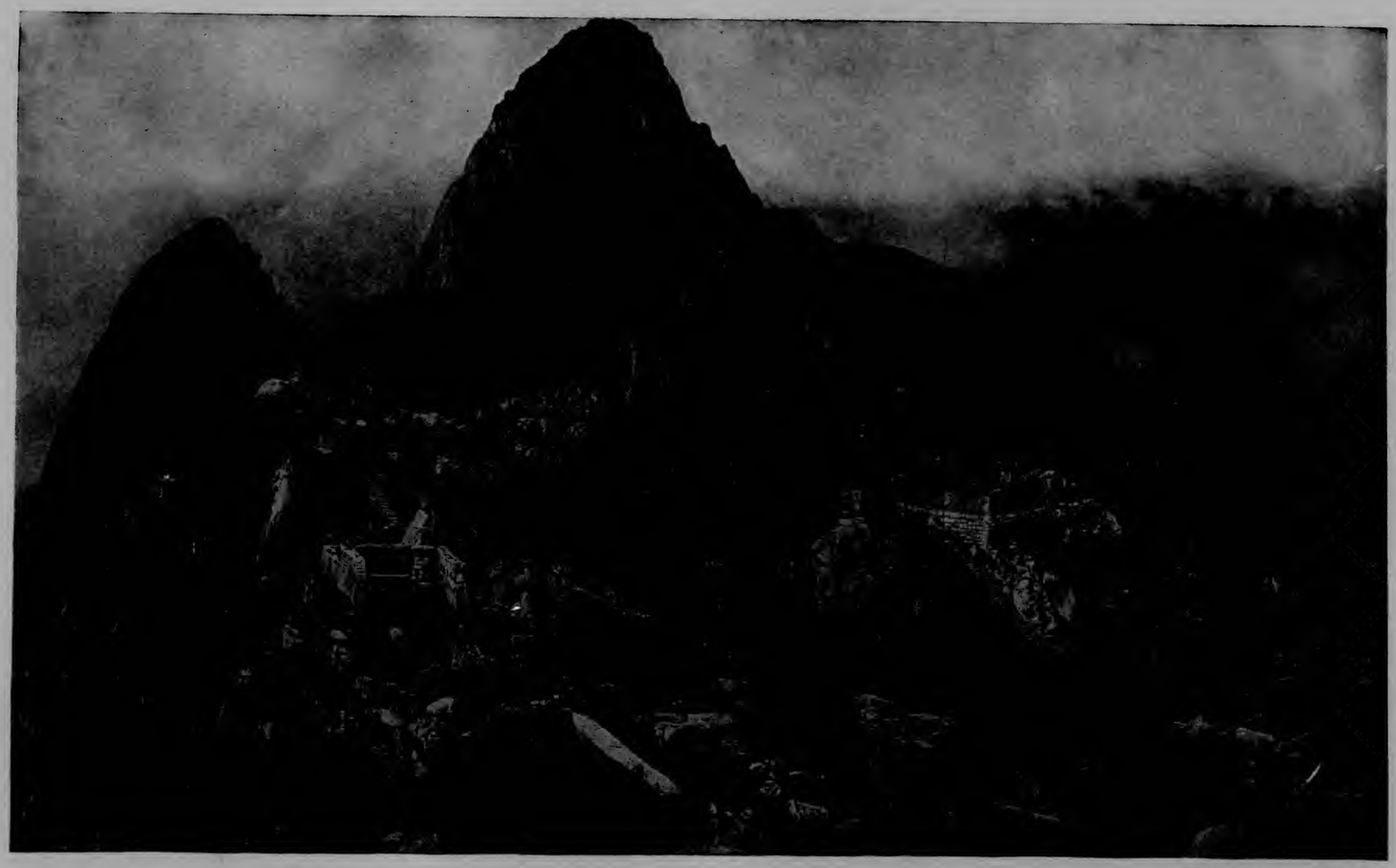

Photo by Hiram Bingham

THIS PICTURE GIVES A GENERAL VIEW OF ABOUT ONE-HALF OF THE CITY OF MACHU PICCHU

On the left are the western agricultural terraces. Above them is the Sacred Plaza, with the Chief Temple and the three-windowed temple to the right of it. Above these and connected with them by the finest stairway in Machu Picchu is the sacred hill, on which is located the Intihuatana, or sun dial stone. In the central picture in the immediate foreground are the rough boulders near which we found most of the little bronze pins and artifacts. Above them are the terraced gardens and a thatched hut built by the modern Indians. Above this in turn is one of the most densely crowded portions of the city, while to the right above the long stairway is the group called the Private Garden Group, and below it, on the extreme right, the group characterized by greatest ingenuity in its stonework. The beautiful peak of Huayna Picchu overshadows the city like a sentinel. On its summit were found a few rough caves whence guards could give warning of approaching danger.

Photo by Hiram Bingham

THE AGRICULTURAL TERRACES WHERE THE ANCIENT INHABITANTS OF MACHU PICCHU RAISED THEIR CROPS

High up on the right may be seen part of the Upper City and the buildings of the Princess Group. Just beyond these is the inner city wall and the dry moat, which comes down the hill just outside the building in the lower center of the picture. Above this, in the center of the terraces, may be seen the archeological camp, and to the left the group called the *outer barracks*, outside of which runs the outer wall of the defenses of Machu Picchu. On the slopes in the distance are the ruins of ancient terraces that have been carried away by recent landslides. Every available foot of the country was once under cultivation.

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Photo by E. C. Erdis

THE DIRECTOR AT REST: MACHU PICCHU CAMP

The main tent in the camp at Machu Picchu and the Director at the completion of the season's work

Photo by G. F. Eaton

DIRECTOR BINGHAM AT WORK

Taking pictures under difficulties on top of a wall hidden in one of the uncleared portions of the city of Machu Picchu

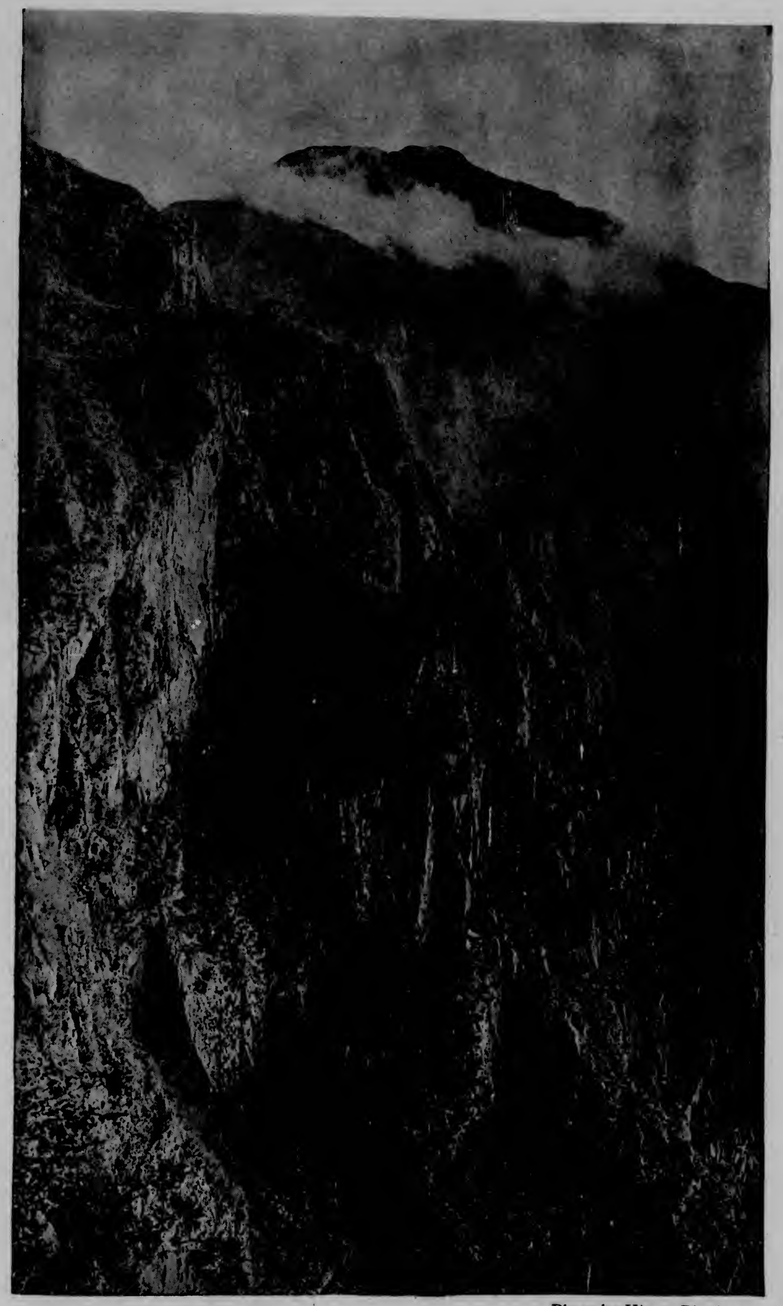
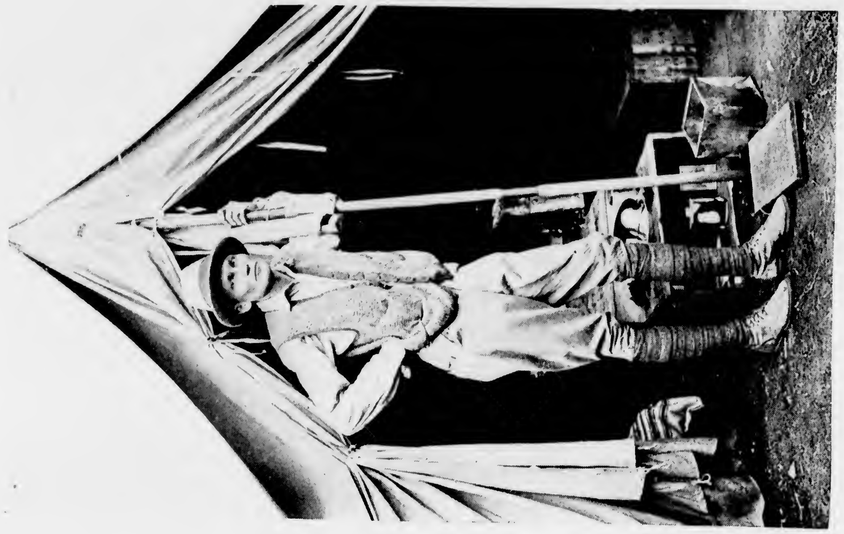


Photo by Hiram Bingham

THE WESTERN PRECIPICES: MACHU PICCHU

Forest trees growing wherever there is a foothold have usually been found in this region to cover ancient agricultural terraces, and they probably do in the cases shown in this picture. The western trail to Machu Picchu climbs out of the cañon in the lower right-hand corner and winds up the precipice until it passes over the shoulder near the top of the precipice.



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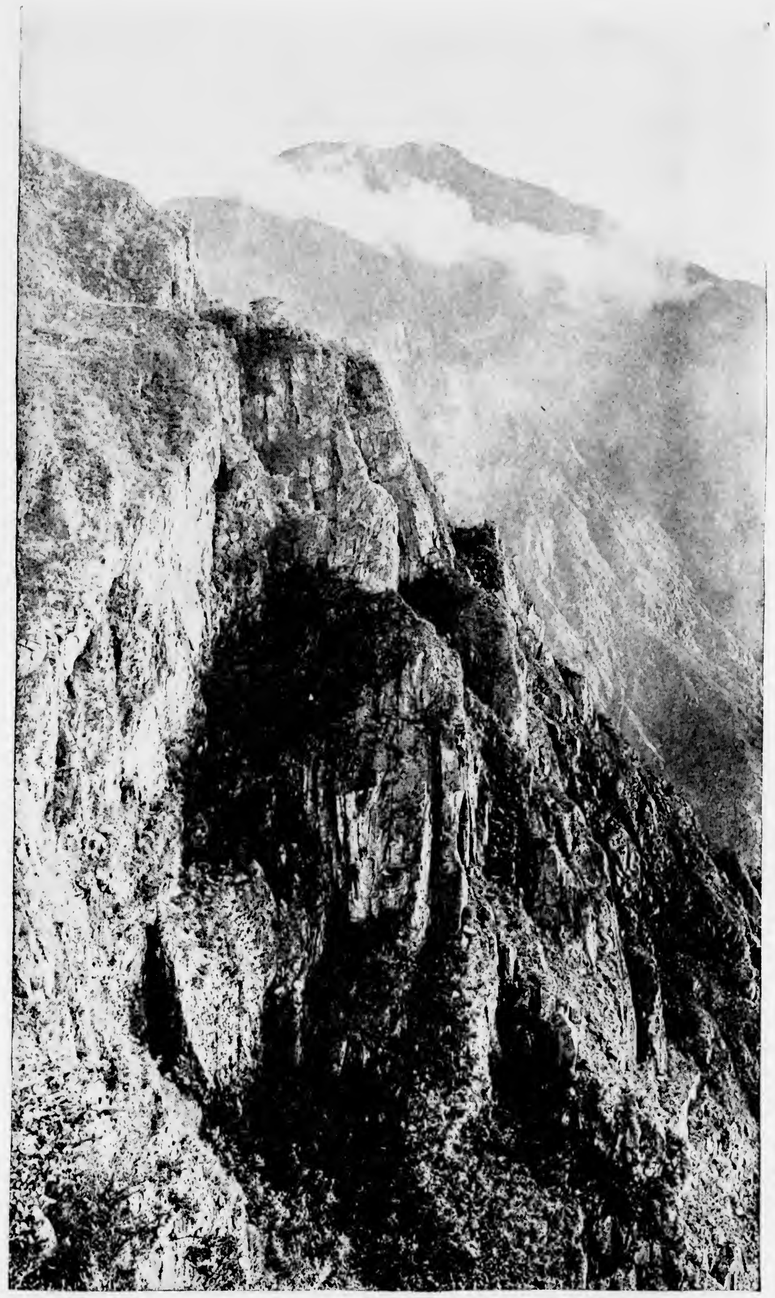

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Retake of Preceding Frame

Photo by H. L. Tucker

WHERE THE POTTERY COMES FROM

The potter's family often lives in a lofty and remote mountain valley. In the present case it was at an altitude greater than that of the top of Pike's Peak. Here the women make the pots, the men take care of the llamas, and when the pots have been baked and are ready for shipment, a number of sturdy llamas are selected from the herds, laden with the pottery, which has been carefully packed in dried grass, and driven off to the nearest market town.

Photo by Hiram Bingham

THE PLAZA OF SAYLLA: CUZCO VALLEY

In the Cuzco Valley, as well as on all the roads in the uplands of Peru, whenever an Indian passes through a village he stops to get a drink of *chicha*, the native beer, a large glass of which may be purchased for about two cents. When it is cleanly made, it is not disagreeable.

Photo by Hiram Bingham

A CORNER OF THE SAN FRANCISCO PLAZA: CUZCO

In the market-places of Cuzco and other Peruvian cities pottery made by the Indians in the vicinity is usually to be bought for prices ranging from five to fifty cents. It is hand made, baked in primitive ovens, and rudely decorated with variegated designs.

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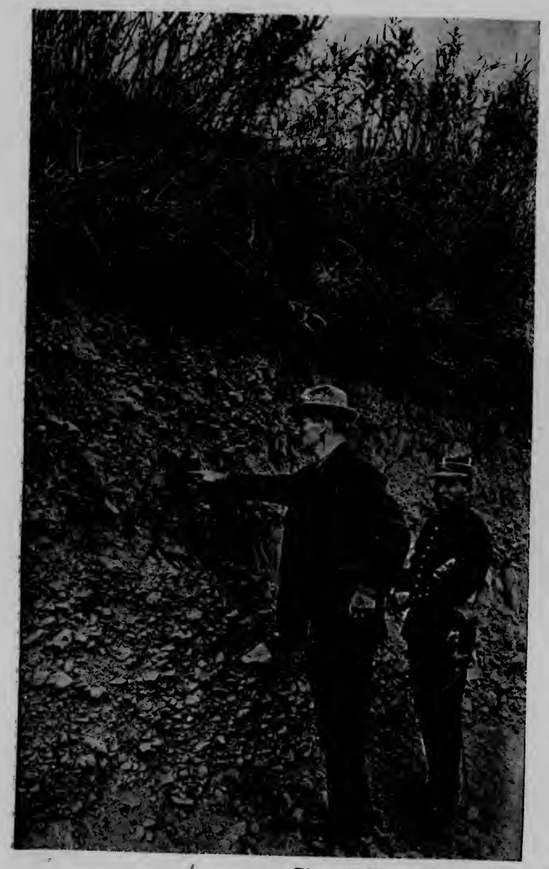


Photo by Hiram Bingham

A GRAVEL BANK CONTAINING BONES AND POTSHERDS: CUZCO (PAGES 500-501)

There are many places near Cuzco where in the stratified gravel banks bones and pieces of pottery may be found interstratified with the pebbles. Dr. Eaton and Lieutenant Sotomayor, on one of our first walks out of Cuzco, located a number of these.

Magazine for October, 1912, and in more extended form in the Proceedings of the American Antiquarian Society for April, 1912.

Returning to this location in August, 1912, I drained the marshes that partly surround the rock at Ñusta Espana and excavated as far as was practicable. To our surprise and mortification we were unable to find any artifacts whatever and only a handful of rough potsherds. We did uncover an interesting priestly throne containing nine seats. The work of excavating and the results may be seen on pages 553 and 554.

V

INCA PLACE NAMES IN THE VILCABAMBA REGION

A problem which particularly occupied my attention was the identification of ancient Inca place names referring to the Vilcabamba country and occurring in the Spanish chronicles, but not appearing on any known maps.

Before leaving New Haven I had an index prepared of all the places that are referred to in the available chronicles. A copy of this list was taken with me in the field wherever I went, and owing to the courtesy of the managers of various plantations and of local government officials, the most intelligent and reliable Indians were carefully questioned in regard to these places.

By this means it is believed that a considerable body of geographical nomenclature has been assembled, and it is hoped that in the future it may be possible to write a report that will elucidate and interpret some of the more difficult passages in the chronicles.

this region.) Furthermore, the rock at Ñusta Espana bears in its carvings marks which indicate that at one time in the remote past it was unquestionably an object of veneration.

This evidence made me believe that at Ñusta Espana was the principal shrine of the ancient people in this entire region, and that the neighboring ruins of Rosaspata were in reality the ruins of Vitcos, the last Inca capital. An account of the discovery of these places and a statement of the proof on which we have based our conclusions may be found in *Harper's*

VI

EXPLORATION OF THE AOBAMBA VALLEY

As part of our plan to cover the area included between the Urubamba and Apurimac rivers, an archeological and topographical reconnaissance was made of the hitherto unexplored Aobamba Valley. Assistant Topographer Heald

Photo by Hiram Bingham

THE OSTEOLOGIST AT WORK: CUZCO VALLEY

In the north bank of the Huatanay River, a mile below Cuzco, Dr. Eaton found a human skeleton interstratified with clays and gravels 8 feet underground. Since the time when the bones were deposited there, the entire field of coarse gravels had been laid there above them, and in the succeding centuries the river had cut down the bank until it finally laid them bare (see pages 500 and 501).

undertook to approach this problem from the mouth of the valley at the junction of the Aobamba and Urubamba rivers. He met with almost insuperable difficulties.

Although the work looked easy as far as we could see from the mouth of the valley, he found that 4 miles from the mouth, up the winding stream, the jungle was so dense as to be almost impassable. There was no trail and the trees were so large and the foliage so dense that observations were impossible even after the trail had been cut. During a hard afternoon's work in jungle of this kind, with four or five men aiding in making the path, they succeeded in advancing only one mile.

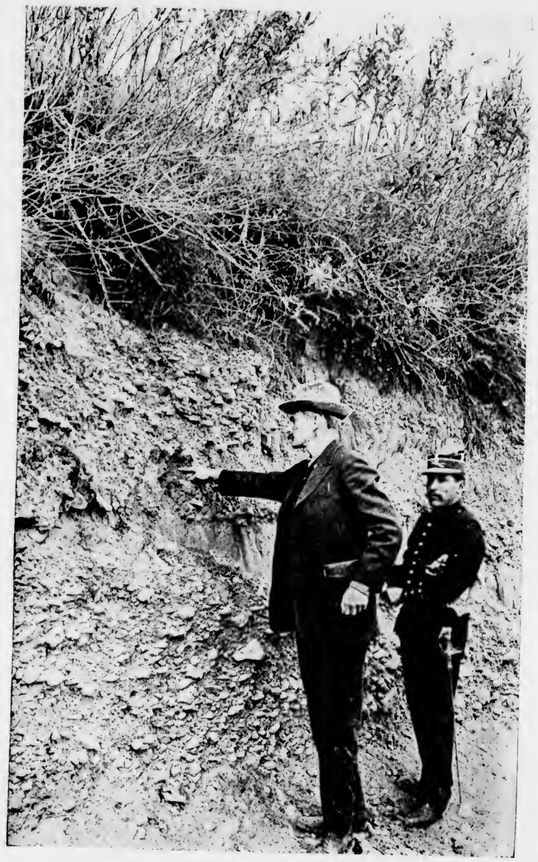
Reconnaissance work in this type of jungle is extremely discouraging and unprofitable. Furthermore, there are occasionally some dangers—as, for instance, the following from Mr. Heald's account of his reconnaissance:

"On the way back to camp one of the men had a narrow escape from a snake, being grasped and held by another of the peons just in time to prevent his stepping on it. It was a small, dust-colored snake, about 10 inches long, and on being examined was found to possess two small poison fangs far back in the jaw. The fangs differed from those of most poisonous snakes in that they slanted back very little, coming almost straight down to the lower jaw."

THREE NEW GROUPS OF RUINS REPORTED.

There was little of archeological interest in the portion of the valley which Mr. Heald succeeded in reaching. Quite unexpectedly, however, I got into the upper reaches of the valley about ten days' later and found some interesting ruins and had an unexpected adventure. It happened on this wise:

The largest and richest estate in the Urubamba Valley, Huadquiña, is owned



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A TYPICAL CUZCO INDIAN MOTHER AND BABY

She is patiently holding the surgeon's yardstick and wondering why she was having her picture taken

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TYPICAL PERUVIAN MOUNTAIN INDIANS

Indian men at a railroad station not far from Cuzco, smiling at the Doctor's efforts to get the picture. As it was a cloudy day with rain threatening, the hat was worn wrong side up.

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GOATHERDS AND SHEPHERDS: CUZCO VALLEY

The shepnerds of the Cuzco Valley are usually small boys who, like David of old, spend their early years with slings in their hands tending their flocks

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A ROMANTIC SHEEP PASTURE: TIPON, NEAR OROPESA

Frequently their sheep graze on ancient Inca terraces near carefully built retaining walls, or in the midst of interesting ruins about whose history we know practically nothing.

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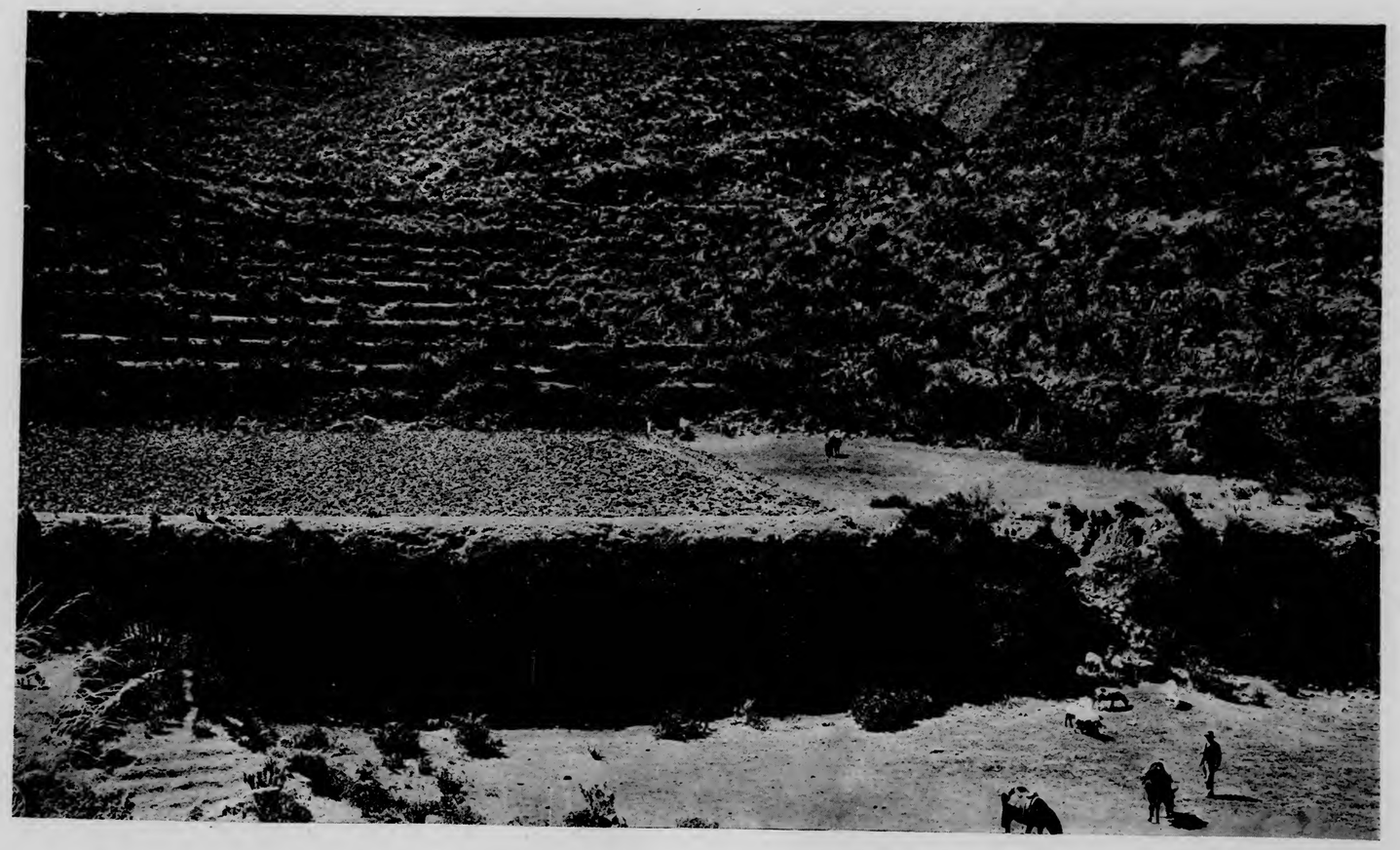


Photo by Hiram Bingham

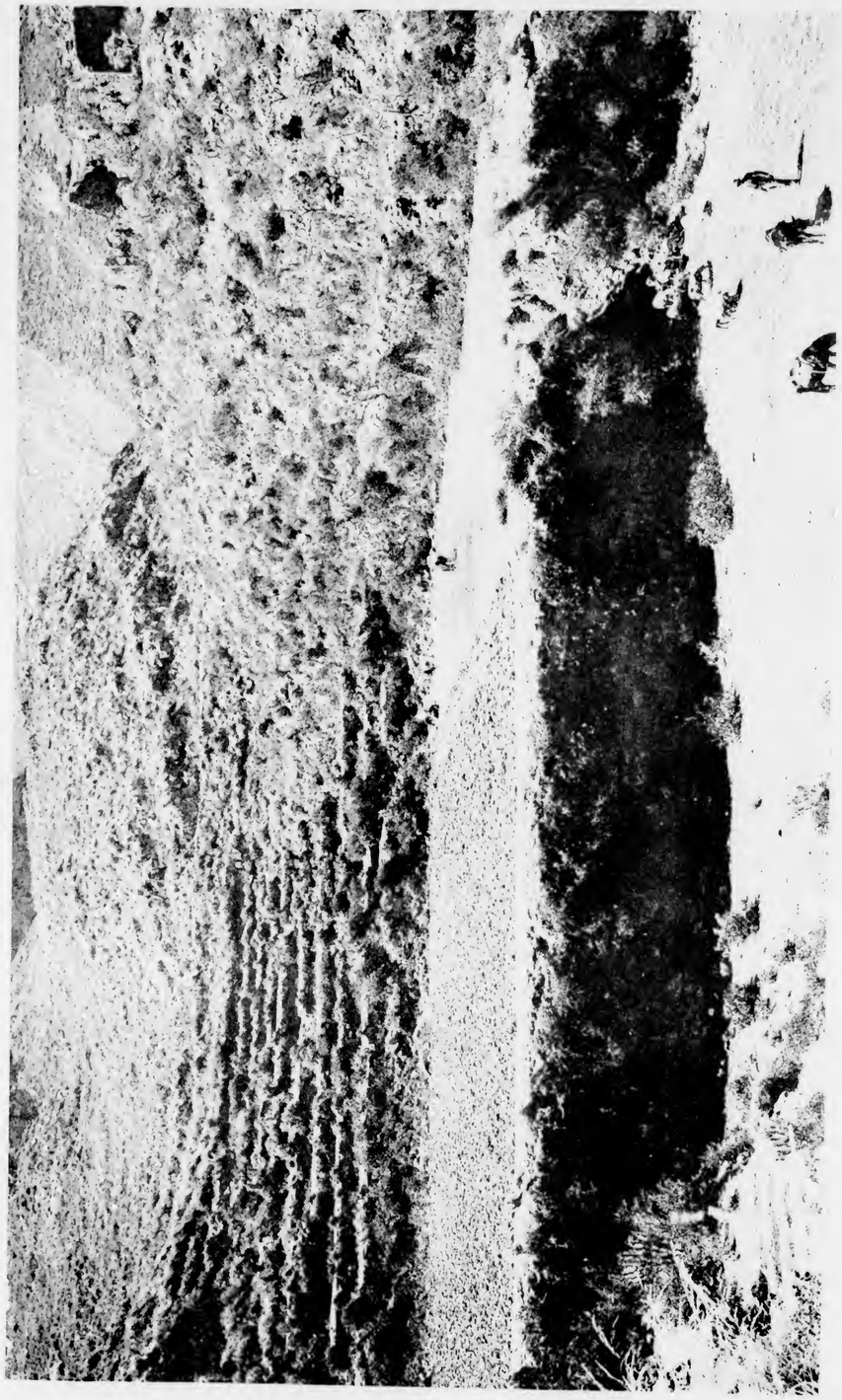
A VALLEY THAT INVITES EXCAVATION: NEAR OROPESA

A general view of the ruins at Tipon, in the Cuzco Valley near Oropesa, where flocks are herded or crops raised on the ancient terraces

Photo by Hiram Bingham

A NEGLECTED SCIENTIFIC OPPORTUNITY: CUZCO VALLEY

Another view of the ruins at Tipon, near Oropesa. Recent unauthorized excavations by treasure hunters in this vicinity have brought to light important finds. This is one of the localities where careful systematic archeological excavation ought to be done in the near future. Although within a few miles of Cuzco, it has been visited by very few people.



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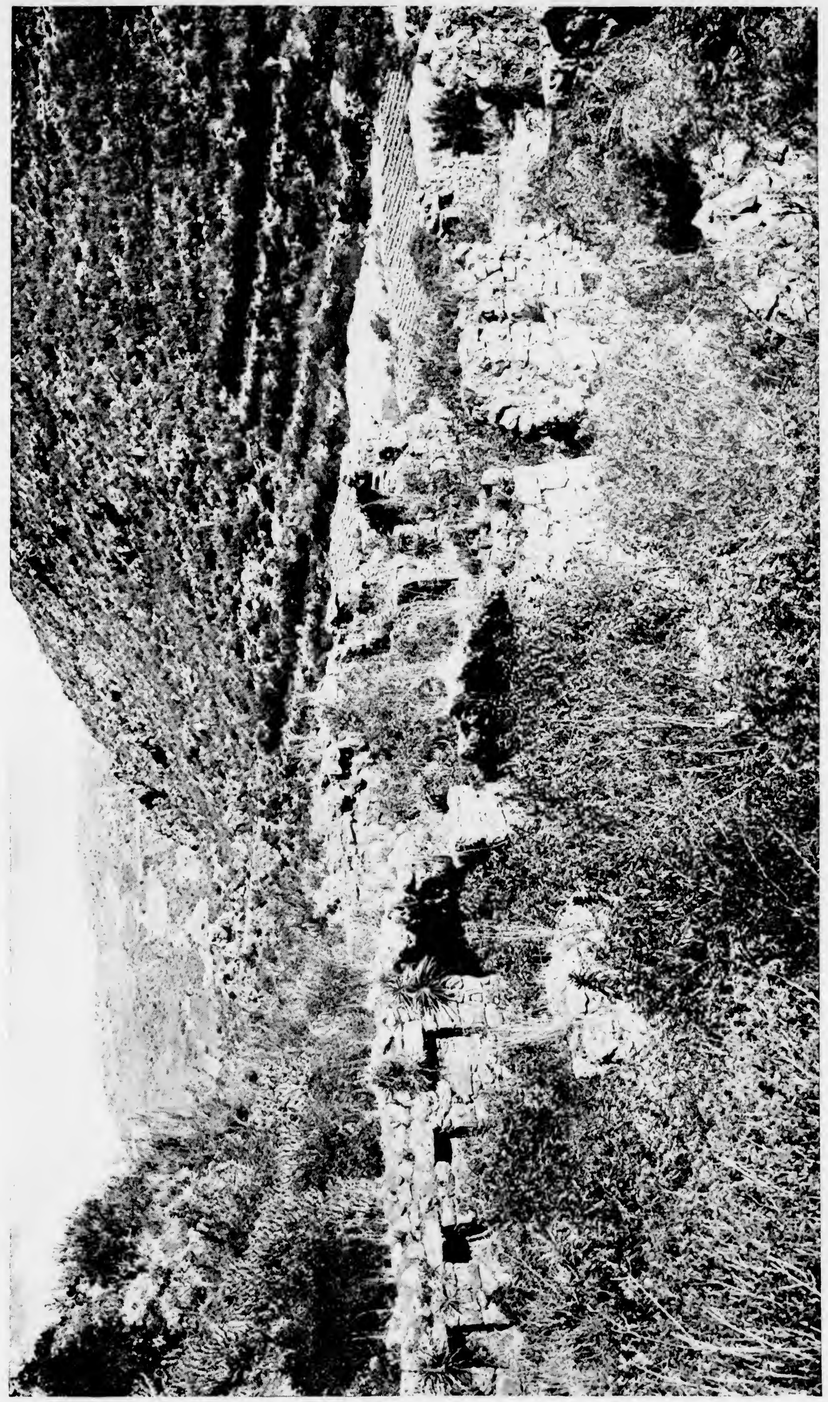

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Not far from Tipon and below Oropesa are the ruins of a large city now known as Piquillacta. It is referred to in Squier's "Peru" on page 422, but he calls it Muyna. The walls of more than 100 houses are still standing, and yet practically nothing is known except through casual oral tradition regarding the builders of this ancient city. It is only an hour's walk from the railroad and deserves to be carefully studied by a well-equipped archeological expedition.

Photo by Hiram Bingham

THE CITY WALL OF PIQUILLACTA

The city of Piquillacta was protected by a long, high wall, which is here shown crossing the hill toward Lake Mohina. On the shores of Lake Mohina are other ruins which also need studying before treasure hunters have made it impossible to determine the age and relative historical position of the material.

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A WALL IN PIQUILLACTA

The walls of a house in the ruined city of Piquillacta showing rough elementary niches and crude stonework. The walls, made of rough stones laid in clay and not fitted together, are sometimes over 20 feet in height.

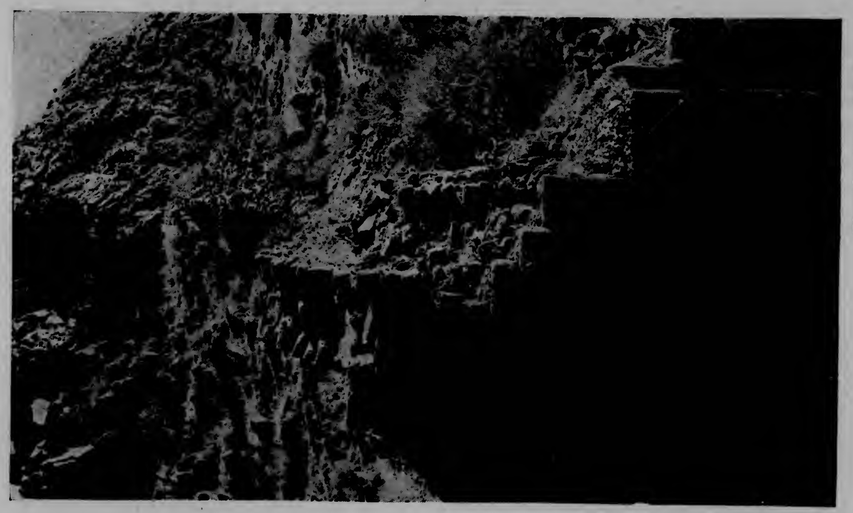

Photo by Hiram Bingham

THE SOUTH WALL OF RUMI CCOLCA

Although the local tradition states that this wall was an aqueduct, the pitch at which it runs up the hill inclines one to believe that it was for defensive purposes, instead of being intended to convey water.

Photo by Hiram Bingham

THE RUINS OF RUMI CCOLCA

A short distance east of Piquillacta are the ruins called Rumi Ccolca. It is impossible to say positively whether this was merely a wall which guarded the entrance to the Cuzco Valley, or whether it was an aqueduct that once carried water to the city of Piquillacta.

Photo by Hiram Bingham

AN ARCHITECTURAL PUZZLE: RUMI CCOLCA

A nearer view of Rumi Ccolca shows the junction of two entirely different kinds of stonework. The original wall is of rough stones laid in mud, but the gateway is lined with cut stones fitted together without mortar after the best Inca style. It may be possible that a later race cut a gate through the ancient aqueduct and lined it in their own fashion with their best stonework.

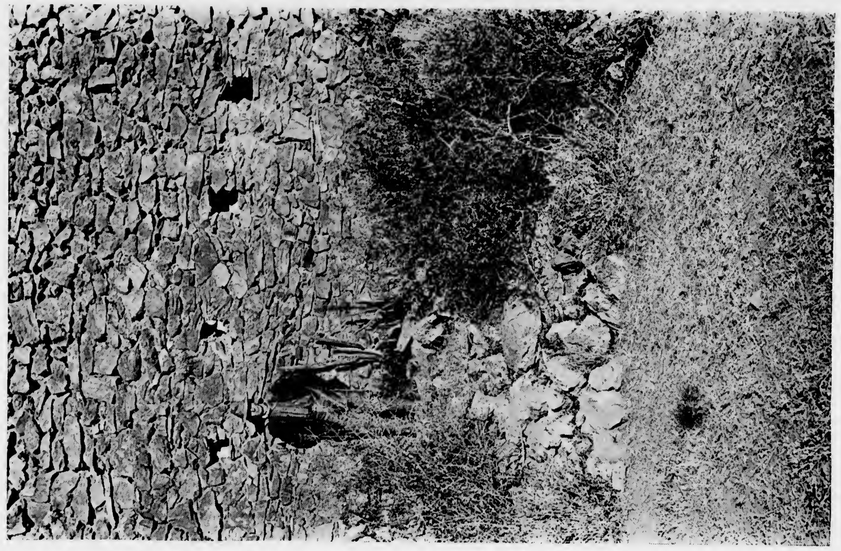

Photo by Hiram Bingham

A WALL IN PIQUILLACTA

The walls of a house in the ruined city of Piquillacta showing rough elementary niches and crude stonework. The walls, made of rough stones laid in clay and not fitted together, are sometimes over 20 feet in height.

Photo by Hiram Bingham

THE SOUTH WALL OF RUMI CCOLCA

Although the local tradition states that this wall was an aqueduct, the pitch at which it runs up the hill inclines one to believe that it was for defensive purposes, instead of being intended to convey water.

Photo by Hiram Bingham

THE RUINS OF RUMI CCOLCA

A short distance east of Piquillacta are the ruins called Rumi Ccolca. It is impossible to say positively whether this was merely a wall which guarded the entrance to the Cuzco Valley, or whether it was an aqueduct that once carried water to the city of Piquillacta.

Photo by Hiram Bingham

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Retake of Preceding Frame

Photo by Hiram Bingham

THE FINEST STONEWORK AT RUMI CCOLCA: CUZCO VALLEY

A detail of one side of the gateway at Rumi Ccolca, which shows stone blocks cut with as much precision as the best work at Machu Picchu. The projecting nubbins left on these rocks are an echo of similar marks left on the stone inside the priest's house near the Sacred Plaza in Machu Picchu (see the picture on page 529).

by the Señora Carmen Vargas, who inherited from her father about 1,000 square miles of land lying between the Urubamba and Apurimac rivers. Some of the land is occupied by sugar plantations; other parts are given over to the raising of sheep and cattle, while a large portion is still tropical jungle. Señora Carmen has always received us most hospitably and done everything in her power to further our efforts.

Her son-in-law, Don Tomas Alvistur, an enthusiastic amateur archeologist, took a considerable amount of interest in our work and was quite delighted when he discovered that some of the Indians on the plantation knew of three localities where there were Inca ruins, so they said, that had not previously been visited by white men.

Don Tomas invited me to accompany him on a visit to these three groups of ruins, but when the time came to go he found that business engagements made it impossible for him to do more than accompany me part of the way to the first group. He went to the trouble, however, of securing three Indian guides and carriers and gave them orders to carry my small outfit whenever it was impossible for the pack-mule to be used, and to guide me safely to the three ruins and home again.

They did not greatly relish these orders, but as they were all feudal tenants, holding their land on condition of rendering a certain amount of personal service every year in lieu of rent, they were constrained to carry out the orders of their overlord.

After Don Tomas departed I was left to the tender mercies of the Indians and of my faithful muleteer, Luis. The Indians had told us that one could visit all three ruins and return the next day. This information, however, did not prevent me from putting in supplies for at least a five days' journey, although I little anticipated what was actually going to happen.

The end of the first day's journey found us on top of a ridge about 5,000 feet above the place where we had started, in the midst of a number of

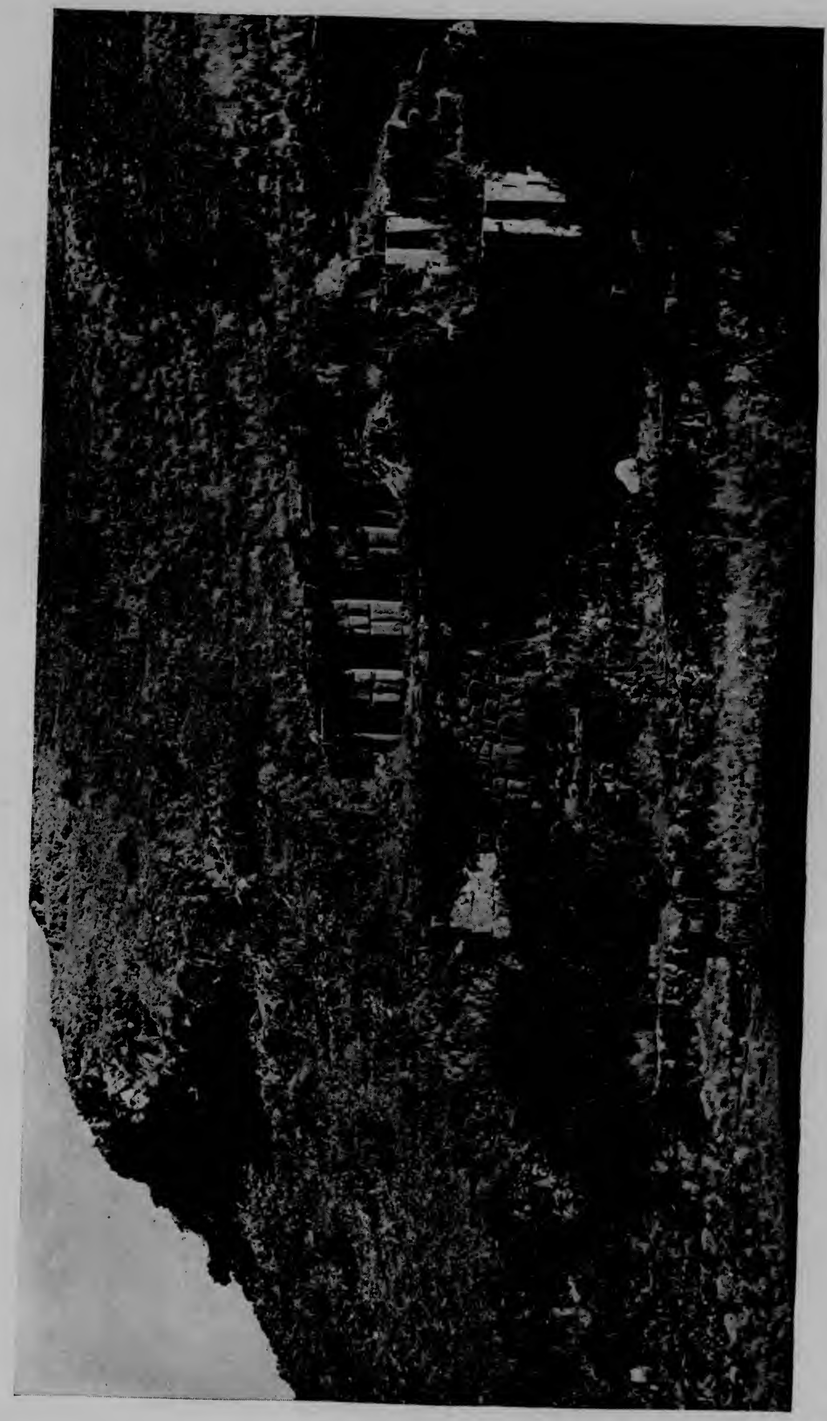

Photo by Hiram Bingham

TAMPU MACHAI: NEAR CUZCO

A two hours' ride from Cuzco are the ruins of Tampu Machai, near the ancient fortress of Pucara. There is a spring here whose waters contain remarkable mineral qualities. Around it the ancients built a fountain and the ruins seem to be those of a temple dedicated to the god of the spring. This is one of the places of the Cuzco Valley that most urgently demands scientific investigation and careful study.

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Photo by Hiram Bingham

PUCARA: AN ANCIENT FORTRESS NEAR CUZCO

The fortress of Pucara on the ancient trail between Cuzco and Calca, which passes over the gap shown in the picture. Some of the structures in this little fortress are of exquisite stonework, and the presence of symmetrical niches and carefully cut drains connects it, however slightly, with the people who built Machu Picchu.

Photo by Hiram Bingham

THE ROCK OF KKENKO, NEAR CUZCO

Nearer Cuzco and more celebrated than any other of the ruins just referred to is the carved rock called Kkenko, an ancient shrine that has been frequently visited by archeologists

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THE WONDERFUL FORTRESS OF SACSAHUAMAN: CUZCO VALLEY

Near Kkenko and still nearer to Cuzco are the remarkable walls of the cyclopean fortress called Sacsahuaman. Many of the stones in its construction are over ten feet in height. The most complete recent description of it may be found in Chapter III of Ambassador Bryce's book on South America. Mr. Bryce says that this fortress is "one of the most impressive monuments of prehistoric times that the world contains." He believes that it belongs to a very early time, and is the work of a primitive people long anterior to those historical Incas whom the Spaniards overthrew.

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LLACTA PATA, THE RUINS OF AN INCA CASTLE

This place was called Llacta Pata. We found evidence that some Inca chieftain had built his castle here and had included in the plan ten or a dozen buildings. They are made of rough stones laid in mud, with the usual symmetrical arrangement of doors and niches. It would be interesting to excavate here for three or four weeks and get sufficient evidence in the way of sherds and artifacts to show just what connection the people who built and occupied this mountain stronghold had to the other occupants of the valley.

After measuring the ruins (see plan, page 556) and taking a few photographs (see page 555), I asked the Indians how far it was to the next group of ruins, and was told it was "two or three hours' journey."

Possibly it *could* be done by an Indian runner, with nothing to carry, in four or five hours, but we had three mules, that is, our two saddle-mules and the one pack-mule, whose load, weighing about 100 pounds, included a small tent, cooking outfit, blankets, and enough provisions for five days.

Although I had selected for this journey one of the best and strongest pack-mules which we possessed, and although his load was not much more than a third of what he could comfortably carry on a good road, he found it impossible to carry this load over the trail that we found before us.

During the first two or three hours the trail passed through a dense tropical jungle. We

Photo by Hiram Bingham

A SMALL CHAPEL ON THE OUTSKIRTS OF ABANCAY

With characteristic hospitality when I left Abancay on my way to Cuzco, I was accompanied this far by the prefect and his aide, and was sent on my way rejoicing and riding one of the prefect's best horses, while my own mule had a day off. It is this generous spirit of friendly courtesy that makes the work of exploration pleasant in a region where nature has done all she could to make it difficult.

repeatedly had to make detours to avoid deep sloughs, and occasionally had to stop in order to have branches cut away so that the mules might get through.

DIFFICULT GOING.

The trail grew rapidly worse, the pack-mule fell down four or five times, and finally became so frightened that he refused to attempt a place in the trail where it was necessary for him to jump up about four feet on a slippery rock. It was consequently necessary to unload him and distribute the cargo among the Indian carriers, and get all hands to help pull and push the mules over the bad spots in the mountain foot trail. This went on at intervals during the remainder of the day.

As a resul we found ourselves at nightfall on a grassy slope on the side of the mountain about 15,000 feet above sea-level. A little shelter here and the presence of a small spring made the Indians prefer to pass the night at this point.

The next morning we crossed a high pass and descended rapidly into a steep-walled valley, containing one of the upper tributaries of the Aobamba. The lower slopes were covered with a dense forest, which gradually gave way to scrub and grass up to the snow-line. About 2 o'clock in the afternoon we reached the valley bottom at a point where several smaller tributaries unite to form the principal west branch of the Aobamba. The place was called Palcay.

Here we found two or three modern Indian huts, one of them located in a very interesting ruined stronghold called Llacta. As the location of the stronghold in the bottom of a valley was not easily defensible, a wall about 12 feet in height surrounded the quadrangular ruin.

The stronghold was about 145 feet square and divided by two narrow cross-streets into four equal quarters. Two of these quarters had been completed, and consisted of five houses arranged around a courtyard in a symmetrical fashion. The third quarter was almost complete, while the fourth quarter had only the beginnings of two or three houses. Each one of the four quarters had a single en-

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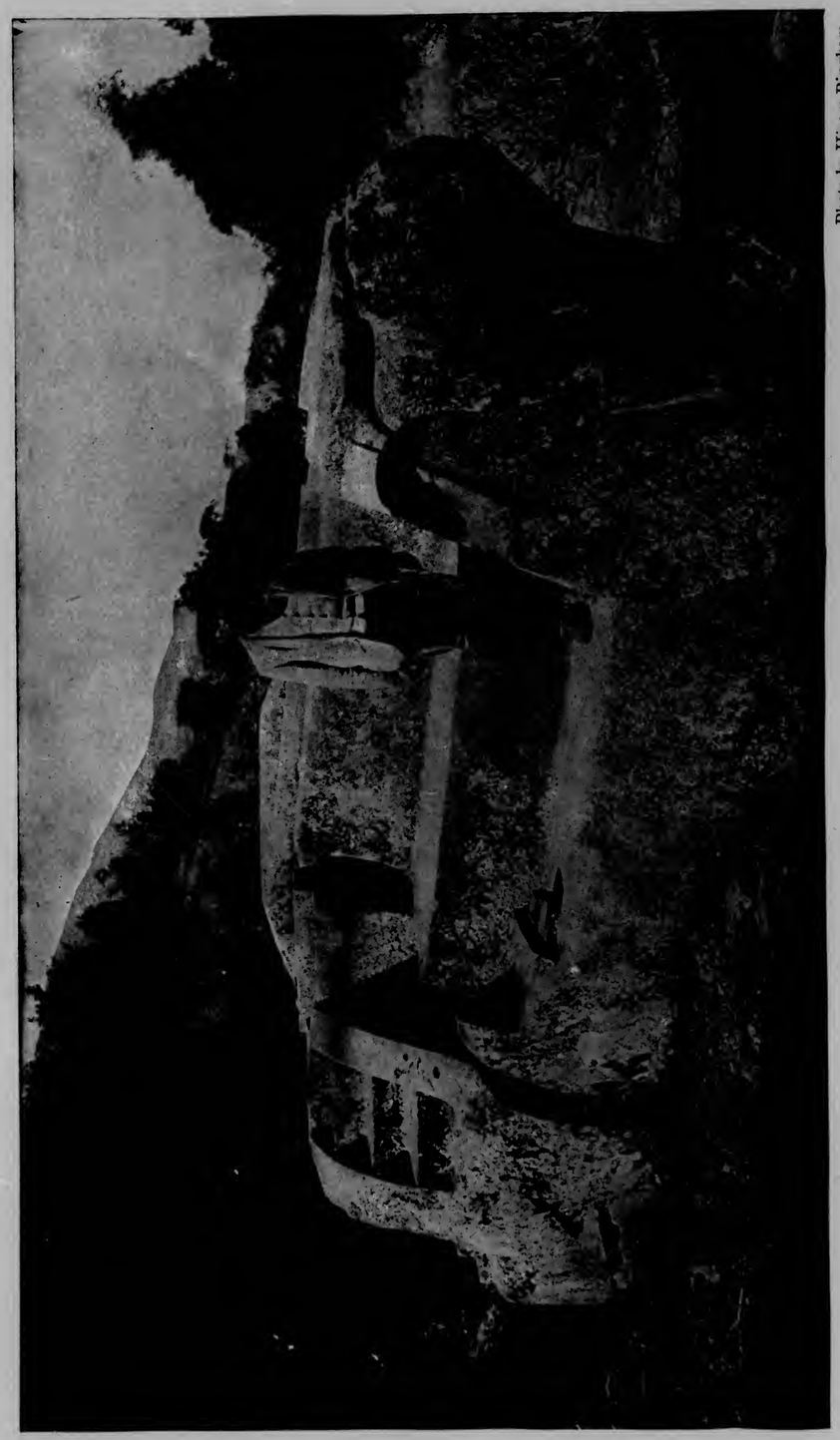


Photo by Hiram Bingham

THE CURIOUS ROCKS OF CONCACHA

Near Abancay, where the topographical cross-section of the Andes was begun in 1912, are some extraordinary carved rocks at a place called Concacha. This one is called by the Indians Rumihuasi, or stone house. It has been inadequately described by several travelers and the vicinity is one that demands early systematic investigation.

Photo by Hiram Bingham

ANOTHER VIEW OF THE STONE HOUSE: RUMIHUASI

Showing the cell where some people suppose a hermit passed his time, while his life was devoted to painfully decorating this boulder by the means of such rude stone implements as he had at hand.

trance gate on its north side. This will be more readily understood by consulting the plan on page 559.

The characteristics of the buildings are distinctly Inca and resemble in many ways those found at Choqquequirau in 1909. The stronghold was made of blocks of stone laid in mud, the buildings of symmetrical pattern, with doors narrower at the top than at the bottom; no windows, but interior ornaments of niches and projecting cylinders alternating between the niches. Whenever the wind did not blow, the gnats were very bad, which made the work of measuring and mapping the ruins extremely annoying.

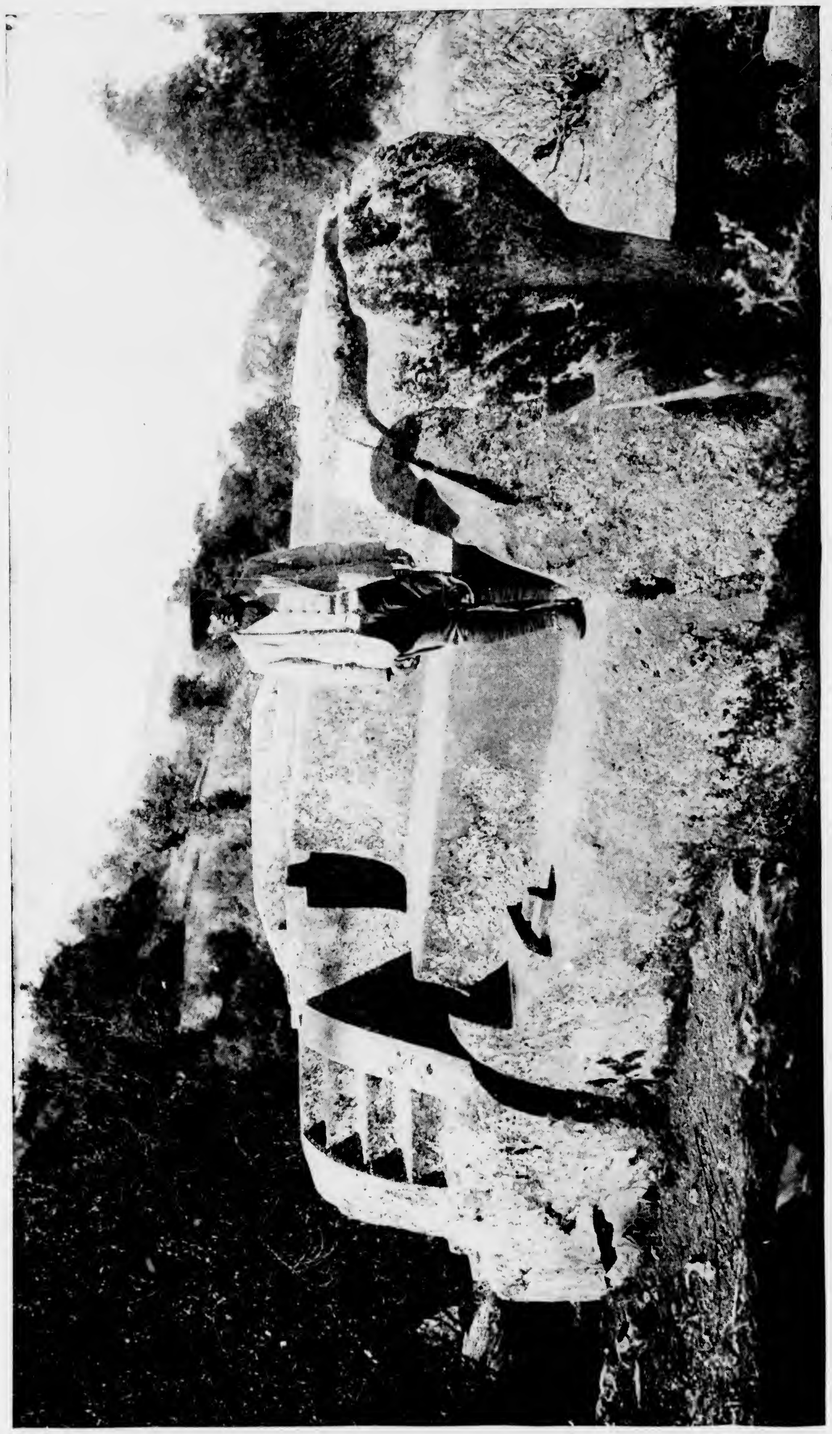
DESERTED BY THE INDIAN GUIDES

I should like to have continued the journey the next day, but the Indians objected, saying that it was Sunday and that they needed the rest. This "rest" gave them an opportunity for concocting a plan of escape, and on Monday morning, when I was ready to start for the third group of ruins, there were no guides or carriers in sight.

Neither Luis nor I had ever been in the region before. We could of course have gone back on foot over the trail on which we had come, but it was very doubtful whether we could have succeeded in getting our mules over that trail, even though we had abandoned our outfit, and we knew that a loaded mule could not possibly go over the trail without constant assistance and a number of helping hands.

To aid us in our dilemma there came a little Indian who inhabited one of the huts near the ruins. He offered for a consideration to guide us out of the valley by another road, and said that it went near the other ruins. He also said that it might not be possible to use this road "if the pass had much snow in it."

We talked to him with difficulty, for, like most mountain Indians, he had no knowledge of Spanish, and our own knowledge of Quichua was somewhat limited. However, there was nothing for it but to follow our new guide, and by distributing the cargo on the three mules make it as easy as possible for the poor beasts to use the foot-path, or goat trail, which was indicated as our "road."



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Retake of Preceding Frame

Photo by Hiram Bingham

A SUGAR PLANTATION IN THE APURIMAC VALLEY

Near Abancay are many charming sugar plantations which are noted for their hospitality. He is indeed a favored traveler whose journey lies through this hospitable region, where he is sure of a warm welcome at the end of his day's journey and the best that the house affords. Many of the sugar planters have traveled abroad and their houses are supplied with comfortable furniture, books, pianos, and even phonographs and pianolas that have been brought over the mountains either on the backs of men or mules.

Photo by Hiram Bingham

THE OTHER IMPORTANT CARVED ROCK AT CONCACHA (SEE PAGE 536)

Called Piedra Labrada, which is simply the Spanish for "carved rock." It was once one of the most extraordinary monoliths in South America. But within the past forty years it has been terribly mutilated. Remains of the animals and strange figures are still to be seen, but most of the heads have been destroyed either through superstition or caprice. Its present state is a glaring example of the necessity for preserving the ancient ruins of Peru, and for sending properly equipped expeditions to study these ancient sites before the historical evidence they contain is lost owing to ignorance or greed.

We had not gone more than half a mile before an abrupt ascent in the trail and a huge sloping rock barred the way for the mules for over half an hour. This difficulty being surmounted, we went on for another mile, only to find our way crossed by a huge avalanche of gigantic granite boulders and glacial drift, which had come down from the slopes of Mount Salcantay during the past year. A couple of hours were spent in negotiating the trail across this landslide.

We then found ourselves near the ruins of a village. Judging by the primitive appearance of the ruins, it could not have been a place of much importance and it is impossible to say whether it had been occupied since the Spanish conquest or not.

THE DISCOVERY OF TEN MAGNIFICENT GLACIERS

Climbing up the valley beyond this ruined village and turning a corner, we came into full view of 10 magnificent glaciers—eight of them in a cirque in front of us and two on the slopes of Salcantay behind us. As the guide was very well informed as to the names of different parts of the valley and could give names for most of the peaks but none for any for the glaciers, I have named these as follows (pp. 560, 563-5):

Photo by Hiram Bingham

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Photo by Hiram Bingham

THE GRAND CAÑON OF THE APURIMAC

A bit of the Apurimac Valley between La Estrella and Abancay. If the Pan-American Railway is ever completed, one of its most interesting sections and one involving tremendous engineering difficulties will be in this immediate vicinity, where the road from Cuzco to Lima crosses this magnificent tributary of the Amazon.

Photo by Hiram Bingham

MAP MAKING IN THE APURIMAC VALLEY

Chief Topographer Bumstead working at his plane table making the map between Abancay and Pasaje. The difficulties of map making in cañons, varying from 4,000 to 10,000 feet in depth, can scarcely be appreciated except by practical engineers (see pages 506, 507).

(1) *Hadley Glacier,* in honor of the President of Yale University.

(2) *Gannett Glacier,* in honor of the President of the National Geographic Society.

(3) *Grosvenor Glacier,* in honor of the Editor and Director of the National Geographic Society.

(4) *Bryce Glacier,* in honor of His Excellency James Bryce, the British Ambassador, whose interest and enthusiastic support has greatly stimulated our work.

(5) *Harkness Glacier,* in honor of Edward S. Harkness, Esq., of New York, whose generous assistance was largely responsible for making possible the expeditions of 1911 and 1912.

(6) *Alfreda Mitchell Glacier,* in honor of my wife, without whose coöperation none of this work could have been done.

(7) *Taft Glacier,* in recognition of the courteous assistance we received from the United States government.

(8) *Leguia Glacier,* in recognition of the courteous assistance we received from the Peruvian government.

(9) *Morkill Glacier,* in recognition of the courteous assistance we received from the Peruvian corporation.

(10) *Yale Glacier*—for obvious reasons (see pages 560, 563-565).

While we were enjoying the wonderful spectacle and wondering whether any civilized being had ever seen the glaciers before, a magnificent gray deer with eight prongs to his horns sprang out of the grass near us, gave us a long look of interested interrogation, and then dashed off to find his friends.

Our little guide was more interested in the looks of the pass than in the deer, and although he shook his head as it came into view, it seemed to us that we were most fortunate, for there appeared to be no snow whatever on the trail all the way to the top of the pass. But we neglected to take into account the fact that we were approaching the pass from the north or sunny side, and that there might be snow on the trail on the other side of the pass, on the south or shady slope.

THE GRANDEUR OF THE SCENERY

All thoughts of this, however, were temporarily swept aside by the magnificent view of Salcantay, which we now had on our right hand. The picture on p. 563 gives but a faint idea of the grandeur of this mountain. In many ways it is an ideally beautiful peak, rising as it does to a sharp point, with its sides cov-

Photo by Hiram Bingham

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(5) *Harkness Glacier,* in honor of Edward S. Harkness, Esq., of New York, whose generous assistance was largely responsible for making possible the expeditions of 1911 and 1912.

(6) *Alfreda Mitchell Glacier,* in honor of my wife, without whose coöperation none of this work could have been done.

(7) *Taft Glacier,* in recognition of the courteous assistance we received from the United States government.

(8) *Leguia Glacier,* in recognition of the courteous assistance we received from the Peruvian government.

(9) *Morkill Glacier,* in recognition of the courteous assistance we received from the Peruvian corporation.

(10) *Yale Glacier*—for obvious reasons (see pages 560, 563-565).

While we were enjoying the wonderful spectacle and wondering whether any civilized being had ever seen the glaciers before, a magnificent gray deer with eight prongs to his horns sprang out of the grass near us, gave us a long look of interested interrogation, and then dashed off to find his friends.

Our little guide was more interested in the looks of the pass than in the deer, and although he shook his head as it came into view, it seemed to us that we were most fortunate, for there appeared to be no snow whatever on the trail all the way to the top of the pass. But we neglected to take into account the fact that we were approaching the pass from the north or sunny side, and that there might be snow on the trail on the other side of the pass, on the south or shady slope.

THE GRANDEUR OF THE SCENERY

All thoughts of this, however, were temporarily swept aside by the magnificent view of Salcantay, which we now had on our right hand. The picture on p. 563 gives but a faint idea of the grandeur of this mountain. In many ways it is an ideally beautiful peak, rising as it does to a sharp point, with its sides cov-

Retake of Preceding Frame

Photo by Paul Bestor

THE FERRY AT PASAJE: APURIMAC VALLEY

The Director crossing the Apurimac River on a raft at Pasaje. The Indian ferryman is looking back in astonishment that a "gringo" should know how to use a paddle

ered with snow and ice, and lifting its head so magnificently thousands of feet higher than anything else in the vicinity.

Our own elevation at the time was a little over 16,000 feet, and a conservative estimate would place the top of the mountain at least 5,000 feet above us. It was a very great disappointment that we were unable, owing to the bad weather, to get the mountain triangulated, so that its height still remains an unknown quantity.

The American mining engineers at Ferrobamba believe it to be the highest peak in the Andes, and Mr. Stevens, the superintendent of the mine, which is nearly 100 miles away from the mountain, told me that he had seen it from so many distant points of the Andes that he felt confident it must be the highest mountain in South America.

Just before getting to the top of the pass we turned aside for a few moments to see the remains of a hole in the ground where it is said that there was once an ancient gold mine.

A few specimens of rock brought from the talings appear to contain small quantities of silver and copper, but the altitude is so great and the surroundings so difficult that it is not likely that this mine will ever be a profitable working proposition.

THE MULES STAMPEDE ON A SNOW SLOPE

Our joy in the scarcity of snow on the north side of the pass was instantly reduced to despair when we reached the summit and looked down a precipitous slope covered with snow for a distance of at least 1,000 feet below us.

The sandal-shod mountain Indians, whose occasional huts are the only signs of human habitation hereabouts, had made a zig-zag path in the snow by means of tramping down the upper crust with roughly cut stumps of stunted mountain trees. The path was about eight inches wide.

Our mules had never been in the snow before. At first our Indian guide declared he would not go down with us, as he was afraid of snow blindness, but he was persuaded to accompany us.

Our mules took a few steps on the little path, then decided that the white snow field looked more inviting and left the

Photo by Hiram Bingham

A VIEW OF PANTA MOUNTAIN

Between Pasaje on the Apurimac and Lucma lies a remarkable mountain region of glaciers and snowy peaks, of which the finest is Panta Mountain. The making of the map in this vicinity was accompanied by great hardships and innumerable difficulties.

path, fell into the soft snow up to their ears, floundered around and attempted to stampede, and rolled down the side of the mountain. It was nearly half an hour before we got them safely back on the trail again, where they stood trembling and unwilling to attempt the descent. Coaxing and curses were equally of no avail. Pulling, hauling, and beating were alternately resorted to.

Somehow or other, chiefly because our trail lay down hill, so that when they fell and floundered off the path they always landed a little nearer to their goal than when they had started, we eventually got the mules to the foot of the declivity, but only after several narrow escapes and three hours of hard work. As we looked back up the trail it seemed that perhaps 1,500 feet would be a more exact estimate of the height of the snow-covered slope.

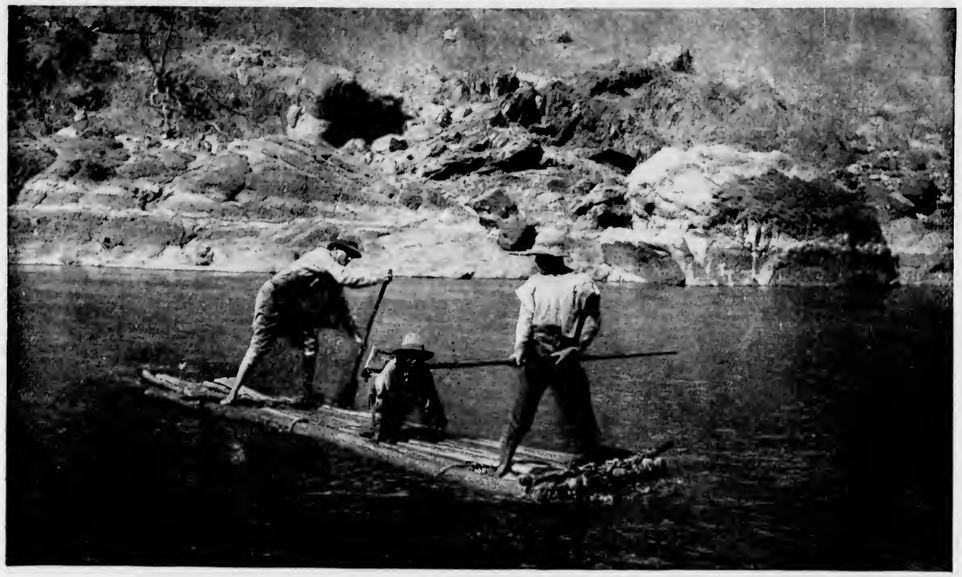
Just at dusk we reached the first hut in the valley, and found that we were in one of the upper branches of the Chamaná River, a tributary of the Urubamba, which Mr. Tucker, of the 1911 expedition, had reconnoitered the preceding year.

DISCOVERY OF THE PICTOGRAPHIC ROCK.

In this valley was the third group of ruins which we had been told about. Their most unusual feature lay in the fact that the Incas, desiring to save as much of the upland valley floor as possible for agricultural purposes, had straightened the bed of the meandering stream and inclosed it in a stone-lined channel, making it practically perfectly straight for nearly three-quarters of a mile.

The valley is still used to a certain extent for raising and freezing potatoes. The owner of the hut near which we camped entertained our Indian guide in compensation for his assistance in spreading potatoes to be frozen that night some distance below us in the valley bottom. The next day our guide took us back up the valley and out through a smaller tributary, where we crossed the divide between the Urubamba and Apurimac valleys and descended toward the town of Limatambo.

This was one of the most fortunate accidents of the trip, for had we decided to go down the Chamaná over Mr. Tuck-



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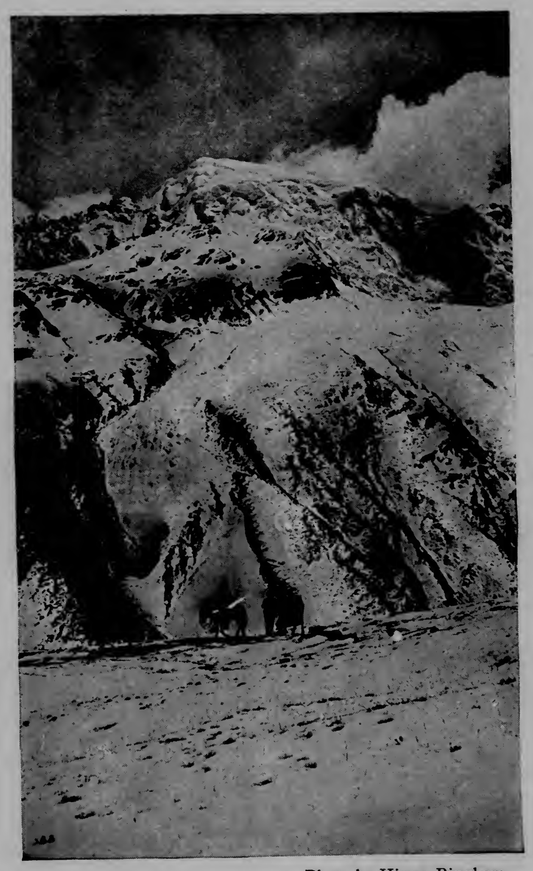

Photo by Hiram Bingham

ANOTHER VIEW OF PANTA MOUNTAIN FROM NEAR CHOQUETIRA

Photo by Hiram Bingham

THE TRAIL FROM ARMA TO CHOQUETIRA

Panta Mountain from the pass near Arma, showing the trail along the mountain-side. One of the stations in this vicinity occupied by Chief Topographer Bumstead in his survey was at an elevation of over 18,000 feet above the sea.

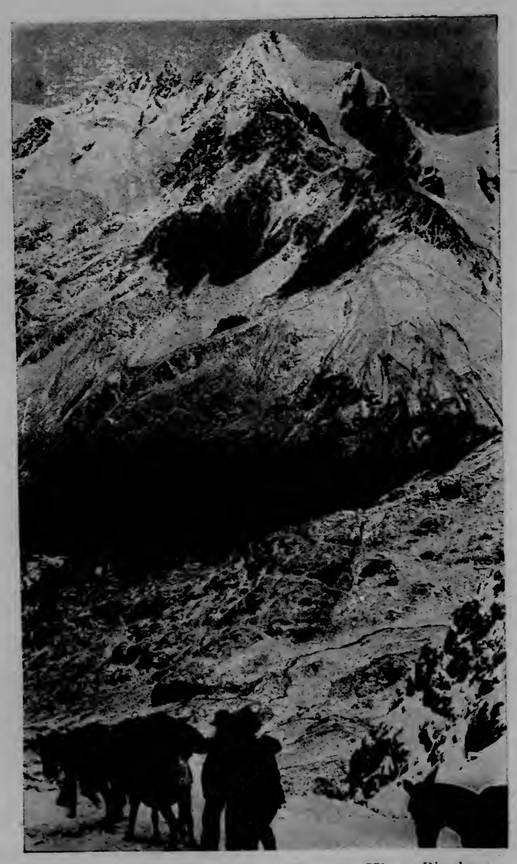

Photo by Hiram Bingham

MOUNT SOIROCCOCHA NEAR PANTA MOUNTAIN

From the pass between Arma and Puquiura. These peaks are all in the neighborhood of 20,000 feet above the sea, have never been climbed, and offer an attractive field for hardy mountaineers.

Photo by Hiram Bingham

THE ARMA VALLEY

Another view of Mount Soiroccocha and the Arma Valley from our camp near an abandoned house

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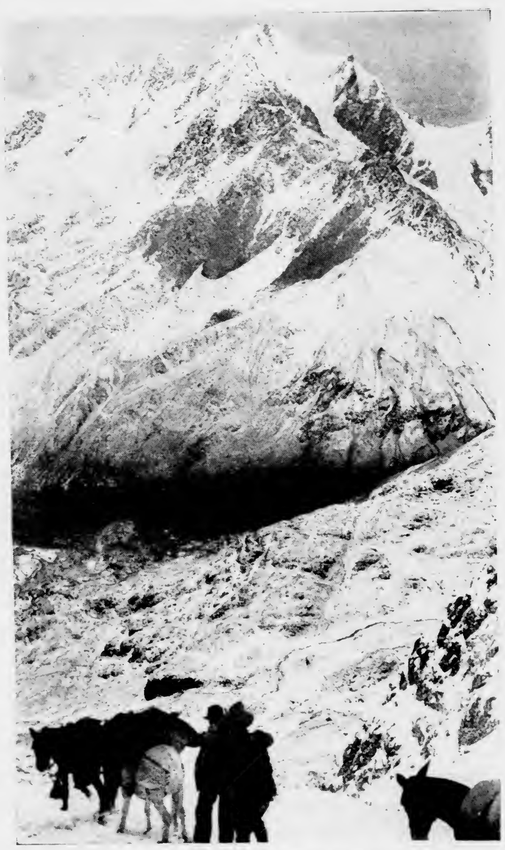

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EXPLORING ONLY 13 DEGREES FROM THE EQUATOR

The caravan crossing a pass near Panta Mountain. The elevation here is about 15,000 feet; the latitude is 13 degrees S.

er's route and return quickly down the Urubamba to our starting point, we should have missed seeing a most interesting rock which lay alongside of the little path we followed on this day's journey.

Neither the guide nor the muleteer had their eyes open for petroglyphic or pictographic markings, and so did not notice that they had passed close to the only rock so far discovered in the department of Cuzco that contains petroglyphs. Others have been reported by vague rumor, but none so far have been located except this one, whose existence was known to one or two cowboys on a neighboring ranch. The photograph gives a better idea of the markings than can be expressed in words (see page 566).

The character of the petroglyphs is essentially savage. They remind one of some of the glyphs used by our own western Indians. It seems to me possible that these marks were left on this rock by an Amazon Indian tribe who came thus far on the road to Cuzco. In the vicinity there were a few groups of stones which might indicate the former presence of rude huts, but until a comparative study can be made of all the pictographs and petroglyphs in Peru and in the Amazon basin it will be difficult to speak very definitely about this new discovery.

That night I was most hospitably entertained at a small ranch house and the next day made a forced march to Cuzco, reaching there shortly before midnight. This journey, which began so inauspiciously and might have ended in disastrous failure, actually produced more results in the discovery of hitherto undescribed ruins than any other part of the work.

VII

CHOQQUEQUIRAU.

In 1909, owing to the courtesy of the Peruvian government and at their urgent invitation, I had visited the ruins of Choqquequirau. An account of this visit was published in the *American Anthropologist* for October-December, 1910 (pages 505-525), and also in my *Across South America,* pages 291-323.

A French expedition had visited the ruins about 60 years before and had reached them from the north, over a path that has turned back several expedi-

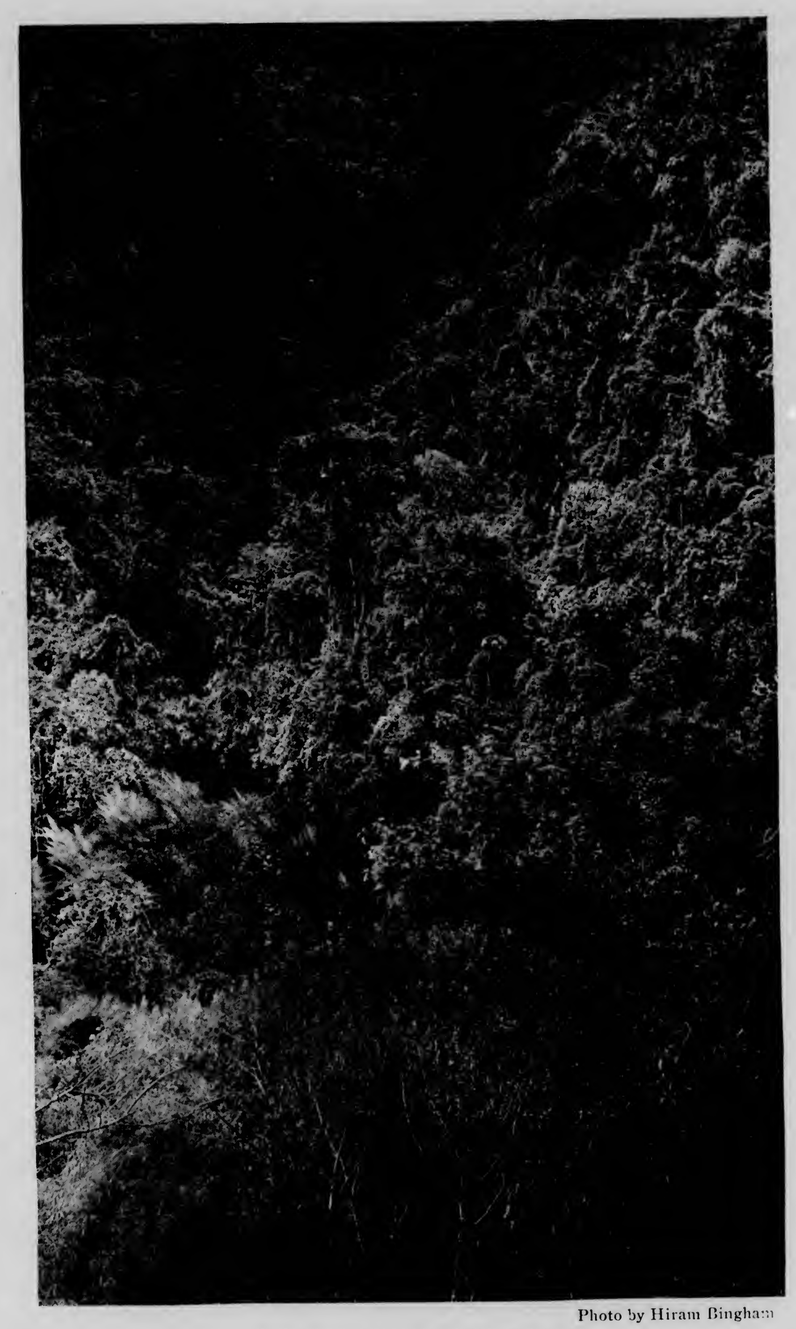

Photo by Hiram Bingham

EXPLORING FIVE HOURS LATER

Five hours after crossing the snow pass shown in the last picture we were going through a dense tropical jungle at an elevation of 10,000 feet above the sea. This proximity of the Arctic regions to the tropical is one of the most striking and at the same time one of the most trying features of the work of Peruvian exploration.

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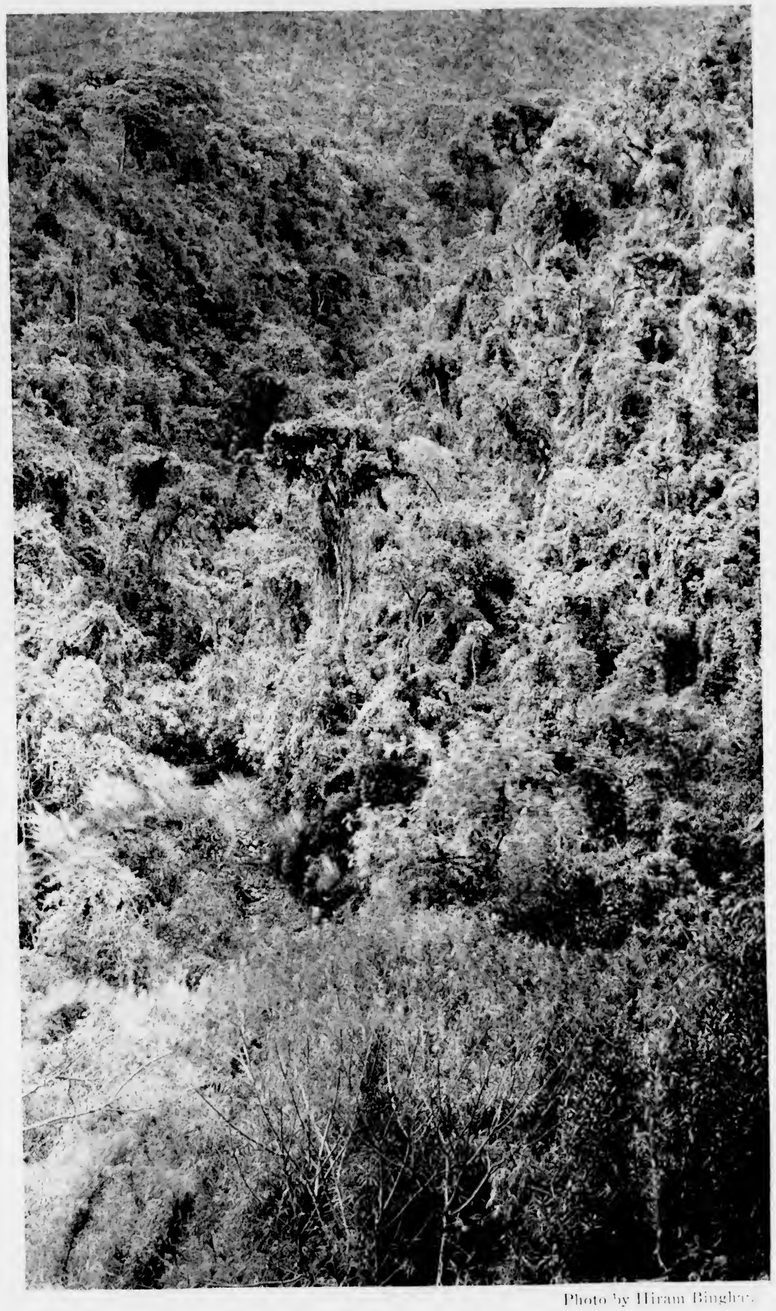

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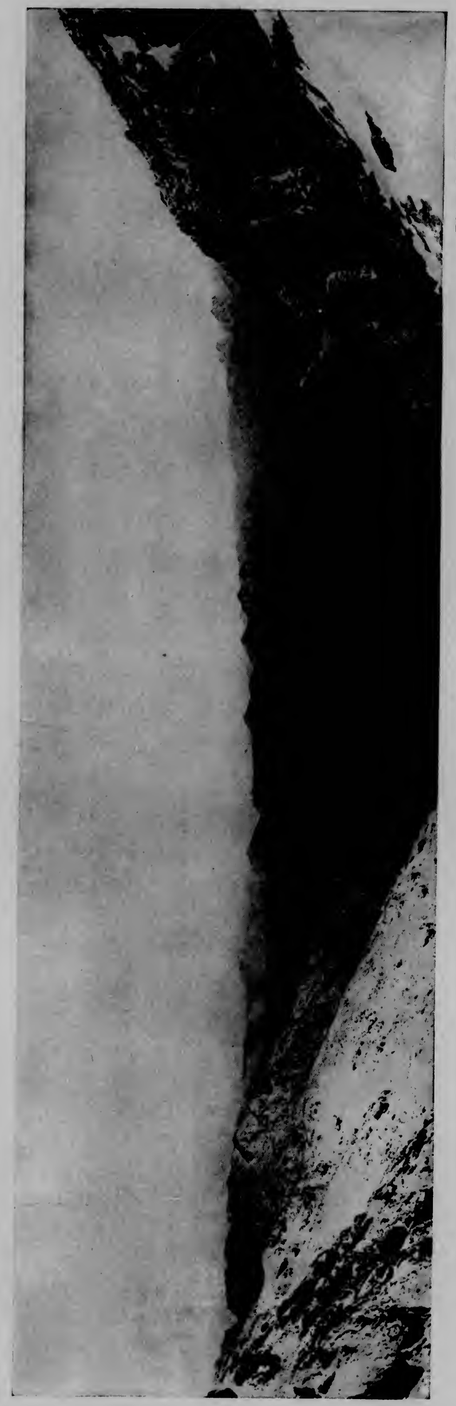

Photo by Hiram Bingham

THE VILCABAMBA VALLEY

A view of the Vilcabamba Valley from an elevation of 14,600 feet above the sea, near the pass between Puquiura and Arma

tions since then. In 1909, owing to the existence of a small temporary bridge, I was able to reach them from the south, but had not found it possible to spend more than four days there.

That bridge disappeared some time ago, and as it was now deemed advisable to attempt a further reconnaissance of those celebrated ruins, I asked Mr. Heald to see whether he could not reach them from the north, across the cordillera of Vilcabamba. An enthusiastic young German merchant in Cuzco had attempted this feat two years before, but failed to get more than half way from Yanama, the nearest settlement.

Knowing Mr. Heald's pluck, I felt sure that he could get there if anybody could, but that if he failed the only alternative must be to reconstruct the bridge over the Apurimac. The latter would have been a serious undertaking, as the river is over 200 feet wide and the rapids are strong and very dangerous.

Mr. Heald not only succeeded in reaching Choqquequirau, but visited the place three times, made a passable trail, and was able to conduct thither Dr. Eaton and Dr. Nelson. Their stay was limited by the very great difficulties which they encountered in securing laborers to accompany them, and in carrying sufficient food for themselves and the laborers over the extremely rough country.

A HARD DAY'S WORK

As a sample of the difficulties encountered, let me quote the following from Mr. Heald's account of his first day out from Yanama:

". . . After a three hours' climb we reached a spot well above 14,000 feet and had a splendid view of the country. From here I could get an idea of the kind of traveling I would encounter, and it did not look very inviting. Where the jungle was not thick the mountain-sides were steep and rocky. I could see the course of the Apurimac, somewhere near which was Choqque-

Photo by Hiram Bingham

OUR CARAVAN CROSSING THE PASS BETWEEN ARMA AND PUQUIURA: THE PASS OF CHUCUITO

Photo by Hiram Bingham

THE HOUSE OF ANDREAS QUINTANILLA: PUQUIURA

A typical hut at Puquiura, in the Vilcabamba Valley, where we were hospitably entertained for several days during the preliminary work of excavating the monolith and shrine at Ñusta Espana, near Vitcos.

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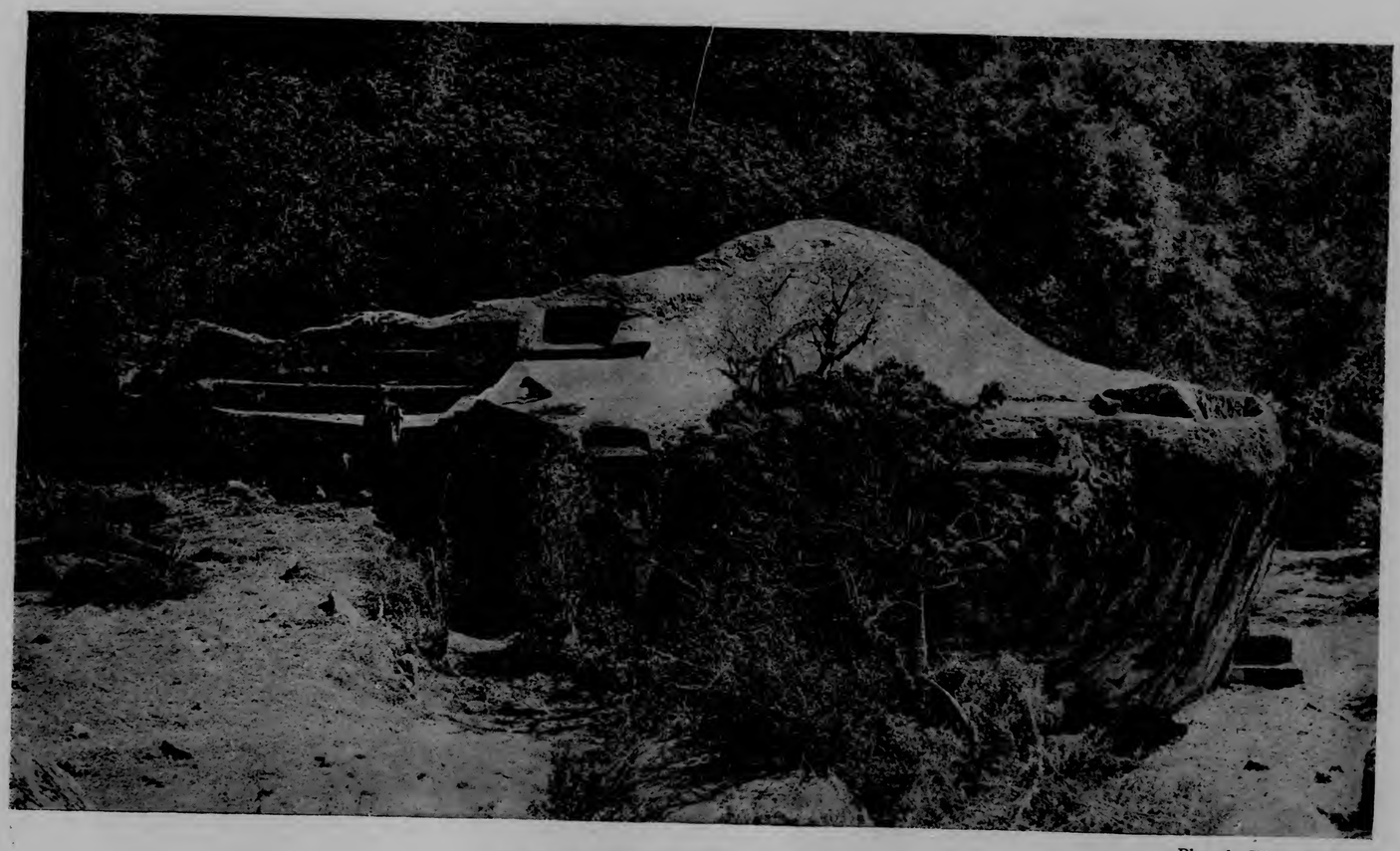

Photo by Hiram Bingham

THE SACRED WHITE ROCK NEAR VITCOS

A general view of the great monolith at Ñusta Espana, near Puquiura. Part of the rock overhangs a spring of water. This shrine is described in the early chronicles of Augustinian missionaries. Near here was Vitcos, the last Inca capital (see text, pages 511-513)

Photo by Hiram Bingham

ANOTHER VIEW OF THE SACRED WHITE ROCK, ÑUSTA ESPANA, NEAR VITCOS

The rock has evidently been flattened artificially and carved in rough relief. There are ten projecting square stones, seven of them in a line; and three above are carved out of the face of the stone. If these stones were intended to cast a shadow, it is significant that they were carved on the north side of the rock, where they would always be exposed to the sun.

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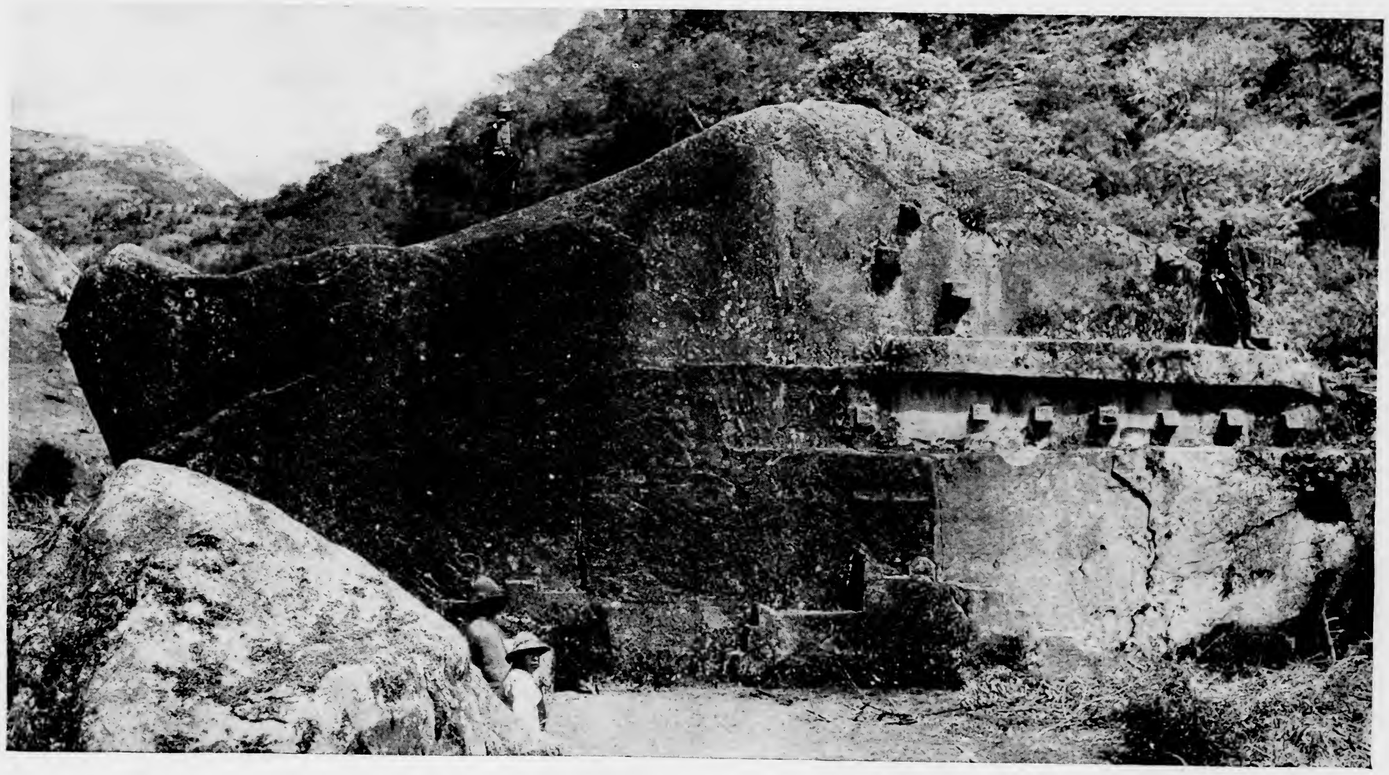

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Photo by Hiram Bingham

ROCK CARVING AT ÑUSTA ESPANA

A detail of some of the carving on the great monolith at Ñusta Espana. These projecting stones remind one of Machu Picchu, where they are frequently in evidence, and seem to have been used for practical as well as ornamental and religious purposes.

quirau, and the green cane fields in the province of Abancay, on the other side.

"From a purely artistic point of view the country was wonderful, with its splendid ranges of gleaming white peaks all covered by glaciers, and the dark green of the jungle below leading down into straight-sided valleys with streams white with foam running down them. From the point of view of one who had to travel through it for the purpose of getting to a place, location unknown, and making a trail to that place, it was anything but lovely. . . .

"After looking my fill and taking compass readings on Yanama and various prominent points, we started down. There had been condors swinging above us ever since we had reached the high point, and now one flew quite close. I fired at him with the *22* Winchester automatic, and for a moment thought he was going to fall. He recovered his balance, however, and went sailing off; but after traveling about half a mile he suddenly collapsed and fell, turning over and over and over into the brush, where, after quite a hunt, we found him, dead.

"He was a splendid bird, spreading a little over 9 feet 6 inches and measuring 4 feet from bill to tail tip. This shot showed both the hitting power of the little *22* and the wonderful vitality of the condor. The mushroom bullet had gone through breast and breast-bone, lungs, liver, and intestines, lodging against a thigh-bone. Tomás carried the bird back to the hacienda, where the prowess of the little rifle caused much admiration. We took off the skin and spread it to dry on one of the frames built to jerk meat, of which there were several in the yard. Next morning it was nowhere to be seen, and, as the mayor-domo said that it was no use looking for it, I surmised that he knew where it was and agreed with him. . . ."

TROUBLE WITH BEARS AND JUNGLE FLIES

Dr. Eaton's party had some trouble with hungry bears, which broke open a food box and devoured a quantity of precious provisions. These bears belong to the *spectacled-bear* genus, and, although plentiful in this region, are extremely shy and hard to get a shot at.

The perils of the trail were many, but the most serious handicap, as every explorer has found in this region before, and the most annoying thing they had to endure, was the ever-present swarms of green jungle-flies. Mr. Heald says in his report:

"They are little fellows, but the way they bite is not the least in proportion to their size. Every place they bite they leave a blood-spot the size of a pin-head, and this burns and itches for two or three days. There were swarms of them, and soon we were all swelling. The only thing we could do was to grin and bear it. When we stopped to rest we made a smudge, but while traveling the best we could do was to slaughter as many as we could.

". . . With the coming of dark the flies had left us, but they left us in very bad shape. Not a man of us could bend his wrists, they were so swollen; the knuckles on the hands were invisible. and our eyes were mere slits that it cost an effort to open enough to look out of. Still, there was a lot to be thankful for. There was lots of dry wood where we stopped, and we soon had a fire going, which warmed and dried us. The night was clear, so there was no danger of being gotten out of bed by rain. I had shot a jungle duck, and the inner man was perfectly satisfied. What bothered me most was that I was afraid the peons would try to run away, and I very much doubted my ability to carry enough food to enable us to find Choqquequirau without their help. . . ."

Photo by Hiram Bingham

ANOTHER VIEW OF THE MONOLITH NEAR VITCOS

The east end of the monolith at Ñusta Espana overhangs a spring. Near this was what appeared at first to be a stone platform. The pictures on page 554 show what our excavations revealed at this point.

THE SCARCITY OF WATER AND SUFFERING FROM THIRST.

Their most serious difficulty, however, was the lack of water and the height and steepness of the mountains, which cut them off from any possible water supply. Here is a sample of what they suffered:

"The next morning, when I went to fill my canteen with water, I found that there was none. The men said that they had drunk it, but I felt pretty sure that they had poured it out, believing that then we would have to turn back. I would have done so (though no farther than the spring we had uncovered the day before), but the Director had told me there was a spring easily found at Choqquequirau, and I was confident that we must be near the place.

"In front of us rose a sharp ridge. I was sure that if we gained its top we would see the city on the other side. The fire had cleared the ground, so going was not hard; it had also cleared out the flies. After about two hours of climbing we stood on top of the lowest saddle of the ridge. This had been reached after some rather ticklish cliff-climbing. On looking over the other side we were tremendously disappointed, for instead of a city there was an impassable ravine. All the morning we worked along

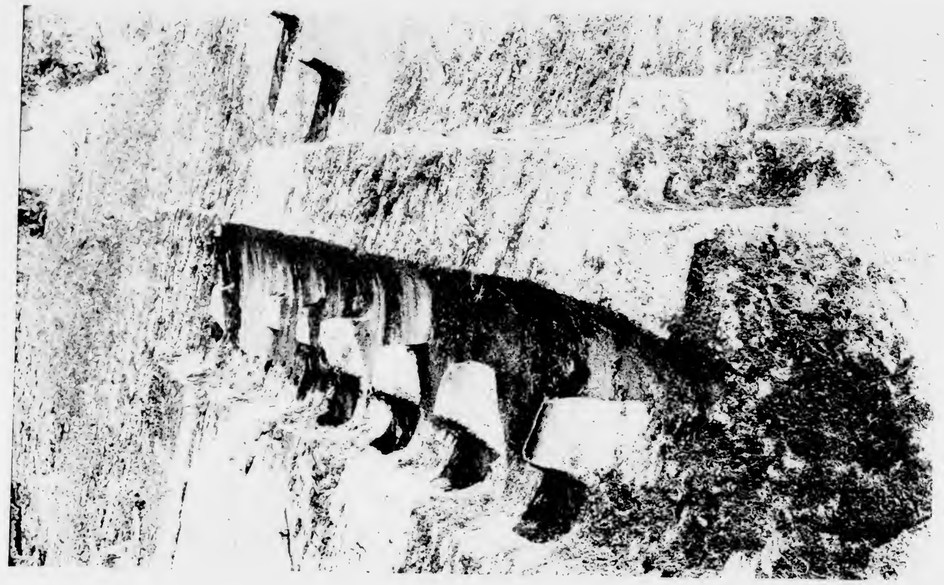

Photo by Hiram Bingham

ROCK CARVING AT ÑUSTA ESPANA

A detail of some of the carving on the great monolith at Ñusta Espana. These projecting stones remind one of Machu Picchu, where they are frequently in evidence, and seem to have been used for practical as well as ornamental and religious purposes.

quiran, and the green cane fields in the province of Abancay, on the other side.

"From a purely artistic point of view the country was wonderful, with its splendid ranges of gleaming white peaks all covered by glaciers, and the dark green of the jungle below leading down into straight-sided valleys with streams white with foam running down them. From the point of view of one who had to travel through it for the purpose of getting to a place, location unknown, and making a trail to that place, it was anything but lovely. . . .

"After looking my fill and taking compass readings on Yanama and various prominent points, we started down. There had been condors swinging above us ever since we had reached the high point, and now one flew quite close. I fired at him with the 22 Winchester automatic, and for a moment thought he was going to fall. He recovered his balance, however, and went sailing off; but after traveling about half a mile he suddenly collapsed and fell, turning over and over and over into the brush, where, after quite a hunt, we found him, dead.

"He was a splendid bird, spreading a little over 9 feet 6 inches and measuring 4 feet from bill to tail tip. This shot showed both the hitting power of the little 22 and the wonderful vitality of the condor. The mushroom bullet had gone through breast and breast-bone, lungs, liver, and intestines, lodging against a thigh-bone. Tomás carried the bird back to the hacienda, where the prowess of the little rifle caused much admiration. We took off the skin and spread it to dry on one of the frames built to jerk meat, of which there were several in the yard. Next morning it was nowhere to be seen, and, as the mayor-domo said that it was no use looking for it, I surmised that he knew where it was and agreed with him. . . ."

TROUBLE WITH BEARS AND JUNGLE FLIES

Dr. Eaton's party had some trouble with hungry bears, which broke open a food box and devoured a quantity of precious provisions. These bears belong to the *spectacled-bear* genus, and, although plentiful in this region, are extremely shy and hard to get a shot at.

The perils of the trail were many, but the most serious handicap, as every explorer has found in this region before, and the most annoying thing they had to endure, was the ever-present swarms of green jungle-flies. Mr. Heald says in his report:

"They are little fellows, but the way they bite is not the least in proportion to their size. Every place they bite they leave a blood-spot the size of a pin-head, and this burns and itches for two or three days. There were swarms of them, and soon we were all swelling. The only thing we could do was to grin and bear it. When we stopped to rest we made a smudge, but while traveling the best we could do was to slaughter as many as we could.

". . . With the coming of dark the flies had left us, but they left us in very bad shape. Not a man of us could bend his wrists, they were so swollen; the knuckles on the hands were invisible, and our eyes were mere slits that it cost an effort to open enough to look out of. Still, there was a lot to be thankful for. There was lots of dry wood where we stopped, and we soon had a fire going, which warmed and dried us. The night was clear, so there was no danger of being gotten out of bed by rain. I had shot a jungle duck, and the inner man was perfectly satisfied. What bothered me most was that I was afraid the peons would try to run away, and I very much doubted my ability to carry enough food to enable us to find Choqquequirau without their help. . . ."

Photo by Hiram Bingham

ANOTHER VIEW OF THE MONOLITH NEAR VITCOS

The east end of the monolith at Ñusta Espana overhangs a spring. Near this was what appeared at first to be a stone platform. The pictures on page 554 show what our excavations revealed at this point.

THE SCARCITY OF WATER AND SUFFERING FROM THIRST.

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Photo by Hiram Bingham

COMMENCING EXCAVATIONS AT ÑUSTA ESPANA NEAR PUQUIURA, NEAR THE STONE PLATFORM SHOWN IN THE LAST PICTURE

Photo by Hiram Bingham

THE RESULTS OF EXCAVATION AT ÑUSTA ESPANA

The seats near the spring at Ñusta Espana after excavation. They are cut out of large rocks, so that the platform on which they rest, the seats themselves, and the lower portion of the back are all part of the same rock. Thus only three or four large rocks were used for the entire row of seats. The excavations here yielded no results in the way of potsherds or artifacts (see page 520).

Photo by Hiram Bingham

CCORIHUAYRACHINA

The ruins of Ccorihuayrachina, in the Urubamba Valley, are very primitive and were visited for the first time in 1912. Inside of one of the houses here shown is a solitary square projecting stone, the only thing that differentiates these ruins from many others.

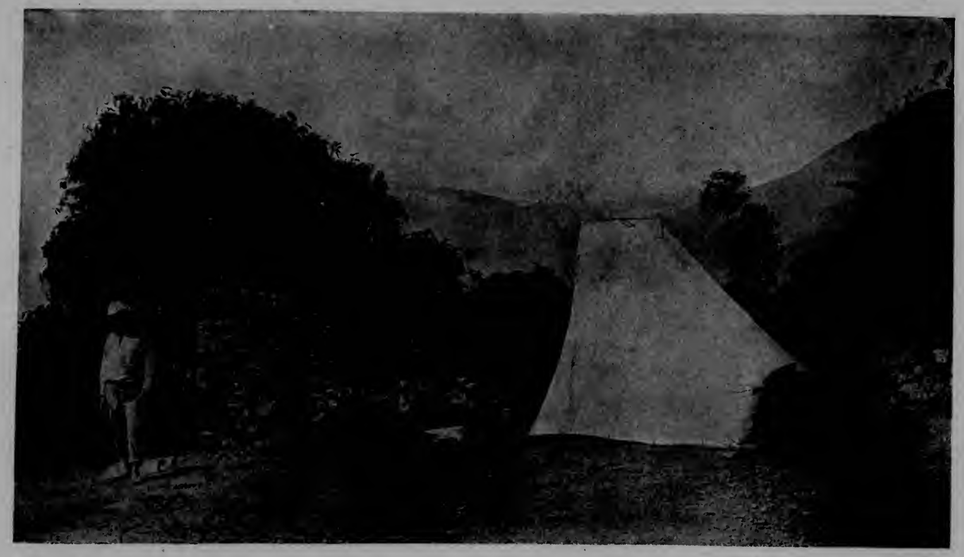

Photo by Hiram Bingham

ANOTHER GROUP OF RELATIVELY UNIMPORTANT RUINS VISITED FOR THE FIRST TIME IN 1912 WAS AT LLACTA PATA IN THE AOBAMBA VALLEY

Corners of two of the smaller houses are shown in this picture as well as the type of tent used by most of our parties. It has only a single pole and may be easily put up by one man in five minutes (see text, page 534).

Photo by Hiram Bingham

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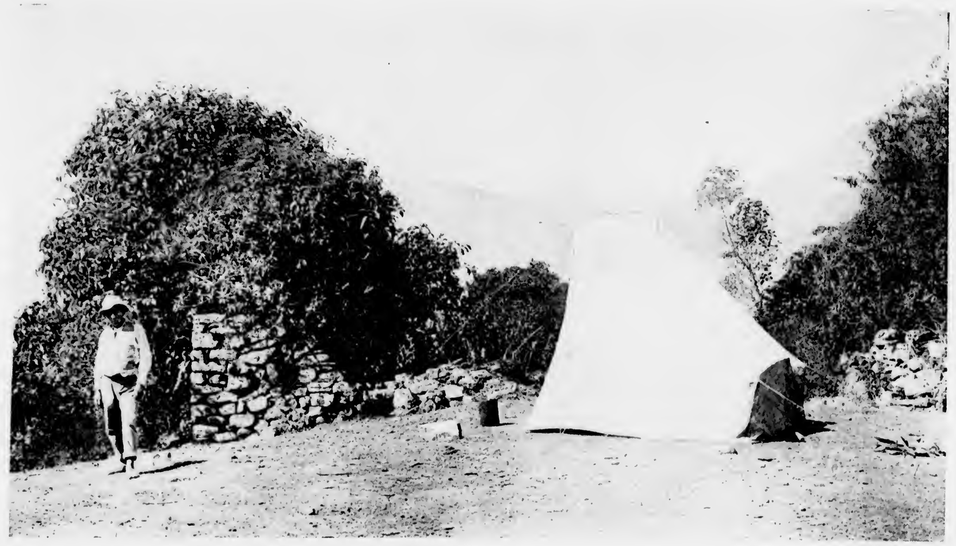

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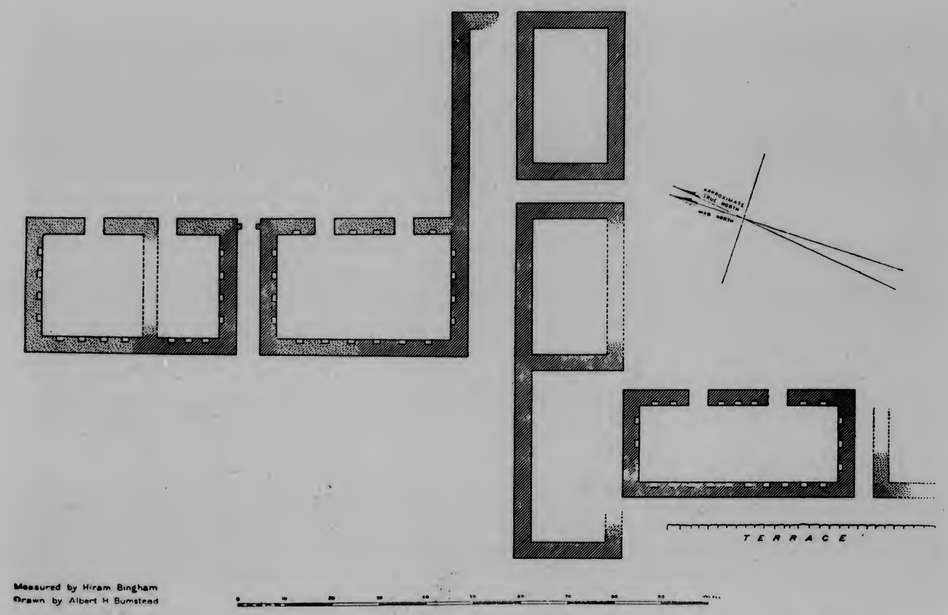


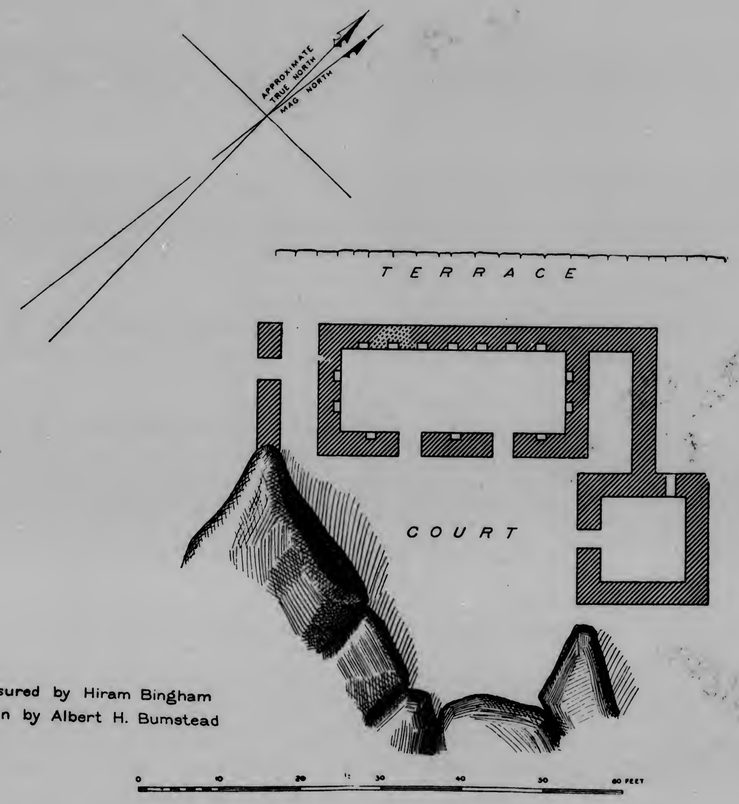
PLAN OF THE RUINS OF LLACTA PATA NEAR HUADQUIÑA, DISCOVERED BY HIRAM BINGHAM IN 1912

This plan shows the more important group of ruins at Llacta Pata, but does not show any part of those illustrated in the preceding picture. As in all Inca ruins, the marked characteristic is the symmetrical arrangement of niches within oblong buildings (see also text, page 534).

Photo by Hiram Bingham

ESTANCIA IN PALCAY

The most important group of ruins discovered in 1912 was that at Palcay, a hitherto unreported locality, where I found an extraordinary square fortified stronghold resembling in architectural details the ruins of Choqquequirau, described in my "Across South America," Chapter XXIII (see text, page 535, and plan, page 559).



RUINS OF ESTANCIA IN PALCAY

This ruin of a small isolated group of buildings at Palcay probably represents a temple and the residence of the priest. The presence of huge rocks, the careful character of the construction, and the absence of other buildings all point to this conclusion.

the knife edge of ravines, hoping that the city would come into view, and always disappointed.

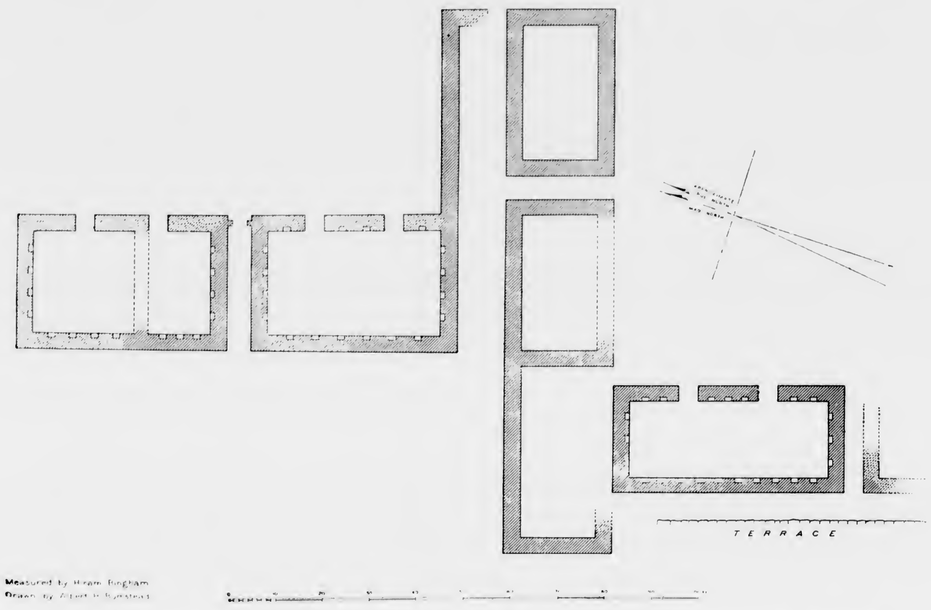
"By noon we had come to where the ridge merged into the mountain proper and were working along its sides. After the stop for lunch the men refused to go any farther. They said if they did it would be merely to die of thirst; that the city of Choqquequirau was non-existent, and that they did not wish to die just because I did.

EXTREME MEASURES BECOME NECESSARY.

"I knew we couldn't make them work, but I thought we could force them to travel. Giving the 22 to Tomás, I told him to shoot any man who tried to bolt, but to do it carefully, around the edges. Then, taking a machete, I started ahead, cutting the way, and told them to follow. As Tomás stood between them and the back trail, they decided to do so, and for two hours we went ahead in that way. By that time I was just about exhausted, as we were working through thick cane and I was going at top speed.*

"Coming out on a little shoulder, I thought I saw some ruins on the next spur ahead. Looking through my glass

* It should not be forgotten that all this time Mr. Heald was suffering from the effects of his accident on Huayna Picchu, which had partially disabled his right arm (pp. 431, 438).



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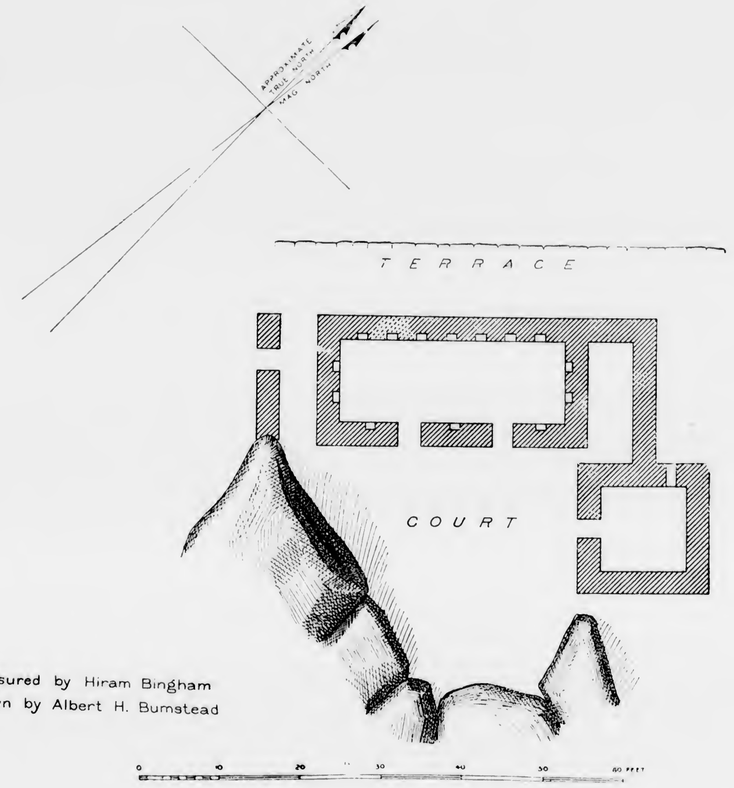

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A CORNER OF THE RUINS OF LLACTA IN PALCAY

Showing a niche and a projecting cylindrical stone, and the chief Indian guide, who deserted with his fellows two days' later and left us in the lurch.

". . . While four of us were fixing camp I sent the other two out to look for water. In an hour they came back with the news that there was none to be found. By this time we were all very thirsty, but there was nothing to do but grin and bear it.

WATER HARD TO FIND

"About midnight I was wakened by a man crying and pleading. It was Tomás, who was having a nightmare. This in itself would not have been serious, but it excited the superstitions of the peons. They said the Incas were angry because we were there, and they wanted to be gone at daylight. I thought it best to spend some time making a search for the spring; so, as soon as it was light, we started and for an hour hunted in the jungle, but without result. The best we could do was to get water from air plants and chew certain bulbs which contained much moisture. This was not such a small help as it might seem, for many of the air plants had a good swallow of water in them, though of course we got it drop by drop at a time.

"Giving up hopes of finding a spring near the city, we took the back trail. We were all pretty weak, but we made very fair time. Reaching the ridge, we climbed down by a new way, marking our trail with piles of stones, and also followed a new trail back to the draw in which the spring was, striking the draw a good deal higher up. This turned out to be a better road; also it led us to the discovery of a series of stone-faced terraces, and at one point in them the spring broke through, so that with a little fixing we could get all the water we wanted, and that was a good deal."

They later found water within an hour's walk of Choqquequirau, and had a plentiful supply for the work of excavating as long as their provisions lasted.

They had hoped to accomplish a good deal of map-work, but, owing to the great amount of rain and the almost continuous prevalence of fog and mist, little could be done besides making a route map.

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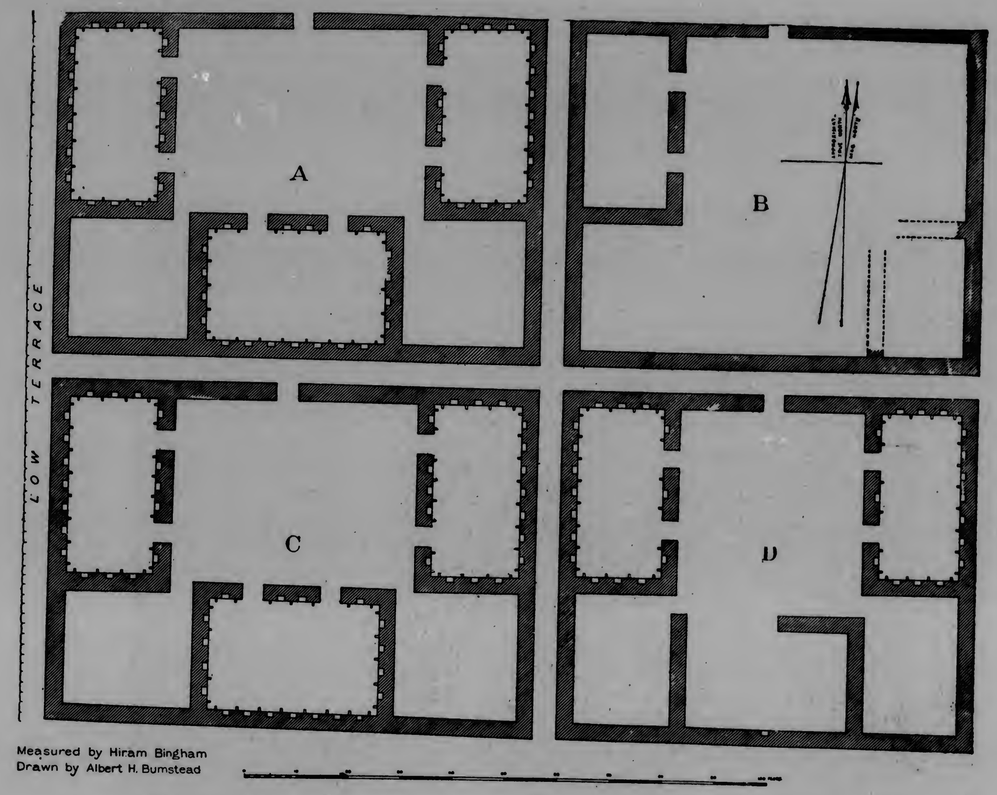
"Two hours of hard work placed us on the spur, though still high above the ruins. From there we could see several stone houses and two thatched huts, which had been left by the treasure-hunters who had come from Abancay two years previously. Just at dark we reached these huts. They showed signs of the old occupancy. There were two or three skulls lying around. A table-stone or two were in evidence and in one corner was an old Inca pot.



PLANS OF THE RUINS OF LLACTA IN PALCAY DISCOVERED IN 1912

The most remarkable feature of this fortified stronghold is that the cross-streets represent as nearly the exact cardinal points as it was possible for men working with crude tools to effect. These ruins are in the Southern Hemisphere, so the North Star is not visible. The ancient Peruvians did not know the use of the compass, and if they had the buildings would have been arranged according to the magnetic north and not according to true north. So exactly do the streets follow the local meridian and parallel that the exact orientation can hardly be said to be an accident (see pages 535 and 537).

ACCIDENTS AMONG THE INDIANS.

The Indians suffered quite as much as the white men on this journey. One of the bearers, who was carrying a food-box weighing 60 pounds, slipped on a steep bank and fell 20 feet; the box, which fell with him, opened his head. The man was not killed, but of course had to be sent home, and as laborers were extremely scarce, his presence was seriously missed.

Another Indian ran a stick into his foot and blood-poisoning ensued. A third slipped off a precipitous rock and fortunately was saved by the rope which had been tied to his waist when passing this dangerous part of the trail, although he had a toe-nail torn off and suffered considerably from blood-poisoning.

The results of these hardships were the route map—the first ever made of this section of the Andes—the discovery of a number of hitherto unknown Inca engineering works, including ditches and agricultural terraces, now buried deep in the jungle and practically inaccessible, and a few boxes of archeological and osteological specimens.

Because of the scarcity of labor, the terror of the Indians, and the small quantity of provisions that could be carried over the extremely difficult trail, the party was only able to spend five days at Choq-

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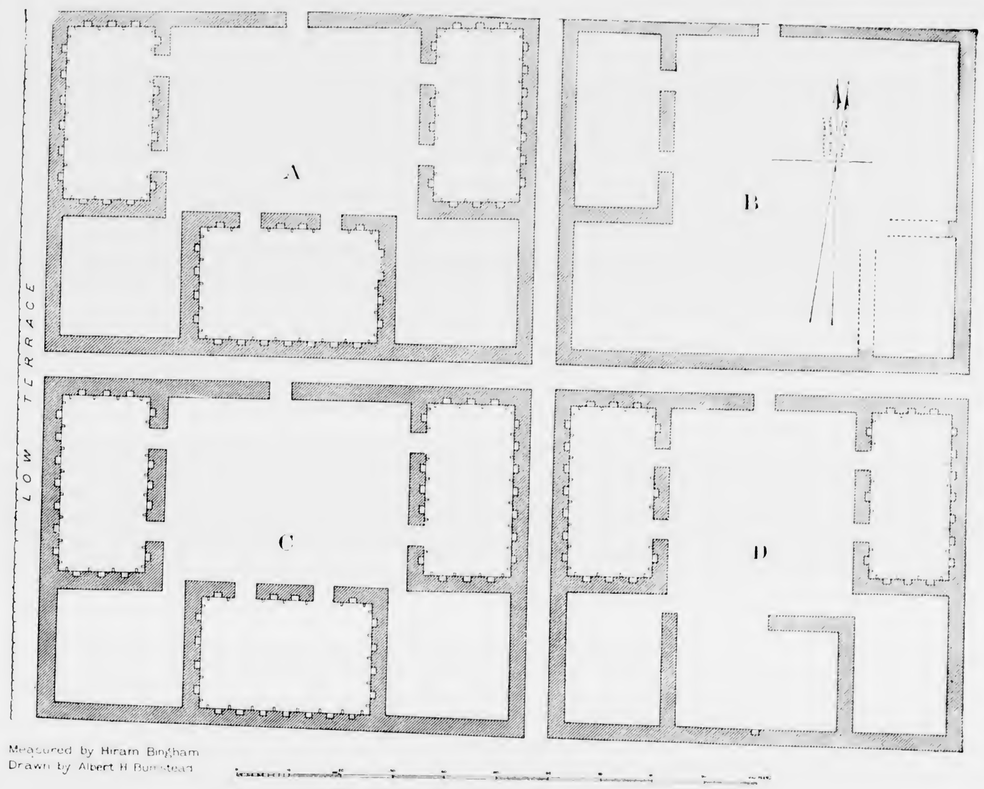

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FOUR OF THE NEW GLACIERS IN THE UPPER AOBAMBA VALLEY

Discovered on the 1912 expedition and named as follows, reading from right to left: Gannett Glacier, Grosvenor Glacier, Bryce Glacier, and Hadley Glacier (see pages 539, 541, 563-565)

quequirau. Under Dr. Eaton's direction 11 graves were examined and such skeletal material and pottery collected as four men could carry on their return march. No metal objects were found in these graves.

The method of burial was similar to that observed at Machu Picchu, except that the construction of bottle-necked graves was far superior at Choqquequirau, and this style of grave apparently more in vogue than at Machu Picchu. It may be noted here as significant that apparently the best example of the bottle-necked grave at Machu Picchu was found in a house closely resembling in its architectural details the buildings at Choqquequirau.

This route had only been used three times previously: (1) by the French explorer Sartiges in 1834, (2) by the Peruvian explorer Samanez in 1861, and (3) by the Almanza brothers in 1885. It was used successfully this year for the first time since 1885. Great credit is due Mr. Heald for his courage and perseverance.

VIII

ANTHROPOLOGICAL STUDIES.

The anthropological study consisted chiefly in the taking, with extreme care and marked regard for scientific accuracy, of a number of anthropometric measurements.

The blanks used for the measurements were prepared by Dr. H. B. Ferris, of the Yale Medical School, and the results and photographs have been turned over to him for the preparation of a report on the anatomical characteristics of the Mountain Indians of Southern Peru as represented in the data obtained by the expedition.

Owing to the habit that the Mountain Indians have of frequently visiting Cuzco, the principal center of population, we were enabled to secure measurements of representatives of many villages and towns that we did not visit. Besides Cuzco, anthropological measurements were taken in Huadquiña, Machu Picchu, and Santa Ana.

At Machu Picchu we had our own workmen to draw on, while at Santa Ana and Huadquiña the managers of the large sugar plantations kindly placed their laborers at our disposal. In Cuzco it was necessary to employ force. Had it not been for the willingness of the Peruvian government to assist us, we should have failed in our object.

The method followed was to have the officer or soldier who was assigned to us go out on the streets and arrest any Indians that seemed to be of pure blood and who proclaimed by their costumes and general appearance that they were typical Mountain Indians.

On being arrested, the unfortunate subjects were brought to the doctor's room at the hotel. Many of the Indians thought that they were being recruited for service in the army, and not a few shed tears at the thought; others were only curious. All were much relieved when they were set free and given a five-cent piece with which to buy *chicha* (native beer made from maize).

Thirty-eight measurements were taken of each subject—measurements of head, face, ears, and nose, as well as of height standing, kneeling, sitting, and others. Many other data were also recorded concerning any peculiarities or deformations, color of eyes and hair, and other facts of anthropological interest.

One hundred and forty-five Indians were thus studied, and a front and side view photograph taken of each. They represented 16 provinces and 60 towns. Most of these were men. Photographs of many Indian women were also taken in Cuzco and at the stations between Cuzco and Mollendo, making 433 photographs in all taken for this study.

Some of the Indians were greatly frightened at the procedure. To one aged Indian military honors appealed, and he took his measurements with a smiling face. Another Indian, when he found he could have his picture taken free, dressed in his Sunday clothes. The next day he returned to see the photograph. When he was shown the negative he refused to believe that it was his picture, because he couldn't see the colors and the spangles that decorated that Sunday coat he wore.

Photo by Hiram Bingham

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Owing to the habit that the Mountain Indians have of frequently visiting Cuzco, the principal center of population, we were enabled to secure measurements of representatives of many villages and towns that we did not visit. Besides Cuzco, anthropological measurements were taken in Huadquiña, Machu Picchu, and Santa Ana.

At Machu Picchu we had our own workmen to draw on, while at Santa Ana and Huadquiña the managers of the large sugar plantations kindly placed their laborers at our disposal. In Cuzco it was necessary to employ force. Had it not been for the willingness of the Peruvian government to assist us, we should have failed in our object.

The method followed was to have the officer or soldier who was assigned to us go out on the streets and arrest any Indians that seemed to be of pure blood and who proclaimed by their costumes and general appearance that they were typical Mountain Indians.

On being arrested, the unfortunate subjects were brought to the doctor's room at the hotel. Many of the Indians thought that they were being recruited for service in the army, and not a few shed tears at the thought; others were only curious. All were much relieved when they were set free and given a five-cent piece with which to buy *chicha* (native beer made from maize).

Thirty-eight measurements were taken of each subject—measurements of head, face, ears, and nose, as well as of height standing, kneeling, sitting, and others. Many other data were also recorded concerning any peculiarities or deformations, color of eyes and hair, and other facts of anthropological interest.

One hundred and forty-five Indians were thus studied, and a front and side view photograph taken of each. They represented 16 provinces and 60 towns. Most of these were men. Photographs of many Indian women were also taken in Cuzco and at the stations between Cuzco and Mollendo, making 433 photographs in all taken for this study.

Some of the Indians were greatly frightened at the procedure. To one aged Indian military honors appealed, and he took his measurements with a smiling face. Another Indian, when he found he could have his picture taken free, dressed in his Sunday clothes. The next day he returned to see the photograph. When he was shown the negative he refused to believe that it was his picture, because he couldn't see the colors and the spangles that decorated that Sunday coat he wore.

CONCLUSIONS REACHED FROM THE MEASUREMENTS AND EXAMINATIONS.

At Huadquiña the Indians were ordered to a room to be measured. One subject objected strenuously and made it as difficult as he could for any measurements to be taken. He would not stand straight, nor sit straight, nor assume any position correctly. Finally, when the measurements were all taken, he was offered the usual *medio* for his trouble. This small coin, with which one could purchase a large drink of native beer, was usually gratefully accepted as a *quid pro quo,* but in this case the Indian decided he had been grievously insulted, and he threw the coin violently to the ground and strode off in high dudgeon.

Remarkably few cranial deformations were found, these being all slightly acrocephalic. The following facts were noticed about the Indians: The leg and back muscles are markedly developed, while their arm muscles show very meager development; their work consists largely of carrying heavy loads upon their backs over mountain trails; the Indians do not become bald, and their hair seldom loses its pigment; their teeth are also remarkably well preserved, except on the sugar plantations, where they suck the sugar-cane and eat coarse brown sugar (*chancaca*).

An interesting custom which still prevails was observed as being practiced about two miles outside of Cuzco, as one goes north toward the Urubamba Valley. At a point in the road where one gets a last look at the city the Indians have a praying place.

THE INDIAN PRAYING PLACE ABOVE CUZCO

This road is one of the principal highways in Peru, and hundreds of Indians pass up and down going in and out of Cuzco daily. The view of Cuzco lying below in the green valley is truly a beautiful one, but it is something more than a sense of beauty that makes the Indians stop, and, with uncovered heads, some kneeling and some standing, offer a prayer as they look toward their Mecca.

It is noticeable that those who are on a journey going away from Cuzco pray for a longer time than those who are approaching the city. Possibly they fear the dangers of the roadside more than those of the city streets.

Another Indian custom which adds a picturesque touch to the roadsides between Cuzco and Machu Picchu is the presence of quaint signs indicating what is for sale in the Indian huts.

A small bunch of wheat or barley tied on the end of a pole and stuck out in front of the hut indicates that there is *chicha* (a native corn beer) for sale within. A bunch of flowers on the end of a pole also has the same significance.

A green wreath means that there is bread for sale, while a piece of white cloth or white paper waving in the breeze indicates that the wayfarer may here purchase *aguardiente,* a powerful white rum made of cane juice and containing a large percentage of raw alcohol.

It is sincerely to be regretted that more Indians could not have been measured, but as this work was entirely in charge of the surgeon of the expedition, Dr. L. T. Nelson, and as his first duty was to attend to the health of the members of the expedition, the anthropological measurements had to take second place. The exigencies of the work necessitated his spending a large part of his time where there was little opportunity for making anthropological measurements.

NO MEASUREMENTS PERMITTED IN AREQUIPA

In Arequipa he found that local sentiment prevented the government from assisting him. Arequipeños would resent any action compelling an Indian to submit to measurements, even though the subject were paid for his time. Furthermore, as practically the only pure-blooded Indians now in Arequipa are transients who come in for commercial purposes, driving their llama trains loaded with produce, the merchants of Arequipa would resent anything which might interfere with business. These difficulties made it impossible to secure any measurements in Arequipa.

On the trip to Choqquequirau, where the surgeon's presence was necessary,

Photo by Hiram Bingham

MOUNT SALCANTAY AND THE YALE GLACIER AT THE HEAD OF THE AOBAMBA VALLEY

This peak, one of the most beautiful in the Andes, is probably 21,000 feet above sea-level, and has never been climbed or triangulated. It was cloud-covered so much of the time that we have hitherto been unable to triangulate it. Clouds may be seen gathering in front of the glacier, and two minutes after this picture was taken the entire mountain was enveloped in cloud, and nothing more than partial and fleeting glimpses were had of it during our stay in the vicinity (see pages 539, 541, 560, 564-565).

Photo by Hiram Bingham

SEVEN OF THE NEW GLACIERS DISCOVERED IN 1912 IN THE UPPER AOBAMBA VALLEY BY HIRAM BINGHAM

They have been named as follows, reading from right to left: Bryce Glacier, Hadley Glacier, Alfreda Mitchell Glacier, Harkness Glacier, Taft Glacier, Leguia Glacier, and Morkill Glacier. Bryce Glacier is in the center of the picture and the summit at the extreme right.

owing to the great risks of sending the members of the expedition over a dangerous mountain trail, it was necessary to cut the equipment down to any such surgical instruments as might be demanded, and it was not possible to take along any of the equipment for making anthropometric measurements.

Finally, owing to the presence of smallpox and an epidemic of typhoid in Arma, Puquiura, and the neighboring villages, the surgeon was obliged to stay with the topographical party all the time that they were working in that region. Their work was greatly hindered by adverse weather conditions, and so much valuable time was lost.

The extent of the smallpox and typhoid fever epidemics prohibited the surgeon from carrying on anthropological work there, on account of the danger of bringing the contagion to the camp. To be sure, the white members of the expedition had been vaccinated, both for smallpox and typhoid, by our medical adviser, Dr. H. S. Arnold, of the Yale Medical School, before leaving this country; but it would have been wrong to have had them run unnecessary risks or to have subjected to the danger of contagion the muleteers, engineering assistants, and the other native members of the party who had not been so vaccinated.

IX

WEATHER OBSERVATIONS

From May 28, the day of our departure from Panama, until the arrival of the vessel off the town of Mollendo, on June 8, a full series of weather observations was taken daily at the hours of 8 a. m., 12 m., and 8 p. m. The data recorded cover the following phenomena: Air temperature (dry-bulb thermometer), temperature by wet-bulb thermometer, barometric pressure, clouds, precipitation, wind, sea, and surface temperature of the ocean.

Photo by Hiram Bingham

ANOTHER VIEW OF THE NEW GLACIERS

Including, reading from left to right: Morkill Glacier, Leguia Glacier, Taft Glacier, and Harkness Glacier, looking down the Aobamba Valley from near the pass to the Chamana Valley (see pages 539, 541, 560, and 563)

On the return voyage from Mollendo to Panama a full series of weather observations was taken similar to that recorded when outward bound.

A complete series of weather observations was taken at Machu Picchu and during the cross-section map-making. Arrangements were made with Mr. Burt Collins, the manager of the Inca Mining Company, and with Mr. Claude Barber, of the Santa Lucia mine, to undertake the establishment of four meteorological stations at widely different elevations along the 71st meridian west of Greenwich. One will be at an elevation of nearly 14,000 feet, another at an elevation of about 6,000 feet, another on the edge of the Great Plains, and still another on the River Madre de Dios.

Self-registering barometers, thermometers, and rain gauges have been supplied for these stations. Mercurial barometers and sling psychrometers have also been provided. Both Mr. Collins and Mr. Barber have agreed to look after the maintenance of the stations for a period of five years.

The instrumental equipment for these stations was in part a loan from the Harvard Observatory through the kindness of Prof. E. C. Pickering, and in part due to the generosity of Mrs. Alfred Mitchell, who placed at our disposal a special fund for the purchase of instruments.

The results of the work should prove most illuminating and ought to be of particular value in connection with the observations made some years ago by the Meteorological Department of the Harvard Astronomical Observatory at Arequipa.

Photo by Hiram Bingham

THE FIRST PETROGLYPHIC ROCK DISCOVERED NEAR CUZCO

At Maranyocc near Limatambo, on the trail from Mount Salcantay to Cuzco, a small boulder was discovered covered with petroglyphs. The right-hand figure is seated near the boulder (see text, page 544).

Photo by Hiram Bingham

A NEARER VIEW OF THE PETROGLYPHS NEAR LIMATAMBO

A partial view of the Maranyocc boulder covered with petroglyphs. Their significance is not known, and there is no tradition in the vicinity to account for their presence here. The picture was taken by arranging the tripod so that the camera pointed almost directly down. It is barely possible that this rock, which is carved in a manner unlike any other hitherto found in the Department of Cuzco, represents the story of an Indian raid from the jungles of the Amazon into the heart of the land of the Incas.

X

COLLECTIONS MADE BY THE EXPEDITION

Our collections have all safely reached New Haven. They consist in large part of the bones of the people who built and lived in Machu Picchu, of the potsherds, pots, and bronzes found there, and of the geological, osteological, and paleontological material collected in the vicinity of Cuzco, of geological specimens from other parts of Peru, and of 2,500 photographs taken with the 3A Special and No. 4 Panaram Kodaks.

In a broad geographical sense the results of Dr. Eaton's collecting is one of the most important and interesting features of the expedition. In the vicinity of Cuzco Dr. Eaton secured the skeletons of probably 20 individuals. At Machu Picchu more than 60 individuals were excavated, and at Choqquequirau ten.

With these ancient denizens of southern Peru were found a number of bronze metal objects, including pins, knives, forceps, and some very attractive pieces of pottery. Although Dr. Eaton was technically the osteologist of the expedition, his work lay in a variety of fields.

Invertebrate fossils were collected from the hills overlooking the town of Payta, Peru, and the site of an ancient cemetery at Pascasmayo was visited.

Vertebrate fossils were obtained from sedimentary gravels in the Huancaro Quebrada.

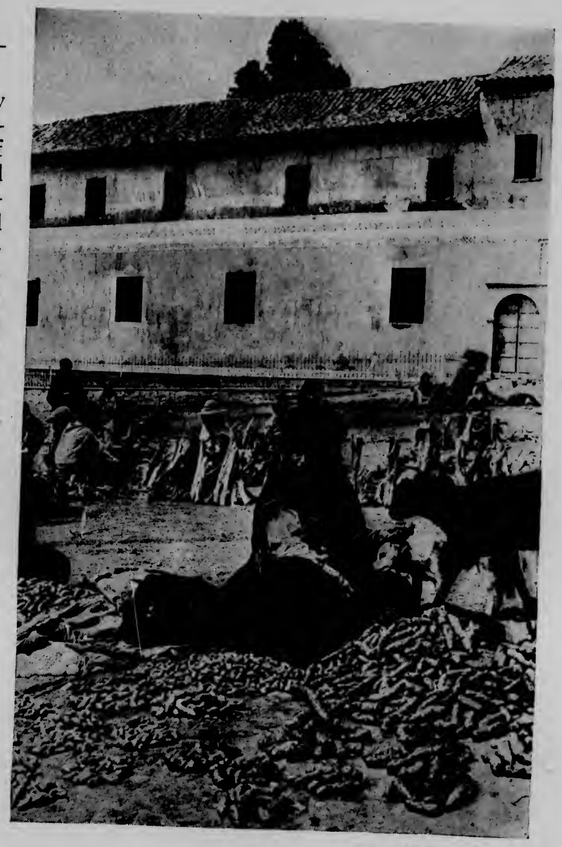

Photo by L. T. Nelson

THE SAN FRANCISCO PLAZA: CUZCO

A corner of the Cuzco market, showing venders of vegetables and fire-wood. Dr. Nelson, the surgeon of the expedition, took many photographs of men and women in the market-place and on the streets of Cuzco (see text, pages 561, 562).

ACKNOWLEDGMENTS

Acknowledgments are due to the United States government for kind offices in connection with securing requisite privileges in Peru and for the loan, on the part of the Army, of a detached service chest, which enabled us to have the use of an abundant supply of medicines and of a complete set of surgical instruments:

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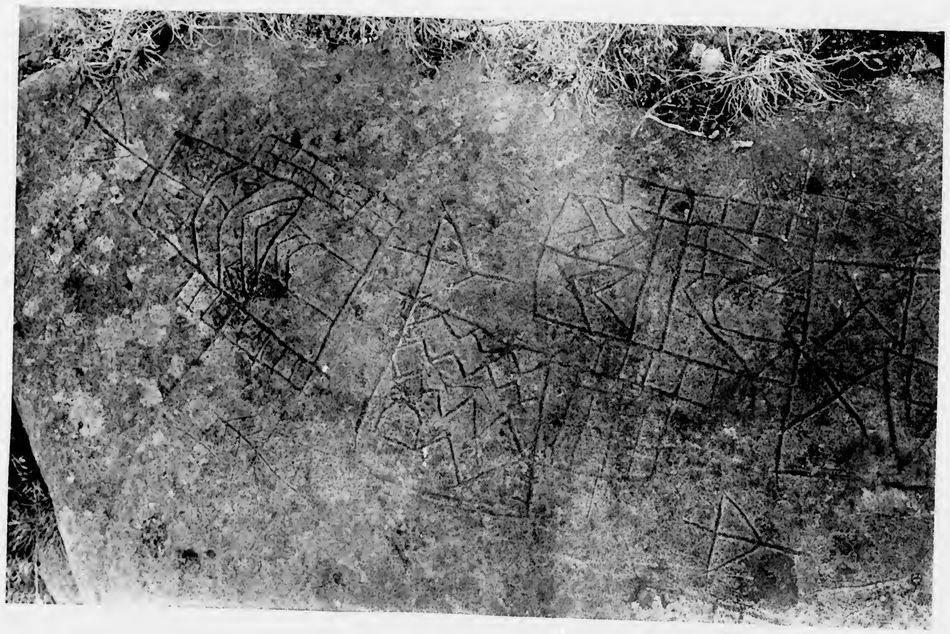

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A FAVORITE SPOT FOR FREEZING POTATOES: NEAR CHINCHEROS

One of the commonest vegetables sold in the market-place is called *"chuñu,"* potatoes dried in the sun by day, frozen at night on selected spots of the high plateau, and pressed the next morning by the feet of hard-working Indians.

Photo by Hiram Bingham

SQUEEZING THE JUICE OUT OF THAWING POTATOES

A *"chuñu"* maker treading the juice out of the piles of little potatoes that were spread out at night and frozen. Potatoes so prepared keep well, but lose their flavor and are extremely insipid. The usual method of preparing them for the table is to grind them on a stone mortar and use the powdered *"chuñu"* to thicken soup.

Photo by Hiram Bingham

A ROADSIDE SCENE NEAR CHINCHEROS

Looking toward the Urubamba Valley from a point near Chincheros. There are almost no wire fences in this country, the place of barbed wire being taken by thorny hedge plants which include cacti, thorn bushes, and agaves, or century plants, as shown in the picture.

Photo by L. T. Nelson

THE ENGINEERS' CAMP NEAR PUQUIURA

Owing to the prevalence of an epidemic of smallpox and typhoid in Puquiura, one engineering party, that had the misfortune to lose its tent by fire, made its camp in a cave said by the natives to have been an Inca prison. It was not very comfortable, but it was dry and it was sanitary.

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Retake of Preceding Frame

00539

Photo by L. T. Nelson

A TYPICAL CUZCO GIRL

A pleasant-faced Cuzco Indian girl holding a yardstick to give an idea of her height, and wearing the regulation costume of the Peruvian Mountain Indian women. The hat is a flat pancake of straw lined on one side with red flannel, and on the other side with blue velveteen decorated with strips of gilt braid. It may be worn either side up, according to the weather.

Photo by L. T. Nelson

ANOTHER QUICHUA WOMAN: CUZCO

Wearing the typical pancake hat, with the edges turned up, to denote that the weather is fine. The women in the Cuzco market-place form one of the most interesting sights for the average visitor.

Photo by L. T. Nelson

TYPES OF INDIAN WOMEN IN THE CUZCO MARKET-PLACE

These are some of the Indians who were measured and photographed by the expedition (see pages 561, 562).

Photo by L. T. Nelson

"THE FATHER OF HIS COUNTRY"

About 150 Indian men were measured and photographed in an effort to get accurate information regarding their physiognomy and anatomy. Most of them were rather frightened, but this one, who has been dubbed the "father of his country," was very much flattered and highly pleased at having his picture taken (see text, pages 561, 562).

Photo by L. T. Nelson

QUICHUA GIRL: CUZCO

The Cuzco Indian women rarely speak anything but Quichua, the language of the Incas.

Photo by L. T. Nelson

A TYPICAL OLD INDIAN WOMAN IN CUZCO

An old Indian woman from the Cuzco market-place quite disgusted with the proceedings and wishing that her spinning had not been interrupted. In her left hand she is holding her yarn and primitive spindle.

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SHEEP AND A LITTLE MOUNTAIN SHEPHERD NEAR CHINCHEROS Photo by Hiram Bingham

The little Quichua boys early learn their duties as shepherds and spend many of the years when they ought to be at school in tending the flocks of their parents

POTTERY FROM MACHU PICCHU (SEE PAGES 446 TO 449) Photo by Hiram Bingham

points whose whereabouts was not generally known.

To Messrs. Cesar Lomellini & Co., of Cuzco, who for two years have acted as our agents and have placed at our disposal their excellent facilities for handling the difficult situations which arise in connection with the organization and administration of an exploring expedition, and all without charging us any commission or any rent, although we occupied a large room in their warehouses as our headquarters for many months.

To Messrs. W. R. Grace & Co., whose unique position in Peruvian commerce enable them to assist us in unnumbered ways, beginning with the procuring of our supplies and ending with the carrying home of some of our collections in their steamers, without charge for any of their services. It is not too much to say that the work of the last two years could not have been accomplished as it has been without the continual friendly offices of this company, whose enlightened policy in regard to assisting scientific endeavor might well serve as an example to other companies engaged in carrying on foreign trade.

In conclusion it gives me great pleasure to acknowledge a large debt of gratitude to the officials of Yale University and of the National Geographic Society for their sympathetic coöperation during both the preparation and the progress of the expedition.

To them and to the members of the expedition I should like to take this opportunity to express my own personal thanks for the loyal support which has been accorded me from the beginning. The end is not yet, for it will take many months of patient and laborious effort to bring out the ultimate scientific results of the Peruvian Expedition of 1912.

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