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## INTO BURNING HADHRAMAUT

### The Arab Land of Frankincense and Myrrh, Ever a Lodestone of Western Exploration

BY D. VAN DER MEULEN

*Former chargé d'affaires for the Netherlands at Jidda*

**F**EW of the present day know even the name of this land. Yet once it was rich, with a highly developed culture.

One of the highroads of the Old World, the trade-route from India and Persia to Egypt and Syria, and to the other countries around the Mediterranean, ran through Hadhramaut; and it supplied its own fragrant contribution to that ancient world commerce—a contribution not great in extent but vast in significance.

Incense trees grew along the barren, rocky plateaus and in the scorching heat of the wadies (dry river beds). And woe to him who, uninitiated, tried to collect the valuable product, for, sooner or later, he perished from thirst and exhaustion. The gathering of incense, myrrh, and aloe remained a work for those trained in the hard and difficult art of traveling over the endless plains of stone, and through the wadies, with their perpendicular walls and deadly heat that drives man to despair. These products of wondrous odor, destined for the service of God and the dead, carry with them something of the mystery of their land of origin.\*

Somewhere near Hadhramaut must lie that other land of mystery, that Ophir rich in gold whose name, like that of Hadhra-

maut itself, is known to us from the Old Testament. The "Hazarmaveth" of the tenth chapter of Genesis contains the same number of radicals as Hadhramaut and is certainly the same word. Another Old Testament episode, set in this area, has to do with the "Queen of the South." She traveled to Jerusalem on hearing of the wisdom and wealth of King Solomon, and had her residence in the land of Saba (Sheba), on the borders of Hadhramaut and the Yemen. The Romans named these provinces *Arabia Felix*, Happy Arabia, in contradistinction to the rest, which they designated *Arabia Deserta* and *Arabia Petraea*, the Desert and the Realm of Stone.

#### WHERE ARABIA STILL GUARDS ITS MYSTERIES

Slowly but surely explorers penetrate the few parts of our globe that remain unknown. But only the most daring have been able to make even hasty trips through these areas. The situation of Ophir has not yet been established with scientific certainty, and attempts to investigate the buried ruins of the palaces and temples of Saba have not yet been crowned with success. That Arabia has been able to guard its mysteries so long against the inquisitive Westerner is due partly to the physical features of the country and partly to the religious fanaticism of its sparse population.

\* See, also, "The Isle of Frankincense (Socotra)," by Charles K. Moser, in the NATIONAL GEOGRAPHIC MAGAZINE for March, 1918.



Photograph by Dr. D. van der Meulen and Dr. H. van Wissmann.

#### THE WATER FRONT AT MUKALLA

Set apart from the main steamer paths, changed little through the centuries, Mukalla handles such sea trade as the Hadhramaut enjoys. The dome at the left surmounts the tomb of the city's patron saint.

A vast wilderness of sand and rock, with neither water nor food for man or beast, makes the crossing of a large section of Arabia an undertaking that can be achieved only under the guidance and with the coöperation of the Bedouins living there. When the inhabitants are unwilling to aid the dis-trusted and hated Unbelievers, then traveling is practically impossible. Small wonder, then, that such a remarkable country as Hadhramaut is even in our day almost entirely "terra incognita."

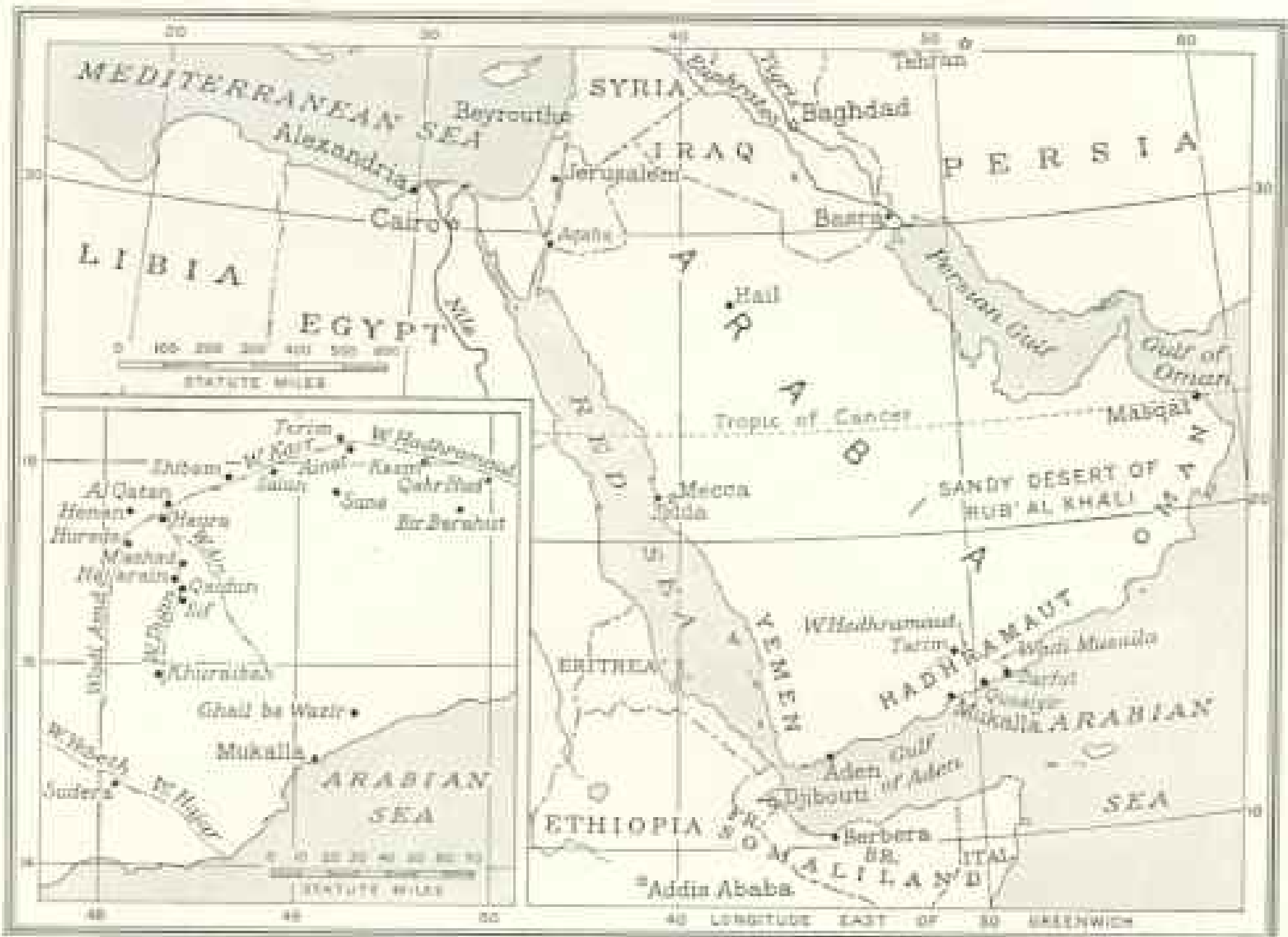
To-day, for reasons growing out of Arab migration to Dutch-owned Java, the Netherlands Government has made an attempt to end this state of mystery. The impetus arose out of the actions of a Hadhrami, or Hadhramaut man, who left his parched and hunger-stricken land to seek his fortune in Java, the country which has been blessed with water. There, thanks to his industry and thrift and to the respect shown him as a *sayid*, or direct descendant of Mohammed, he amassed a great fortune.

Not satisfied with a life of ease in his adopted country, where he had acquired Dutch citizenship, he began to dream of power. His ambition was to become a ruler

in his native land, if only of a small piece of rocky plateau with a couple of villages and a few villagers. So he hired soldiers and bought arms and set out to conquer a kingdom! The inhabitants of the area where he installed himself appealed to the Sultan of Mukalla, who sent a small but well-equipped army and a cannon to eject him; the village was laid in ruins, the hiring soldiers fled and the would-be king was taken prisoner and a ransom of 80,000 florins demanded for his release!

Now the last thing a Hadhrami is willing to do is to pay out money. Hence the captive's relatives, in Java, entered a protest with the Netherlands Government and even asked that a warship be sent to Mukalla to demand the release of this naturalized Dutch subject. Obviously, the Netherlands Government did not wish to take such drastic measures. By other means this remarkable Dutch Hadhrami was released, yet out of his case grew our commission to undertake a political and economic expedition to Hadhramaut.

Most of the 80,000 Arabs in Netherlands India are from Hadhramaut and the majority of them, through long residence, have



Drawn by Newman Rumstead

HADHRAMAUT PROVINCE EXTENDS EAST FROM THE ADEN PROTECTORATE ALONG THE SOUTHERN COAST OF ARABIA

Its limits are vague, but it is about 350 miles long and 150 miles wide. The larger map shows its relation to Egypt, Syria, and Persia. The inset shows the main part of the province, lying west of the 51st degree of east longitude. Its chief geographical feature is the Wadi Hadhramaut, a winding, fertile valley. Since accurate, detailed surveys of the region have not as yet been made, the positions of some of the towns are only approximate. Data for this map were compiled not only from the author's own map, but also from those of such pioneers as Leo Hirsch and J. Theodore Bent, from maps of the British War Office, and others.

acquired Dutch nationality, so that there is always the danger that once again one of them will dream of a kingship in his native land and cause difficulty to the country of his adoption.

FOR DECADES CHRISTIANS SOUGHT TO ENTER HADHRAMAUT

It was easy enough to give a commission to explore Hadhramaut. Yet the carrying out of such a task appeared at first very difficult, if not altogether impossible. The first attempt to penetrate into the interior of Hadhramaut was made in 1835 by Lieuts. J. R. Wellsted and C. Crutenden, but it remained for Adolph von Wrede, in 1843, to follow up their work. He wandered for two months in the hinterland, meeting hardships and dangers. Yet he never set foot in the land of his desire, for at the very portal he was recognized as

a foreigner by fanatical Bedouins, ill-treated, robbed, and forced back to the coast. However, this gallant pioneer collected much scientific material and to a certain degree opened the road for others. In his fatherland his tales of the marvelous countries he had seen met with nothing but ridicule and he died on foreign soil, a disappointed and forgotten man.

Fifty years later Leo Hirsch made an attempt to continue the work of Von Wrede. For six months he traveled up and down the coast and was then fortunate enough to enter the hinterland and to reach Hadhramaut. There he visited three large towns, only to find himself threatened, though in the house of his host; after a stay of only a few hours he was driven out, and had to return to the coast.

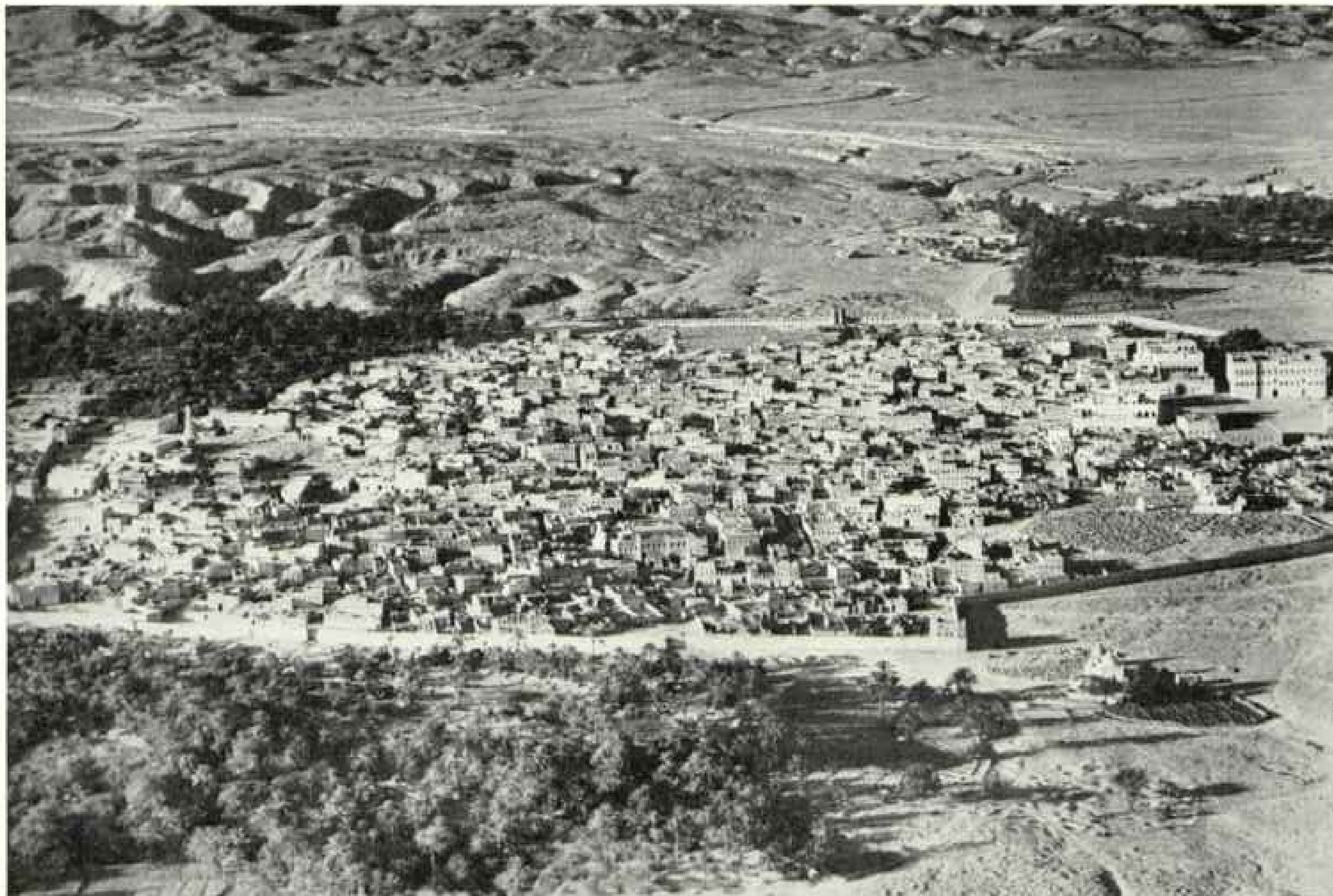
At the end of that same year, 1893, Mr. and Mrs. J. Theodore Bent and their party



Official photograph, Royal Air Force; Crown copyright reserved

MUKALLA, NEXT TO ADEN, IS SOUTH ARABIA'S PRINCIPAL PORT

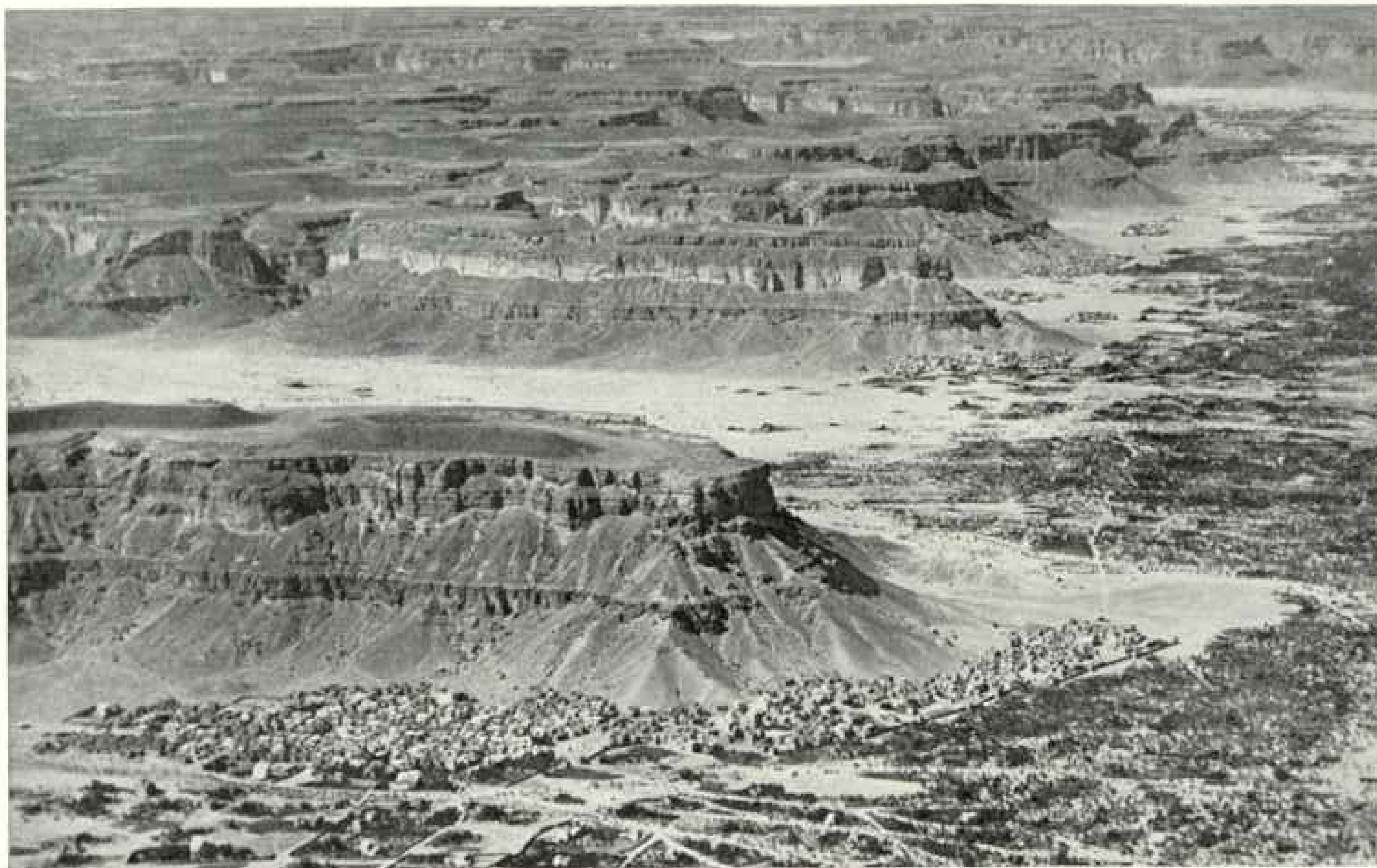
Despite the heat and its barren aspect, Mukalla trades with India, the Somali coast, Red Sea ports, and Masqat. It exports gums, hides, senna, and some coffee. From Bombay it buys cotton goods, metals, and crockery; dates and dried fruits come from Masqat, coffee from Aden, and sheep, aloes, and frankincense from African ports. Most of the Hadhramaut tribes owe allegiance to the Sultan of Mukalla, head of the Qaaiti dynasty.



Official photograph, Royal Air Force; Crown copyright reserved

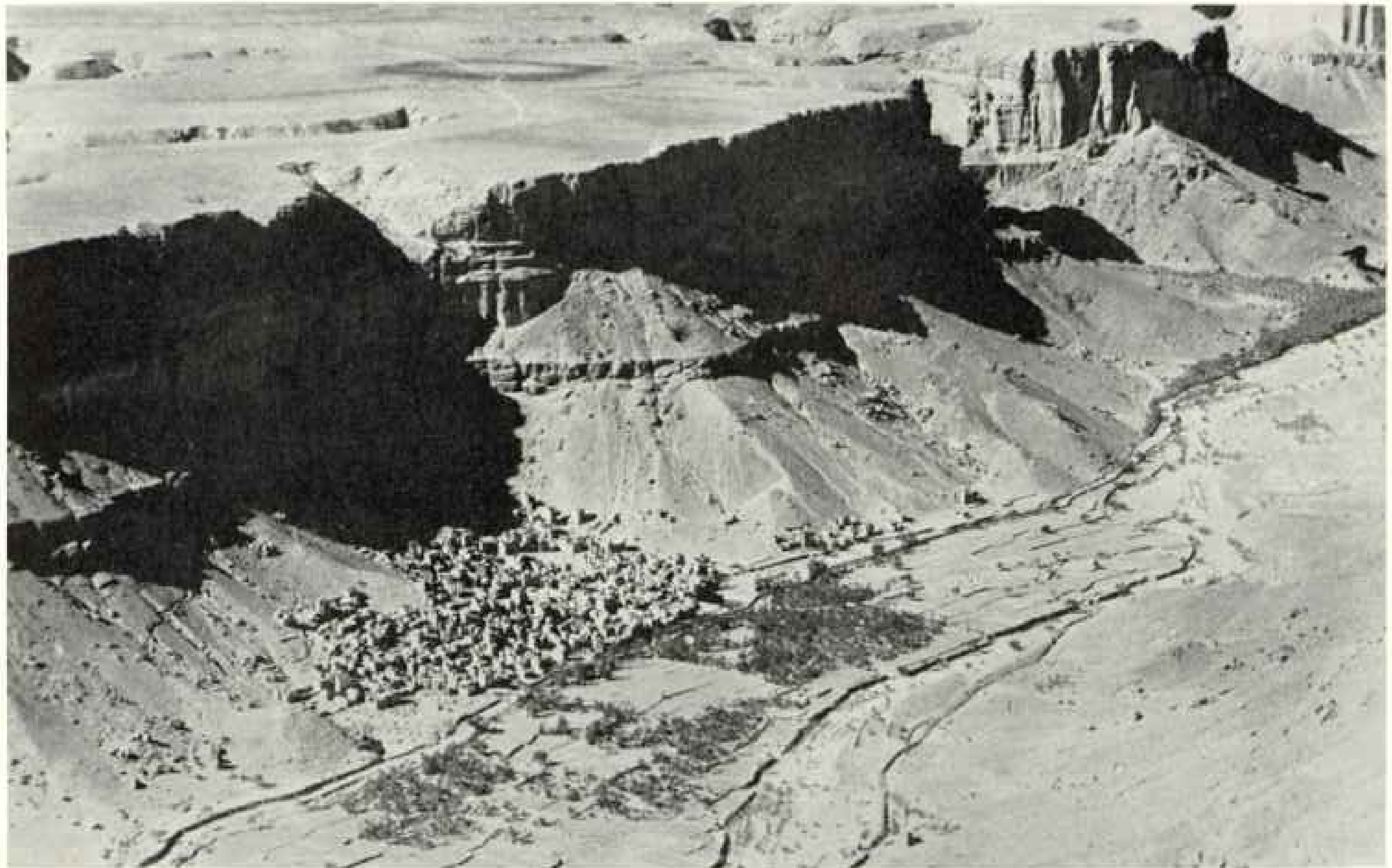
THE STRONGLY WALLED TOWN OF GHAIL BA WAZIR, FAMOUS ALONG THE RED SEA LITTORAL FOR ITS HAMUMI TOBACCO

Flocks of wild pigeons find shelter in near-by hills, reports Mr. W. H. Lee Warner, the British explorer. Neighboring tobacco patches are irrigated by water carried in underground channels similar to Persian *kanats*. A group of Bombay Parsis markets the tobacco crop for the Sultan of Mukalla, to whom this whole oasis belongs.



Official photograph, Royal Air Force; Crown copyright reserved

WESTERN TRIBUTARIES OF THE WADI DU'AN RESEMBLE EARTH FORMATIONS ALONG THE GRAND CANYON OF THE COLORADO  
Several small towns appear below the desert promontories. When seen from the air, the houses of sun-dried bricks are so similar in color to the cliffs above them as almost to pass unnoticed.

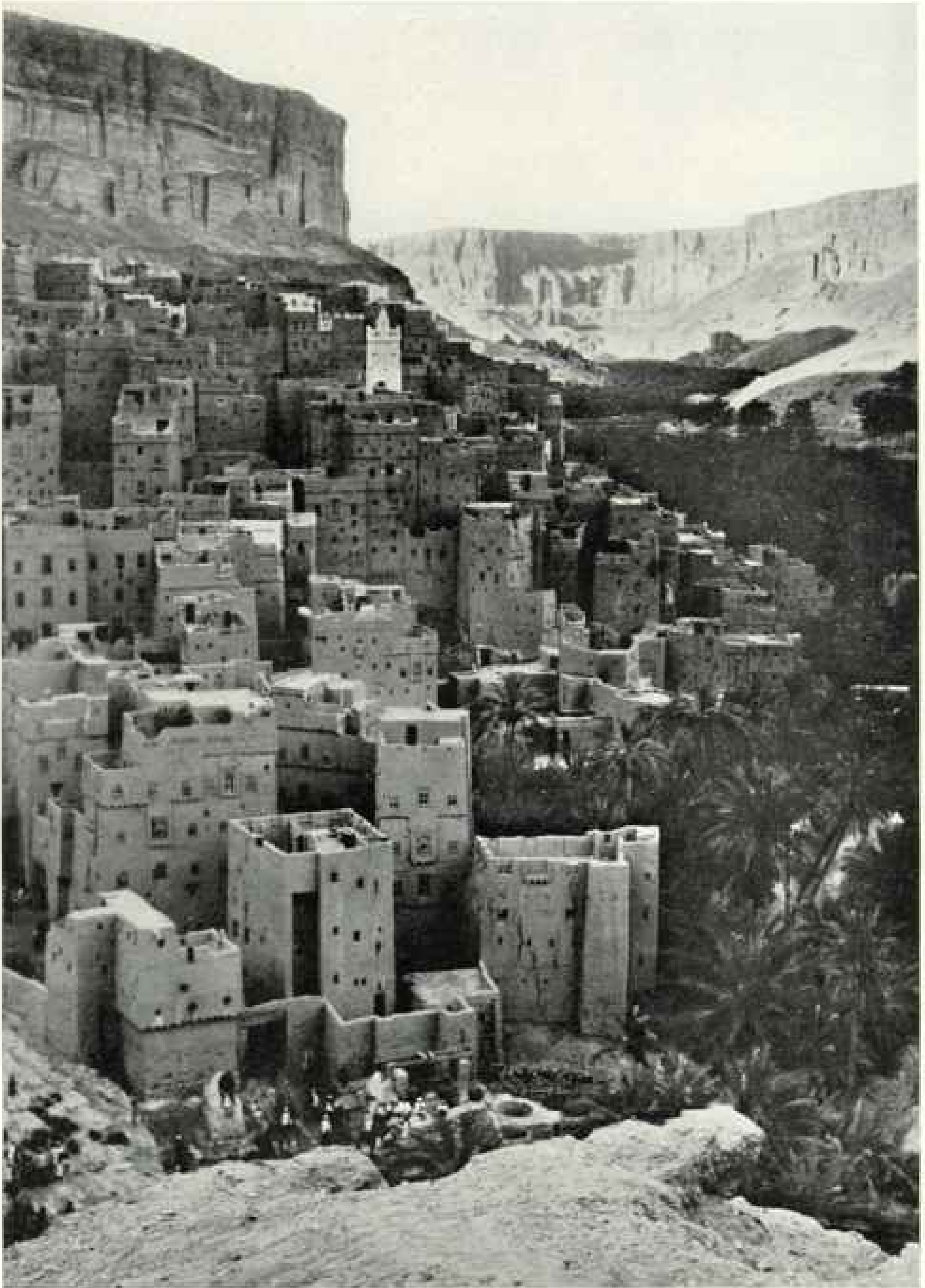


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LITTLE-KNOWN QAUDUN, A SMALL TOWN SNUGLING UNDER CLIFFS IN A VALLEY ADJOINING THE WADE DU'AN.

Other explorers, including J. Theodore Bent and Leo Hirsch, passed near this town; but, so far as known, the British airmen, R. A. Cochrane and A. R. M. Rickards, are the first Europeans ever to see and photograph it. Near it is the tomb of Saïd bin Isa el Amudi, first sheik of the Amudis.





Photograph by Dr. D. van der Meulen and Dr. H. van Wissmann

#### KHURAIBAH CLINGS TO RUGGED CANYON SLOPES

The explorer J. Theodore Bent was not permitted to approach Khuraibah, chief town of the Wadi Du'an (see, also, text, page 397). He records that its name signifies "The Ruins," and that it may be the ancient city which Pliny called Toani.

tried to solve the many remaining mysteries of Hadhramaut. They reached Shibam, the first town in the great valley, but had to turn back from there. Other attempts were made later, but all were unsuccessful. British army planes flew over the hinterland in 1929 and made some excellent photographs, which only added to the ever-mounting interest in this marvelous land, shut in by rocks and desert.

Until we came, the national sanctuary of Qabr Hud, visited each year by thousands of Hadhrami pilgrims, had never been reached by a Westerner. Hidden towns, with superb palaces and fortresses, were practically unknown; the existence of ruins from Sabæan and Minæan times was only suspected, and the enigma of Bir Barahut (Barhut), "the Mouth of Hell," where the souls of Unbelievers were said to be imprisoned, was still unsolved. Even the very map of Hadhramaut was but an inaccurate, unfinished sketch.

#### HOW WE ENTERED THE FORBIDDEN LAND

In April, 1931, the writer and Dr. H. von Wissmann met at Aden, to start out from there on our attempt to enter Hadhramaut. Besides our report on its political and economic conditions, to be made for the Netherlands Government, we hoped also to make some scientific contribution to the knowledge of that land.

From Aden we sailed on a small coastal steamer for Mukalla (see, also, pages 388 and 390). Its open roadstead lies exposed to the monsoon. Waves dash against the foot of the outermost row of houses and devastate the long main street, and extreme heat is mitigated by sea breezes. The whole town tastes and smells of the sea, and subsists by it. In the days of the southwest monsoon the roar of the breakers drowns the bustle of the busy bazaar, where Bedouins jostle each other about the articles exposed for sale by Arabs and Indian traders. At the big, well-guarded gates of the town the Bedouins have to surrender their rifles and cartridge belts; then they wander about making their purchases, until the departure of their caravans for the interior. Flour, rice, and sacks of dried fish, mostly small sharks, are the chief commodities bought.

Such Bedouins are scantily clad. They wear only a small loincloth, plus a plaited leather band around their heads to hold up



Photograph by Dr. D. van der Meulen

THIS LEAN, BEARDED HADHRAMI PLAYED HOST TO THE AUTHOR IN THE WADI YEBETH.

their long, greasy, curly hair. About each man's neck is also hung a leather strap with an amulet attached. To protect their skin against sun and dry winds, they smear it with indigo. This makes their already dark color a dirty-looking blue-black. Each evening grease is rubbed all over the indigo to keep the skin "moist."

After only a week's delay at Mukalla, we were able to join a caravan that was returning to the interior. The Sultan spends most of his time in Hyderabad, but his Wazir, thanks to the friendly relations that exist in Netherlands India between the Hadhramis and the Government, gave us every aid. Hence, where others had failed, it seemed we were to succeed. Yet, until we were actually on our way, we dared not expect too much; even after we had started, recurring difficulties kept us in a state of



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann.

A VIEW FROM THE ROOF OF THE AUTHOR'S LODGING PLACE  
IN THE WADI DU'AN.

continuous suspense and uncertainty. Qabr Hud and Barahut were the goals for which we secretly hoped, though for the time being we spoke only of the large cities of Hadhramaut, Shibam, Saiun, and Tarim.

DODGING THE DESERT ROBBERS

On the day set for our departure suspense rose to the breaking point. We waited from dawn to afternoon before we could see the authorities; they seemed to have been spirited away, leaving no trace. Then we heard that at a little distance out of town enemy Bedouins were lying in wait for the members of our caravan, with whom they had a blood feud to settle. The Wazir had been treating with them in person from early morning and had just re-

turned from arranging an armistice of a few weeks. But for fear they might change their minds suddenly, the Wazir urged us to start in one of the Sultan's own motorcars, go to a point beyond the danger zone, and there await the caravan. This we did, the camels joining us in the course of the night.

For days we journeyed through rocky wadi beds, toward the inland plateau. Aridness increased as we proceeded, but this minimized the danger of malaria. Although the heat by day became almost unbearable, the nights, fortunately, were cooler. The wadies of southern Arabia are famed for being some of the hottest places in the world; they may also be the wildest. Only trained hill camels can follow over these rocks and along the sides of the precipices; often we had to clamber on hands and feet. At night the Bedouins kept strict

watch, posting sentries on the high points about camp. By muffled calls and whistles they kept in constant touch with one another, guarding the sleeping camp against attack.

Finally the last wadi bank was scaled and we came out onto the *jol*, the endless plateau of rock, where the table mountains, with their horizontal ridges, stand out against the far horizon. Here there was practically no vegetation and no water at all; the plain is covered with sharp metallic stones, through which the camel-path runs like a shining ribbon. For centuries the calloused pads of tens of thousands of camels have been set down on this same narrow path, so that its gleaming, polished strip affords more striking evidence of the

land's antiquity than is found in its partly buried ruins.

Our days of monotonous and exhausting travel were varied by all manner of incidents. The jol is uninhabited, but on its borders are depressions like flat, shallow bowls, where mud has been washed in by the rare rains; here grass grows and here also we saw the scanty remnants of the once flourishing culture of incense trees (see, also, illustration, page 400).

#### WILD BEDOUIN WOMEN LAUGH AT OUR GOLD TEETH

Here we had our first contact with a Bedouin camp. The nomads do not live in tents of goat's-hair as elsewhere in Arabia, but in caves, under overhanging crags or under primitive shelters made by setting up four poles with cross-pieces between them, hung with a cloth to make shade. This camp we approached cautiously, uncertain of our reception. The able-bodied men and the youth of both sexes seemed to be away with the flocks; we saw only old and infirm men, women, and small children. But our advances met with better results than we had expected; soon we were standing in a circle, while people stared and finally began to ask questions.

Suddenly one woman noticed a gold crown in my mouth. She pointed it out to the others, who burst into laughter. In reply I bared my teeth for them to get a better view; but that was too much! They shrank back with cries of fright. When they saw us in turn laughing at them, they came closer, and both Von Wissmann and I had to open our mouths wide and to submit to a minute examination of our teeth. With every new discovery of a bit of gold, it was pointed out and greeted with general hilarity. The boldest ventured to rub my bare arm with her hard, black fingers to see if she could remove some of the white. She cried out in astonishment when the white would not rub off.

The sleeve of my khaki shirt was pushed up—there it was even whiter! The examination was continued to my throat and breast, and before I knew what was happening the tail of my shirt was pulled out and a black hand was passed admiringly over that part of my anatomy which is usually decorously covered. To the accompaniment of general hilarity, my investigator would have proceeded further, but I

laughingly assured her that I was the same color all over.

Then questions fell thick and fast. Were we born so, or had we made ourselves white by the use of soap; they had heard that Westerners smeared themselves with it? What did we eat? Did we drink milk? Did we sometimes walk in the sun, or did we always remain indoors?

We were pressed to stay the night. They offered to dance for us with the clapping of hands, and the brightest of them suited the action to the words. We told them that we had to hurry on our way. "Do stay and we shall give each of you a wife!" I could not help smiling as I glanced about the circle of far from beautiful women; but the spokesman immediately guessed my meaning and added, "Oh, no, not these! The young maidens are with the flocks, but they come back at sunset."

#### THE PORTAL OF THE PROMISED LAND

Refreshed by this encounter, we proceeded farther toward Wadi Du'an, the great tributary of the Wadi Hadhramaut, a marvel of overpowering beauty. After the days of exhausting travel through the dull, endless spaces of the plateau, with no sign of life but an occasional lizard, we now stood on the threshold of our "promised land." Our eyes, tormented as they had been by the glitter of the sun reflected on stones, were now caressed by the restful shades of green in the depths of the wadi.

Perpendicularly the jol broke off; 100 to 150 feet below lay the wadi bed, like a wide, jubilant river of green. In its middle wound the gleaming white ribbon of the sand bed of the flood waters, along which the stream flows after the rare rains, searching for a course through the wadi.

Palms grew halfway up the rocky banks of the wadi. On these steep declivities the towns are built, so as not to waste a single square foot of the valley soil that can be irrigated (see, also, page 392).

These houses, rectangular and built entirely of adobe, are often five or more stories high. Under a noonday sun the towns are scarcely distinguishable, since they are the same color as the gray-brown slopes against which they are built. No one goes out of doors at this time of overpowering heat, so that no living creature was to be seen. No sound rose to us. It was like looking down upon a petrified,



DRESSED IN BEADS, BELT, AND KNIFE, TWO SUDERA BOYS TAKE A CAMERA TEST  
Scant clothing, generations of sun tan, and the mixture of slave blood chiefly from Zanzibar Island have gradually blackened the skins of many Hadhramaut people.



Photographs by Dr. D. van der Meulen and Dr. H. von Wissmann

THE BIG BEARDED MAN IN THIS WADI YEBETH GROUP IS A NEGRO SLAVE.

Long after the trade was outlawed, "blackbirders" still smuggled slaves from Africa to Arabia. Their lot, however, was seldom harder than that of free men in this impoverished land. They embrace the Moslem faith, but do not assume Arab names.



THE AUTHOR'S CARAVAN DESCENDS A TRAIL INTO THE WADI DU'AN.

Far below the sure-footed, hill-climbing camels may be seen irrigated fields and palm groves. The inhabited valleys are a welcome green contrast to the high, dry Hadhramaut plateau.



Photographs by Dr. D. van der Meulen and Dr. H. von Wissmann

LOOKING DOWN FROM THE CASTLE OF BA SURRA

Time and again this stronghold in the Wadi Du'an has echoed to the shouts and shots of tribal war. Until some 30 years ago the valley was the home of the powerful Amudi tribe, later almost annihilated by the Sultan of Mukalla. Now only an Amudi remnant remains.



Photograph by Charles K. Mauer.

THE FRANKINCENSE TREE, WHEN ITS BARK IS CUT, YIELDS A MILKY JUICE THAT SLOWLY HARDENS INTO OLIBANUM, OR TRUE FRANKINCENSE

Since the very dawn of history, frankincense has been used in the religious rites of many people. To get it, Persians and Phœnicians ventured to the ends of the then known world; high priests of Judah prized it, and Romans burnt it to celebrate the triumphs of the Cæsars. Once abundant in the Hadhramaut, it is now very scarce there. A tree on Socotra Island.

forgotten city, sleeping the long sleep that awaits the Day of Resurrection.

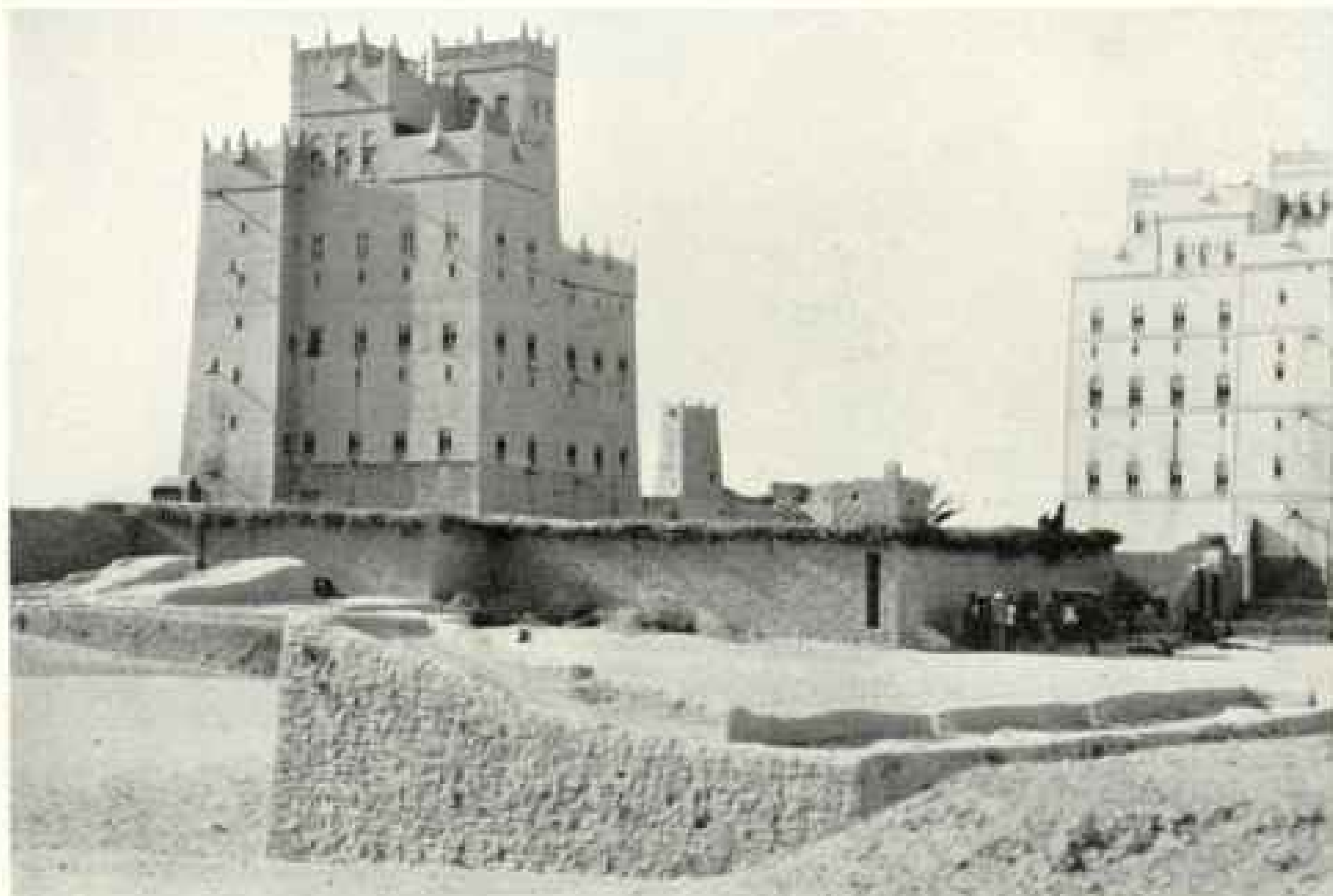
At last we shook ourselves free from the enchantment of the scene and turned back to reality. We found the caravan waiting at the beginning of the *aqaba*, the steep, rocky path that leads down into the valley below. This path was so steep and so primitive, and the precipice so threatening, that we were aghast at the thought of the long-legged, heavily laden camels having to follow it.

We gave our patient beasts a rest with their loads removed, before risking the descent. Then Bedouin guides were strung along down the path, each in charge of a pair of camels, a safe distance between. The animals seemed to know what awaited them. They rose with much grunting and turned restlessly from side to side before the *aqaba*, hesitating. In melodious cadences the head driver spoke to his nervous beasts with words of praise and encouragement. The camels turned their heads

toward him; slowly the one in front ventured to take the first steps down the rocky path, and the others followed. Soon the crags echoed to the loud encouragement sung by the Bedouins. Slowly and with the utmost caution the animals achieved the difficult descent. In the wadi both guides and pack animals had to be changed, for the camels of the jols and *aqabas* are unsuitable for the marches through flat, sandy river beds.

OLD MEN RECALL WHITE TRAVELERS OF LONG AGO

Wadi Du'an had been visited by our forerunners and the old, blind governor, Ba Surra, recalled the visit of Hirsch and, soon after, that of the Bents. In his gray, mud citadel, high up above the villages and towns, we were welcomed by the old chief as if in a medieval castle. Even the architecture of the fortress, with its corner turrets, battlements, and loopholes, added to the illusion. We were admitted by the



DIJAR AL BUQRIE, A DESERT STRONGHOLD AT THE WESTERN ENTRANCE OF HADHRAMAUT VALLEY

Such outlying fortresses, distributed over a wide area and occupying commanding positions, stand guard over several Hadhramaut cities and are numerous about Tarim. Sometimes armed slaves, commanded by the dominant tribe, man the city defenses (see, also, illustration, page 404).



Photographs by Dr. D. van der Meulen and Dr. H. von Wissmann

WOMEN PULLING WEEDS IN A CORNFIELD

Such farmlands as exist in the Wadi Du'an belong mostly to the sayids. They grow millet, tobacco, dates, alfalfa, indigo, and some cotton and corn; but additional food must be imported, for crops are meager.





Photograph by Dr. D. van der Meulen and Dr. H. van Wissmann

BEDOUINS OF THE AUTHOR'S ESCORT ENJOY A MEAL OF RICE AND DRIED STARK

Using no knife or fork, the Arab takes rice in his right hand, squeezes it into a ball, and bolts it. If fowl or mutton is served, the leader of the party tears it to pieces and tosses a portion to each diner, who deftly catches it in mid-air.

guard through a heavy door, adorned with fine carvings and wrought-iron work (see, also, page 399).

Passing through the soldiers' quarters, we went through a second door into a stable, past a few cows, and then beyond to a third door. It gave entrance to the hall, where the blind governor sat, surrounded by his counselors, sons, grandsons, and soldiers—a mixed company, of which the gray-haired patriarch formed the honored center.

As Ba Surra's guests, we spent a few pleasant days of rest, but we had to hurry on, for we were impatient to visit the still almost unknown towns of Hadhramaut proper.

Notorious Sif is the place where Von Wrede nearly lost his life. It was here the Bents, to escape, had to threaten to invoke the might of Britain's Queen. We passed through Sif without harm, although to us also it was made very clear that the visit of the two *Nasranis*—their name of contempt for Christians, or Nazarenes—was anything but welcome. We spent an unpleasant night on the roof of a stable,

bothered by inquisitive street urchins and insolent soldiers. With difficulty we managed to obtain fresh pack animals. Finally, after much agitation and many hard words, we passed out of the narrow streets of sinister Sif, followed by looks and words of hatred.

Feeling great relief, we entered the lonely wadi, which is here wide and devoid of all vegetation, and moved northward. Because of our late start, we had to endure the scorching heat of high noon. The temperature rose from 110° to 118° F. Through the quivering air, we hazily saw our goal, the old town of Hajarain, situated on an island of rock at the mouth of a side wadi. Gone now was the cheery repartee, exchanged to keep up our spirits; only curses were heard, curses on the heads of the people of Sif, whom we blamed for our late start. Then even the toughest fell silent; occasionally the silence would be broken by an angry word at one of the exhausted beasts, or by the sound of a sharp blow. Then again the same dull, strained stillness, as we trudged on through the scorching wind, with throats and eyes tor-



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

#### THE JOL IS A VAST DRY PLATEAU STREWED WITH ROUGHLY BROKEN STONES

The countless padded feet of camel trains wear paths like polished stone ribbons through this wilderness (see, also, text, page 396). The dragon's-blood tree, at the right, yields a red, resinous gum, the cinnabar of antiquity.

mented by dust and with only one thought in our dazed brains: "Somewhere ahead is our goal."

Our reception at Hajarain made us forget for the time being the misery of the last march. A Hadhrami, who had lived for years in Java and had acquired Dutch nationality, threw his house open to us and took the whole dead-tired caravan into his care. Gratitude for the good that he had found under Dutch rule, coupled with real Eastern hospitality, unhampered this time by religious fanaticism, prepared for us a few unforgettable hours.

#### HUREDA HOME-TOWN MEN GET RICH IN JAVA

In the afternoon we continued our march through the first large group of ruins, dating from Sabæan and Minaean times, to Mashad, a village lying in what used to be a notorious robbers' area, but where safety now rules, thanks to a powerful sayid family. We were here at the very portal of Hadhramaut proper; but before we entered, prompted by a sense of gratitude, we turned north a couple of hours

into Wadi Amd to visit Hureda, the home of the sayid family of el-Attas, which is so favorably known to the Netherlands Government in Java.

Hureda had never previously seen a European within its walls; earlier explorers had been steadfastly kept out. Now for us a festive welcome was prepared. Arm in arm with the governor on one side and the head of the el-Attas clan on the other, while my companion was similarly escorted by other notables, I proceeded in state through the streets, fantastically lighted by lanterns flaring against the blackness of night.

This town is waging an unequal fight against the powers of Nature that threaten it with drought and famine. By groups of slaves, singing at their work, drinking water is drawn from wells more than 30 feet deep. It is only by means of the money sent from Java by former citizens that the town is kept alive, and even enriched with beautiful mosques and dwellings.

To save us the fatigue of covering the difficult desert entrance to Hadhramaut by camel, a friend from that place, we learned,



Official photograph, Royal Air Force; Crown copyright reserved

DIJAR AL BUQRIE LOOMS ABOVE A WILDERNESS OF SAND NEAR AL QATAN

This desert skyscraper consists of three well-built, lofty forts in which an obstinate warrior has for years entrenched himself against encircling enemies (see, also, text, page 408). Such fortress-castles are features of the Hadhramaut landscape and, with their battlements and towers, are reminiscent of the medieval castles of Europe (see, also, illustration, page 401).



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

THE AUTHOR'S BEDOUIN ESCORT TAKES A MIDDAY NAP AMONG THE BOWLDERS



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LIKE THE LOWER LITTLE COLORADO IN ARIZONA, A DEEP, WINDING CANYON CUTS  
THE HIGH HADHRAMAUT PLATEAU

Although rainfall is usually light, the valleys, enriched by centuries of alluvial deposits, are very fertile. In many places the flow of water is below the surface, and wells must be dug. Underground channels are also built to carry water long distances without evaporation. As it winds eastward toward the coast, the Hadhramaut Valley tends to dry up, through the exhaustion of its stream by intensive irrigation.

was sending us his motorcar. In spots the trail was so bad that a roadway had to be dug to permit the automobile to pass.

On the third day of our stay, the quiet town was startled by the approach of a strange monster, the like of which it had never seen before. It descended upon the town with a great noise. Children and men dashed into the streets to gaze, from a safe distance, on this marvel from Allah's outer world. Women clambered to the flat roofs and, in their haste not to miss the sight, forgot to veil themselves. One of

them happened to look round at the house where the Nasranis were lodged and then suddenly all the fun and chattering ceased. Warning cries passed from roof to roof, and immediately folds of robes were drawn across faces and there was a hurried exit with averted heads. For there stood the two Christians on the roof of their house, and instead of looking at the new wonder they were probably gazing at the women!

Motorcars are transported with much difficulty and at great cost from the coast



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

THE KNIFE IS THE MOST CONSPICUOUS POSSESSION OF THESE  
DEVIN BEDOUINS OF THE JOL.

Strictly, the rocky jol is uninhabited; but around its edge occur shallow depressions like big flat bowls. Rare rains wash dirt into these, scant grass grows, and here Bedouins pitch camp.

to Tarim by being taken apart and loaded upon the backs of the strongest camels. Abu Bakr el-Kaf, the wealthy and progressive sayid who lives at Tarim, sees in the motorcar a powerful instrument for pacifying his country. At his own expense, therefore, he is busy constructing a motor road from Tarim to the south coast; he has also built the first mountain road for cars in Hadhramaut. We tested this pride of the Hadhrami engineers when we approached Tarim, but resolved not to repeat the experiment! Those road-builders, up to the present, understand more about the

hill-climbing powers of the camel than those of the motorcar.

So it came to pass that we left Hureda on a burning hot afternoon, in an unexpectedly modern conveyance, for the desert portal of Hadhramaut Valley. The motorcar, packed to fullest capacity, was soon swallowed up by the dry and burning wilderness. The hot wind cut face and hands like the keen, frosty wind of northern winters. The curtain of air over the desert quivered and distorted the contours of the rock walls of the ever-widening wadi. Where Wadi Amd opens into Wadi Kasr, the banks draw so far back that we had almost the feeling of sailing in a boat on a vast ocean of sand.

Certain crags, which appeared only now and again through the mist of heat and dust, served as landmarks by which our driver gauged his direction. Long, thin columns of sand rose in front of us, mounting to the sky, their summits

frayed by the wind. With great velocity more and more of these yellow-brown columns raced over the plain. Soon we ourselves were caught in one. The burning wind whistled from all directions and we could scarcely see each other. We covered our faces with towels and bent forward, silent, holding our breath.

As the shroud of dust became more transparent, heads would appear with a sigh out of the enveloping cloths, and Bin Marta would start his engine again. At another time we had to get out and push; then again we had to cling to the sides of



BEING WITHOUT TENTS, HADHRAMAUT BEDOUINS DWELL IN PRIMITIVE SHELTERS, EVEN IN HOLES AMONG ROCKY HILLSIDES, TO ESCAPE THE SUN

The almost utter lack of any change of clothing, the possession of but few utensils or implements of any kind, are characteristic of most desert Bedouins. Except for a few domestic animals and the inevitable knife or gun, they own none of the personal chattels familiar to town Arabs (see, also, text, page 397).



Photographs by Dr. D. van der Meulen and Dr. H. von Wissmann

FEAKED STRAW HATS ARE WORN IN HADHRAMAUT VALLEY

Women enjoy more social rights here than in most other Moslem lands. If a man repudiates his wife without cause, he earns public contempt and cannot marry another from the same social class. Polygamy is rare, though usage permits a Hadhrami to take another wife while living abroad, since Hadhramaut women usually refuse to quit their country.



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

#### A DESERT CITY OF THE DEAD ON THE OUTSKIRTS OF HUREDA

From Mosul to Aden, one sees such Arab graveyards, usually developed about the sepulchers of religious leaders. The vaultlike brick and mud tombs are a defense against vandal dogs and digging wild animals (see, also, illustration, page 412).

the car to avoid being bumped out, as almost impassable stretches of road had to be taken at high speed to avoid stalling in the soft sand.

Suddenly there loomed out of the cloud of sand a high, unreal, light-gray fortress. Far out in a wilderness of sand rise the Dijar Al Buqrie, three well-built, lofty forts in which an obstinate warrior has for years entrenched himself against encircling enemies (see pages 401 and 404).

We longed for a short respite from the sand storm, and for a drink of hot, bitter coffee; so Bin Marta honked his horn loudly in the deep stillness. Immediately sentinels thrust black heads above the parapet, to look down upon us in mute astonishment. We shouted that we wanted to call on their commander. They called back that we must drive around to the other side, as the gate on this side lay in the line of possible enemy fire and could not be opened.

While our visit in the Dijar Al Buqrie was short, it was full of interest. As I stood opposite the commander in the great council hall, my eyes wandered round the walls where the soldiers on entering had

hung their rifles and cartridge belts on long wooden pegs. He guessed my thoughts and said, "War is a manly job!" I looked at him and denied it shortly. "Why not?" he asked. "Because of war," I replied, "you are imprisoned in your own proud citadel, the last palm tree in your gardens has perished long ago and the desert has encroached upon your very threshold." The soldiers listened with interest to our interchange of thoughts on war and kindred subjects; but we could not tarry here, at the very portal of Hadhramaut.

#### INTO THE HADHRAMAUT VALLEY BY MOTORCAR

We spent that night in the small town of Henan, in the hospitable home of Bin Marta, the rich Hadhrami from Surabaya and the owner of the motorcar. Old geographers speak of Henan as a town on the incense road; now it is but a shadow of its former self. The sea of sand has engulfed it, the palm groves have perished, and the whole place is largely in ruins. It lies like a village on a barren coast, battered by storms.



Photograph by Dr. D. van der Meiden and Dr. H. von Wissmann

UPPER-CLASS HADHRAMAUT WOMEN MUST WEAR VEILS, THOUGH THEIR YOUNGER DAUGHTERS NEED NOT

Slave women go unveiled, as do some of the Bedouins and lower-class town dwellers. Women of the sayids and merchant classes, however, dress here much as their sisters do in other parts of Arabia. In place of sandals they wear red or yellow shoes.

Next morning Bin Marta drove us into the Hadhramaut Valley. We meandered among sand dunes and loam hills, trying to find a way through. Finally the ground became firmer, the loess appeared above the sand, and we could even catch glimpses of a few palms. Gradually the wilderness withdrew into the background and in its place fresh green relieved the eye. Even the loud squeak of the pulleys through which beasts of burden drew the ropes to raise water out of the wells struck pleasantly upon the ear. The belt of palms soon became broader and the yellow-green lace of the trees shrouded the desert completely from sight.

Under the shadow of the date palms, the drawing of water and the irrigation of the fields were in full swing. Whole families worked together. There were even birds in the trees. All that lived seemed to move and sing, welcoming us out of the silent desert to this land of new life. The oppression of the hours in the wilderness fell from us.

Ours was a joyful march now, through

light and shade and green to the strongly walled town of Al Qatan, where the Sultan of Shibam has a fine palace (see page 418). Having climbed the flight of mud steps, we let the heavy iron knocker fall resoundingly. Soldiers opened to us and disappeared again into the innumerable adobe passages to announce our arrival. The Sultan was away at Shibam. We were received by a member of his family, but with such studied reserve that we hurried on to Shibam!

WHERE PALACES ARE MADE OF MUD AND WOOD

Shibam is apparently the oldest town in the valley. In its architecture, strength and defense are primarily aimed at. Its "skyscrapers" are close together and the streets form narrow, dark tunnels between; only the roofs and the uppermost of the five or six stories are whitewashed, the rest of the houses being a grayish brown (see pages 411, 416, 417, 426).

When we suddenly caught sight of this high, wide, gray block of buildings with its





Photograph by Dr. D. van der Meulen and Dr. H. van Wissmann

AINAT, WITH ITS STATELY MOSQUES AND TOMBS OF SAINTS, WAS ONCE THE GOAL OF PILGRIMS

Like most settlements in the Hadhramaut, it stands in a valley where palms will grow. Beyond the town is seen the rocky rim of the dry, level plateau.

gleaming white top shining through the sand storm, we mistook it for a mirage. The whole town seemed to be lying under a cover of snow! We entered through a huge double gate. Close up against the city wall stood the Sultan's palace, a massive, imposing, and yet peculiarly graceful building (see page 420).

What marvelous artists the Hadhramis are, to create such beautiful structures from no other material than mud and a scanty supply of short, crooked, and usually poor wood! Whether it be the poor man's hut, an imposing fortress, a beautiful garden villa, or a mosque with its graceful minarets, every edifice here is made of sun-baked mud! The Bents photographed this palace in 1894, so it is certainly upward of forty years old; the Sultan claimed that it had been in existence at least 100 years.

Later we saw in the narrow streets of Shibam much that aroused our admiration as well as our astonishment. The snow-white mosques stood out blindingly against the high, dark houses and seemed dwarfed in comparison. Beautifully carved wooden

doors were to be seen in the somber fronts of the tall houses.

They laugh at hygiene in Shibam! Gutters of hollowed-out palm stalks jutted out from kitchens, bathrooms, and toilets, and the fluid waste poured down from various levels into the streets below. Running through the middle of the streets are open masonry drains, clogged with garbage, on which chickens, cats, and donkeys feed. We had to walk warily, with our eyes continually uplifted, ready to dodge any rain of filth from above.

While at Shibam we were privileged to be the guests of friends of the Sultan, in their fairylike garden home outside the town. However, we could not tarry long, having to hurry on to Saïun and Tarim.

Saïun is the largest and most beautiful of the three towns and forms a striking contrast to Shibam, for its houses are low and spread out. The garden quarter and the cemetery are both within the walls of the town. Saïun is the heart of Hadhramaut and the residency of the Sultan of the Kathiri tribe, warlike and powerful



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SHIBAM, NEAR THE QUEEN OF SHEBA'S REPUTED HOME, WAS LONG A BUSY STARTING POINT FOR CARAVANS OF THE TRADERS IN FRANKINCENSE AND MYRRH

To-day, still walled and fortified, it enjoys some industrial activity. Most populous of interior Hadhramaut towns, it makes indigo dye, palm-fiber rope, and leather polish from acacia, and it is surrounded by many productive farms. Inside the walls, facing its double main gate, is an open plaza faced by imposing homes and the Jemadar's palace. Many Shibam homes are connected by subterranean passages. Standing in the middle of the wadi, Shibam's citadel can fire on any enemy passing along the valley. Some ancient East India Company cannon have found their way here, according to the explorer Bent (see, also, text, page 389).

rival of the Quaiti. His palace was the most beautiful example of Hadhrami architecture that we saw in our travels.

Here, in the heart of Hadhramaut, the influence of Java is so great that even at the Sultan's court Malay is constantly spoken. The dress of the people is quite similar to that worn in Java, and a Javanese meal, the "rice table," is considered the highest form of culinary art. In this town live hundreds of Dutch-Arab subjects. On our arrival, the Sultan greeted "the first repre-

sentative of the Netherlands Government" to visit his town, with true Eastern exaggeration. "Here you are sultan and not I, for your subjects outnumber mine!" was the compliment he paid me. It is easily understood, then, that we felt peculiarly at home here and spent some wondrously pleasant days on the roof-terrace of the Sultan's white garden home (pp. 422-423).

"Tarim wa la teroom ghairha!" That is to say: "After Tarim you desire nothing more." That is a well-known play on the



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

THE GUIDES AND ARMED ESCORT OF THE AUTHOR RESTING ON THE SANDS OUTSIDE HUREDA

So far as known, Van der Meulen and Von Wissmann were the first Christian whites to visit Hureda, in the Wadi Amd. A motorcar sent here to assist the explorers created a noisy demonstration. Women in their excitement climbed unveiled to the housetops, for here was the first automobile Hureda had ever seen (see, also, text, page 403).



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

THE SUDDEN VISION OF A SILENT, MYSTERIOUS CITY, BUILT UNDER CLIFFS AS IN OUR PREHISTORIC SOUTHWEST, ASTONISHED THE CHRISTIANS WHEN THEIR CARAVAN REACHED THE CANYON BRINK

But for these deep, winding canyons and their tributaries, the Hadhramaut would be uninhabitable. Centuries of floods and erosion have deposited silt along the stream beds, resulting in much tillable land. Sheep, camels, donkeys, cows, and oxen graze in the side canyons and depressions, but horses are rare. Curiously enough, some of these remote Hadhramaut towns saw motorcars before they saw Europeans.

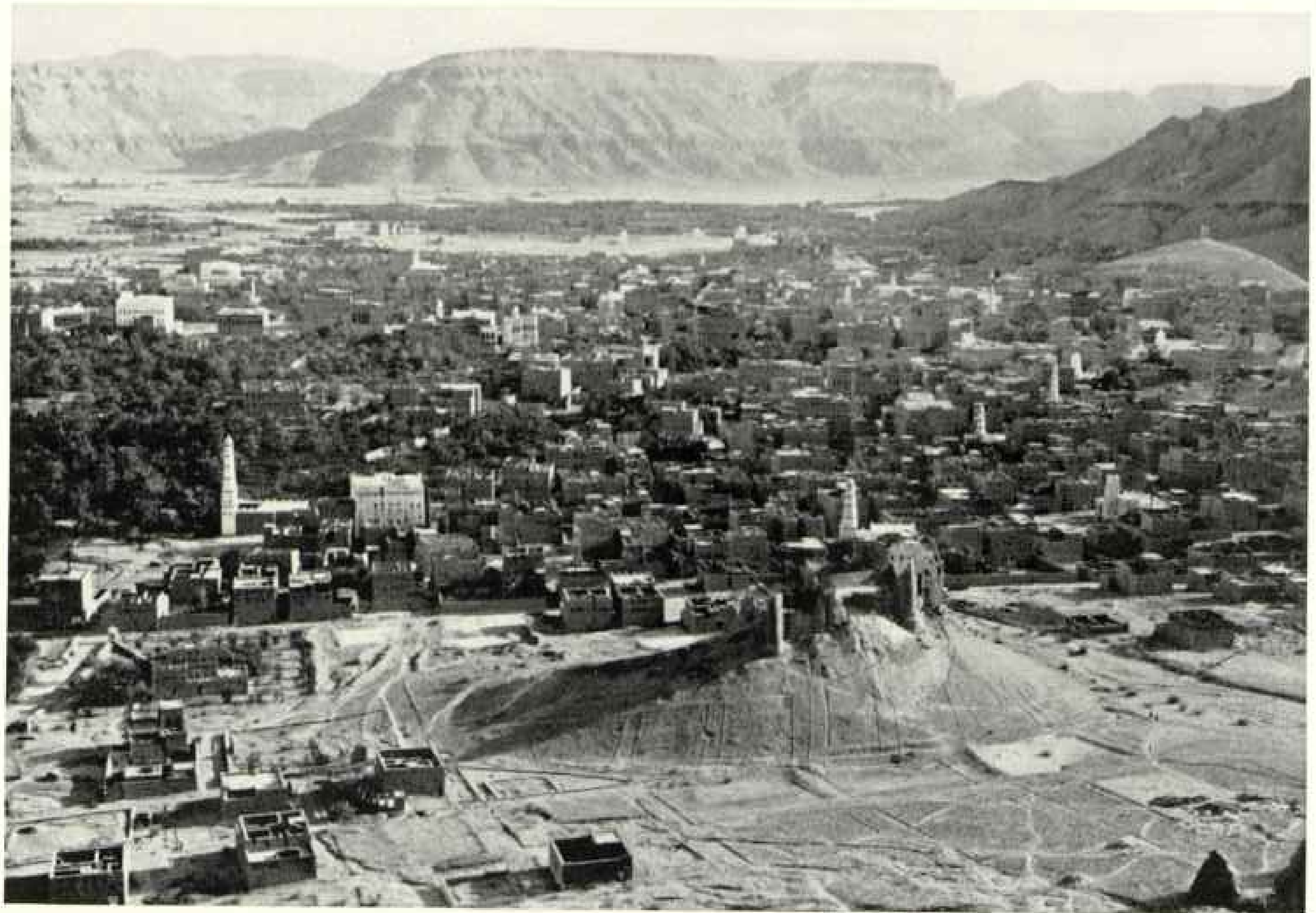


Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

TARIM, ONCE THE LARGEST OF ALL HADHRAMAUT CITIES, AS WELL AS THE MOST HIGHLY CULTURED, IS NOW FALLING INTO DECAY

Once a great weaving industry flourished here, with looms in almost every house, and there were many teachers and philosophers, now removed to Samu.

It was long-continued tribal wars, in which fighting was often staged in parts of Tarim itself, which forced its decline (see, also, text, page 411).



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

A SUBURB OF TARIM, WITH ITS VALLEY ORCHARDS AND DISTANT RANGES, SUGGESTIVE OF SOUTHERN CALIFORNIA  
 The castles along the city wall and in the valley beyond are fortresses built for defense and often manned by faithful slaves. Tarim, like Salun (see illustrations, pages 422 and 423), is one of the strongholds of the Kathiri dynasty (see, also, text, page 410).



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann.

#### A SUGAR-WHITE MOSQUE IN THE GLOOMY CITY OF SHIBAM.

Most of Hadhramaut's costly mosques were built by zealous Arabs, who, after growing rich from business ventures in foreign lands, returned to end their lives in their native country. The turrets, domes, and zigzag decorations give a medieval appearance even to modern structures.

name of this most easterly and most remarkable of the three towns and one that is essentially different from the other two. After Hirsch's brief visit in 1893, no other Western explorer had been here, though in 1929 some scouting planes of the British Royal Air Force from Aden had circled low above it. But when inquisitive Bedouins fired on these "wonder birds," with the object of getting a closer view of them, they rose again to higher levels and Tarim was not disturbed. Shortly afterward, Lieut. Col. the Hon. T. M. Boscawen, accompanied by a Hadhramaut Arab, went

as far as Tarim via the Du'an and Hadhramaut wadies.

Forty years ago Hirsch was besieged by a fanatical crowd in the house of his host: the sayid's party, which was powerful, demanded his surrender to them. It would have gone ill with him had his host not stepped in on his behalf and promised that he should leave the town immediately. Times have changed since then! Abu Bakr Bin Sheik al-Kaf, the most influential sayid of Tarim, threw his palatial dwelling open to us. He offered us not only a hospitality that made us marvel, but also arranged for our further travels and made them possible, through his great influence over the Bedouins of the region.

#### SKYSCRAPERS IN THE HEART OF ARABIA

Tarim is called the town of religion and science: this honorable title it owes to its past glory, much of which has passed away. The saying that it has 300

mosques was probably true at one time, but it is no longer so, though their number is still impressive. One afternoon Von Wissmann and I climbed what is said to be the loftiest minaret in Hadhramaut. It is 175 feet high and made entirely of adobe, whitewashed on the outside. Unfortunately the usual rounded form has been replaced by the modern square, and the simple decorations of stripes have been marred by windows cut in the tower.

The mud stairs become narrower, so that finally, toward the top, only very slim people can worm themselves through the cork-

screw tunnel. By keeping close together we could just stand under the dome, which is encircled and supported by pillars of mud. The top swayed gently in the hot, dry wind. We did not notice this at first, but when we did our imagination exaggerated the motion and we were seized by the thought that we were standing there, 175 feet above the ground, on a shaky pinnacle of baked mud! Silently, hurriedly, we made the necessary measurements and took photographs. Then, with a feeling of relief, we crept down the brown, narrow stairway. Yet we could not but admire these Arab architects who, though unable to calculate tension and strain, have learned by experience how to create lofty structures of clay.

Tarim is also a town of palaces. Here live the Hadhramis whom we know as the wealthy land proprietors, the owners of fine houses and great hotels in the Straits Settlements or of the large cities of Netherlands India. The Sultan is so overshadowed by these men of wealth and fame that he prefers to live in the town of his uncle, the Sultan of Saïun.

Tarim architecture is strongly under the influence of India, Singapore, and Java. Here the simplicity and dignity of the Hadhrami style have been lost, but hygiene has won. Teakwood for building is imported from Java; high, wide windows and stout doors have been introduced; bathroom and toilet arrangements have also been modeled on those of Java.



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

#### LOOKING OVER SHIRAM FROM THE ROOF OF THE SULTAN'S PALACE

In the foreground is the Sultan's mosque, with the walled city beyond. Since feuds and wars are endless and heavy artillery lacking, these walls guard against surprise attacks. Many towns close their gates at dusk; so woe betide the traveler or tardy citizen caught without!

But the most striking feature of the town is something else. When, from the ridge of the last mountain spur, we saw Tarim lying before us, we were chiefly surprised and arrested by the unreal colors of the palaces, which rose square and high, above the encircling date palms. We saw sky-blue and vivid yellow designs around the rows of tall windows; others were pink, with blue lines, and still others were sea green. What in our countries would be deplorably ugly are not unlovely in this land, full of light and sun, yet otherwise





Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

#### THE SULTAN OF SHIRAZ HAS AN IMPOSING PALACE AT AL QATAN

The explorer Hirsch (see text, page 389) describes the town as "a collection of fortresses and castellated houses, among which the palace of the ruling head of the Qaniti tribe stands out most conspicuously." At the left are wooden troughs projecting through the walls of a bathroom on each floor, from which waste water is poured down on the streets below. In front is one of the automobiles imported into Hadhramaut in recent years. The town itself, clean and prosperous, lies among palm groves and gardens, at the head of the main Hadhramaut Valley, and has many mosques, a bazaar, and fine stone houses.

so drab and poor in color. Here are only the light brown of the houses and streets, the somber dark brown of the banks of rock, the gray of the stony desert, the unchanging deep green of the date palms, and the pale blue of the hard, glaring vault of heaven. The eyes are tormented and wearied by the sharp sunlight on these colorless surroundings. Small wonder that those Arabs who return from more blessed

lands wish to bring back some happy reminders in color to brighten drab places like Tarim! (See, also, pages 414, 415.)

#### WHERE MIDDAY HEAT IS ALMOST UNENDURABLE

We were in Tarim at the hottest time of year. During the day a deathly silence reigned over the town. Only in the shade of the date groves could be heard the reg-

ular tread of the animals drawing water from the wells, and the cries of the women and children scaring off the birds from the ripening fruit. The streets then are almost deserted; the days are a torment that must be endured somehow, preferably by sleeping. Toward sunset the town revives, people go out to the public squares or to the gardens, or busy themselves preparing the flat roofs for the evening's recreation or for the night's rest.

Sons of the rich go out to their garden homes, where they jointly observe the ritual of evening prayer and where they bathe together in the tepid waters of the masonry swimming pools. Later the men assemble on the roof terrace of one of the palaces, tea from samovars is passed round, and discussion of the World War, an endless favorite subject, is resumed from night to night. In this war-ridden land they wish to hear all they can about it. My companion's knee had been shot away in an aerial fight on the Western Front. Though he does not care to speak about his war experiences, the young men urged him to, and plied him with innumerable questions.

I, too, had to tell tales that brought a glitter to the eye. Soon the younger interrogators had to give way to their elders; but "Harmal," a Bedouin corruption of Hermann, the German soldier, had become their hero. Later we were always introduced by these youthful friends in the words: "This is the Consul—he is only a man of politics. This is Harmal, the German soldier—look at his stiff knee! Yet he fears neither heights nor depths." This last tribute Von Wissmann owed to his daring rock-climbing and to his descent into caves, which are here so much shunned.

We spent wondrous days at Tarim, in the hospitable palace of Sayid al-Kaf. Among these people, themselves so restful and free from ambition, we were the only restless ones, with great and unsatisfied longings. Although we were in a town which is supposed to satisfy all earthly desires, we wished eagerly to investigate the two mysteries of Hadhramaut, *i. e.*, that national shrine of pilgrimage, the tomb of the Prophet Hud, and Bir Barabut, the Mouth of Hell.

Our host tried to dissuade us from undertaking these two excursions at such a hot season, as even at the best of times they are exhausting and not free from danger.

In order to divert our thoughts, he arranged for us to visit the group of ruins at Sune, which lies some little way south of Tarim. The extreme heat we endured on this trip did not, however, deter us from the more arduous undertaking. In the end Sayid al-Kaf gave in to his guests "who had grown more and more into his heart," but whom all the same he thought slightly crazy.

#### TO THE TOMB OF THE PROPHET HUD AND THE MOUTH OF HELL

None of the members of the household thought of accompanying us; so, attended only by Bedouins, we left in two cars to go as far eastward up the valley as was possible. We entered a part of the country that is perishing as a result of drought and internecine wars. The cars took us to the medieval fortress of the Hakim of Kasm. Two of his sons had died of fever in Borneo, but two younger ones had managed to survive and were now beginning to make a little money. The family Benjamin is still at home, but will also have to leave the country and try his luck in Borneo. I had to refuse the request of his father to take him with me as far as Java, as I was not returning there direct from Hadhramaut.

From Kasm we traveled still farther eastward through the wadi, on camels and donkeys. Although our Bedouins were reluctant to march during the hot hours, we were forced to do so in order to survey the country. This caused much bickering and tension.

Toward evening on the second day we approached the ravine of Nabi (Prophet) Hud. In the desolate, silent valley we saw, sharply outlined against the almost black slopes of rock, the white buildings of the cult. Somewhat lower lay the town, Qabr Hud, inhabited for only three days in the year, when a general armistice makes it possible to come to this sanctuary from the farthest corners of the land. From this thinly populated, barren wilderness of a country about 3,000 souls congregate in this remote valley to pray for inner peace and greater happiness (see page 427).

My companion and I had far outdistanced our caravan and were alone when we set foot on this holy ground of Hadhramaut. Everything was motionless. At first we saw no living thing, but later caught sight of a group of pilgrims, bowed in



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

THOUGH BUILT 100 YEARS AGO, THE SHIBAM SULTAN'S PALACE IS ALMOST MODERNISTIC IN SOME PHASES OF DECORATION

Built of sun-dried bricks, some Hadhramaut palaces rise to ten and eleven stories. In hot weather people sleep on the flat roofs. Goods are stored on the ground floor; on the second live the servants, on the third are guest rooms, while above are the family quarters.

prayer, among the pillars of the *naqa* mosque. Fortunately, absorbed in their devotions, they did not notice us and we were able to approach this shrine of pre-Islamic times.

Where we had expected to find primitive and neglected buildings, encircled by a half-collapsed village of hovels, we saw instead graceful, gleaming white, substantial mausoleums, mosques, and pavilions for purification; and, deeper in the valley, a town of large, well-kept, imposing houses of three or more stories. Deep devotion and love have been shown in the building and maintenance of this sacred place.

#### AT QAER HUD ALLAH RESCUED HIS PROPHET HUD

We, the first pilgrims from the West, stood sunk in admiration, and gazed down upon that which, being the highest in man, seeks expression everywhere, even here, at the extreme edge of a barely habitable land. Here gather together Bedouins and town dwellers during the few days in the year when all strife and vendettas cease.

Here man stands with his need and sorrow and with an indestructible hope, on the borders of a better land.

Hud was a prophet, sent by Allah to the Addites, the aboriginal inhabitants of Hadhramaut. As a preacher of repentance, he called the people to conversion and threatened them with Allah's terrible punishment if they did not obey. His words resounded in the wilderness. He was persecuted and is said to have fallen into the hands of his enemies on this spot; but Allah intervened and cleft open a rock, which received him. His faithful *naqa*, or racing camel, on whose milk he lived, died at his tomb and was turned into stone.

The *naqa* mosque was later built against the petrified camel and over the split rock a repentant posterity erected the domed tomb of Hud. The body of the prophet, more than 13 feet long, projects far out beyond the cupola and is marked by a whitewashed stone railing. Inside the dome we saw the split rock, whose sides were polished smooth by tens of thousands of hands, passed prayerfully over it, and by



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

#### THE FORGOTTEN RUINS OF MARIYAMA, BETWEEN SAJUN AND TARIM

Leo Hirsch (see text, page 389) describes both the new and ancient city, which he calls Méryeme, as follows: "In front of Méryeme is a dilapidated cemetery with a few walled graves. The (modern) city is located on the western slopes of an outthrust mountain mass, and from there we can see the dilapidated houses and ruins of the former Méryeme, which was apparently destroyed not long ago by mighty rain floods, the force of which pushed boulders to the very summit, where they are now piled and threaten to fall at any moment. This city of ruins is far more extensive and important than the new settlement." In ancient times a Himyaritic civilization flourished in this frankincense country and left its records on stones inscribed in a form of writing in use long before Christ—the boustrophedon, in which alternate lines are written in opposite directions, one from left to right, the next from right to left. Such ruins now found usually stand on an elevated spot above the sand level, under which others may be buried.

countless lips which in ecstasy had kissed the holy stone (see, also, page 429).

By Qabr Hud, Wadi Barahut opens into the main wadi. At the end of this wild, rocky valley is situated the place of terror, mentioned by all writers on Hadhramaut, even the earliest. It is the spot which Allah came to hate most and which therefore he ordained as the abode of the souls of Unbelievers. The stories which had been handed down about it made Western geographers think that there must exist here an active volcano; if so, it would be the only one on the whole Arabian peninsula and would be important from a scientific point of view. No wonder, then, that our Christian predecessors in Hadhramaut had always tried—though in vain—to reach Bir Barahut as well as Qabr Hud. Now that we were in Qabr Hud, it was inevitable that we should try also to reach

Bir Barahut and if possible to descend into its terrifying depths.

Following a day full of emotions came a night in which alternating hope and doubt, endured amid suffocating heat, rendered restful sleep impossible. We camped together on the flat roof of a house belonging to the al-Kaf family. Black crags towered threateningly above us and radiated the heat that they had absorbed during the day. Even the roof was hot and remained so all night; to lie still and wait to see if sleep would come was the heavy test laid on our will-power.

#### INTO THE MOUTH OF HELL

Not only we Westerners but also the Bedouins were concerned over what might happen on the morrow. Some of the more venturesome Arabs had made up their minds to accompany us, but others hesi-



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

#### THE RICH SAYIDS OF SAJUN DWELL IN GRACEFUL MUD-WALLED VILLAS

Various tribes and distinct social groups, often at war among themselves, form the Hadhramaut population. Many differ sharply from Arabs farther north. Sayid, meaning lord, chief, or prince, is the hereditary title of a numerous Hadhramaut class that claims descent from Mohammed's grandson. They settle disputes, wield vast influence, and even the Arab sultans kiss the sayids' hands (see, also, text, page 410).

tated and were leaving it to their dreams or other omens to decide for them.

Before dawn we were on our way with a small group of men and with a camel laden with water-bags. As guides we had Manahil, Bedouins who roam in small groups with their flocks through this, the remotest of the still inhabited part of Hadhramaut—the southern border of the great Empty Quarter, the Rub' al Khali. We had with us electric torches, a kerosene lamp to test the air inside the cave, a rope, and compasses. The Bedouins had also armed themselves against the expected onslaught of snakes and other fearsome monsters!

After two or three hours on the march, during which the longing for the unknown drove us to even greater speed, we came to a place where high up above us, in the steep crags, the black mouth of Bir Barahut became visible. Here the wadi had become much wider, the almost perpendicular bluffs were more rugged and cleft than anywhere else in Hadhramaut, and dark

caves yawned between the masses of rock; yet all this seemed hardly enough to account for the antipathy which Wadi Barahut arouses among the Arabs.

We all clambered up the cliffside as fast as possible to gain a closer view of the mysterious cave. No suffocating fumes, or flames, or explosions, or rumblings were to be noticed. Inside the high, wide entrance gigantic boulders lay scattered, and farther back was a black fissure through which we soon clambered. We had to creep through a low but wide cleft to get inside this mysterious world, and then an opaque blackness cut us off from the outer sunlight. The absolute stillness and the almost tangible darkness assailed us; the rays from our electric torches could not penetrate to the bottom of the abyss, along the edge of which we had to proceed. Even the boldest was affected by the atmosphere of this underworld and each one recalled the stories of what would happen to the explorer that disturbed the peace of these hidden depths.



Photograph by Dr. D. van der Meulen and Dr. H. von Wissmann

THE SULTAN'S PALACE DOMINATES SAÏUN, WITH ITS OUTER FOREST OF DATE PALMS

While Hadhramaut itself now has no sources of wealth, many of its sultans, sayids, and prominent Arab families have grown rich on trade with India and through business ventures in the Straits Settlements and Dutch East Indies. Most of their furniture, jewelry, clothing, and many weapons are imported from India (see, also, text, page 417).

Courage failed some of the company, who turned back while they could still feel their way out; no one ventured to reproach them. Von Wissmann, with tape and compass, made measurements and sketches of our route in the cave. The passage we followed had many side corridors, each of which we examined to their ends. It was as hot in these blind corridors as it is in the stokehole of a steamer in the Red Sea!

Sometimes these side passages were very steep and occasionally it was necessary to enter them by crawling through small openings. Once most of the company shrank back from a descent that seemed to lead to a bottomless pit. Only Von Wissmann and one of the Arabs ventured in. Standing on the loose rubble, they let themselves slide down the steep incline and disappeared into the darkness. At first we could hear the falling of pebbles and then all was silent.

We extinguished our torches to save the batteries and stood waiting in pitch blackness for what seemed like hours. Finally we saw the flicker of a light gradually ap-

proaching, and with a feeling of relief we helped our friends through the narrow opening back to our side.

OUT OF THE CAVES OF DARKNESS

After two hours of hard work we shuffled and groped our way back to the entrance. The layer of fine powder on the floor of the cave deadened all sound. The temperature improved and we were guided by compass and sketch-map. Finally a faint glimmer became visible and we knew that the exploration of Bir Barahut, which was neither the "mouth of hell" nor a volcanic crater, had been brought to a successful conclusion.

At the entrance we found our waiting escort in deep slumber. They stared at us in dumb amazement when we awakened them. We looked more like chimney sweeps than spirits from the underworld! When at the end of half an hour we had not returned, they took for granted that we had met with the punishment we deserved for our reckless daredeviltry!



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AN AIR VIEW OF QUSAIYIR, ON THE HADHRAMAUT COAST, CLEARLY REVEALS THE PLAN OF A WALLED ARAB SEAPORT, WITH ITS WATCHTOWERS AND ITS UNPROTECTED SEAWARD SIDE.

Along the Hadhramaut coast many Arabs fish for a living. Dried shark fins are one item of commerce; a more intensive industry is the catching and drying of a small sardinelike fish. When dried and mixed into an evil-smelling compound, it serves as food for both humans and camels.



Official photograph, Royal Air Force; Crown copyright reserved

THE WADI MUSAILA, FINAL STRETCH OF THE MAIN WADI HADHRAMAUT, WHICH DEROUCHES INTO THE ARABIAN SEA

The physical phenomenon of the Hadhramaut country is the spectacular system of deep, cliff-lined valleys which cut its high, dry plateau. The main valley, or Wadi Hadhramaut, curves southeasterly for some 500 miles and receives many tributary wadies. Generally rich and well watered, it tends to go dry about where it crosses the 50th meridian of east longitude, according to recent British air reconnaissances, and changes its name to Wadi Musaila (see, also, map, page 389).





A PANORAMA OF SHIBAM, FACING A BROAD, DRY SAND WASH, WITH THE SULTAN'S PALACE AT THE RIGHT



Photographs by Dr. D. van der Meulen and Dr. H. von Wisemann

THE NEED FOR SAFETY FROM DESERT RAIDERS, NOT HIGH GROUND RENTS, ACCOUNTS FOR SHIBAM'S TALL BUILDINGS



Official photograph, Royal Air Force; Crown Copyright reserved.

AT QABR HUD STANDS THE TOMB OF THE PROPHET EBER, A PATRIARCH MENTIONED IN THE TENTH CHAPTER OF GENESIS

Eber, also called Hud, was a Moslem missionary. According to native legend, those who spurned his teachings were choked by hot winds or turned into apes, whose descendants still live on a hill near Aden. Eber was the son of the prophet Salih, whose tomb near Shibam is also a shrine (see, also, page 429).

Days later we set out on our return journey to the coast, seeking to make the overland route direct to Aden. We left our baggage with Sayid al-Kaf, who undertook to have it transported for us to Mukalla, and we ourselves tried to ride through the war zone on fast camels, so as to see yet more unknown territories and tribes. But good fortune seemed to have deserted us and we were frustrated in our plans.

Once, as night was falling, we came out of a sand storm before the fortress of a certain Bedouin sheik who could have helped us to cut across country to a British outpost in the hinterland of Aden. But he refused. He told us that we would have to wait until a caravan of two or three hundred camels had collected for that route, and that then we could join it. But Westerners are wont to be in a hurry; we could not spare the time to wait indefinitely, so we tried to reach our goal by a round-about way.

To do this we had to get away from this beleaguered fort, and pass a hostile defense-works to reach Dijar al-Buqrie, which was once again encircled by foes. We had been courteously and cordially received on our outward journey by the al-Buqrie brothers; so we determined that when it was dark we should try to reach their friendly citadel (see, also, text, page 408). Our small amount of baggage was loaded on a single camel and a guide was secured to show us the way through the trenches to the protecting hill country.

We dropped quickly, one after the other, into a deep trench, which began just outside the adobe fort. Its banks were so high on both sides that a laden camel could pass along easily without being observed by the enemy. From this ditch my companion climbed up for a moment to survey the landscape! A cry of Arab horror arose at such crazy recklessness, and he was dragged down roughly and covered with curses.

Von Wissmann's action had drawn the attention of the enemy and from watch-towers on the banks of the wadi sentries began to fire. Fortunately in the falling darkness the danger was not great, but the enemy was of course apprised that our convoy was in motion. As quickly as we could, in single file, we plowed through the deep, loose sand. At the points where the

trench changed its direction, dugouts had been made with the trunks of date palms and here soldiers kept guard. There were also many auxiliary trenches, but we kept steadily on in the main one. This forced march, plodding through loose sand, with the view shut off by the two high banks and with no knowledge of direction, proved very exhausting.

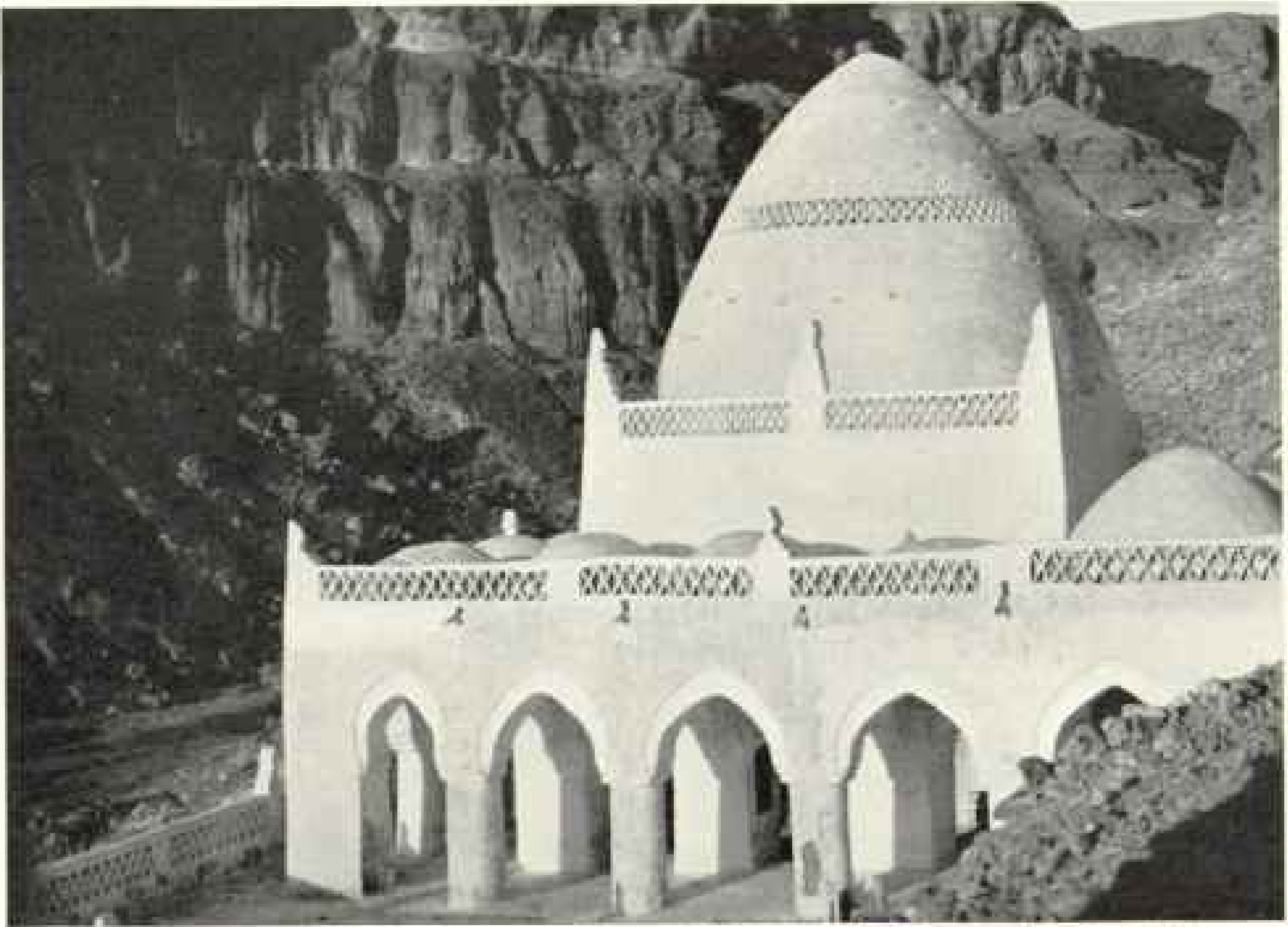
Finally the trench stopped and we found ourselves among the sand dunes. After many twists and turns, it seemed that the guide had lost his way. It was not safe to remain where we were until dawn; we had to move forward with care and silence, for any encounter now might be dangerous. A friendly patrol might fire on us before discovering the mistake; also, to approach Dijar al-Buqrie at night would be a hazardous undertaking, as the famous watchdogs were then unleashed.

Exhaustion made us dazed and indifferent to danger; we thought only of our consuming thirst and need of rest. Suddenly we were alert. We heard in the distance the sound of approaching men and the barking of dogs. We knew this must come from Dijar al-Buqrie. The guide went ahead to make certain, and then gave the password, which was answered by the others. Soon we were surrounded by soldiers who one after the other joyously shook our hands. The note we had sent by messenger to announce our arrival had been received hours ago, and when shots were heard and we did not turn up, anxiety for our safety was felt and a search party was sent out.

#### A FRIENDLY VISIT IN A DESERT FORTRESS

It was not long before we were sitting on the roof terrace of the friendly fortress, stared at by the soldiers and overwhelmed with questions from the brothers al-Buqrie. In a corner on a wooden tripod hung a bulging waterskin, from which the earthenware bowls were constantly refilled and passed from mouth to mouth around the circle.

Slaves and freemen, the male members of the commander's family as well as the household servants, sat together in brotherly fellowship; they not only drank out of the same bowl, but later ate out of the same dishes that were placed before us on the floor. But first the foreigners had to tell their story. We painted in warm colors



Photograph by Dr. D. van der Meulen and Dr. H. van Wissmann

#### BEDOUINS VENERATE THE TOMB OF THE PROPHET HUD

Whether originally a heathen site of veneration and now endowed with an orthodox Moslem name, or really the burial place of Hud (Eber), named in Genesis, Qabr Hud has long existed as a wilderness shrine (see, also, text, page 419, and illustration, page 427).

the hospitality which we had received from sultans and sayids. The wonders of Tarim, its progressiveness, the plans and ideas that were being considered there—all these things filled the hearts of our war-weary listeners with pride and hope.

Our hosts now had their turn and gave to the conversation the trend that we had both expected and dreaded. "Why doesn't the Netherlands Government put an immediate end to all this misery and despair caused by internal strife? Was it not chiefly gold from the Dutch colonies that made the continuance of the struggle possible?"

I replied with a further question: "How could my Government do that, and who gave it the right to interfere by force in these internal affairs?"

". . . But if your Government would

by proclamation threaten to banish from its territory any Hadhrami . . . It is the great wealth amassed by many Hadhramis in Java . . ."

The tension among the listeners increased. But I neither gave vain hope, nor entrenched myself behind conventional replies. These men were worthy of a candid and manly answer.

The following morning we mounted our silently trotting camels. The whole population of Djar al-Bugrie stood together, under the protection of their mud walls, to see us off. *We* rode toward freedom, if God would spare us on the long and unknown road that lay before us; *they* remained, prisoners in their own desert citadel, in the scorching gateway of Hadhramaut, loyal to their poverty-stricken land.



# STYRIA, A FAVORED VACATION LAND OF CENTRAL EUROPE

BY MELVILLE BELL GROSVENOR

**S**TYRIA is both the Shenandoah Valley and the Birmingham of Austria. In an Alpine country whose borders touch no salt water, Austria's city dwellers take to the grassy slopes of her tall mountains, or to rural villages tucked away in smiling valleys, when their annual playtime rolls around.

Hiking along winding mountain paths; wearing deerskin or chamois shorts, hob-nailed boots, green-trimmed jackets, and hats plumed with a trophy of some other year's outing; hunting the cock of the wood or other game; taking part in the rural festivals of the village, where young and old don the costume of their home town and join in the folk songs and dances (see Color Plates IV and V); and mountain-climbing to dizzy heights on Austria's Alpine sentinels, are some of the attractions which crowd the spotless Styrian hostleries with city families holiday bent.

Hunting the chamois is the favorite sport for city-dwelling Austrian and German visitors. Living in mountain fastnesses difficult of approach, the chamois are perhaps the most agile of all Europe's Alpine animals. Their pliant skin furnished the original leather of that name, and the stiff black hairs tipped with creamy yellow, which grow on the back of the animal's neck, are worn in the hat as a badge of hunting prowess (see Color Plate VI). Quail, cock of the wood, pheasant, partridge, and many other game birds are found in Styria and neighboring Tyrol. Tail feathers from the cock of the wood also are valued as hat plumes to supplement Austrian costumes (see Color Plate II), and silver pins which hold the feathers in place are huntsmen's heirlooms, often handed down for generations.

## STYRIA PLAYS A STELLAR RÔLE IN AUSTRIA'S INDUSTRIAL LIFE

Steiermark, as the Austrians call this little province astride the Niedere Tauern, a straggling eastern outpost of Europe's mighty Alpine range, supplies 99 per cent of the Republic's iron needs; and, by harnessing the latent water power in its mountain streams, it provides a substitute for

the missing link in Austria's chain of raw materials—coal deposits which the latter lost after the reorganization of the Austro-Hungarian Empire.

From the Vordernberg-Eisenerz Range, in the north of Styria, comes the bulk of the raw material for the iron works of Graz, Leoben, and Donawitz. Since the outcropping ore is of such high iron content, it is mined from the surface, not through deep shafts and chambers, as is the general practice in other parts of the world. While the mines have been worked for more than twelve centuries and were once considered as the largest known deposits, their total production for all time is less than a third of the world's annual output to-day.

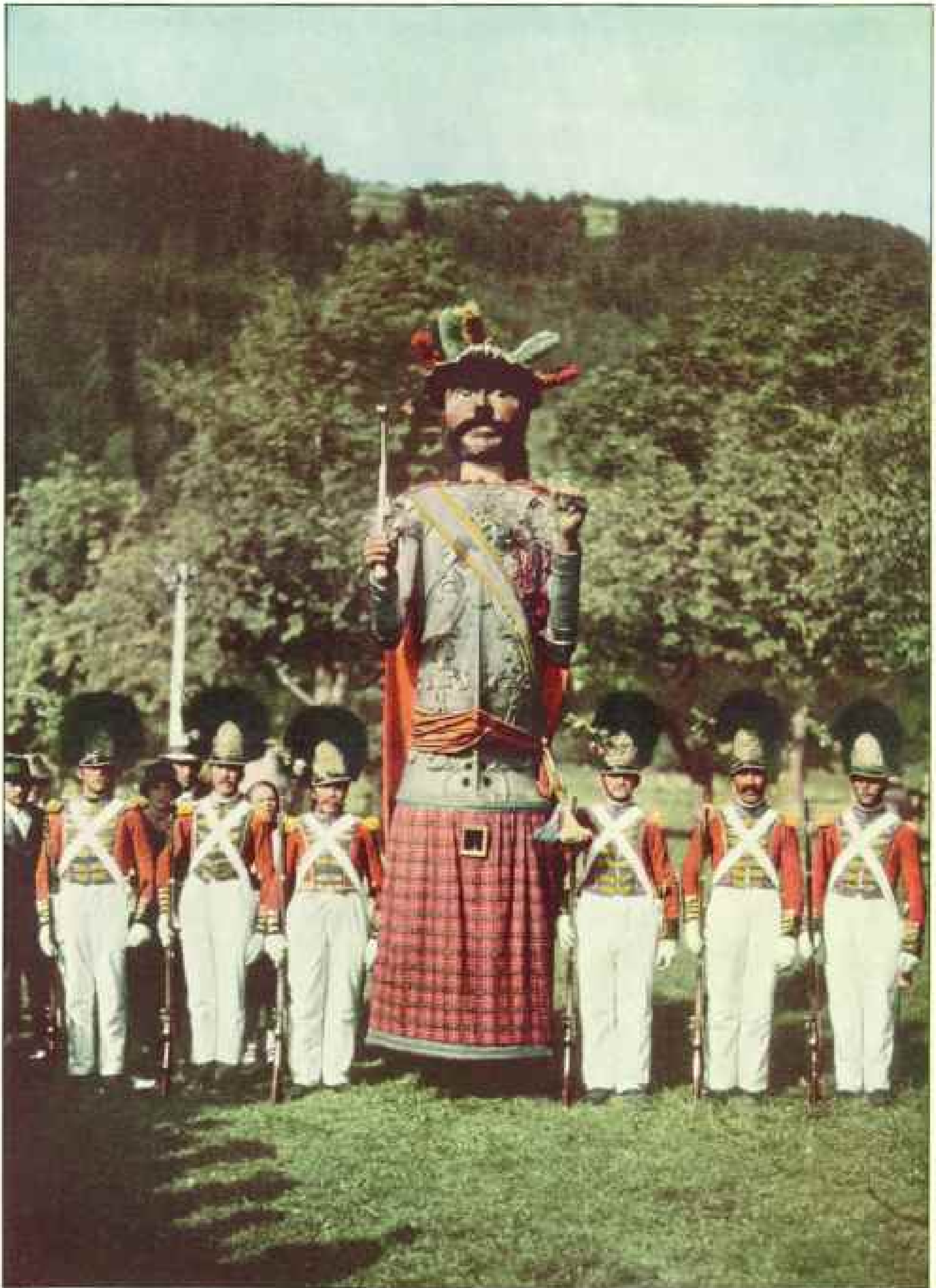
Among the miners, there is a tradition as to how little Styria fell heir to such rich iron-ore mountains. After the barbarians had driven the Romans south of the Danube, the Wizard of the Mountains wished to honor the conquerors. He said to the ancestors of the Styrians, "Which would you rather have—gold mines for one year, silver for twenty, or iron forever?"

The wily Styrians, perhaps mindful of their recent victories with the sword, quickly replied, "Iron mines." Which, legend says, accounts for the source of Styria's ferrous wealth and the relatively smaller deposits of copper, lignite, gold, and silver!

## STYRIA IS THE HOME OF ARSENIC EATERS.

In the iron-mountain regions especially, where arsenic is a by-product of iron smelting, some peasants eat this virulent poison. It is taken in small doses, which are gradually increased as the system becomes used to it, until it may be taken daily, without visible ill effect, in a quantity sufficient to kill an average person. The arsenic is supposed to clear the complexion, increase the appetite, and improve breathing, especially for mountain climbers. Horse handlers sometimes put small quantities on a horse's food or in his mouth to make his coat sleek and glossy and improve his wind on mountain slopes.

SUMMERING IN STYRIA, AUSTRIA'S RURAL PLAYGROUND



© National Geographic Society

Natural Color Photograph by Hans Hilfenbrand

A REWARD FOR BRAVERY—NOT A GROTESQUE CIRCUS GIANT

Two and a half centuries ago a bishop of Salzburg presented this fantastic figure to a village whose soldiers had fought heroically in battle. Citizens of Murau, on the River Mur, call it their "Samson" mask.



© National Geographic Society  
IN STYRIA AN UMBRELLA IS LARGE ENOUGH TO COVER A FAMILY

Besides the voluminous "rainsticks," the women dangle from their wrists improvised market bags of colored cloth. These folk of Murau wear the costumes of the mountainous regions of Austria. Only an expert can distinguish the slight details that differentiate those of one village from another.



Natural Color Photographs by Hans Hildebrand  
AS THEIR GREAT-GRANDFATHERS WORE THEM

Treasured since the days of Archduke Johann, one of Austria's most popular rulers and a foe of Napoleon, these costumes seem not unlike those worn in rural Austria to-day. The man's hat plume is a proud possession, a hunting trophy made from the tail feathers of a cock of the wood.



© National Geographic Society



Natural Color Photographs by Hans Hildebrand

## MODERN MURAU MAIDS IN GALA ATTIRE

The gold-embroidered cap and silk apron worn by the girl at the left indicate that she is of aristocratic lineage. The rose kerchief and black velvet cap merely trimmed with gold ribbon suggest that the maid to the right is of humbler origin.





A GROUP OF PEASANTS ON THE MUR BRIDGE AT TEUFENBACH.

Some of the men's costumes in this group are historical, but those of the women are modern. The Mur River is the backbone of Styria. To its banks cling chains of villages, many of them with somber castles rising from rocky crags.



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Natural Color Photographs by Hans Hildenbrand

CITY GIRLS ON HOLIDAY BENT

Whole families from Vienna and Graz flock to Styria's villages in the many picturesque mountain valleys. Children play in the fields and their elders climb mountains, or hunt deer and chamois.

SUMMERING IN STYRIA, AUSTRIA'S RURAL PLAYGROUND



READY FOR THE SCHNADAHUPPERL—FOLK SONGS AND DANCES

Boys of Murau dance in a circle around their sweethearts. The man with an accordion takes the lead part as singer, the others joining in the refrain. Their ditties, often improvised by the leader, invariably end in a reverberating yodel.



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Natural Color Photographs by Hans Hildenbrand

NATURE SETS THE STYLE OF BOOTS FOR THE MEN OF VILLACH

Because of the marshes around their homes in Carinthia, the men wear high leather boots in contrast to the hobnailed shoes of their neighbors in the more mountainous regions.



© National Geographic Society

THE TUPTS IN THEIR HATS ARE A SIGN OF HUNTING PROWESS

The "beard" of the chamols is much sought by huntsmen. It grows on the back of the neck in the form of stiff, dark hairs. In summer men's knees are usually bare to allow freedom for climbing, but in cold weather style gives way to comfort and underclothes protrude.



Natural Color Photographs by Hans Hildebrand

GIRLS OF MURAU ATTIRIED AS BRIDESMAIDS

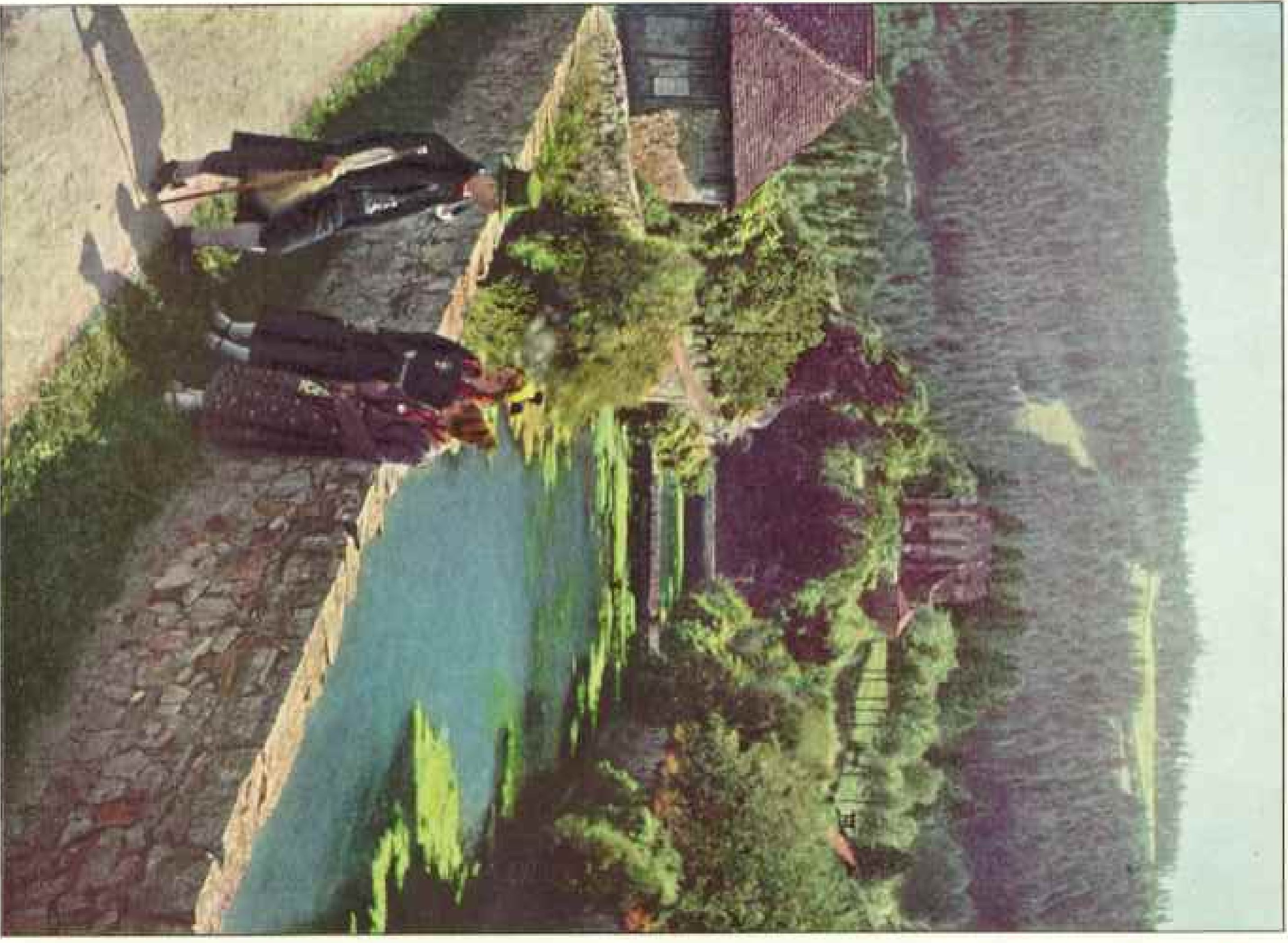
The blue shawls draped over their shoulders and the silk aprons are features of woman's dress in Austria's rural districts. The flower-decked, lace headdresses with long ribbon streamers indicate that these peasant girls are on their way to a wedding.



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A FRIESACH PEASANT WITH COW HORN AND BRANDY KEG  
COLLECTS MONEY FOR A NEW CHURCH BUILDING



Natural Color Photographs by Hans Hildenbrand  
A TRIO OF HAPPY SCHOOL GIRLS ENJOY A SUMMER  
VACATION AT MURAU



© National Geographic Society

FORMAL. INVITATION TO A WEDDING IS EXTENDED BESIDE  
THE ANCIENT MONT OF FRIESACH

Natural Color Photograph by Hans Hildebrandt

A friend of the two families carries a staff with white tassels when he goes his rounds to invite the guests to a nuptial ceremony in Carinthia, Styria's neighboring province.

Naturally this practice is frowned upon and discouraged by physicians.

The murmuring Mur winds across the length and breadth of Styria. Its upper reaches, especially near the neck of Austria's "panhandle," where it is fed by glacial brooks, look on a map or to the high-altitude airman like the backbone of some gigantic fish. Along its course and slender "fishbone" tributaries cluster the villages and principal cities, which seem to grow in size as the river widens, as in the case of Murau and Teufenbach, the industrial city of Leoben, and farther south, just before the river leaves Austria, Graz, the Nation's second largest city and Styria's official seat of government.

Straddling the Mur, Graz seems a veritable combination of Venice and Athens in miniature. Its ancient houses rise abruptly from the river's edge, suggesting the Grand Canal of the romantic Italian city; while its Schlossberg and square clock tower, perched high over the city's head, dominate the skyline as the Acropolis does at Athens.

Yet, unlike either of these, Graz is primarily a manufacturing city. Here are made bicycles, wagons, machinery, Styrian champagne and beer, linen, leather goods, and iron and steel products; and here work and live many of those vacationers who frequent the country villages of the Mur Valley in summer and take delight in "going native" by donning rural costumes.

#### GRAZ COULD OUTFIT A MEDIEVAL ARMY

In Graz there is a museum in which many a youngster would delight to linger on a rainy afternoon. Within the Landeszeughaus, or Arsenal, there is preserved in perfect condition enough medieval armor to outfit completely an army of 14,000 men. Spears, swords, helmets, chain mail, battle-axes, complete suits of armor—in fact, all of the equipment a well-appointed knight could desire—are kept ready to hand. But, strange as it may seem, not a single suit of armor in the museum would fit a six-footer of to-day, nor could an average modern man wield with ease the cumbersome weapons of that bygone age. Austrian mercenaries wore some of this armor, and much of it saw service against the Turk when Graz was one of Europe's bulwarks against the oncoming horde of Moslem invaders.

The unchanging charm of Styria lies in her small rural villages, each with its steepled church or turreted castle perched high on some rocky crag. Nestling in the lonely valleys at the feet of giant sentinels of the eastern Alps, these little towns are a world to themselves.

#### DAIRYING IS RURAL STYRIA'S CHIEF OCCUPATION

While dairying has been the principal industry of rural Styria for many generations, farming is being encouraged, because Austria to-day has to import large quantities of food. Agricultural schools are scattered throughout the province. Timber covers over half of Styria's area and gives work to many lumbermen, who make telegraph poles and railroad ties for export.

Across the rich bottom lands stretch rows of strange haystacks with cross-arms which resemble grotesque scarecrows. As soon as the snow leaves, in early spring, the dairy herds are turned into these fields. Then, as the weather becomes warmer and the snow recedes, the cattle are driven to higher pastures. The meadows are then used to grow hay and farm crops.

Boys and girls, usually children of the owners, tend the herds, milk the cows, make cheese, and in summer live in log cabins or flimsy chalets provided for them in mountain retreats. The milk, cheese, and butter are brought down daily, and in more favored villages are sent to the local dairy, a model of cleanliness and modern appliances.

In late afternoons romantic swains climb the mountains to see their milkmaid sweethearts. Then the hills echo with their yodeling. If the lady welcomes her caller, she answers him with a yodel. If no response is forthcoming, he continues his upward climb anyway, looking for another!

The return of the herd to the lowlands, when snow flies, is the signal for rejoicing. Wreathed in smiles and garbed in her finest costume, the prettiest milkmaid of the village comes first, carrying bouquets and leading her favorite cow, whose brightly shined bell tinkles pleasantly. That night there are folk songs and dances into the small hours to celebrate the return of the herders. Thus the children of Nature enjoy the simple pleasures of rural life in hidden Styria.



Photograph by Bonycastle Dale.

LIKE A FLYING TRAPEZE PERFORMER, A GREAT BLUE HERON TURNS IN THE AIR. These birds congregate in colonies at nesting time. In this colony in Northumberland County, Ontario, five nests are seen in one tree.

# THE LARGE WADING BIRDS

Long Legs and Remarkable Beaks, as Well as Size,  
Form, and Color, Distinguish the Herons,  
Ibises, and Flamingos

By T. GILBERT PEARSON

PRESIDENT OF THE NATIONAL ASSOCIATION OF AUDUBON SOCIETIES

*With Paintings from Life by Maj. Allan Brooks*

THE GEOGRAPHIC presents in this number the second of a comprehensive series of paintings descriptive of all the important families of birds of North America. The first, "Seeking the Smallest Feathered Creatures (Humming Birds)," appeared in the issue for July, 1932, and the third of the series will appear in an early number of the NATIONAL GEOGRAPHIC MAGAZINE.—EDITOR.

**H**AUNTING the solitudes of the marshlands, the tule regions of the West, the winding streams and muskegs of the North, and the moss-hung cypress swamps of the South, are found those birds we may call the large waders. Their size, their grace, the snowy whiteness of some, the striking colors of others, their unusual forms and attitudes, immediately arrest the attention.

Their lonely surroundings enhance their appeal to the lover of the wilderness, for a glimpse of one suggests the days of the pioneer, before steam shovels dug canals that took the water from seventy million acres of our picturesque regions. Their presence brings to the imagination other forms of wild life that one might see—an otter sliding from the bank, a bright-eyed mink darting to cover, or a turtle sunning itself on a log. This environment, years ago, was the haunt of the Indian seeking the bear, the beaver, and the white-tailed deer. In fancy, these are the things I see when a heron rises and wings its way into the shadows of the swamp.

## LONG LEGS AND REMARKABLE BEAKS AID IN GAINING LIVELIHOOD

What influences in the evolution of life caused these birds to develop their long legs and remarkable beaks of varied shapes, one can only conjecture. Nature has provided them with specialized equipment that serves them well in their daily lives. Their bills are of use not only in oiling and preening their feathers, in carrying sticks for their nests, and in turning their eggs, but serve also as weapons of

defense, and, when the birds are young, as hooks with which to support their weight when falling from a limb. Each species possesses a beak especially adapted for gathering the kind of food upon which it subsists. The sharp dagger of the heron spears fish, the curved bill of the ibis explores nooks and holes for crawfish, and the peculiar bill of the flamingo makes it possible to gather mollusks from the mud.

As these birds collect virtually all their food from shallow water, their long legs, bare of feathers to a point near the body, make wading easy.

Members of this group are distributed over nearly all parts of the globe, but are especially numerous in tropical and temperate zones.

## HERONS ARE ONLY REMOTELY RELATED TO CRANES

This article treats of the 18 species and 11 varieties that have been found in North America from Mexico to the Arctic seas (Canada and southern Alaska). They are classified under the Order *Ciconiiformes* and are placed in four separate families.

The herons and bitterns (Family *Ardeidae*), because of their large necks and legs, bear a superficial resemblance to cranes, but are only remotely related to that group.

The storks (Family *Ciconiidae*) are distributed through the warmer parts of the earth, though only one species, the wood ibis (see Color Plate I) reaches the United States.





WHITE IBISES IN FLIGHT OVER TAMIAHUA LAGOON, MEXICO



A LARGE WHITE EGRET OVER CUMBERLAND ISLAND, OFF THE GEORGIA COAST

Photographs by George Shiras, 24



Photograph by George Shiras, jr

A GROUP OF LOUISIANA HERONS IN A SWAMP NEAR ORMOND, FLORIDA

This slender bird, graceful in every movement and pose, richly deserves the descriptive title, "Lady-of-the-waters," bestowed upon it by the naturalist-artist Audubon. The nests contain four or five pale-blue eggs.

The ibises and spoonbills (Family *Threskiornithidae*) are of large or medium size, resembling storks. The ibises have the long bill decurved at the tip instead of straight, as in the storks, while in the spoonbills the bill is greatly broadened and flattened at the tip.

The flamingos (Family *Phoenicopteridae*) have certain characters that ally them to the ducks and geese, with which they were formerly grouped, but more modern studies place them with the storklike birds. The form of the bill, which is abruptly bent downward at the middle, is found in no other bird. While at first glance this may seem a deformity, it is an adaptation required by the long neck and the method of procuring food. As the neck is lowered, the bent portion of the mandibles is held parallel to the surface of the ground, so that thin sand can be passed through the bill and the small shells and other food that it contains be strained out and swallowed.

Though flamingos ordinarily are considered tropical species, in South America they range into Patagonia and to lakes at high altitudes in the Andes. In the latter localities they nest in colonies of many thousands. Natives procure their eggs, roast them to preserve them, and transport them for sale into the lowlands.

#### THE ROSEATE SPOONBILL FACES EXTINCTION

One July day in my boyhood, when the tide was low and the greasy mud lay bare under the mangrove bushes, I crawled along behind a man with a gun. My hands were cut by shells, and mosquitoes and stinging flies swarmed over my face, but these meant little in the excitement of the moment. From behind the broken stub of a mast, which the Gulf had cast ashore, we were listening soon to the contented guttural notes of a flock of feeding roseate spoonbills (see Color Plate I).

As the birds waded, their long bills skimmed the bottom, swinging from side to side as a mower's scythe reaches for the timothy stalks in the meadow. My companion raised his gun and fired. Familiar with the habits of his prey, he reloaded quickly and bade me remain quiet. Within two minutes the flock had returned and was swinging low overhead. Seven roseate spoonbills were carried back to the boat at the edge of the Florida key.

On other keys, about shallow ponds of the pineland prairies, up nameless streams of the Everglades, or in the depths of the Big Cypress, many such killings were going on, for other men and boys were abroad with guns. Curio stores in St. Augustine, Tampa, and Jacksonville displayed fans of wonderful pink feathers, which thousands of tourists bought to take north as souvenirs of their sojourn under sunny skies.

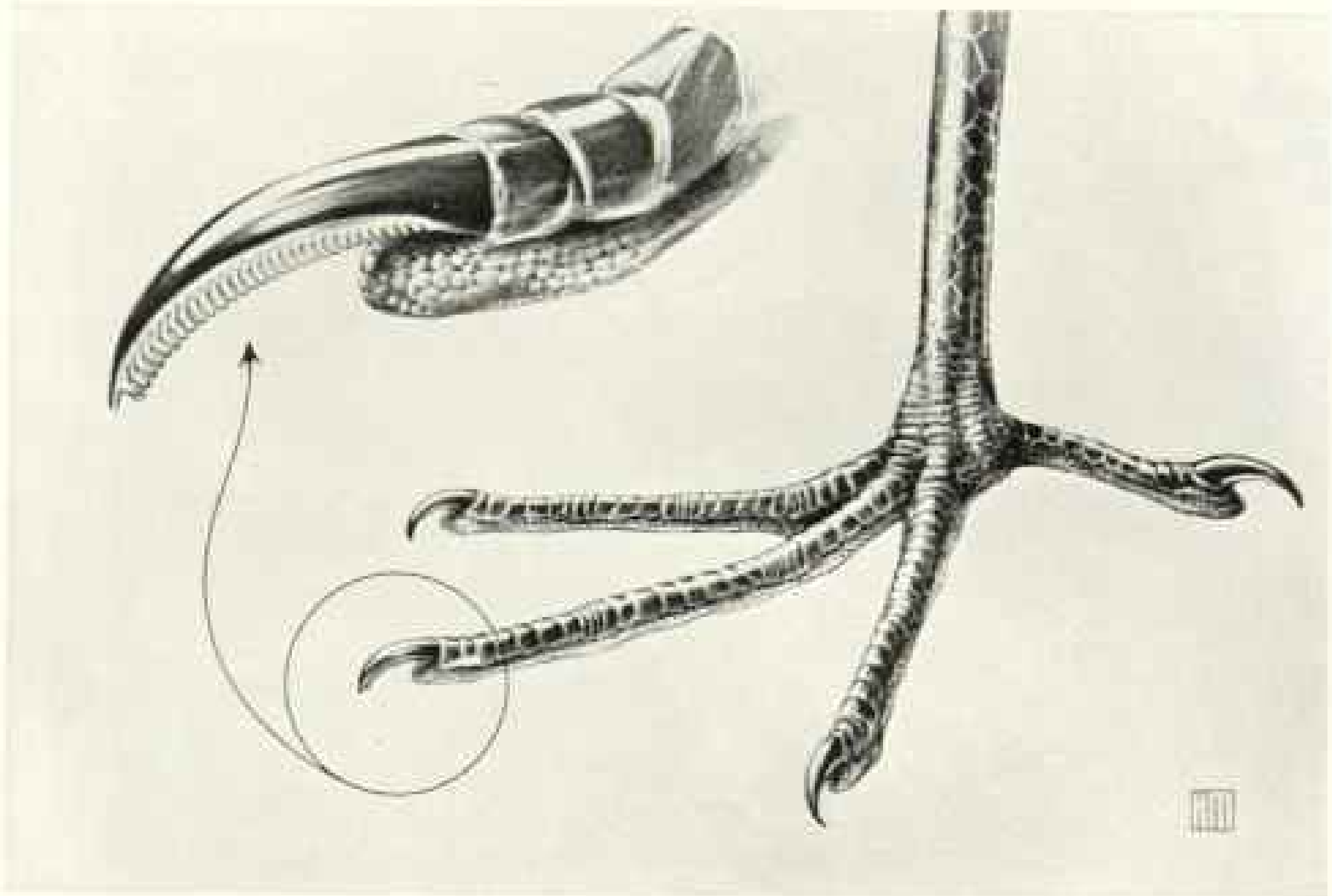
The spoonbills were also esteemed as food. Back in the Everglades, Indians cooked them in steaming pots beside their palm-thatched lodges, and fishermen, alligator hunters, and orchid collectors broiled them in charcoal buckets.

Mankind has wrought great havoc with these birds in the United States. From hundreds of thousands, two generations ago, they have dwindled to a pitiful few hundred. Even yet some men seem determined to hunt out and slay the last survivors of one of the most striking birds of our country. Within the United States, there are still a few hundred in Florida, one breeding colony in Louisiana, and two or three nesting places in Texas; but that is all, and it is a question whether or not the race can be saved north of the Rio Grande.

My most recent experience with nesting spoonbills was on May 22, 1932, in a populous heron colony occupying a cluster of trees and bushes on the prairie of Cameron Parish, Louisiana. There were fifty birds, perhaps half of them being in the full pink plumage assumed only after two years' growth. In constructing their nests, ten of which were located, I noticed that the birds had used not only dead twigs, but also liberal supplies of small branches bearing green leaves. The nests contained freshly laid eggs which would require 28 days of incubation before the young would appear.

#### WOOD IBISES MUDDY THE WATER, MAKING FISH APPEAR

Once, upon emerging from a cabbage-palm hammock, I reined my horse to a sudden stop. Before me, amid the scattered slender pines and clusters of scrub palmettos, was a shallow pond crowded with wading birds moving rapidly about and making a great commotion. Scratching with their feet, they were muddying the water so that the fish were obliged to



Drawing by Hashime Murayama

RIGHT FOOT OF GREAT BLUE HERON, SHOWING THE PECULIAR COMB, OR PECTEN,  
ON THE CLAW OF THE MIDDLE TOE.

This curious structure, found in herons and also in whippoorwills, nighthawks, barn owls, and some other birds, is supposed to be useful in cleaning and dressing the plumage and may be of assistance in removing the bird lice known as mallophaga. The foot is shown one-half natural size, with the inset of the claw enlarged two and one-half times.

rise to the surface to breathe. I had come suddenly upon a flock of wood ibises, birds closely related to the storks (see Color Plate I). They were gathering their food in the peculiar, communistic manner they sometimes employ, for when many thus work at the same time they can so pollute the water that their victims quickly appear.

Wood ibises do not stab their prey as do herons, on occasion, but seize it between their large and powerful beaks. A bill I once measured was nine inches long and seven and a half inches around at the base.

The head of this bird is without feathers, lying bare to the beating sun and to the sweep of every wind that blows. "Flint-heads," the native Floridians call them. In Arkansas the hunter speaks of the "gourd-head," and chuckles with anticipation as he prepares it for dinner. When, in summer, they appear in the low country of South Carolina, the Gullah boatman points across the marshes and says, "De gannets come, enty?"

The Corkscrew is a great yoke-shaped bend of the Big Cypress 30 miles south of Fort Myers. Here the trees are old and many of them are very tall. To this spot come wood ibises in great numbers, when the season arrives for them to lay their eggs and rear their young. Long, gray moss hangs from the trees, and air plants decorate the limbs in great profusion, while here and there an orchid adds its brilliant touch to the somber solitudes. In large part the water, hidden by a massed growth of floating wild lettuce, is from knee to shoulder deep.

I have never seen a place where cotton-mouthed moccasins were so numerous, grew so large, or were so exasperatingly tame. They decorated nearly every log or fallen limb. For protection I carried a stout club, for these snakes are not always inclined to retreat at the approach of an intruder. In wading across one strip of the swamp, 200 yards wide, I felt obliged to kill 14 of them, one with a length of



Photograph by C. P. Martin

HUNDREDS OF TREETOP NESTS FORM A HERON COLONY NEAR SPRINGFIELD, OHIO

Cradled in the topmost branches of tall beeches, poplars, and red oaks are the rough, basketlike nests of the great blue heron and its neighbors, the black-crowned night herons. Often a dozen of these nests are found in one tree. The view shows nearly a hundred nests, and in this one small wood lot there are more than three hundred others.



Photograph by C. P. Martin

IN FLIGHT THE GREAT BLUE HERON IS A SPECTACULAR FIGURE



Photograph by Alvin R. Cain

THE LEAST BITTERN: A STUDY IN EXPRESSION



Photograph by Oscar E. Baynard

## AN EGRET MAKING ITS TOILET

more than five feet. There were many others in sight. I counted seven at one time that I did not molest. The moccasins had collected in such unusual numbers to feast upon the dead fish falling day by day from the hundreds of nests far overhead.

For perhaps two miles the bird encampment extended along the sides and around the curves of the Corkscrew. Between swamp and pines is a strip of glade, and as far as one could see, fish crows were traversing this open space. In nearly all cases each of those returning from the cypresses carried a large white egg transfixed on its bill. This little crow is the greatest natural enemy with which the big wood ibis has to battle in its annual efforts to reproduce its kind.

I never tire of traveling the Tamiami Trail, which, south of Lake Okeechobee, traverses our attractive southern peninsula from coast to coast. When water conditions are favorable, 20,000 large wading birds may readily be seen in a few hours. One is almost certain to find wood ibises, sometimes thousands of them. They may be sitting on trees 200 yards from the trail or flying across the saw-grass wastes of the Everglades. Now and then a flock

soars aloft. In wide circles it continues to rise with scarcely a movement of the black-tipped wings. Silently and with infinite grace the giant birds go up and up until their white bodies seem to vanish in the far-away heavens.

## THE WHITE AND GLOSSY IBISES

There was a report that a man employed to guard a large nesting colony of birds had proved untrue to his trust. It was alleged that he was taking hundreds of eggs and selling them to collectors. The informant had passed the bird island and had seen many limbs that had been broken from the trees, he said, by the unfaithful warden, as he climbed about collecting eggs. Going to investigate the matter, three days later the prow of my boat came to rest on the muddy shore of that island. Everywhere small branches and twigs lay on the mud or hung from limbs above, as if a gale had swept the region.

The trees were alders, which have very brittle limbs. Several hundred white ibises had appeared on the lake and had caused the damage by deciding to roost and build their nests in company with the herons and egrets here. Birds generally possess keen judgment as to the supporting strength of



Photograph by L. W. Brownell

TWO YOUNG BLACK-CROWNED NIGHT HERONS IN THEIR NEST

limbs on which they attempt to alight. Only in rare cases have I seen a branch break under the weight of a bird, and this was the first instance I had ever known where a whole flock made so many miscalculations.

WHITE IBIS SURVIVES PERSECUTION

In Florida the white ibis (see Color Plate II) is more abundant than in any other State, despite its long persecution by hunters. For fifty years and more it was the custom for men to go in boats into the uninhabited Shark River country to shoot the "white curlews" in great number. Reports are common that several thousand have been killed in a season, their bodies salted in barrels and taken to Havana and elsewhere for food. In recent years wardens employed by the Audubon Society have camped on the river bank or lived in a houseboat, from where they could warn away those who would destroy the ibises and other water birds.

Like several others of the large white birds of our country, the white ibis has black-tipped wings. Plumage with such striking contrasts, combined with the flash of red from their long, carmine-colored bills, makes a picture that, once seen, can-

not readily be forgotten. As they come to roost in the evening, rank after rank sweeping low over great areas of green lily pads, then rising sharply to perch in trees lighted by the rays of the setting sun, they make one of the most pleasing pictures of bird life.

Sometimes with them, but more often alone, glossy ibises appear. The iridescent, bronze-tinted plumage of the fully adult bird is discernible only on close inspection. Usually it is merely "black ibises" that one sees flying across the marsh. In America these are extremely rare birds.

West of the Mississippi is found a very similar species, the white-faced glossy ibis. To study it, go to the brackish marshes of western Louisiana, to the tule regions of Texas or California, or, better still, to the Bear River marshes of Utah, and to the great reaches of the little-known Carson Sink of Nevada. This ibis feeds in shallow water and usually builds its nest with others, among the tall rushes. It flies with its long neck stretched forward to the utmost, in true ibis fashion.

Over much of North America the great blue heron (see Color Plate III) is known by sight to more people than any other of



our large wading birds. Standing about four feet in height, it is the tallest of our common water birds. It is known by various local names, such as "Poor Joe" and "Old Cranky," but as a rule people refer to it as the "blue crane."

Its prowess as a fisherman is such that anglers often express a dislike for the bird, which they regard as too successful a competitor for the game fish which they like to consider their own particular property. Many overlook the fact that this heron often feeds, in large part, upon fish of no special value to mankind, and that it destroys countless water snakes, which are among the greatest natural enemies of game fish.

#### BLUE HERONS COLONIZE IN FORESTS

In some of the Northern States and in Canada, it is a common experience to find great blue herons colonizing in forests, often at quite a distance from a lake or stream. For example, on certain high, wooded ridges of Cape Breton Island, Nova Scotia, perhaps a hundred pairs assemble annually to rear their young. Some of these colonies are very old. The big nests of twigs are in the tallest trees, and the location chosen is at least a mile from any body of water. I have seen such nesting colonies in dry, wooded regions in Maine, in the Carolinas, in Georgia, and elsewhere. In the Gulf States the nests are built usually in trees or in bushes growing in the water.

On islands along the Texas coast where trees are scarce, the nests are placed in mesquite bushes or on cacti. I found on North Bird Island, south of Corpus Christi, 75 occupied nests, every one of which was on the ground. In a tule marsh in northern California I counted nearly as many nests of tule reeds, built to a height of from two to three feet. The intervening rushes were trampled down, so that the nesting area appeared as an extended flat surface covered with numerous tree stumps.

Similar to this bird in size is the great white heron, which is confined to the extreme southern tip of Florida and the adjoining keys and mud flats. In single pairs or in small groups, it nests on the tiny, mangrove-covered islands of Florida Bay and southward.

The seepage from the marl was milky white in the shallow hole which my guide

had dug near camp. Here, at sunrise, we filled our canteens, for we had a long day ahead and the spring drought of 1913 lay upon the land. For hours we traveled through open pinelands and skirted dried-up swamps. Once I was shown the nesting hole used the year before by a pair of the almost extinct ivory-billed woodpeckers. At times our thirsty horses turned hopefully to openings in the landscape, only to find that the ponds were dry. On the caked mud lay hundreds of small dead fish, warped by the heat of the sun.

At noon we reached our destination, a small cypress "head" where my guide had found a flourishing colony of nesting egrets, "long whites," as he called them (see Color Plate IV). To our chagrin, we discovered that others had preceded us by a few days, for a flattened pile of dry palmetto fronds showed where blankets had been spread. Nibbled grass, broken weeds, and tracks indicated various places where horses had been tethered. The remains of numerous white egrets, torn and dragged about by vultures, revealed the success of the plume hunters' raid. The parent birds had been shot as they came to bring food to their young, and the skin bearing the aigrettes had been stripped from their backs.

Up in the cypress trees were the nests, dozens of them, but not a sound of young birds came to our ears. Their last faint calls for food had died away. In what had been a populous, clamorous egret rookery, nothing was left but sickening odors, dancing heat waves, and the silence that comes with death.

Far away in some great city, fashionable women would wear on their hats those long, white, airy feathers which Nature had given as nuptial plumes to the birds whose pitiful remains now lay about us. The aigrettes adorn the birds only in the nesting season, and to collect them for the millinery feather trade it was most profitable to shoot the birds at the time of year when they were caring for their young.

I have visited egret breeding colonies since 1886, 46 years, and with others have worked to protect them. Our pleas before committees of State legislatures and of Congress during a period of 15 years finally brought laws making it illegal to kill egrets or to sell their feathers.

Twenty years ago it seemed almost certain that a losing fight was being made, and



Photograph by Dr. A. A. Allen

AFTER AN UNEXPECTED TUMBLE INTO THE WATER

The young green heron is an awkward but an efficient swimmer.

that white egrets would disappear from our country; but restrictive laws and an awakened public sentiment in time began to have their effect, and to-day they exist by tens of thousands. There are numerous breeding colonies, especially in the South Atlantic and Gulf States. In summer some individuals wander up the Atlantic coast, the Mississippi Valley, and the Pacific coast almost, if not quite, to the Canadian border.

REDDISH EGRETS FIND A HOME ON  
GREEN ISLAND

The history of the smaller snowy egret parallels closely that of the larger species. It inhabits the same general regions, gathers its food, and conducts nesting operations in the same manner, often in company of its larger neighbor. In spring it bears beautiful, recurved aigrettes. For a time it was threatened with extermination by plume hunters for the millinery feather trade, but now it, too, is gaining rapidly in numbers.

In Laguna Madre, Texas, perhaps 40 miles above the mouth of the Rio Grande, lies Green Island. The greater part of its area is covered with a thick, tangled mass

of thorn trees, so compact that a heron could walk upon their tops almost from one side of the island to the other. In 1920, quite by accident, I discovered that this was the summer home of the largest percentage of reddish egrets in the United States (see Color Plate IV). When notice of this came to the attention of the Legislature of Texas, that body enacted a law authorizing the State Land Commissioner to lease it to the Audubon Association as a bird sanctuary. Since then a guard has lived on the island several months each year.

A tower was built where visitors may look out over the 25 acres of low trees and view the 8,000 reddish egrets and perhaps 4,000 other larger waders that resort here throughout the summer months. Of all the Heron family, this species is the least shy. So tame have the birds become on Green Island that they permit a visitor to approach within 15 or 20 feet and photograph them at leisure.

The hoarse squawk that comes out of the darkness when a black-crowned night heron flies overhead may in some cases have been "the cry of the night bird," which fanciful writers have been wont to



STUDYING FLAMINGO NESTS ON ANDROS ISLAND, BAHAMAS (SEE TEXT, PAGE 469)

At the right is the late artist-naturalist, Dr. Louis Agassiz Fuertes, who, with Doctor La Gorce, led an expedition for the National Geographic Society to make a photographic study of the flights of flamingos in the Bahamas. The party made the first successful motion pictures of a flock in the air.

refer to as an evil omen. Seldom are night herons seen abroad on a bright day except during the warmer months, when the demands of their young force them afield in quest of food. They may be encountered in suitable localities from the waterways of southern Canada to the savannas of South America (see Color Plate VI).

In trees or bushes, in secluded ponds, on islands, or among sand dunes, or in the rank growths of marshes, this bird seeks its abode, often with hundreds of its kind and sometimes in company with other herons. It lays greenish-blue eggs, which require about 21 days to be hatched. So common is this night heron that almost any bird student with field experience can name one or more places where it congregates to rear its young.

The bittern (Color Plate VII) has long been heralded by writers as a bird of mystery and its name associated with the owl and the bat in scenes of desolation. It inhabits marshes and bogs, where it skulks in the shelter of rank vegetation. Usually it prefers to hide when danger is near, and unless surprised in an exposed position is

loath to take wing. Although it breeds throughout the Northern and Central States, nowhere is it found in numbers, and it never gathers with others in colonies, as do most of the herons.

In solitary pairs they pass the spring and summer, with their nests usually hidden in a section of the marsh most likely to be free from intrusion. Sometimes the nests are made in salt marshes, but thickets of bulrushes, and cat-tails growing in fresh water, are more to their liking. Now and then a nest is discovered on dry ground, showing that, although a somber, meditative, retiring individual, the bittern nevertheless possesses an imagination which permits it to deviate at times from its customary habits.

#### THE BRILLIANTLY PLUMED FLAMINGO

One of the world's largest birds of brilliant plumage is the American flamingo (see Color Plate VIII). The studies of C. J. Maynard, made at a flamingo colony on Andros Island in 1884, first brought to general public attention the fact that here, at our door, is to be seen one of the most



Photograph by Capt. Albert W. Stevens

#### HUNDREDS OF FLAMINGOS IN FLIGHT OFF THE ORINOCO DELTA COAST

The black shadows of the birds are seen on the still surface of the clear, shallow water, beneath which is visible a vast expanse of tidal sand ridges. White clouds are also reflected in the mirrorlike surface, giving a dappled effect to the remarkable photograph, which was taken on the National Geographic Society's 1930 aerial survey of Latin America.

stirring sights in all the ornithological world. Two thousand great flame-colored birds of unusual form, gathered on a white and leafless plain, is a spectacle of the first magnitude. In such a place I have seen fully a thousand of their mud nests (see page 452) in a single group.

From a veranda on Turiguano Island, off the north coast of Cuba, my host at sunrise pointed to a mass of red a mile away and said: "There are the birds you are looking for." A few minutes later a great company of flamingos arose and, with legs and neck outstretched, streamed through the sky, their scarlet wings flashing in the early sunlight. In a semicircular

course they followed the shore line around the end of the island and alighted in a shallow lagoon. Sheltered by a few mangrove bushes, we approached close enough to the feeding host to determine that about 1,100 flamingos were in action only a few hundred yards from us.

This was in 1924. I was taken by a Cuban boat captain to near-by Cayo Coco and shown the site of a former flamingo colony from which, two years previously, he had taken 1,500 of the young. In his schooner they were transferred to Cuba, herded through the streets of Morón like so many geese, and sold for food to the residents.

**WOOD IBIS (*Mycteria americana*)**

The wood ibis inhabits the low wet country of the Southern States and is more abundant in Florida than elsewhere. As a rule, it is a shy and wary bird and sentinels are posted when a flock is feeding. The best way to study them in action is about their rookeries, as they are loath to leave their young, and when frightened away will soon return and give the hidden observer an opportunity to view them at leisure.

The best place I have seen to get near to wood ibises is on Alligator Lake, near the extreme southern tip of Florida. Here the limbs of some clusters of low, wide-spreading mangroves were thickly covered with their nests when I visited the region, early in May, 1929. At that time young of various sizes were standing with their parents all over the dome-shaped trees. Again, in February, 1930, while many young were in evidence, eggs still remained in various nests.

In portions of the rookery undisturbed by our presence, feeding evidently was going on. The coughing, groaning, wheezing croaks that issued from behind the mangroves indicated a considerable amount of mental agitation, or perhaps it was anticipation. None of the nests was over 20 feet above the water. Some were so low and so easily accessible that one could photograph their contents from a horizontal position while standing in a small launch lying alongside.

One who has been repeatedly disappointed in attempts to photograph young great blue herons in the nest, because they are so prone to lie down when one comes near, will find in the young wood ibis a very satisfactory subject for his art. I have watched them at a distance of eight or ten feet for many minutes, during which they stood erect and moved only occasionally.

The nest of the wood ibis has not impressed me as particularly large for the size of a bird which weighs from 11 to 12 pounds. However, it is about 15 inches across and is a substantial structure of small limbs and twigs. The white eggs are two to four or five in number. The shell is lightly pitted and is sometimes covered with blood stains.

Wood ibises like the company of their own kind and as a rule are seen in flocks. I have found them engaged in their nesting operations in colonies ranging from 100 to fully 5,000 birds. Usually the nests are built in cypress trees, often 80 feet or more above the water of the swamp in which the big cypresses grow. Under ordinary circumstances this bird is difficult to approach, which argues well for its preservation.

Food is sought in marshes or more often in shallow ponds or along the margins of grassy lakes. Here, to the accompaniment of clattering bills, they gather their diet of fish, snakes, frogs, tadpoles, water insects, and, according to Audubon, young alligators.

When a flock takes wing from its feeding ground the roar of wings may be heard at considerable distance.

In the United States this bird breeds in the coastal country from South Carolina to Florida and Texas. Beyond our borders it extends to Peru and Argentina. After the nesting season some individuals migrate northward, rarely as far as Montana and Massachusetts.

**ROSEATE SPOONBILL (*Ajaia ajaja*)**

Roseate spoonbills live in flocks, the number in a company ranging anywhere from five or six individuals to as many hundreds. So strong is this liking for companionship that if a group becomes scattered by hunters, storms, or from other causes, single birds will for a time join flocks of other waders encountered in the neighborhood. Particularly have I noticed single spoonbills in company with wood ibises. This may not be due so much to an instinct for sociability as to a desire to seek that element of safety which certainly is enhanced by a greatly increased number of watchful eyes.

These birds feed in shallow water, where they sift the sand or silt in their long, flat beaks. Often the head and sometimes the entire neck is submerged for brief periods. No great amount of data has been collected on the subject of their food, but examination of stomachs has revealed the remains of fish, shrimps, and insects. Audubon says that the birds grind their food by moving their partially open mandibles laterally to and fro.

The bone near the tip of the spoonbill's beak is perforated by numerous tiny orifices for nerves, which perhaps are of value in aiding the bird to select its food by the sense of touch.

In taking wing, spoonbills fly in a more or less confused group, but if the flight be prolonged they often assume a rank formation, frequently with one end of the line well in advance of the other.

When the breeding season approaches, they collect with other birds of the Order Ciconiiformes. Their nests are scattered among those of herons, but are more substantial structures. They have many larger sticks, and, being made for heavier birds, are placed in secure positions among trees or bushes. The eggs vary from three to five, and are covered with dots and blotches of varying shades of olive brown. The shell is granulated, without any gloss.

The breeding season of the roseate spoonbill varies in different parts of the country. Those in Alligator Lake, Florida, had newly hatched young on January 1, 1930. On Big Vingtune Island, Texas, young two weeks old were found in nests on June 25, 1931. At first the bodies are covered with white down, through which a vivid pinkish skin is revealed. The young in the nest get their food by inserting the bill deep into the mouth of the parent. They do not attain full plumage until at least two years of age.

The beak of the newly hatched bird is short, with little resemblance to that of the parents, but very soon the spoonbill shape of the tip begins to develop. By the time the bird matures, the beak has become very flat, is much widened, and is from 6 to 7 inches long. The bird varies in length from 30 to 35 inches, from bill to tail tip.

Near Aransas Pass, Texas, in the spring of 1920, I observed at intervals during a period of two days a spoonbill whose body was black—a most unusual occurrence of melanism.

This species breeds from the Gulf States, Cuba, and Mexico southward to Argentina and Chile. On rare occasions it has been known to come northward as far as Pennsylvania, Illinois, Wisconsin, Utah, and California.

IBISES, HERONS, AND FLAMINGOS



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ROSEATE SPOONBILL

These figures are approximately one-eighth natural size.

WOOD IBIS



© National Geographic Society

The figures are approximately one-eighth natural size

WHITE-FACED GLOSSY IBIS  
Upper

SCARLET IBIS

WHITE IBIS

**WHITE-FACED GLOSSY IBIS (*Plegadis guarauna*)**

The white-faced glossy ibis is the most widely distributed of the various ibises of our country, being an inhabitant of open marshes, where it ranges in flocks often of considerable size. As ordinarily seen, it appears as a dull silhouette, the striking colors of the adult being visible only under unusual circumstances.

It breeds in colonies in growths of rushes, bending the stalks down for a foundation and on this placing a nest of similar materials with well-marked depression to contain the two to six dark bluish-green eggs. Young ibises are ungainly creatures, scantily covered with black down with a whitish patch on the back of the head. About their colonies the birds make strange grunting calls.

In the air, ibises fly in lines or open wedges, each bird spaced equally from those adjacent. Although these birds are not particularly shy when unmolested, they will not allow too familiar an approach.

They feed mainly in wet, marshy ground, and in the West come often into freshly irrigated fields, particularly where earthworms are abundant. These form part of their food, which includes also frogs, crayfish, aquatic insects, small fishes, and similar creatures. In some places there has been complaint that they trample freshly irrigated fields of alfalfa in their search for food. They have been hunted in various localities, but are now on the protected list of birds.

The white-faced glossy ibis breeds from Oregon and Utah south to Texas and southern Mexico and is found locally also in Louisiana. It winters from California and Louisiana southward. It occurs also as a nesting species in South America, south of the Amazon Valley.

A related species, the glossy ibis (*Plegadis falcinellus falcinellus*), rare in the United States, differs mainly in not having white at the base of the bill. For several years a few pairs nested regularly every spring in the alder bushes on Bird Island, in Orange Lake, Florida.

The breeding glossy ibises of southeastern Louisiana are of this species, which ranges southward to Cuba and Haiti. This species is common in many parts of Europe, with related races in Asia and Australia. In 1925 I visited a large colony nesting in the tall rushes of Kis Balaton, in southwest Hungary. They were associated here with numerous white spoonbills and purple herons, all three species having their nests in close proximity to each other and apparently getting along very well together.

**SCARLET IBIS (*Guara rubra*)**

Although the adult scarlet ibis possesses such an amazing red plumage, the young for a time are grayish brown. The pink and then the reddish feathers develop through a series of molting seasons extending over a period of two or three years.

Our knowledge of the habits of this species is limited and fragmentary. Travelers in South America have written of visiting breeding colonies of scarlet ibises, but the accounts of their observations do not always agree. Thus Schom-

burgk, in 1848, says that they use the nests several seasons in succession, while Lloyd (1867) states that this ibis never builds a nest of any kind, but instead takes forcible possession of the nests of the snowy egret. There is agreement, however, in the statements that in the nesting season they colonize in enormous numbers.

Two eggs ordinarily constitute a set, with sometimes three and rarely four. The ground color varies from grayish or greenish to yellowish white, marked with different shades of brown, being similar to eggs of the white ibis.

The scarlet ibis inhabits the coastal areas of northern and eastern South America from Venezuela and Trinidad to Brazil. There are various records of its occurrence in the United States, but many of these are vague and not well substantiated. The reports of specimens found in Texas are perhaps the most convincing. One account from Corpus Christi tells of a bird evidently blown there from the south by the storm of August, 1916. Ten years ago R. D. Camp, of Brownsville, Texas, reported to me that he had seen three of them near Point Isabel after a gale of long duration. Others have been reported from New Mexico, Louisiana, and Florida.

**WHITE IBIS (*Guara alba*)**

John James Audubon, writing a hundred years ago, said that sometimes white ibises will drop pieces of mud down a crayfish hole, wait patiently until the little crustacean comes up pushing the mud before it, and then seize it. There are those who claim that crayfish feed extensively on fish eggs, and that therefore lakes frequented by these birds may be expected to contain more fish than others not blessed with these natural guardians.

White ibises accumulate in large colonies to breed, sometimes thousands occupying the trees of some small island. The nests are of sticks and are crowded closely together, often many in a single tree, at times nearly touching each other. Egg-laying often begins before the nest has been finished, and sticks are added daily until the young are hatched. Four or five greenish or bluish-white eggs, spotted with various shades of brown, are deposited. They are two and a quarter inches long and one and a half inches wide.

The bare skin about the head, as well as part of the long, curved bill and the legs, is yellowish, turning to light red in the breeding season. As Major Brooks has shown in Color Plate II, the gular sac beneath the base of the bill becomes distended at this time. The immature bird is grayish brown, with the rump and underparts white and with the white of the head and neck streaked with grayish brown. In this plumage it is known in some regions as the "Spanish curlew." An adult specimen is about 25 inches long and has an expanse of wings of three and a third feet.

The white ibis breeds from southern Baja California, central Mexico, Texas, Florida, and South Carolina, south to Haiti and northern South America, wintering from Florida, Louisiana, and Mexico southward. Casual occurrences have been reported from Colorado, South Dakota, New York, and elsewhere.



### GREAT WHITE HERON (*Ardea occidentalis*)

Florida Bay and the immediate adjoining regions constitute the home of the great white heron, from which it never regularly migrates. No large bird of North America occupies such a restricted range. It lives about the waters just off the southern tip of the mainland and principally in a region less than 30 by 50 miles in extent. Here the sea is very shallow and the bottom is covered with mud. At low tide vast reaches of this slimy marl are exposed. This is traversed by tidal channels through which only boats of very shallow draft can make their way.

When the tide comes in and flows over the flats, the great white herons collect in small, scattering groups to feed. One may see them at a distance of one or two miles, standing as immovable as statues. They feed largely upon fishes, which they procure by simply waiting for them to come along, for this heron does not stalk about or dart here and there in pursuit of its prey. As the rising tide reaches the bird's body, it lifts in the air and departs with slow, measured wing beats. The neck is drawn in until the head appears to be attached directly to its body and the long legs are extended straight out behind.

Scattered about in this extraordinary sea are numerous small mangrove-covered keys, to one of which the bird repairs to rest and to digest the ample meal so recently consumed.

Audubon, who studied the habits of these little-known birds in 1840, kept some of them for a time in captivity. Among his various observations he records that their appetite for food was astonishing. For example, he says that two young birds "swallowed a gallon of these fishes." Apparently they would consume almost any animal food they could capture, for he tells that they killed and swallowed young Louisiana herons and reddish egrets, although they were being fed bountifully on green turtle flesh at the time. Audubon found that he could not make friends with these birds as one can often readily do with the young great blue herons.

The islands of their haunt are usually small and are covered with either the red mangrove or both the red and black mangrove. To these the great white herons resort in small colonies to raise their young. Egg-laying may be at any time of year from October to the succeeding July, although December, January, and February are the months when most of them engage in nest construction. The nests are heavy structures of sticks and twigs. Three or four pale bluish-green eggs are laid. The young are clothed with white down.

In 1858 the ornithologist Baird described the Wurdemann's heron, which inhabits the south Florida region, as a distinct species. The latest studies of Ernest G. Holt and others, however, revealed the fact that *Ardea wurdemannii* is a hybrid of the great white heron and the Ward's heron.

The great white heron is confined to the southern tip of Florida, mainly in Florida Bay, and near Cape Sable and Cape Romano. An allied race is found in Cuba and has been reported from Puerto Rico and Jamaica.

### GREAT BLUE HERON (*Ardea herodias*)

The stately form of the great blue heron decorates the shallows, ponds, streams, lakesides, and estuaries from Alaska and Canada to the West Indies and the Galápagos. As is usual with large birds, individuals vary considerably in size, being from 42 to 50 inches in length (bill tip to tail tip). Some have a six-foot wing spread and weigh from six to eight pounds.

About twenty years ago Makepeace Reservoir, in Atlantic County, New Jersey, was created by the damming of a stream. The rise of the water killed a grove of white cedar trees, to which a colony of great blue herons repaired to establish their domiciles. Visiting the lake on June 1, 1919, I found 66 heron nests, all apparently of recent construction and placed at heights varying from 12 to 40 feet above the water. Twigs and small limbs had been employed as building materials and the nests were very substantial affairs. Many were fully three feet in width.

In addition to consuming fish and frogs, this bird preys upon snakes of considerable size, as well as young muskrats, grasshoppers, dragon flies, lizards, meadow mice, pocket gophers, and young rats. It has even been known to eat young birds. However, fish is its principal diet. Like all herons, the food it conveys to its young is carried in its stomach and delivered by regurgitation. These birds often walk about on the dry land, where they secure the mice and insects that give variety to their menu.

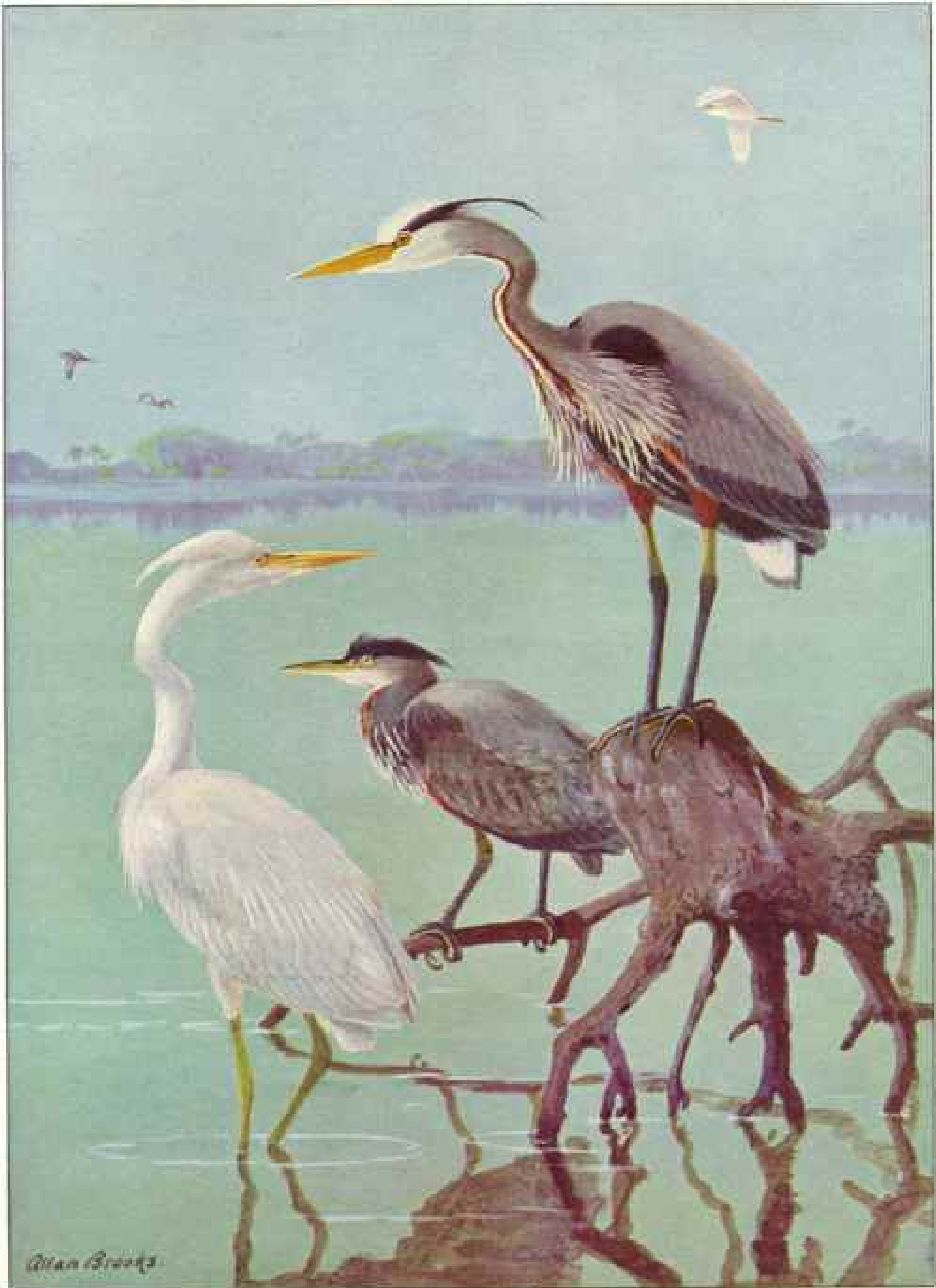
When fishing, two methods are regularly employed. One is to stand motionless and patiently await the coming of the prey. The other is to stalk carefully along until a fish is seen; whereupon the head darts forward with lightninglike rapidity. The fish is first stabbed and disabled, or, if it be a small one, it is tossed upward and swallowed head first.

A much rarer method employed is to fish in deep water. Only once have I seen this. On the Cape Fear River, in North Carolina, I discovered seven herons fishing in this way. One at a time they would spring from the top of some old pilings and land squarely in the water. As the current carried them downstream they would strike repeatedly, as if floating amid a school of fish. After progressing for a few hundred feet, they rose, returned to their perches on the piling, and repeated the performance.

The great blue heron nests from Nova Scotia, Quebec, and southeastern British Columbia to Nebraska, Iowa, and South Carolina, wintering from Massachusetts and New York southward to northern South America.

The race known as Ward's heron (*A. h. wardi*), distinguished from the typical great blue by its larger size, is found from South Carolina, Florida, the Gulf coast, Indiana, and Oklahoma southward. Other subspecies are: Treganza's heron (*A. h. treganzai*), found from Wyoming to Baja California and Sonora; northwestern coast heron (*A. h. fannini*), breeding from Cook Inlet, Alaska, to Washington; California heron (*A. h. hyperborea*), Oregon to northern Baja California; and Espiritu Santo heron (*A. h. sancti-lucei*), inhabiting southern Baja California. Also, there are other races of the great blue heron in the West Indies, Mexico, and the Galápagos.

IBISES, HERONS, AND FLAMINGOS



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GREAT WHITE HERON

The figures are approximately one-sixteenth natural size

GREAT BLUE HERON  
Young, middle; adult, above



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The figures are approximately one-tenth natural size

REDDISH EGRET

Dark phase; white phase, above.

EGRET

SNOWY EGRET

**AMERICAN EGRET (*Casmerodius albus egretta*)**

Due to its large size, its snowy whiteness, and the remarkable grace it exhibits in flight or when at rest, the American egret arrests the attention of every observer. In the breeding plumage the bird is adorned with about 50 aigrettes, that grow from the back between the wings and extend well beyond the tail. These exquisite, filmy feathers attain a length of 21 inches. As the nesting season advances, these are gradually shed, and examination shows that they exhibit marked evidences of wear.

Of the three species of egrets in the United States, this is the largest, its length varying from three to three and a half feet. The slender, dagger-shaped bill is nearly five inches long and is a dangerous weapon when driven vigorously by the bird's long and flexible neck. The yellow color of the bill is a character that easily distinguishes this species from the snowy egret when larger size is not evident.

They feed intensely by day and apparently will eat almost any small animal life encountered. Among the various articles they have been known to consume are fish, small snakes, frogs, dragon flies, crickets, grasshoppers, and moths.

This is one of the few species of our birds many individuals of which regularly migrate northward in late summer after the nesting season, making their way to New England and Ontario.

The American egret occupies the tropical and subtropical sections of America, breeding from North Carolina, Arkansas, and Oregon (rarely) southward to Patagonia. Allied forms are found in the Old World.

**SNOWY EGRET (*Egretta thula*)**

The snowy egret is two feet in length, its plumage is of snowy whiteness, and in the spring and summer its back is decorated with numerous recurved aigrette plumes. It is smaller than the egret and has the bill and legs black and the toes yellow. Formerly this bird was shot for the millinery trade in such immense numbers that by the beginning of the present century it was regarded as one of the rare and fast-disappearing birds within the United States. The passage of the Audubon laws to prohibit killing it and to make the sale of its plumes illegal, followed by years of intensive public education and the guarding of its breeding colonies, has been one of the most successful efforts in the protection of any single species of North American birds. It has regained its numbers, and to-day exists by tens of thousands, being particularly plentiful in the low country from South Carolina to Florida and in the same character of country in Mississippi, Louisiana, and Texas.

They frequent shallow ponds, quiet salt-water lagoons, and flooded rice fields, where they seek minnows, frogs, and other small life.

They are decidedly the most animated members of the heron family of which I have personal knowledge. In feeding they dart about most vigorously in the shallow water, and in their nesting colonies they are pugnacious and resentful of the approach of other birds. They are quite capable of defending their nests against

their twig-stealing neighbors, who are ever on the alert to acquire additional nesting materials. They breed usually in company with other herons and lay from three to five bluish-green eggs.

Like the American egret, this species wanders north in late summer to Kansas, Maryland, and casually to southern Canada.

The extensive Bear River marshes adjoining Great Salt Lake on the northeast are one of this country's most famous resorts for water birds of many species and are a well-known feeding and nesting ground for the form of this heron known as Brewster's egret. Here, in the tule marshes, they gather in numbers to construct their nests and raise their young.

The nesting range of this egret extends from North Carolina southward in the coast country to Florida and Texas, and on through tropical America to Argentina and Chile. Formerly it nested north to New Jersey, Indiana, and Nebraska.

The race known as Brewster's egret (*E. t. brewsteri*) breeds from Utah and California southward to Baja California.

**REDDISH EGRET (*Dichromanassa rufescens*)**

The general habits of the reddish egret are similar to those of other herons. It feeds in shallow water, builds nests of sticks and twigs, lays bluish-green eggs, and, if successful, rears three or four young in a season. However, it appears to frequent only salt and brackish water areas mainly. Its food consists chiefly of small fish. When animated, the long feathers of the back of the head and upper breast and the aigrettes of the back are erected in such a manner as wholly to change the form and appearance of the bird.

This species occurs in two very distinct phases of plumage. The dark one is of a bluish slate color except the head and neck, which are rich chestnut. Specimens of the white phase show no color in their plumage, except that in some cases there are faint markings of gray at the tips of the long wing primaries. In both phases the end of the bill is dark. This egret superficially resembles a little blue heron, but is larger and attains a length of about 30 inches.

Like all other wild birds, the reddish egret has its natural enemies. On Green Island, Texas, where is situated their largest breeding colony in the United States, the chief foe appears to be the great-tailed grackle, which is a great destroyer of eggs. Like the fish crows in the heronries of the South Atlantic States, they are ever on the watch to seize the eggs of the herons and egrets that may be left unguarded for a moment. They are very aggressive, and I have seen them drive an egret from its nest and then begin to eat its eggs.

The reddish egret (*Dichromanassa rufescens rufescens*) breeds from the Gulf coast of the United States south to Jamaica, Haiti, and Guatemala. Formerly it was common in southern Florida, but became nearly extinct there. Now, however, it is seemingly becoming more abundant.

Dickey's egret (*Dichromanassa rufescens dickeyi*), found in Baja California, differs in being darker on the head and neck.

**LITTLE BLUE HERON (*Florida caerulea caerulea*)**

This handsome species breeds in colonies in swamps, where usually it is associated with other herons. The eggs are four or five in number, dull blue in color, and are laid in nests of twigs built in trees or stout bushes. The down of the young little blue heron is white and the feathers that follow also are white. It is not until well along in the summer of the next year that the slaty-blue plumage of the adult is acquired. This comes gradually, thus giving to the bird at that period of its life a peculiar spotted appearance. In the white plumage it is often mistaken for the snowy egret by untrained observers, but may be distinguished by the dull greenish, instead of black, legs and bill, and also, in the hand, by a few slaty markings atop the white primaries.

In a cluster of young cypress trees growing in an arm of Orton Pond, in Brunswick County, North Carolina, many little blue herons have their nests every spring. The young, like those of other herons, are fed by regurgitation.

The power of expelling food is also well developed in the young. While sitting in a boat at the edge of this colony one May morning, I noted with what frequency the young were disgorging their recent repasts. This is not an unusual performance when the herons are old enough to stand on the nests or clamber awkwardly about on the near-by branches. Those before me were continually having personal difficulties, and when young herons become agitated they frequently disgorge.

As each contingent of minnows fell, there was a swirl in the water. Wondering what was happening beneath the surface, I pushed my boat beneath a small tree containing several young birds and was quickly presented with a dozen minnows by one of them. Using these as bait and dropping the line overboard, I discovered that the water was swarming with yellow perch and black bass, drawn to the colony by the food, which was continually falling like manna from above.

Local inhabitants contend that alligators will jar the young herons out of the bushes with blows from their tails.

The little blue heron is found during the nesting season from Delaware and Arkansas southward to the Gulf coast and Central America. In late summer many individuals migrate northward and remain for some weeks. At this season they come at times to New England, Iowa, Colorado, and Nova Scotia and other points near the Canadian border. An allied race is found in the West Indies and northern South America.

**LOUISIANA HERON (*Hydranassa tricolor ruficollis*)**

A southern heron colony is a very busy and fascinating place. From the vantage of some elevated limb one looks out over the tops of the bushes below, where various kinds of herons are carrying sticks, incubating eggs, shading newly hatched young, fighting intruding neighbors, and engaging in many pretty love antics. The chatter of the young as the parents approach with food is a sound that swells in volume as

the days pass. Black vultures are usually perched here and there; they eat young herons. Fish crows are skulking about in quest of eggs. The glorious sunlight sheds its luster over all and reveals the great variety of colors in the plumage of the several species inhabiting this city of the long-legs.

Among these is the Louisiana heron, generally the most numerous, sometimes several thousand being gathered in a single breeding colony. It is an exceedingly slender bird, about 26 inches in length, and graceful in all its movements. "Lady-of-the-waters," Audubon called it.

When one meets its mate, there is always a pretty greeting, some expression of interest and tenderness. They bow, they elevate their crests and aigrettes, touch each other with their necks, and gently pick each other's plumage. The male brings many sticks for the nest and his mate places them to her liking. He helps her in incubating and guards the four or five pale-blue eggs while she goes away for food.

In feeding, the Louisiana heron advances through the shallow water with stealthy tread until suddenly, with amazing swiftness, the head darts forward and the bill seizes a luckless minnow, insect, or frog.

This bird inhabits both fresh- and salt-water bodies, feeding in the shallows where small fish abound. In the marshes along the coast it finds the margins of mud flats much to its liking. It usually avoids places where tall grass or rushes interfere with a view of its surroundings.

It breeds from Cape Lookout, North Carolina, and the Gulf coast south to the West Indies and Central America, and on the Pacific side from central Baja California south into Mexico. An allied race is found in northern South America.

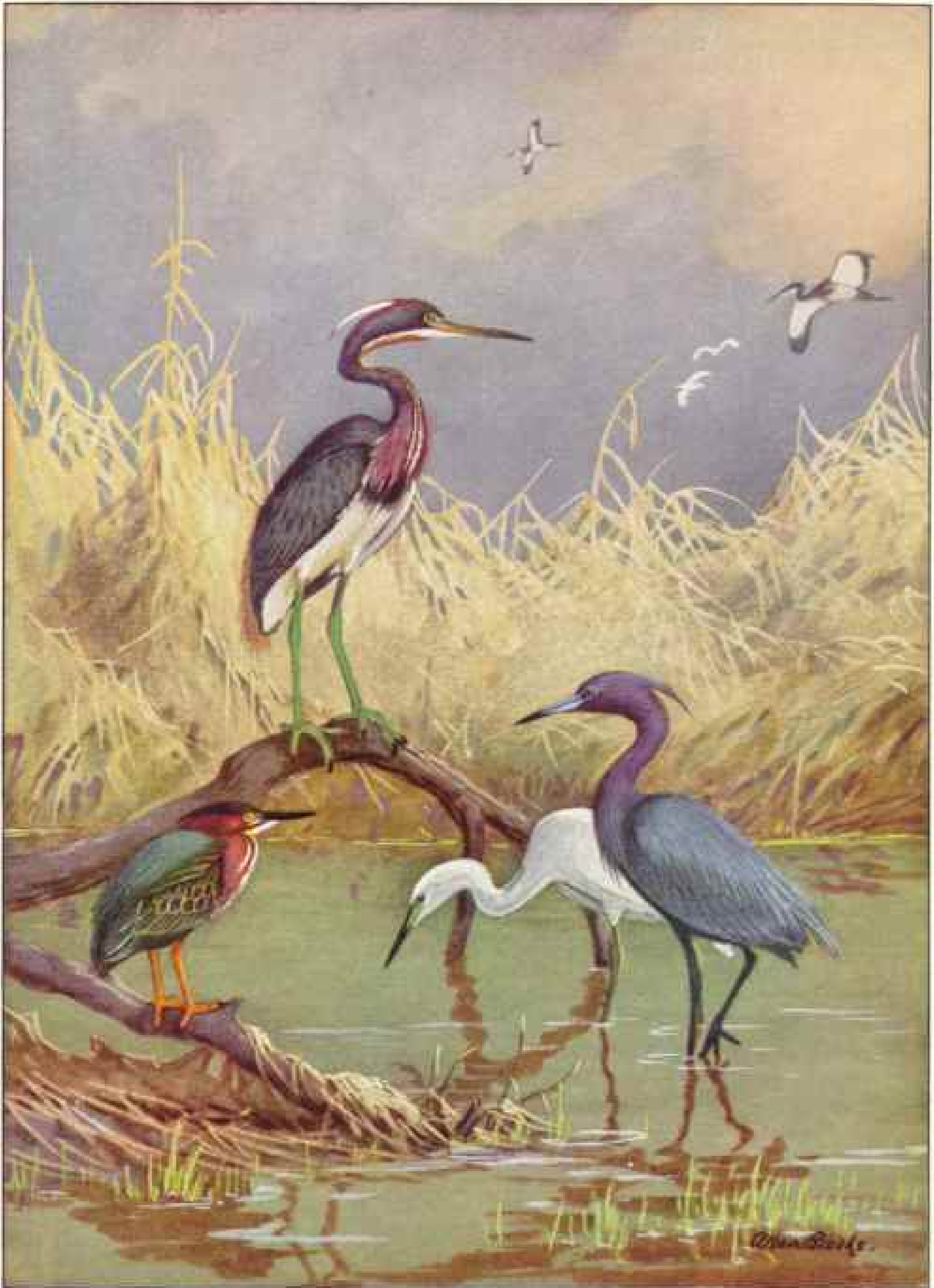
**GREEN HERON (*Butorides virescens*)**

It would seem that in eastern North America there could scarcely be found a farm boy who does not know the green heron, although he may not recognize it by this name. Perhaps he calls it "shute-poke," "fly-up-the-creek," or "Indian hen." While found commonly about large swamps and marshlands, it is by no means confined to such areas. It may be startled from the shore of almost any creek. With a sharp, lusty squawk it will fly suddenly ahead, perhaps disappearing around a bend in the stream or perching on a limb for a brief period to watch the intruder.

The herons' custom of nesting in colonies applies to this species less than to most of the others. The slight nest, made of small dry twigs, is seldom more than ten feet from the ground and frequently much lower. Four or five eggs are usually in a nest of this heron, but as many as nine have been found.

The eastern green heron breeds from Nova Scotia and North Dakota southward to northern Honduras and westward to New Mexico. It winters from Florida and Texas southward to Central America and Columbia. Besides the eastern green heron, there is Frasar's green heron (*B. v. frasarii*) of Baja California and Anthony's green heron (*B. v. anthonyi*), found from Oregon south to Sonora and northern Baja California. Other forms of the green heron are found in the West Indies and Central America.

IBISES, HERONS, AND FLAMINGOS



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LOUISIANA HERON

GREEN HERON

LITTLE BLUE HERON  
Young (white), left, and adult



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YELLOW-CROWNED NIGHT HERON  
Young (left) and adult

The figures are approximately one-eighth natural size

BLACK-CROWNED NIGHT HERON  
Young (left) and adult

**YELLOW-CROWNED NIGHT HERON**  
(*Nyctanassa violacea*)

In a heavy hardwood forest near Levy Lake, Alachua County, Florida, is a little pond not more than 100 feet across in any direction. It is closely surrounded by tall trees and thickly grown with large buttonwood bushes. Here, deep in the shade, a small colony of yellow-crowned night herons came for many years, during the month of April, to lay their four or five bluish-green eggs. No others nested with them except now and then a green heron. They built heavy nests, so deeply hollowed at the top that it was practically impossible for the eggs to roll out and be lost. I first discovered this rookery in 1896.

In an extensive morass on the prairies of Manatee County, Florida, there is a half-submerged island covered with a heavy growth of bushes, where water turkeys, Ward's herons, and snowy egrets breed in limited numbers. Among the birds in this colony I found, in 1904, two yellow-crowned night herons with their nests.

There is a large swamp, known as The Burn, in West Feliciana Parish, Louisiana, where both of the white egrets and other herons have a nesting place. In May, 1920, I found that eight pairs of yellow-crowns had constructed their nests a little to one side of the main nesting area.

The largest known breeding colony of this species is in Gros-bee Lake, Louisiana. It numbers 1,000 birds. These are typical of various locations where I have found these birds engaged in nesting operations. They like deep shade for their nests and seem rarely to colonize in any great numbers. Quite different are their nesting habits on some of the almost barren islands of the Bahamas. There it is difficult to find shade, and they have become accustomed to brooding in the light.

These birds feed both by day and by night. They eat small fish, but are partial to crawfish and a wide variety of crabs; also, they are reported to feed upon snails, leeches, snakes, and small quadrupeds.

The plumage of the immature bird differs much from the adult's. This first coat of feathers, with its many rows of brown and whitish spots, is worn until the next March or April succeeding the hatching of the bird.

The common cry of this bird is the usual heron squawk, but its difference is discernible to those well acquainted with its voice. If alarmed when sitting on its nest, it creeps stealthily away through the intervening branches and then springs upward with a hoarse call.

The regular breeding range of the yellow-crowned night heron reaches from South Carolina and southern Illinois to the West Indies, Brazil and Peru. It has nested rarely in Massachusetts and New Jersey. It seems less inclined to wander northward after the nesting season than do some others of its tribe. Yet there is a certain amount of this peculiar migration. Casual visitors have been found in Colorado, Iowa, Nebraska, New Hampshire, Ontario, Nova Scotia, and elsewhere.

Bancroft's night heron (*Nyctanassa violacea bancrofti*), with larger, heavier bill, is found locally in southern Baja California.

**BLACK-CROWNED NIGHT HERON**  
(*Nycticorax nycticorax hoactli*)

Our best-known nesting colony of black-crowned night herons, the Barnstable rookery on Cape Cod, occupied for more than 100 years, but now deserted, has perhaps been visited by more bird students than any other heron colony in this country. It was often raided by gunners, and on some occasions was literally "shot out," but continued to persist. It was located on Sandy Neck, a region of sand dunes in which grow many trees. In the summer of 1920 Dr. Alfred O. Gross found that it contained 2,536 nests, 850 trees being occupied. Ninety per cent of the nests were in pitch pines, the remainder in scrub oak, maple, and a few bushes. These trees stand on dry ground, not in a swamp.

On July 12, 1914, I visited a night-heron colony on Bradbury Island, Maine. Strong evidence existed that a family of ravens was playing havoc with the young birds, a number of which had been killed and the flesh picked from their bones.

These are but two examples of many night-heron rookeries occupying trees over dry ground. In Oregon an ornithologist visited a colony of 200 pairs in a forest of fir "in which none of the nests were less than 130 feet up." Near San Francisco Bay he found "41 nests of the great blue heron and 28 nests of the black-crowned night heron in a single giant sycamore tree 120 feet high." I have seen photographs by this same gentleman showing night herons standing beside their nests in a tule marsh in Oregon. In Texas this bird is known to nest on the ground. The pale bluish-green eggs usually number three to five in a set.

It will be seen that this heron easily adapts itself to its environment. Although the name implies that this is a night bird, it also is active during the day, especially toward evening or when the sky is overcast. It inhabits many swamps and lonely reaches of salt-water marshes. It will even come to exposed mud flats in our large cities. Not long ago I saw several standing at their nests, built on a great vine that climbs over the flying cage in the Zoological Park in Washington, D. C. Probably they were drawn here by their sociable, colony-breeding instinct. Confined in the flying cage are several night herons whose nests are visible to their wild neighbors on the outside.

These birds feed largely on fish. Not long ago I saw a night heron in the air carrying an eel and being closely pursued by three other night herons bent on plunder.

As herons consume so much fish, it would seem that their flesh might not be palatable. However, certain species at times are eaten. I know of regions where the young great blue heron is highly regarded as game, and many have been illegally taken for food. The black-crowned night heron seems to be most enjoyed as food. Great numbers of these in the past have been shot along the Gulf coast. This is especially true of Louisiana, where the bird is called the "gros-bee."

The black-crowned night heron breeds from the northern United States and southern Canada south to Paraguay, being locally distributed through this vast area. A related race is found through much of the Eastern Hemisphere.



### AMERICAN BITTERN (*Botaurus lentiginosus*)

Few North American birds vary so much in size as does our large bittern, individuals ranging from 23 to 34 inches in length. The total expanse of their wings varies from 2 feet 8 inches to 4 feet 2 inches.

This bird inhabits marshes, bogs, and wet meadows, seldom being found in any other type of country. When alarmed by the approach of an intruder, but still believing itself unseen, it has the peculiar habit of remaining perfectly still, with head erect and bill pointed upward at a sharp angle. At the same time the feathers of the neck and body are compressed, so that the bird assumes the appearance of a discolored limb or old root, or even a slender clump of marsh grass. This similarity is heightened by the stripes on its throat and breast.

That the bittern depends on its color protection to escape its enemies is shown by the fact that often it will not move until it is almost trodden upon. On more than one occasion I have been within a few feet of one before it flew. In every case I was totally unaware of its presence.

Upon taking flight, the bird rises with loosely flapping wings and departs slowly, giving the impression that it is not accustomed to flying or perhaps feels that it has ample time to escape. Such a slow-rising bird naturally is a tempting shot to many who wander the marshes gun in hand, and in spite of the laws, it often is shot. A wounded bittern is a very animated creature and may prove to be a dangerous one. Squatting on the ground, with arched wings and with every visible feather of back and breast elevated to the utmost, with its daggerlike beak presented, it awaits the approach of its tormentor. On such occasions there is an element of real danger in coming too close, for the bittern strikes for the face with a swift and vigorous blow.

This hermit of the fen is famous for its booming call in spring. The various notes suggest to many hearers the sounds produced by a wooden pump in action, or those made when a stake is being driven into a bog; hence such descriptive names for the bird as "stake-driver" and "thunder pumper." Its actions when producing these strange sounds have thus been described in part by Arthur J. Parker:

"First, a forward thrust of the head with opened beak, whereby air was gulped, the bill being audibly snapped upon each 'mouthful.' The swallowing motion would be repeated perhaps five or six times, and during the operation a strange swelling and contortion of the neck could be plainly seen; it was as if the bird had swallowed a frog. There was a downward movement of the enlarged part of the neck. There at once followed the explosive eruption of air, the boom, closely followed by the second sound, a clear syllable *ka*, like the stroke of a mallet on a stake."

The bittern nests on the ground in a marsh and lays four to six olive-brown eggs. It nests from British Columbia and Newfoundland south into California, Arizona, Kansas, and New Jersey, and occasionally farther south. In winter it migrates as far as the West Indies and Panama.

### LEAST BITTERN (*Ixobrychus exilis*)

This is the smallest of all the members of the heron tribe, measuring one foot in length. Although an observer may not get the impression that this is a particularly slender bird for its type, the fact remains that it can greatly compress its body when occasion requires. Audubon found that one passed readily between two books set one inch apart. This ability to move through narrow openings is constantly employed, as it traverses the dense reedy marshes in which its life is spent. At times the least bittern wades in shallow water in true heron fashion, but often it progresses through the reeds by grasping the stalks with its long, flexible toes.

It eats frogs, tadpoles, and fish as well as various insects and their caterpillars.

No bird of the marshland world in which the least bittern dwells is possessed of such a peculiar flight. It rises slowly and with feeble, awkward movements takes its departure. Seeing it for the first time, one may readily mistake it for the young of some unfamiliar species.

If, however, the bird finds it desirable to make an extended flight, it soon stretches its legs straight out behind and proceeds in a more rapid and businesslike manner than that exhibited by most herons with which it is so closely allied.

The nest of this species is built over the water in cut-tails, rushes, or bushes. I have found them at heights of from one to four feet, but never higher. Some have been found so low that the bottom portion of the nest, usually about six inches across, actually was in contact with the water.

A variety of nesting materials is used. Bent-over reeds or marsh grass generally serve as the base upon which a collection of grasses, stems, or twigs is laid. In Florida I have often found them nesting among colonies of boat-tailed grackles in clusters of buttonwood bushes. The nests here were made chiefly of twigs. The bluish or greenish-white eggs range from four to six in number.

The young are fed by regurgitation. When a parent arrives at the nest, the hungry offspring seize its bill and shake it until the old one opens its mouth and permits the bills of the young to enter, one at a time.

The eastern least bittern (*I. e. exilis*) breeds from the southern Canadian provinces southward, but in winter is not found north of Florida. Its range extends through the West Indies and Central America.

In addition, there is recognized as a subspecies the western least bittern (*I. e. hesperis*), which inhabits the Pacific coast country of North America from southern Oregon to central Baja California and western Guatemala.

The form that has been called Cory's least bittern (*I. neorena*) is known from about 30 individuals taken mainly in Florida and in Ontario. It differs from the ordinary least bittern in the richer, darker browns of its feathers, and many ornithologists now consider it merely a color phase of the least bittern, though others maintain that it is a distinct species. Its habits and life, so far as known, were like those of the ordinary bird. None has been reported recently, so that, whether phase or species, it seems now to be extinct.

IBISES, HERONS, AND FLAMINGOS



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The figures are approximately one-sixth natural size

CORV'S LEAST BITTERN  
Adult male, left

LEAST BITTERN  
Adult female

AMERICAN BITTERN  
Adult male



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The figure is approximately one-seventeenth natural size

FLAMINGO

**FLAMINGO (*Phoenicopterus ruber*)**

For 100 years rumors have persisted that flamingos have at some time bred in Florida. John James Audubon, studying birds in the Florida Keys about 1840, tried hard to establish the fact that they nested in that region. He hunted assiduously, saw flamingos and pursued them on various occasions, but in the end gave up the idea that they were residents of the United States. He died without ever finding the nest.

To-day we know that there are three great breeding colonies about 200 miles from the region of his search. These are on the islands of Great Abaco and Andros, in the Bahamas, and on small islands near Morón, off the north coast of Cuba. These regions are about 125 miles apart. Undoubtedly from one or more of these places flamingos come to the coast of south Florida at rare intervals, usually during the winter or early spring months.

Since Audubon's time flocks ranging from 500 to 1,000 birds have been seen on several occasions in Florida Bay. Smaller numbers have been reported many other times; for example, in the spring of 1932. Authentic reports of such occurrences are comparatively rare and the birds seen in all probability have been visitors that remained on our shores only for a brief period.

There was a time when the impression was abroad that flamingos sit astride their tall mud nests with their legs extending downward on either side. On May 14, 1884, C. J. Maynard discovered a colony of them on Andros Island, and later published a statement of his findings. In this he established the fact that flamingos, like other birds, sit on their nests with their legs folded under them. He says:

"The rookery occupied about a half acre of land, or rather what was once land, for all, or nearly all, nests were surrounded by water, and were built on a kind of peninsula which had water on three sides of it. The nests were constructed wholly of marl piled layer upon layer, without waiting for any layer to dry, for in some cases the bottom was as soft as the top. In scooping out the marl the birds evidently used the lower mandible of the bill, while it is spread and flattened with the feet. The clay is not gathered at random about the nest, but from a pit on either side, or often from three pits, and it is the joining of these pits that causes the nests to be surrounded with water.

"None of the nests are constructed quite to the margin of the peninsula; thus a dike nearly surrounds the rookery. I say nearly, for this was broken through on the southern end, and the water from the creeks flowed in; thus the slight inland tide rose and fell among the nests.

"The nests were, as a rule, not over two feet apart, measuring from their base, but they were generally constructed in groups of from three to seven or eight, each one being joined to one or two of the others at the base, oftentimes for a foot or more. This rookery had evidently been used for at least one year previous to this, as we saw many nests, especially the higher ones, which had, to all appearances, been constructed on top of an old foundation.

"New nests built throughout of soft marl were, on an average, only a foot high, and were built in a certain part of the rookery.

"All the nests in the older part of the rookery contained eggs, as a rule only one being deposited, and this was placed on the slightly cup-shaped top of the truncated pyramid. Incubation had begun and in nearly all the eggs the embryos were considerably advanced."

Mr. Maynard estimated that there were 2,000 nests in this colony. In all but about fifty cases each nest contained a single egg, the others holding two and in one case three. The eggs are chalky in texture, usually dull white, though rarely tinged with pinkish. It was Maynard, therefore, who first wrote from observation concerning the nesting habits of this amazing bird.

It remained for Dr. Frank M. Chapman to give a very full and rich account of this Andros flamingo colony, or its successor, as a result of his observations on that island in 1902 and 1905. His remarkable photographs and the publication of his careful, intimate studies attracted wide attention and aroused much public interest in these birds.

Dr. Chapman estimated the colony in 1905 to contain about 2,000 adult birds, which very closely parallels Mr. Maynard's estimate of "2,000 nests," seen by him 23 years before. Of the habits and movements of the very young birds, he said in part:

"The young flamingo when hatched is sufficiently developed to leave the nest before it is dry, under the stimulus of an apparently instinctive fear. At my approach young birds with the plumage still wet from the eggs would crawl over the edge of the nest and fall to the ground or water below, when their strength seemed to fail them. A few hours later, when the plumage was dry, chicks could swim and run readily, and when they were a day old they invariably left the nest as I drew near. When not disturbed, the young remain in the nest three or four days. During this time they were brooded by the parents."

The food of the flamingo on Andros, at least, seems to consist wholly of a small, spiral-shelled mollusk known as *cerithium*. The old birds feed the young with the regurgitated fluid from this shell.

At one of the first meetings of the directors of the National Association of Audubon Societies after its incorporation, in 1905, Dr. Chapman presented the need of extending protection to the Andros flamingo colony. Guardianship seemed necessary, as the natives were killing and eating these birds in large numbers. A resolution, therefore, was passed asking the Bahama Government to extend legal protection to flamingos. Such action was taken shortly afterward by the Bahama Parliament, at the request of the Colonial Governor. Since that time the birds have been carefully guarded by agents of E. W. Forsyth, Commissioner of South Andros Island, who prizes the flamingos as the chief attraction of his flat, palm-girded island.

Flamingos from Andros or Cuba are occasionally imported into the United States for zoological parks. As a rule, they do not long survive, and for the sake of the birds it seems well that the number of such importations is declining.

The flamingo breeds locally in the Bahamas, Cuba, Haiti, Yucatan, Guiana, and Peru, wandering to some extent after the nesting season, but not going far outside these limits.



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LITTLE AMERICA, BASE FOR THE AERIAL MAPPING FLIGHTS OF THE BYRD  
ANTARCTIC EXPEDITION

In the waste of snow and ice the towers of the wireless station which kept the party in contact with civilization are conspicuous. Among the most important of the many scientific results of Admiral Byrd's Expedition are geographic features set forth in their proper relation for the first time in the Map of the Antarctic Regions, which is published as a supplement with this issue of the NATIONAL GEOGRAPHIC MAGAZINE.

# MAPPING THE ANTARCTIC FROM THE AIR

## The Aerial Camera Earns Its Place as the Eyes and Memory of the Explorer

BY CAPT. ASHLEY C. MCKINLEY

THIRD IN COMMAND AND AERIAL PHOTOGRAPHER OF THE BYRD ANTARCTIC EXPEDITION

*With Illustrations from Aerial Photographs by the Author, and a Special Map Supplement of the South Polar Regions*

THE entire population of the farthest south village was restlessly waiting for the wind to subside. For the past week the snow had been drifting, at times reaching the intensity of a blizzard.

Clear weather was to be the most important factor of our flight to the South Pole. If we were caught in an Antarctic blizzard while flying between the high peaks of the Queen Maud Range, 450 miles away in a frozen wilderness, the flight might easily end in a disastrous crack-up.

Accurate air navigation in the Antarctic, where the compass variations are unknown, is dependent upon the sun; also, even if known, the variations change rapidly down there, near the South Magnetic Pole. That is why the Burnstead sun-compass was necessary.

At this time William C. ("Cyclone") Haines, of the U. S. Weather Bureau, was the most important man in Little America. It was upon his shoulders that the responsibility of giving the word "Go" rested. Each morning, after the night watchman had rolled him out of his warm sleeping bag, Bill, after scraping the hoar frost from his instruments, would make his observations, the data from which were to decide the day of the take-off.

On the morning of November 28 he gave the word for which we had tensely waited. The camp immediately was full of activity. Every man had his special job, for months had been spent for this one day.

Balchen with the mechanics started heating the oil, digging out the hard-frozen skis, and warming up the motors of the *Floyd Bennett*. Commander Byrd began checking the navigational instruments. June went over the radio, and I checked up the mapping camera, even though I had done the same thing at least 100 times during the last few days. The remainder

of the 42 men, except for those out on the trail with the dog teams, assisted the supply officer in loading the equipment in the plane.

### A 1,600-MILE PHOTOGRAPHIC PANORAMA

At 3:29 p. m. (3:29 a. m., November 29, 1929, Greenwich mean time) we took off perfectly, with Balchen at the controls. The day was ideal for the flight. With relief I reflected that the mapping camera should be able to record from the plane to the horizon for the entire 1,600 miles.

Overlapping pictures were to be taken from the east side on the way to the Pole and from the west on the way back to our base. In these pictures would be recorded miles of snow, crevasses, long broken glaciers flowing from the Polar Plateau to the foot of the mountains, 10,000 feet below, and possibly undiscovered mountains too far in the distance for Amundsen to have seen, as he traveled on the surface. The South Pole itself would provide the last pictures of the outgoing strip.

This panorama was running through my mind as the skis left the snow; but intermingling with this pleasant dream was the recurrent nightmare of static-streaked, broken film or a frozen shutter. I dreaded the thought of returning with a weirdly disfigured film, a partial record of the trip, or, even worse, nothing recorded at all.

The first hundred miles was a flat plain of snow, as far as the eye could see. While uninteresting from a pictorial point of view, it was all recorded, as it was important to prove, by subsequent study of the pictures, that no appearance of land exists. The first break in this white monotony was a heavily crevassed area at latitude 81° 5' south (see Polar Flight detail of Special Map Supplement). Just beyond, the dog teams of the geological party were sighted. In less than two hours we had flown over



Photograph courtesy Paramount Pictures Corporation

#### LOADING THE "FLOYD BENNETT" FOR THE SOUTH POLAR FLIGHT

Every item of equipment and every ounce of emergency supplies were carefully checked and rechecked before the start from Little America.

an area that had taken them weeks to traverse. As we passed over the party we dropped a few supplies and some aerial photographs which had been taken on a previous flight.\*

Only a short time after we had left the geological party behind, the Queen Maud Range appeared on the horizon to the south. As the plane approached, it seemed as if Nature had placed these magnificent, frowning sentinels as a barrier to keep this little-known area from the eyes of men. Near the mouth of Liv Glacier, as we

\* See "The Conquest of Antarctica by Air," by Rear Adm. Richard Evelyn Byrd, in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1930.

started up the pass, the altimeter registered around 9,000 feet. Even from this elevated position the peaks were thousands of feet above us—great tilted facets of snow and ice, with harsh outcroppings of dark ledges (see, also, page 478).

#### CLIMBING UP TO THE POLAR PLATEAU

As we started to climb through the pass up to the Polar Plateau behind the peaks, it was evident that it was going to be very difficult to maintain the overlap of the photographs. Soon the stone walls were towering above us. The pictures that were obliques had now become practically horizontal. The interval between photographs



THE AUTHOR BEFORE ENTERING THE PLANE FOR THE FLIGHT TO THE POLE

On the aerial camera can be seen the level bubble and on the right the roll of film on which he kept his records. The number of the exposure is recorded on the left side of the camera.

necessary to maintain a sufficient overlap had been a matter of minutes before reaching the mountains; now it was seconds.

If the film were wound too fast in the dry, cold air, static discharges would result. Therefore, I had to keep my mind clear, if I was to carry out all the necessary detail work of aerial mapping.

While I was methodically and carefully snapping the photographs and keeping the record of the exposures, the plane began to wallow through the air. Balchen was climbing her all she would stand. The surface of Liv Glacier was not far below. June started ripping open gas cans; the plane must be made lighter if we were to

get over the hump. As June emptied a can into the reserve tank he would pass it back to me to drop out through the trapdoor, between "shots" with the camera. Then came word from the Commander that we must drop the emergency rations. Again it was necessary for me to leave the camera to drop the bags of food.

During the entire flight from the barrier until we skimmed over the edge of the Polar Plateau, nearly a half hour had passed; but to me this interval had been so crowded with events that, as we slipped along over the plateau with comparative ease, I endeavored to collect my confused thoughts sufficiently to determine whether





A VIEW OF THE CREVASSED AREA BEYOND 81 DEGREES SOUTH FROM AN ELEVATION OF 5,000 FEET

Amundsen had crossed this rough area by dog sled 18 years previously. Some of the crevasses are more than 100 feet wide and of unplumbed depth.

the necessary overlap had really been obtained. I was never really sure until the film was developed.

There was still too much work ahead to give the subject further thought at the time, even though the interval between exposures could be increased. In the east, mountain peaks protruded above the surface, even though the Polar Plateau itself is, at its rim, 10,000 feet high. This range continued in sight some time after we had reached 87° south. Then the camera again recorded a flat, barren surface. I now had time to realize that I was really hot, even though the temperature was subzero. Struggling in fur clothes with a 50-pound camera in a crowded ship had been hard work.

#### AT THE POLE

The operation of the camera was now becoming routine; in fact, I was doing it almost automatically. I had been taking

pictures continuously for almost 10 hours. It seemed as if we must be near our objective. Between each shot I glanced at the Commander, hoping to have him signal that we had arrived at the imaginary spot on the earth's surface which we call the South Pole. Suddenly the plane turned to the right; it circled. The Commander opened the trapdoor and saluted, as he dropped the Stars and Stripes. I began snapping the camera at top speed, so as not to miss any of this barren surface—mere rippled snow—where all meridians converge.

As the plane turned north, pictures were taken to the west. Eight hundred miles more of terrain were to be photographed, but this was done almost without incident.

The night after our return to Little America the films were developed. As the shades were drawn in Little America, that part of the 24 hours of daylight was our night. It is not hard to realize the sus-



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#### CLEARING THE PEAKS ON THE TRIP UP LIV GLACIER TO THE SOUTH POLE

At this point in the flight the plane began to wallow in the air and the load was lightened by the emptying of gas cans and by dropping 250 pounds of food (see text, page 473).

pense I was under while the reels were in the developer. As they were wound on the drying wheel the photographic record of the flight was unfolded. The aerial camera had done its work!

During the World War the aerial camera had become the eyes and memory of the airplane; but there have been great improvements during the last few years. Now the aerial camera has taken its place in polar exploration.

#### AN ANTARCTIC PHOTOGRAPHIC LABORATORY

On the flights made soon after our arrival in the Antarctic, our first aerial photographs were taken, including those of the newly discovered Rockefeller Mountains; but it was long before I had opportunity to learn what the results had been. The work of constructing Little America and digging in for the winter had made it impossible to build a photographic laboratory. Finally, however, the way was clear.

The original plan was to construct a room in the Administration Building, but the aerial developing machine and tanks required so much space that the main water supply, the kitchen stove, which melted snow in a tank, must be close at hand. The construction of a separate house was the final decision. A unique place it turned out to be! Built of old lumber and boxes, it was erected in a 15-foot hole in the snow, next to the mess hall. Time after time the hole had to be dug out because some caprice of the weather caused a series of blizzards at this time, and in the morning we would go out and find our excavation filled again. Finally, canvas was put over it at night, and then the work was not so often interrupted.

The completed laboratory finally became buried in the drifting snow; so that, as you walked over it, you would never guess that it was beneath. The house consisted of two rooms. One was a dark-room; the other was used as an office,



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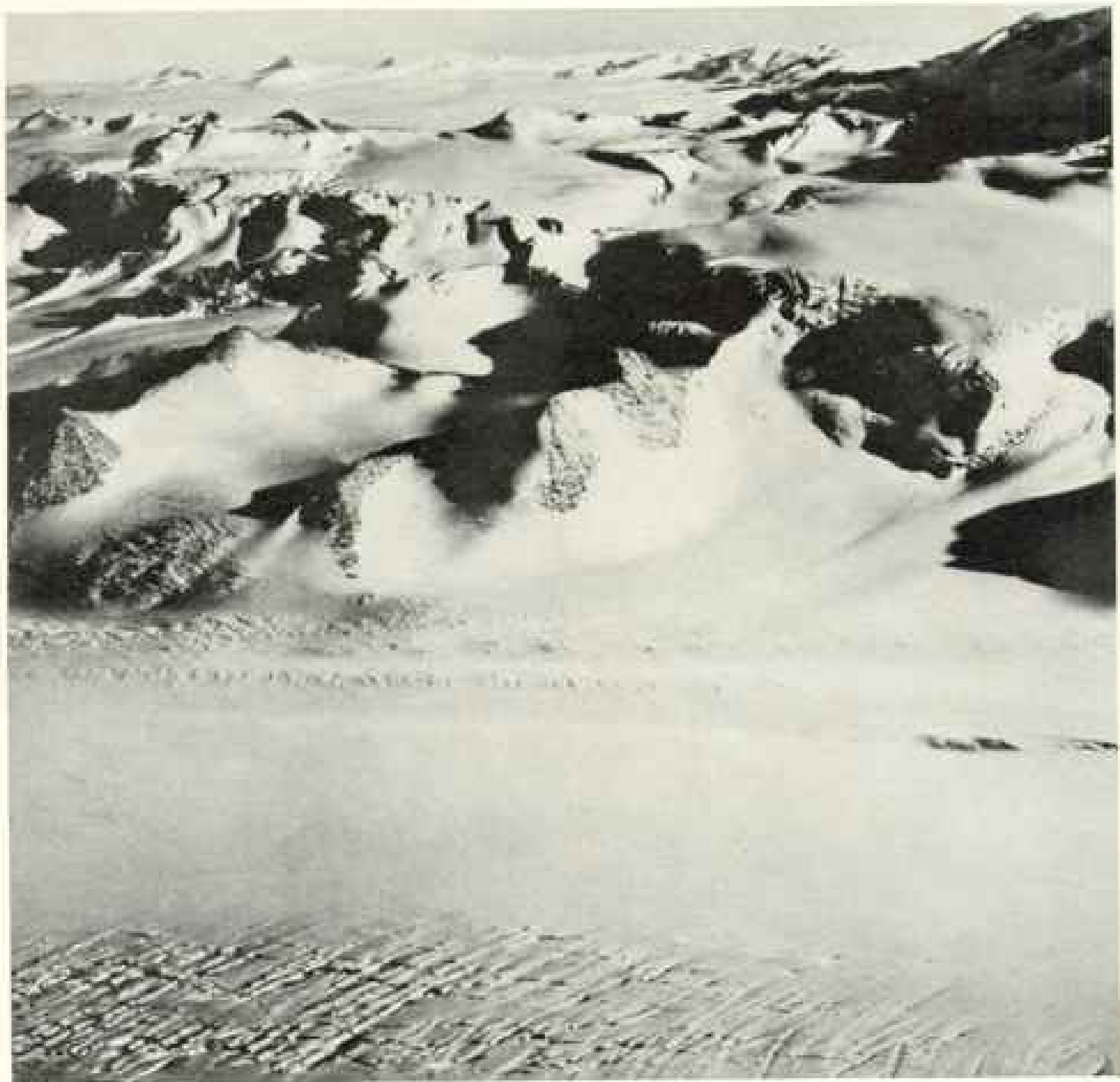
THE PLANE APPROACHES THE POLAR PLATEAU

It seemed as if Nature had placed these magnificent frowning sentinels as a barrier to keep this little-known area from the eyes of men.



THE "FLOYD BENNETT" FLIES OVER THE EXPEDITION'S SLEDGING PARTY

In less than two hours the Pole-bound plane covered the distance between the base at Little America and the foot of the Polar Plateau—an area across which the geological party had been plodding with dog teams for weeks (see text, page 471).



SNOW-COVERED STONE WALLS FLANKING THE PASS TO THE POLAR PLATEAU

As the plane started up Liv Glacier the altimeter registered 9,000 feet, but even at this elevation the surrounding peaks towered thousands of feet above the flyers (see text, page 472).

drying and chemical room, and was the general "hang-out" in intervals between work.

This little house had to be heated to 65 degrees Fahrenheit when the temperature outside was that much below zero. If it had not been covered with snow, this would have been impossible. After the interior was sheathed with oil paper, no trouble was found in raising the temperature well above 65 degrees. It got, however, progressively colder toward one's feet, until at the floor there was ice. Often when developing film I wore fur mukluks to keep my feet warm and was stripped to the waist to keep cool above.

The developer was kept to the correct temperature with chemical heating pads

especially made to fit the tanks. This enabled us to keep the developer at about 70 degrees. At night, when the fire was turned out, the solutions were kept from freezing by placing them in thermos jugs. It was always necessary to thaw out the pipes, tank, sink, and water-heater, and, although our day began at 8 o'clock, it was usually noon before work could be started. Truly there are difficulties in operating an Antarctic darkroom.

PHOTOGRAPHIC DEVELOPER CUTS BOTTOMLESS HOLE IN THE ICE BARRIER

An unusual experience was encountered in getting rid of laboratory water. We thought that, as it ran out of the sinks and tanks to the outside, it would quickly freeze

and build a pyramid of ice; so we dug a hole twenty-five feet deep to take care of the anticipated accumulation. But when the first batch of aerial developer, about 90 gallons, was sent through the drain pipe, it cut a hole in the snow and disappeared in the barrier! How deep that hole was and where it went we never found out, for the bottom could not be seen. It was never filled up and served throughout our stay as a funnel to take out waste water to some deep recess in the Bay of Whales. This further aroused our curiosity as to what sort of ice shelf we were living on.

Daily every one in camp had been asking when the aerial photographs would be developed, but it can be well understood that no one was quite as anxious as the photographer. Fears were continually going through my mind lest the aerial film had been spoiled on its trip through the Tropics to Little America, or become light-struck in the changing bag which was used before the laboratory was completed. Now the cans of film were covered with a sheet of ice, and when I wanted to develop a roll I had to use a pick to get them out.

Before the laboratory was completed I often looked at the film "on ice" and wondered if there was anything on the rolls or not. It seemed almost impossible that the supersensitive emulsion could withstand such treatment. In the Army, where we have all the necessary conveniences, aerial film is developed as soon as possible after exposure.

#### DIFFICULTIES IN GETTING WATER

When everything was in working order, we started melting the snow to obtain the 200 gallons of water which were needed for each roll of aerial film. Those who have never had the experience of melting snow in the Antarctic can scarcely realize what this means. Many expeditions have found it difficult to get enough water even to wash with (see, also, page 481).

A bucketful of Antarctic snow, taken out of an atmosphere 30 degrees below zero, must "set" on a red-hot stove half an hour before it melts, and then there is only one-third of a bucketful of water. It was slow, discouraging work, and an extra tank had to be built to keep the water from freezing until a sufficient amount had been accumulated to start operations.

The darkroom was nearly filled by a large developing machine and tanks, and the drying reel actually filled the other room. Fortunately, however, realizing that space would be limited, we had had this reel made so it could be knocked down when not in use. The hypersensitized film must be developed in absolute darkness. Three of us, during the development, had a hard time in the darkness to keep from falling into one of the tanks. Indeed, I once stepped into a tank and had to continue developing with wet feet—not an agreeable experience with the floor temperature at zero.

After many anxious moments and a number of mishaps, the work was finally completed. It is rather difficult to express my feelings of relief when, as the film was wound from the developing machine to the drying drum, the Rockefeller Mountains stood out on the negatives sharp and clear and I found that sufficient overlap had been obtained.

Upon completion of the developing of the first season's work, I had time during the winter night to study the results. I then realized how much the airplane does to increase one's conception of the vastness of this ice-covered land. Hundreds of square miles of territory, with long, rolling expanses of white, could be seen at a glance. The inequalities of surface, which show pressure beneath, and the outcroppings of rock, which definitely mark the presence of land, all showed plainly. The work of gigantic forces, which twist and break the barrier into deep and awful chasms, became apparent, as it can never be to the lonely traveler, as he stands in awe on the brink of a great ice precipice, unable to see the many miles of similar upheavals and openings on either side.

To one in an airplane, all the magnificent vista is exposed at once in all its intricate relationships. The aerial camera registers such a view in an instant, and it may then be carefully studied at leisure. Moreover, it records much more faithfully than the eye and retains much more surely than human memory all the marvelous manifestations of Nature which can be understood only when studied in their entirety.

#### A MAP CONSTRUCTED FROM PHOTOGRAPHS

Haines and I constructed a rough map from the photographs taken on the flight



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#### ICE-PRESSURE RIDGES NEAR THE BAY OF WHALES

Where the barrier is held by land in the vicinity, the ice movement causes tremendous upheavals. It was necessary for the geological party on its trip to the south to make its way over this area.

to the Rockefeller Mountains and one of the coastline east of Little America to Hal Flood Bay. When looking at such a photographic map, one feels as if one were in reality over the ice and snow.

The photographs making up our Antarctic maps were taken at a high altitude and were pieced together to form a mosaic portraying the terrain as it can be shown in no other way. The individual aerial views were made with a 20-inch focal length camera and were taken from a somewhat lower altitude. These views proved to be constructive and some of them quite picturesque. Among this collection were photographs of icebergs and unusual pressure conditions, which may be studied by the glaciologist at his leisure.

A conception of the area shown by aerial photographs is conveyed in the statement that from an altitude of 10,000 feet the horizon is visible at a distance of 132 miles, whereas the observer on the earth has a view of less than five miles. As a sledge party travels over the snow, its visible world is about 75 square miles; from the airplane, flying at 10,000 feet, this visible

world is increased to more than 50,000 square miles. The speed of the airplane and the increased range of vision have made it possible for the aerial explorer to accomplish in a few hours exploration which, if possible at all, would have required months by dog team.

Comparing our flight over King Edward VII Land with the only other trip made there, that of Prestrud's dog-team journey, is illuminating. His trip occupied almost five weeks; ours less than three hours. Prestrud, who was a member of the Amundsen expedition, must have traveled within a few miles of the point from which the Rockefeller Mountains were discovered by Commander Byrd in his plane, yet the former did not see them. More of King Edward VII Land was seen from our elevated platform in a few minutes than either Scott from his ship or Prestrud from the surface saw during their entire journeys.

The flight over the Rockefeller Mountains demonstrated definitely the value of the aerial camera in exploration. Not only did it show the trend of the range and



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SHOVELING SNOW INTO THE BIG MELTER AROUND THE MESS-HALL STOVE

In developing photographic films in the Antarctic, one of the most trying problems is to keep on hand a sufficient quantity of water (see text, page 479).

the relationship between the peaks, but the photographs later revealed much more than our observation and memory had been able to record. There proved to be many more peaks in the range than we had remembered counting with the naked eye. Although the eye can record with fair accuracy, the memory becomes confused when the range of view is increased, as in the air, and the scene is changing at the rate of 100 miles an hour.

AÉRIAL CAMERA HAS GREAT PRECISION

The aerial camera is not only eyes and memory for the explorer; it is also his most expeditious and economical surveyor. The aerial camera is constructed with the same precision as the surveyor's instruments. Many of its parts are fitted to the fraction of a thousandth of an inch. The lenses have great rapidity and are free from all possible aberrations, so that most accurate placements of all features of the terrain become possible.

A roll of hypersensitized panchromatic film 75 feet long and 9 inches wide is used in aerial work. With 100 to 110 expo-

sure possible on one roll, a large area can be covered without changing the film.

There are two general types of aerial photographs—the vertical and the oblique. The vertical is taken with the camera pointed down through an aperture in the floor of the airplane. The oblique is taken outward and downward, at an angle between the horizontal and vertical. Oblique photographs produce a perspective with which everyone is familiar, resembling a picture of the lowlands taken from a mountain. As an oblique covers a much larger area than the vertical photograph, it was decided that it was better suited for exploration mapping. This was the method used in the Antarctic.

This decision was made, as it is very important to record everything seen from the air. Each of the oblique pictures was taken at such an angle as to include the horizon. Thus, every image beneath us, from within a few thousand feet of the plane, as far as the eye could reach, was included.

As the exposures overlapped each other approximately 60 per cent at the horizon,





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*A MAGNIFICENT VISTA—LONG, ROLLING EXPANSÉS OF ICE-COVERED LAND*

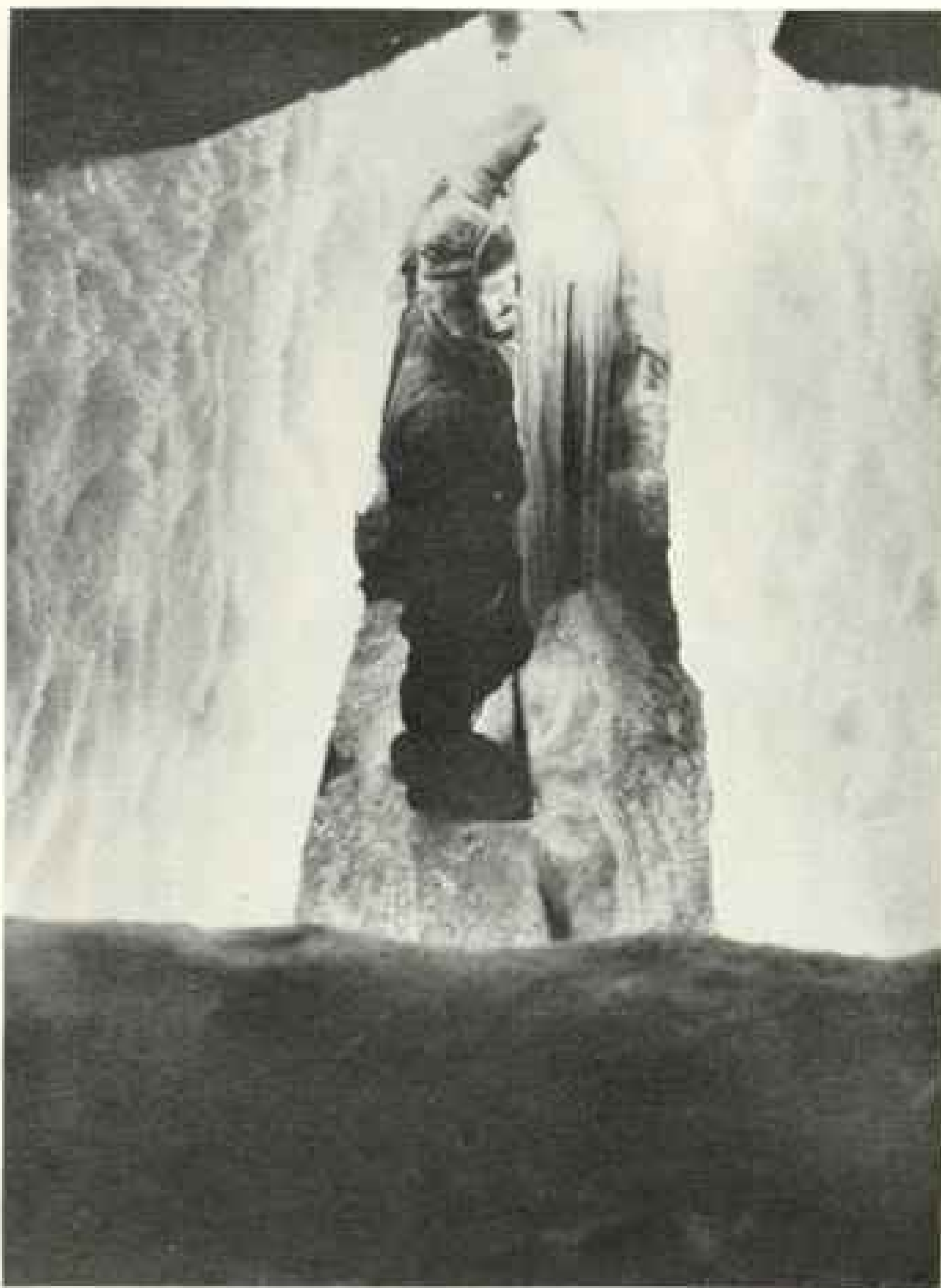
The aërial camera registers such a view in an instant and retains it for the future study of the map-maker. Here the inequalities of the surface indicate pressure beneath and the outcroppings of rocks definitely mark the presence of land.



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WHERE THE BARRIER IS HELD BY LAND IN THE VICINITY, THE ICE MOVEMENT CAUSES TREMENDOUS UPHEAVALS

It was necessary for the geological party on its trip to the south to make its way over this area. The pressure conditions in the vicinity of the Bay of Whales are of exceptional interest to the glaciologist.



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#### AN ARTIFICIAL ICE CAVE FOR LABORATORY OVERFLOW

A member of the Byrd Expedition stands in the hole outside the photograph darkroom made to receive water from the tanks. However, the water cut the long slit at his feet and went down through the barrier, presumably into the sea, for the hole never filled up (see text, page 478).

nothing was missed on the entire flight. Considering a map as a representation of details on the earth's surface, the aerial camera records in a manner impossible by any other method.

#### MAPPING WITHOUT GROUND CONTROLS

In planning the mapping work before reaching the Antarctic, we realized there were going to be many problems which had never arisen before. Though a general plan of the flights could be determined upon, it was impossible to establish a routine procedure, as every photographic flight in the Antarctic would have problems

which would concern that flight alone. For example, on the mapping mission over the Rockefeller Mountains and on the polar flight to the foot of the Queen Maud Range, ground controls laid out by the geological party were available.

These flights could be carried out in much the same manner as the Canadian oblique surveys, which are dependent to a great extent upon a network of ground controls. On the other hand, there were miles of aerial mapping in the Antarctic which depended upon navigational control. Operating without ground controls necessitated the keeping of a rather complete record, while on the flight, of altitudes, exact time of each exposure, and other details. This added greatly to the work of the aerial surveyor.

For more than two years since the expedition's return, the work of preparing maps from the photographs has been carried on. The navigational-control method of constructing maps from aerial photographs is a recent one, requiring much time and patience. But the photographic work in the Antarctic was conducted under such difficulties that it entirely justified our making every effort to obtain the best possible results, as the line maps were made here.

Work on the photographs was carried on with the utmost care and precision. Nothing that could be of any assistance was overlooked. All possible formulas and methods were checked and rechecked

against each other hundreds of times. Even the shadows of peaks were used in checking the azimuth of objects in the photographs. Many special grids were constructed from which the relation of images on the photograph to one another could be determined.

Two thousand miles of horizon, as shown on the pictures, were studied over and over again, so as not to miss the smallest or most distant peak. Commander Harold E. Saunders, Construction Corps, U. S. Navy, in making a supreme effort to obtain the best possible results, devised a

special method for taking readings from aerial photographs for line-map construction.

This new method of exploration and reconnaissance mapping will undoubtedly increase the value of the aerial camera to the explorer and the military observer a hundredfold.

Commander Saunders and I believe the work in the Antarctic and the long, tedious map construction at home have been fully justified by the results obtained. The aerial camera has earned its place as the eyes and memory of the aerial explorer.

## THE SOCIETY'S MAP OF THE ANTARCTIC

WITH its Map of the Antarctic Regions, which appears as a special supplement with this issue of *The Magazine*, the National Geographic Society rounds out a program to provide its members with wall charts of all the major divisions of the world.

Among the large map supplements in colors issued previously are the Arctic Regions, North America, South America, Europe, Asia, Africa, the Islands of the Pacific, the Countries of the Caribbean, the United States, and the World.

The new map will prove especially valuable to members interested in the romance and adventure of exploration, for it records all the important routes of those dauntless navigators who for a hundred and fifty years, through trackless frozen seas and skies, have sought to chart the Antarctic Regions.

What a galaxy of geographers they are, and what fortitude, resourcefulness, and deeds of heroism and self-sacrifice are called to mind by their names—Palmer, Wilkes, D'Urville, Ross, Weddell, Baleny, Bellingshausen, Biscoe, Drygalski, Charcot, De Gerlache, Nordenskjöld, Bruce, Shackleton, Filchner, Amundsen, Scott, Mawson, Isachsen, Riiser-Larsen, Wilkins, Byrd!

And what strange vicissitudes and coincidences are recalled by the routes of these men of science! Here we find that Columbus of the Pacific, Capt. James Cook, sailing below the Antarctic Circle as early as 1773. And other dates remind us that the resourceful Amundsen reached the South Pole just a month and four days

before the intrepid Scott, the latter to lose his life on the return journey.

We find that the explorer Borchgrevink was the first to set foot on the Antarctic mainland, in 1895, more than 50 years after the recognition of it as a continent by the American Wilkes—a distinction with which the Norwegian was not credited until the airplane flights of Wilkins in 1928 established the fact that the Antarctic Archipelago, lying between the Weddell Sea and Bellingshausen Sea, is not a part of the mainland. At another point we see where those pioneers, Wilkes and D'Urville, came within a few days of meeting each other, as their paths crossed off Wilkes Land, in February, 1840. One of the former's lieutenants, Ringgold, in command of the *Porpoise*, even exchanged signals with the French navigator's famous *L'Astrolabe*.

The place names in the Antarctic present a fascinating study. Many of the "Lands" tell their own story of the nationalities of their discoverers and of the generous patronage given to those who have gone forth to chart the far places of the earth.

Two of the inset maps, showing Marie Byrd Land and the route of Admiral Byrd's South Polar Flight, bristle with new names that have not previously appeared on any map of the Antarctic Regions.

New bays, mountain ranges, peaks, plateaus, and glaciers, which have been christened by Admiral Byrd, in accordance with the international privilege accorded to a discoverer, have now been placed accu-



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CAPTAIN MCKINLEY EXAMINES FILM IN THE LITTLE AMERICA DARKROOM

More than 500 overlapping photographs taken by Captain McKinley were studied with exhaustive care by Commander Saunders in constructing the two inset maps (King Edward VII Land and part of Marie Byrd Land and the South Pole Flight) of the Antarctic Regions.

rately in their relation to each other and to the general terrain through the indefatigable labors of Com. Harold E. Saunders, U. S. N. Commander Saunders was supplied by Admiral Byrd with all the photo-

graphic data, the time records, and the logs of the flights made by members of the Byrd Expedition.

In this work, which has required more than two years devoted to exhaustive computations, Commander Saunders has evolved new principles of map construction in the use of aerial photographs when ground control is impracticable—principles which will prove of inestimable benefit to future map-makers.

For the first time on any general map of the Antarctic, the flights of the four pioneers in Antarctic aviation—Wilkins, Byrd, Riiser-Larsen, and Mawson—are here shown, and for the first time on an English-language map the work of the Japanese Expedition of 1912, under Lieutenant Shirase, is charted.

It is believed that the members of The Society will find this wall map a valuable companion chart to the Map of the Arctic Regions,\* issued as a supplement to the

NATIONAL GEOGRAPHIC MAGAZINE for November, 1925.

\*Additional copies, both of the Arctic and Antarctic Maps, may be obtained by members at 50 cents per copy, paper edition; \$1.00 on map linen.

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# MONTE ALBÁN, RICHEST ARCHEOLOGICAL FIND IN AMERICA

## A Tomb in Oaxaca, Mexico, Yields Treasures Which Reveal the Splendid Culture of the Mixtecs

BY DR. ALFONSO CASO

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National Museum of Mexico*

**I**N THE south of Mexico, at the meeting point of the two great mountain ranges that border the Republic along the Atlantic and the Pacific—a region of lofty mountains constantly shaken by earthquakes—lies the State of Oaxaca. Practically all its area is mountainous, but near the center three great valleys, the Étla, Tlacolula, and Zimatlán, join, forming the richest and most populous section of the State.

At the union of those valleys and on the River Atoyac is the modern city of Oaxaca, which the Spaniards founded, under the name of Antequera, four centuries ago.

The territory of Oaxaca was inhabited in days gone by, and still is, by numerous indigenous tribes speaking different tongues. The most important tribes were the Mixtecs and the Zapotecs, who were at constant warfare up to the time that the Spanish Conquest surprised them and definitely fixed them in the territory they now occupy.

### AZTEC AND MAYA NOT THE ONLY CULTURED EARLY AMERICANS

To the great majority of those who are not specialists in the field of Mexico's ancient history, there existed only two civilized races—the Aztecs, who inhabited the plateau, and the Mayas, who flourished in Yucatán and Central America. However, there were other independent peoples who had developed a culture in some respects superior to that of the Aztecs and Mayas, and in the van of these were the Mixtecs and Zapotecs.

These two distinct and mutually antagonistic races probably constituted the link which united the peoples of the central plateau with those of Yucatán and Central America.

Much is known of the history and life of the Aztecs from the writings of the Conquistadores, the friars who accompa-

nied them, and the natives who learned to write with European characters. There are relics of their past, also—books written on maguey or agave paper or on tanned deerskins—and their history and calendars were cut in stone.

Our knowledge of the Mayas is less, but in recent years the expeditions and work undertaken, principally by American institutions, have resulted in the collection of excellent data throwing light upon the history of this great people.

### LITTLE KNOWN HERETOFORE ABOUT THE ZAPOTECES

On the other hand, we know practically nothing of the history of the Mixtecs and Zapotecs. What we do know consists chiefly of legend rather than historic knowledge.

Three years ago I began the investigation of this particular point, and at that time published a book entitled "Las Estelas Zapotecas" (The Monuments of the Zapotecs), in which I undertook to study the hieroglyphic writings of this race. At that time I noticed that, while certain elements and data necessary to reach a definite conclusion were lacking, yet there was undoubtedly a relationship with Maya and Aztec writings.

For the purpose of pursuing these investigations, I organized, under sanction of the Department of Monuments of the Federal Government of Mexico, an expedition to Monte Albán which lasted until February of this year.

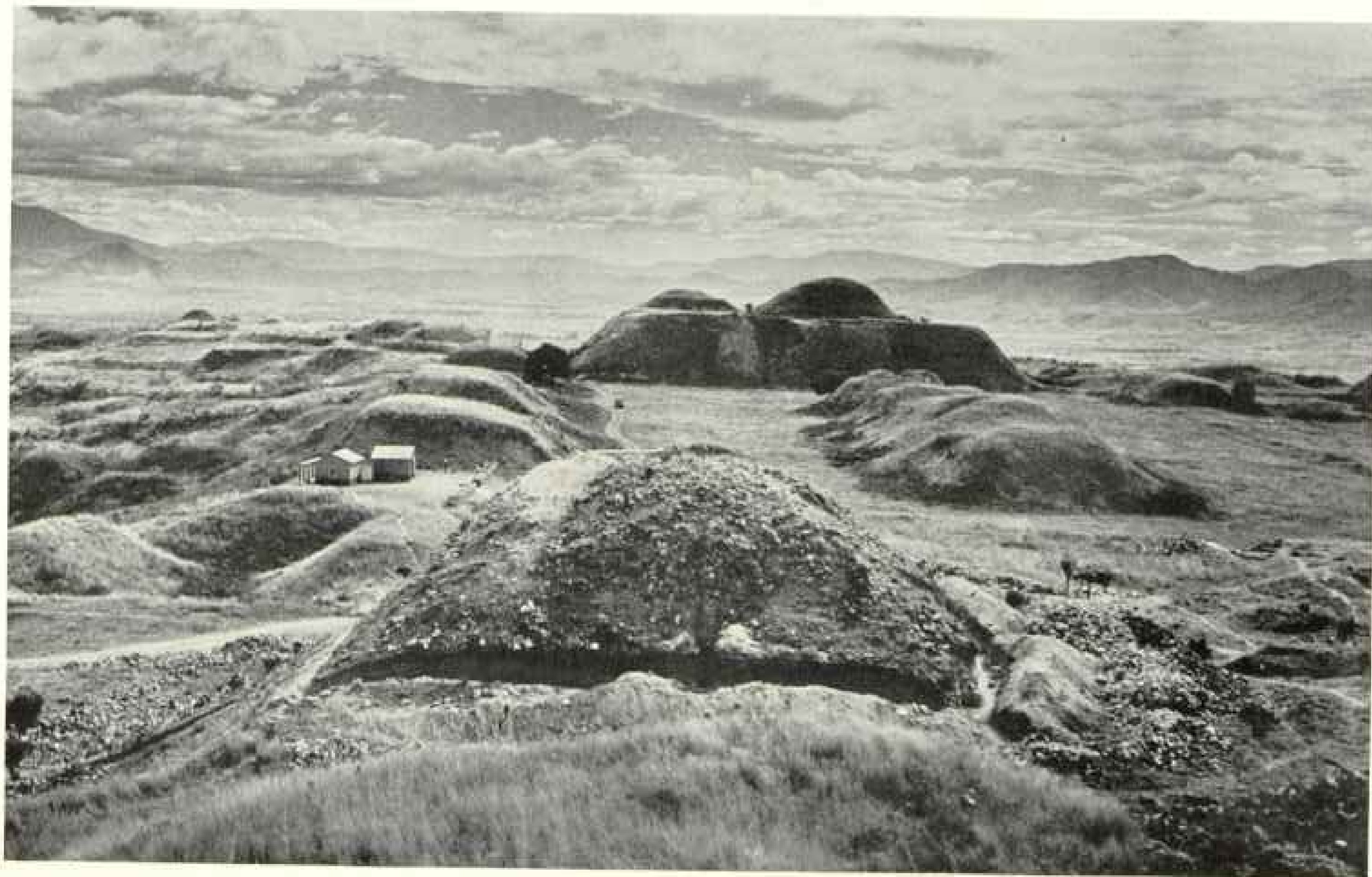
For the first time in Mexico, other institutions, such as the National University and the Pan American Institute of Geography and History, collaborated in financing the expedition, as did some individuals: Messrs. Dwight W. Morrow, Eleazar del Valle, Rafael E. Melgar, and J. Velázquez Uriarte. The National University assigned me two students from my own



Photograph by Clifton Adams

OAXACA'S MANY-ARCHED MUNICIPAL BUILDING DROWSES BESIDE THE SHADY PLAZA

Because of the frequency of earthquakes, all structures in the capital city of the State of Oaxaca are low; but they achieve architectural grace, with their green stone walls among great trees that have rustled to the winds of centuries (see text, page 490). Oaxaca is 225 miles southeast of Mexico City.

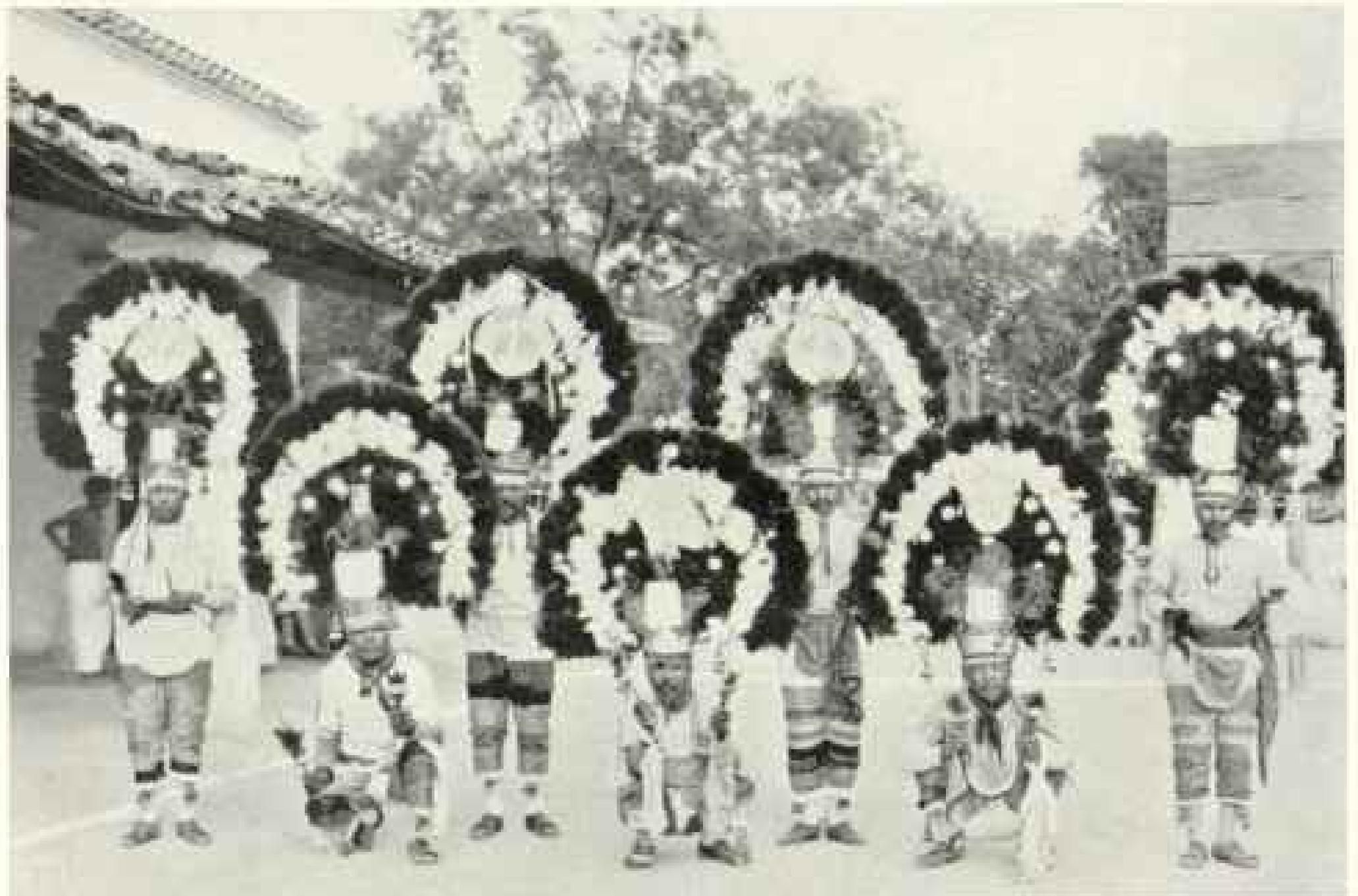


MYSTERIES OF THE AGES AWAIT THE EXCAVATORS AT MONTE ALBÁN

Photograph by Roberts A. Turnbull

In the vast unexplored area are hundreds of mounds, many of them doubtless rich in relics of forgotten civilization and promising stupendous possibilities for future discovery. Fortunately, the author found the field untouched save for a few tombs that had been opened and emptied of their contents (see text, page 496).





FEATHERS STILL HAVE RITUALISTIC SIGNIFICANCE AMONG THE ZAPOTÉCS

Headdresses of bright plumes lend stateliness and color to the native religious dances in Oaxaca. Archeological discoveries prove that the style of ornaments goes back to the time of the builders of the tombs.

Department of Archeology, Miss Eulalia Guzmán and Mr. Juan Valenzuela, whose services proved of outstanding value.

Monte Albán, the archeological site, is located on a chain of mountains that extends along the Oaxaca Valley and reaches a height of some 1,000 feet above the valley.

From Oaxaca to Monte Albán is a 20-minute ride by automobile over an excellent road, which enables the traveler to enjoy the magnificent scenery offered by this exceptionally fertile valley, for it is watered by the Atoyac River and enjoys a semitropical climate. Cold is unknown in Oaxaca, yet in summer the heat is not excessive.

Crops of the Temperate Zone and of the "hot land" make the Oaxaca Valley a veritable paradise, and from the highway leading to Monte Albán may be seen villages nestling among fruit orchards and fields of sugar cane or of corn, the cereal which to-day feeds, as it has fed since time immemorial, the American Indian. To reach Oaxaca from Puebla is a 12-hour journey, traversing an extensive area and especially a large canyon, the Tomellin, a place of blistering heat in summer. The Oaxacans

say, referring to it, that in order to reach heaven, which is Oaxaca, one must go through hell.

Oaxaca lies in the center of the valleys and, being the metropolis of a large mineral region, it was in former days an opulent city, with many industries well developed. Its silversmiths, blacksmiths, and potters were celebrated in New Spain, and even to-day it produces manufactured articles of incomparable beauty.

The city is built almost entirely of stone, which has a lovely green color, and its low houses, although designed to resist earthquakes, have majesty and grace, nevertheless. One of the great earthquakes in the history of Oaxaca occurred as recently as January 14, 1931, destroyed a large section of the city, and affected an extensive area in the State.

Although severely damaged, the city is being slowly rehabilitated and presents many picturesque attractions, of which Oaxaca's Saturday market is notable. Numbers of the Zapotec and Mixtec Indians of the region come into town on that day to sell the products which they create with their own hands. Many objects are



Photograph by Clifton Adams

NATIVE GIRLS SELLING HANDWORK BRIGHTEN THE OAXACA SATURDAY MARKET  
Zapotec and Mixtec Indians to-day retain much of the artistic skill of their ancestors, making baskets and pottery of exquisite design (see text, opposite page).

of a beauty that would be difficult to surpass elsewhere in Mexico.\*

#### EXCAVATING THE NORTH PLATFORM AT MONTE ALBÁN

Leaving Oaxaca by the Atoyac River bridge, the road ascends rapidly along the mountain side and in 20 minutes one arrives at the central plaza of Monte Albán. The entire mountain was transformed by the ancient natives, and the terraces, walls, pyramids, and mounds erected over the tombs are clearly perceptible (see p. 489).

The main plaza of Monte Albán is a rectangle 1,000 feet long by 650 feet wide, its entire area surrounded by platforms from which pyramids rise. In the center of the plaza are three large mounds. In one of them is a tomb which was excavated more than a century ago, but concerning its contents no record was kept.

We undertook the exploration of the site in October of last year and began work at the structure that incloses the great plaza on the north side. It was a pile of

formless ruins covered with grass and shrubs.

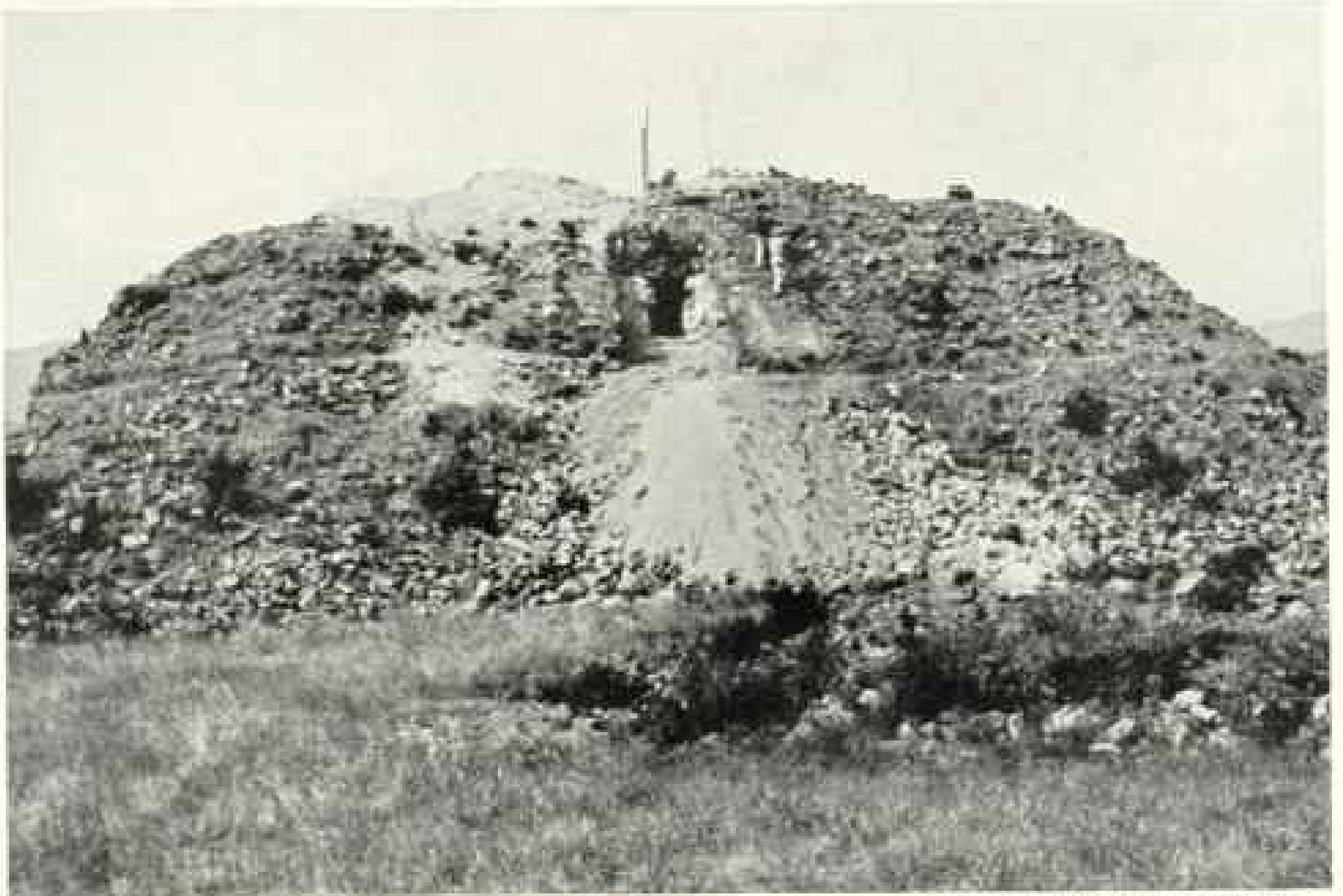
The first task was to remove the vegetation from this monument, and afterward, guiding ourselves by the lines of rubbish apparent, we discovered the last steps of the grand stairway leading up to the building. Upon completion of the excavation, it was found that the stairway was nearly 130 feet wide by 42 feet high and consisted of 33 steps.

It is a curious fact that the general rule of native Mexican ruins shows one structure built over another, leaving the first hidden. Thus, in the great stairway of the North Platform, we found three separate periods of construction, or, rather, three stairways superimposed, which may be clearly seen in the illustration on page 494.

It is still a mystery to us why the indigenous Mexicans executed these superimposed works, which apparently do not follow any practical ends, but represent a tremendous expenditure of time and energy.

Fully to understand this, it is necessary to remember that by means of the superimposition of the three stairways the total

\* See, also, in the NATIONAL GEOGRAPHIC MAGAZINE for May, 1927, "Among the Zapotecs of Mexico," by Herbert Corey.



Photograph by Roberto A. Turbull

#### A TUNNEL TO THE ENTRANCE OF A 60-FOOT TOMB

In opening such a mound, the excavators first dig from the top through the roof of the treasure chamber; then, having ascertained the position of the door, drive a lateral shaft directly to it.

height of the edifice was increased by less than two feet, while it was twice necessary to cover the previous stairs with mud and rock.

Probably some religious motive caused the ancient people of Monte Albán to renew their monuments periodically.

The great stairway, which is believed to be the widest in America, is supported on each side by two walls 39 feet wide, the base being decorated with a double panel similar to those found on the walls of the palaces of Mitla.\*

On each side of the great stairway we found two others, giving access to the upper part of the platform, and to the east and west of these stairs the walls forming the front of the structure are extended. They are of hewn rock, joined with mud and covered with a coat of stucco which was probably painted red.

One of the strangest finds at Monte Albán was relief sculptures of human beings, all of whom have some bodily de-

formity. Some show the heads too flat, while others show them extraordinarily elongated. In some the extremities, usually the feet, are twisted; others are bent, and in some I found hermaphroditic characteristics (see illustrations, pages 496, 502).

These sculptured stones were utilized in the North Platform merely as construction material and show that they were torn from some older edifice. Since they do not present the characteristics of the Zapotec sculpture, I do not believe that they belong to the same civilization that constructed the Great Platform. Although some bear hieroglyphics, they cannot be deciphered by any of the keys to the writings so far known in Mexico or Central America.

Who were the authors of these writings, and why did they prefer to show cripples in their sculptured stones? Here are two problems that arise before Mexican archaeologists, and their elucidation will be one of the principal objects of the explorations that I shall launch this autumn.

Was it the intent to ridicule certain enemies? Or should we see in these sculptures a representation of the sick who

\* See, also, "Hewers of Stone," by Jeremiah Zimmerman, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1910.



Photograph by Roberto A. Tarnbull

#### TO THIS GROUP, TOMB 7 REVEALED ITS TREASURES

The author (wearing spectacles) stands slightly forward, near the center of the upper row, with the Señera Caso on his right and at her side Martin Buzán, assistant. Señorita Eulalia Guzmán and Juan Valenzuela, who kneels in front of Doctor Caso, are students in the author's Department of Archeology at the National University.

came to a temple in which there was a god who performed miraculous cures? Could Monte Albán have been at one time a kind of Lourdes?

For the time being we can offer only hypotheses, for we still lack sufficient data to solve the problem.

At the base of the great stairway and next to the retaining wall, we found the bowl and five plates shown on page 497. The plates were within the bowl and appear to have contained food and drink. Both the plates and the bowl are modern, probably not more than 50 years old, which proves that even in recent times the natives of Oaxaca rendered homage to gods once venerated on the sacred hills of Monte Albán.

Elsewhere in Oaxaca State, in the famous buildings of Mitla, I once was able to see signs of recent worship, for I found on a stone a wreath of flowers of the kind known as *zempoaxochitl*, which are still used by the Indians in their burial ceremonies, and the remnants of a wax candle which some pious soul had lighted to ap-

peal to the gods of Mictlán (the realm of the dead) for the eternal rest of his relatives.

On the upper part of the platform, in Mound B, there is a subterranean temple which also shows indications of superimposition. In this mound I found numerous objects of jade, such as beads, plaques, etc., which seem to have been cast down as offerings, and many tiny vessels, particularly some in the form of a jaguar's claw.

All this represents a very active religion in this mound, and probably during the next season of work, after finishing the excavation of the subterranean temple, we shall find sufficient data to determine to which god so many offerings were made.

#### JADE AND GOLD OBJECTS FROM MONTE ALBÁN IN MANY MUSEUMS

For a long time, both in private and in museum collections, there have been articles of gold and jade which have been taken from Monte Albán. For this reason one of the objects of my research undertaken last December was the exploration of the



Photograph from Dr. Alfonso Caso

NEARLY 130 FEET FROM SIDE TO SIDE, THE GREAT STAIRWAY IS BELIEVED THE WIDEST IN AMERICA

It is 42 feet high, with 33 steps. The outer flight (the narrow, dark strip next the left supporting wall), for some unknown reason, is superimposed on an earlier and similar set (center), which in turn covers a third (the part nearest to the right flanking structure). Before excavations began, the whole place was a formless ruin (see text, page 491).



Photographs from Dr. Alfonso Caso

## EVEN ROCK CRYSTAL YIELDED TO MINTEC LAPIDARIES

Production of this perfect urn of a substance known as one of the hardest and most difficult to work (see text, page 508) would tax the resources of a modern sculptor using the finest tools available to-day. It was found in Tomb 7.



## RELICS FROM THE TOP OF TOMB 7

The sea shell, with one end clipped to form a mouthpiece, apparently was once used as a trumpet. Both the necklace and earrings are of polished jade. No human remains were found near these objects (see text, page 497).



Photograph from Dr. Alfonso Caso

#### GROTESQUE RELIEFS ON STONES IN THE WALLS PRESENT A PROBLEM

Because the sculptures have no Zapotecan characteristics and since they appear only on blocks used for ordinary construction purposes, the author believes them to be relics torn from buildings of an earlier civilization (see text, page 492). Like this representation of a man with a twisted foot, all the figures are of human beings with bodily deformities (see, also, illustration, page 502).

tombs, from which I thought many such objects had come.

The first tomb which we explored, considerably to the south of the main plaza, had already been stripped, and so our work was limited to clearing away the stones and dirt which had accumulated in its interior.

The second tomb, to the west of the plaza, was intact, but produced only a few clay vessels.

All the other tombs are situated about two-thirds of a mile north of the platform. Only one, the fourth, had been completely rifled, although, because of its construction, it was the most important of those we have explored.

#### OPENING THE TREASURE TOMB

In all the other tombs (Nos. 3, 5, 6, 8, 9) we found human skeletons, pottery, and some articles of jade, shell, and obsidian; but it was Tomb 7 which yielded the greatest returns during the first period of work at Monte Albán and proved to be one of

the most important archeological discoveries ever made in America.

The Indians of Oaxaca believe that whoever explores a tomb is punished by the spirits of the dead and may become bewitched.

For that reason, when I uncovered Tomb 7 and no traces of sorcery made their appearance, there sprang up in Oaxaca several tales, one of which I mention because of its excellent folklore characteristics.

It is related that one night, when I was in the central plaza of Monte Albán, a well of crystal water opened up at the foot of one of the monuments, and in the middle of it floated a red vessel made from a gourd shell, inside of which was a gilded fish. Instead of being frightened by this marvel, I caught the jug and the fish within it; whereupon the fish informed me of the location of the treasure in Tomb 7. Therefore it was not strange that one to whom the fishes of Monte Albán had spoken should be in no danger of having a spell cast upon him when uncovering the tombs!



Photograph from Dr. Alfonso Carr

#### NATIVES OF MODERN TIMES HAVE PAID HOMAGE TO THE OLD GODS

At the base of the great stairway and next to the retaining wall (see illustration, page 494) were found this bowl, with the five small plates inside it. Evidently it had contained an offering of food and drink. The author estimates the age of these utensils at not more than 50 years (see text, page 493).

We began the exploration of the small mound occupied by Tomb 7 on January 6 of this year and discovered in its upper part the foundations of some small rooms the floors of which were formed by a heavy layer of mortar. We also found a canal about eight inches wide, but this could not have served as a drain, for it was closed at both ends. This type of canal is characteristic of Zapotecan tombs, but its purpose has not as yet been ascertained.

We found on top of the tomb a sea shell, the tip of which had been cut off to form a mouthpiece, thus making it into a trumpet. Next to the shell were two necklaces of exquisite jade and two small earrings of the same material, but we did not find any human remains to which these ornaments might have belonged (see page 495).

Frequently in the tombs of the Oaxacan region there are found the bones of a man or a dog, together with several other articles, near the principal grave. The Mexicans believed that in the journey taken by

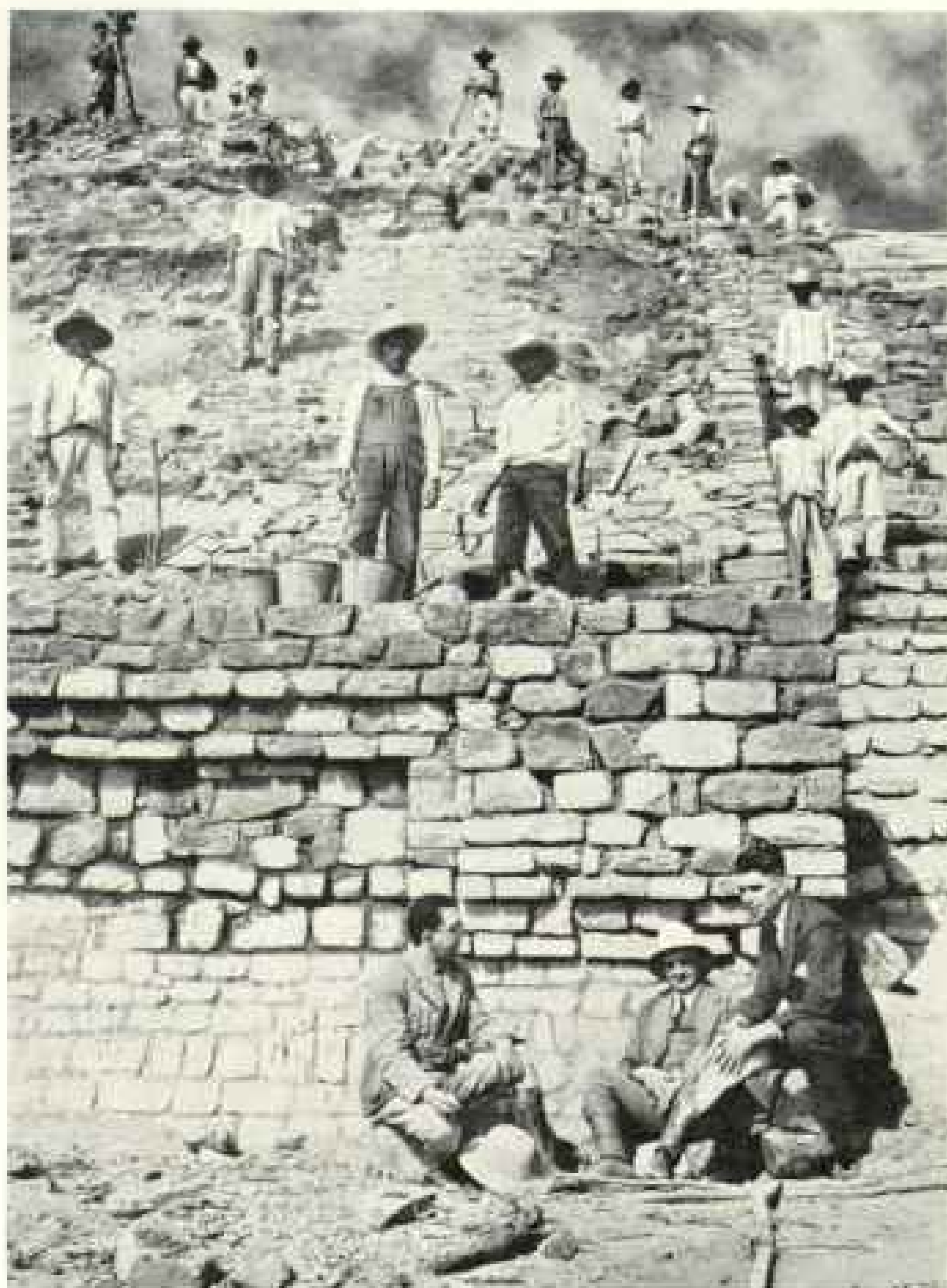
the spirit in the realm of the dead there came a time when a wide river, difficult to cross, was reached. For that reason they killed a dog to accompany his master on this last journey. The spirit of the dog was supposed to reach the far side of the river in advance of the man, and upon seeing his master would jump into the water and help him across. The human remains found near the Zapotecan tombs probably have a similar explanation; perhaps some slave was killed to accompany his chief to the realm beyond the tomb.

When we found the aforementioned shell and ornaments of jade in Monte Alban, we knew immediately that the tomb below in all probability would be very rich in relics.

#### FIRST OBJECT REVEALED BY FLASH LIGHT IS HUMAN SKULL

We made an opening near these first finds, and soon the sound of our picks warned us that there was a cavity below and that we were directly over the roof of





Photograph by Roberto A. Turnbull.

#### BENEATH THE DÉBRIS OF YEARS, THE TOIL OF CENTURIES

At the base of one of the 30-foot-wide side walls of the great stairway (see text, page 492; also, illustration, page 494), the author (left of lower group) discusses the work with Señor José Reygadas Vertiz, Chief of the Archeological Department of Mexico (center). The workmen above are clearing away the rubbish which completely covered the gigantic structure.

a tomb; but, before coming to the stones of the burial vault, we still had to break through a second layer of stucco.

About 4 o'clock in the afternoon of January 9 we began to remove one of the stones which formed the arch of the second chamber of the tomb. Through the narrow aperture, lighted by a flash light, I could see a human skull and next to it two vases, one of which seemed to be of black clay with an extraordinary polish. It proved to be a goblet of rock crystal, which appeared black because of the earth within it (495).

I then removed another stone forming an angle with the first, and the opening was large enough for one of my assistants, Mr. Valenzuela, to squeeze into the tomb. Lighting his way with a flash light, he descended, and could not restrain his exclamations of astonishment at the riches revealed. My eagerness to behold the wonders of our discovery spurred me to extraordinary effort, and I finally succeeded in overcoming the difficulties of the narrow opening.

The first thing to be seen upon entering the tomb was a great white vessel in the center of the second chamber. Upon illuminating it from the inside, I saw that it was translucent. The material of this beautiful amphora is a variety of onyx marble known in Mexico as *tecali* (see page 500).

On the threshold, or vestibule, separating the two chambers of the tomb, and in the center of a great pile of bones, glittered objects of gold—beads, little bells, etc. Strung on the arm bones of

one of the skeletons were ten bracelets, six of gold and four of silver. I found here also what at first appeared to be a tiny vessel of hammered gold ornamented with the figure of a spider, but which subsequently I have come to think was used as a clasp for a belt.

Finally, near the door of the tomb, I saw a golden diadem and next to it the plume, twisted and bent, which at one time served to decorate it (see, also, page 507).

Upon turning to leave, I was attracted by the skull, decorated with a mosaic of

turquoise, which was in the first chamber near the threshold (see, also, illustration, page 510).

#### FLOOR OF TOMB GLEAMS WITH JEWELS

Valenzuela and I had made this first inspection of the tomb by stepping along some stones projecting irregularly from the ground and permitting us to make the examination without disturbing the objects and human bones. Upon lighting the floor of the tomb, we found it aglow with pearls, golden beads, and innumerable small, flat pieces of turquoise that at one time had composed a rich mosaic. It was impossible to reconstruct it, notwithstanding the fact that my first care was to see if I could save it, even if only in part.

In order properly to begin the exploration of the tomb, we measured its length, so that we might locate the position of the door on the outside, after which we climbed out of the opening in the roof and covered it.

As we left the tomb I realized the incalculable richness of my discovery from a material, an artistic, and a scientific viewpoint. I had no knowledge of any previous discovery in America of such a treasure.

#### WORK GOES ON ALL NIGHT

Despite the fact that it was then 6 o'clock in the afternoon, I resolved to work all night and uncover the entrance to the tomb as quickly as possible. Six of our best workmen began digging an opening 23 feet to the east of where we had first pene-



Photograph by Roberto A. Turnbull

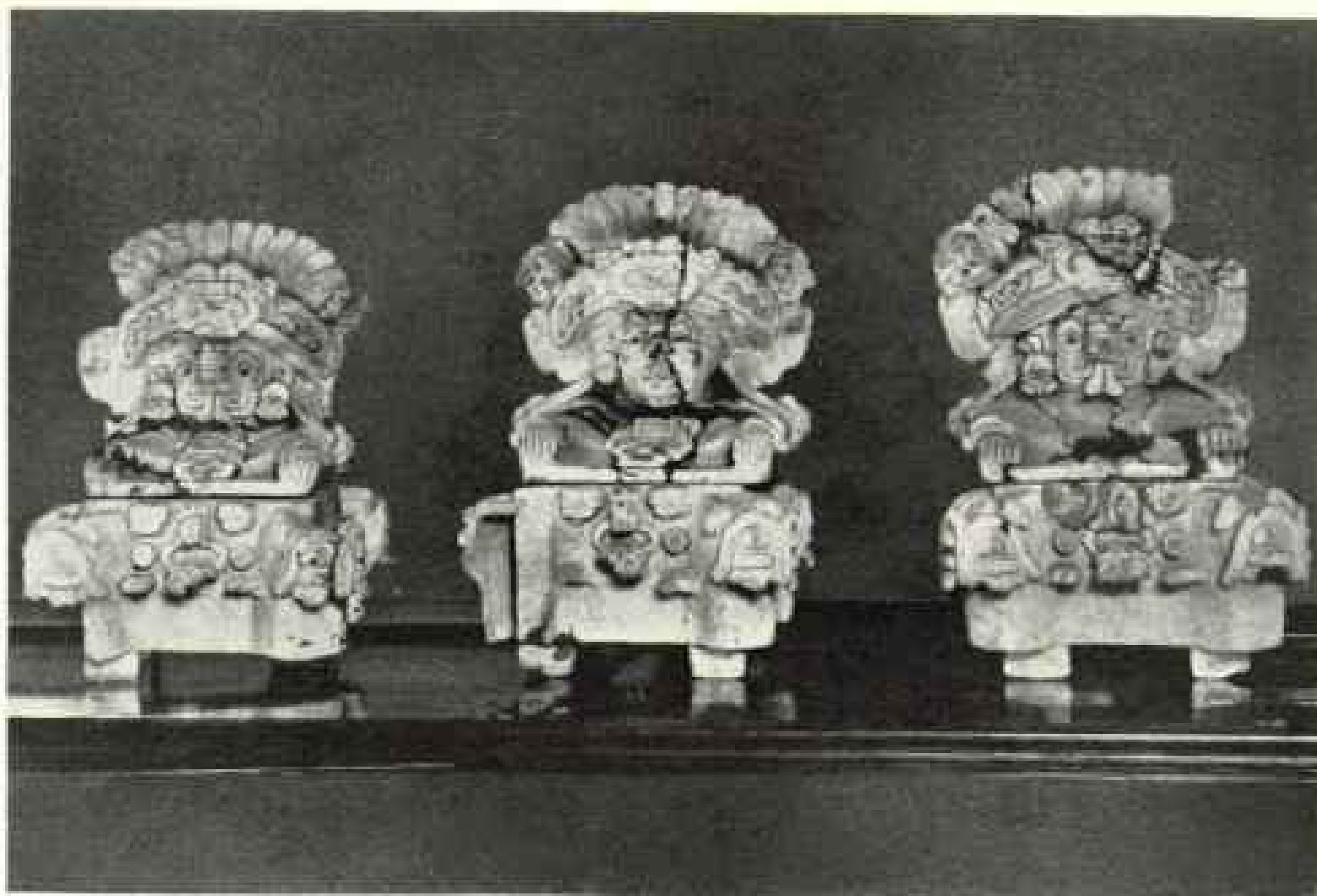
#### RELIEF SCULPTURES SHOW PECULIAR MOTIFS

Comparison of the figures on these rocks, taken from one of the tombs, with those of some of the building stones of the Great Platform (see illustration, page 502) makes clear the reasons for the author's belief that the two types were produced by different races.

trated into the tomb, the work being carried on by the light of a gasoline torch.

The first objects we came upon while digging this opening were fragments of large clay vessels, characteristically Zapotecan, on the front of which was the figure of a god profusely adorned, bearing a crest of plumes. Each sacred urn stood on a hollow clay pedestal (see page 500).

After removing the urns, we dug until we came to a stone that served as the lintel of the doorway, and to other flat, irregular stones that closed the entrance. Removing these, we found that the doorway was filled with dirt nearly to the height of the



BROKEN PIECES OF CLAY URNS, REPRESENTING A PLUMED GOD, FOUND IN THE ANTECHAMBER OF TOMB 7

The pedestals are hollow. The position of the fragments indicated that the urns had been broken intentionally and buried later in the antechamber.



Photographs from Dr. Alfonso Caso

VASES OF TECALI (ONYX MARBLE) SHOW REMARKABLE ARTISTRY

The cup on the left bears intricate inscriptions. That in the center, though its substance is marble, is so smoothly carved that it gives the impression of having been molded from clay. The serpent heads supporting the third are drilled to such exquisite thinness that they are translucent.



Photograph from Dr. Alfonso Caso

SEÑORA CASO UNCOVERS THE BEADS OF A GOLD AND JADE NECKLACE IN TOMB 7

The individual pieces are approximately two centimeters in diameter. Beside them lie fragments of human bones. To record accurately the position of the relic, Señor Valenzuela is measuring its distance from the wall.

lintel, although a crack was left which allowed me to use the flash light and for the second time see the treasure contained in the tomb.

From then on our work was simpler, although more delicate. We had to enlarge the small opening by removing the dirt that blocked the door, but it was necessary to examine each handful of earth we removed to see if any objects from the tomb were mixed with it.

It was 3 a. m., January 10, when for the second time I was able to enter the tomb with my two assistants, Messrs. Martín Bazán and Juan Valenzuela. We gathered the golden articles most accessible, in each case measuring the distances in relation to the north and east walls of the tomb. That first night we recovered 36 objects of gold, outstanding among them the diadem, the plume, and the great breastplate which represents a "jaguar-knight" (see, also, text, page 508).

Our position was not exactly comfortable. Not only were we forced to go on our knees, but we could not move freely

for fear of disturbing the human bones and innumerable objects. Moreover, the gasoline torch by the light of which we worked increased the heat and transformed the tomb into a veritable steam bath.

Hearing a noise at the entrance, I saw the driver of our truck and one of the foremen watching the operations, and I shall never forget the emotion and astonishment written on their faces.

After cataloguing these first objects gathered in Tomb 7, we made our exit just at dawn. Leaving my assistants to guard the excavations, I returned to Oaxaca to place in safe-keeping the objects we had removed.

For a week my two associates, my wife, and I explored the tomb, gathering the articles and bones and making up the catalogues, each day working more than 14 hours. All the objects were found either on the earth floor or at a depth of an inch or so below it. This fact indicated that the burials were made upon the ground covering the bottom of the tomb, and that



Photographs from Dr. Alfonso Caso

#### DID ROCK SCULPTURE RIDICULE A CONQUERED RACE?

In the walls of the Great Platform were found many stones upon which were carved such distorted figures (see text, page 492, and illustration, page 496).

#### SUCH INSCRIPTIONS MAY SOLVE MONTE ALBÁN MYSTERIES

Whether the carvings on this rock found on the corner of the largest mound are merely ornamental or of greater archeological significance, scholars have yet to determine (see text, page 492).



Photograph by Roberts A. Turnbull

MORE THAN 500 ARTICLES HAVE BEEN CATALOGUED FROM TOMB 7

The great ornament in the center is made of gold, with the characteristic fringe of bells. Some of the other necklaces are of the same metal. The group also includes necklaces and other objects of jade, and large, spindlelike earrings (see, also, illustration, page 505).



Photograph by Roberto A. Turnbull

#### JEWELRY FOUND IN TOMB 7 REPRESENTS UNTOLD WEALTH

The mask portrays the god Xipe-Totec (see text, page 510). It is of gold, intricately carved, with earrings and a lip ornament, and even hair, represented by filigree work. Beneath it is a golden ear pendant. The upper necklaces and smaller objects are of jade. The large collar below is entirely of gold with a fringe of bells.

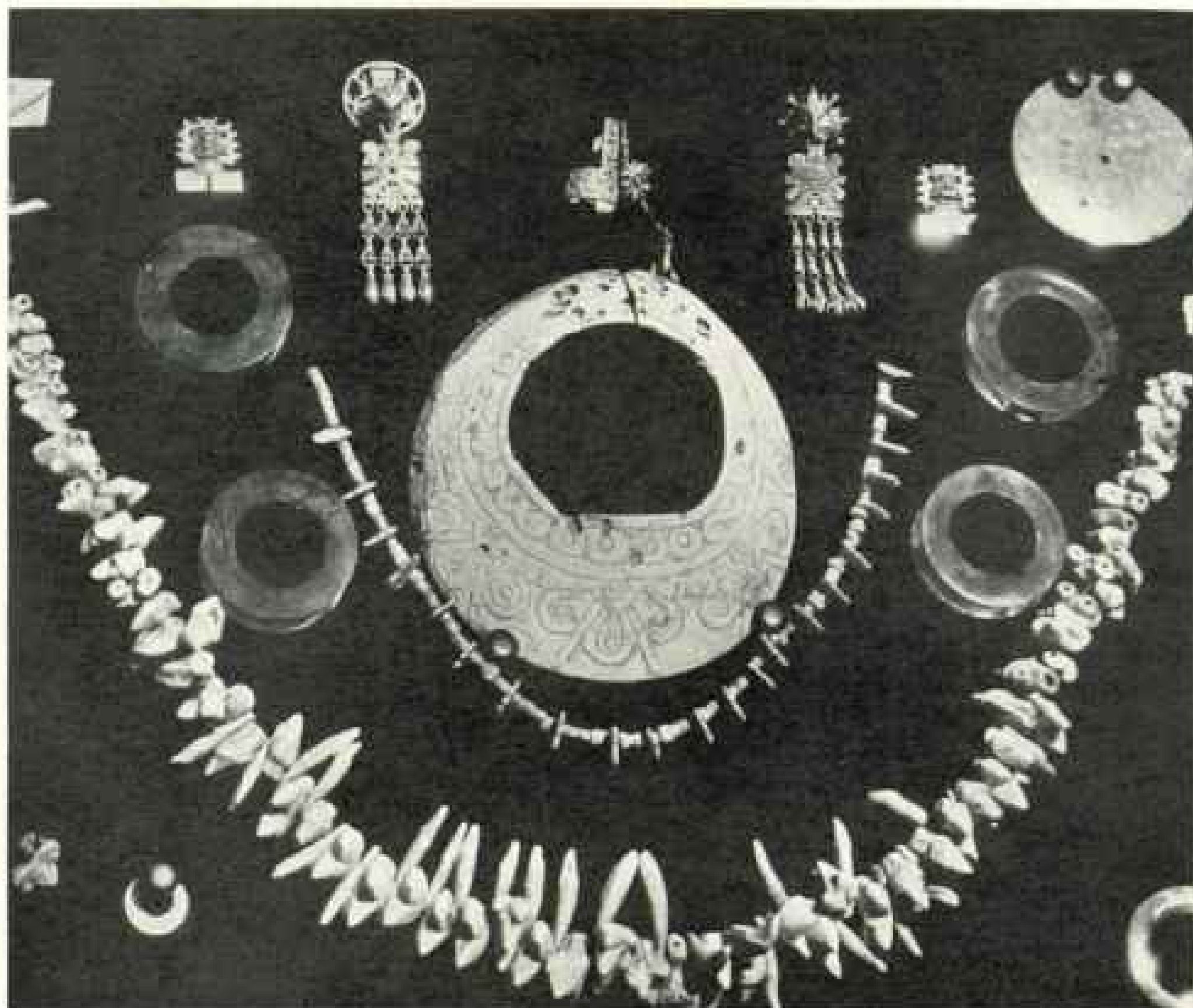
those who laid the bodies at rest did not leave by the door, but through the roof, sealing the entrance subsequently with a large stone bearing a Zapotecan inscription.

#### DAMPNESS HAS DESTROYED MANY OBJECTS

By reason of the dampness of the tomb, and probably, also, because the dead were buried in a sitting position, the human remains were mere piles of bones, without form, and for the most part disintegrated. Nothing of cloth, wood, or other perishable material was preserved. The beautiful masks decorated with mosaics of turquoise and the breastplates of the same material had come apart, for in each case the pieces of shell and turquoise had been affixed to a wooden frame.

All objects gathered from this superficial burial were of precious material save five small clay spindle whorls. These are generally conical and served as balances or weights for the native looms which the women used in weaving. Although the preliminary studies of the bones made by Dr. de la Borbolla have not yet given definite proof that any of the skeletons were feminine, the finding of these spindle whorls in the tomb, as well as of some rings of very small diameter, suggests the possibility that one of the bodies was that of a woman.

Neither is it possible to determine from the ornaments whether one of the bodies was more important than the others, although those found in the vestibule separating the two chambers and the one



Photograph by Roberto A. Turnbull

A NECKLACE MADE OF CROCODILE AND WOLF'S TEETH AND  
OTHER MINTEC ORNAMENTS.

In this representative assortment of smaller objects from Tomb 7, the large piece in the center is an ear ornament of carved jade; in the row above it are an exquisitely fashioned ring and four ear pendants of gold; beside it are shining black earrings of obsidian glass (extremely difficult to work); and below it are a small jade necklace and the longer chain of crocodile and wolf's teeth.

occupying the interior of the tomb directly below the niche appear to have been more richly decorated.

The niches in Tomb 7 were empty, as were those in the other tombs that we explored, with the exception of No. 9, in which a clay vase was found in the left niche.

NECKLACES OF GOLD, PEARL, AND  
TURQUOISE

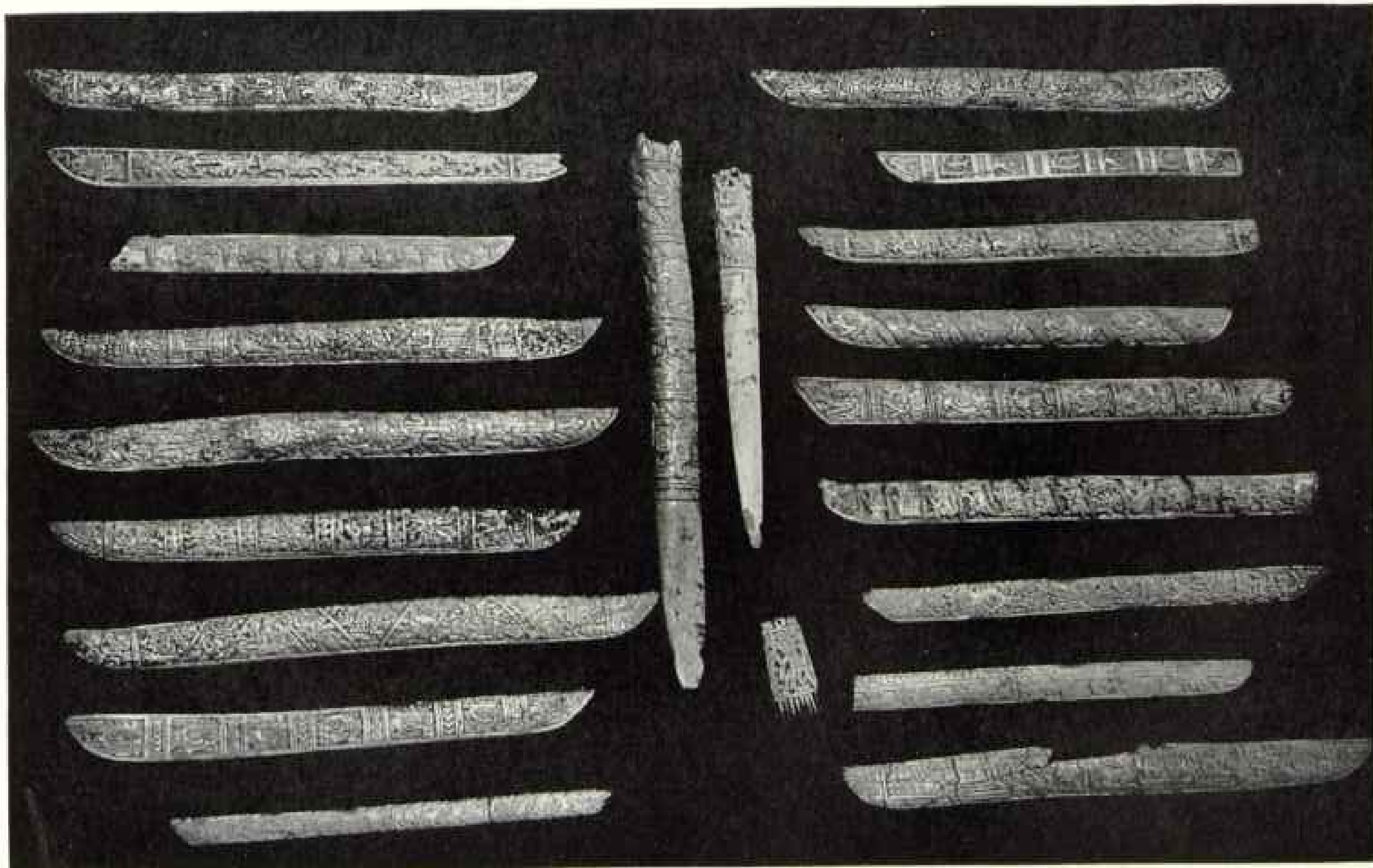
In Zapotecan tombs these niches are always found one at the back and two on the side walls—a fact which, if we grant the niches greater importance later in the construction of the tombs, gives rise to the belief that possibly they originated the cru-

ciform type of tomb, such as those of Mitla and No. 3 at Monte Albán.

We have catalogued more than 500 articles from Tomb 7, at times including under one number necklaces of gold, pearl, and turquoise, composed of hundreds of beads each. Naturally the necklaces have been restrung by us. Nothing has been restored or polished, however, but simply washed with water to remove the surface dirt. Only in rare cases did we find beads still on their strings, but in a few cases we found the beads on the ground in the same position as on the original necklace.

Most of the vessels found in the tomb are of tecali (see text, p. 498), found in abundance in the mountains north of Oaxaca.





MIXTEC CARVINGS ON JAGUAR AND DEER BONES

Photograph by Roberto A. Turnbull

More than 30 of these interesting relics were found in Tomb 7 (see text, page 512). The use of all save the comb and sacrificial knives (see illustration, opposite page) remains a mystery. Some of them are incrustated with turquoise.



Photographs from Dr. Alfonso Caso

**CARVED BONE DAGGERS DREW SACRIFICIAL BLOOD**

Several of these significant relics were found in Tomb 7 (see text, page 512)



**DIADEM AND PLUME OF GOLD CROWNED THE MIGHTIEST**

The warrior who put on this finery must have been a person of high-rank (see text, page 511).



Photograph from Dr. Alfonso Caso

#### THE "JAGUAR-KNIGHT" PROVES THE JEWELS MIXTECAN

The interwoven symbols, suggestive of an "A O" monogram, on the lower right plate of this pectoral, signified a year to these people, but they were never used by the Zapotecs.

One of the most extraordinary pieces found was a rock-crystal urn. It measures  $4\frac{1}{2}$  inches in height by 3 inches in diameter and the sides are two-fifths of an inch thick (see page 495).

Since rock crystal is one of the hardest substances and is most difficult to work, it is inexplicable how the Mixtec lapidaries succeeded in creating such a perfect object, which even to-day would be truly a *tour de force* for a sculptor who possesses tools of a refinement and precision unknown to the ancient natives.

Few examples of the work of the ancient Mexicans in rock crystal are extant. In London there is a skull, almost life

size, fashioned from this substance, and in the National Museum of Mexico we have a very small skull, and a rabbit about four inches in length. The rock-crystal urn, the four earpieces, as well as the beads of the same material found in Tomb 7, have added tremendously to the world's wealth of articles fashioned from Mexican rock crystal.

Naturally it has not yet been possible to ascertain what the urns and other vessels contained, for to do so it is necessary to make a microscopic analysis of the earth found in them. The first Spaniards who wrote on Indian subjects tell us, however, that it was the custom (as with many other races) to bury with their dead food and drink, which they believed would aid them in the journey beyond the tomb.

Besides rock crystal, the Mixtecs worked other hard stones. In Tomb 7 we found articles of a volcanic glass (obsidian) which

is exceptionally difficult to shape. These are principally earrings and knives (see pages 503 and 505).

The earpieces are round, much like spools, with the flanges very wide. The natives wore them in the ear lobes, and for this purpose they perforated their lobes during infancy, and enlarged them little by little until they were able to wear rings from two to almost two and a half inches in diameter. The lobe became a mere strip of flesh around the ring or disk. These obsidian earpieces have been fashioned in such a way that they are about as thick as a piece of paper and are translucent.

The tiny obsidian knives found in the tomb were used by priests for the sacrificial rites of drawing from the body blood which was afterward offered to the gods. Some carved stone daggers which we also found in Tomb 7 were used for the same purpose.

Curiously, although there were nine bodies in this tomb, we did not find any other objects that might be classified as weapons, save a hatchet of copper—a fact which would suggest that the personages interred in this tomb were more likely to have been kings and priests than warriors.

#### THE QUESTION OF JADE IN MEXICO

The numerous carved jade objects found in the tomb include the handle of a fan shaped like a serpent, three rings, an exquisite bird's head with eyes of gold, an eagle's head on the back of which was a golden plate that served as a lip ornament, various pendants, one in the form of a turtle shell, earrings, and bead necklaces, among which the most notable is one of almost white jade, made up of three large rectangular beads alternating with spherical beads.

The question of jade in Mexico is one which has aroused great interest among investigators, but no special studies have been undertaken to locate its source; hence, from time to time one still hears the theory advanced that all of the jade found in Mexico came from China. It is true that we have not yet been able to locate deposits of jade, but it is also true that in the beds of rivers, principally in Oaxaca and



Photograph from Dr. Alfonso Caso

#### THE SERPENT HAD A PLACE IN ZAPOTEC RITES

This urn, found in Tomb 6, evidently represents a deity. Future study may reveal the significance of the tongue in the form of a snake with opened jaws.

Guerrero, are found many jade pebbles. From the Aztec tribute books which have come down to us we know that the cities of Oaxaca and Guerrero rendered to the rulers of Mexico jade, gold, turquoise, and other precious materials like those found in Tomb 7. The workmanship and polish of the jade objects, as well as the fact that they were made of this precious material, give them first place among the riches discovered in Tomb 7.

Small turquoise tiles for mosaics and beads were also abundant in this tomb.

Up to now there have not been found in Mexico any ancient mines of turquoise; so it has been thought that this material



Photograph from Dr. Alfonso Caso

INCRUSTED WITH TURQUOISE, A HUMAN SKULL MAKES A STRIKING MASK

Perhaps this gruesome trophy was the skull of a captured foe (see text, page 512). The inside of the death's head was painted red.

was brought from New Mexico.\* The wealth of turquoise in Tomb 7 and the fact that in the Aztec tribute books various towns in the regions of Oaxaca and Guerrero contributed turquoise demonstrate, in my opinion, that there must exist in these States old mines of turquoise which a systematic investigation may uncover.

Metal objects were found in gold, silver, and copper—that is to say, in the only metals which the ancient natives of Mexico worked. They used various processes and arts in treating them: smelting, filigree, cold-wrought, and repoussé.

THE "JAGUAR-KNIGHT" BREASTPIECE

Among the golden objects, the great breastpiece in the form of a "jaguar-knight" (see page 508) was of special interest. It represents a human head wearing a jaguar's head helmet with imitation feathers of golden thread. Over the mouth is a mask in the shape of a fleshless human

\* See account of the National Geographic Society Expedition's discovery of the famous Pueblo Bonito turquoise necklace, in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1925.

jawbone, and the cords which support it may be clearly seen passing below the nose. In the ears are two disks from which serpent heads project forward, and suspended from the neck is a collar with a small bird as a pendant.

If its artistic side is striking, its scientific value is no less great; for in the two plates below the deity appear two years, represented by a symbol like the letters A O interlaced, which among the Mixtecs signified a year.

To make this breastpiece, various parts were cast and afterward soldered to each other by heating the gold. On the back are two small rings that served to support it.

SLAVE KILLED AND SKINNED AS HARVEST SACRIFICE

Another beautiful golden object is a small mask, some three inches in height, that represents the head of the god Xipe-Totec, "Our Lord the Flayed."

In a bloody ritual celebrated to make the earth fruitful, one of the slaves killed was skinned and a priest dressed in this skin. The little mask vividly depicts the skin



Photograph from Dr. Alfonso Caso

#### FIVE PECTORALS REPRESENT EAGLE-KNIGHTS

The eagle symbol represents the sun and day. The jaguar used on other pieces is the sign of the moon and night.

of the victim; also, the half-open eyes and mouth and the cords hanging from each side of the head, which serve to support the skin. On the back of the mask is the hair, imitated by filigree work, which varies in height on either side, for it represents the tuft of hair which warriors allowed to grow on one side (see, also, page 504).

This god of vegetation and corn is also the god of the workers in mosaics of turquoise and of the goldsmiths and silver-smiths, since the ear of corn is a natural mosaic and the skin of the victim resembles the sheet of gold with which the ancient jewelers used to cover wood or other objects.

This mask has several perforations which indicate that it could be suspended, perhaps as a frontal buckle of a belt, for we found it near the hip bones of one of the bodies.

There are also armlets and earrings of gold; necklaces in which each bead represents a turtle; others in which they represent jaguar teeth, and innumerable necklaces of cylindrical or spherical beads of various sizes.

One of the most striking objects is the gold crown adorned by a plume of the same material. Ordinary fighters used bands of red leather to hold their hair and decorated them with eagle feathers; but the occupant of Tomb 7 undoubtedly must have been of high rank, for he had a crown and feather of gold (see page 507).

Among the silver objects we found three rings of comparatively simple design. Among those of silver and copper, which probably formed a natural alloy, we found a bowl shaped like a pumpkin, rings decorated with eagles, pincers, and some large bells that alternated with others of gold.

For the first time in Mexican tombs, we encountered in Tomb 7 jet and amber. There are many beads and plaques of jet, and the amber group includes some earrings and a necklace of spherical beads with a small duck's head in the center.

The Mexicans also held colored shells, red ones especially, in great esteem and there are several necklaces made up of hundreds of beads of this color, armlets, necklaces of little shells which were used to ornament breastpieces of jaguar skin,

earpieces, and little plaques of shell that were utilized in the mosaics.

Unfortunately, most of the turquoise mosaics were on wooden bases, and of these nothing is left but the eyes made by perforated shells. The only mosaic which was preserved, although much damaged, is one made on a human skull (see page 510), probably that of some great warrior captured and sacrificed by the Mixtecs. Afterward they used it as a macabre war trophy, making an opening in the top and painting it red on the inside. The turquoise mosaic was then affixed with a paste made principally of copal, a substance anciently used by the Mexicans as incense. An imitation knife made of shell was placed in the hollow of the nose.

From a scientific viewpoint, the most important findings of all are the carved bones, which cast much light on the writings and history of the Mixtecs. They are the bones of some large animal, probably a jaguar or deer, but their use is still a mystery to me. The bones are cut in high relief, and the work is so exquisite that it would not be surpassed by the finest products of China and India in ivory. Many had the background incrustated with turquoise, which made the design stand out more effectively. Others were simply carved and used as religious daggers for the sacrificial rites, which consisted in drawing blood from different parts of the body (see pages 506, 507).

I shall not describe each one of the bones that form this important collection, for there are more than 30.

#### THE MIXTECS USED ZAPOTECAN TOMBS

In addition to the articles found on or near the surface in the interior of the tomb, we recovered from the same ground, but from greater depths, some small vessels and a fragment of a clay urn, all of which were characteristically Zapotecan, in contrast to the objects of the upper burial, which are Mixtecan. For this reason I believe that Tomb 7 was used on two occasions, first by the Zapotecs, who built it, and afterward by the Mixtecs. The latter removed the bodies and other objects which were in the tomb, leaving only a few of these small clay vessels, and later filling

the tomb with dirt until the entrance was blocked. Then they came out through the roof and sealed the exit with a stone bearing Zapotecan inscriptions, which had previously been used in the first burial to seal the entrance.

It is our problem to learn why the Mixtecs buried their nobles in this ancient Zapotecan tomb.

As regards the date of the burial, I do not consider it very old. There are indications that the jewels cannot be from an era much before the Spanish Conquest. For example, in a manuscript of the 16th century, it appears that the Indians of Tepetlaxtuc gave to the Spaniards a necklace of little golden turtles exactly like the one found at Monte Albán.

Such, in brief, is what we have found thus far in Monte Albán, although the exploration has barely begun. My object in undertaking this research is to gather data that will make it possible to read the Zapotecan writings and to establish the relations between the Zapotecs and the Mixtecs with the Mayas and the Mexicans.

Hundreds of tombs, some probably as rich as Tomb 7, remain unexplored, and magnificent edifices covered by vegetation and rubble await the archeologist.

The Mexican Government, which is working simultaneously at various other archeological sites, will dedicate greater resources this year to the exploration of Monte Albán. But if the support of private individuals should back up official action, its excavation would be realized much more quickly, and would solve interesting questions not only in the history of Mexico, but all America.

The discovery of Tomb 7 has given us works of art comparable, and in many respects superior, to the finest productions of the ancient Egyptians, Greeks, and Chinese. It has shown that there existed in Mexico, prior to the arrival of the Spanish conquerors, great cultures with technical and artistic achievements that we did not suspect.

It is my hope that during the second period of research, to be inaugurated in October, new findings will be made that will broaden our knowledge of this ancient civilization.

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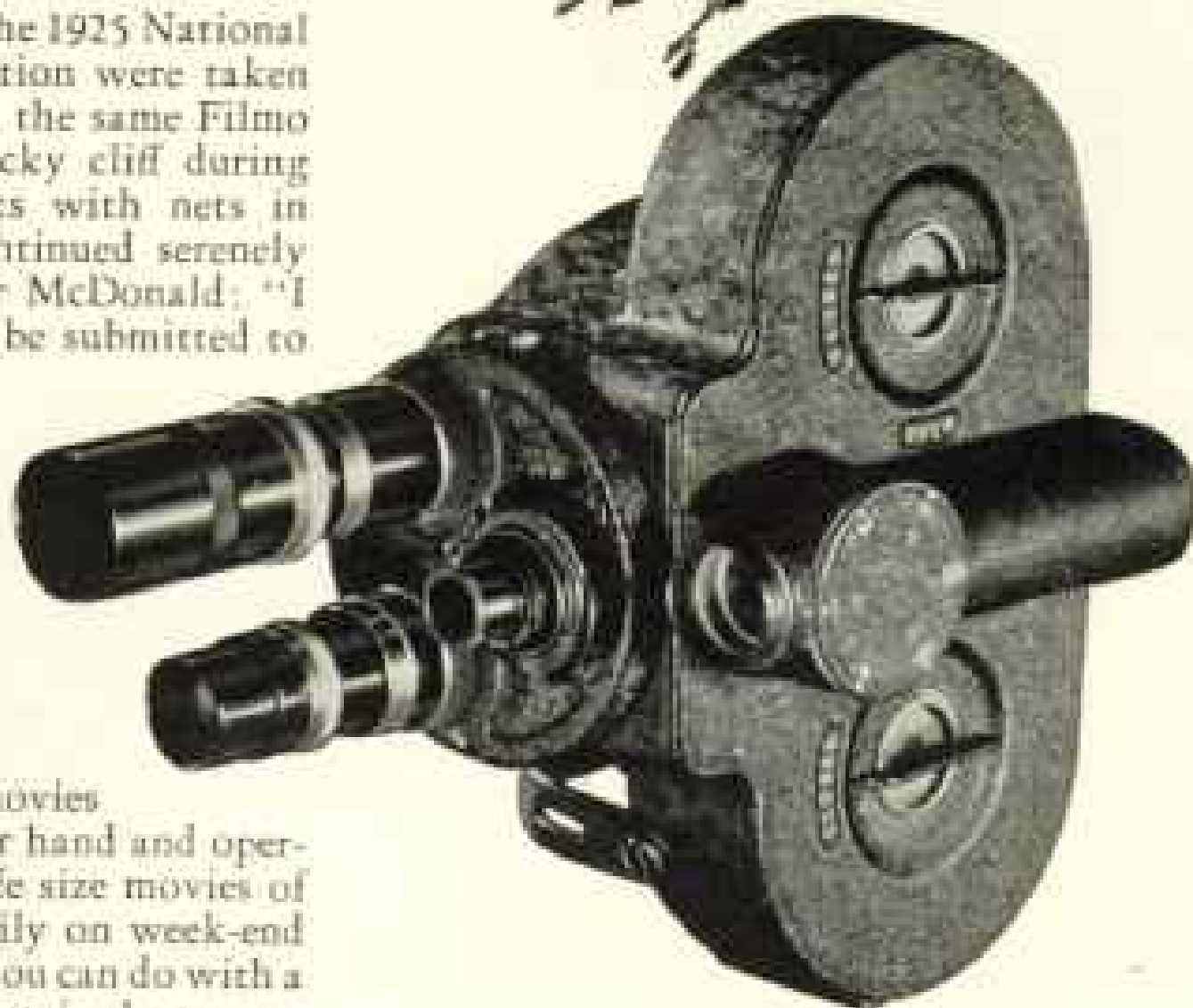
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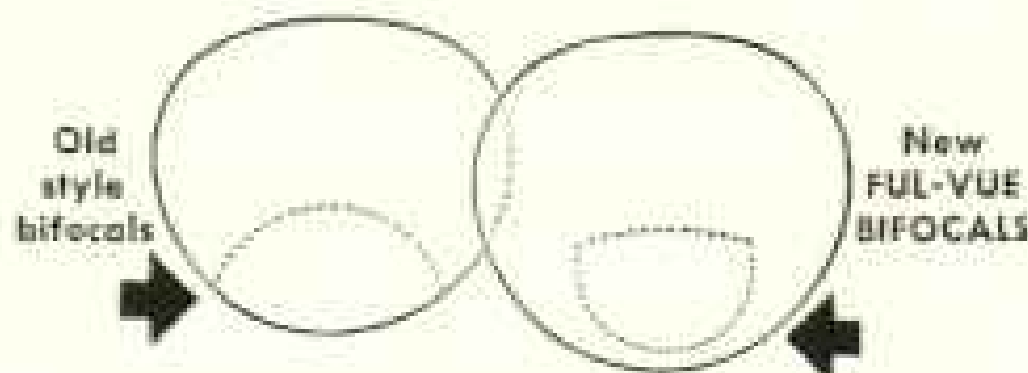
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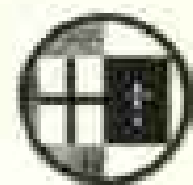
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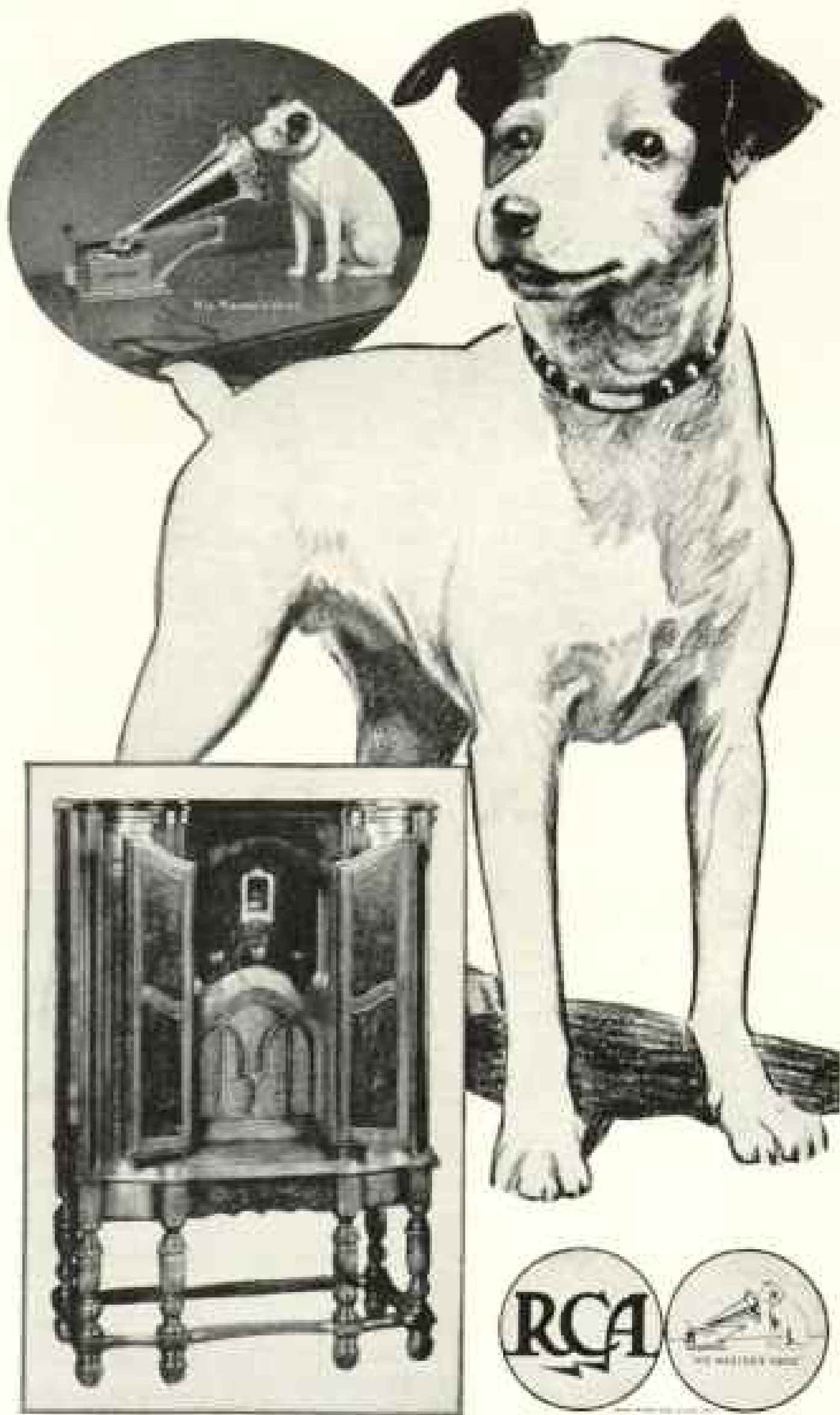


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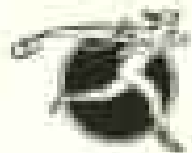
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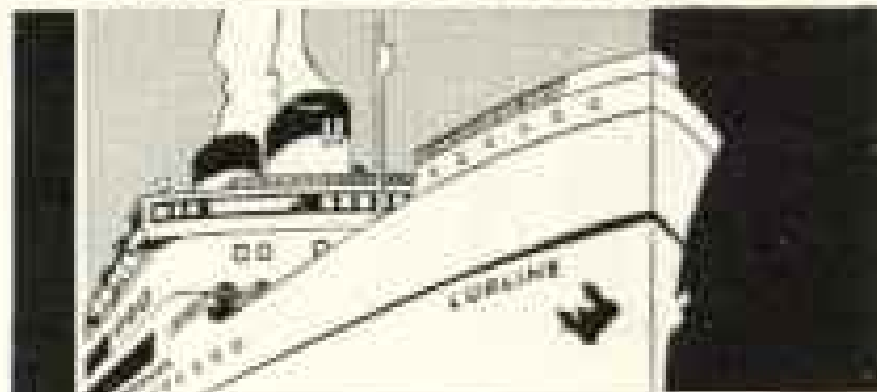
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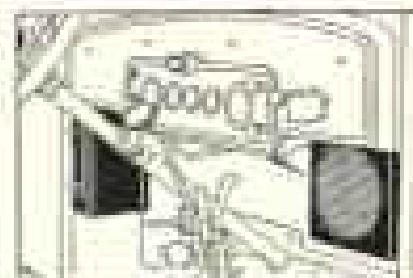
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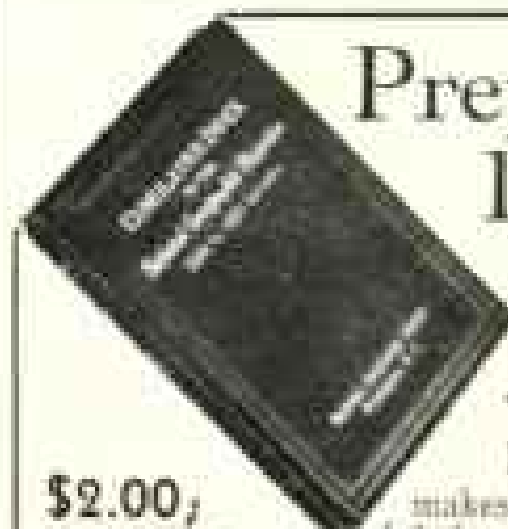
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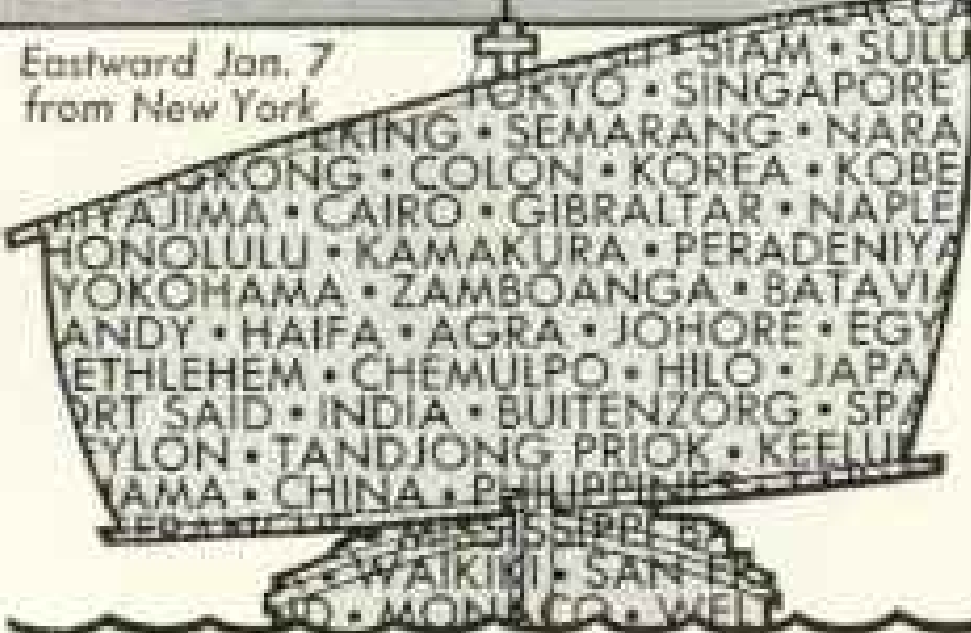
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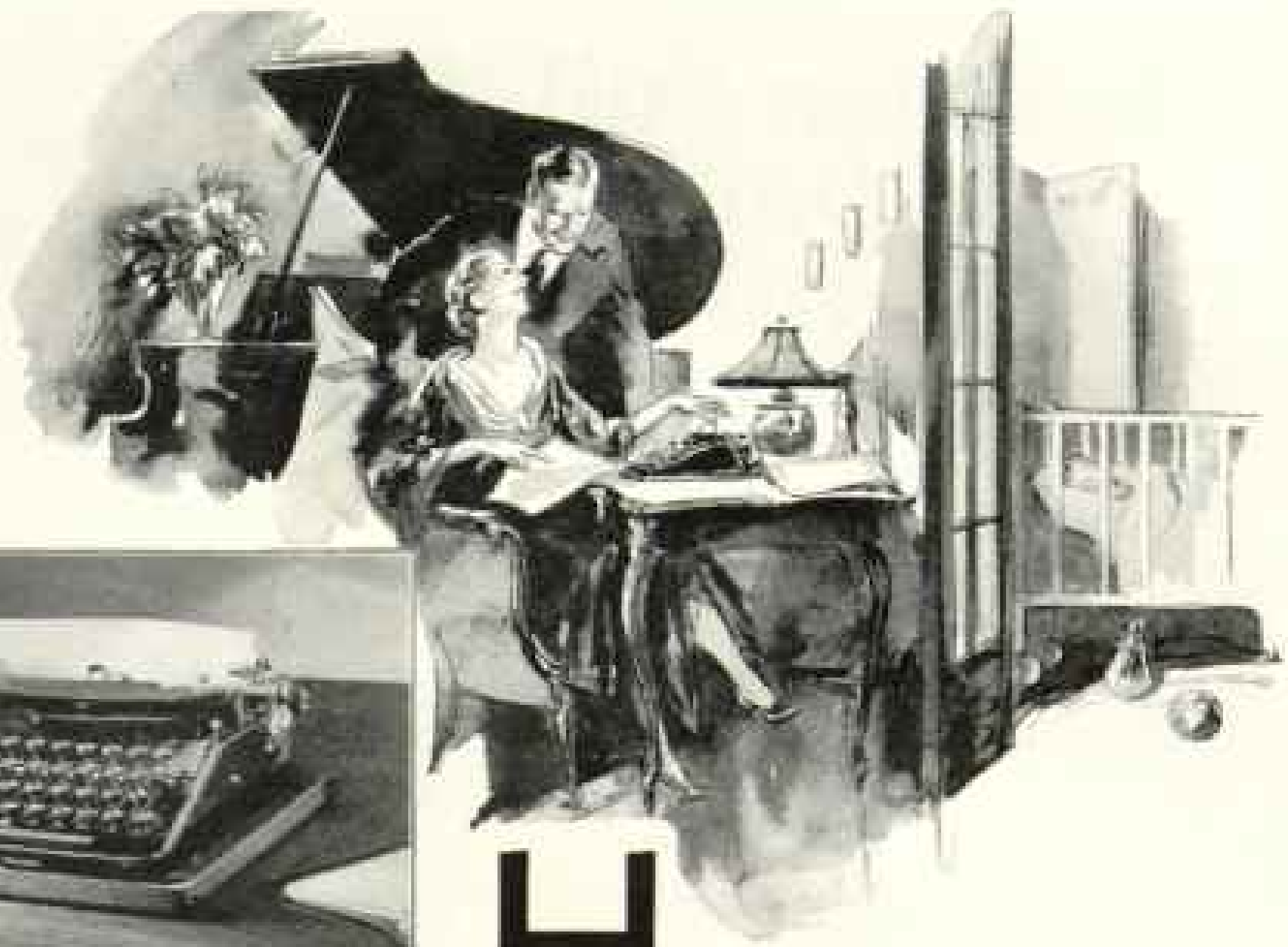
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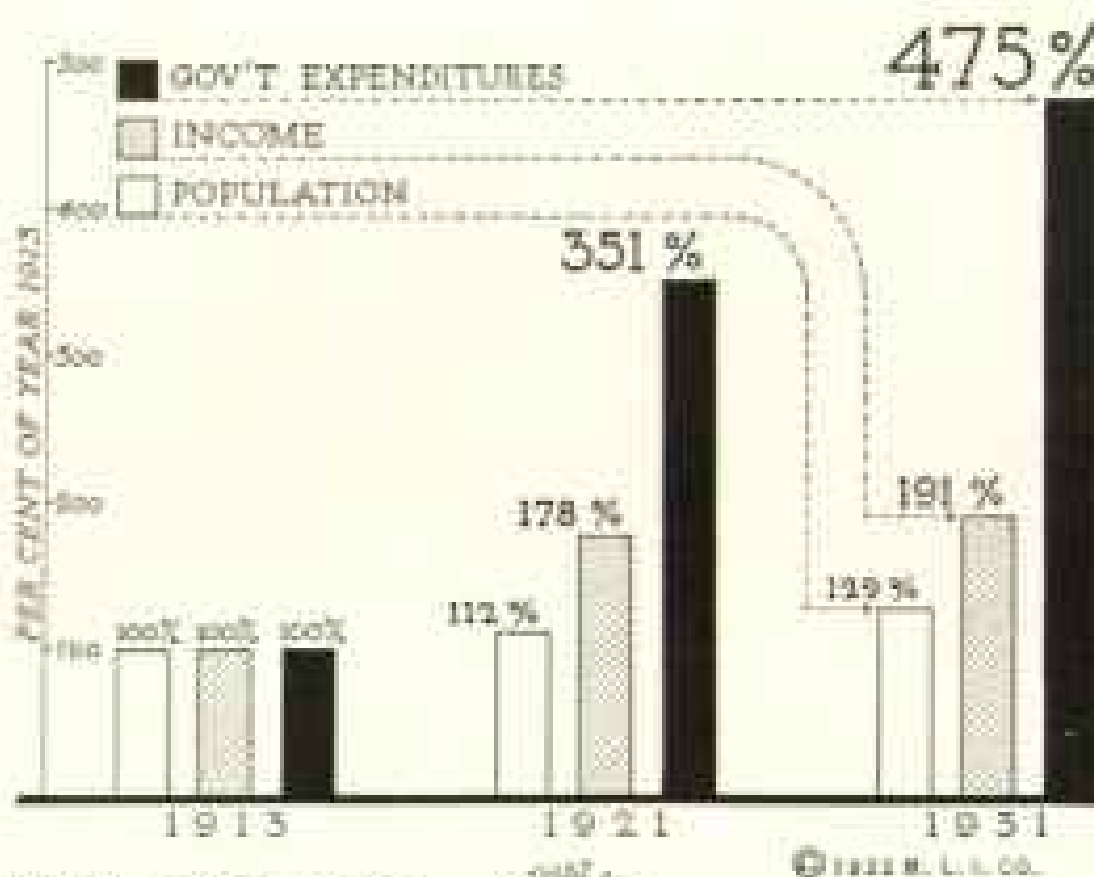
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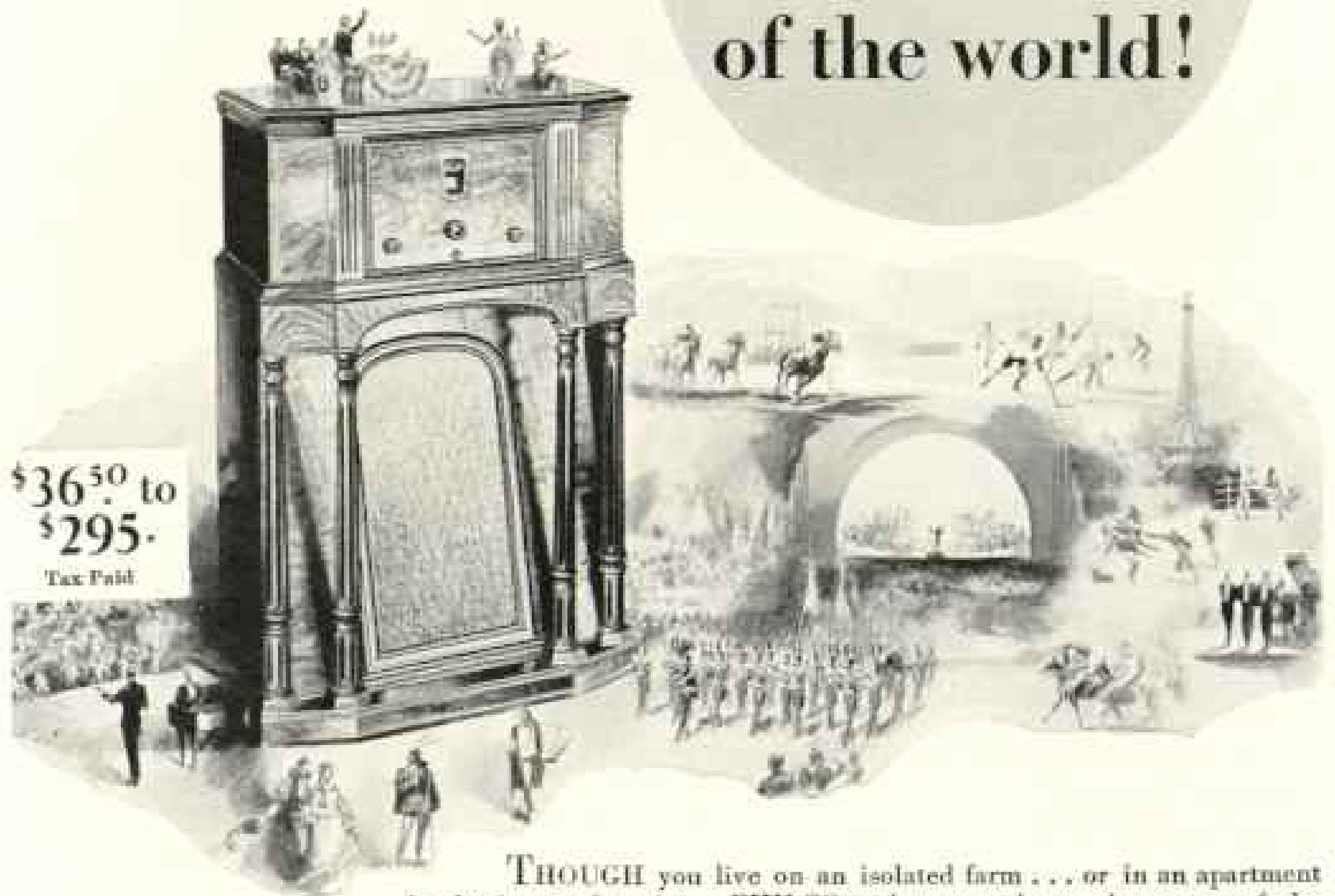
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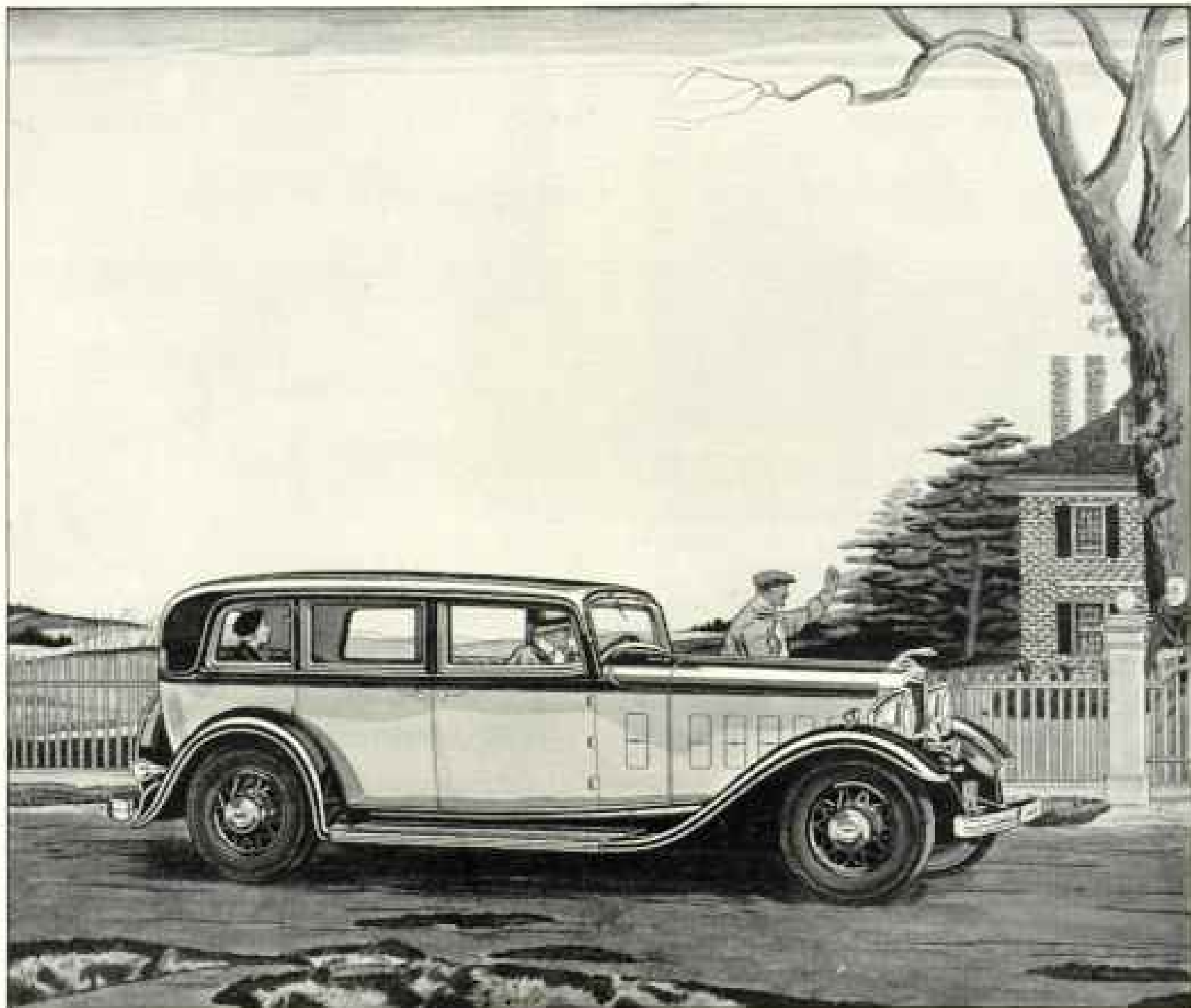
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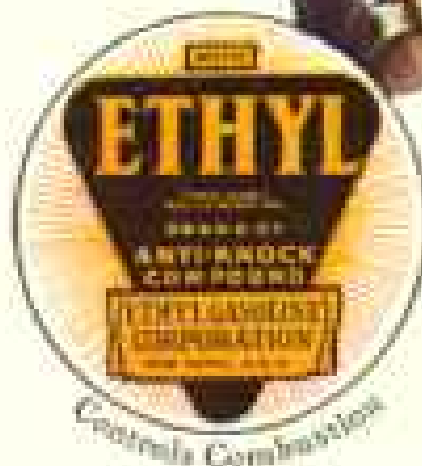


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