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THE NATIONAL GEOGRAPHIC MAGAZINE

To the Men at South Pole Station

BY REAR ADMIRAL RICHARD E. BYRD, USN

Four days before he passed away on March 11, 1957, Admiral Byrd, a Trustee of the National Geographic Society, made final corrections in the following article for its Magazine and sent it to the Editor. In these, his last words written for publication, the great aerial explorer of both Poles pays tribute to Dr. Paul A. Siple, his protege of 29 years ago and staunch companion on every Byrd antarctic expedition since.

In seven previous National Geographic articles since 1925, Admiral Byrd has greatly contributed to human knowledge of polar regions by recounting the results of his expeditions in fascinating firsthand narratives, classics in the annals of exploration.

As Officer in Charge of United States Antarctic Programs, Admiral Byrd bore the over-all responsibility of establishing bases at the bottom of the world to add to scientific knowledge during the International Geophysical Year.

It is appropriate that his last article should appear simultaneously with the beginning of that world-wide "symphony of science," the IGY, on July 1, 1957.—*The Editor.*

ALL Americans—for that matter, all peoples everywhere—must share my ringing pride that our Navy and Air Force have successfully built a scientific station at the geographic South Pole.

This is a tremendous accomplishment, unique in polar discovery and exploration. Think of what it means, in terms of obstacles overcome and promise of scientific rewards!

The base, now manned and operating, stands on a nearly featureless, 9,200-foot-high ice and snow plateau. Around it swirls the world's cruelest weather; early winter temperatures there already have plunged to −72° F. and likely will drop lower than −100°.

IGY Stations Encircle the Earth

This South Pole Station, itself without counterpart, is, however, only one of more than 1,000 that will furnish data for the International Geophysical Year—popularly, the "IGY." From July, 1957, through December, 1958, 58 nations will make concerted studies of the earth sciences in this global effort to enlarge man's knowledge of his physical environment. Highly skilled civilian specialists, selected with the approval of the U. S. National Committee for the IGY, man the American bases jointly with Navy personnel.*

As Officer in Charge of U. S. Antarctic Programs, I am proud to have a part in bringing this ambitious conception to fruition.

In January, 1956, I made a survey flight to scout conditions at 90° South, a year before the scheduled installation of the IGY station. For the sixth time in history, human beings were at the South Pole. For the third time, I was looking down upon it.

At my side in the airplane sat Dr. Paul A. Siple, who had been with me on each of my four previous antarctic expeditions.

Away back in 1928 a contest was held by the Boy Scouts of America to name one Scout to take part in my first expedition to Antarctica. From thousands of candidates the choice was narrowed to six and then, with my full consent, to Paul Siple.

That meeting comes back to me clearly.

* See "The International Geophysical Year, Man's Most Ambitious Study of His Environment," by Hugh L. Dryden, NATIONAL GEOGRAPHIC MAGAZINE, February, 1956.

Underwood and Underwood

1928: Scout Siple Reports to Explorer Byrd

Nineteen-year-old Eagle Scout Paul A. Siple, of Erie, Pennsylvania, was selected in a nationwide contest among Scouts to go on the first of Admiral Richard E. Byrd's antarctic expeditions. Here, meeting in New York City, the two men begin a close partnership that lasted nearly 30 years and during five expeditions to the southernmost continent.

I took an instant liking to the tall, 19-year-old Eagle Scout (above). He had earned 60 Scout merit badges, two-thirds of those offered at that time.

On that pioneer expedition, even as an inexperienced youth, Siple cheerfully accepted duties that others shied away from. At our first Little America he served willingly as longshoreman, dog-team driver, and bird and seal skinner.

Siple did so well in all that we asked of him that I appointed him assistant to the scientific staff. His special duty was to study marine animal life.

A few days later, Siple was with me in a small boat when a herd of killer whales chased us. At the last moment we leaped ashore on a tongue of ice. I still have to chuckle, recalling the merciless ribbing the men gave Siple the next day. "Why aren't you out in the bay studying the killer whales?" they taunted him. The young man faced up to the gibes with his characteristic wide smile.

After graduation from college, Siple went on to study geology and climatology at Clark University in Worcester, Massachusetts. His doctoral thesis, *Adaptations of the Explorer to the Climate of Antarctica*, has proved a gold mine of information to students of the southernmost continent.

On subsequent expeditions Paul Siple's fine talents were of tremendous help to us: he served as sledge-party leader, navigator, biologist, geologist, glaciologist, and supply boss. He installed the Bolling Advance Weather Station, where I spent four and a half months alone in 1934. Siple constantly grew with the job: on each new antarctic venture he shouldered heavier responsibilities.

Since World War II, when he directed

weather and clothing research for the Army, Dr. Siple has been a military geographer with the Army, for his special knowledge of environmental problems, particularly of Antarctica, is an invaluable asset.

In 1955-56 Siple went once again with me to Antarctica, this time as my deputy and also as Director of Scientific Projects for Navy Operation Deep Freeze I.*

A few months later it came time to pick a scientific leader for the scheduled South Pole Station. In my view there could be only one choice—Paul Siple. Such an important decision, however, had to be entirely his.

Dr. Siple's acceptance ensured strong and capable leadership for the first team of scientists to live at the South Pole.

We have named the new base the Amundsen-Scott IGY South Pole Station, commemorating Captain Roald Amundsen and Captain Robert Falcon Scott, the two immortal explorers who raced to the Pole, Amundsen reaching it first on December 14, 1911, Scott on January 18, 1912.

When the South Pole Station was inaugurated in January, 1957, I was honored to receive messages applauding the success of our efforts from President Eisenhower, King Haakon VII of Norway, Prime Minister S. G. Holland of New Zealand, and Mr. Selwyn Lloyd, United Kingdom Secretary of State for Foreign Affairs. A base of importance so obvious that men like these took special note of its establishment naturally demanded outstanding leadership. And this, I am confi-

* See "All-out Assault on Antarctica," by Rear Adm. Richard E. Byrd, NATIONAL GEOGRAPHIC MAGAZINE, August, 1956.

1947: Two Veterans and a Newcomer Pay a Call on Little America II

Returning on Operation Highjump, Admiral Byrd dug down 15 feet in the snow to uncover his second antarctic quarters. There he found a corncob pipe left behind in 1935, a cache of butter, meat, crackers, pineapple, and chocolate, and a 13-year-old copy of the NATIONAL GEOGRAPHIC MAGAZINE.

Paul Siple opens a box of sugar, unchanged after more than a decade. Lt. Richard E. Byrd, Jr., making his first trip to the Antarctic, holds a book from the Admiral's long-forgotten polar library.

David S. Boyer, National Geographic staff

Admiral Byrd's Dream Comes True: Aerial Freighters Conquer Once Invincible Antarctica

When the explorer first flew over the Pole in a lumbering trimotor 28 years ago, he foresaw the day when planes would break the continent's isolation. Here the Douglas Globemaster *City of Peoria* sweeps over Beardmore Glacier on the route to the Pole. In moments it passes a full day's march for earthbound adventurers Shackleton and Scott, who followed this river of ice to the polar plateau in 1908 and 1911.

dent, is exactly what Dr. Siple is giving his scientific coworkers at the South Pole.

How splendidly, in the 29 years between our first meeting and the current United States assaults on Antarctica, has this faithful associate lived up to his promise as scientist and leader of men!

I can say with frank and full-hearted pride that the progress and achievements of Paul Siple throughout our long and close association have been for me a profound satisfaction.

A Cherished Relationship of 32 Years

I am delighted that Dr. Siple's engrossing story of the infancy of our new South Pole Station is appearing in this issue of the NATIONAL GEOGRAPHIC MAGAZINE. Especially is this true, since the warm friendliness built up during 32 years between the National Geographic Society and me has been one of the cherished relationships of my life. The officers and staff of The Society have given me all-out support in every major venture of my exploring career.

Among my dearest friends I gratefully number Dr. Gilbert Grosvenor, Chairman of the Board of Trustees, formerly President of The Society and for 55 years Editor of its Magazine, and Dr. John Oliver La Gorce, Vice-chairman of the Board of Trustees and recently retired as President of The Society and Editor of its Magazine. Dr. Melville Bell Grosvenor, newly elected President of The Society and Editor of the NATIONAL GEOGRAPHIC MAGAZINE, I have known and much admired ever since he was a young man.

I am greatly proud that the continuing record of my adventures in exploration and discovery has been published in the National Geographic.

Each of these narratives of my travels and researches has aided, I hope, in the preparations for later expeditions by many nations. And it is constantly my desire that the written record of my polar journeys shall help light the way for the seekers and finders from all countries who accept the siren challenge of Arctic and Antarctic.

We Are Living at the South Pole

U. S. Scientists and Navy Men, Dug In at the Bottom of the World, Brave the Long Polar Night to Study Secrets of Earth and Sky

By Paul A. Siple

Scientific Leader, Amundsen-Scott IGY South Pole Station

With Photographs by David S. Boyer, National Geographic Foreign Staff

While the world's first scientific station at the South Pole was being established, Dr. Siple dictated a running account for this *National Geographic Magazine* article as a permanent record of that historic event. The fourth and final tape recording went out on the last plane to leave the polar station before the winter night set in.

Still in touch by short-wave radio, Dr. Siple recently was asked, "Have you experienced any notable surprises? Has anything turned out to be different from what you expected?"

"We have been having so much wind," came the answer from the tall antenna in the darkness at the bottom of the globe. "We have also had very high clouds—we did not expect such high clouds here—and frequent snow. The wind has rarely if ever dropped below 6 to 8 knots and sometimes is much higher."

"What has proved to be your most challenging, most difficult problem?"

"The problem of supplying snow for our snow melter," he replied, to our astonishment.

"Since the temperature has dropped to the minus 80's," he explained, "it is extremely difficult to go outside for snow for water. We have had to tunnel a 'snow mine' beneath the camp. We designate four men each week to dig; we call them the Snowflake Brigade."—*The Editor.*

SOON after I dictate these words at the South Pole, the summer sun will be gone.

For months it has toured in constant circles around our sky, morning, noon, and midnight. Now it skims the round horizon, casting long purple shadows across the snow. In a few more weeks it will disappear altogether, and we shall be in darkening twilight.

No man has ever seen the sun set at the South Pole before. No one has ever spent a winter night at the very bottom of the earth. But when you read this in July, it will be midnight here.

South Pole Base Expects 120° Below

Already it has grown much colder. Blizzards rage more often than before. The warm zero weather of summer is only an elusive memory. Our thermometers show 40°, 50°, sometimes even 60° below zero.

We are wearing face masks and breathing with difficulty as we struggle to finish the first base ever established at the South Pole before winter hits us with all its fury.

There is no question in my mind that during our six-month-long night we shall know the coldest temperatures ever faced by man.

The thermometers outside in the instrument shelter, which we must check religiously every three hours no matter how grim the weather, are certain to plunge below the world's record of −89.7° F., set in 1933 at Oimyakon, Siberia. Here at the polar station, my calculations show, we may have to endure the frightening unknown of 120° below zero, or even lower!

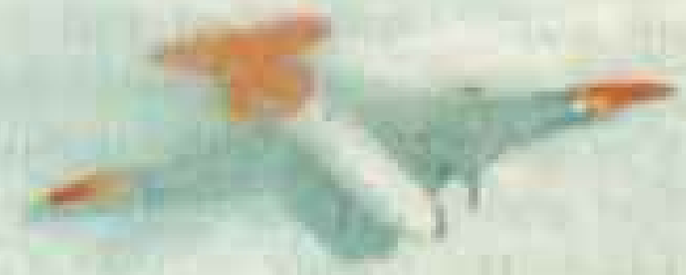
But the weather, after all, is one of the reasons we volunteered to come here.

Sizzling Steaks and Beethoven

Eighteen of us, nine U. S. Navy men and nine civilian scientists, are dug in to study weather and stars, to measure earth tremors and magnetism, to investigate ions in the upper air and eons of time recorded in depths of glacial ice beneath us. Ours is only one of 44 IGY scientific stations of 10 countries on the vast, white, essentially unexplored Antarctic Continent (map, page 15).

As I look through a skylight at the orange glow of the sinking sun and think of the darkness and lonely months ahead, I cannot help marveling at the fact that we are here at all. Even though our plans for the first base at the South Pole began more than three years ago, its realization seems incredible.

I glance around our warm mess hall. Chester Segers, our Navy cook, is turning a dozen boned T-bone steaks sizzling on his stove. Navy technician Earl Johnson is reading for the third time this afternoon a letter



First Plane Lands at the South Pole. Navy Men Plant the Stars and Stripes on a Frozen Sahara

Until Rear Adm. George J. Dufek, commander of Task Force 43, and six other Navy men touched down on the 9,200-foot-high plateau last October 31, no one had set foot at the Pole since the British party led by Robert Falcon Scott, in January, 1912.

Could a plane land at the Pole? When this ski-equipped transport left McMurdo Sound, no one knew. Some pilots believed the surface was too soft; others feared hard wind-blown ridges of snow.

Developments in flight eased no one's mind. Oil leaked heavily; flashing signals warned falsely that landing gear would not lock in place. But the venerable Douglas R4D Skytrain, oldest aircraft in U. S. Navy service, droned on. At last the navigator announced, "We are over the Pole!"

As feared, the landing was rough; snow proved to be hard rather than soft. Reversing normal procedure, the pilot landed with the wind, to keep the sun at his back; the plane's shadow gave him depth perception on the huge white plain.

Hacking a hole in close-packed snow, Admiral Dufek and his party cached a paper certifying their landing; atop it they placed the American flag. Within minutes faces began to turn white with frostbite in the 58-below-zero cold.

Take-off was harrowing. The skis froze fast; 15 JATO bottles —jet assisted take-off charges— were fired to lift the plane.

Here the R4D prepares to blast off. An Air Force Globemaster, from which this picture was made, circles overhead, its vapor-trail shadow streaking the surface.

Trampled path leads from plane to barely visible flag.

As the International Geophysical Year gets under way this month, more than 300 Americans are quartered at seven lonely outposts in Antarctica. The long polar night shrouds them in darkness; the world's worst weather rages about their snow-drifted huts.

To set up the stations, including one at the South Pole, 3,500 Navy and Air Force men battled blizzards and ice during Operation Deep Freeze II.

from his girl in West Palm Beach, Florida. A few minutes ago he showed me the postmark. Seven days to the South Pole!

On a lounge chair sprawls lanky Lt. (jg.) John Tuck, Jr., officer in charge of military personnel. His silky brown beard is the envy of the whole camp (page 22). Jack's eyes are closed, while softly, near his ear, a high-fidelity tape recorder lulls him to sleep. At the South Pole he is listening to Beethoven!

Modern Explorers Arrive by Air

The last polar explorers ever to sleep here had virtually no comforts at all. Many times we have thought of Britain's Capt. Robert Falcon Scott and his four companions, who pitched a trail tent here on the snow 45 years ago.

Their wet sleeping bags gave them only fitful rest. Hard biscuits, horsemeat, and pemmican, a greasy mixture of beef, fat, cereal, and powdered fruits, were their only staple foods. So little even of these did they have that visions of food obsessed them.

It was January 18, 1912, when Captain Scott and his men planted the Union Jack at the Pole. They were heartbroken to find a Norwegian flag already there. Roald Amundsen and four other Norwegians had reached the South Pole a month before them.

"Great God! this is an awful place," Scott wrote in a diary later found with his frozen body, "and terrible enough for us to have laboured to it without the reward of priority."

In his wildest dreams, Scott could never have imagined the modern comforts we enjoy today at the South Pole. But it hasn't been easy, even in the age of the airplane.

In 1929 Admiral Byrd, only 18 years behind Amundsen and Scott, became the first to fly a plane over the Pole. But not until 1956 did human beings stand again on the polar snow where Scott had camped.

When Rear Adm. George J. Dufek and six companions landed a U. S. Navy plane on the flat, almost featureless polar plateau on October 31, 1956, they found the temperature 58° below zero (pages 7, 10, and 11). A 10-mile wind made it the equivalent of nearly twice that in its effect on human flesh.*

The seven men were on the ground 49 minutes. Wielding an ax to chop a hole for the United States flag in the crusted snow, Admiral Dufek paused to look at his crew members. Patches of white skin showed that some faces were already freezing.

"You have frostbite on your face, Doug," he said.

"You have it too, Admiral," replied Capt. Douglas Cordiner.

"Let's get . . . out of here!" Admiral Dufek shouted.

But getting out was not so easy as landing. Skis of the Navy R4D were frozen to the snow. Fifteen JATO (jet assisted take-off) propulsion bottles were required to blast the plane free and into the air.

Through the frosted windshield the pilot, Lt. Comdr. Conrad "Gus" Shinn, could see nothing. He took off on instruments. At 60 knots he reported, "We're flying!"

"That's not flying speed, is it, sir?" protested crew chief John Strider.

"It sure isn't," Shinn said. "But we're flying."

Engine oil was leaking. Red warning lights flashed on Shinn's instrument panel. Finally someone pulled a circuit breaker, blanking out the ominous lights. As the Navy boys put it, it was "pretty hairy."

Hours later, safely back at McMurdo Sound on the Ross Sea, Admiral Dufek told us:

"This is too early in the season. It's too cold to operate up there, and it would be humanly impossible to do outside construction work. I'm not going to put men up there until conditions are better."

Airstrip Built on Antarctic Ice

As commander of U. S. Naval Task Force 43 and Operation Deep Freeze, Admiral Dufek was charged with installing and maintaining seven bases and scientific stations in the Antarctic. One of them was to be at the South Pole; the men he spoke of were 23 Navy men, volunteers who were ready to risk their lives to build it. Because I was to be scientific leader at the Pole, I would fly in with the construction crew.

For nearly three weeks we marked time waiting for the cold to lessen, while our planes stood by on the McMurdo airstrip.

During the last bitter winter night, the Navy had carved a 6,000-foot strip on the snow-covered sea ice of McMurdo Sound, nearly 850 miles from the Pole. Laboring 12-hour shifts under searchlights at temperatures close to –60°, the men had worked in

* The full story of this historic landing appears in Admiral Dufek's book, *Operation Deepfreeze*, published by Harcourt, Brace and Company, New York, 1957.

↑ These Seven Were the First Americans to Stand at Earth's Southernmost Point

Left to right: Rear Admiral Dufek; Petty Officer 2/c John P. Strider, crew chief; Lt. Comdr. Conrad S. Shinn, pilot; Petty Officer 2/c William A. Cumbie, Jr., radioman; Capt. Douglas L. Cordiner, observer; Lt. John Swadener, navigator; and Capt. William M. Hawkes, copilot. After the photograph was made, the Navy group left McMurdo for the Pole in their plane, *Que Serd Serd* (What Will Be, Will Be).

↓ JATO Boosters to Hurl a Plane Skyward Ride the Belly Like Rows of Bombs

Rarefied air and sandlike snow freezing to skis make take-off runs nearly impossible at the Pole without the added power of expanding gases from a battery of JATO bottles. Seventy-seven pounds of fuel in each container ram a plane forward with a thousand-pound thrust. Empties are discarded in flight. Here, beneath an R4D at McMurdo Sound, a mechanic removes seals that protect the charges from exposure to weather.

relays, ducking frequently into shacks on the 15-foot-thick ice to warm up.

From this strip huge four-engined Air Force Globemasters would fly a total of 760 tons of packaged building materials, food, fuel, and scientific equipment to the site of our South Pole base. They would airdrop all this to us after we reached the Pole.

"Big Eye" Strikes the Base Party

These were anxious days for the volunteers impatiently standing by at McMurdo. Their job would be to land, find the geographic pole by sun sights, and construct the base.

While we waited, Lt. (jg.) Richard A. Bowers, Navy construction officer, kept his men busy rechecking plans and equipment. I had watched this young officer for weeks. Dick was a fine leader. His men would have followed him to the end of the world. As a matter of fact, they were going to.

Perpetual daylight brought nervous tension and sleeplessness. Often we stayed up around the clock, drinking hot chocolate and coffee and debating what life would be like at the Pole—if we got there.

Through the windows of our barracks the never-setting sun watched us every minute. We became victims of the familiar antarctic malady, the "Big Eye." Our eyes became swollen and inflamed. When exhaustion finally caught up with us, we slept in the light.

But Dick Bowers's big day finally came. On November 19 I watched Dick and "poodle pusher" Richard J. Prescott load 11 sledge dogs on two aged but valiant ski-equipped R4D's (page 12). I shook hands all around and waved as the eight-man advance party took off for the South Pole.

Temperature was −29° when men and dogs were unloaded safely on the polar snow. They pitched trail tents and set up a theodolite to take sun angles. Moving from place to place, Bowers and his crew gradually closed in on the geographic pole. To make traveling less arduous for this advance party, two sledges and a weasel—the tracked vehicle so valuable in modern polar work—were sent parachuting down to Bowers and his men by courtesy of the 52nd Troop Carrier Squadron, 18th Air Force (page 16).

Bad luck, however, floated down with them.

Frozen Fast, *Que Será Será* Hugs the Pole; Whirling Propellers Kick Up a Blizzard

U. S. Navy, official

11 U. S. Navy, Official

Polar Visitors Work Rapidly; 58-below-zero Cold Discourages Loitering

Explorers Dufek (right) and Hawkes talk into a movie-camera microphone. The apparatus froze; only still photographs recorded the event. Radar reflector was left behind to help future flights locate the spot.

The weasel transmission and battery cases were cracked. Replacements took days to arrive. Meanwhile, as had the Norwegian discoverers of the South Pole, the Americans traveled by dog team. When Dick pronounced the Pole found, he was eight miles from where the plane landed.

Airman Parachutes to South Pole

Then Globemasters started regular deliveries. The first man ever to parachute to the South Pole, Air Force T/Sgt. Richard J. Patton, jumped from a Globemaster. He went to work at once on a ground-to-plane radio as controller for air deliveries.

Food, fuel, buildings, lumber, a D-2 tractor, and radio equipment rained from the sky. Ten more Navy men were landed. In a week, the South Pole advance camp turned into a growing base.

Now it was my turn. I said goodbye to Howard O. Wessbecher, who had spent a year preparing the South Pole equipment for air drop, and headed for the bottom of the world.

As I flew to the Pole, I wondered how they felt, those young volunteers up there alone on that white polar nothinguess. Did they doubt their ability to handle this cold, frightening job? Were they worried?

When my plane jounced onto the snow at the Pole, I found out they were working too hard to be worried. The first insulated-fabric Jamesway huts were up, and the job of finding, digging out, and dragging in air-dropped gear was well advanced. The place was busy as an anthill (page 32).

The first day after landing I went out with a shovel, a snow saw, and a strong curiosity to find out how cold it was far down in the snow. This deep temperature would give a clue to the average annual temperature at the Pole.

I must have moved three to five tons of snow in that first day's work, digging my hole and an access ramp. The high altitude had me breathing pretty hard. In four days I had a pit 18 feet deep, and my thermometers showed −62°. That's about 50 degrees colder

In the Lee of Mount Erebus, ➔ Sailors Lead Sledge Dogs Aboard a Transport

Three weeks after Admiral Dufek's historic landing, eight men and eleven dogs flew to the polar plateau from the newly built airstrip on McMurdo Sound.

Their departure signaled the start of a daring airlift. Throughout the antarctic summer, planes shuttled back and forth 84 times to the bottom of the world.

Navy transports such as this R4D delivered construction workers, food, scientific equipment, and wintering-over personnel. Air Force Globemasters dropped 760 tons of packaged building material, fuel, and supplies.

Two ski-equipped R4D's landed the advance party within eight miles of the Pole. The men camped at the spot for two days; then, with dogs pulling a loaded sledge, four of them hiked the grueling last lap; the others came later by weasel.

The dogs remained at the polar station while it was built. Had a plane crashed near the base, they would have led rescue operations. Fortunately they were not needed.

The furrowed cone of Mount Erebus, rising 13,200 feet above McMurdo Sound, wears a cloud cap. Expeditions of British explorers Robert Scott and Ernest Shackleton based beside the doring volcano half a century ago.

← Paul Siple's Sunglasses Mirror McMurdo's Flurried Activity

Dr. Siple, scientific leader at the polar station, has spent three winters and nine summers —nearly five years—in Antarctica.

As a 19-year-old Scout, he accompanied the first Byrd expedition to Antarctica in 1928. On four later expeditions—in 1933, 1939, 1946, and 1955—he journeyed south with Admiral Byrd. He has lived longer on the remote continent than any other American.

Dr. Siple and 17 other volunteers are now wintering at the Pole, the first men to attempt such a feat of survival. Living in snow-banked houses, they observe and study weather conditions, auroras, and other natural phenomena as part of the IGY program.

Dr. Siple and his companions have bidden farewell to the outside world until October. Radio is their only contact. On March 21 the sun disappeared from sight, not to reappear for six months. Outside temperatures may drop as low as 120° below zero.

➔Skis in hand, Dr. Siple prepares to board the transport plane that carried him to the Pole. Navy men load fragile weather instruments and radio equipment.


UNITED STATES NAV
17163
XO


GLASS

than the annual mean at Little America.

Just going from one building to another inside our snow tunnels will be a serious proposition. My pit temperatures indicate these tunnels may go below –60°. Every time we leave our quarters to eat, work, wash, see a movie, or get a midnight snack, we shall have to dress to the teeth.

Even at –60° men sometimes find themselves spitting blood. The capillaries of the bronchial tubes break down. To prevent this, we have anticold "gas masks." During World War II they were a secret weapon, for they made it possible for men to operate where no enemy might expect to find them.

It is a simple device, this face mask. As you exhale, some of the heat and moisture of your breath is absorbed in a pad of steel wool. Then, as you inhale, the dry, frigid air is warmed and humidified by the wool. The mask soon becomes filled with ice, but you merely crush the nosepiece with your gloved hand and shake the ice out.

But my snow pit had a more immediate purpose than estimating temperatures. I had brought equipment to check density of the snow as well. Col. H. A. Crosswell, commanding the 18th Air Force Globemasters delivering our supplies, was wondering about the possibility of landing those largest operational transport planes in the world on the polar snow. Was it hard enough?

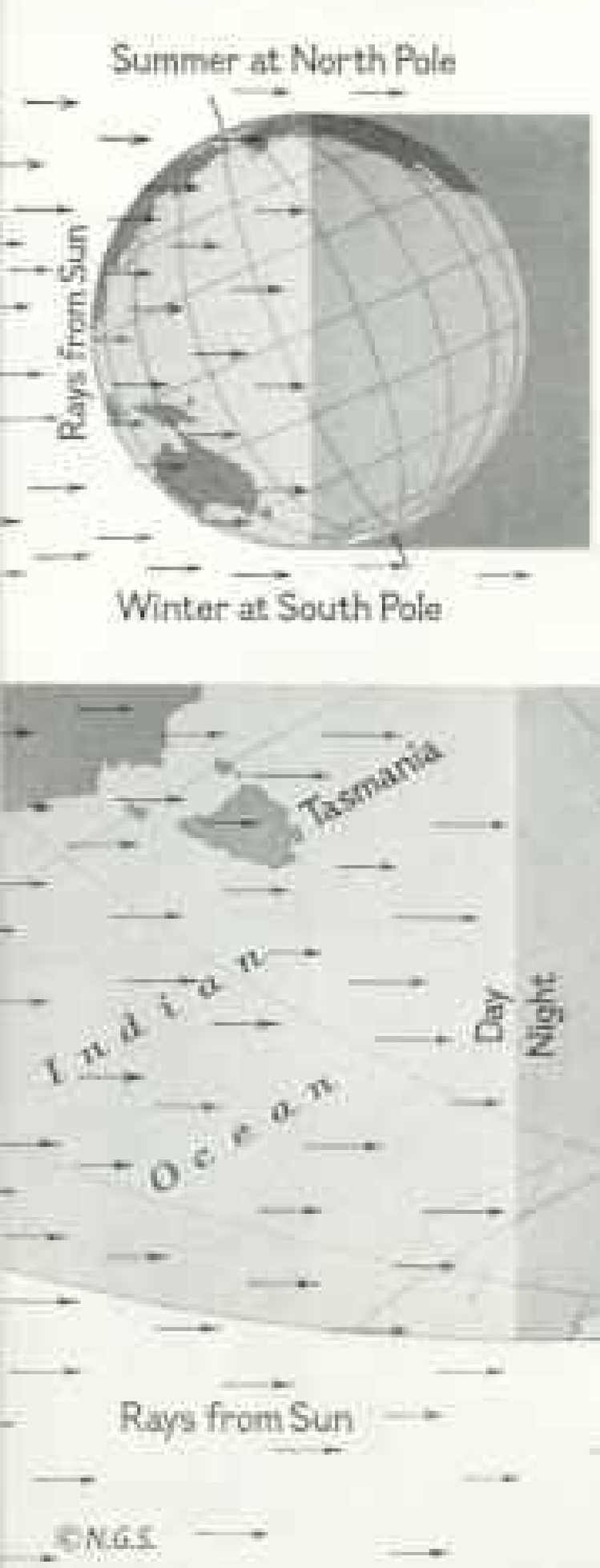
My instruments gave the answer: No. The freight shipments would have to come by airdrop.

Pole Someday May Have Atomic Power

But one day, if occupation of the Antarctic becomes an accepted thing, we may have nuclear reactors at places like the South Pole. Atomic heat could enable us to melt large quantities of snow to build permanent ice runways. The day may not be far off when Globemasters can land here just as they do on the sea ice at McMurdo Sound.

With me had arrived the last of the Navy construction crew. Now they were working like fury, anxious to get the job done and get

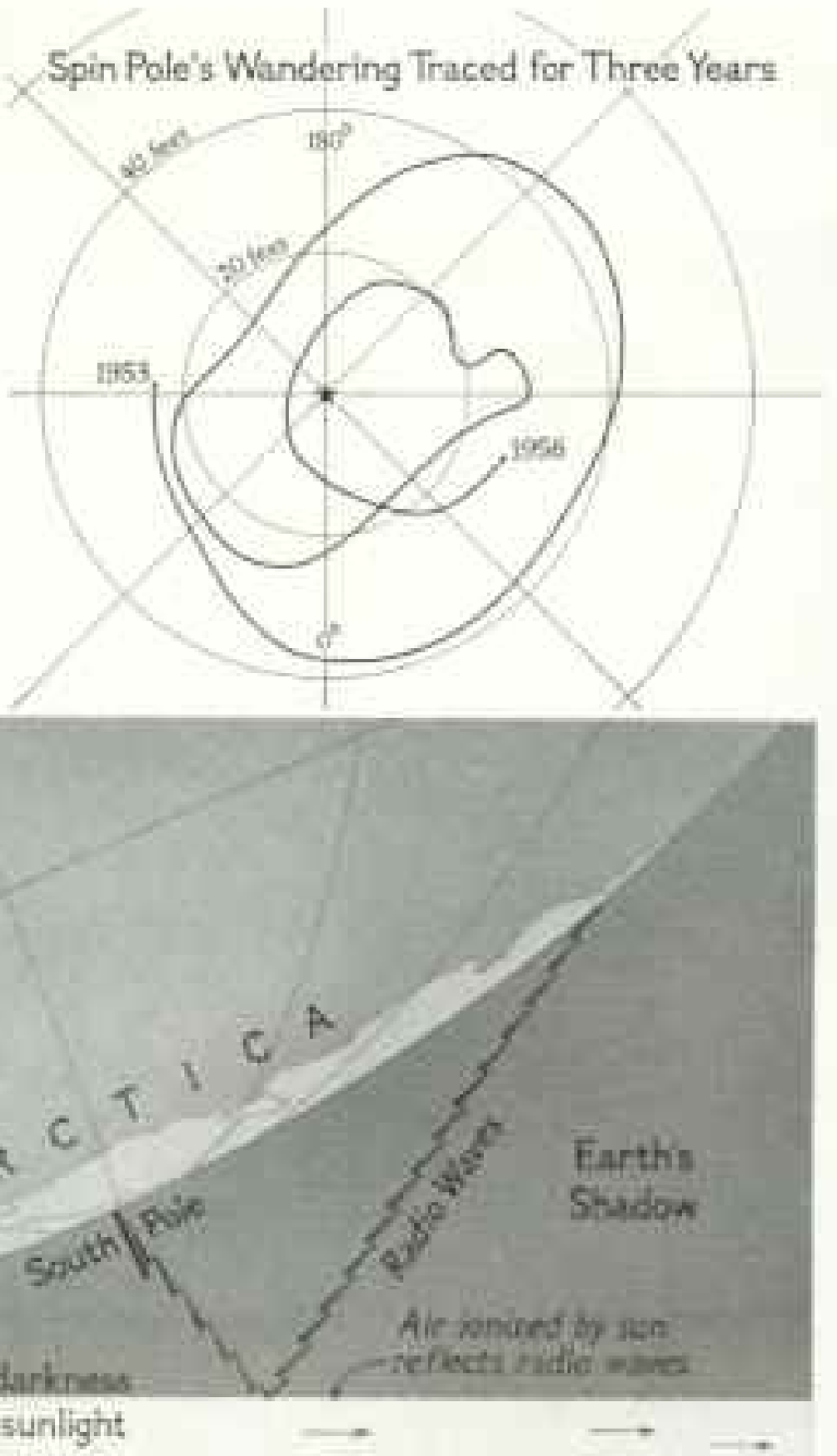
Based Near the Wavering Spin Pole, Men Will Probe Earth's Secrets During the Winter Night

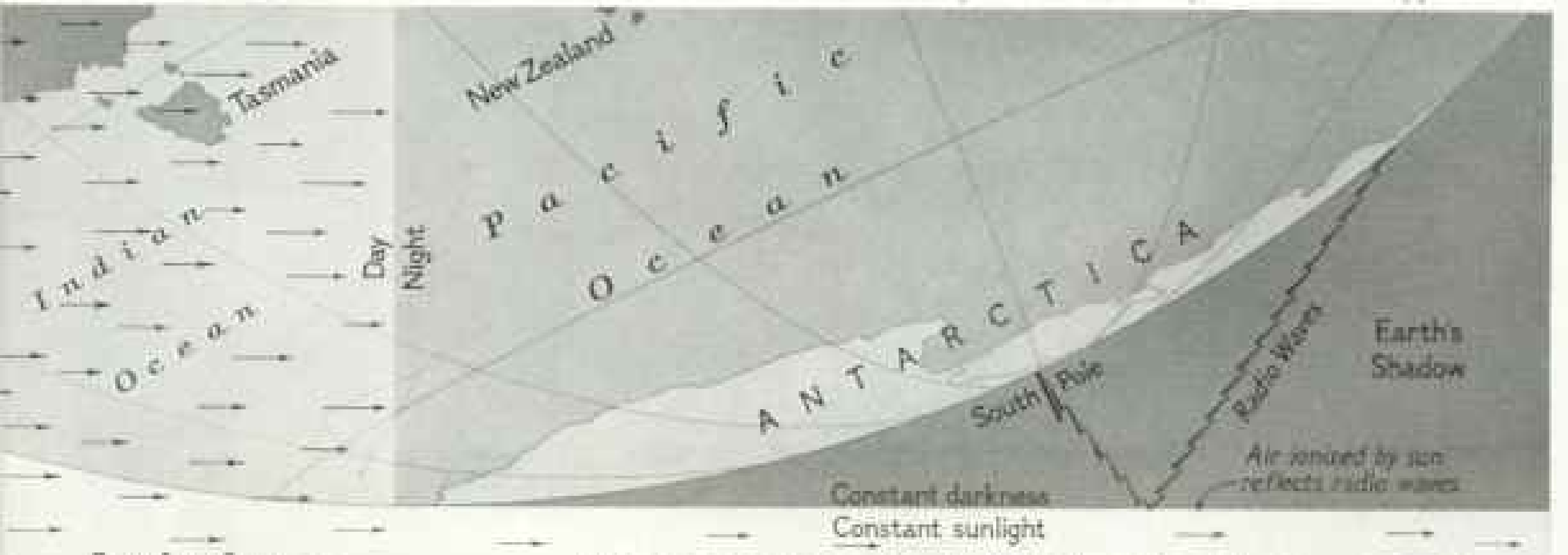


Countless physical changes keep the spinning earth slightly out of balance. Diagram at right shows how much the globe has wobbled on its axis during the last three years. If an observer at the geographic South Pole (star) could see the "spin pole," it would appear to move around him in an exceedingly slow, erratic arc.

Drawing at left illustrates how the tilt of earth's axis produces the long polar night.

Below: Though winter darkness shrouds the South Pole, sunlight slants through space above it.





Solar energy charges, or ionizes, the atmosphere. During the winter, air near the pole is shielded from the sun and not affected. This condition is ideal for studying the sun's effect on the upper air.

15

44 Outposts, Manned by Scientists of Ten Nations, Dot Little-known Antarctica

The frigid land mass, nearly twice the size of the United States, averages 5,000 feet above sea level—higher than any other continent. IGY studies here will yield greatly increased knowledge about the upper atmosphere and near-by space, bringing improved weather forecasts and radio communication.

out. Permanent personnel would not come in till the polar base was nearly finished. Until then, I was resigned to feeling a little lonesome. I was the only one here who would winter over.

These Navy men, mostly Seabees, could certainly make the chips fly. But the chips lay where they fell. The crew had deadlines to meet; yet to me, with a winter night ahead, every piece of scrap was important. Sometimes, it seemed, I spent ten hours of my 12-hour workday picking up bits and pieces.

Even now, every time something is uncrated, I collect the debris. Every chunk of wood, every stitch of canvas, every length of wire, I try to have sorted and placed under cover. During the long winter months ahead we can't send out to the corner store every time we need something. And this is a place where not a stick of wood grows.

During those early weeks we usually didn't get up in the "mornings" until nearly noon, for the Globemasters arrived in the afternoon. Work then went on until 11 or 12 p.m. Sometimes the dropped equipment wasn't all retrieved till long after midnight.

On a typically clear day the roar of airplane engines overhead switches some of us from other work to the drop zone. A red-trimmed silver Globemaster circles the Pole station (page 32). Every ten minutes it flies around the world. And every ten minutes it crosses the 180th meridian, the world's date line, droning nonchalantly from today into tomorrow and back again.

Men Work in a Weird Setting

I join Sergeant Patton. In thermal boots, down-lined parkas, blizzard-proof trousers, mittens, gloves, and anti-snowblindness goggles, we look a little like deep-sea divers. We waddle out of orange-painted buildings prefabricated of aluminum, glass-fiber board, and plywood. A white, flat world stretches away as far as eye can see, without a hill, tree, change, or break.

Already at the drop zone, Chief Petty Officer Charles M. Slaton rides the growling D-2 tractor we use to drag airdrops into camp. Slats usually wears no parka, only a sweater. Of course our midsummer temperatures are averaging only about zero, but, still, he must be pretty tough.

Colonel Crosswell's plane comes in for the first drop of the day. Patton's radio is tuned to conversation inside the plane:

← An Airlift Plane Gulps a Load of Parachutes

Air Force Globemasters, unable to land on the polar ski-plane airstrip, dropped machinery, equipment, and prefabricated buildings to construction workers. Parachutes eased the fall and prevented cargo from being smashed and buried deep in the snow. Here a crane hoists folded parachutes.

Below: A pair of one-ton snow sledges lashed together (foreground) and a three-ton weasel were dropped from a height of 2,000 feet.

Two Air Force sergeants attach parachutes to the cargo. The weasel (in back), mounted over the elevator well, will drop first. Rollers, not yet installed, will carry equipment from the front of the plane to the well.

"Cargo doors open!"

"Cargo doors open, sir!"

"Thirty seconds . . .

"Fifteen . . .

"Ten . . .

"Five, four, three, two—drop!"

The Globemaster is abreast of us, over the drop zone. Out of her belly slide three bundles, black against the glaring sun. Behind them, whipping in the slip stream, parachutes struggle to open (pages 24-25).

For what seem endless moments we stand wide-mouthed and silent, praying that the chutes will open. A "streamer" means loss of precious supplies; at the least, Slats Slaton and his men will have to dig the goods out of deep snow. An excited cheer escapes our lips as the parachutes blossom out in gigantic canopies of colored nylon.

There is a 20-mile wind. We rush to cut the parachutes free before they drag equipment across the snow. Then we force the chutes to collapse, and roll them up for salvage. We use nylon and straps from parachutes to cover our scrap piles and cache of oil drums, stretching the cloth over some drop-damaged building beams.

Stars and Stripes Flies from Pole

These airdrop leftovers are also the things that make our camp more livable. Before the barracks building was up, I used a yellow-orange parachute to decorate my corner in the Jamesway hut. Jack Tuck called it "horrendous." But it did brighten up the greenish cast of the Jamesway. It also covered the padding we salvaged from the airdrops to use as insulation on the walls.

Two weeks after I arrived, we also put up our own version of the South Pole—an orange-and-black-striped bamboo barber pole that now stands atop our garage. The Stars and Stripes flies from it, and at its top gleams a silvered glass ball (page 30).

From this spherical mirror the sun now flashes a welcome to incoming pilots. Should we wander over the horizon out of sight of our camp buildings, it might also be a life-saving beacon for us. After the sun sets, I hope that another of these silvery globes that I brought will help me in a problem of scientific photography (page 22).

During the winter darkness, spectral green and yellow patterns brush across the antarctic sky. These are the aurora australis—the southern lights.

To make extreme wide-angle color photographs of this electromagnetic turmoil in the ionosphere, I plan to aim my National Geographic cameras into this spherical mirror. Perhaps that way I'll be able to catch the southern lights shimmering across half the sky in a single picture.

Cost: $1,000,000 a Man

Colonel Crosswell warned us that more and more items would have to be free-dropped. Lumber is coming in without parachutes now. Drop equipment is running short.

We hope they don't run short of airplanes. The colonel hit a snow bank landing back at McMurdo after making a drop here. I talked with him about it by radio. It wiped out the nose wheel, but this can be repaired.

Another Globemaster had crashed weeks earlier, and now a third has landed short, trying to use the smoother first half of the runway, and washed out completely. The pilot broke his leg in jumping out of the burning plane.

This wreckage represents a lot of cold cash.

There is no calculating the exact expense of setting up this science station at the Pole. Money comes from the Army, Navy, Air Force, and Marine Corps, and also from appropriations to scientific organizations through the National Science Foundation. But as I try to comprehend the effort to put us here, I can only guess that it will cost a million dollars each to station 18 of us here for a South Pole winter.

That may seem a great deal of money. But those of us experienced in modern science have no doubt the taxpayer will get his money's worth. Facts uncovered during the International Geophysical Year will be of in-

Winging Back from the Pole, a Globemaster Roars over the Queen Maud Range

Continental Antarctica, rising nearly two miles at the Pole, suffers temperatures averaging many degrees colder than the sea-level Arctic. Winds are the most constant and violent in the world. Frigid blasts whistling down a funnel-like tributary of the Beardmore Glacier (left) have stripped these mountainsides bare.

19

Wind-swept Peaks Thrust Through a Flowing Sea of Ice and Snow

To build and supply seven U. S. stations in this desolate land cost the lives of seven Navy men during Operations Deep Freeze I and II. Landings on a rough ice runway damaged three Globemasters. Bright tail and wingtips worn in antarctic service help locate aircraft forced down on the snow.

estimable value. Scientists with theories and ideas will put the knowledge we gain to work, and the lives of people all over the world will be affected.

We are not the only explorer-scientists wintering over at a polar station. On the edge of Antarctica, in Wilkes Land, French scientists are located near the magnetic pole. The Russians plan to occupy a base near the south geomagnetic pole, 794 miles away in the direction of Australia.

Scientific Data Freely Exchanged

Some people, I know, find it difficult to believe that such stations in Antarctica are truly part of a peaceful, open, international, scientific research effort. They question the avowed free exchange of scientific discoveries among IGY nations. They point out that American armed forces built our antarctic bases. They even circulate rumors we are planning to use Antarctica for testing atom and hydrogen bombs.

These rumors are definitely not true.

Nor do we have any plan to search here for uranium or to test guided missiles. The United States, and other nations as well (so far as we know), abide by the peaceful purpose and agreements of the IGY.

The reason our armed forces installed the South Pole Station and others is simply that they alone have the ships, the planes, the manpower, and the know-how to overcome the problems posed by this grim climate.

Admiral Dufek radioed us appointing Jack Tuck officer in charge of military personnel at the polar station. I approved heartily; he couldn't have chosen a more serious and capable young explorer.

Of the 18 of us wintering over, Jack and I are the only veterans of a previous antarctic night. Jack majored in geography and has decided to make the polar regions his profession. It is good to have his kind of company.

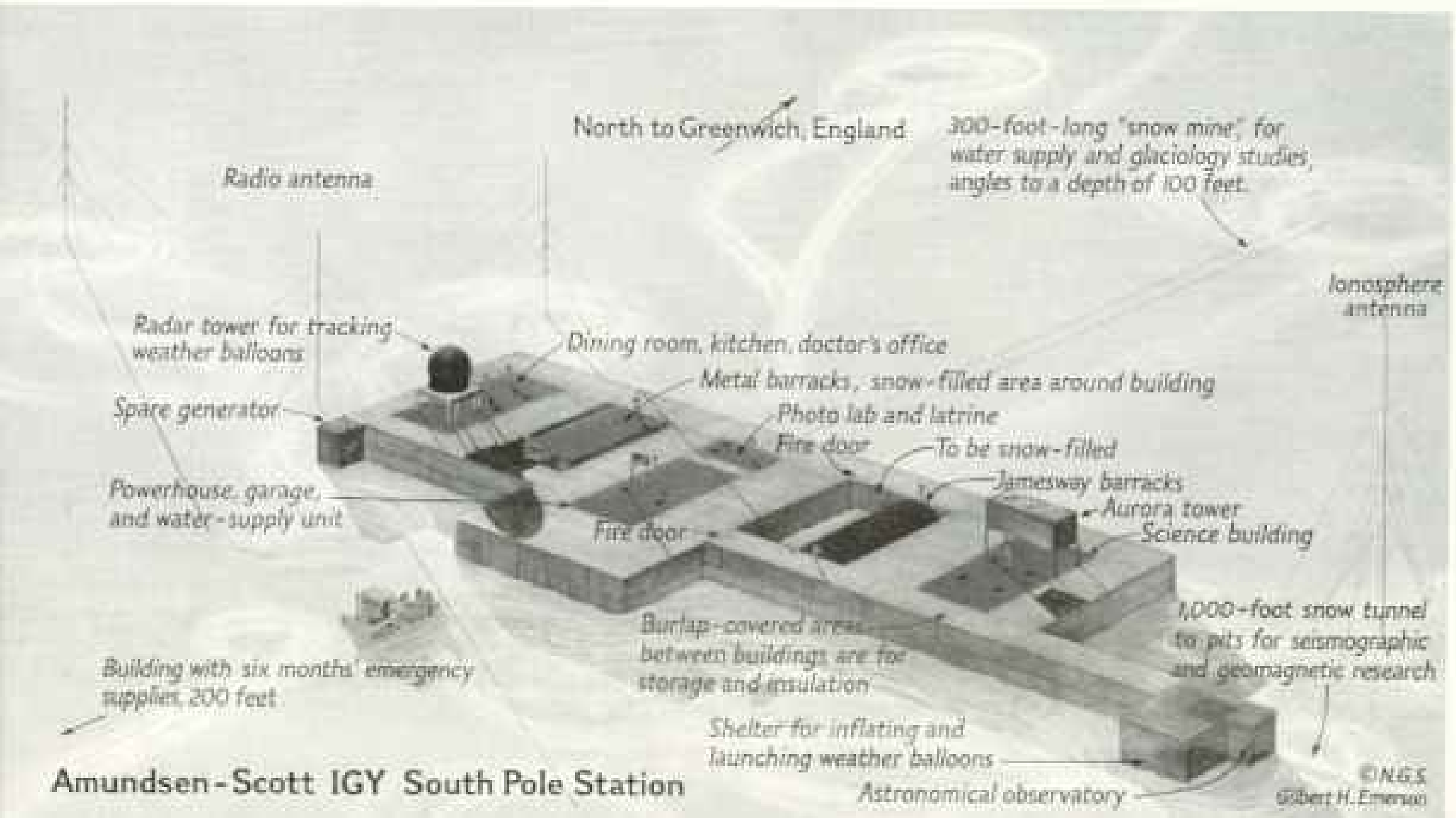
Sometimes I wonder whether wintering-over is becoming old hat for me. I have already spent three winters and nine summers in the Antarctic—by next summer a fifth of my entire adult life.

Antarctic living is changing, however. It seems a bit strange to have hot water, warm latrines, shower baths, clothes-washing machines, and even electric sunlamps. In the good old days we got along for weeks without a bath or a change of clothes. We called ourselves the Knights of the Gray Underwear.

Holiday Phone Calls Cheer Families

It is wonderful, too, to be able to talk occasionally with our families back in the States. When radio conditions are good, amateur operators are able to make radio-phone patch connections right to our home-town telephones. On the day after Christmas, and again at ten minutes to 12 on New Year's Eve, I had a chance to talk to my family in Arlington, Virginia; the other men have completed similar calls.

The first ham contact we had here at the polar station was with 16-year-old Jules



Amundsen-Scott IGY South Pole Station

Paul A. Siple

Billowing Nylon, Whipped by 20-mile Winds, Sends a Skier Flying Across the Snow

Parachute-riding ranked as No. 1 outdoor sport in the polar summer. Falls were frequent on the rough surface.

Madey in Clark, New Jersey. It was a big feather in his cap, of course, and he has remained one of our most regular contacts even though it's usually at least midnight by his time when we're talking with him. Apparently he comes home from school, goes straight to bed, then gets up later to man his amateur set. His brother John, I understand, is an ardent ham also.

Wrong Number from the South Pole

The funniest phone call was made by Willie Hough, our seismologist and ionosphere observer, soon after he came in by plane. He wanted to let Mrs. Hough know he had arrived safely, but Jules somehow was given a wrong number on the phone patch.

The man who answered at first accepted the reversed charges but hung up when Willie asked, "May I speak to my wife?" I wonder if he was able to make his friends believe that he had been awakened at 1:30 a.m. by a wrong number from the South Pole!

I can certainly put up with all these modern conveniences. I'm nearly 30 years older than the Boy Scout named Siple who came down here with Admiral Byrd in 1928. I don't suppose I'm as rugged as I was then.

Sitting here with electricity, oil-burner heat, and all the rest of it, I cannot help remembering Admiral Byrd's terrible winter in Antarctica in 1934.*

All alone, he manned a little weather station on the Ross Ice Shelf, 123 miles out from Little America toward the Pole. Carbon monoxide fumes from a faulty stove nearly killed him. For four months and 13 days he

* See "Exploring the Ice Age in Antarctica," by Richard E. Byrd, NATIONAL GEOGRAPHIC MAGAZINE, October, 1935.

↑ **This Mirrored Globe Now Perches Atop a Striped "South Pole"**

Aiming his camera at a similar ball, Dr. Siple (left) will take 180°-angle photographs of auroras and other atmospheric phenomena (pages 17 and 30). Wearing fingerless gloves for picture-making, he discusses the mirror with Lt. (jg.) Richard A. Bowers, USN, who supervised station construction.

↓ **Bravo, Polar Party Mascot: Pampered Pet of Eighteen Masters**

The Siberian Husky-Alaskan Malemute, only animal wintering over at the Pole, is now 10 months old and weighs close to 100 pounds, but retains the bounce and playfulness of a puppy. Here Lt. (jg.) John Tuck, Jr., USN, 25-year-old commander of military personnel at the polar station, checks Bravo's teeth.

remained there by himself, sometimes too weak to eat, until a relief party arrived.

I was a member of the trail party that built Admiral Byrd's one-man advance base, going out across the Shelf in motor tractors. Next spring I may try my hand at trail work again on the polar plateau, this time using our weasel.

The British and the New Zealanders will be coming to visit us next summer, with tractors and dog teams. I think it would be an excellent idea if we could go out 50 or 100 miles across the polar plateau toward the British party coming from the Weddell Sea and also toward the New Zealanders coming from McMurdo to lay courtesy depots with gasoline and food.

Dynamite Blasts Will Plot Terrain

So far as we know, this polar plateau, as large as the United States, is a vast plain of snow and ice thousands of feet deep. Beneath may be mountains and valleys. We do not know. One of the significant contributions of the Anglo-New Zealand trans-antarctic expedition will be a series of dynamite explosions. Timed echoes will give us some idea of the thickness of the ice and conformation of the land below.

Until then, we can only think of the interior of Antarctica as a practically level whiteness going on almost forever, as if a snow-covered Kansas wheat field stretched from New York to San Francisco.

Yet the snow surface here is not so level as I had visualized from flying over it. One of our horizons is less than a mile away, another perhaps 10 or 15 miles. If the weasel goes off toward our north, it soon disappears over the "hill"; if it goes in the opposite direction, we see it for many miles. We are really on a very gentle hillside.

Ice Would Raise Oceans 40 Feet

Of course, every direction from our polar camp is north. To simplify matters, we have our own compass points. Grid North, as we call it, points toward Greenwich, England, on longitude 0°. Grid South is toward Little America, along the 180th meridian, the international date line. Grid East, or 90° East, points toward India, and Grid West toward Chicago.

Many explorers and scientists have guessed at the depth of the ice beneath us. Estimates range far and deep. If the average guess is correct, the polar icecap, if melted, would raise the level of the seas by 40 feet—sufficient to require gondolas in the streets of London and to leave tourists stranded on the steps of the Lincoln Memorial in Washington, D. C.

We intend this winter to dig a shaft 6 feet square and 100 feet deep into this frozen sea beneath us. By taking samples of snow in tunnels at different levels, we hope to collect deep-frozen micro-organisms that may give us some idea of the recent geologic past. Bacteria or pollen grains blown here from Australia, for example, might enable us to calculate whether winds centuries ago blew from the same directions they do today.

We may be fortunate enough to find dust from Krakatau. This Indonesian volcano, which exploded with tremendous violence 74 years ago, left traces in many parts of the world. Discovery of Krakatau dust at the South Pole would help us determine the age of the ice and the accumulation rate of polar snow. To our glaciologist, Edward Remington, there is history locked in ice.*

Bravo Joins Antarctic Party

All of our wintering-over party were screened psychologically. They are good, serious men, deeply interested in what we may discover here. It's important that they should be.

Good men's personalities, I've noted, tend to become better under hardship. The reverse is often true, too. Personalities don't remain in a gray state in antarctic isolation. They turn either white or black.

"Jack," I said to Tuck one night when it was too hot to sleep in the barracks back at McMurdo, "whatever kind of men we turn out to be, we're going to need an emotional outlet."

Jack is one of the calmest people I know. But he's human; my idea was for him, too.

"We'll have no mothers, no wives, no children," I continued. "A man sometimes needs somebody to talk to, somebody to tell things to that are deeply personal. . . ."

I didn't have to go further. Jack knew I had Bravo in mind, his pet Siberian Husky-Alaskan Malemute puppy born at McMurdo.

Bravo arrived on one of the recent personnel flights. Already he's the most spoiled sledge dog alive.

* See "Eruption of Krakatoa," by Sir Robert Ball, NATIONAL GEOGRAPHIC MAGAZINE, June, 1902.

Kodachromes by Paul A. Siple and (below) David S. Boyer, National Geographic Staff

↑ **Globemaster Skims Above the Station. Lumber Splashes Like Bombs in the Snow**

Two dozen Navy men built the base. In midsummer temperatures that hovered between 5° above zero and 25° below, they erected seven buildings connected by tunnels. Weather permitting, Globemasters flying out of McMurdo made up to four drops daily. Most equipment was parachuted; lumber and a few other items were free-dropped from 100 feet. Tents sheltered builders until prefabricated huts were assembled.

→ When parachutes failed, cargo "streamed in." Such mishaps became less frequent after an airdrop controller, T/Sgt. Richard J. Patton, parachuted into the camp and directed operations by radio. His jump was the first ever made at the Pole. Here a tractor crew prepares to pull out a load buried 10 feet deep.

↓ Cargo plunges toward the airstrip used by ski planes.

25

Icicles Drape a Mustache

Words literally freeze on the lips. Goggles prevent snow blindness.

The planes that brought in our wintering-over Navy personnel, and those that took out the last of the construction men, landed on a 10,000-foot-long airstrip leveled by Slats Slaton and his crew.

First they broke up the sastrugi, the wind-blown snow ridges, by dragging a parachute loaded with snow behind the tractor. Later they used a heavy steel-pipe drag and made their runway as smooth as the McMurdo strip. The R4D's and the new Navy P2V7 patrol bombers arriving from the States still had to use JATO bottles in taking off, though. At 9,200 feet the air is a little thin for props to bite into.

Even after we had been here for weeks, Dick Bowers kept taking sun sights from time to time and moving the South Pole around. A little plywood shack, 4 by 4 by 8 feet and standing on a metal airdrop platform, marks the spot; we call it the South Pole Observatory. It's now about 1,200 feet out from camp, along the 132nd meridian; once Dick had it out 4,000 ft.

We know that even now it isn't at the exact South Pole, but only as close as one can come by taking sun elevations with a theodolite. During the winter night, by star sights, we shall get a more accurate fix. But if there is a mountain mass beneath us, pulling the instrument's plumb line to one side, we may still be as much as a mile off.

The time may be far in the future when we can plant a flagpole in the snow and say, "This is it!"

Even Traffic Affects Earth's Balance

Actually, there are three poles beneath us—the balance pole, the spin pole, and the geographic or map pole.

Everything that takes place on or around the earth's surface affects the balance of our whirling planet. A heavy snowfall in Canada, atmospheric pressures flowing over the earth, tides ebbing and flooding, millions of tons of silt carried down the Mississippi and the Nile—all disturb that delicate balance. Even automobile traffic out of New York City on a week end minutely unbalances the earth.

As the planet turns, it tries desperately to spin on its north and south balance poles, but it cannot keep up with everything that happens to it. So it wobbles on its spin poles (diagram, page 14).

Imagine for a moment that you are standing in outer space, watching the earth, like a giant ball of putty, spin on a wire. As atomic explosions, tides, traffic, and vast atmospheric changes alter the earth's balance, the spinning mass wobbles on the wire; as a result, the point at which the wire leaves the putty describes a slow, wavering circle.

To us, actually standing on the south polar icecap, were we to see that wire coming through the snow, the spin pole would wander in a roughly circular track varying from 10 to 60 feet in diameter.

Somewhere within this migrant track of the earth's spinning axis are the elusive balance pole and a point fixed from time to time by astronomers and mathematicians as the geographic South Pole.

One day, perhaps, we'll have telescopes and other instruments here that will enable us to locate the spin pole and even to follow its path, actually marking out the circles on the polar snow. But now, strange as it may seem, we must rely on scientists in Italy to tell us where the spin pole was at any given time, thus fixing the position of the geographic or map pole.

Astronomers Track Elusive Point

Italian mathematicians help provide the world with what we call the International Latitude Service. They receive data on star observations made by five groups of astronomers near the 40th parallel—one in Japan, one in Russia, two in the United States, and one in Sardinia.

But it is not for us here at the Pole that the astronomers do their work. It is for the timekeepers, surveyors, and map makers of the world.

Unless you know exactly where something

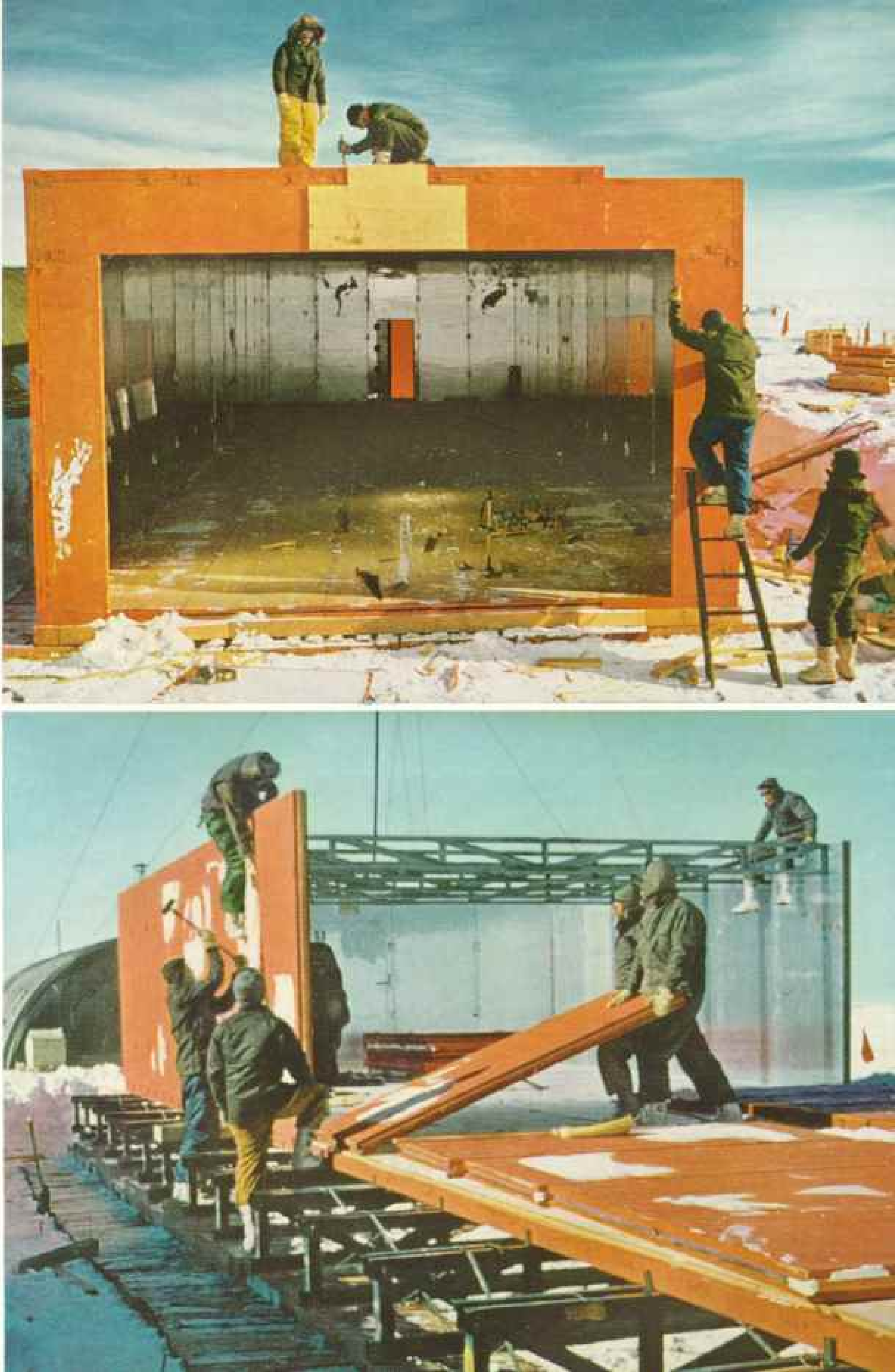
Bright Orange Walls of a Polar Village→ Cast a Ruddy Glow over the Snow

Prefabricated panels, designed for Antarctica's frigid climate, made swift construction possible. Walls, floor, and roof of this garage are four-inch aluminum-and-plywood sandwiches filled with glass-fiber board. Brilliant exteriors help both aerial and ground parties spot the base.

To keep roofs uniformly level, buildings were set at various depths in the snow. Winter blizzards may bury the camp to the eaves, but fierce winds are expected to keep rooftops clear. Skylights are the only windows.

Below: Mess hall and galley sits on trusses lest heated floors melt the snow and sink the structure.

Kodachromes by Paul A. Siple



28

Crownlike Radar Dome Atop Polar Mess Hall Lends a Futuristic Look

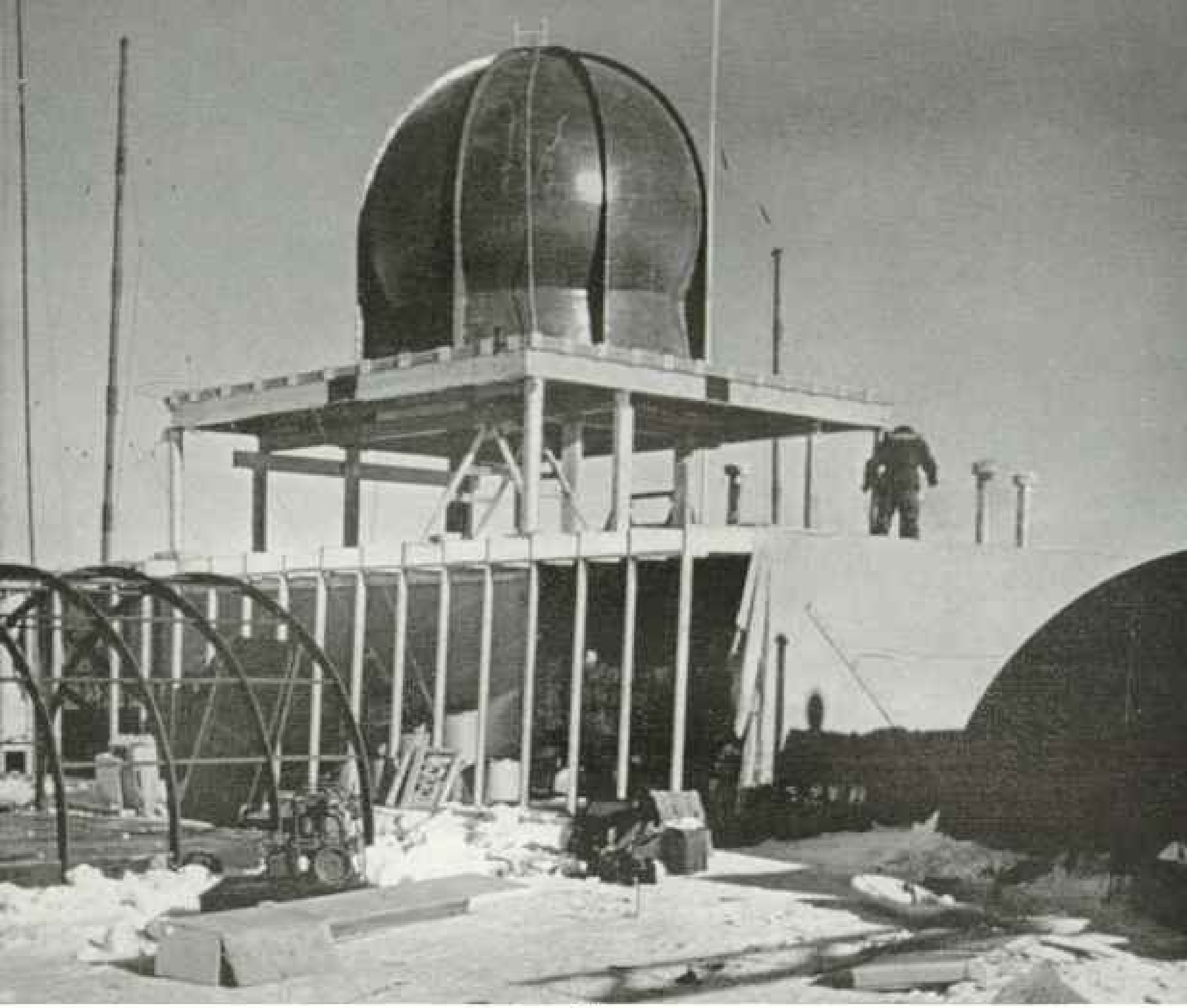
Radar inside the plastic tower tracks weather balloons sent aloft at regular intervals. Transmitters attached to the balloons radio back reports on temperature, pressure, and moisture.

The tower, called a rawindome, rests on pilings to prevent drifts from forming around its base.

Workmen in foreground disassemble a Jamesway hut, moving it 200 feet from the camp for use as emergency quarters should fire sweep the station.

← Even in the bitterest storms, men walk from building to building through passageways like this. Corridors provide for storage of supplies and equipment. Burlap and chicken wire cover the two-by-four framework.

Paul A. Siple



is on the planet—and the somethings we start with are the poles—it is impossible to determine exactly where anything else is. In an age of aerial navigation and, even more important, of guided missiles, locating points on the earth's surface with respect to the spin poles becomes a matter of considerable interest. It is a map-making fact that as the spin pole moves, the astronomical latitudes and longitudes of Washington, London, Moscow, and every other point on the earth's face change accordingly.

We occupy many of our evenings by discussing such scientific oddities as these movements of the poles—perhaps right under our barracks floor!

Over hundreds of millions of years, I strongly suspect, the earth may have moved not feet but thousands of miles around its spin poles. Otherwise, we find it hard to explain the large amounts of coal on the continent.

Obviously, Antarctica has not always been a desolation of snow and ice. At one time in the geologic past, forests and swamps played out their hour on this now inhospitable stage.

Has Antarctica not always been at the South Pole? Could it once have been somewhere in the Tropics, where the sun rose and set on it every day? Has this land not always been at the bottom of the world?

These are questions a scientist finds whirling around in his brain as he sits turning slowly, in a figurative swivel chair, on the very axis of the earth—the South Pole.

How to Bake a South Pole Cake

Such musings are likely to be broken by strange interruptions. Once it was the sudden recollection that we'd left ice cream freezing too long in the snow. Another night it was a radio call from the Pillsbury flour company in Minneapolis, telling Segers how to bake a cake at 9,200-feet altitude without having it fall. Segers followed Pillsbury's advice to add more flour, and now he gets a good cake every time.

The ultimate in interruptions has just rung

Kodachromes by Paul A. Siple

↑ The "Pole" Becomes a Reality: Dr. Siple Raises a Bamboo Spire

Locating the exact position of the earth's axis is extremely tricky; scientists believe initial measurements may be as much as two miles off. But star sights during the sunless winter should pinpoint the Pole more exactly. Meanwhile, this marker, capped by flag and spherical mirror (page 22), has been raised above the base garage. It bears signatures of the polar party.

↓ Explorers Enjoy a Midnight Snack; Outside, Bright Skies Deny the Hour

This Jamesway hut, a canvas version of the quonset, served as radio shack, weather station, office, first-aid center, and galley while the base was being built. When the cook's cakes failed to rise, he radioed an appeal to a milling company in the United States. Thanks to its advice, the wintering party often sits down to four-layer delicacies.

for the first time in our science building—a telephone. Our building-to-building phone system is installed and working. I'd thought one of the advantages of coming to the South Pole was that you didn't have to answer telephones!

One of the last jobs in readying our base for the long winter has been to finish our tunnels, through which we can walk from building to building no matter how bitter the storms outside.

What we call "tunnels" will not really be tunnels until they are buried by the snow. Now they are just passageways of wooden framework, covered with chicken wire and burlap (page 28).

Through some miscalculation, we have enough burlap to build a tunnel for miles. The Navy sent four huge bales of it to us. All our tunnel building so far has used up only one.

One tunnel, actually dug out of the snow, is a fifth of a mile long. To ensure that our delicate earthquake recorders are not disturbed by vibrations from the camp, our seismology laboratory stands nearly 1,000 feet out. And Willie Hough and Bob Benson must be able to reach it without having to go out into the terrible winter temperatures.

Snow Melter Provides Fresh Water

We trust the wind will not blow enough snow over the station to cover skylights, exhausts, and ventilators on our flat building roofs, yet will pile up enough to bank the sides of buildings and tunnels, holding the heat inside; otherwise, even though we have an extra year's supply in reserve, we might not have enough fuel.

Nearly 1,000 55-gallon drums are cached along our tunnel walls, spouts turned inward for ready use.

Our snow melter, which runs on the exhaust heat of the big motor generators in the garage, is giving us plenty of hot water now. At first we had to drag in parachute bagfuls of snow to feed it, but now we have a hopper on the outside of the garage with a chute leading straight to the melter. The tractor can pull a sledload of snow right to the chute.

The construction crew was elated when the time came for our permanent personnel to fly in to complete construction. Those sailors did a grand job, but they were ready to go! All of them, that is, except Bob Chaudoin, our postmaster and assistant meteorologist (page 35). Bob wanted very much to stay, even though he had already been away from home more than a year. He asked permission by radio, and I think he almost cried when the Navy said he had to leave.

On board the incoming planes were nine men chosen from among thousands of Navy volunteers. The first two of our scientific staff were with them. Ed Flowers came as Pole meteorologist for the winter night. John Guerrero, electronics technician, was dressed for the sunny south, a gaudy Hawaiian sport shirt under his parka!

Sunspots Disturb Radio Communications

We said goodbye to Dick and Slats and the others with a tinge of envy. They would be seeing their families soon.

It is well that we are all volunteers. There are going to be days when each in his own heart will ask what in the world he is doing here.

During the winter night there will be no getting out. No presently available airplane could land and take off again in the midnight cold. Its lubrication would freeze and its motors would refuse to function.

Even short-wave radio will provide only fickle communication. "Storms" on the surface of the sun shower the earth's outer atmosphere with high-speed nuclei of hydrogen atoms. These solar disturbances, called sunspots, reach a peak of activity every 11 years. This year marks one of these peaks. As heavy bursts of hydrogen nuclei hit the ionosphere, magnetic storms will rage over great areas about the south geomagnetic pole.

Auroral displays, the beauty of the magnetic storms, will be frequent, to be sure; but when the aurora appears, an "electric curtain" will shut off our radio signals for days from the outside world.

Constant Sunlight Slants Above Base

Actually, we may make an important contribution to the future of radio communications. Even on the 21st of June, the keystone of the long archway of winter night, sunlight will not be far away. Three hundred fifty miles directly overhead in the blackness of space, constant sunlight will slant through the upper atmosphere above the Pole (diagram, page 14).

To Willie Hough and Bob Benson, our ionosphere observers, these beams of sunlight

An Oasis Springs Up on the Bleak Polar Plateau. Here 18 Men Wait Out a Long, Lonely Vigil

While fellow countrymen back home bask under the summer sun, nine civilian scientists and nine Navy men live in a world of darkness, numbing cold, and howling gales.

Theirs is a rigorous, dangerous ordeal. Yet their few luxuries—warm quarters, soft beds, hot water, and movies—contrast sharply with life as early antarctic explorers knew it.

Just 45 years ago, Capt. Robert Scott and four other Britishers slogged more than 800 miles to the Pole from their Ross Sea base. Pulling their own sledge and suffering cruelly from frostbite and starvation, all five perished on the return journey.

In 1934 Admiral Byrd spent 4½ black months alone in a shack more than 100 miles from his Little America base. Stricken by poisonous fumes from the stove, he barely survived until rescue came.

Today's wintering group lives in a compact community of prefabricated buildings. Here construction is under way. Builders have moved from survival tents into two Jamesway huts. A 35-foot radio antenna tops the smaller structure.

At right, workmen erect the powerhouse and garage. Crates of IGY equipment and steel trusses sprawl near by.

Tractors and sledges weave a spiderweb of tracks between base and drop zone (foreground). Fuel drums raise a dark mound at the rear of the camp. Ski planes use the 10,000-foot airstrip in background, dragged smooth by snow-filled parachutes.

Stars and Stripes flying in foreground marks the location of the Pole as thus far determined. The flag flew at half-mast for 10 days following Admiral Byrd's death. "We thought this was the one spot where he would have liked to have a special observance," Dr. Siple radioed.

National Geographic photographer Boyer made this picture from a Globemaster zooming low to drop lumber.

will be scientifically significant. They are like a giant sloping mirror, revolving every 24 hours out there on the edge of space. Beneath is constant darkness; above is constant sunlight.

Only at the Poles can this stable ionospheric phenomenon be observed. This revolving surface provides a test reflector for certain radio waves that bounce from ionized atmospheric layers. With these regions of both constant darkness and constant light above us, we have ideal conditions for studying how the normal radiation of the sun provokes air molecules to discharge electrons, producing ions.

Who knows what physical secrets science may reveal from the records of our experiments? Navy physician Howard Taylor and I may add a page or two to cold-weather physiology.

Shivering Saves Man's Life

Together, we intend to study the effects of cold on the human body. By next summer, when new Navy men and scientists fly in to take over for a second South Pole winter, we may have much to report of value to the newcomers. We simply do not know now what is going to happen to us at temperatures of 100° or more below zero.

The body has ingenious ways to protect itself from cold. The shivering mechanism, an involuntary exercise triggered by cold, automatically produces heat.

I knew a man who tried to commit suicide during one antarctic night by going out into the snow without his cold-weather clothing. Search parties failed to find him. Meantime, both mind and body refused to cooperate. After two days he staggered back to Little America, shivering, frostbitten, and disgusted. He hadn't dreamed that shivering would help keep him alive!

No New Germs at Polar Base

Besides investigating some of the problems of cold-weather medicine, Doc Taylor will see that we take our vitamin pills, patch us up if we get hurt, and diagnose our aches and pains. With luck, we may not have many of these. We are living in a closed community. No new disease germs can reach us till next October, when supplies and replacement personnel arrive from the outside world.

The biggest job facing Dr. Taylor will probably be dental work. We couldn't afford a dentist here, but Doc has had special training for this job.

There's been a lot of pooh-poohing about the belief that cold weather causes fillings to drop out of the teeth. But usually there is a lot of tooth trouble on these expeditions. Perhaps it's because as your nose tissue gets cold, it becomes easier to breathe through the mouth, and pretty soon there is a differential reaction between teeth and fillings. Then a filling comes out.

Surgical operations or serious accidents may cause Doc some anxious moments. He could always, of course, confer with specialists by radio. But should magnetic storms black out our reception, he would be absolutely alone to cope with whatever emergency might occur.

Hut Ready if Fire Strikes

We have learned from past expeditions to guard against fire, and have taken every precaution in building the base. As a last resort, however, should fire sweep the camp despite our vigilance, we have one separate hut 200 feet out in the snow, detached from everything. It is stocked with food, sleeping bags, and fuel. If a fire destroyed our main camp, we could exist until October, in the antarctic spring, when a rescue plane could reach us at the Pole.

Spring, however, seems a long way off from this darkening point in time.

Lower and lower goes the sun at the South Pole, day by day. The last ski plane will soon land. When it leaves, taking with it our last letters home and the final tape-recorded notes for this article, we shall be isolated and alone at the bottom of the world, tucked in for the six-month night.

So, we'll see you in the morning. . . .

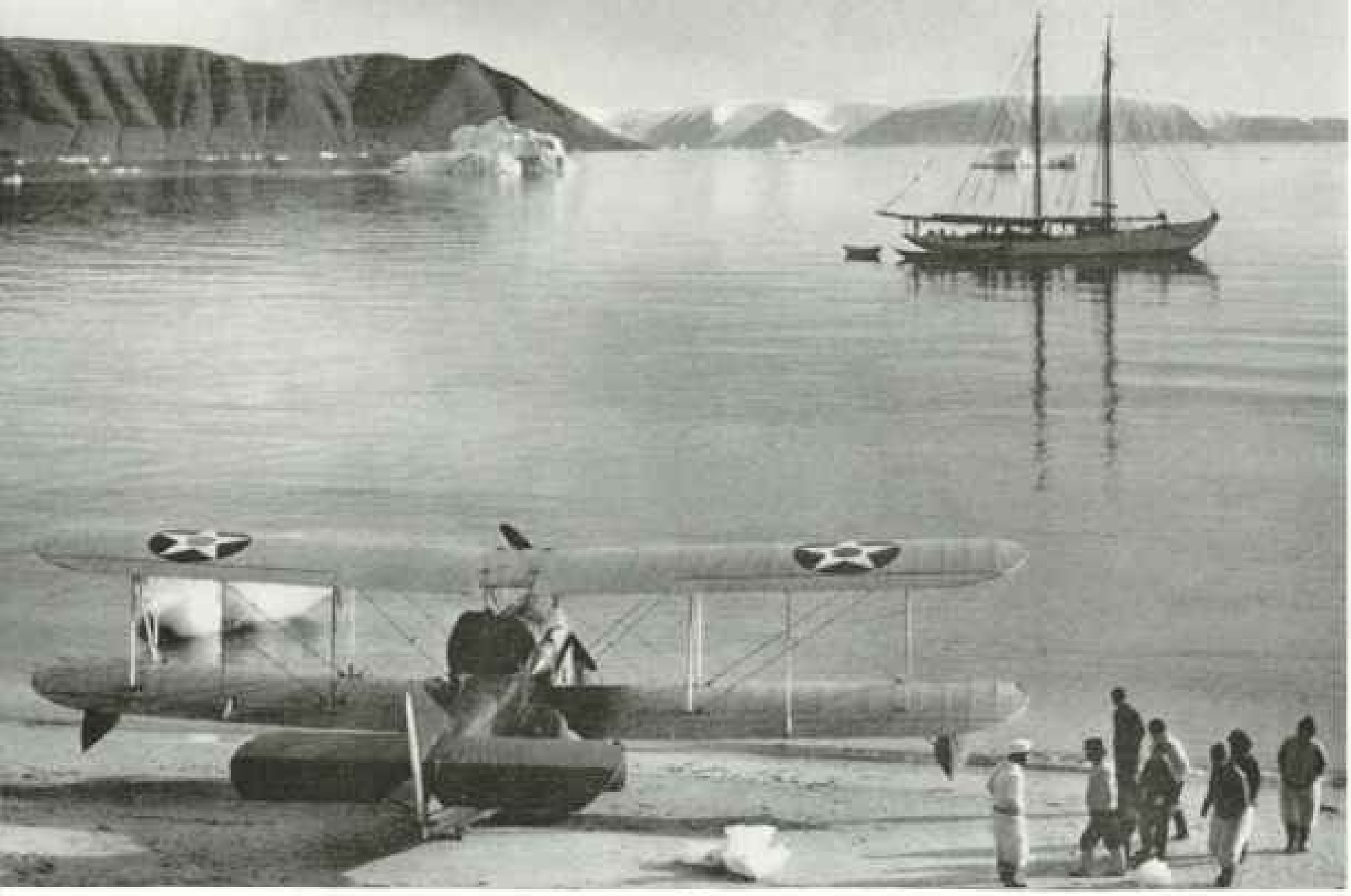
Philatelic Mail Swamps the Polar Base; Each Letter Gets a Coveted Postmark

Stamp collectors have sent more than a quarter-million letters, requiring $10,000 in stamps alone, to be mailed from the station. Here acting postmaster Robert L. Chaudoin cancels the stamps and imprints each cover: Pole Station, Antarctica.

Below: For the world's whitest Christmas, the traditional tree was essential. This fir from Oregon was dropped at the Pole by an obliging Air Force plane. Holiday dinner featured two thick steaks apiece with trimmings, supplied by construction-crew cook Raymond R. Spiers (blond beard, center).

Admiral of the Ends of the Earth

By Melville Bell Grosvenor
President and Editor, National Geographic Society



WHAT the round earth was to Columbus, what circumnavigation of the globe was to Magellan, polar exploration was to Richard Evelyn Byrd. If Columbus was Admiral of the Ocean Sea, Byrd, first man to fly over both Poles, was Admiral of the Ends of the Earth.

No man in history contributed more to knowledge of the Arctic and Antarctic than Byrd. This year's great scientific assault on Antarctica represents the culmination of his lifetime of work and leadership.

With the passing of the greatest explorer of the Air Age last March 11, the National Geographic Society lost a beloved Life Trustee, a firm friend and ally in the cause of discovery for 32 years.

One day in the spring of 1925, as a junior member of the National Geographic staff, I was asked to welcome a young naval officer who had called at The Society's headquarters.

Straight as a jack staff, handsome and forthright, Lieutenant Commander Byrd had an enthusiasm and warmth of personality that we of the National Geographic found instantly to our liking. Even more, we were attracted by his bold, yet sound, ideas.

Audacious Idea: Planes in the Arctic

He had come to see Dr. Gilbert Grosvenor, then The Society's President and Editor, to win his backing in a new kind of exploration: by airplane over the frozen Arctic.

If this idea seems less than startling today, it is largely because of Byrd's own accomplishments. In 1925 flying was hazardous, even over civilized country. Planes were crude and unpredictable; aerial navigation as such was in its infancy. To most people, Byrd's plan to take planes into the polar wastes was as fantastic—almost—as Columbus's scheme to reach the East by sailing west.

Byrd's bold scheme bore fruit: he joined forces with the Donald B. MacMillan Arctic Expedition of 1925, to which The Society had made a grant of $40,000. A small undertaking, perhaps, by today's standards, the combined MacMillan-Byrd expedition consisted of 38 men, two ships, and three U. S. Navy planes.*

They established a base at Etah, Greenland, 140 miles north of what is now Thule Air Base. From there, Byrd and his companions explored thousands of square miles over Ellesmere Island, and he and Floyd Bennett became the first men ever to fly over the Greenland Icecap.

The expedition proved beyond doubt that aerial exploration of the frozen North—and the frozen South—was feasible. And it began an association between Byrd and the National Geographic Society that lasted for the rest of his life. Much later he was to say:

"The help the National Geographic Society has given to explorers has been very great. I happen to be one of those explorers, and I am glad to acknowledge that without the help of The Society . . . in all my expeditions there would have been a very different and less successful story to tell."

This Arctic expedition also produced the first in a long series of notable articles by Byrd in the NATIONAL GEOGRAPHIC MAGAZINE, exclusive first-hand accounts of his expeditions. That story began, prophetically, with the words: "Aviation will conquer the Arctic—and the Antarctic, too."

From then on, Byrd's life was to prove the truth of this prediction.

Society Flag Borne to Both Poles

The warmest kind of friendship grew up from the start between Byrd and Dr. Gilbert Grosvenor and Dr. John Oliver La Gorce, then Associate Editor of the National Geographic. For three decades The Society sponsored and supported Admiral Byrd in the explorations and daring adventures of his astonishing career. He carried The Society's flag on his first flights over both Poles.

"Other than the flag of my country," he once said, "I know of no greater privilege than to carry the emblem of the National Geographic Society."

Five Presidents of the United States paid tribute to Admiral Byrd's service to his coun-

* See "Flying Over the Arctic," by Richard E. Byrd, and "The MacMillan Arctic Expedition Returns," by Donald B. MacMillan, NATIONAL GEOGRAPHIC MAGAZINE, November, 1925.

↓ No Place to Land Here! Giant Crevasses Seam the Face of Verhoeff Glacier

In 15 days during the 1925 MacMillan expedition, Byrd and his companions explored 30,000 square miles. They were the first to fly over Greenland's Icecap; this photograph records the accomplishment.

Opposite: In this light Loening amphibian, vintage of 1925, Byrd pioneered over the mighty ice sheet. *Bowdoin*, expedition flagship, lies at anchor in tranquil Robertson Bay. Herbert Island looms beyond.

← Marvard Owen Williams

38 Maynard Owen Williams

Sun Compass Guided Byrd to the Poles

Albert H. Bumstead invented this device for Byrd's aerial exploits in the Arctic and Antarctic, where neither the magnetic nor the gyroscopic compass works properly. "It was the sun compass," Byrd said later, "that made it possible for us to fly with confidence to the North and South Poles and to find our way back to our bases."

An accomplished mathematician, Mr. Bumstead was the first chief cartographer of the National Geographic Society. Training a corps of map makers, he began The Society's remarkable map supplement series. Here he presents the compass to Byrd on the eve of the explorer's first arctic venture in July, 1925.

try. Among the most cherished honors he received from them were The Society's Hubbard Medal, given to him in 1926 by Calvin Coolidge, and its Special Gold Medal of Honor, presented by Herbert Hoover in 1930 (page 45). He was proud of his long-standing membership in The Society and in 1953 became one of its Life Trustees.

First over the North Pole

Byrd had no sooner returned from Etah than he was preparing to go back north.

His second attempt, made the following year, was a major triumph, sufficient by itself to ensure his place in history. He and his copilot, Floyd Bennett, took off from Spitsbergen on May 9, 1926, in a three-engined Fokker monoplane. They became the first men ever to fly over the North Pole.

"We had a short-wave radio set operated by a hand dynamo, should we be forced down on the ice," Byrd wrote in the September, 1926, National Geographic. "A handmade sledge was also stowed in the fuselage, on which to carry our food and clothing should we be compelled to walk to Greenland. We had food for ten weeks . . .

"Our chief concern was to steer as nearly due north as possible. This could not be done with the ordinarily dependable magnetic compass, which points only in the general direction of the north magnetic pole rather than the geographic North Pole.

Used National Geographic Sun Compass

"There was only one thing to do—depend upon the sun. We had to use a sun compass.

"This instrument was invented and constructed for our use by Albert H. Bumstead, chief cartographer of the National Geographic Society. I do not hesitate to say that without it we could not have reached the Pole; it is even doubtful if we could have hit Spitsbergen on our return flight . . .

"When our calculations showed us to be about an hour from the Pole, I noticed through the cabin window a bad leak in the oil tank of the starboard motor . . .

"Bennett suggested that we try a landing to fix the leak. But I had seen too many expeditions fail by landing, so we decided to keep on for the Pole with our two remaining motors, if necessary . . .

"At 9:02 a.m., Greenwich civil time, our calculations showed us to be at the Pole! The dream of a lifetime had at last been realized."

Fortunately the ailing engine never quit. The leak was caused by a rivet jarring out of its hole, and when the oil got down to the level of the hole it stopped leaking.

"The dream of a lifetime," Byrd had called it. Yet when the dream was realized, an instinctive modesty made him minimize his accomplishment:

"We simply took advantage of the knowledge gained by three centuries of Arctic heroes and applied our Navy training to aviation . . . and so added a short paragraph to the story of man's conquest of the globe on which we live."

After his flight over the Pole, Byrd turned his attention temporarily from the ends of the earth to transatlantic flight. His object was a highly practical one: to fly from the United States to Europe's mainland in a large, multiengined plane, one that could carry a

useful load of passengers or cargo. This had never been done before, though two other attempts had been made.

Byrd and a crew of three (Bernt Balchen, Bertram B. Acosta, and Lt. George O. Noville) took off from Roosevelt Field, Long Island, in rain and fog on June 29, 1927, just 40 days after Lindbergh's flight. Later, in the National Geographic, he described the awful tension of the flight.*

Putty Seals Leaking Gas Tank

In mid-ocean an incident occurred that illustrates Byrd's remarkable ability to anticipate problems and prepare for them before they arose. "We discovered a leak in the gasoline tank," he wrote, "but we had provided against that by bringing along a putty substance. Although we stopped the main leak, a little gas continued to seep out. After awhile it ceased. . . ."

"About the time we expected to hit Paris we got temporarily out of the thick weather. I saw bright lights ahead and a flashing light which I at first mistook to be Le Bourget. My astonishment was great when I found that the flashing light was a lighthouse on the coast of France!

"The compass had taken us in a circle. . . . I watched the course carefully after that and checked compasses every few minutes. . . .

* See "Our Transatlantic Flight," by Richard E. Byrd, NATIONAL GEOGRAPHIC MAGAZINE, September, 1927.

International Newsreel

↑ Polar Hero Receives the Hubbard Medal

Six thousand members and friends saw President Coolidge present The Society's coveted award on June 23, 1926, for the first flight over the North Pole. Gilbert Grosvenor, then President of The Society, mirrors the explorer's pleasure.

↓ A trimotored Fokker monoplane carrying Byrd and Floyd Bennett takes off from Spitsbergen on the epochal polar flight. "The dream of a lifetime," Byrd called it.

40 International Newsreel

Marie Byrd and Gilbert Grosvenor Shared Byrd's Glory

Though she encouraged her husband's explorations and thrilled at his daring feats, Mrs. Byrd remained always in the background. The Admiral gave his wife's name to Marie Byrd Land, a vast reach of Antarctica where an IGY station is now located (map, page 15).

As President, Gilbert Grosvenor directed The Society's support of all Byrd's major expeditions. Here the trio motors to a reception given by President Hoover on June 20, 1930, to honor the first man to fly over both Poles (page 451).

"Finally, we got to the point beyond which, if we had continued, we could not have returned to the coastal waters, on account of the diminished gasoline. . . . I believe at the moment we turned we were near Paris. . . ."

It was pitch dark on a night of rain and wind.

"We emerged from the mists and there was the lighthouse ahead of us. . . . We decided to land near enough to the beach line to swim ashore, if necessary, and to salvage the plane, if it were not too badly wrecked. . . .

"We now dropped a number of flares as nearly in a line as we could, about 100 yards from the beach line. They all ignited. . . .

Crash-landing on the Dark Sea

"I gave the orders to land. . . . The wheels touched, and . . . the landing gear . . . was sheared off, along with the wheels, with hardly a jar of the plane, as though a great knife had cut it. . . .

"I suppose I was dazed a little. I know I got a pretty stiff blow over the heart. I had been looking out of the cabin window and found myself in the water outside. . . .

"The plane had instantly filled with water. Noville was getting out of the window. . . . I found Balchen slightly caught under water and trying to extricate himself. . . . A moment later Acosta appeared, apparently from nowhere, swimming toward the wing. . . ."

It was still dark when they reached the village of Ver-sur-Mer, a mile away. "Even after we reached it," Byrd wrote, "we spent much time going from house to house trying to arouse someone. . . . A boy on a bicycle passed us, but he must have thought we were tramps, for he hurried on. Wet and bedraggled, we certainly were not prepossessing."

Finally they convinced the lighthouse keeper they really had flown from America. Once convinced, the whole village turned out to welcome them and then the whole world showered them with honors.

Unknown Antarctic Beckons

But transatlantic flight was only an interlude, and in 1928-30 Dick Byrd was back on his main crusade. This time he set his sights on mysterious Antarctica. To this first Byrd Antarctic Expedition and to the second expedition of 1933-35 the National Geographic Society made substantial grants.

In the antarctic spring of 1929, after wintering over at the first Little America, Byrd took off on a flight to the Queen Maud Range to establish a supporting base for the planned air voyage to the South Pole.

Mission accomplished, the plane headed back.

"Approximately 100 miles from Little America we reached an area which the dog teams had reported dangerous, if not impossible, for an airplane landing," Byrd wrote in "The Conquest of Antarctica by Air" in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1930.

"Over this place the motors began to miss. [Harold] June said we were low on gas. Suddenly all three engines stopped. Dean Smith had the wheel. . . .

"We bumped hard, rocked along crazily, and came to rest without smashing, greatly to our surprise. It hardly seemed possible that we had gotten down safely in this area. We were on the edge of the worst part. We were lucky."

Thirty-six hours later a rescue plane reached them with more gas, and they were able to return to Little America.

41 Wide World

"Welcome Home!" Transatlantic Flyers Parade up Broadway amid a Paper Blizzard

Byrd and a crew of three (Bernt Balchen, Bertram Acosta, and George Noville) were first to fly from the United States to Europe's mainland in a multiengined plane. Throngs cheered their triumphant return to New York on July 18, 1927. Byrd rides in the lead automobile with Grover Whalen, Gotham's official greeter.

70-foot Radio Towers Cap Little America

The first Byrd Antarctic Expedition built this outpost on the Ross Ice Shelf in 1929. Forty-two men were quartered here 14 months.

When Byrd returned a quarter of a century later, he found the masts almost completely buried (page 48).

The *Floyd Bennett*, a Ford trimotor named for Byrd's friend and flying partner, taxies from its snow hangar at Little America. The big plane performed superbly during the history-making 1,600-mile round-trip flight to the South Pole on November 29, 1929.

At last came the day for the first attempt to fly over the South Pole. Like a mighty wall between them and their goal reared the lofty Queen Maud Range.

The engines labored as the trimotored Ford strained upward over Liv Glacier.

"Suddenly the ailerons failed to have any effect; the wheel turned loosely in [Bernt Balchen's] hands," Byrd wrote.

"Above the roar of engines Bernt yelled, 'It's drop 200, or go back!' "

Food Sacrificed for Altitude

"June jumped to the dump valve of our fuselage tank. A slight pressure and 600 pounds of gasoline would go overboard. But if we did that we would not have enough gasoline to reach the Pole and get back. . . ."

Instead, two 150-pound bags of precious emergency food were jettisoned. The plane eased safely over the lip of the pass.

"Bernt let out a yelp of joy. No mountains ahead. A clear route to the Pole, dead ahead over the horizon! . . ."

Soon they were at the southernmost axis of the globe, 90° South.

"That imaginary point—the aloof and lonely bottom of the earth—was beneath us. I handed June a message to radio to Little America:

" 'My calculations indicate we have reached the vicinity of the South Pole. Flying high for survey. Soon turn north.' "

To an ordinary man, successful first flights over both Poles might have been enough. Byrd could easily have basked in glory. The Congress of the United States honored him by promoting him to Rear Admiral on the Retired List; book publishers, magazines, and lecture agencies sought him out.

In June, 1930, President Hoover presented Byrd with the National Geographic Society's Special Gold Medal of Honor. More than 15,000 members applied for tickets to see the Admiral's lecture film, but only 6,000 could crowd into the largest available hall, Washington Auditorium.

But to Byrd the vast unknown Antarctic

Continent was irresistible, and in 1933 the second Byrd Antarctic Expedition got under way.

One of the characteristics for which he became famous was careful planning. Months of work went into anticipating every danger.

"I would not have left the country without every item necessary for the safety of my men," he wrote, "and it would have been futile to do so without adequate scientific equipment." This meticulous preparation paid off: on his first three Antarctic expeditions, when Byrd was in personal command of operations, not a single life was lost.

Faulty Stove Threatens Admiral's Life

Yet not even Byrd could foresee all the dangers; and his second assault on the frozen South nearly cost him his life.

In the winter of 1934 Byrd manned by himself a tiny weather hut 123 miles south of Little America. Called Bolling Advance Weather Station, it was the first inland base ever occupied in Antarctica.

"The observatory was planned for three men," Byrd wrote in the National Geographic of October, 1935. "Three bunks were crowded in the tiny portable shack . . . [but] we could not take supplies for three men. A two-man station was out of the question. . . .

"In the woods it would be another story. Even the trees are alive. There is noise from their rustling and from birds on their branches, and the call of the wild. The sun rises and sets. But two men living alone . . . jammed together in a silent, dark, dead, bitter cold environment, staring at each other for six months. Could it possibly work out? . . .

"Someone had to go. I couldn't ask two men to go and I couldn't ask one. It seemed to be up to me."

All went well from March until May. The lonely scientific observer posted a notice in his shack: "There will be no gossiping."

Of this vigil Byrd wrote: "Cold does queer things. At 50° below zero a flashlight dies out in your hand. At −55° kerosene will freeze, and the flame will dry up on the wick. At −60° rubber turns brittle. . . . Below −60° cold will find the last microscopic touch of oil in an instrument and stop it dead. If there is the slightest breeze, you can hear your breath freeze as it floats away, making a sound like that of Chinese firecrackers. . . ." *

Byrd began to feel ill. Unknown to him, carbon-monoxide fumes from a faulty burner of his oil-fuel stove were poisoning him.

* *Alone*, by Richard Evelyn Byrd, published by G. P. Putnam's Sons, New York, 1938. Copyright.

Straining and Panting, Antarctic Sledge Dogs Pull Supplies from Ship to Base

Sledge teams, oldest form of polar travel, supplemented modern carriers such as planes and tractors on all Byrd's antarctic expeditions. Dogs proved invaluable for hauling food and equipment as well as for rescue missions. Finn Ronne, a member of the 1933-35 party, guides this sledge by the gee pole in his hand. Driver behind uses his feet as brakes to slow the load on a downhill run.

Byrd Antarctic Expedition

44 © BAE

Flag and Stone: Tribute to a Comrade

Floyd Bennett, Byrd's partner on his North Pole flight, died of pneumonia in 1928. To honor his memory, the Admiral weighted this flag with a stone from Bennett's grave in Arlington National Cemetery and dropped it over the South Pole.

Even when he realized what was happening, Byrd's pride and concern for his men made him hide his desperate plight from his expedition mates at Little America. He would not give them cause to set out in the bitter, black antarctic night to rescue him.

But the irregularity and weakness of his keyed radio signals finally betrayed his condition. A relief party set out.

His radio told Byrd that help was at hand. "At 6 o'clock I was again at the trapdoor.... Armed with another flare ... I pulled myself up the hatch.... The fingering beam of a searchlight moved slowly up and down against the dark backdrop of the horizon....

"A few minutes before midnight I went topside again. They had come very close. I could see the bulking shadow of the tractor. ... Three men jumped out.... I remember shaking hands all around, and [Amory] Waite insists that I said: 'Hello, fellows. Come on below. I have a bowl of hot soup waiting for you.' If that is really so ... no theatricalism was intended."

With his winning personality and the unmatched adventures he had to relate, Byrd was inevitably destined to become a star of the American lecture platform.

His first appearances after four expeditions were before the members of the National Geographic Society in Washington, D. C. The motion pictures he brought back from Antarctica were superb. I recently had a chance to view again the film of his 1928-30 trip. For interest, excitement, and variety of coverage, that picture is the equal of the best adventure films of today.

Audiences Thrilled by Byrd Lectures

But it was the Admiral's own engaging self—enthusiastic, gallant, always courteous and modest—that won the hearts of his nationwide audiences. With his zeal for adding to man's knowledge of the waste places of the earth, he became one of the foremost lecturers of our time.

In May, 1936, Byrd wrote to my father: "My lecture tour, thank Heaven, is finished at last. I have lectured in 146 cities since September...." Mrs. Byrd, always quietly in the background, accompanied him on some of his lecture trips.

For the second Byrd Antarctic Expedition the U. S. Post Office Department issued a special commemorative stamp. A post office was authorized for Little America.

The Postmaster General designated as postmaster Dr. John Oliver La Gorce, at that time Vice President of the National Geographic Society. Dr. La Gorce, with a strong preference for palms and tropic breezes, freely admits that he was happy to appoint a deputy to act in his stead!

Byrd's next antarctic venture was the United States Antarctic Service Expedition of 1939-41. An official U. S. Government project, it included extensive studies of geology, biology, meteorology, and other scientific aspects of Antarctica as well as exploration.

World War II followed hard on the heels of this expedition, and for the next few years that struggle cut off any possibility of a return to Antarctica. Byrd returned to active duty in the Office of the Chief of Naval Operations. From 1942 to 1945 he headed

President Hoover Presents The Society's Special Medal of Honor

For Byrd's aerial conquest of the South Pole and his contributions to antarctic knowledge, The Society struck a special gold medal.

Herbert Hoover bestowed the award before a distinguished Washington audience of 6,000 on June 20, 1930.

Earlier in the day cameramen staged this preview on the White House lawn. Gilbert Grosvenor and Capt. Harold C. Train, naval aide to the President, stand beside Byrd. Col. Campbell B. Hodges, the President's military aide, is half-hidden.

The medal, designed by Laura Gardin Fraser, bears a profile of Byrd with stars and anchor of a rear admiral. On the reverse a winged man spans the globe from Pole to Pole.

International Newsreel

important missions in the Pacific, including surveys of remote islands for airfields. One assignment took him to the fighting fronts of Europe. He was repeatedly cited for exceptionally meritorious service and was present at the Japanese surrender.

Yet, though he was a naval officer and trained as a fighting man, Byrd was always saddened by wars and political strife. He served with selfless energy on numerous committees working for world peace and extension of democratic ideals.

Over the South Pole Again

Within a year after the war ended, Byrd was back in the Antarctic in force. The U. S. Navy's "Operation Highjump," with 13 ships, 6 planes, and 4,000 men, was the biggest exploring expedition ever organized. For the first time in history, an aircraft carrier launched planes over the frozen continent for far-reaching aerial surveys. In the National Geographic for October, 1947, the Admiral described vividly some of the unearthly terrain they saw on the second flight over the Pole:

"We were flying into the strange sunset of the Antarctic's late-summer midnight. The sun was low, a great ball like a red wheel rolling along our horizon. . . .

"The temperature dropped steadily. The heating system and automatic pilots refused to work, congealed by cold. [Lt. George] Anderson's ears began to freeze. My own

Byrd Antarctic Expedition

1934: Ski Planes Map a Frozen Continent

More than 450,000 square miles of Antarctica were explored or mapped by the 1933-35 Byrd expedition. Four aircraft flew dozens of reconnaissance flights as far as 300 miles inland. Here shadows of the *Miss American Airways* and the *William Horlick* (right) play leapfrog over Marie Byrd Land. Beyond, the Rockefeller Mountains thrust through the icecap.

↓ Five members of the expedition sledged nearly 700 miles into the interior, one of the longest treks in polar history. Here Stuart D. L. Paine (*left*) and Quin A. Blackburn breakfast on Robert Scott Glacier.

Richard E. Byrd, Jr.

hands stuck to the metal of my sun compass. . . .

"A few miles beyond the top of the [Shackleton] glacier we started straight south along the 180th meridian toward the Pole. The spectacle to the right and left and below was one of the most awesome I have ever seen. To the west lay the Dominion Range; to the east, what I believe to be the southernmost mountain range yet known on earth, the Grosvenor Range.

"This range I had discovered in 1929 and named for my long-time friend, the President of the National Geographic Society. . . .

"Actually, the way we traveled proved as breathtakingly beautiful a road through the skies as could be imagined. It might have been called Avenue of Frozen Rainbows. . . .

"To east and west towered great mountains. . . . Where the sun struck their peaks and slopes the light was reflected from

them in an indescribable complex of colors. There were blends of blues, purples, and greens such as man seldom has seen before."

Slowly, year by year, exploration tore away the mystery from the south polar regions. And Admiral Byrd, leading the exploration, became increasingly aware of Antarctica's tremendous scientific and strategic importance. In 1947—ten years before the International Geophysical Year—he pointed out its value for studies of the earth sciences.

"A major consideration in all Antarctic exploration is research in pure science. This comes second only to the essential geographical discovery . . . ," he wrote.

"Here has been set up by Nature herself a titanic physical, chemical, and biological laboratory where phenomena impossible of duplication elsewhere are in progress.

"Here the story of the ice ages is repeated. Here is the extreme limit of the living world, where through thousands of generations the very small percentage of life that has survived has become adjusted to the most difficult possible conditions.

"Thus the region is an unpredictably rich field for the physicist, the geologist, the biologist. It offers particular advantages to students of terrestrial magnetism, of cosmic radiation, and of the still unexplained radiation of showers of particles from the sun responsible for the indescribably weird auroral phenomena."

To lead and coordinate American participation in antarctic phases of the International Geophysical Year, President Eisenhower named Admiral Byrd Officer in Charge of U. S. Antarctic Programs. In his new role the Admiral paid a last visit to Antarctica in 1955-56. He joined in dedicating the fifth Little America and flew over the South Pole for the third time.

Once more he reported the expedition results to members of the National Geographic Society, in the article "All-out Assault on Antarctica," in the August, 1956, Magazine. Like all of Byrd's articles, it was voted one of the most popular of the year.

Late in December, 1956, Admiral Byrd regretfully decided not to go south on phase two of Operation Deep Freeze. Affecting his decision was a request from the President that he prepare, in concert with other government departments, legislation toward establishing a permanent unit for antarctic activity. In this important work the Admiral was engaged at the time of his death.

Explorer Honored by His Government

Admiral Byrd received an avalanche of awards and citations. The United States gave him the Congressional Medal of Honor, the Navy Cross, Distinguished Flying Cross, and Distinguished Service Medal with Gold Star.

On February 21, 1957, Admiral Arleigh Burke, Chief of Naval Operations, on behalf of the Secretary of Defense, presented to Admiral Byrd the Medal of Freedom "in recognition of his outstanding accomplishments as Officer in Charge, U. S. Antarctic Programs, and his humanitarian contributions to the world."

At the time of this award, Dr. Gilbert Grosvenor recalled their long association:

"One Thing More from the Heart—Dick, I Salute You!"

Thus President Franklin D. Roosevelt greeted Byrd at the Washington Navy Yard on May 10, 1935, as the explorer stepped ashore from his second antarctic expedition. It marked the first time the President had gone in person to meet a returning hero. Lt. Comdr. George O. Noville, executive officer of the expedition, stands behind Byrd.

Washington Post

48 Andrew H. Brown, National Geographic Staff

Antarctic Veterans Hold a Reunion at Little America

Visiting Antarctica for what was to be the last time in December, 1955, Admiral Byrd stands on a familiar site. Snows of three decades had almost buried the 70-foot radio mast marking his 1929 base. His second camp, built atop the first in 1934, lies 40 feet below the surface.

Others (left to right): Dr. Paul A. Siple; Maj. Murray Wiener, the Admiral's Air Force adviser; Lt. Richard E. Byrd, Jr.; and Edward E. Goodale, an IGY representative.

"How many kindnesses and honors you have given me throughout the years; naming that long mountain range in Antarctica after me and bringing me a piece of rock from the range, presenting it mounted with a silver engraved identification mark on it. Ever since, this souvenir has held the place of honor on the mantelpiece in our home.

"Looking today again at our new map of the world (March, 1957, NATIONAL GEOGRAPHIC MAGAZINE), I see, not far away from my range, the La Gorce Mountains, another thoughtful kindness given me by honoring my lifelong associate. . . . I have not words to express how grateful I am for your warm, inspiring friendship.

"Your whole life exemplifies the highest ideals of America. All America loves you. . . ."

For the new United States scientific base at the South Pole, Richard Byrd chose the name Amundsen-Scott IGY South Pole Station. It was his way of paying homage to Norway's Roald Amundsen, who discovered the South Pole in December, 1911, and Robert Falcon Scott, the English explorer who reached it only a month later and died on the return trip. When the South Pole Station was dedicated in January, 1957, Admiral Byrd said:

"In this year of international activity in the Antarctic, it is fitting that we should honor the memories of those two great and gallant men who first reached the South Pole. '. . . Scott lies gently shrouded in the Antarctic snows he loved and so often traversed. Amundsen lies at the other end of the earth, beneath the waters of the Arctic."

In his last article in this issue Admiral Byrd pays tribute to the men now carrying on his work in Antarctica, and in particular to the small group wintering at the South Pole.

To these men news of the Admiral's death came as a shock. The flag at South Pole Station flew at half-mast from the day he died, March 11, 1957, until the sun went down to usher in the six-month antarctic night.

Admiral Byrd was buried with full military honors in Arlington National Cemetery on March 14, 1957. With the assistance of Mrs. Byrd and of Lt. Richard E. Byrd, Jr., the Admiral's son, the National Geographic Society has undertaken the planning and execution of a suitable graveside memorial.

It will not be easy to devise a monument that can begin to do justice to the memory of Richard Evelyn Byrd.

Flight to Adventure

Flying Their Own Single-engine Plane, a Daring Couple Span Jungle and Desert in a Yearlong Odyssey over Africa and Asia

By Tay and Lowell Thomas, Jr.

With Illustrations by the Authors

THREE of us hurtled through the thin air over Africa's west coast. There was Tay—my wife, copilot, and navigator; there was I; and there was Charlie. Charlie had six cylinders, 225 horsepower, and a dashboard full of dials that spoke a language as clear as English. Right now he was warning us:

"You're in trouble. You've got 400 miles to go, and you can't make it. You're going to run out of gas."

And Charlie never lied.

Clouds Force Plane Out to Sea

We were flying south to Villa Cisneros, in the Spanish Sahara. Beyond that would be Dakar, and then the great green heart of Africa itself. On our right stretched the Atlantic. On our left rose the Atlas Mountains; behind them lay the desert, vast and bleak and empty (map, page 54).

But now rain clouds, low and black, forced us down to 1,000 feet, then to 500. We flew out over the water, where there was less likely to be an obstruction. But then the clouds lowered even more, until we were skimming a mere 100 feet above the waves.

The wind shifted. A tail wind, which had been boosting us along at 180 miles an hour, turned into a head wind, and our ground speed dropped to a mere 120. And Villa Cisneros, which an hour ago had seemed within easy reach, suddenly became remote. With that head wind we simply hadn't enough gas to make it.

We had one alternative. According to the map, there was a Spanish fort with a landing strip at Villa Bens, 100 miles ahead. We had no way of knowing, of course, whether or not Villa Bens had any fuel. Still, in a pinch, ordinary auto gas would do, and we hoped to find that at least. So we kept Charlie's nose in the air, heading south, and peeled our eyes for the strip.

Thus, in a storm of wind, rain, and clouds Tay and I took the first big jump into our flight to adventure. True, we had already spent six weeks traveling the 7,000 miles from our home in Princeton, New Jersey, but much of that was on an ocean liner. Charlie (short for registration number N2343C, or "four three Charlie") had also crossed the Atlantic by ship. We had flown from Paris to Gibraltar and then across the strait to Rabat and Marrakesh. But that was safe, easy flying, with a modern airport every few miles.

Now there was only the bleak coastal desert below us. If we should be forced down here—well, Charlie was an agile plane, a Cessna model 180 with sturdy fixed landing gear. He could light on any reasonably flat surface. He could take off again with surprising ease despite a 250-pound overload. Landing on a smooth African beach should not be too tricky.

Search for an Invisible Airstrip

Without gas, though, we couldn't take off again, however firm and wide the beach. We would just have to sit there until help came. To anyone searching for us, Charlie's bright red paint should be easy to spot in this desert land. And to make doubly sure, we carried a signaling mirror, a Very pistol for firing red flares high into the air, and two flashlights. We also carried emergency food and water supplies for four days.

But even as I pondered all this, our immediate troubles lessened: the clouds lifted, permitting us to rise again to 2,000 feet, and

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The Authors

Lowell Thomas, Jr., world-traveling son of the renowned radio and television commentator, learned to fly as an Air Force pilot during World War II. His wife, the daughter of Samuel F. Pryor, Jr., Vice President of Pan American World Airways, was born to aviation and majored in geography at Smith College. That training stood Mrs. Thomas in good stead during her recent appearance on the CBS television program, "The $64,000 Challenge."

Taking turns as pilot and copilot, the young couple set out on an airborne journey that carried them from Paris to Istanbul by way of equatorial Africa and the Near East. More of their experiences are described in their illustrated book, *Our Flight to Adventure*, published by Doubleday & Company, Inc., New York.

The Rock of Gibraltar Greets Two Travelers Sky-hopping to Africa

Almost as casually as motorists on a transcontinental tour, Mr. and Mrs. Thomas undertook an adventurous 45,000-mile aerial odyssey through Africa and Asia.

In Charlie, their lightweight single-engine Cessna, they braved desert and jungle, touching down at remote airstrips wherever they could find them.

Baggage for the yearlong trip, including six hot-water bottles of emergency water, overloaded the plane by 250 pounds. Three suitcases carried a year's clothing.

At Great Britain's Mediterranean fortress the authors bade goodbye to Europe on the first leg of their trip. From the Spanish side they glimpsed an unusual view of Gibraltar's town, naval harbor, and jet airstrip where they landed.

Kodachromes by Tay and Lowell Thomas, Jr.

then Tay spotted our destination dead ahead.

The settlement itself was easy enough to see, but where was the landing strip? At closer range we saw a few houses near where the waves crashed on the beach, then a wind-driven generator and several slender radio towers. But still no airfield.

We circled the settlement and circled again. Now we could make out what looked like three trimotored Junkers near the buildings. There *must* be an airstrip somewhere. Then we noticed a man standing near the fort and signaling, motioning with his hands as if he were bowling. Finally we realized he was telling us where to land.

Without wasting any more precious gas, we swept around and glided in. Sand grabbed the wheels; the plane lurched through one drift, then another, and I waited tensely for a bigger one to nose us over. Thanks to Charlie's tail-heavy overload, none did.

Spanish Airmen Rush to the Rescue

When we stopped, our wheels were deep in the sand and even full throttle wouldn't move us. Shutting off the engine, Tay and I climbed out as a truckload of men in the drab blue-gray uniform of the Spanish Air Force came careening toward us, looking as if they were ready to repel an invasion.

They were friendly and considerate, however, and pushed Charlie through the drift. Then we tried all the words we knew for gasoline—petrol, *essence*, benzine—and their faces lighted up.

"*Si, si,*" they replied. "*Gasolina!*" Several airmen rolled out a drum of aviation gas, and a few minutes later our tanks were full.

The take-off was even more nerve-racking than the landing, because this time we knew what we were up against. I gave the plane almost full throttle before releasing the brakes. Charlie plunged through the sand, and then I held the wheel back and we staggered off with an air speed of only about 40 miles an hour, with the stall-warning horn "beep-beeping" in our ears. But once in the air we quickly gained speed; we had plenty of gas, and our next stop was only two-and-a-half hours away.

Villa Cisneros is the capital of the Spanish territory of Rio de Oro, a small country by African standards but nearly ten times as big as the State of New Jersey. So we expected a city of some size and planned to spend the night there, taking off for Dakar early in the morning.

Instead we found a handful of white buildings perched on the shore of a long sandy peninsula, with a few fishing boats anchored offshore, and a desert airstrip, clearly marked, at least, and hard surfaced. But the village looked like a place with few extra beds.

Wind Charger Powers Desert Inn

We landed and taxied toward the control tower. Even before the propeller stopped, a huge gas truck pulled up to refill our tanks. We asked, doubtfully, about food and a place to sleep.

"Why, of course!" we were told. "The inn is right over there."

The most prominent structure in Villa Cisneros is the fortress, a blindingly white building surrounded by a sparkling whitewashed wall. The inn stood just beyond it, with a wind charger on the roof, an enormous propeller geared to a generator which supplies the inn's electricity. (When the wind dies, as it did that evening, guests use candles.)

In the little dining room we found an English-speaking Berber, who obligingly ordered eggs for us from the kitchen. We asked him where he had learned English.

"During the war," he said. "Working with the British and Americans."

"Where is your home?" Tay asked.

"In the desert," he replied.

"But where?" we asked.

We got out our flying map, and he pointed to an area that was completely blank.

"It takes many days by camel," he explained.

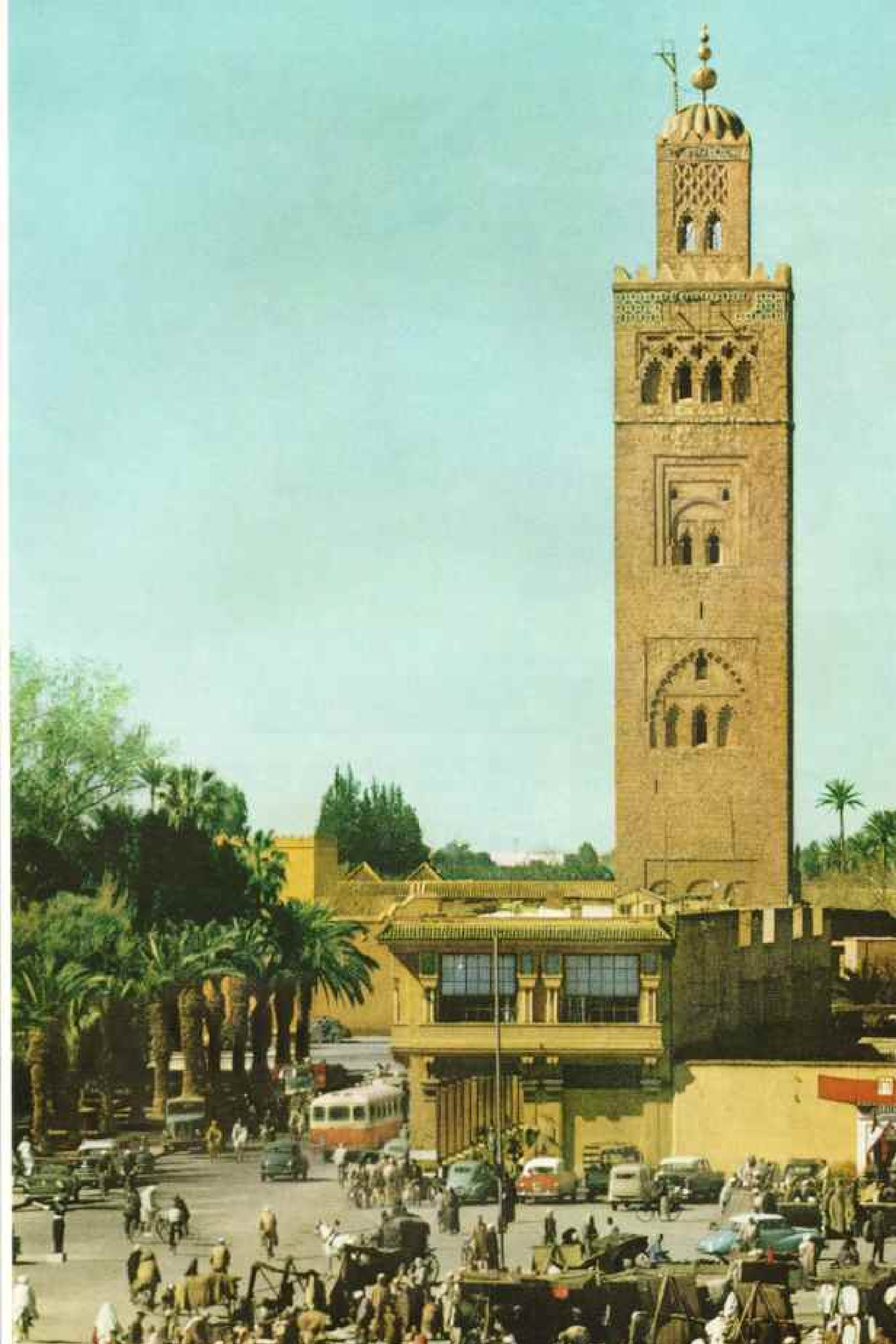
"Is there a village?" we asked.

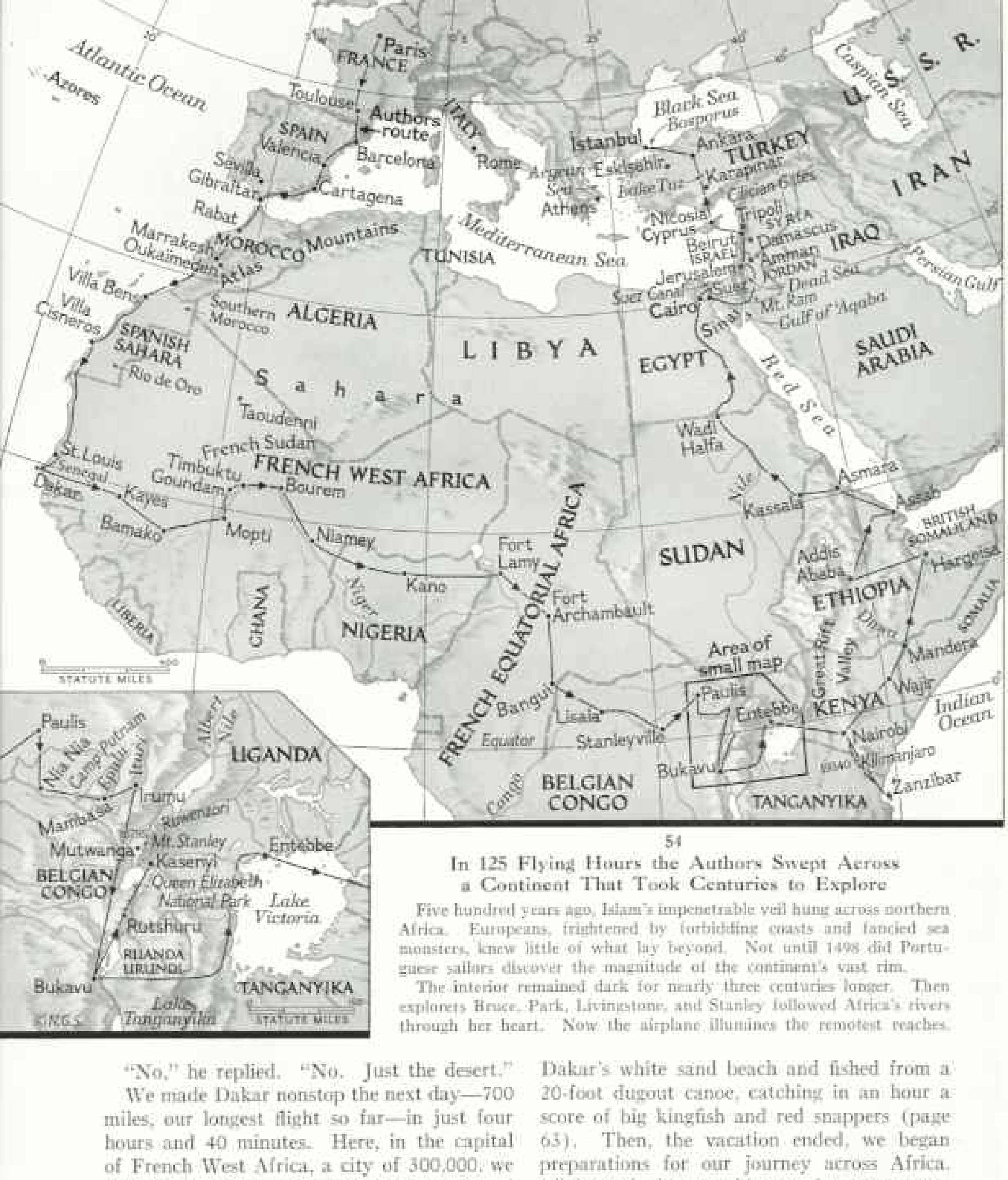
Koutoubia, Mosque of the Booksellers, → Towers 221 Feet Above Marrakesh

Here the authors found a sister to Sevilla, Spain. The outstanding landmark of the Moroccan city, the slender Koutoubia, is a counterpart of Sevilla's equally celebrated tower, the Giralda. Both were built by Yakub el Mansur, a Berber chieftain of the 12th century.

Legend says that El Mansur's wife donated her jewelry for three golden spheres, the largest 4½ feet in diameter, to top Koutoubia's dome. Present ornaments are gold-plated copper.

The view looks into Marrakesh's "Concourse of Sinners," so-called by travelers because sultans once exhibited there the heads of executed traitors. The area is now a parking lot.





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In 125 Flying Hours the Authors Swept Across a Continent That Took Centuries to Explore

Five hundred years ago, Islam's impenetrable veil hung across northern Africa. Europeans, frightened by forbidding coasts and fancied sea monsters, knew little of what lay beyond. Not until 1498 did Portuguese sailors discover the magnitude of the continent's vast rim.

The interior remained dark for nearly three centuries longer. Then explorers Bruce, Park, Livingstone, and Stanley followed Africa's rivers through her heart. Now the airplane illumines the remotest reaches.

"No," he replied. "No. Just the desert."

We made Dakar nonstop the next day—700 miles, our longest flight so far—in just four hours and 40 minutes. Here, in the capital of French West Africa, a city of 300,000, we planned to luxuriate for ten days as a sort of Easter vacation. We knew that from here on even modest comforts would be few.

Rubber Bottles Hold Emergency Water

In the modern Hotel Croix du Sud the French cuisine was so appetizing that Tay, thoughtless of Charlie's limitations, gained five pounds. This forced me to issue an ultimatum: we could not afford to add another ounce to Charlie's overload!

We swam in the lukewarm Atlantic off Dakar's white sand beach and fished from a 20-foot dugout canoe, catching in an hour a score of big kingfish and red snappers (page 63). Then, the vacation ended, we began preparations for our journey across Africa. Flight and photographic permits were necessary; we had to plan our stopping points and arrange for living accommodations at French outposts where quarters for visitors are rare and tourist hotels nonexistent. And Charlie's engine had to be overhauled.

We also rechecked our first-aid kit and emergency supplies: two cans of corned-beef hash, one of pork and beans, two tins of cheese, two of sardines, one of crackers, some rice and raisins. Our drinking water filled two canteens and six hot-water bottles.

The bottles were a suggestion of Brig. Gen. Charles A. Lindbergh; they'd be less likely to break, he said, during a crack-up. He also gave us another piece of counsel: in a single-engine plane, avoid flying over terrain where you can't land. Sound enough advice, but a bit odd, we thought, coming from him!

Finally we took off. Our first major goal: the Belgian Congo, in the heart of Africa's green jungle.*

During the next 70 days we flew a long, curving route eastward across the breadth of the continent, a journey of more than 5,000 miles, as far as a round-trip flight across the United States.† We did it, of course, in daylight hops of 300 to 600 miles.

And on the way we learned a great deal about the joys and hazards of substituting a small plane for the family car in seeing the world.

One hazard was made very clear the first day. Looking out Charlie's window, we spotted far below on the sand the scattered parts of a small, single-engine aircraft. Its pilot, a young Frenchwoman bound for Dakar, had run out of gas and cracked up the day before. She had escaped with a broken leg, but there was little left of her plane.

Dive-bombed by African Storks

Following the Niger River east toward Goundam, in the French Sudan, we met hazards two and three.

Number two was peculiar to the time and place: migrating storks. Flocks of them filled the sky around us. They seemed half as big as Charlie and had a habit, when we passed beneath them, of folding their wings in mid-flight and apparently diving straight at the plane. So we took turns bird-watching to avoid them.

This in turn complicated hazard number three. We had chosen a route that led over the Niger River, and the stream, along with map, radio, and compass, was to serve as our guide. At first it was easy to follow the river—a bright, broad line paralleled on both sides by cotton fields. But within an hour it began to wander and branch, to form lakes and ponds and swamps in a completely haphazard manner.

In cases like this our maps were almost useless, and it was all too easy to follow some riverlike strip of water completely off our route. Similarly, African roads were apt to divide and subdivide into ill-defined tracks or disappear from view entirely under the spreading tops of green forest.

African weather, of course, was a constant problem. Sandstorms over the Sahara or fast-rising thunderheads over the jungle could play hob with our flight plans, and sometimes did. This was usually less of a risk than an inconvenience: if the weather was bad ahead, we simply stayed on the ground.

Engine Failure a Constant Threat

The most frightening of all the dangers on a flight like ours was the possibility of engine failure, particularly over dense jungle.

"How could we make a forced landing in that tangle?" Tay and I would ask ourselves as we looked down on some trackless sea of green below. It was a question I, at least, had to be ready to answer as best I could.

Our only hope would be to plop into the treetops just at stalling speed with the tail low, praying that the forest's heavy canopy would hold the plane by wings and fuselage, preventing a crash to the ground more than 100 feet below.

Even if we came through such a jungle-top landing, what then? Charlie's remains would settle into the forest and be lost to any aerial search. And unless we could shinny down a liana and find a road, there would be little hope of our survival. This was another reason we tried to fly above roads or rivers where possible.

It was also why we treated Charlie like a pampered baby, straining every ounce of gas he drank, changing his oil and cleaning his filters and plugs at every opportunity. Yet, despite all our precautions, we had alarms.

Emergency Develops at 7,000 Feet

Setting out one morning from Niamey in French West Africa, bound for the Nigerian city of Kano, we leveled off at 7,000 feet. Just as we reached cruising speed, there was a frightening clatter and a heavy vibration up front.

I thought a bearing had let go. But the engine kept running; oil pressure and temperature were okay; so were the magnetos, the cylinder-head temperature, and everything

* See "White Magic in the Belgian Congo," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, March, 1952.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Safari Through Changing Africa," August, 1953; and "Safari from Congo to Cairo," December, 1954, both by Elsie May Bell Grosvenor.

↑ **Atlas Snows Gleam Above Marrakesh**

Mr. Thomas's movie camera scans tanning vats that produce famed morocco leather. The flatland oasis reminded the authors of Tucson, Arizona.

↓ **Snake Charmer Practices an Outlawed Art**

Morocco achieved independence last year; since then a city ordinance forbids such spectacles. Arabs, Berbers, and Frenchmen watch the risky performance.

↓ **Vendor with Fringed Hat and Clanging Bell Quenches Thirst in Dusty Marrakesh**

Throughout the Moslem world "walking soda fountains" patrol city streets, attracting parched customers who drink, one after the other, from the same bowl of polished brass. This salesman dispenses water from a bagpipe-like *guerba* of goatskin; spare cups, ready for a rush of business, hang from his shoulder.

else I could check. Still the clatter went on. We headed back for Niamey, radioing to let them know we might not make it.

To our relief, we reached the airstrip in one piece. After we landed, we learned the trouble was not really so bad as it had sounded. Some of the screws holding the engine cowling had worked free, leaving a sizable sheet of aluminum shuddering in the propeller blast. New screws and washers from our spare-parts kit fixed it quickly, with no damage done except to our nerves.

Yet minor crises like this helped to keep us from getting overconfident, and so did the news, later on, that still another small plane like ours had run out of gas over the jungle and crashed in a village clearing. (In spite of all the warnings, I *did* eventually become overconfident, with nearly disastrous results. But that came later.)

These were the hazards, or some of them. Though they may sound ominous, they were more than offset by advantages. Flying our own plane, we could move with almost complete freedom where no roads existed. We could reach in a few hours settlements that would otherwise have taken days or weeks of sweltering overland travel.

500 Miles Between Breakfast and Lunch

Charlie, once in the air, could fly 160 miles an hour without straining—even faster with a tail wind—which meant we could easily complete a 500-mile hop between breakfast and lunch. Tay and I took turns at the controls. If we didn't want to stop at lunchtime, we brought along a box lunch, crackers and cheese or sandwiches, and ate in the air.

And when the ground temperature was unbearably hot (in some outposts we stifled through days at 110° to 115° F.), Charlie lifted us gently into cool, bracing air at 5,000 feet or higher. He could take us up to 24,000 if necessary.

Our chief limitation was the availability of airstrips and gasoline, and these were surprisingly frequent, even in "darkest" Africa. Landing strips of some kind or other were seldom more than 200 miles apart, and we found usable aviation gas for sale at nearly all of them.

But the freedom of movement, freedom to change our plans to suit our whims, was what we valued most. In Stanleyville, deep in the Belgian Congo, we heard about the Mangbetu, a group of Africans who have retained a unique dance, unlike anything we could witness elsewhere in Africa. To see it, we would have to detour to Paulis, 100 miles off our route to the north.

"Is there an airstrip at Paulis?" we asked. Yes, a grass strip cleared from the jungle. Was there gas? For Charlie would be strained to make it there and on to our next stop without refueling. A Shell Oil representative at Stanleyville recalled that a few drums had been left at the place long ago.

"There Goes Our Cleaning Fluid"

So, with next-to-no advance planning, we flew to Paulis, the first American plane, the Belgian administrator told us, ever to visit this out-of-the-way settlement.

The spectacular dance was well worth the trip. Men and women wearing feathered headdresses and loincloths of bark or animal skins moved slowly in a great circle, shuffling in the dust, tossing their red-plumed heads from side to side, and jingling little bells on their wrists and toes. The men waved their spears against a sky studded with black and white cumulus clouds (page 84).

Next morning we went to refuel our plane. Paulis had gasoline, as promised—two grades of it in the over-aged drums: 100 octane and 73 octane. We chose the 73 as least likely to have spoiled. But as we filled Charlie's partially empty tank, we heard someone remark, "Well, there goes our cleaning fluid."

"What?" I asked. "Has this been used as cleaning fluid?"

"Yes," we were told, "but not very often."

Never, I am sure, has gasoline been more carefully filtered. And when we got into the air, I stayed safely over Paulis's airstrip as I gingerly switched to the tank of "cleaning fluid." Fortunately the engine ran as smoothly as ever.

Soldier Guards Plane from Elephants

High on the list of projects that had brought us to central Africa was a visit to the Bambuti Pygmies of the Ituri Forest in the Belgian Congo. Here we also hoped to meet Anne Eisner Putnam, a remarkable American woman who, we had heard, was living in close contact with them.

So we set out for the village of Mambasa, passing over the Ituri River at Nia Nia and picking up the thin thread of a dirt road that wound east from there to Irumu. Beneath our wings now, hidden under the almost im-

penetrable cover of the dense Ituri Forest, were bands of Pygmies, hunting, perhaps, with bows and arrows and no doubt wondering at the sound of Charlie's engine.

The Mambasa airstrip was only a rectangle of grass carved from the forest. There was no hangar, no structure of any kind. This raised a question: Where would we put Charlie while we visited the Pygmies?

A friendly Belgian official solved the problem for us. He spoke to some Africans standing by, who lopped off branches from near-by trees with razor-sharp bush knives. We pounded the stakes into the rain-soaked earth with clubs, anchoring Charlie to them with our cargo ropes.

Then a native soldier was appointed Charlie's guard, to shoo off any elephants that might try to use a wingtip for a back-scratcher or any hyenas that might fancy chewing up the tires.

Sign Points Way to Jungle Inn

We still had an hour's drive ahead, which we made through the forest with a young Belgian agricultural expert. A rutted dirt road, the one we had seen from the plane, led us toward the west. Finally, sloshing through a heavy tropical downpour, we came to a side road and a sign: "Camp Putnam. Lodgement. Diner." The road led off into the forest.

We drove through the rain for half a mile or so, with the dripping forest pressing closely

Skis and Snow on the Roof of North Africa Provide a Holiday from Desert Heat

Within an hour or two of the tropical flowers and palm trees of Marrakesh, the Atlas range sheers upward from the plain to more than 13,000 feet. Here, at about 8,000 feet, the authors indulge their favorite sport. A Berber worker, capped and robed like Santa Claus, supervises the ski lift in background.

← Goatherd and Skier, Both Barelegged, Shiver in the Evening Chill

The Berber drives his flock home from greener slopes on the other side of the mountain. His impressions of the author's summery garb can only be guessed, but a French bystander exclaimed, "*Quelle horreur!*" Mr. Thomas has smeared his face with zinc ointment against sunburn.

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in on both sides. The rain was still falling as we stopped at last and scurried inside an attractive leaf-thatched house. There, crowded around a large stone fireplace, were our first Pygmies!

Camp Putnam a Scientists' Mecca

They were just as small as we had expected them to be. The tallest were no more than chest-high to us and wore the barest minimum of clothing—nothing, in fact, but bark loincloths.

Just then Anne Putnam appeared, a slender, almost wiry woman in her forties, dressed in faded slacks and a white blouse with the tails hanging out.

"Glad to see you," she said hospitably. "You're just in time for breakfast." Whereupon we helped her polish off a platter of pancakes, though it was nearly noon. Then she showed us our "room," an attractive circular thatched hut at the edge of the forest clearing.

Anne Putnam is a painter who moved from New York's Greenwich Village to Africa because her husband was interested in the Pygmies. Patrick Putnam served for a time as public health officer for the Belgian Congo Government. Then, in 1932, he established a forest "hotel" for the few travelers who came this way.

Camp Putnam soon became famous. Scientists used it as a base from which to study natural history or the Pygmies. Patrick Putnam became an authority on tropical diseases, and doctors, missionaries, and others came to consult him.

← A Picture in 60 Seconds Delights Two French Children

The Polaroid Land camera, which quickly produces a developed photograph, warmed children's hearts and broke down the reserve of tribesmen. Once they had seen their own likenesses, many camera-shy subjects eagerly agreed to color photography.

Here Mrs. Thomas gives a picture to youngsters at a chalet near Oukaïmeden in the Atlas chain.

He died in December, 1953. At the time of our visit his widow, surrounded by some 200 Pygmies and other local tribesmen who looked to her for guidance, was continuing the work her husband had begun 22 years before.

As much as we liked Camp Putnam's informal atmosphere and pleasant meals, it was clear that we were not seeing the Pygmies in their natural environment; they are essentially forest dwellers.

"Let's go into the forest with them," I urged Tay. "That's the only way we can observe and film their normal life." Luckily, Anne Putnam offered to go with us.

We got an early start. Anne, Tay, and I and about 20 Pygmy families crossed the camp road, turned into a narrow path, and were instantly swallowed by the jungle.

Giant trees stood all about us, their great trunks tall and straight in the shadowy greenness. High overhead hung an almost unbroken canopy of leaves through which, here and there, it was possible to catch a glimpse of the blue sky. All about us, like a lesser forest within the greater one, grew bushes, vines, smaller trees, ferns, and mosses, covering the moist, springy earth as completely as the vast treetops obscured the sky.

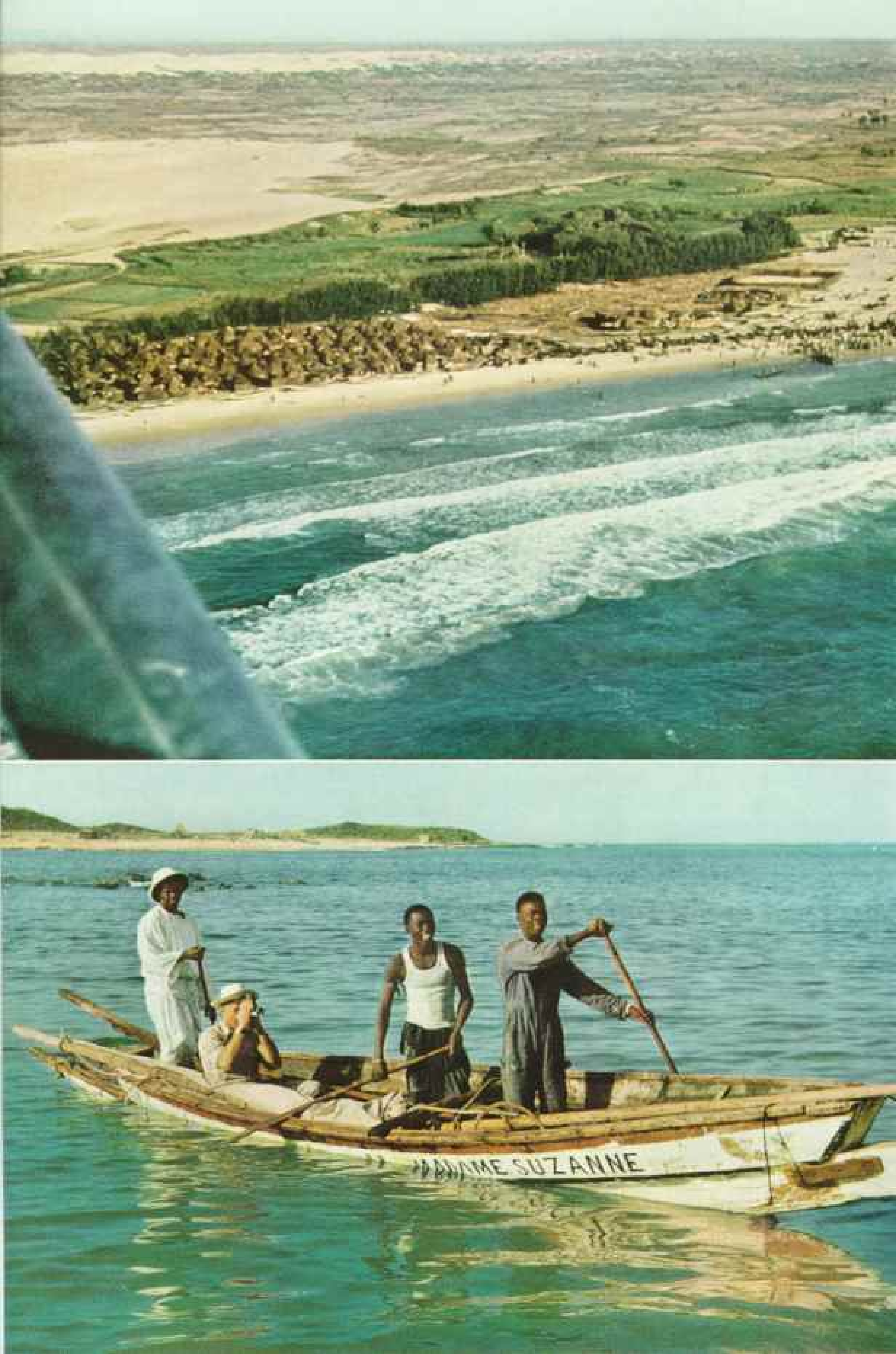
Jungle Trip Resembles Picnic

Here was Africa as nature made it. Exploring this same forest in 1887, Sir Henry M. Stanley had watched starvation, fever, and hostile tribes strip him of almost half his expedition. Now, only 67 years later, we were being convoyed by our happy band of Pygmies on a journey that resembled Stanley's terrible march much less than it did a picnic.

What now impressed us was that our surroundings were so peaceful, quiet, and beautiful. We were conscious of no dangers and we had no guns. The only weapons anywhere about were the bows and arrows of the Pygmies. And the only sounds we heard were those of birds and laughing voices.

The Pygmies had chosen a campsite in a small forest clearing; we had no sooner reached it than the work of the women began. While the men made pipes out of long banana stems and sat down to smoke, the women built the houses the new camp would require.

Within an hour the clearing was dotted with a dozen comfortable little rainproof huts made of saplings and broad *mongongo* leaves. The most elaborate were surrounded by a drainage ditch to keep the floor dry inside. Fires


MARIE SUZANNE

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↑ Fishermen Off French West Africa Must Run a Gantlet of Surf

For 1,500 miles from Rabat, in Morocco, to Dakar, in Senegal, the Thomases' "flight to adventure" paralleled the Atlantic coast. Over much of that distance their plane followed a desolate line separating an ocean of salt from an ocean of sand. Settlements were rare, airstrips and roads even rarer. At times storms forced the plane within 100 feet of the waves.

North of Dakar the authors spotted this Senegalese fishing village surrounded by greenery. At a tiny coastal settlement such as this, fuel shortage forced the plane to land in sand drifts.

Tongues of sand (upper left) hint of vast desert stretches to the north and east. Macadam road connects St. Louis and Dakar.

← Paddles Propel *Madame Suzanne*

Fishermen from N'Gor, northwest of Dakar, show smiles of pleasure, for catches run heavy off this sheltered Atlantic beach.

→ Tay Thomas marvels at an hour's catch of kingfish and plump red snapper stowed aboard the dugout. Senegalese anglers took these fish on heavy hand lines, using three-inch silver lures.

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Two Hoist a Load of Fish That One Head Will Carry

When Senegalese fishermen dock canoes on the beach at N'Gor, their women swarm around them to divide the catch. Each marks her share so Dakar's fishmongers will know whom to pay. This woman snipped identifying notches in the tails.

had been kindled from embers that had been brought along, and the newly created village was complete even to mongrel dogs and an indefinite number of hens and baby chicks. These nomadic little people carry all their belongings with them when they change camp; the chickens had been transported in reed baskets.

Oddly enough, the Bambuti never eat the chickens or even their eggs, but keep them for their Negro masters.

This curious arrangement is one facet of a strange and somewhat intricate relationship between the little people and the larger Bantu of the vicinity.

A Negro master may have almost any number of Pygmies, though they are neither slaves nor subjects in the ordinary sense. The "big chief" may be supplied fresh meat, for example, by his Pygmy followers, but he, in turn, is expected to provide them with tobacco, iron arrow points, foodstuffs, salt, and other small necessities.

On the other hand, not even these Negro masters can make the Pygmies serve against their will. If they are not happy, they slip away into the forest and attach themselves after a time to a new master.

Having erected huts for themselves, the Pygmies next built two rectangular and much larger huts for Anne and for us. They were big enough to stand up in, and ours was long enough for two cots and a shelf of sticks. We promptly made ourselves at home.

Our wash water came in a bucket from a near-by stream.

"Look," said Tay, "they've even made us a shower stall!" Sure enough, there stood a leafy enclosure made of mngongo leaves on a frame of saplings. Some earlier visitor had given Anne a canvas bucket with a shower head on the bottom. When this was filled with warm water and suspended over the leafy enclosure, it worked almost as effectively as showers do at home.

Among the Bambuti, children under four wear nothing at all, and the others next to nothing. Yet they seem to have much the same attitude toward nakedness as more heavily clad people.

"Just the other day," Anne Putnam told us, "I saw a fight between two Pygmy boys, with all the Bambuti watching and cheering. Suddenly one of the boys lost his loincloth, and his mother immediately carried him off. A few minutes later he came back, properly clad again, and the fight continued!"

Pygmies Dine on Varied Menu

The food they prepared for us was excellent: mushrooms cooked in palm oil; antelope meat skewered on sticks and broiled; manioc pounded into flour, made into balls, and cooked in palm oil; and honey tea.

The pleasantest part of each day in the forest camp came after supper, when the

(*Continued on page 73*)

♠ **Charlie Drinks a Milk Can of Gas; Every Half Pint Means an Extra Mile**

The plane's 60-gallon capacity allowed nonstop hops as long as 750 miles. Even so, finding fuel in remote places was a major problem. Once the only gasoline available had been used as cleaning fluid. The authors filtered it through chamois to remove dirt and water.

♦ **Baby, Head Shielded from the Sun, Rides Papoose-style in Dakar**

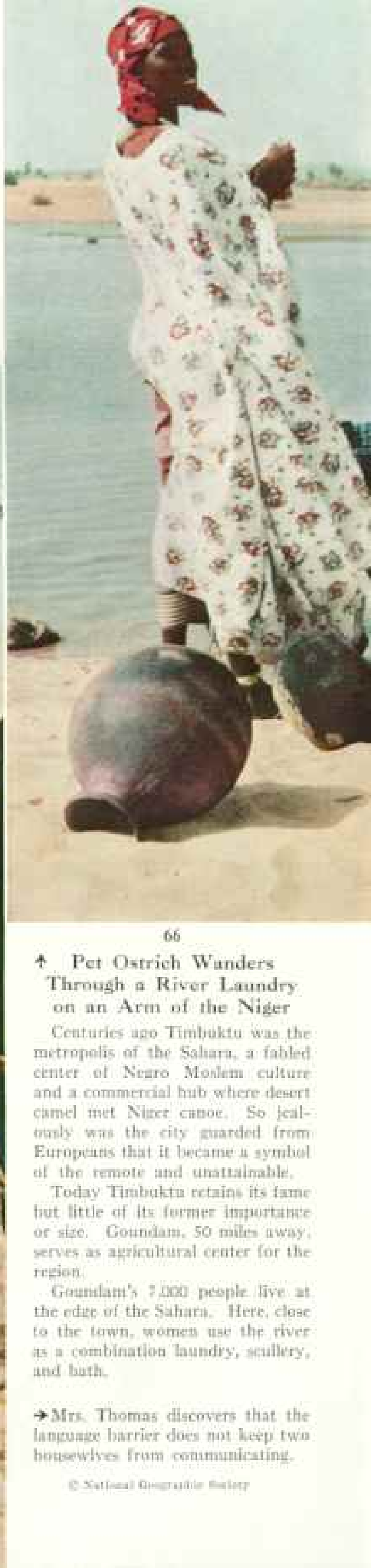
Senegalese women, displaying their wealth through elaborate and gaudy clothes, favor voluminous Mother Hubbards and intricately wound turbans with rakishly projecting ends. This mother chews a limewood stick; Tay Thomas smiles at the infant.

Desert Salt, Famed for Magic Powers, Sells by the Slab

Cursed by lack of salt, west and central Africa draw supplies from the open mines of Taoudenni, in the desolate heart of the western Sahara. The mineral, quarried in tombstonelike blocks, reaches Timbuktu and Goundam—400 miles to the south—by caravans of as many as 6,000 camels. So hazardous and exhausting is the trek, the authors were told, that the cargo increases in value fivefold, and the camelmen receive three bars of every four as compensation.

Here, in Goundam, a trader haggles with women over 55-pound slabs worth about $4.25 each. French Sudanese reject ordinary salt, believing it lacks curative properties of the desert product.

Kodachromes by Tor and Lowell Thomas, Jr.



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Pet Ostrich Wanders Through a River Laundry on an Arm of the Niger

Centuries ago Timbuktu was the metropolis of the Sahara, a fabled center of Negro Moslem culture and a commercial hub where desert camel met Niger canoe. So jealously was the city guarded from Europeans that it became a symbol of the remote and unattainable.

Today Timbuktu retains its fame but little of its former importance or size. Goundam, 50 miles away, serves as agricultural center for the region.

Goundam's 7,000 people live at the edge of the Sahara. Here, close to the town, women use the river as a combination laundry, scullery, and bath.

➔ Mrs. Thomas discovers that the language barrier does not keep two housewives from communicating.

Milling Throngs on Horse and Foot Welcome a Visitor to Goundam

Negro, Moor, and Tuareg race through the square, excited by the arrival of a Negro member of the French National Assembly. The procession, carrying the Tricolor, passes the post, telephone, and telegraph office (left).

↓ Tuareg Men Veil Their Faces; Their Wives Do Not

Nomadic Tuareg were masters of the Sahara until the French broke their power at the turn of the century. Fearless and bloodthirsty, they fought with lance, sword, and antelope-hide buckler long after their ancient enemies, the Arabs, had taken to firearms. Some Tuareg staged uprisings as late as 1940.

Hard manual labor dishonors these "people of the veil." "Shame enters with the plow," say the tribal nobles. Much of the time they wander through the desert, breeding camels and goats and escorting caravans. They hold Negro farmers in virtual peonage, taking a lion's share of their harvest.

A Hamitic people, the Tuareg are related to the Berbers and the ancient Egyptians. Their white skins seldom show white, for they rarely bathe, and the blue dye of veils and robes rubs off like carbon paper. Though Moslems, Tuareg men do not require their women to veil.

This chief gave the author the dagger worn on his left arm. Leather bags below his veil hold amulets and personal possessions.

Opposite, below: Tuareg clap while watching a dance. Red veil violates custom, which frowns on brightly colored clothing.

↑ A Tuareg Rides Contemptuously Past Goundam's Adobe Huts

Negroes of the town live by farming the river's irrigated banks. Their way of life bears little resemblance to that of the nomadic Moor and Tuareg, who live in temporary encampments near by.

↓ Desert Warriors Entertain the Authors with Music and Tea

Sitting in a Goundam courtyard, the host pours syrup-sweet tea. Blue cone by his hand is the authors' gift of a sugar loaf. Tape recorder on right captures the plaintive strumming of a guitarlike *guabri*.

← Moorish Girls Learn Their Lessons from French Primers

Eleven percent of the children in French West Africa go to school. These Goundam youngsters study the same subjects as children in metropolitan France.

Below: Mrs. Thomas helps Moorish pupils clothe dolls owned by a French playmate. Discarding stylish European dresses, the girls wrapped the dolls in simple desert style.

smoke of the campfires curled upward into the darkness overhead and the Bambuti lay about in happy contentment.

At every opportunity Pygmies sing and dance. On our first evening in camp everything was quiet until one of the men produced a small hollowed-out piece of wood and began to tap on it with a pair of sticks. Little by little all the others began to sing and clap.

A few of the men started to dance about the fire, bending toward it, leaping away, and weaving a kind of formless pattern about it. Shortly every Pygmy in camp was dancing, singing, or otherwise taking part.

The dance went on and on, with no end in sight. Eventually Tay and I went to bed, though there was scant hope of sleep until hours later, when the camp finally quieted down.

Another night, long after the camp had gone to sleep, we were awakened by a Pygmy voice that called out loudly, as if making a speech in the darkness. What the words meant we could not tell, but the next morning the Bambuti told Anne that one of their ancestors, taking the voice of an owl, had spoken from the forest. The voice we had heard, Anne explained to us, had been that of the Pygmy who had answered.

"We Bambuti," he had shouted to the forest-dwelling spirit, "have come in peace. There are white men among us. We have done no wrong. Go away and leave us alone."

Bambuti Warrior Takes to the Air

By way of a grand climax to our visit we invited some of the Pygmies for an airplane ride. Only one was willing to accept. His name was Faizi, and he had a reputation as the very bravest of all Bambuti, the only one in that section with an elephant to his credit —an elephant he had killed by slipping silently through the forest until he was able from almost beneath the animal to drive a spear into its vitals!

At our suggestion, Anne gave Faizi a detailed briefing, explaining as forcefully as possible that the control wheel that stood only a few inches in front of him was linked to mine; and that it should be considered as if it were "a charging bull elephant—something to be left alone." On the other hand, the handle to which he was told he might cling was "a tree—a place of safety." These explanations clearly made an impression.

I strapped Faizi into Tay's seat, while she climbed in behind with our cameras. She kept the metal fire extinguisher within easy reach lest the little warrior, despite his bravery, should succumb to panic amid the strange surroundings.

The door slammed shut. The engine roared. Faizi grasped the handle that Anne had called "a tree." He looked a little grim, but other than that the first real sign of emotion I detected came when we passed over the Epulu River at the height of a thousand feet and I pointed it out to him.

"*Mace, mace,*" he said. "Water, water." And then, as we returned and banked around the airstrip before landing, he saw some of his Pygmy friends in the crowd below.

"Bambuti!" he said excitedly.

Pygmy Declines a Second Flight

When we had landed and rolled to a stop, Faizi showed signs of relief, though he did not release his hold on "the tree" to which he had clung throughout the flight. Tay and I unstrapped his seat belt and let him out.

"*Wapi!*" whooped Faizi as he ran to rejoin his fellows. And that, as nearly as we were able to learn, was the Bambuti equivalent of "Wow!" He excitedly described the plane going into a bank. Then he stooped and plucked a blade of grass. Holding it up, he pointed first to the grass and then to his friends.

"This," he was saying, "is how small you looked from up there."

We offered to take him up again, but he declined. A second flight would have added little to his reputation. Already his bravery was legendary, for had he not killed an elephant? And now he was also the Bambuti hunter who had flown!

In Pygmyland, I am sure, that is reputation enough for any man.

Not far from Pygmy country stands one of the great sights of the world, the fabulous Mountains of the Moon, the Ruwenzori.

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Circling and Writhing, Slashing and Fending, Tuareg Warriors Dance with Danger

Curiously, we found that, for us, the best way to reach the Congo side of these mountains was to leave the Congo.

If this sounds like a riddle, so it was. There is an airport at Rutshuru, a trading center about two days' drive from our goal. But when we got there, we found there was neither car nor driver available.

Not far across the border in Uganda, however, there was an airstrip at Kasenyi, in the newly established Queen Elizabeth National Park, less than a day's drive from the mountains. Perhaps we could hire a car there. It was worth a try.

The "airport" was a grass strip in the middle of nowhere. Before landing on it, we had to buzz off a herd of buffalo grazing at one end.

Natives came running from a small village near by, but there were no signs of park wardens or cars and, naturally, no telephone. And in an African game sanctuary one would rather not stand by the road hitching a ride. There are too few cars and too many wild animals.

We sat down in the shade of Charlie's wing and thought it over. There should be a British official at the park's Mweya Safari Lodge, 20 miles away, and probably a car. So we decided to "bomb" the lodge with a note.

"We are two Americans," Tay wrote, "coming from the Congo, and will land at Kasenyi, where we'd like to leave our plane for a week while visiting your lodge and Mutwanga. Could you send an auto for us? If so, please wave your arms as a signal. Thank you."

Airborne Message Interrupts a Siesta

We stuffed the scrap of paper into an empty cheese box, along with a few stones, and hopped back into the air. As we flew over the lodge at about 100 feet, Tay released the missile, which landed right at the foot of the lodge flagpole.

"Lucky shot," I commented.

"Luck nothing," said Tay. "Expert marksmanship."

By the time we had completed our fourth circle, a European, wearing a bathrobe, appeared and waved a towel. Obviously, we had interrupted his afternoon siesta.

So back to the Kasenyi strip we flew, and an hour later a pleasant young Britisher

arrived in a Land-Rover. He was our towel waver; we learned that he was the park warden, too, when he admonished us for having flown so low during our "bombing run."

"Bad for the animals, you know," he said. "Stampedes them, which is jolly bad for us if we happen to be in the way."

Authors Hitchhike to Ruwenzori

We spent two days at the lodge, seeing the park and its animal life—elephants, buffaloes, waterbucks, kobs, wart hogs, and hippos.* And by luck we met a German woman there with a little Volkswagen; she was bound for Mutwanga, back across the Congo border, in the foothills of the Ruwenzori. So we rode with her instead of trying to hire a car.

The Hotel Ruwenzori sits high in the foothills. Bright flowers, green lawns, and blossoming trees surround it, and from our room we could see the steep mountain slopes and get glimpses, when the clouds cleared, of their snow-covered peaks, some of which tower to more than 16,000 feet.

For the first few days we rested, ate, and caught up on our correspondence. The food was equal to any we had ever had—on a par, we felt, with Maxim's of Paris. But then I decided that just looking at the Mountains of the Moon was not enough: I was eager to climb higher on those impressive equatorial slopes. When a young Belgian arrived on leave from his work as a government veterinarian, he and I promptly organized a two-man expedition and enlisted the innkeeper's aid in rounding up the necessary porters, food, and sleeping bags.

Tay preferred a few more days of rest, so I left her at the inn. With my Belgian companion, our porters, our modest equipment, and supplies for five days, we set out one morning to climb the slippery, muddy trail.

For an hour we climbed through tall elephant grass. Then, at the entrance to the Ruwenzori forest we paid a fee of 400 Congolese francs each and picked up an African guide.

Rain drenched us as we climbed upward through a strange forest studded with enormous tree ferns. Gnats swarmed constantly about our heads, and all around us unseen insects sang shrilly in the humid air.

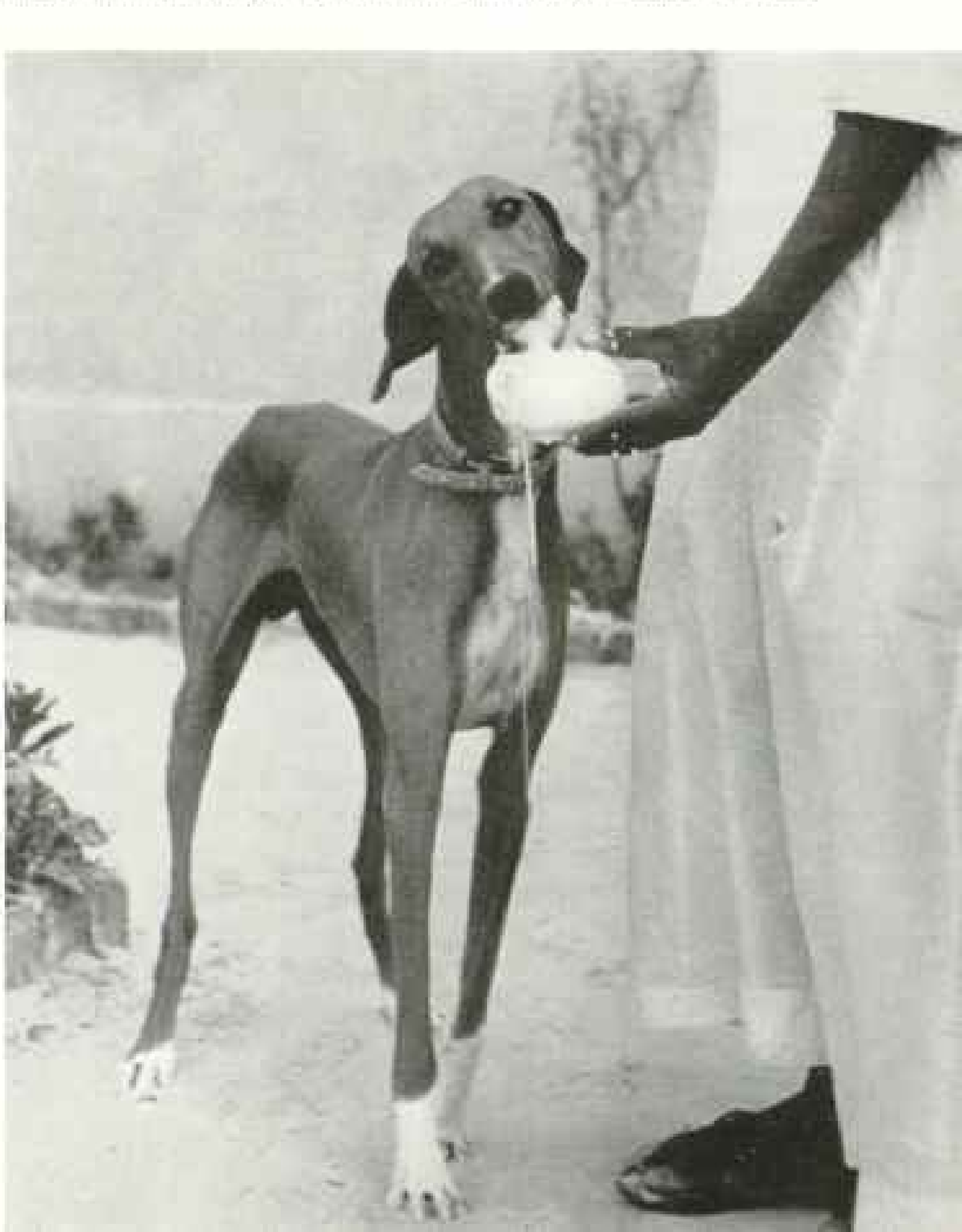
About 12:30 we reached Kalonge, the first in a series of resthouses built along the trail. Finding myself in a comfortable bungalow, I dug out of my rucksack a treatise that I had brought along with just such a moment in mind. It was a paper Tay had written about the Mountains of the Moon during her senior year at college, when she had taken a course in African geography.

I don't know how proud Tay is today of its style or content, but as I read it in the Kalonge bungalow, while the rain drummed endlessly on the roof, it gave me a wonderful briefing for the climb ahead.

*See "Roaming Africa's Untenced Zoos," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, March, 1950.

Desert Aristocrat, a Saluki, Laps Milk from a Cup

Bred through countless centuries, this hound is probably the living representative of the first dog trained for hunting by man. Easily running at speeds up to 40 miles an hour, it can tire a gazelle.



"Africa," she had written (with no thought, perhaps, of ever penetrating into its interior), "is still a dark, unearthly continent to most people. . . . Perhaps its greatest mystery is that surrounding the Mountains of the Moon. Their very name, their legendary history, their rugged grandeur, and immense altitude, and, above all, their amazing illusiveness, present a fascinating subject for exploration.

"The importance of these mountains," she continued, "is accentuated by their strategic location at the head of the Nile watershed. For centuries historians and geographers have inquired about the source of this river. Homer traced the Nile south of Libya to a land of Pygmies . . . but it was the Alexandrian geographer Ptolemy who first referred to this source as the Mountains of the Moon."

I learned from my wife's college paper that Sir Henry M. Stanley, on his expedition of 1887-89, made the first accurate report of the existence and location of the Ruwenzori. Today the range's highest mountain bears his name.

We spent that night at the Kalonge bungalow. Though the elevation was only 6,500 feet and we were barely 30 miles from the Equator, we found it uncomfortably cold.

In the morning, stage two took us down a steep slope to a running stream which we hopped across from rock to rock, and then up into a forest of bamboo where densely massed stems stood 20 feet or more in height.

Forest Carpeted with Springy Moss

Higher up, the bamboo gave way to gnarled and moss-hung trees that resembled cedar. Springy mats of moss that varied from green to yellow and even orange carpeted the ground.

The last hour on the trail was a nightmare, for the way was extremely steep and slippery. Finally, as we paused on the difficult terrain, the mist opened above us and a second bungalow appeared. Beyond it on the higher slopes we glimpsed snow. Though the clouds closed in and it began to rain again, we struggled on until we reached the resthouse.

Our second day's climb had been difficult, but the one next morning was even more so. Vegetation covered the slope, and underfoot lay a confused tangle of roots. We could feel the effects of altitude now and panted as we scrambled laboriously from root to root. Between the roots was black watery ooze into which our shoes disappeared each time we slipped. Great dank pits yawned wide here and there, forcing us to make our way around them with the utmost care.

The forest now had become the most unusual I had ever seen. Gnarled trees with reddish bark and "umbrellas" of pinelike needles flaunted long streamers of greenish-gray moss. Sometimes these trees gave way to giant lobelias covered with thick crinkly bark and supporting bulbous masses of green leaves (pages 92-93).

Bitter Cold Shrouds Equatorial Peak

At noon we staggered into Kiondo, a shelter hut at 14,000 feet. There wasn't a breath of wind, and mist hung over the mountain like a wet veil. In the bitter cold I found it impossible to believe that the Equator lay just beyond Ruwenzori's southernmost peak.

All afternoon the clouds and rain hung over us. Then, at sunset, they parted and revealed the craggy slopes above, their snows a rich pink in the sun's last rays.

That night was the most uncomfortable we experienced. Fully dressed and wearing a heavy sweater, I shivered in my sleeping bag for hours. And when, unable to sleep, I went outdoors at 5:30 in the morning, I found our water supply capped with a quarter-inch of ice.

After cooking breakfast and warming at the fire, we climbed to the foot of a glacier. For more than an hour we clambered upward, past a tiny wooden shelter, and on until we were above 15,000 feet on the equatorial snows of Margherita Peak.

From that point the way to the top looked tempting, but special permission is required before one may set foot on any of the Ruwenzori crests. So back we went to the little shelter, where we shared some bread and cheese with our shivering, barefooted porters before returning to the Kiondo bungalow.

By now both of us had headaches brought on by the altitude and the exertion. After a two-hour rest we started down. The clouds were all below us in the bright sunlight, with the dazzling peaks and snow fields vivid against the sky behind us. Then we plunged into the mist and for three struggling hours let ourselves down from root to root, slipping and sliding on the muddy trail.

We spent that night in the Kalonge bungalow again. Next morning, eager to reach the inn, I hurried ahead in a long series of skids and falls, covering in three hours the ground it had taken us seven to climb.

(Continued on page 85)

Kodachromes by Tay and Lowell Thomas, Jr.

↑ Half a Head Shaved Is High Style for a Moorish Youngster

Nudity is the rule among Goundam's children, whether Negro, Tuareg, or Moor. This boy feels adequately clothed with his leather amulet, worn for health's sake. He prizes a strip of paper discarded from Mr. Thomas's film pack. The lad's father is a member of the *goumiers* (page 78).

↓ An American Woman Takes Lessons in the Sahara's Primitive Rhythms

Freed of their voluminous turbans during the evening's relaxation, these Moors display enormous mops of curly hair. A bystander at left waits a turn at the donkey-skin tambour, while Mrs. Thomas tries to keep up with a native drummer. Smoker puffs on a tiny pipe of ebony and silver.

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Mounted Desert Police Carry France's Tricolor

Safety of caravan and outpost rests on constant vigilance by camel patrolmen known as goumiers. Most of them are Moors, whose ancestors, fanatic Moslems of Arab and Berber blood, carried conquest and culture from North Africa to Spain in the Middle Ages. Moroccan goumiers in both World Wars displayed spectacular bravery.

Three-inch spines make the thornbush (lower right) an effective barricade in this French Sahara camp.

◆Flashing teeth highlight the darkness of a turbaned, bearded goumier. His dromedary carries a saddle of light wood and goatskin. When he rides, his legs straddle the high pommel.

➔Haughty *mekaris*—ill-tempered, evil-smelling, and unbelievably durable—can carry their riders 300 miles in a week and bear 300 pounds. Brand marks a government camel.

Wagenia Tribesmen Tread a Precarious Catwalk Above the Boiling Congo

Coursing 2,700 miles through mid-Africa, the Congo drains an area almost half that of the United States. Daring fishermen near Stanleyville, Belgian Congo, built this scaffolding hundreds of feet out into the river.

81

Rushing Waters Trap Fish in Basket Funnels Half Submerged in the Cataract

The Wagenia, "people of the river," virtually live in the water. When swift currents damage the scaffold, tribesmen wedge new poles in the rocks and secure them with lianas. Checking baskets is an every-morning chore.

←Dugout Paddlers, Their Race Ended, Put to Shore

Celebrations in memory of Sir Henry M. Stanley, whose explorations for Leopold II led to the creation of the Belgian Congo, brought these Wagenia boatmen to Stanleyville. Each craft represents a village. Chieftains in leopard skins sit in the prows; drummers amidships serve as coxswains.

"As many as 50 Wagenia manned the longer canoes," observed the Thomases. "All stood and paddled in perfect unison to the tom-toms, with such rhythm they almost seemed to be dancing."

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← A Visitor to Stanleyville Wears City Styles

Many of the Wagenia mix Western and native clothing with complete aplomb. This tribal leader, in coat and trousers, accompanies the authors from Stanleyville to his native village. A lesser tribesman clings to more comfortable garb.

Fishermen's scaffolding (page 80) straddles the river in the background.

Back Home, He Puts On → a Chief's Regalia

The same man assumes a regal air with a necklace of leopard teeth and a medal awarded by the Belgian Government.

Leopard skin is a symbol of authority among the Wagenia. This ruler wears the spotted pelt on his head and across his chest; a tail (lower right) hangs to the dust, dragging a bell to announce his passage.

Wild flowers fill trophy cups won in the Stanleyville races.

Several years ago this chief played a part in the Clark Gable movie "Mogambo."

↑ Dancers at Paulis, Belgian Congo, Jog to the Cadence of Drum and Gourd

"Horns" at ends of the hollowed log serve as handles. Thick green leaves mute the sound.

↓ Bespectacled Chief Lolls in a Sedan; His Bearers Sway and Stamp

Mangbetu dancers jangle bells on wrists and toes. The chief whisks flies with an elephant's tail.

I rejoined Tay at Mutwanga, and soon we took to the air again. From the Mountains of the Moon (after a side trip to Zanzibar) our route lay east and then north; Nairobi, capital of Kenya, was our jumping-off place for central Ethiopia, a high, cool country of rugged mountains and lofty plateaus, as different from the tropical Congo Basin as Maine is from Florida.

Our brief side excursion southeast from Nairobi may be described, literally, as the high point of our whole flight. We flew over Kilimanjaro, Africa's loftiest mountain, which rises in solitary splendor from Tanganyika's plains to the ice-capped height of 19,340 feet.

We circled the mountain, gaining altitude each time. Since we had no oxygen, we watched for signs of the lightheadedness that sometimes precedes a blackout at such altitudes. Finally above the summit, we flew right over the great mountain's symmetrical crater and looked down into its yawning crevasses from 21,000 feet.

Special Permission for Desert Trip

The flight into Ethiopia was going to be difficult. Much of the country is high, mountainous, and exceedingly rugged. Part of our route lay over the Great Rift Valley, a series of huge cracks in the earth's surface that stretches from southern Africa to Syria.

Desolate, almost roadless northern Kenya is usually barred to single-engine aircraft. We had to obtain special permission from the British authorities, which they granted only after they learned of our flights over North Africa and the Congo.

We decided to follow a roundabout route: northeast from Nairobi to British Somaliland, then west to Addis Ababa, capital of Ethiopia —two sides of an enormous triangle. The available airstrips were reasonably close together, and there were even isolated dirt roads we could follow.

Early one morning we took off from Nairobi, aiming for one of these roads. We followed it across the scrub of northeastern Kenya to Wajir, a small white fort surrounded by a village of mud huts.

We circled three times, a signal prearranged by the British authorities, and then attempted to follow the road on to Mandera, where we could land and gas up. But unfortunately (and contrary to our map), there was not one road leading from Wajir, but four.

Tay picked one. I chose another. We flew over my choice until it veered off to the north. The copilot assumed an "I told you so" air, and we angled toward her choice. Twenty minutes later we came to a fork. Again we disagreed. I chose the smaller road because it seemed to parallel the compass course, but it soon narrowed to little more than a footpath.

Just as we were about to admit defeat, the track suddenly broadened into a well-traveled road. We followed it and relaxed when a narrow ribbon of green showed up in the distance. This was the Dawa River, which led us on to Mandera, a small outpost where the corner of Kenya touches Ethiopia and Somalia.

Grease Glistens on Somali Hairdos

The moment we landed on the grass airstrip, hundreds of people came running from all directions. They were different from any Africans we had seen before—tall, handsome Somalis of the eastern Hamitic family, with long stringy hair wiped with grease. Men and women alike wore ample lengths of orange-brown cloth draped from shoulder to knee. Having no words in common, all they or we could do was stare and smile until two Britishers, the local administrators, came running up.

I quickly refueled Charlie with five-gallon tins of gas, while several hundred Somalis watched. We took off immediately, turning down an offer of "a spot of tea" with the two Englishmen. Hargeisa, chief city of British Somaliland, lay 400 miles away. We would be flying by compass the entire distance, there were no emergency airstrips, and we had to make it by dark.

The terrain between Mandera and Hargeisa was as bleak and deserted as a landscape on the moon. So we kept to a compass heading with the utmost care and passed the time playing a sort of grim game—spotting small patches of earth where we could land in dire emergency.

Some two hours after we left Mandera, thunderheads began billowing up around us—an ominous sight, for a thunderstorm's turbulent winds can wreck a small plane in seconds. Then, to our relief, we spotted a distinct dirt road leading toward Hargeisa, now only 20 miles away.

Contacting the airport by radio, I got more bad news.

↑ Pygmies Inspect Charlie on a Mid-African Airstrip

In the Ituri Forest of the Belgian Congo the Thomases lived 10 days with the Bambuti, the world's smallest people. This 1,800-foot emergency strip, mowed with knives, is government-maintained.
↓ Faizi, a tribal hero, steels himself for his first airplane ride.

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↑Sunlight in a Forest Glade Spots a Boy-size Cargo

Pygmies average 4½ feet tall. Almost totally unschooled, they carry on no agriculture, but gather roots and seeds. These nomadic hunters transport antelope meat wrapped in leaves.

↓Bowmen, carrying poisoned arrows fledged with leaves, emerge from the jungle to look at the Thomases' plane. They normally avoid clearings because of dislike of the unaccustomed sun.

"Four three Charlie," reported the RAF tower operator, "a thunderstorm's moving in here. It's raining on the north end of the runway, but you may be able to beat the storm to the south end." This struck me as highly dubious, and Tay began watching the road for places to land.

Still talking to the tower, I headed for the billowing clouds ahead. But when the airport came in sight, I understood the situation better. The field was more than a mile long, and the far end, as reported, was under the edge of a storm. We taxied in just as the first big drops of rain came pelting down on our windshield. We had made it, but only by the skin of our teeth.

Library Becomes Impromptu Bedroom

The British airport official drove us to town. In Hargeisa, he told us, there are some 30,000 Somalis, about two hundred Europeans, and a local club where travelers may stay—an attractive, low white building. After a long, tiring day we looked forward to a good night's sleep there. When we greeted the innkeeper, however, he threw up his hands in despair.

"I'm sorry," he said, "but we're absolutely full up. There isn't a room left."

Sleeping-bag time, I thought. Tay glanced toward the living-room couches. The manager noticed it and came up apologetically with an even better idea: he would set up two cots in the small library. There, insulated by shelves and shelves of books, we slept soundly despite the violent storms outside.

The next day's hop to Addis Ababa was easy. Below us lay a spectacular view of the Great Rift Valley, with its sheer rock sides dropping abruptly to a flat, grassy floor. Extinct volcanic craters dot the rift, some of them transformed into clear lakes. Beyond the valley the land rose again.

Horsemen Thrust Big Toes in Stirrups

Then, sprawling over the green mountain slopes, Addis Ababa appeared before us, a capital city of 450,000 and home of His Imperial Majesty, Haile Selassie I, Emperor of Ethiopia, King of Kings, Elect of God, and Conquering Lion of the Tribe of Judah.

We found it a city of surprising contrasts and sudden progress. Modern government buildings look out on rows of cluttered shanties. Many-storied office buildings stand beside unkempt hovels. Palatial homes have huts for next-door neighbors.

Robed and barefoot horsemen rode by on padded saddles, their big toes thrust through circular metal stirrups not more than two or three inches in diameter. Automobiles and bicycles, donkeys and carts passed us with much honking of horns and tinkling of bells.

Though it was July, the day was cold. The Ethiopians were bundled in heavy robes or army coats, and the Europeans all wore woolen clothes. Tay and I, fresh from milder Nairobi and lightly dressed, were thoroughly uncomfortable. But we quickly warmed up at the home of a friendly United States Embassy official, Mr. Edick Anderson, Jr., and enjoyed our first American food in more than four months.

Our stay in Addis Ababa was pleasant, but scarcely adventurous. In borrowed formal attire we attended a ball celebrating Haile Selassie's birthday, though the Emperor himself was away. We had an audience with the Crown Prince. And on a tour of the city we went to the "zoo," where, logically enough, the only animals on display were lions—the national symbol of Ethiopia.

Near East Beckons from Cairo

From Ethiopia Charlie took us into the Sudan. Then we worked our way northwest to the Nile, watching the ground below change from mountainous, rocky wasteland to sand dunes and featureless desert.

The Nile led us north to Cairo, a city already familiar to both of us. Here we had to make flight plans and check with the Egyptian Civil Aviation office, for the African portion of our adventure was over and the Near East now beckoned.

On an August morning we dipped our wings to the fast-awakening Continent of Africa, swooped over the Sphinx, roared between two of the great pyramids, and headed east from Cairo toward the Suez Canal. Our objective was Jordan and the Arab sector of Jerusalem.

To our surprise, the Egyptians had given us permission to fly over the canal. We reached it just north of Great Bitter Lake and then turned south, respectfully maintaining an altitude of 5,000 feet. Another pilot had told us that when he flew low here, he had plainly seen the muzzles of antiaircraft guns as they tracked him. We had no desire to duplicate his experience in these trigger-happy times.

From the port of Suez our route led us east across the barren Sinai Peninsula, where

↑ Charcoal from a Cook Pot Serves the Little People as a Cosmetic

↓ Inside a thatched hut, Tay Thomas examines the long net with which Pygmies trap antelope, okapi, and rodents. Strung between trees, the web entangles the quarry as it flees from noisemaking women and children. Ivory mallet of elephant tusk, hafted in primitive fashion, is used to pound bark into breechclouts and aprons.

Pygmies Swing on a Vine, as Lighthearted and Frisky as Children

Though capable of hard work, the Ramhuti of Ituri Forest rarely let it interfere with the chief business of their lives—having fun. Camps bubble with continual laughter and explode into a din of dancing and singing at the downbeat of a drum.

Here the little folk indulge a favorite pastime. Man at right claims the swing; his companion gets ready to jump.

Lower: The liana never stops moving as the new rider pulls legs over loop.

Moses and the Children of Israel wandered for so long on their journey to the Promised Land. That morning Tay had arranged with our Cairo hotel for a box of sandwiches and fruit, and we were munching on them when the Gulf of 'Aqaba appeared some 20 miles ahead. To our left lay the tip of the Negev, the southernmost part of Israel.

We had been warned that if we flew over any portion of Israel, we would not be permitted to enter Arab territory. Avoiding this had led us so far south.

At last the greenish-blue waters of the Gulf of 'Aqaba glistened beneath us, and we knew we could turn northward. Now once again we came to the Great Rift Valley, the 4,000-mile-long fault system we had flown over in Africa. Here it forms the deep trough that cradles the Dead Sea.

Charlie slid down, down through the air until the altimeter, unwinding past the zero mark, recorded an elevation of 1,000 feet below sea level—and our wings were still nearly 300 feet above the water.

"Think of it," said Tay. "Just 50 miles away the waves of the Mediterranean

Agile as Monkeys, Hunters Scramble Up a Honey Tree

Like kids in a candy store, Pygmies cannot resist honey. This band set out to kill big game but abandoned the hunt immediately on spying a bee tree.

Climbers carried baskets filled with smoldering sticks wrapped in leaves. Smoke from these firebrands dulled the swarming insects so the hunters could rob the hive. They feasted indiscriminately on honey, wax, and larvae, climbing down smeared from head to toe. On the way home they licked themselves clean of the gooey sweet.

are pounding beaches 1,000 feet higher than our heads!"

The Jerusalem airfield, now only 20 miles away, was at an elevation of 2,460 feet. We climbed to 3,500 and radioed the control tower for landing instructions. Back came the reply with a thick Arabic accent.

"Roger, four three Charlie, landing to the west. Call me three miles out."

We approached over the Wilderness of Judaea, a rocky expanse without a tree or even, it seemed, a blade of grass.

"There it is!" Tay called as she caught the white gleam of the Holy City beyond the Mount of Olives. "But don't get too close; the Israeli frontier runs right through the city." *

We spent almost a month in Jordan on a special project: making a movie of the life and training of a soldier of the famous Arab Legion. Our photographic plan was to follow a young Bedouin from his desert home through Arab Legion training to his military assignment, ending with his return to the tent as a hero.

We wanted a Bedouin because

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Jerusalem to Rome in the Path of St. Paul," by David S. Boyer, December, 1956; "Crusader Lands Revisited," by Harold Lamb, December, 1954; and "Hashemite Jordan, Arab Heartland," by John Scofield, December, 1952.

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Eerie Mountains of the Moon Suggest a Lost Age or an Alien Planet

A wall between the Belgian Congo and Uganda, the snow-crowned Ruwenzori Mountains wear an almost perpetual shroud of mist and cloud drawn from the Indian Ocean by the equatorial sun. Illusive, mysterious, they appealed to ancient geographers. Ptolemy wrote of "the Mountains of the Moon from which the lakes of the Nile receive snow water . . . ." Thus he mixed fable—that the moon once touched the summits and turned them to silver—with fact—that these mountains nourish headwaters of the Nile.

Explorer Stanley first saw the range in 1887. Its crown of snow appeared to be "a peculiar shaped cloud of a most beautiful silver colour." He adopted the native name for the chain, Ruwenzori, meaning "Cloud King," or "Rain Maker."

Above: As a change from flying, Mr. Thomas climbed to glacier line in these spectacular mountains. Here, at 7,000 feet, his guide sinks to the knee in a soggy mattress of moss and lianas. Higher, the men passed into a musty forest of 50-foot tree heaths, ghostly with streamers of yellowish lichens.

→The scene at 12,000 feet is like few others on earth. Familiar herbs seem mad with ambition to be trees. Giant lobelia (center) leaps twice as high as a man. Groundsels grow swollen and distorted; their woody trunks lift fleshy tops 20 feet (left). Boot-high lady's mantle carpets the ground. Biologists guess that gigantism here is the result of low, constant temperature, high humidity, acid soil, and intense ultraviolet light at high altitude.

Upper, right: The author's companions inch down lichen-slick rocks on Margherita Peak. The cable is a fixture left by climbers.

Kodachromes by Lowell Thomas, Jr., and (right) W. G. Kennedy

most people, I believe, think of the Arab Legion as made up of these tent dwellers. Actually, the men of the Jordan Army, as it has since been renamed, come largely from towns and villages.

Tay Conspicuous in All-male Camp

As a first step, we spent three days at the Arab Legion training center outside 'Amman, capital of Jordan, picking out our Bedouin "star" and photographing various phases of legion training. At this all-male camp Tay found herself embarrassingly conspicuous.

"Needless to say," she wrote later, "certain problems arose because I was a woman in the middle of a Moslem army camp. For one thing, I found it necessary to wear the one dress I had with long sleeves and a high neck. For another, I tried to be as inconspicuous as possible, though I certainly felt that all eyes were on me.

"That was especially true one morning when, as I was standing by the roadside waiting for Lowell, a company of recruits came marching by.

"'How well trained they are,' I thought. 'Marching perfectly—looking straight ahead.'

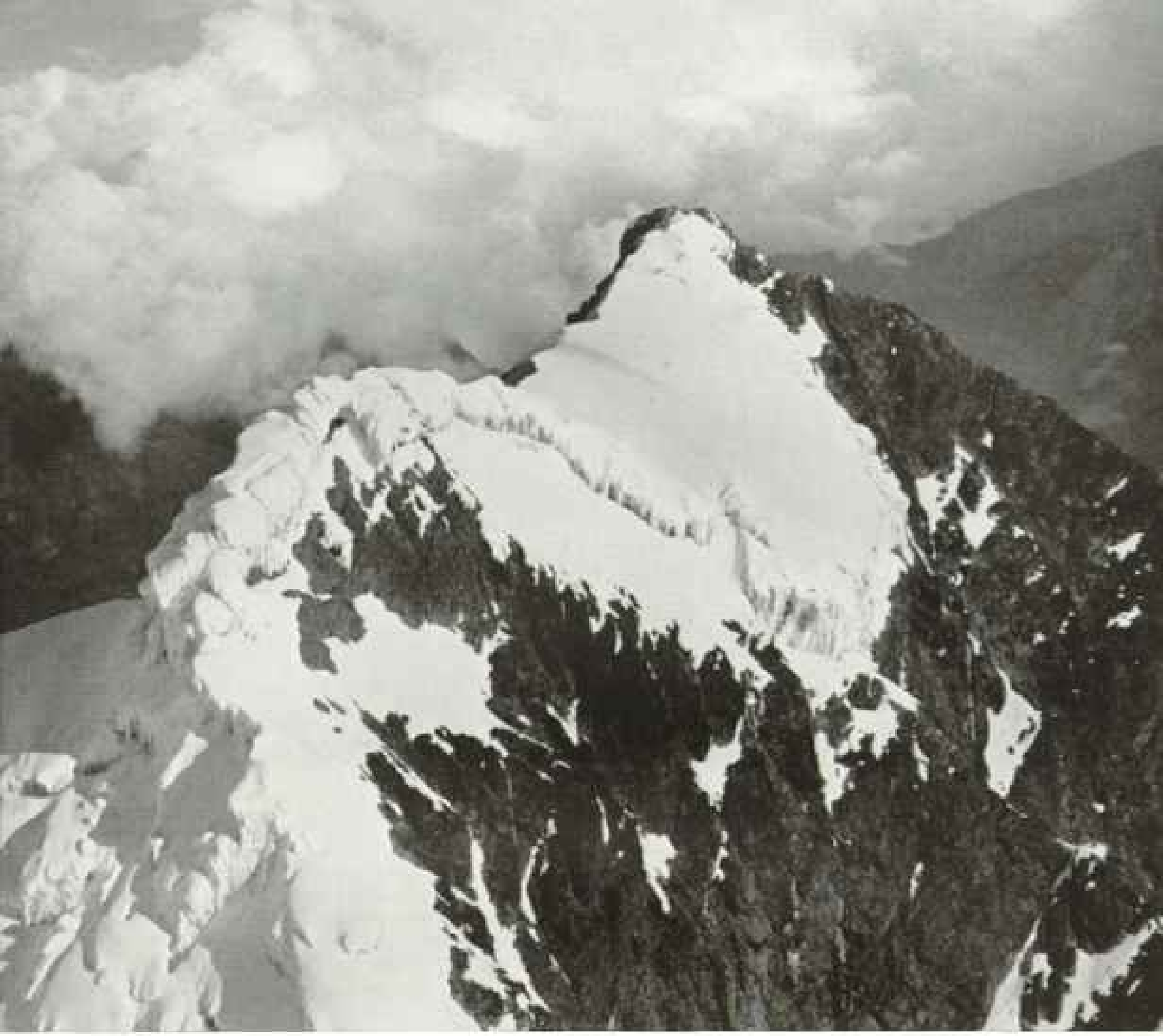
"But just as they reached me, the sergeant barked an 'eyes right' command in Arabic, and instantly I had the whole company staring directly at me."

When we had completed our work at the training center, we flew north over the desert hills to Mafraq, home of our leading character. As we winged above the barren countryside, we saw the black tents of the Bedouin and even their herds of sheep and camels.

An army Land-Rover whisked us from the Mafraq airbase to the home of our star. To our chagrin, our "Bedouin" turned out to be no tent dweller after all;

Watusi King Dwarfs an Average-size Man

Nattily dressed and speaking impeccable French, the Mwami told Mr. Thomas of his distaste for the notion that his people are savages. The ruler drives an American-made car with the seat specially placed to allow room for his legs.



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Everlasting Ice Thatches the Roof of Mount Stanley, the Ruwenzori's Highest

he lived in a near-by village. Swallowing our disappointment, we decided that our film should still show something of Bedouin life; so we headed into the desert, determined to make ourselves known at the first tent we came to. As luck would have it, we soon found a group of four.

Nomads Adopt a Movie Star

The Bedouin readily agreed to adopt our star for an hour of picture taking and co-operated with the greatest gusto, obviously enjoying every moment they spent before the camera.

The tent we chose to be our soldier's home was divided into two sections—one where the women cooked, the other where the men sat on beautifully woven rugs while they smoked and talked.

"The men had coffee in the 'living room,'" Tay wrote when she set down her account of the visit, "while I joined three women in the kitchen. Of course we couldn't talk to each other, but I made a fuss over their cute, plump children, and we admired each other's clothing.

"The women wore plain black dresses, with bright embroidery down the front. I wore blue jeans, but had on a bright-red silk blouse over which they ohed and ahed. Then one of them pointed shyly to my brown arms.

"'*Shams*,' she said, which was a word I knew. It means 'sun' in Arabic.

"To these bronzed women, who must always live out of doors, any woman not a Bedouin has enviable lily-white skin. But after five months in Africa mine was nearly as dark as theirs. Maybe they thought I was a Bedouin, too, but from a far-off land."

Having filmed our legionnaire's training

Dancing Giants, the Aristocratic Watusi Brandish Weapons and Shake Monkey-hair Manes

Leaving the smallest people in the Congo, the Thomases flew to Ruanda Urundi to visit some of the world's tallest. Many of the Watusi tower seven feet. Despite black skins, they are not Negroes, but come from a Hamitic strain. Among the most advanced Africans, they become teachers, nurses, veterinarians, and agricultural advisers.

These performers, students of a Belgian missionary school, preserve old-time dances. Their brilliantly patterned cotton skirts, headdresses, and ankle bells became familiar to movie-goers in the film "King Solomon's Mines." Dancers make tremendous but graceful leaps and charge wildly with spears fixed.

and "home life," we drove to Qalqilye, a frontier town in western Jordan. There, to wind up the film, our star was to be assigned to a border patrol. We chose Qalqilye because it occupies a wedge of Jordanian territory that extends far into Israel, and much bitter fighting has taken place there.

Our most important scenes were of a border patrol simulating defense maneuvers. Armed and wearing helmets, the men ran through a network of communicating trenches as if to take up their positions in the front line. Tay and I, cameras in hand, went out in front of them. But first I turned to the lieutenant in charge.

"Please," I asked, "be sure all the guns are empty. They'll be pointing directly at us."

"Don't worry," he replied. "The men have their instructions."

Most of the men carried rifles, but I concentrated on one who had a Sten gun. Tay, at work with a still camera, was photographing two riflemen. Wanting a little action, I asked the Sten gun operator to work the bolt of his weapon. When he did, the "unloaded" gun went off with a sharp report (page 108).

The lieutenant, as surprised as we, instantly seized the weapon and emptied it of cartridges. Not until then did I realize that the bullet had buried itself in the ground within a yard of Tay!

It had happened so fast that no one had any feeling of fright. But now there was another danger to consider: we were so close to the Israeli border that the accidental shot might well draw some return fire.

"I've had enough of front lines," said Tay, as we got out of there, "to last me a lifetime."

Infected Ear Fells Charlie's Copilot

From Jordan we flew northwest to Istanbul, Turkey, with stopovers in Beirut, Lebanon, and the island of Cyprus.* On the way Tay and I came down with miserable colds, and by the time we reached Istanbul, Tay was seriously ill with an ear infection and a high fever.

At our urgent call a doctor came and was obliged to puncture her eardrum. Tay spent most of the next two weeks in bed, surrounded by medicine bottles bearing directions in Turkish.

Fortunately, we had generous friends in the city. When Charlie Waggoner, the Pan American World Airways sales manager in Istanbul, heard of our plight, he and his wife Ollie promptly took us into their home and treated Tay like a daughter.

During the next week she improved rapidly, and since she was in the best of hands I felt safe in taking a short trip. I had heard that Cinerama, a motion-picture technique in which both my father and I are interested, was to be on view at the International Trade Fair at Damascus. I wanted to see, and perhaps to film, the reaction of Near East visitors to the movie, "This Is Cinerama."

At the last minute, Bill Kayser, Pan American's 30-year-old chief mechanic at Istanbul, decided to come along. So we took off together one morning on a round trip that very nearly turned out to be the last flight either of us ever made.

Airlines Mechanic on Busman's Holiday

It is 700 miles from Istanbul to Damascus, and the flight was a breeze. Bill, whose regular task was to keep Pan American's enormous four-engined Clippers flying, was taking a kind of busman's holiday, and he, as well as I, enjoyed it.

Our stay in Damascus was short. One evening was enough to convince me that Cinerama was a success in the Near East—so much so, in fact, that units of the Syrian Army had to be called out to help control the crowds at the theater gates. So, on the second day after arrival, Bill and I took off again for Istanbul.

We got a late start, however, and I delayed things still more by landing at Beirut, 55 miles away, to air-express a case of exposed film to New York.

When Bill and I finally made our start for Istanbul, it was nearly 3 in the afternoon. To make matters worse, a weather report told us of a cold front in Turkey.

At 3:06, over Tripoli, I tuned our long-range transmitter to Istanbul Control's wavelength and called across the intervening 600 miles. The pleasant voice of a woman came through my earphones, speaking English with a Turkish accent.

"Four three Charlie," she said, "present Istanbul weather: sky overcast at 8,000 feet, broken clouds at 4,000, visibility eight miles, wind two seven zero degrees at five knots."

*See "Athens to Istanbul," by Jean and Franc Shor, NATIONAL GEOGRAPHIC MAGAZINE, January, 1956.

Kenya's Defenses Against the Mau Mau Call to Mind Stockades on the American Frontier

The authors visited East Africa at the height of the rebellion, a murderous uprising of a part of the Kikuyu tribe embittered by land encroachments and inflamed by a secret terrorist society, the Mau Mau.

Here, close to Nairobi, the Thomases watched Kikuyu tribesmen loyal to the Kenya Government drill outside a stockade complete with tower, drawbridge, and 15-foot moat lined with sharp spikes. Cardboard shields dangle behind them. A small boy marches in line, shouldering a make-believe gun. Learning to protect their villages against attack, some home guards train with hand weapons (below); others practice with shotguns (opposite, lower).

This report showed improvement over the one we had been given at Beirut.

We passed just west of 11,444-foot Bolkar Dağları not far from the narrow rock-walled pass of the Cilician Gates, then headed out over the Anatolian plateau. We were above the town of Karapınar, south of the great salt lake of Tuz, at 5:12, but to make this course good I had to hold a 10-degree drift correction, crabbing into a southwesterly wind.

I figured our ground speed to be 142 miles an hour. If it held, we would reach Istanbul at 7:30 after a total flight of nearly five hours. Fifteen minutes later the engine spluttered as the right tank ran dry, and I switched over to the left. After checking and rechecking our consumption, I estimated the right tank had carried us for two hours and forty-five minutes. At that rate, Charlie would be all done five hours and thirty minutes from the time of our Beirut take-off.

Night Falls as Gas Runs Low

"How much reserve will that leave us?" I wondered.

I worked it out quickly. The answer was 45 minutes—that is, if our ground speed held. And a 45-minute reserve is not much, especially if there is a chance of losing one's way.

Sunset came at 6 o'clock as we flew over a solid overcast that reached up 8,000 feet—the work of that cold front. Ankara was only 20 minutes away on our right by now, and I thought of going in there while there was still a bit of light. Not to do so would be gambling, all or nothing, for once darkness had fallen there would be no alternative to Istanbul.

"What do you say, Bill?" I asked my companion. "Shall we go for it?"

"Suits me," he replied. "I'd like to get home tonight."

Far ahead, against the pink afterglow of sunset, the sky was crystal clear and there were no signs of higher clouds to come. This, too, was reassuring, though when I tried to call Istanbul for another weather report my voice was completely lost among the more powerful voices of airliners and military planes talking with Istanbul, Athens, Rome, Beirut, and even Cairo.

By the time I realized that Istanbul did not hear me, the pink had faded from the western sky and we had been swallowed by the night. The clouds beneath us hid any ground lights, and there was no moon. Every time I looked up from the map the instruments showed Charlie in a turn, and I would have to get him back on course again.

How I missed my copilot navigator! If Tay had been there she could have taken over the map work, but Bill couldn't. He was a mechanic, not a navigator, though he had learned to hold Charlie on course during daylight.

Changing Wind Alters Charlie's Course

I wondered exactly where we were. Eskişehir's radio beacon, the one crucial fix now, had apparently gone to bed. There was dead silence where that station should have been, though I had been counting heavily on it. It is one of Turkey's major jet bases, and all my information indicated that it was supposed to operate day and night.

The fact is that, if Eskişehir had come through, the radio compass would have shown that we were already drifting off course. Without our knowledge, the wind had swung around from southwest to northeast, perhaps to almost due east.

(Continued on page 109)

Baby Zebra on Wobbly Legs Presses Close to Mother →

East Africa is a vast natural zoo; nowhere else can such a variety of wild game be seen. From the air and on the ground the authors spotted frequent herds of elephant, zebra, giraffe, wildebeest, and antelope.

Zebras they found in great numbers in Nairobi National Park. This 44-square-mile preserve in Kenya is only 20 minutes from Nairobi, largest city in British East Africa and principal outfitting post for safaris visiting the game fields of the region.

Here a troop of "tiger horses" grazes in the protection of Nairobi Park. Tan stripes on the foal will turn black as it matures. Though vivid at close range and seemingly an attraction to enemies, the markings blend at a distance into gray camouflage.

Tusker Bathes in a Kenya Water Hole →

African bush elephants, largest and most powerful of land animals, reach a weight of more than six tons. Hannibal used 37 of them in his invasion of Italy. A recent training program in the Belgian Congo has proved that African elephants can become as tractable as their hard-working Asian cousins.

The authors fretted lest elephants use Charlie as a back-scratcher when the plane was parked on bush strips. This fear was never realized, but a bull elephant did give the couple a scare when it charged their car in Uganda's Queen Elizabeth National Park.

Here a bull enjoys an afternoon plunge in Tsavo, largest of Kenya's six national parks. The gap in his ear is probably a battle scar.

Massive Kilimanjaro Lifts an Icy Crown Above the Clouds

Africa's highest peak, an inactive volcano, rises 19,340 feet above sea level from the plains of Tanganyika. Masai tribesmen, who inhabit the district, call the peak "House of God."

Ice and snow clothe Kilimanjaro's summit the year round, though it lies only 200 miles from the Equator. Some mountaineers find the cold and altitude harder to bear than in the Himalayas.

This Masai urges his donkeys past an acacia tree. His tribe, once warlike, now herds cattle.

Opposite, lower: Lions seem to prefer the plentiful zebra above all other game. The big cats kill only when they need to eat, and only one animal at a time.

Here a male lingers over the carcass of a zebra in the Masai game region, Kenya.

Head Cradled on Paws, Leo Sleeps Off a Meal

Lions may eat 40 or 50 pounds from a kill, sleep a day, and return to feasting. They remain close to the carcass to guard it from thieves until they have had their fill.

Photographs by W. P. Kelley (left), Quentin Keynes (below), and Ylla

"House of Eternity" for a King, the Great Pyramid at Giza Endures the Ages as Man's Mightiest Monument

God and monarch of ancient Egypt, Khufu (Cheops) dedicated the labor and fortune of his whole kingdom to build this refuge for his soul after death. According to Herodotus, the ruler even sacrificed his daughter by hiring her out as a courtesan to raise money for the tomb. The Greek historian tells how gangs of 100,000 men worked 20 years quarrying stone from the distant escarpment (right), floating the blocks across the Nile, and dragging them overland.

With enormous engineering skill but no power machinery, the Egyptians set blocks 30 feet long one upon another, massing solid masonry around a core of rooms and passages. So precisely did they build that a papyrus leaf was too thick to pass between the stones.

When completed, the pyramid covered a square 755 feet to a side and rose, in a glittering sheath of polished limestone, a majestic 480 feet. Enduring 46 centuries, it proved truly a "house of eternity."

Vandals have sheared off the pyramid's white facing and 30 feet of its peak. Wooden tripod on the structure's blunted top shows the original height.

Here an Egyptian dragoman leads a group of camel-mounted sightseers. Many travelers climb the pyramid with guides pushing and pulling them up the staircaselike exterior. Others are content to watch fleet-footed villagers race up and down the sides for a fee.

Kodachromes by Taz and Lowell Thomas, Jr., and (above) David S. Boyer, National Geographic staff

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↑ From a Pyramid Perch Mr. Thomas Records His Impressions

The Nile pours life into Egypt. Fingers of irrigation water from the river nourish this fertile stretch between the village of El Sammân (right) and distant Cairo. ↓ Flying north from Wadi Halfa, the authors see a knife of green slice between Nile and desert waste. Farmers live in fortresslike compounds (left and right), out of reach of the water. Here the river's annual flood is just beginning.

Tay Rides a Lofty Perch➔ Beneath the Pink Walls of Jebel Ram

During World War I, Lowell Thomas, Sr., met Col. T. E. Lawrence, famed British author and Arab leader, in a Jordanian wadi.

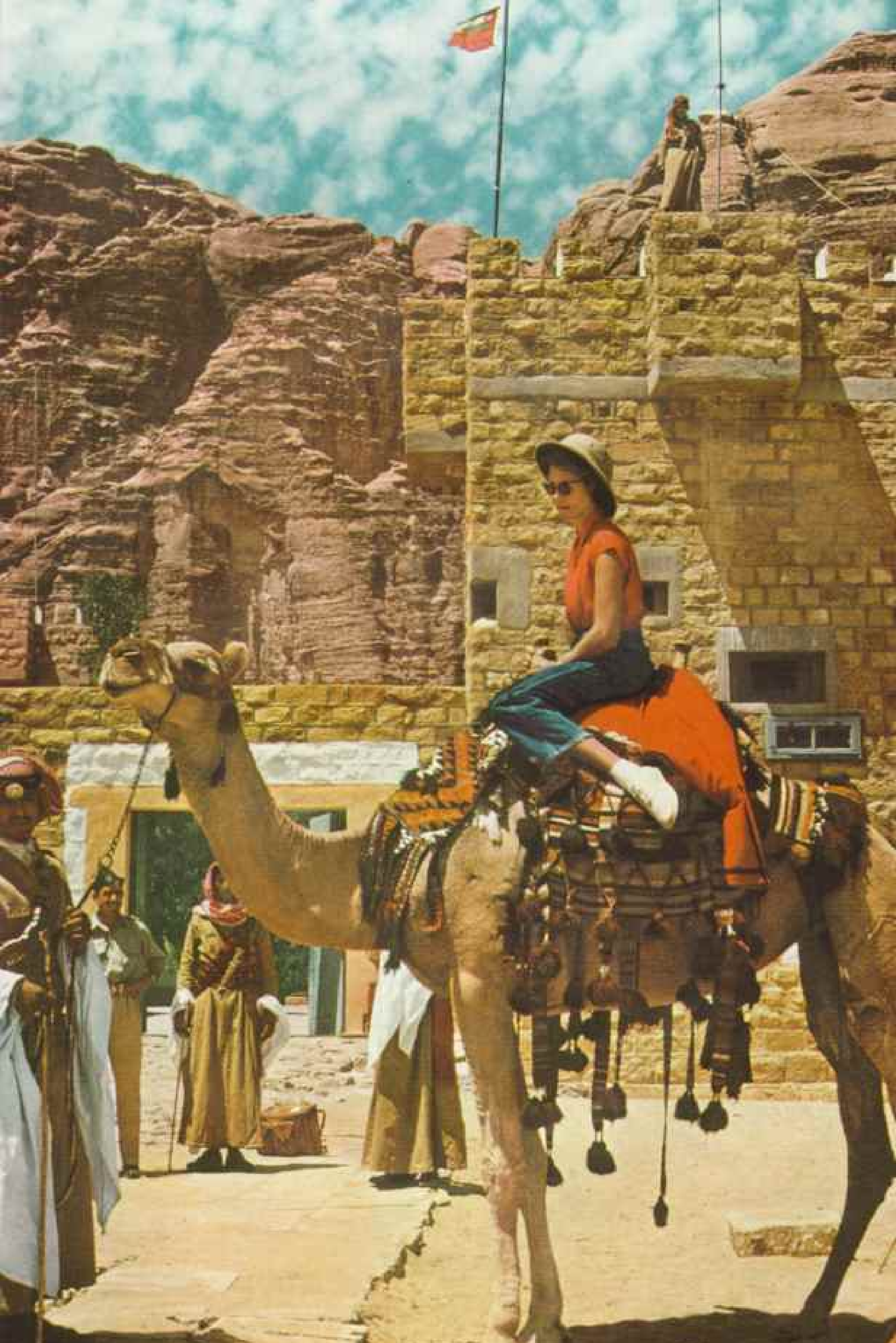
Forty years later, Thomas's son, visiting the same region, found an outpost of the Arab Legion, the crack fighting force that grew out of raiding groups organized by Lawrence to harry the Turks.

Jordan Army flag flies above the sentry; Jebel (Mount) Ram rises beyond. Near by the authors saw ruins of a Nabatean temple that called to mind Lawrence's *Seven Pillars of Wisdom*.

➔Desert patrolmen, unmistakable in red-and-white headdresses, skirted khaki robes, and enormously long white sleeves, are a part of the Jordanian Army. This patrolman owns a magnificent camel. At a tap from the riding stick, the groaning animal obediently tucked chin in sand.

Landing in Wadi Ram's pink canyon, the authors nearly met disaster when a tail wind swept them off a tiny airstrip. The plane jolted miraculously through boulders, ditches, and brush. Half a dozen men had to lift the tail wheel out of the sand before take-off.

➔In the tent of a Jordanian Bedouin—and everywhere else—the Thomases found that friendliness always inspired friendliness.



← Ambling Mule on a Cyprus Road Hauls a Cartload of Girls and Grain

The change undoubtedly occurred about the time we climbed above the overcast, while I had continued to hold our earlier heading. So, instead of drifting just ten degrees off our course, we were drifting ten degrees plus the effect of the new wind.

We were still too far away to rely on the Istanbul radio. I watched the needle of our radio compass trying to search out the direction from which the signals were coming, but it swung back and forth through a range of 60 degrees, refusing to make up its mind. Still, its average reading indicated that Istanbul was due north at that moment, not northwest as we were heading.

"No!" I thought to myself, still holding to the course we were flying. "The direction finder is crazy. We're still too far out to put any faith in it."

VHF Gets Through to Istanbul

Ten more minutes and there was no change in radio signals, so I altered our heading desperately, 30 degrees to the right.

I was intent on striking the southeast leg of the radio range so that I could follow it in. But even as I was doing all this, I still had no realization that we were due south—later we were actually southwest—of Istanbul.

Unable to raise the control tower on the long-range set, I tried VHF—very high frequency—and the tower replied. The weather was worsening, we learned. Beneath the overcast, more clouds were forming.

We were still no closer to the steady hum of the beam, so I shifted our heading once more, another 30 degrees, to due north.

I was frightened now. If the radio compass was wrong and the range signals unreliable, we would soon be flying over the Black Sea with our tanks about to run dry. On the other hand, if the radio was right and I persisted in holding to my dead-reckoned heading, we would wander out over the Aegean Sea, an equally watery grave.

I broke out in a cold sweat. In fact, I nearly panicked. I could feel it beginning to well up in me. But then I took myself in hand.

"Look!" I said to myself. "If you give up, you've had it. There *must* be a solution. Believe your instruments!"

Poem on Dashboard Buoys Hopes

Although I couldn't see it in the dark, I thought of the poem Tay had taped to the instrument panel in front of her seat:

Peace be in thy home
And in thy heart,
Or if thou roam
Earth's highways wide,
The Lord be at thy side
To bless and guide.*

I repeated it to myself and found that it meant as much to me as the blind-flying instruments. Then I followed the needle of the radio compass, banking the plane to a heading of 25 degrees, then to 30.

From northwest I had now swung the plane to northeast!

"Incredible," I thought. "But what else to believe?"

Our estimated time of arrival came and went. Our gas dwindled, and the suspense increased as the fuel gauge sank farther and farther into the red.

But now the on-course signal of the Istanbul range grew louder. Then both Bill and I spotted a faint dome of light in the overcast, immediately ahead—the reflected lights of a great city! With only five minutes' supply of gas remaining, we were over the lighted area, and the radio-compass needle swung 180 degrees.

Our destination was below!

I grabbed my microphone. We were over Istanbul at 10,000 feet, I reported, requesting immediate clearance to let down, as we were "a bit low on gas."

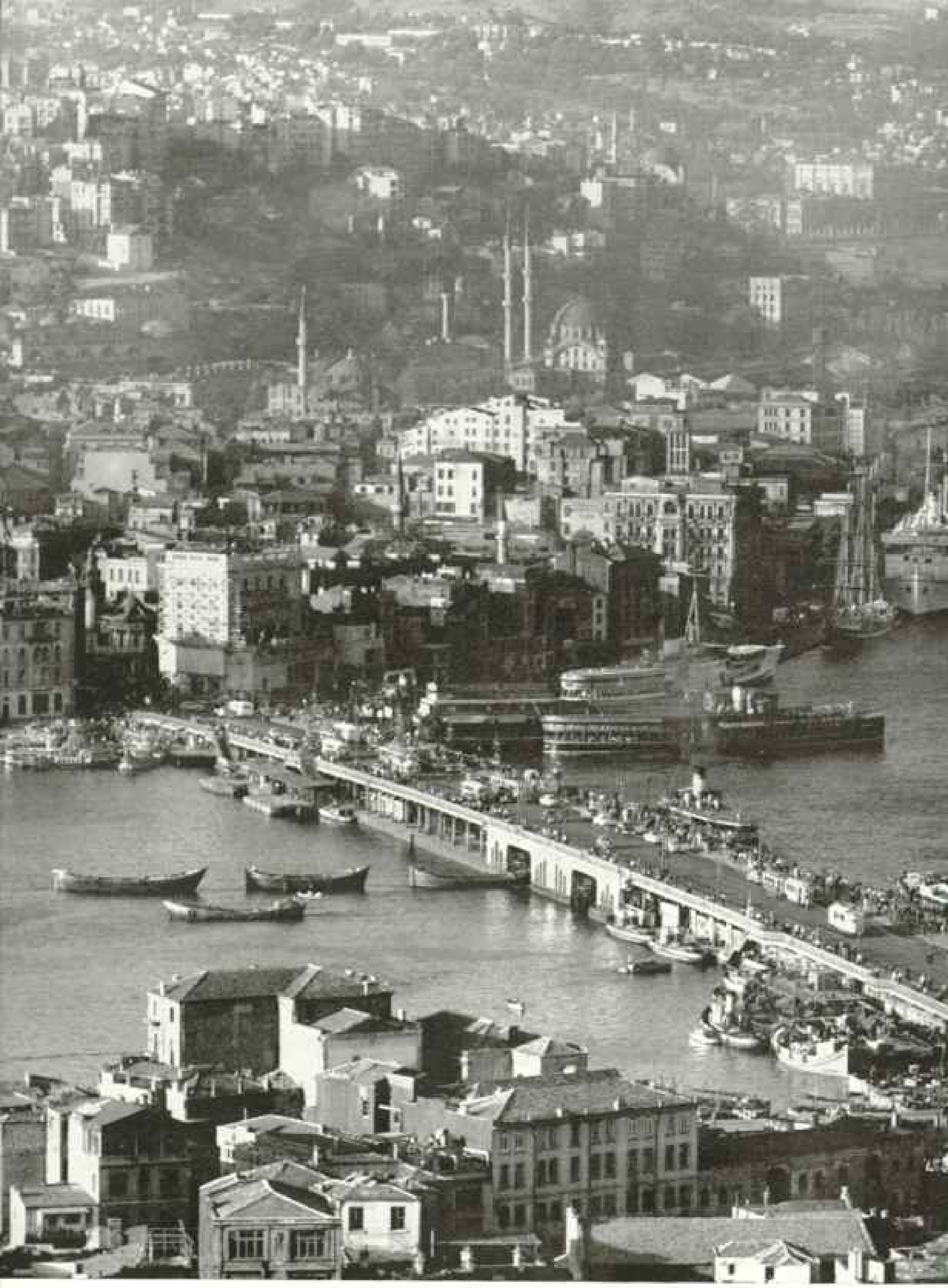
"Cessna four three Charlie, Roger," came the reply. "Roger. You are cleared number one."

I pulled back the throttle, and with the rpm's cut to the limit to save gas, I began an instrument letdown.

← The Camera Looks Down a Muzzle; a Moment Later the Gun Went Off

Tragedy almost struck when Tay made this photograph of Jordanian troops on maneuvers near the Israeli border. Supposedly the guns were unloaded. But when Mr. Thomas (right, with movie camera) asked the Sten gunner to work his bolt, a bullet tore the earth close to Mrs. Thomas's feet. Both maneuvers and photography ended abruptly.

* By permission of Ruby E. Cleeve. Copyright.



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Galata Bridge Spans the Golden Horn, a Scimitar of Sea in the Heart of Istanbul

The Turkish city embraces a congregation of towns and villages. Settled by Genoese merchants in the 13th century, Galata (center) remains the commercial heart. The bridge crosses the harbor on iron pontoons.

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New Mosque of the Sultan's Mother Lifts Minarets High Above the Teeming Bosporus

Medieval Istanbul (*foreground*), a place of palaces, public buildings, mosques, and markets, once served as seat of the Turkish empire. The Bosporus (extreme right), a deep-coursing strait, separates Europe from Asia.

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"...If Thou Roam Earth's Highways Wide, the Lord Be at Thy Side..."

This inspiration, taped to Charlie's dashboard when the Thomases left Dakar, buoyed and comforted the adventurers during many anxious moments. On a flight to Istanbul it saved the pilot from panic when storm, darkness, failing gasoline supply, and an out-of-range radio beacon combined to threaten calamity. Here Lowell Thomas, Jr., calls the control tower from an airfield parking strip.

Charlie broke out of the overcast at 2,000 feet, with the runway lights to port.

We quickly entered the traffic pattern, and I rolled onto the final approach to the lighted runway, slowed to 100 miles per hour. Then, with flaps down, I cut to 80 and from force of habit set up a slight power approach. I was just congratulating myself on our good fortune when—

Cough—splutter—silence.

We were out of gas, and the engine had quit!

New Emergency at 500 Feet

Bill was surprisingly calm.

"Can you make it, Lowell?" he asked.

Flaps down, air speed slow, altitude 500 feet.

"Bill," I replied, "I don't think so."

We held our breath as the plane inexorably sank, too rapidly to make the end of the runway.

At that moment the engine caught and surged momentarily. For perhaps as much as two seconds it pulled strongly. It coughed again, hesitated, and pulled once more, for perhaps another two seconds. Then it quit for good.

It had given us a final three or four seconds of power, but that was enough. We barely cleared the lights at the head of the runway. The wheels touched, and we bounced before settling down.

With the propeller standing straight up and down, the plane had just enough momentum to roll off the runway onto a taxiway. The tower sent out the gas truck. We took on only a couple of gallons before taxiing to the terminal.

An hour or so later Tay greeted me in Istanbul. She seemed to know that something desperate had taken place. She told me that when she heard I was coming through, she had looked out the window at the reflection of the city's lights on the overcast and had said a prayer.

It is easy to say that Bill and I had reached the Istanbul field "on instruments." But I knew that something more than instruments had guided us in through the night to safety.

New Mexico's Great White Sands

Feathery Dunes of Snow-white Gypsum in a 140,000-acre "Sandbox" Make This Area Unique Among National Monuments

By William Belknap, Jr.

With Illustrations from Photographs by the Author

By the time you reach White Sands National Monument, near Alamogordo, New Mexico, you're used to mirages. So the porcelain streak you see among the heat waves simply can't be real.

You still don't believe it when you start up the eight-mile White Sands Drive.

You stop where the road touches the first dune and run your hands through the incredibly soft stuff, cool and delightful. Off come your shoes; the next impulse is to lie down and roll.

It looks and feels like fine sand, but there the similarity ends. For these hills of stunning white are wind-crumbled gypsum.*

Dunes Cast a Strange Spell

Enchantment, disbelief, puzzlement—these are typical reactions among startled visitors to White Sands. Many, like my own family, come with little more than an inkling of the scenic surprises in store.

When we turned off U. S. Highway 70 at the Monument Visitor Center, the country looked flat and unpromising. I began to wonder what there would be to photograph. Fran, my wife, rolled down her window and accepted our car permit from a ranger.

"Stay on the roads, folks, and watch our speed limits," he said cheerfully. "Have fun!"

As we drove along White Sands Drive, my disappointment quickly faded. Shimmering dunes, fresh as a wilderness snowfall, loomed ahead. Our son Buzz, 12, and daughter Loie, 10, called a halt when we reached the first drifts and shot from the car as if spring-ejected. They scampered up a near-by slope, dropped to their knees, and scooped up great handfuls.

Then the magic hit Fran and me. Matching our children's abandon, we slipped off our shoes and raced up a snowy mound.

"I had no idea it could be this beautiful," Fran said. "It's like fairyland!"

We strolled along the roadside dunes, fascinated by the way desert plants—yuccas, sumacs, and even cottonwoods—managed to keep their heads above the sugary tide. Here and there we found grotesque mounds held together by close-knit root systems (pages 126 and 127).

"Don't look back," I said to Fran as we headed for the car. "Remember the Bible story about Lot's wife? I'd hate to leave you here as a pillar of gypsum!"

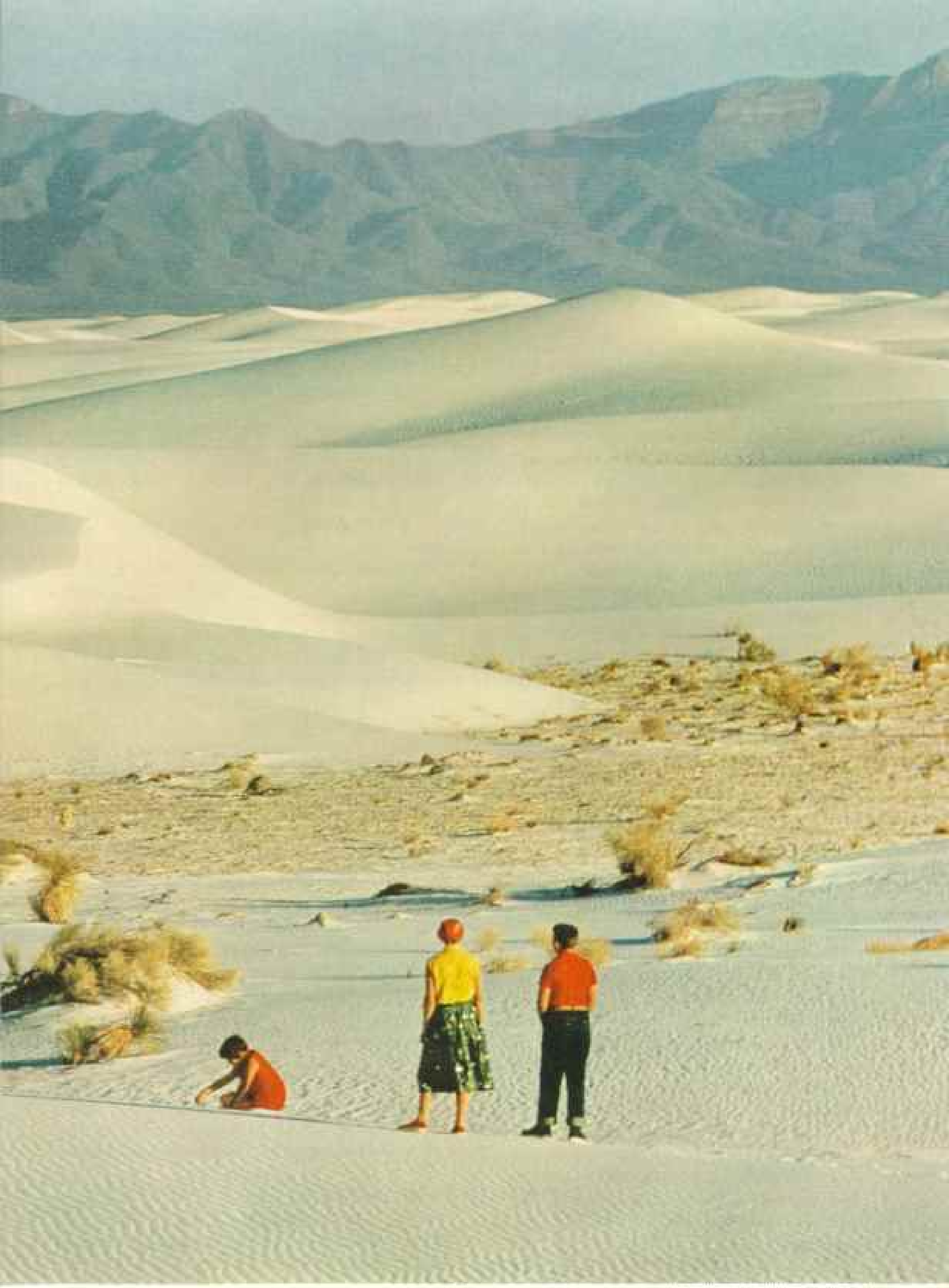
Like three million visitors before us, we began to appreciate White Sands' uniqueness. Later, at the museum, we learned it is the world's largest known surface deposit of gypsum sand. Utah and Australia have some, but neither deposit rivals New Mexico's 275-square-mile display. Dunes at White Sands are not only the largest in area; they move faster, pile steeper, look whiter, and are just plain more fun than any others.

Dizzy statistics? There is enough white

* See "The White Sands of Alamogordo," by Carl P. Russell, National Geographic Magazine, August, 1935.

A Billowing Sea of Dunes Laps the Eroded Shores of the San Andres Mountains

Rain and melting snow carry tons of gypsum from strata near the range skyline into New Mexico's Tularosa Basin. The solution mixes with gypsum-bearing ground water from beds beneath the valley floor.



Kodachromes by William Bollman, Jr.

White Sands National Monument Forms Part of the World's Largest Gypsum Desert

Sun evaporates chemical-laden water from the flats; wind pulverizes the glassy selenite crystals that remain and whirls them into gleaming drifts (page 136). Restless as the gusts that whip them, dunes build peaks 50 feet high.

sand to fill 214,000,000 freight cars—a train that would encircle the earth 57 times!

How does pulverized gypsum differ from ordinary beach sand? If you heat quartz sand, it melts into glass, but gypsum bakes into pure plaster of paris (page 136). Also, gypsum is much softer. It rubs to powder between your fingers, and its wind-driven crystals will not pit the finish of your automobile.

You can even taste the difference. Unlike sand, gypsum dissolves in water and has a definite flavor—mineral and unpleasant.

Late on our first day a windstorm arose, and we saw nature's construction force at work building the dunes. Fran and Loie stayed snug in the car, but curiosity sent Buzz and me struggling up a powdery hillside.

Amazingly, once on top we walked through the storm without getting sand in our eyes. The heavy gypsum traveled as "bed load," rolling, skipping, and bouncing, instead of airborne.

Swirling white dust clouds rose from the distant alkali flats, diffusing the sun. Braced against the blast, with heavy particles peppering our legs, we saw White Sands come to life. Wind undermined our shoes when we stood still, letting us sink slowly. Air turbulence started small dunes while we watched. Feet first, we slid down the steep dune—and got sandblasted as our faces passed the crest.

Wind Makes Sand of Glassy Crystals

Where does the wind find the gypsum?

Mountains that border New Mexico's Tularosa Basin are made of sedimentary rocks. Cloudbursts and melting snows dissolve their gypsum content and carry it into a crystal-spangled marsh called Lake Lucero. There the water stands, for the basin, like the Dead Sea, has no outlet (page 122).

Transparent selenite crystals, a form of gypsum, remain when the water evaporates. Then the wind takes over, knocking particles of crystal loose and bouncing them along. Eventually they hump into drifts and join the accumulation of centuries. Because the particles are angular in shape, they pile into steeper dunes than the rounder grains of ordinary sand.

At the Visitor Center we met Superintendent Johnwill Faris. Boss at White Sands for 18 years, Faris has a profound knowledge of the wondrous sand pile he calls "my baby."

With him we toured the four-family Park Service community clustered about the entrance station and museum (page 118). In four years more than a million visitors have checked in at the entrance arch. During a half-hour count we spotted licenses from 19 States.

"Say, what can we see up there? Just sand?" asked a motorist. "If so, we have plenty on the beach at home. Nice and white, too. Guess we'll keep going."

Bob Viklund, the ranger on duty, grinned. "Talked himself out of it," he said as the man backed up and headed south.

"Like Nothing You've Ever Seen Before"

The next car brought an Air Force family moving between duty stations. They had a few hours to sightsee.

"Where do we go and what's there? Just sand?"

This time Bob detected a spark of interest.

"Yes," he began, "just sand. But it's like nothing you've ever seen before, great rolling waves of it, white as snow. Your youngsters will have a three-ring circus. The round trip takes about an hour. On the way back, come see our museum."

The airman was sold.

Many visitors do tour the museum, where attractive displays tell the White Sands story. Other colorful exhibits make natural history so entertaining we almost forgot dinner.

Next day we met Mrs. Faris and Del Major, the chief ranger's wife. Fran had wondered how Park Service wives like keeping house in adobe haciendas 15 miles from the nearest city.

"Living here would be fine," Lena Faris told us, "if it weren't for the everlasting wind. But when you have to clean house twice a day, like yesterday, it makes you long for an apartment in town."

I asked what Park Service families do on their days off.

"You'd never guess," Mrs. Major said. "Each family brings food, everybody puts on play clothes, and we head for the Sands. Talk about a busman's holiday!"

As chief ranger, ex-Navy pilot Tom Major has his hands full. The job is an odd combination of protecting a natural wonder and running an amusement park.

Gleeful Children Roll Down a Hill → as Fine as Sugar, as Soft as Snow

"Traffic is our number-one problem," Tom explained. "People like to race and cut corners on the Loop Drive. Patrols help, but our cars and rangers are spread too thin.

"Some visitors ignore the no-dune-driving signs; they don't realize the danger. If they don't bog down near the road, the bigger dunes beckon. Usually they leave the car imbedded and hitchhike for help."

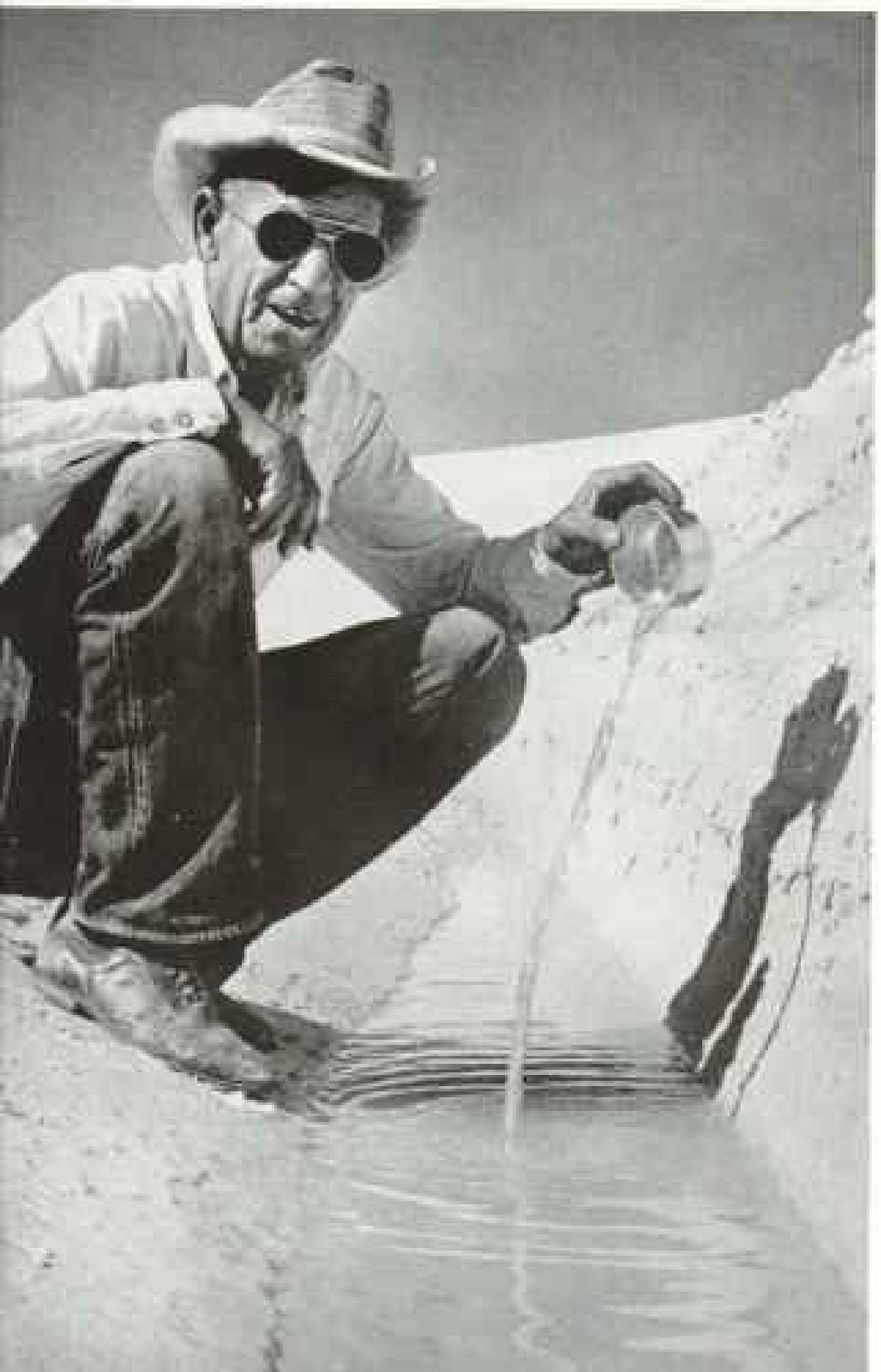
Ex-cowpuncher Battles Drifts

Perhaps the busiest Park Service man is Joe Shepperd, an ex-cowpuncher who puts in endless hours aboard a road grader. The more the wind blows, the harder Joe works. Often you find him hard at it by dawn, using his grader like a snowplow.

"We used to fight the sand," he said. "Now we cooperate with it. If a dune wants to cover the road, we bulldoze another route around the dune."

Joe and I had been chatting outside the museum. Johnwill Faris joined us.

"Been looking for you," he said. "Let's take that ride I promised you."



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↑ **Cool, Thick Adobe Walls Shelter Monument Headquarters and Museum**

In 1933 the Federal Government set aside some 140,000 acres as the White Sands National Monument, thus preserving Lake Lucero and roughly one-third of the gypsum desert.

Prehistoric Indians apparently avoided the White Sands; remains of their fires, pottery, and arrowheads have been found only along the desert's rim. In the 17th century Spanish explorers came this way, leaving behind a wooden-wheeled cart, now on display in the museum patio. Today visitors total 282,000 a year.

← A shallow ditch uncovers abundant water only a few feet down, but high mineral content makes it too strong to drink. Surface evaporation and reflection of the sun's rays keep sands relatively cool.

I'd heard about Mr. Faris's legendary dune driving. Rumor says even jet pilots have come back muttering what they'd do if they ever got him in a plane.

Rangers Ride Dunes in Emergencies

Instead of the special dune buggy I'd expected, here was a stock Park Service car. In the back lay shovels and boards.

"Hop in," Faris invited, revving the motor. "We'll go west of the road. If I take off from a conspicuous place, some stranger might try it too. Then we'd have a rescue on our hands."

On an average Sunday, he told me, 2,000 people are scattered over the monument's 140,247 acres. Park rangers must cover ground, and in emergencies they can't bother with roads; that's why they have to learn to drive the dunes.

We bounced over brush-dotted desert toward the white ridges. Mr. Faris shifted into second and floorboarded the throttle. The car leaped as if branded with a hot iron.

"Hang onto your cameras," he said.

I braced for a jolt that never came. Up we zoomed, climbing and diving, accelerating, braking. Except for an occasional bush, we might have been stunting above the clouds.

"The secret is momentum," Johnwill con-

← "Candles of the Lord" Light a Wilderness of Barren Sands

Early Spanish settlers likened the flower-topped stalks of the yucca to flaming tapers. But this sand-loving member of the lily family was a welcome sight for more than its beauty. Pioneers and Indians ate the tender young shoots and flowers, ground the seeds for porridge, made soap of the roots, and fashioned baskets, ropes, nets, and saddle blankets from the tough leaf fiber.

Today ranchers depend on *Yucca elata* as forage for cattle during drought.

Waxy, bell-like flowers pollinate only with the help of a tiny moth which lays its eggs nowhere but in the yucca. At night, when the opening blossoms exude a heavy fragrance, a misty host of the insects flutters about the torchlike stems.

↓ Blooms of the buffalo gourd splash gold along the marginal dunes. The name of the species, *fortidissima*, derives from its rank odor.

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↑ White Coats Protect These Earless Lizards

Tularosa Basin's *Holbrookia* clan is normally brown. Through the centuries only the lighter members among those living in the Sands escaped their enemies. Survivors thus produced a race of reptiles white enough to blend into the background.

Like many of its kind, the lizard sheds its tail when seized and scurries to safety. A new appendage eventually replaces the one lost.

Earless lizards possess an insatiable curiosity and will approach close to human beings. Although their talent for running makes them difficult to catch, these two specimens ride contentedly on a shoulder.

Many animals—badger, skunk, fox, rabbit, coyote, gopher, and kangaroo rat—make excursions into the Sands, but besides the lizard the only full-time inhabitant is the Apache pocket mouse. It too wears a white coat.

fided, sweeping into a turn. "It takes time to know how much 'oomph' you need.

"You get so you can read the sand. The ripples tell you where it's too soft."

We skimmed back toward the highway.

"Got to find a place to drop off," said the busy driver, scanning the white expanse. "I guess this'll do."

Even Skilled Dune Drivers Get Stuck

I was sure he'd made a terrible mistake. We plunged over a precipice and stopped, hanging below the brink. Suddenly I found myself standing on the dashboard, looking down through the windshield.

"What happened?" I gasped.

"Oh, nothing," said Johnwill. "We're stuck, that's all. I shouldn't have stopped."

"How can you sit there, or whatever you call it at this angle, and say we're stuck? If we take a deep breath, the car will tumble end over end!"

"I don't think so," he replied, climbing out and stretching. He grabbed a shovel and passed me one. I had trouble enough standing up without digging, but watching the master I learned. Soon we uncovered the wheels.

"It'll go now," said Johnwill. Riding a glacier of white sand, the car slid gently down the 40-foot slope. At the bottom I dug the bumper out, and five minutes later we were at the Visitor Center.

Truckloads of men and equipment had rumbled by since early morning. The White Sands annual Play Day, held on the second Saturday in April, was getting under way. It looked as if Alamogordo and near-by Hol-

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An Automobile Threads Drifts Like a Mouse in a Monstrous Maze

In the monument's early days, the National Park Service built a clay-topped road into the desert. Dunes loped over it. A request to change the track's location went to Washington, D. C. By the time it was granted, sands had rolled over the proposed bed.

Finally, after discovering that moist flats need no topping to support traffic, the White Sands park officials got permission to grade a track wherever fickle nature directs.

Here a car travels the main road, which swings around the Heart of Sands (foreground), the monument's recreation area. Trough at center was dug by a road grader to demonstrate how close water stands to the surface of the flat (page 118). Shaded picnic table casts its shadow at right.

Sweeping across the crystal-encrusted marsh of Lake Lucero (upper center), the prevailing wind swirls the sand into ever-changing patterns. Drifts rise in slopes before the face of the wind, drop off as cliffs in its lee.

Somersault Endangers Neither Life nor Limb

Only casualty from a tumble here is the loss of personal treasures from pockets.

"You'd be amazed," muses the monument's chief ranger, "at the number of articles we're asked to look for—pens and pencils, keys, wallets, money, watches, even diamond rings. People drive up to a dune, jump out, and make a run for it. First thing you know, ordinarily dignified folks are hurtling head over heels. Loose items shower from their clothes."

Is anything ever found? "Sometimes people are lucky," said the ranger, "especially when the wind helps. We've discovered jewelry and coins sitting on tiny pillars of sand."

↓ Rangers' chief responsibility: to keep teen-agers from doing on wheels what they find is such fun on foot—racing on the dunes.

Those who ignore no-dune-driving signs risk whizzing over a crest into a family of picnickers. At best they bog down and have to dig out.

Kodachromes by William Belknap, Jr. (above) and J. Baylor Roberts, National Geographic Photographer

loman Air Development Center were taking over the Sands. We drove out to see.

White Sands' recreational hub is its picnic area. We thought the palette-shaped arena had been carved by bulldozers, but these creamy flats are natural. Their hard-packed floors are surprisingly moist.

Sheltered picnic tables are movable units set on concrete bases. We watched Joe Shepperd putting them up in a semicircle, like covered wagons drawn up for an Indian battle (page 130).

"These are for the old-timers," Joe called. "They're guests of honor at Play Day."

Alamogordo service clubs set up concessions while airmen from Holloman helped wire the bandstand. High school officials and athletes marked black lanes on a freshly graded oval.

Sandstorm Fails to Stop Play Day

Saturday dawned breezy. Sandstorms slowed traffic as we left Alamogordo; it was hardly a day for sports. At White Sands the wind shifted into high. Dust curtains so blanked out backgrounds that people and cars seemed suspended in milky space.

Track teams from 200 miles around had turned out; so had girls' softball clubs. But the track meet was going badly. Wind sandblasted the runners and tipped over hurdles. Far from discouraged, officials announced the meet would adjourn to Alamogordo (page 129).

But on Sunday, Play Day fans came back. Six thousand strong, they filled the picnic area. Lively music issued from an Air Force band. Old-timers had gathered from far corners of the Tularosa Basin to reminisce and watch their grandchildren frolic.

The holiday brought out Mrs. Tom Charles, whose husband was White Sands' first custodian. Tom Charles labored tirelessly for nearly 25 years to win recognition for the Sands. Finally, on January 18, 1933, President Herbert Hoover signed a proclamation creating White Sands National Monument.

Mrs. Charles recalled how, as a young couple, she and Tom had homesteaded near by in 1909.

"Back in those days we used to picnic on the dunes," she told us. "Tom always felt White Sands should be protected for future generations. From 1909 to 1933 was a long time, but Tom never lost his enthusiasm. He saw the job through."

Charles continued as custodian until 1939. His persistent striving for improvements resulted in the present Visitor Center, museum, and road system.

By lunchtime our family had scattered. I stopped shooting pictures long enough to eat fried chicken at the Chamber of Commerce "open house." Beside me stood a chap who seemed to know everybody.

"Do you live in this part of the State?" he asked.

"No, I came to photograph Play Day and the White Sands," I said. "And I'm impressed!"

"Play Day gets bigger every year," said my new acquaintance. "I've watched it grow. The first one I came to was with my high school track team. Later, during World War II, I was stationed at Holloman and we'd come out in uniform. I haven't missed many times."

"What are you doing now?" I asked.

"Oh, I work for the State," he said.

Johnwill Faris came over to introduce us.

"Governor, may I present Mr. Belknap?"

"Thank you," said the Governor of New Mexico, smiling. "We've just had lunch together!"

Later that afternoon four Air Force jets whistled over the crowd, then darted through 10 minutes of precision aerobatics. The departing roar of their afterburners signaled the end of Play Day (page 132).

Next morning footprints pocked the dunes as if an army had passed. I asked J. Marion Bell, manager of the Alamogordo Chamber of Commerce, how long it would take them to wear away.

"If we get wind," said he, looking at the clouds, "by tomorrow morning you won't see a mark."

City Name Recalls First Atom Blast

Alamogordo in Spanish means "fat cottonwood." A fast-growing city of 20,000, it lies at the eastern edge of the Tularosa Basin, elevation 4,330 feet. The community was founded in 1898 when the El Paso & Northeastern Railroad reached the present site.

A vital factor in Alamogordo's growth has been Holloman Air Development Center, with an annual payroll of about $38,000,000. With this, plus nearly 300,000 visitors coming to near-by White Sands each year, it is not surprising that Alamogordo has grown and prospered. Residents are proud of their

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↟ Yucca Roots Stretch Like Long Rubber Necks

When an advancing dune threatens yuccas with extinction, their roots put out new growth. Some extend many feet to keep heads above sand.

These plants bind together a pillar of gypsum, all that remains of the once-entombing dune. Such habits make the yucca a useful defense against drifting sands.

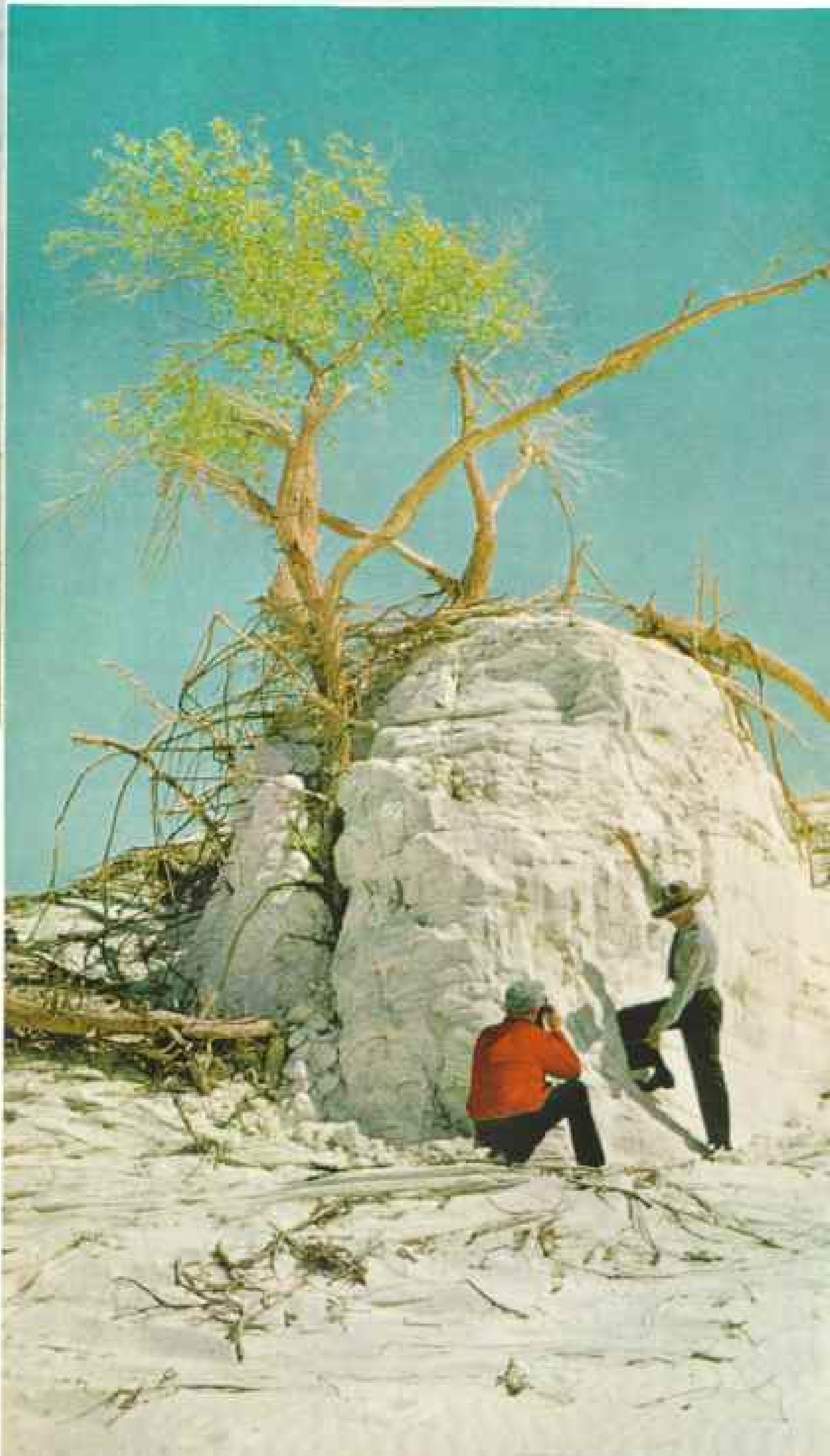
↡ Among Trees, Only the Cottonwood Survives Here

Despite a love of water, the cottonwood marches right into the sands. The tree pays for such audacity with stunted and twisted growth.

This cottonwood holds to its sandy pedestal with a tangle of root hairs. Despite a solid look, the mound would crumble should Johnwill Faris, superintendent of the monument (right), attempt to climb it.

Like all park officials, Faris worries about visitors damaging his monument's plant life, but here the dunes are continually more destructive than man.

Author Belknap crouches for a picture.



↞To the casual observer the White Sands region is starkly barren. Botanists, however, have discovered an astonishing number of adventurous plants adapting themselves to an arid and alkaline life. A recent count revealed more than 100 species in the monument.

Here a single centaurium plant makes a charming nosegay.

city's identification with the burgeoning science of rocketry and delighted at the popular nickname given their community—"The Rocket City."

Because of its relative isolation, natural barriers, and clear atmosphere, the Tularosa Basin was picked as a bombing range during World War II. The name Alamogordo still rings a bell the Nation over for its connection with the first atomic bomb; the historic blast was set off in a remote section of the bombing range, known as Trinity Site.

Later converted by the Army into a testing area for guided missiles, the range is now used by the Army, Air Force, and Navy.* It was set up originally to experiment with German V-2's and has since been used for intermediate-range missiles as well as high-altitude research rockets.

Missiles have long been associated with White Sands. Several fluted stone projectile points—spearheads used by Folsom man some 10,000 years ago—have been found in the area. Campsites, arrowheads, and implements of later nomadic Indians show up along the margins of the Sands.

Near the Visitor Center an early Spanish road can be traced by a curiously straight line of mesquite trees. Supposedly they sprang from beans in the droppings of oxen.

Near-by history in the 1880's reads like a shoot-'em-up western. Bullets whizzed during the Lincoln County War, Indian battles at Dog Canyon, and a two-year pursuit of Geronimo. And not far from White Sands a young desperado cut down some of the 21 men he is credited with killing. His name: Billy the Kid.

Modern missiles affect visitors at White Sands only infrequently. Officers at the proving ground occasionally restrict traffic along the highway during important "shoots," but it is purely an ultra precaution. The rockets land many miles away and are seldom seen from the road.

Two Animals Unique to White Sands

At least two animals have helped make the Sands famous, or vice versa. The white Apache pocket mouse and the bleached earless lizard are found nowhere else.

But don't rush out hoping to see white mice on white sand; being nocturnal, they are hard to find. There's one in the museum, and park rangers will tell you "they're out there." We saw tracks but no mice.

"You really ought to photograph a white lizard," Bob Koonce, owner of the White Sands concession, told me one morning.

"I'd like to," I said, "but I can't catch one. The little rascals are too fast."

"I'll get somebody to watch the shop. Let's take our youngsters and go get one."

The Koonce girls showed Buzz and Loie their flying-tackle technique and rounded up two fine specimens. Once in captivity, the pair rode on the children's clothes like ornaments, perfectly at ease (page 121).

Tracks Reveal Night Prowlers

To photograph animal tracks at White Sands, you must be early. By breakfast time they vanish, but in the sunrise stillness myriad footprints, accented in shadow by the sun's low angle, record the night's activities.

Star track-maker is the "high-tailer," a darkling beetle. Its meanderings look as if an embossing tool had been run back and forth in impressionistic designs.

Few mammals truly live in the Sands. Tracks indicate they come from the surrounding desert or marginal dunes. Skunks, porcupines, coyotes, and gophers have been recorded within monument boundaries. A bear was seen near the Visitor Center, and a truck hit a mountain lion. One evening I saw a lone fox near the picnic area. Snakes are common in the Tularosa desert, but I saw none among the dunes.

Johnwill Faris took me to see White Sands' wildlife sanctuary, a 2½-acre lake fed by an artesian flow of hot mineral water. Garton Well was at one time a popular local spa. Many Tularosa Basin old-timers swear they are alive today because of the healing effects of its water. An impressive guest list of waterfowl includes ducks, geese, sandpipers, snowy egrets, and pelicans.

One Sunday Joe Shepperd showed me Lake Lucero, the drainage area at the southwest edge of White Sands. Because rockets occasionally land near there, this section of the monument is closed to traffic. But it plays such an important part in the story of White Sands that our special visit was arranged.

We bounced 30 miles over rough roads to

(Continued on page 137)

* See, in the National Geographic Magazine: "Rockets Explore the Air Above Us," by Newman Bumstead, April, 1957; "International Geophysical Year," by Hugh L. Dryden, February, 1956; and "Seeing the Earth from 80 Miles Up," by Clyde T. Holliday, October, 1950.

Wind-driven Shower of Milky Dust Breaks Up a Track Meet on Heart of Sands

Each year Alamogordo, New Mexico, 15 miles away, sponsors a Play Day at the monument. Billed as the world's largest picnic, the event features an old-timers' reunion, a track meet, softball games, and speechmaking. Sand surrounds the frolic in expanses so broad that it swallows crowds numbering thousands.

Last year the temperamental sands stopped the show. Blasted by grit-laden gusts, the White Sands Relays adjourned to Alamogordo.

On a calmer day the desert resembles a sea-rippled beach, ideal for ticktacktoe.

Curving Shields Protect Picnic Tables from Wind and Sun

For years before the establishment of White Sands National Monument, settlers of Otero County used the gypsum desert for church socials, Easter egg hunts, and moonlight picnics.

In the spring of 1934 older residents gathered on the sands to reminisce about pioneer times. They called the outing Play Day and had so much fun that families and friends joined them the following year.

Except during World War II, Play Days have continued annually. This year 7,730 people gathered from the ends of New Mexico.

Snow fence (left) directs traffic. Canvas provides additional shelter from wind.

Opposite page, below: A cool watermelon makes a refreshing climax to a morning on the dunes. Here the smallest of the fry lends a hand at slicing.

Park Service employees devised this sail-like picnic shelter especially for White Sands. The concrete base anchors redwood slats or corrugated metal sheets. Semipermanent, the shelters are set to ward off afternoon sun and prevailing winds.

This family's outdoor chef cooks hamburgers over a stove fashioned from the rim of a truck wheel.

Jets Roar over Play Day Spectators in a Show from Holloman Air Development Center

During World War II the armed forces used part of the gypsum desert as a bombing range. When planes crashed in the monument, Park Service men often assisted in the rescue. These F-94's thrill the crowd with rolls and loops.

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The World's First Atomic Bomb Was Exploded in 1945 on a Near-by Wasteland

White Sands testing range is the largest all-land installation in the Nation for the firing of intermediate-range missiles. Deserts extending 100 miles permit firing, flight, and recovery of the weapons.

↑ **Sunset: Shadow Islands Float on a Sea of Amethyst**
After a day busy with people and loud with play, peace comes to the desert.

↓ **Dusk: A Shroud of Blue Touches the Land with Mystery**
Campfire of these Air Force picnickers will leave a "plaster cast" (page 136).

A Fire on Gypsum Sand Produced This Lump of Plaster of Paris

Gypsum has served mankind since the dawn of history. Egyptians plastered the vaults of their pyramids with the calcined mineral and made urns from a translucent form known as alabaster. Greeks used transparent gypsum crystals for greenhouse roofs and palace windows.

Benjamin Franklin advised the use of gypsum fertilizer, demonstrating its excellence in a clover field near Philadelphia.

Today science has discovered many commercial uses for the mineral. The building industry turns it into wallboard, lath, sheathing, and plaster. As plaster of paris, gypsum makes industrial molds and orthopedic casts.

Although the White Sands lie too far from population centers for commercial development, they provide one highly appropriate product—plaster souvenirs of the monument.

↓ A penknife separates crystalline selenite—a form of gypsum—into daggerlike slivers. The mineral, ground to powder by the wind, makes up the sea of sand.

reach the lake. Since it was the dry season, we found Lucero a land of heat waves and mirages, bad-water pools and crystals.

Joe stopped the car on what seemed a broad plain of broken glass. A close look showed king-size selenite crystals sticking out of the ground. Their amber faces flashed in the sun like giant sequins.

With his knife Joe split off a micalike sheet, clear as glass, and held a lighted match under it. Popping and sputtering, the clear piece turned opaque white.

"Heat drives out the moisture," Joe explained. "This white powder is pure plaster of paris. Just add water and it'll set up rock hard. If a fellow busted a leg out here, he wouldn't lack for a plaster cast!"

Joe was right. Gypsum, chemically a hydrous calcium sulphate, is a most useful mineral, but so plentiful throughout the world that only big deposits, close to population centers, are worked commercially. This fact answers a question visitors ask about the Sands: "Why didn't somebody stake a claim?"

How white are the White Sands?

They compare favorably with the classic "white as snow"—until the snow starts melting. Visitors anxious to see snow on the dunes are usually disappointed. At first the whites nearly match, but moisture turns the sands a dismal creamy-gray.

The darker color of moist gypsum is always apparent between dunes. Because these flats are near the bottom of a drainless basin, water is close to the surface. If it weren't, White Sands would blow away (page 118).

Joe Shepperd told us the Park Service had tried to use easily available gypsum water for everything except drinking, but it ruined pipes and plumbing. Now water for the Visitor Center comes from a distant well.

Trees Fight a Losing Battle

The unusual combination of plentiful water and shifting sand is confusing for trees and plants. The water says "grow" and the sand says "stop." Which wins? Of more than 100 species growing at White Sands, all but a handful get smothered by the advancing dunes. The fighting few keep "afloat" by sending down long roots and growing new ones higher up. We measured one exposed cottonwood root 120 feet long.

After being "stretched" to many times their usual height, normally low plants like yuccas can't stand up when dunes walk off and leave them. You see their dried stems, often 20 feet long, on the White Sands Drive.

Sometimes the plants seem victorious, but only temporarily. Enough of them can slow a dune, yet the sand eventually wins.

The most prevalent plant is the three-leaf sumac. Its many roots follow lines of least resistance between sand layers, binding them together. After a dune has moved on, the sumac lives atop its white column like a shaggy head of hair.

Desert Blooms in Springtime

The peculiar botany of White Sands can be seen all year, but in late May and early June the ivory desert blooms. We made a special trip then for wildflower pictures.

Yucca, the State flower, is widespread. At White Sands we often found more camera fans than yuccas near the road, but back in the dunes the supply was unlimited.

At the Sands' outer edge we found deep-yellow gourd blossoms (page 121) and cane cactus popping out bright red. Between the marginal dunes grow delicately purple sand verbenas and pink centauriums of the gentian family (page 126). The only cactus we saw within the Sands was the beautiful flaming torch.

Unless visitors come to make pictures or study natural history, they seldom spend more than a few hours at White Sands. By far the greatest number are travelers attracted by the magnetic name. But those who enjoy the place most are the thousands who come for fun—to play, relax, and picnic.

White Sands has no campground, but visitors may park trailers or pitch tents overnight. Table shelters and fire grills are better for picnics than camping. Wood and water are strictly bring-'em-yourself.

In contrast with most national parks and monuments, recreation is emphasized more than protection of natural features. As one official put it: "What damage can anyone do?" He pointed out that the moving sands bury more plants in a month than visitors could pick in a year. Even the litter-bug finds it hard to mar their beauty for long.

"We don't for a moment condone breaking Park Service regulations," Johnwill Faris explained. "'Take only pictures, leave only tracks' is a good rule here, as anywhere else. But our feature attraction, being in motion, is just about indestructible!"

Coronation in Katmandu

The Pageantry of Marco Polo's Asia Comes Alive Once Again as a New King of Nepal Ascends the Cobra Throne

By E. Thomas Gilliard

With Photographs by Marc Riboud, Magnum

NEPAL'S exotic capital seethed with color as I wormed my way along its pulsing streets. Katmandu normally holds about 150,000 people; now it bulged with nearly half a million. The two simple hotels had long since been overwhelmed. Hastily imported cots cluttered even their lawns and lobbies.

Around me the Nepalese labored in a frenzy of preparation. Peasants painted their houses in gay pastel colors. Gods of temple and hearth were being newly gilded for the great day. And, already, elephants vividly splashed with fresh color lumbered through the crowd, grazing the projecting eaves of temples on either side.

Phone Call Starts 9,000-mile Quest

How strange it seemed to be here! Only three weeks before, in New York, Lowell Thomas, Sr., had telephoned to inquire if I could drop everything and rush halfway around the world to Nepal. He wanted, he said, to film the coronation of Nepal's new King for a forthcoming Cinerama production, "Search for Paradise."

Mr. Thomas knew full well how difficult it would be to reach King Mahendra in time. Nepal is one of the world's most remote and least-known kingdoms, a land which for centuries has held itself proudly aloof from the rest of the world.* And as if that were not enough, Mr. Thomas faced the further task of rounding up 23 technicians and 14,000 pounds of equipment, then scattered from Death Valley to Rome, for a dash to Delhi and thence another 500 miles toward the roof of the world to Katmandu (map, page 142).

Fantastic? It would demand a series of miracles. But I agreed to try.

In New Delhi the Nepalese Embassy was shuttered for a two-day holiday. I banged until the Ambassador arose from his siesta. He listened politely to my problem and studied me thoughtfully.

"I will telephone to Katmandu," he said.

Telephone! Never had the Nepalese admitted publicly that such a facility existed, not even in the tense days when the Chinese were invading Tibet.

"But let me caution you," he added, "that you must not let your hopes rise. It will probably be impossible to reach the King in time."

Two Months for a Routine Message

As we drove back to the United States Embassy, Counselor Graham Hall further dampened my spirits. "When we send a routine message to Katmandu," he warned, "we allow a couple of months for a reply."

Half an hour later the Embassy phone rang.

"I have just talked with the Foreign Minister in Katmandu," the Nepalese Ambassador bubbled happily. "He said, 'No, it is impossible.'"

Halfway around the world for nothing, I told myself bitterly. It had been 43

←Waning Sun Spotlights a Medieval Drama

The King of Nepal greets one of 400 guests in the last act of an age-old coronation ritual. The world's only Hindu monarch, 36-year-old Mahendra wears his nation's supreme symbol of authority, a helmetlike crown. Some $2,000,000 worth of pearls, diamonds, rubies, and emeralds glitter on its surface; plumes of the greater bird of paradise billow from it in a cascade of pale gold.

The 8,500,000 people of Mahendra's swiftly changing domain look on their progressive new leader—crowned last year—as an incarnation of Vishnu the Preserver. The gilded throne's nine-headed serpent symbolizes his relationship to this Hindu deity.

Queen Ratnarajyalakshmi sits between her husband and the feather-hatted commander in chief of Nepal's 45,000-man army. A diamond-studded tiara contrasts with the simple Hindu marking on her forehead.

Microphones and dark glasses shielding the King's eyes from photographers' lights added an incongruous note to the fortnight of pomp and splendor.

*See, in the National Geographic Magazine: "Peerless Nepal—A Naturalist's Paradise," by S. Dillon Ripley, January, 1950, and "Nepal, the Sequestered Kingdom," by Penelope Chetwode, March, 1935.

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↑ Fitting Steed for the "King of Kings": Nepal's Tallest Elephant

Royal guards escort their Sovereign and Queen to the final audience of the coronation (page 138). Behind them a retainer carries a ladder for dismounting. The royal couple's howdah, borne by a towering 45-year-old animal, sways 14 feet above the red-carpeted roadway.

← Following hallowed custom, the newly crowned King threw a handful of coins at the umbrella-shaded image of Hanuman, the Monkey God (right), outside Katmandu's Monkey Palace. Then he climbed to his lofty perch for a triumphal tour of the capital. Yellow-hatted Hindu priests led the procession.

→ Native musicians play on the oboelike *sanayi*. Nepalese army band in background uses conventional European instruments.

years since Western eyes had glimpsed a Nepalese coronation, and then the lucky witnesses had been precisely two European officials. Now we were to miss what would probably be the last chance to capture on film this unique pageant out of Asia's past.

"Then the Minister said, 'Wait,'" the beaming voice went on. "'I see His Majesty coming down the hall. I will ask him.'

"And, my dear Mr. Gilliard, the answer is 'Yes.' You can radio Mr. Thomas that the King knows all about Cinerama. He says, 'Give the Americans every assistance.'"

Lesser miracles followed in due course. Finally, late on a Saturday afternoon—the last possible day—a Globemaster dropped out of brazen skies. Aboard were the Cinerama crew, seven tons of equipment, and Lowell Thomas.

"Here we are, Tom," he called in greeting. "And I can tell you, I still don't believe it."

Sun Predicted for King's Big Day

On coronation day we were awake before dawn, squinting anxiously at the sky. Rain is no stranger to Katmandu in May; two days before, a cloudburst had nearly floated us out of our hastily constructed tent "hotel" in the outskirts of the capital. But the royal astrologers had predicted sun for His Majesty, and here it was, rose-tinting the distant Himalayas. Mist still flooded the valley, but, as the haze lifted, russet-hued houses, temples plated with brass, and brick-walled paddy fields swam into focus.

Lowell Thomas, who had come to Nepal as one of President Eisenhower's three emissaries, with the rank of special ambassador, emerged splendid in top hat and tails.

"I feel odd," he muttered ruefully, "washing in a tin basin, taking a bucket shower in a pasture, and then donning this outfit for breakfast."

Sacred Images Borne to Katmandu

We surged off toward the city, cameramen and all, primly correct in jackets and ties. The roads were alive. Peasants on foot and mounted on ponies streamed toward Katmandu from Bhutan, Sikkim, and Tibet. Fittingly, some of them carried gleaming Buddhist images, for the Lord Buddha himself was born not far from Katmandu more than 2,500 years ago.

The wealthy traveled in tubs carried on long poles, sometimes with a folding top like that of an old-fashioned buggy. Impervious to the traffic, fakirs stumbled and even crawled along the highway's edge; some entered a trance every hundred yards or so. Banners, strung across triumphal arches, proclaimed, some of them in English: "Long life to our gay royal couple" and "Distinguished guests from foreign countries are heartily welcome."

Flags representing the dozen or so nations whose representatives would attend the coronation flew on every hand. Among them I saw the standard of Red China flying alongside United States flags, handmade by the thoughtful Nepalese.

Lost in this dream world of strange tongues and stranger actors, I drifted along with the varicolored human tide until it washed me to the foot of a towering idol: Kali the Destroyer. Generations of worshipers had worn smooth the low approaching steps, knelt in submission beneath the painted lips in the coal-black face, bowed before the crown of skulls. As I watched, children and old men reverently sprinkled flower petals over their heads, unawed by the goddess's powerful arms and ornaments of skulls and human heads (page 151).

I seemed to have been caught up in a kind of Oriental Mardi Gras. Nepalese maidens, sleek in their jet braids and jeweled at

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All Nepal Dons Its Best Bib and Tucker to Greet the New King

Though one of earth's hidden kingdoms, its isolation jealously guarded until recently, Nepal and its people are surprisingly well known to Westerners.

In 1953 a Nepalese Sherpa, Tenzing Norkey, made headlines by accompanying Sir Edmund Hillary to the summit of Everest, Nepal's—and the world's—loftiest peak. During two World Wars some 360,000 Nepalese, roughly one of every five eligible males, volunteered for duty with Great Britain's rugged Gurkha regiments.

The well-to-do women above, like all their Nepalese sisters, favor bulging sashes around their waists. Members of Nepal's Newar tribe, they wear lavish displays of hand-wrought jewelry.

The peace-loving Newars, whose language is related to Tibetan, claim to be Nepal's aborigines. Their skill as workers in gold, silver, copper, and bronze accounts for much of the country's rich heritage of art.

→ Peacock feathers edge ceremonial fans, which symbolize the King's authority. Jade disks surround the monarch's bespectacled likeness.

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A Frosted Himalayan Rampart Broods Above Katmandu's Terraced Valley

Nepal's many-towered capital and near-by Patan (page 148) are almost hidden by trees in the distance. In the foreground a country town huddles compactly within the circle of its irrigated fields. This lush 4,000-foot valley holds most of mountainous Nepal's level land. Beyond the jagged, snowy range lies Communist-dominated Tibet.

145 Walter Bosse

Even These 24,000-foot Peaks Are Commonplace in Sky-scraping Central Asia

To bolster state revenues, King Mahendra recently put his nation's mountains "on the market." Climbers attempting to scale 29,028-foot Everest must now pay $630; 26,811-foot Dhaulagiri, earth's highest unconquered peak, costs the same. Lower peaks, which stud Nepal from end to end, may be climbed for bargain prices.

← **Suspicious Devil Dancer Eyes the Camera from Behind a Painted Mask**

This costumed villager performed during the coronation. Wood-fiber "hair" dangles from his papier-mâché mask. Lotus-petal design, often seen on Nepalese metalwork, ornaments the topmost ring of the massive necklace.

Other members of the troupe assumed features of demons and death's-heads as the masked figures acted out dramas between the forces of good and evil.

↓Until recently, graceful bird of paradise plumes waved above the heads of most Nepalese officials. Now export of the plumes from their native New Guinea is forbidden. Except for the King himself, dignitaries of the Himalayan kingdom must be content with showy but plebeian rooster tails, such as those worn by be-medaled General Baber.

United States envoys to Mahendra's crowning took 97 bird of paradise skins as a coronation gift. Seized as contraband in 1924, they had been stored at the American Museum of Natural History. A hint from the author, Associate Curator of the museum's Department of Birds, and prompt approval by the museum's Director, Dr. Albert E. Parr, resulted in this appropriate addition to the royal wardrobe.

the ear, chattered among themselves, their expressive hands fluttering like hummingbirds (page 143).

Passing a long brick wall, I gave a twirl to each clacking prayer wheel, as a small boy might run a stick along a picket fence. Then, overtaking a brace of victorias drawn by spanking bays, I came to the lofty façade of the Palace of Hanuman, named for the monkey god of the Hindus.

A knot of armed guards demanded my credentials. Fortunately, I wore on my breast a silver medal bearing the crown of Nepal and carried a royal permit embossed in gold. These talismans saw me through the barriers and into a narrow corridor sheathed in shimmering brass.

I emerged from this burnished passageway and hurried into the coronation courtyard. White-clad workmen were arranging chairs in three ranks against the west wall. From another wall sprouted a series of carved flying buttresses, and at the junction of two others rose a tall, many-roofed temple. Above us a slender, roundish tower pricked the sky.

Massive Throne Dominates Pavilion

Looking curiously out-of-place, yet the center of a swarm of anxious shuffling priests, stood a thatched pavilion. Here the King would formally receive his crown. Already Cinerama technicians were on their hands and knees installing cables and lights with which to illuminate the scene.

The royal astrologers had divined that the auspicious moment for the coronation would be at precisely 10:43 a.m. Since my watch indicated I still had two hours, I decided to explore a little.

The coronation pavilion, raised upon stone slabs, seemed oddly fragile. Green, red, and yellow brocade upholstered its low walls, and slender tree trunks wrapped in crimson and gold supported its grassy roof. The immense throne within it looked like a giant's chair in a child's playhouse.

The throne, as big as a four-poster bed, was uncomfortably backed in metal embossed with writhing snakes. Over it loomed the golden hood of a nine-headed cobra, symbolizing Vishnu the Preserver. On the floor lay the skins of lions, tigers, and leopards.

A steady influx of dignitaries seeped through the brass-lined corridor and into the coronation arena. I picked out easily the yellow-robed delegates of Tibet's Dalai and Panchen Lamas. The Vice President of India, turbaned and sashed, blinked behind professorial iron-rimmed glasses. The Crown Prince of Sikkim arrived in lavender robes. Jigme Dorji, brother-in-law to the King of Bhutan, wore a sword and long felt boots with upturned spiked toes; he had marched for six days over mountain passes from his fortress realm.*

Visitors Crowd Coronation Scene

Princes, maharajas, and ambassadors flocked forward. A sober proletarian note was struck by the envoy from behind the Bamboo Curtain: six-foot Ulanfu, a Deputy Premier of the People's Republic of China, severe in a black work cap. Just behind him, in vivid contrast, stalked Britain's Lord Chamberlain, the russet-faced, white-mustachioed Earl of Scarbrough, in flowing silken cloak and a rainbow of medals. More conservatively dressed were the United States representatives: Mrs. Robert Low Bacon, Dr. Charles W. Mayo, the noted physician, and Lowell Thomas. And with all of these, I was sure, stood invisible ranks of Hindu gods and goddesses, who had also been formally invited to attend.

The seconds ticked away, and tension mounted in the jam-packed courtyard.

Then from the street outside we heard a crescendo of cheers and cries of "Maharaj! Maharaj!" The boom of a 31-gun salute rocked the city.

Soldiers snapped to attention. In strode the brothers of the King—and then, with a blare of brassy music and a roll of drums, the King himself.

Monarch Anointed with Butter

He was clad in simple white homespun and dark sunglasses, an ivory-handled dagger in his belt. His slim consort, Queen Ratnarajyalakshmi, glided along beside him in a scarlet sari, her lovely hair floating free. Down the red carpet they walked and through an ornate door in the north wall.

Here, in separate chambers, the King and Queen would be bathed and anointed. Brahman priests applied fifteen kinds of mud to the King's body as a part of his physical purification. For strength and fleetness there was mud from elephant and horse stables;

* See "Bhutan, Land of the Thunder Dragon," by Burt Kerr Todd, NATIONAL GEOGRAPHIC MAGAZINE, December, 1952.

Two Miles from Katmandu, Patan's Temples Rise Tier on Tier Like Storybook Palaces

Red-coated royal guards lead a carriageload of dignitaries through the city. The King, paying his first state visit, followed on elephant back. Blue-and-white United Nations flag flies at far left.

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Women and Children Jam Balconies and Rooftops Along the King's Route.

Nepalese men remain on ground level; none would dare place himself higher than his Sovereign. Gurkhas equipped with walkie-talkies kept enthusiastic townsmen from overwhelming the royal procession.

for wisdom, earth from the Himalayas. Soil from an anthill, a carriage wheel, and a meeting place of holy rivers each added a kingly attribute.

Minutes later the royal couple emerged, shaded by scarlet and golden umbrellas, and made their way to the coronation pavilion. Prostrate before the cobra throne, Mahendra lay at the feet of red-scarfed Hindu priests. Nor did he move a muscle as they sprinkled him with clarified butter from a golden jar, curds from a silver pot, milk from a copper bowl, and water from an earthen vessel.

Mahendra Belongs to Warrior Caste

This act of obeisance held meaning. The King comes from the warrior, or Kshatriya, caste; the blood of Hindu Rajputs flows in his veins. Here he acknowledged the superior ranking of the Brahmans and symbolically guaranteed their age-old privileges; in Nepal no Brahman may be executed, not even by the King.

The archaic ceremony droned on. And yet, I reflected, one could already discern the present. This youthful Nepalese ruler would be the first in more than a century to ascend the cobra throne as a truly absolute monarch. For generations Mahendra's predecessors had been virtual prisoners of Nepal's prime ministers, who represented the powerful Rana family. Even the minister's crown was larger, and glowed with more fabulous ornaments, than the King's.

But in 1951, while Mahendra's father reigned, the power of the Ranas was broken. Now a year had passed since the old King's death in the aseptic hush of a Swiss hospital. And already his 36-year-old son was taking unheard-of liberties. The coronation ritual, which traditionally spans many days, had been abridged at his orders and shorn of such kingly prerogatives as a bath in the waters of a thousand rivers.

Rite followed rite as the priests, frequently consulting their notebooks and holding quick whispered huddles, wound their way through half-forgotten ceremonies. Other celebrants kept up a continuous chant of Vedic hymns. Yellow-hatted boys skirling on the bell-mouthed *sanayi* competed with a brass band (page 141). And through all the cheerful noise waiters circulated with cigarettes and soft drinks. In one corner a brown calf destined for later sacrifice serenely chewed its cud.

At length the monarchs got to their feet and mounted the double throne, dwarfed by its resplendent hood. Two priests, still chanting, then brought forth a jewel-encrusted helmet topped with the magnificent nuptial plumes of greater birds of paradise.

It was a crown studded with gems worth at least two million dollars and set by generations of long-dead craftsmen—a trophy that would have aroused the avarice of Genghis Khan. Yet, as an ornithologist acquainted with birds of paradise, I knew that the plumes swaying over it were "jewels" of even greater rarity.*

Each set of plumes represented a male bird found only on New Guinea and its island satellites. So prized have they always been that, even when New Guinea lay beyond the borders of the known world, daring traders carried them to Ternate, Makassar, Cathay, and over the burning wastes of Mongolia, along routes later made famous by an enterprising traveling salesman named Marco Polo.

"O People, This Man Is Your King!"

But first a priest presented to the King a long golden scepter and a slender sword in a red scabbard, emblems of authority. As the hands of my wrist watch reached the magic moment of 10:43, a priest, careful lest he dislodge the monarch's dark glasses, slowly lowered the crown upon Mahendra's brow.

* Ornithologist Gilliard has led two National Geographic-sponsored expeditions to New Guinea and reported to The Society's members in memorable articles and photographs. The first, "New Guinea's Paradise of Birds," appeared in November, 1951. It was followed in April, 1953, by "New Guinea's Rare Birds and Stone Age Men" and in October, 1955, by "To the Land of the Head-hunters."

Grisly Trophies and a Vacant Stare → Adorn a Six-armed Goddess in Katmandu

For centuries two of Asia's dominant religions, Hinduism and Buddhism, have existed side by side in this isolated corner of the world's lofty attic. The same images often serve adherents of both.

Hindus revere this figure near the Monkey Palace as a form of Kali, black goddess of death and destruction. Buddhists know it as a deity who assumes a menacing guise in defense of the faith.

Here a woman stretches on tiptoe to make an offering of rice. "Confetti" of chopped flower petals left by other supplicants clings to the prostrate figure beneath the idol's feet. Kali's bland expression belies her garland of severed human heads, crown of skulls, and wristlets, anklets, and earrings of snakes.

Duly the priests endowed him with "the glow, the splendor, and the energy of the gods" and declared him "unrivaled in purity, greatness, and kingship." For his part, Mahendra solemnly promised "never to be arbitrary."

The priests, turning to the audience, cried out: "O people! This man is your King! He is the King of us Brahmans!"

Coins Shower on Cheering Throng

The King, his iridescent plumes flashing pale gold in the sunlight, now rose. Tall under the massive helmet, he marched across the courtyard and down the glistening corridor. Outside, at the palace gate, he mounted a white stallion, to symbolize his godlike speed, then nimbly dismounted and clambered aboard a silver howdah balanced on the back of Nepal's tallest elephant (page 141).

Seated beside his tranquil Queen beneath a raspberry-tinted canopy, he set off toward his own 1,000-room mansion through dense swarms of uproarious subjects. Army commander in chief Kiran, riding tandem with the King and Queen, showered handfuls of silver coins on the spectators from a basket between his feet, provoking good-natured stampedes among the crowded subjects below.

Behind the royal beast guests hurried atop another 26 waiting elephants and joined the glittering procession.

They made a brave show. The elephants, freshly painted, wore elaborate trappings strung with scores of merry bells. The generals and princes swayed upon them, looking a trifle seasick.

A King had been crowned. But more than a king, perhaps; more, even, than an absolute monarch, rare as these are in a democratic era. We had witnessed the age-old rituals attending the incarnation of a god, the life-preserving Vishnu, absolute sovereign of eight and a half million Nepalese.

Lowell Thomas, Sr., Holds a King's Ransom in Billowing Bird of Paradise Plumes

The 97 skins were taken from vaults of the American Museum of Natural History, where they had been stored for 32 years, and arranged in dazzling standards for presentation to the King (page 146). His crown alone uses plumes from half a dozen birds. Mr. Thomas was one of three U. S. envoys at the coronation.

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To carry out the purposes for which it was founded 69 years ago, the National Geographic Society publishes the National Geographic Magazine monthly. Receipts are invested in The Magazine or expended to promote geographic knowledge.

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In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives. It has aided and encouraged exploration literally to the ends of the earth, having contributed to expeditions of Rear Admiral Robert E. Peary, discoverer of the North Pole, and Rear Admiral Richard E. Byrd, first man to fly over the North and South Poles.

Photomapping the heavens to a depth of a billion light-years from Palomar Observatory, the National Geographic Society and California Institute of Technology have expanded the known universe at least 25 times and discovered tens of thousands of giant star systems. This seven-year Sky Survey (1949–1956) has made available to observatories all over the world the most extensive sky atlas yet produced.

In Russell Cave, Alabama, in 1956, an archeological expedition of The Society and the Smithsonian Institution excavated the oldest material of human origin yet found east of the Mississippi—charcoal from cooking fires of 8,000 years ago. The site revealed a unique record of man's occupancy from 6500 B.C. or earlier until about A. D. 1650. Finds included many artifacts, weapons, and the 4,000-year-old bones of a man and a dog.

National Geographic exploration and scientific study made known to the world the natural wonders now preserved as Katmai National Monument and Carlsbad Caverns National Park.

The Society's notable expeditions pushed back the historic horizons of the Southwest to a period nearly eight centuries before Columbus by dating the vast ruins of Pueblo Bonito.

In Mexico, The Society and the Smithsonian Institution, January 16, 1958, discovered the oldest dated work of man in the Americas. This stone is engraved, in Maya-like characters, November 4, 291 B.C. (Spinden correlation). It antedates by 300 years anything else in America bearing a date and reveals a great center of early American culture, previously unknown.

On November 11, 1935, the stratosphere flight of the world's largest balloon, *Explorer II*, sponsored by The Society and the U. S. Army Air Corps, reached a world-record altitude of 72,395 feet. Capts. Albert W. Stevens and Orvil A. Anderson recorded scientific results of extraordinary value.

The Society and individual members contributed $100,000 to help preserve for the American people the finest of California's sequoias, the Giant Forest in Sequoia National Park.

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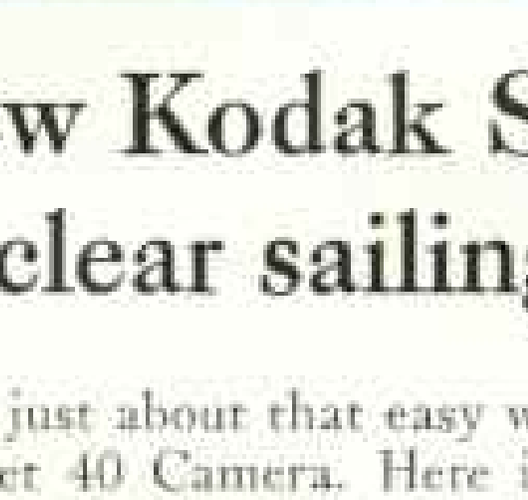

To focus, bring together the images in the range-finder-viewfinder window. Shoot from 2 feet away.

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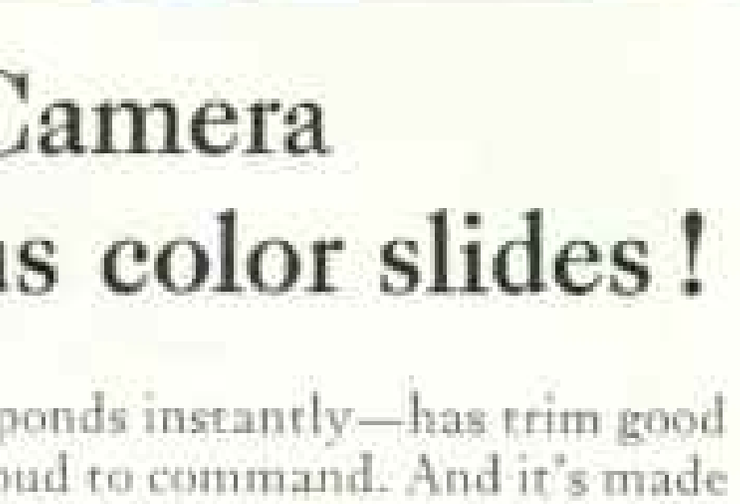

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What do giraffes have to do with High Blood Pressure?

IN ITS SEARCH for more knowledge about baffling diseases, medical science takes some strange turns. For example, doctors have gone to Africa to study the blood pressure of giraffes.

They found that it takes an unusually high pressure to pump blood from the giraffe's heart to his brain—a distance of some 14 to 15 feet. Yet, its heart and blood vessels are not under strain.

Doctors are trying to learn more about how this is accomplished for it could shed new light on the disorder affecting an estimated 6 million Americans—high blood pressure or hypertension.

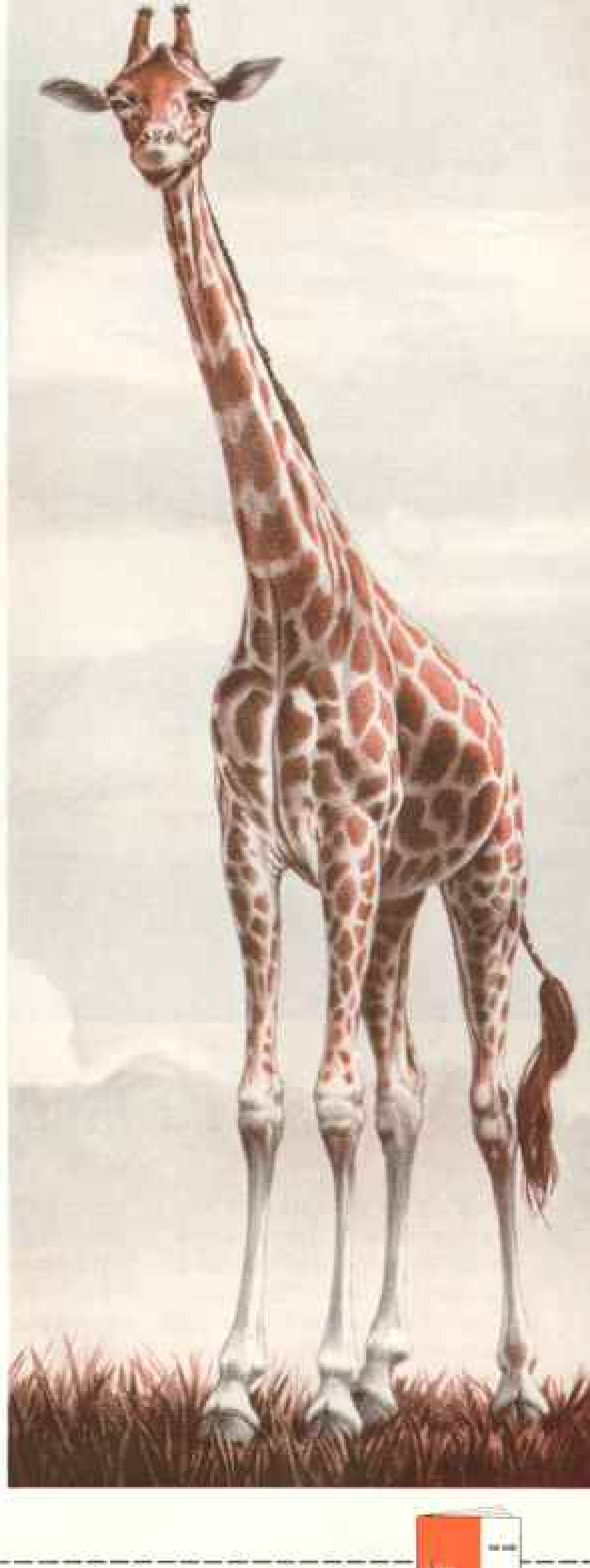
Fortunately, most cases of hypertension can be helped by proper treatment. In fact, it can often be controlled simply by relieving day-to-day emotional stresses which push blood pressure up and tend to keep it excessively elevated.

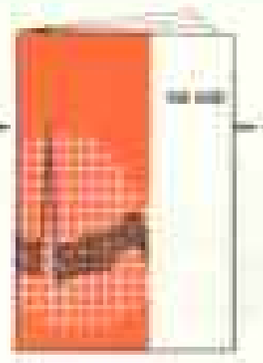
If you have hypertension, your doctor may suggest a way of life especially adapted to your needs. Among other things, he will probably recommend *plenty of rest* and *weight control*. The latter is important in treating, and possibly *preventing*, hypertension. In fact, hypertension is four times as common in overweight men as in those who are underweight.

If changes in living habits do not control this disorder, then other treatments . . . including medicines, special diets or surgery . . . may be used.

Hypertension is more easily controlled when discovered early. So, *everyone* should have periodic health examinations. Those who have reached middle age, are overweight, or whose parents or close relatives had elevated blood pressure should be especially watchful.

When hypertension is diagnosed, a patient should continue to see the doctor regularly. Then possible complications can be prevented, postponed or, if they occur, treated promptly.





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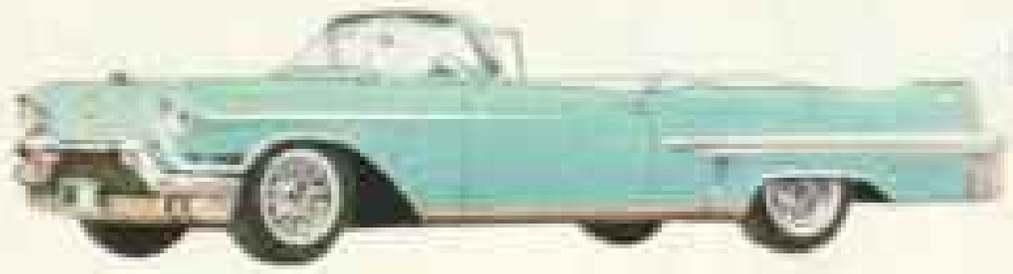

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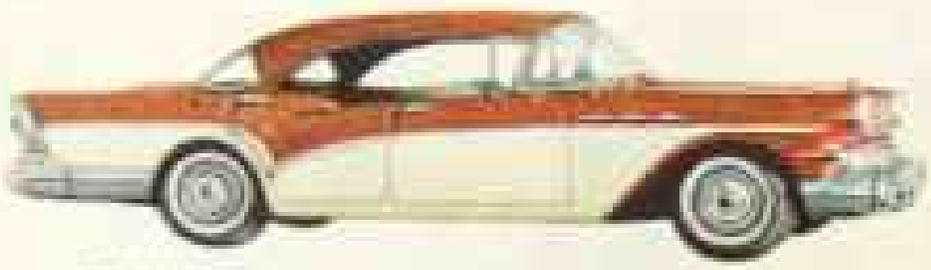

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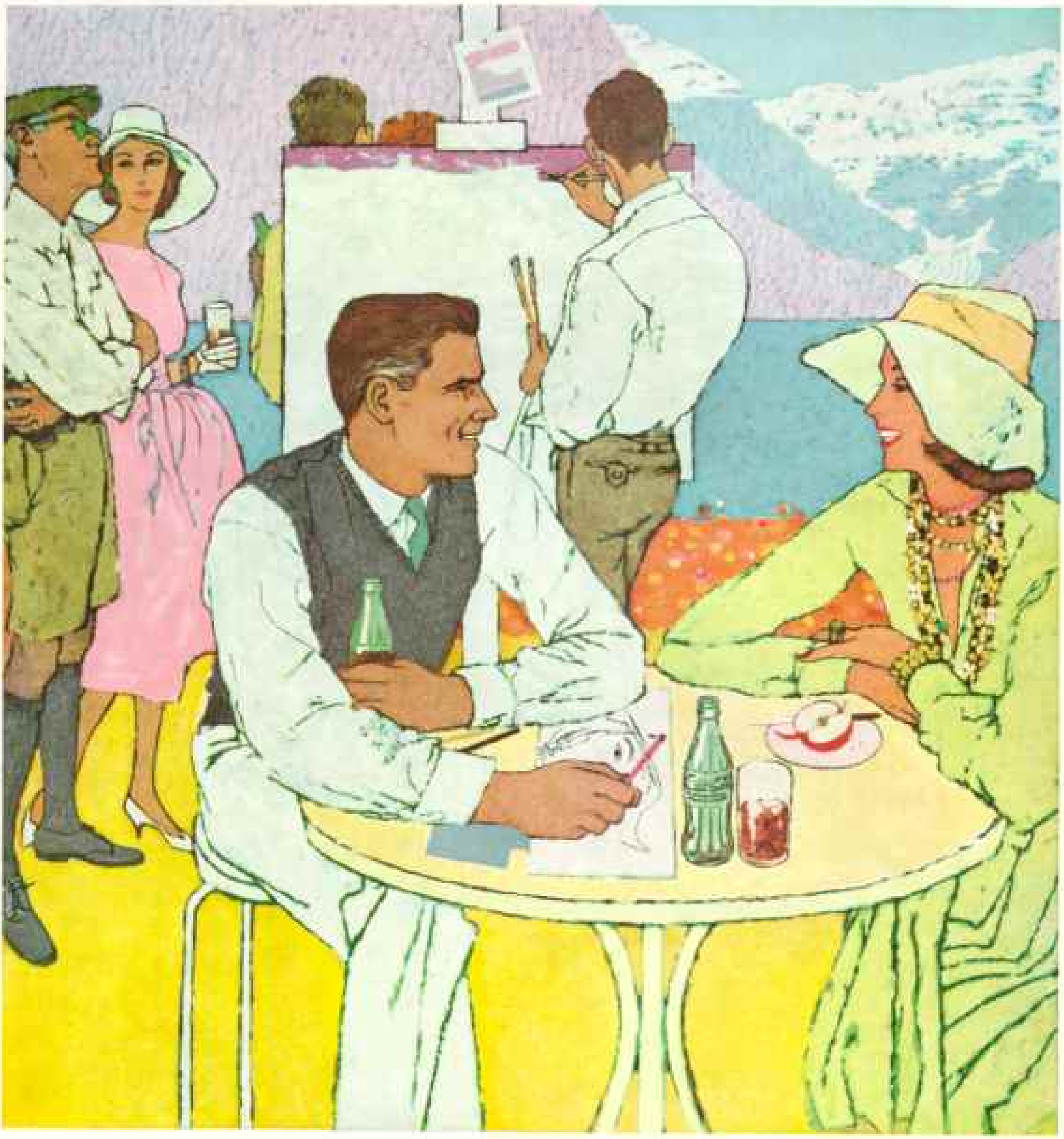

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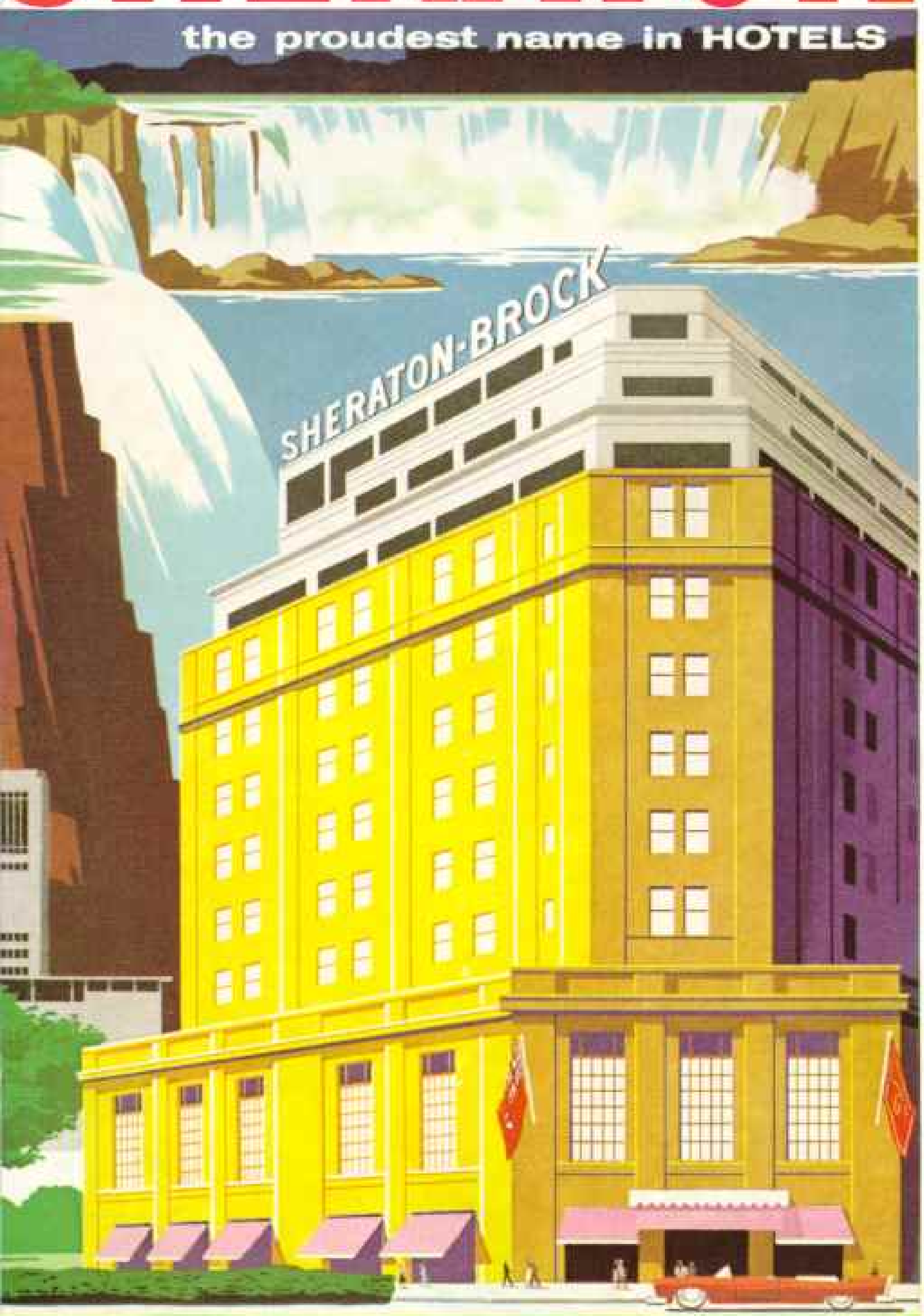

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