

VOLUME CVIII

NUMBER SIX

THE NATIONAL GEOGRAPHIC MAGAZINE

DECEMBER, 1955

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DAVID S. BOYER

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To carry out the purposes for which it was founded sixty-seven years ago, the National Geographic Society publishes the National Geographic Magazine monthly. All receipts are invested in The Magazine itself to expand directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

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.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus. By dating the ruins of vast ceremonial dwellings in that region, The Society's researches solved secrets that had puzzled historians for 300 years.

In Mexico, The Society and the Smithsonian Institution, January 10, 1909, discovered the oldest dated work of man in the Americas. This stone is engraved, in Mayan characters, November 4, 291 B. C. (Spencer Correlation). It antedates by 200 years anything else dated in America 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 72,385 feet. Capt. Albert W. Stevens and Grad. A. Anderson took with a ton of scientific instruments and obtained results of extraordinary value.

A notable undertaking in astronomy was launched in 1949 by The Society and Palomar Observatory of the California Institute of Technology. This project photomapped vast areas of space, making available to observatories all over the world, at less than cost, the most extensive sky atlas yet achieved.

In 1948 The Society sent seven expeditions to study the sun's eclipse on a 5,320-mile arc from Burma to the Aleutians.

A Greek cargo ship sunk in the Mediterranean 2,300 years ago was found in 1952 and is being excavated by the National Geographic Society-Cyprus Marine Archaeological Expedition led by Capt. J. V. Coatsworth of the French Navy.

The National Geographic Society and the Royal Ontario Museum in 1951 explored and measured newly found Chubb meteor crater, 11,500 feet in diameter, in northern Quebec.

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.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration in 1947.

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A sound child body — the founda-

tion of a sound adult body — must be built from the food that goes into it. The true effect of a mother's care during childhood has only begun to be understood. And, since eating habits are formed in childhood, the conscientious parent can do much to insure the child against later penalties of wrong eating.

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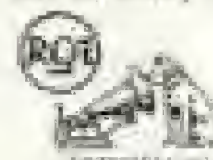
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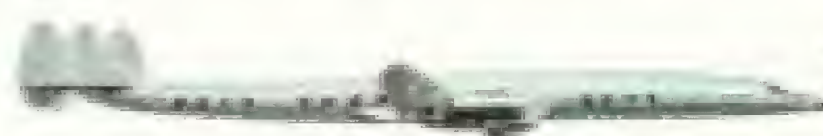
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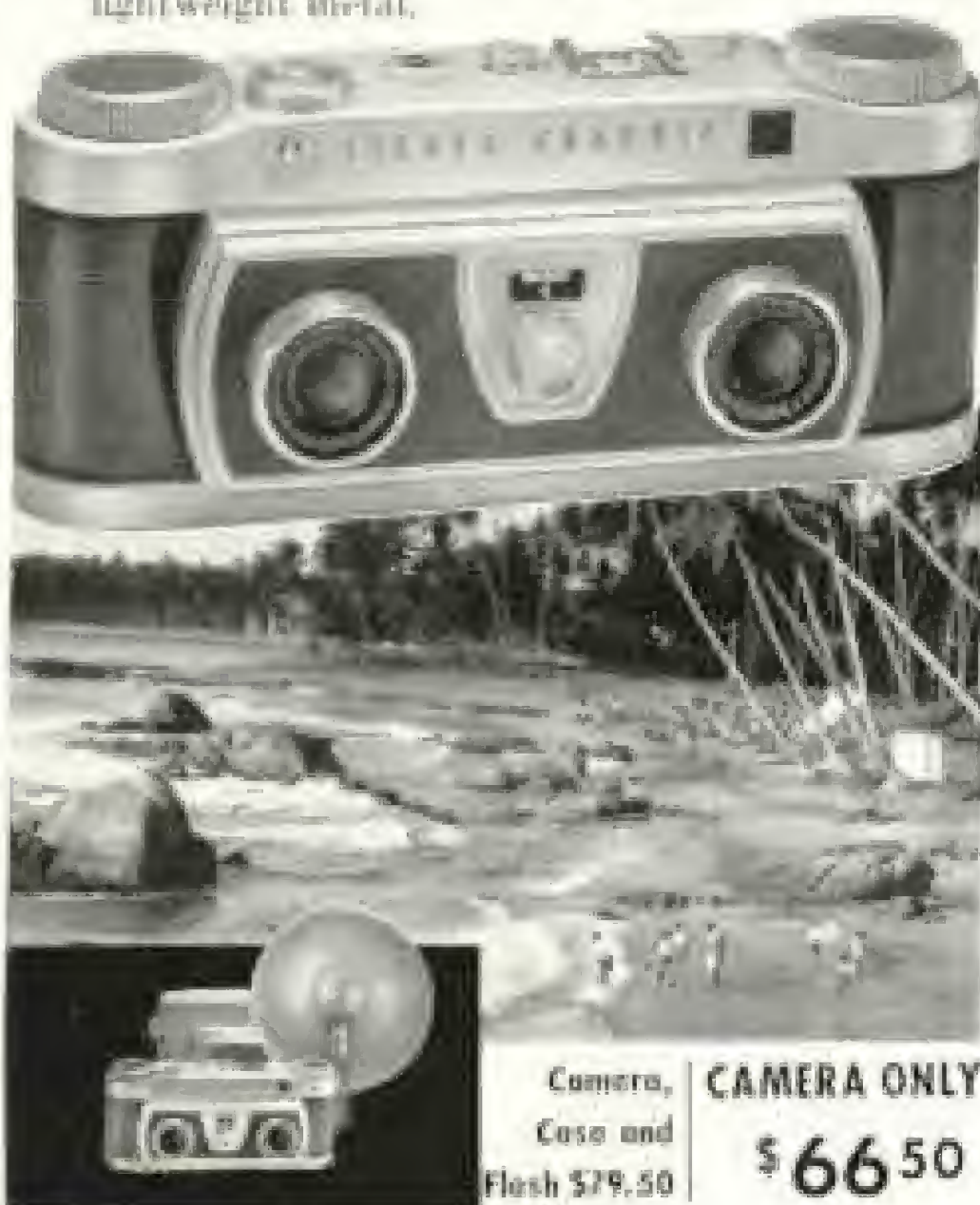
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Do you really know how old you are?

BEFORE you answer this question, read this story about a boy, his mother and an elderly lady.

"How old is your son?" the elderly lady asked.

"Physically, he's 10. Emotionally, about 7. Intellectually, around 15. Counting birthdays, he will be 9 next Sunday," the mother exclaimed.

Like the little boy who was 10, 7, 15 and 9 years-old, no one has a *single* age, regardless of birthdays.

This is because aging occurs in different people at different rates in different parts of the body. So, despite the calendar, in some ways you may always be "young" . . . while in other ways, you may be "older" than your years.

Everyone wants to stay as "young" as possible throughout life. Fortunately, there are ways to help retain certain youthful assets, even into the "sunset years."

Foremost among your early preparations for living long and happily are annual health examinations. Through them, your doctor can watch for clues to mental and physical impairments which, though minor today, could grow worse as time passes. Correction of any defect, at its very beginning, is the best way to help keep that defect from interfering with your future.

A younger person's health program should also include observance of good health habits. It is both possible and wise . . . to get enough sleep and rest, to eat properly, to exercise sensibly . . . and still not miss any fun during the prime of life.

After age 40, two things become very important: (1) Guarding against degenerative diseases, such as heart and blood vessel disorders, diabetes and arthritis; and (2) preparing for your retirement years.

Health examinations may, sometimes, be desirable at least *twice* a year after mid-life to help prevent, postpone or control degenerative ailments. Greater care, too, should be given to nutrition. A good, *varied* diet may help delay certain aging processes.

Naturally your living habits change as you grow older. So, to keep mentally happy, include a hobby in your plans for the leisure years.

If you are growing older (*and aren't we all!*), you might like to know some of the things many doctors recommend for those who are now 65 and older. This information is in Metropolitan's booklet called *Your Future and You*. Mail the coupon below for your free copy.

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A National Geographic Cartographer Goes Whaling off Newfoundland, Tastes a Cape Horn Gale, and Visits African Diamond Mines

BY NEWMAN BUMSTEAD

725

National Geographic Magazine Staff

With Illustrations by National Geographic Photographer Volkmar Wentzel

FISHING smacks rocked silently as we waited in the star-specked Newfoundland night. Above us tier upon crooked tier of houses rose on a slope too steep for footing save on its narrow, shelflike streets. The smell of the sea was strong.

Less than three hours had passed since midnight, but lights were blinking on as fishermen stirred from warm beds, pulled rubber boots over woolen socks, and set their kettles boiling for tea.

Soon shadowy shapes, punctuated here and there by the glow of a cigarette, slipped by us in the street and down through the night to the waterfront. One of them stopped. It was Ray Riche, in whose boat we were to visit codfish traps off St. John's. He peered at us closely, and spoke not of fish but of tea.

"Ye had no drop this morning, did ye?"

Minutes later, in Ray's kitchen, we were downing big cups of strong tea and piles of buttered toast. We would not put to sea on empty stomachs.

50,000-mile Trip Girdles Atlantic

Thus staff photographer Volkmar Wentzel and I began a series of adventures with the Atlantic and the hardy souls who live along its shores, fight its angry moods, and fish its depths. Our journey was a 50,000-mile-long "string" girdling both North and South Atlantic Oceans. Its purpose, in the words of

National Geographic Society President John Oliver La Gorce, was "to tie The Society's new 10-color supplement map of the Atlantic to the scene itself."

Twenty years as a cartographer do something to a man.* Months of work on the Atlantic map had filled me with a desire to look at the other side of the drawing board, to see the water, the soil, the people, the capes, and the coastal reaches of this ocean that stretches nearly halfway around the world.

Crew Earns \$247.50 Before 8 a.m.

Now, fortified with Ray Riche's tea and toast, we chugged into the open Atlantic.

A few miles north of St. John's fishermen strained at a net from the sides of their listing boats. For half an hour we watched the grim effort. An incoming tide swept under them, pushing the net and its tons of fish against a barnacled hull. Rising and falling with each long swell, men, boats, and taut net were one. Inch by inch, tugging hands won out.

The men shoveled their catch into the 30-foot vessels with dip nets until they stood hip-deep in slithering, slimy codfish. Freeboard was reduced to inches (page 726).

Back in St. John's we saw Job Brothers &

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Around the World in Eighty Days," December, 1951; and "A Map Maker Looks at the United States," June, 1951, both by Newman Bumstead.



726

Dawn off Newfoundland: the Cod Harvest Begins

♣ Here the author, starting his odyssey around the Atlantic, found fishing scenes as timeless as the sea itself.

These men arose in St. John's between 2 and 3 a.m. Now, at dawning, they draw a cod-laden trap net from 14 fathoms. It holds $3\frac{1}{2}$ tons of fish—nearly two full boat-loads—for which they will receive $2\frac{1}{4}$ cents a pound, or \$247.50.

Pouch Cove Buildings → Perch on Stilts

Fishing is the lifeblood of this gale-swept village 15 miles north of St. John's. Its processing sheds sit above jagged rocks on poles that are stouter than their teetering look indicates.

Here a winch hauls a bucket of cod from boat to platform for cleaning and salting.

Boys among the watching children will someday join their fathers and older brothers at sea.





↑ Fishermen Haul In a Silver Bonanza

Today, as for years past, fishing employs more Newfoundlanders than any other industry. The 1954 catch, totaling 614,755,000 pounds, totaling \$15,000,000 to the Province's income.

The Newfoundland Fisheries Board assigns sites for trap nets, which must be spaced at least 50 fathoms apart. Most of the 30-foot boats carry a crew of three or four men, who work on shares. When the cod are running well in June and July, nets are emptied twice a day.

This boat hoists a trap net with the help of a companion vessel just out of picture at right. Sluggish and half dead, the cod turn up silvery bellies. Lessening pressure as they rise from the depths causes air sacs to expand, crippling the fish.

Soon the boat was loaded to the gunwales, burying the men hip-deep in gasping cod, and still enough remained for half a load on the other vessel.



Co., Ltd., pay 2½ cents a pound for this 11,000-pound catch. The seven-man crew had earned \$247.50 before 8 a.m.—time to eat again.

Our host for this second breakfast was 240-pound Ken McGrath, onetime Job Brothers office boy and now production manager of the 175-year-old firm. Ken's duties include flying trips to Lisbon to "tie up the sale of bait to the Portuguese cod fleet" and the shipping of millions of pounds of frozen cod and haddock to the United States, where they are converted into fried fish sticks.

And what did Ken serve for breakfast? Fish sticks! At the first tasty bite I understood why U. S. sales have risen to 60,000,000 pounds a year since their introduction in 1953.

Whale Plays Tag with *Arctic Skipper*

While working on The Society's new chart of the Atlantic (page 807), my thoughts often turned to whales and whaling. But I didn't expect the subject to pop up in conversation with a St. John's salesgirl. As she waited on me, I mentioned my codfishing experience.

"I go whaling week ends," said Jennie Reid, as if she were talking of trout fishing.

This was enough to send me off to Dildo, Jennie's home town on Trinity Bay, where I set out with Capt. Iver Iversen in his 30-foot whaler, the *Arctic Skipper*. For the 10 days before I boarded his ship, Captain Iversen had averaged a whale a day. Whether it was the usual bad luck that attends me whenever I wet a line or camera shyness on the part of our quarry, I'll never know. But for three days we plowed the waters of Newfoundland's east coast and caught nary a whale.

The fourth day was different. We were it in an 8-hour game of hide-and-seek with an 80-foot blue whale.

The game went thus: The whale surfaced and breathed from three to seven times with blasts like the exhaust from a diesel truck. Then he arched his broad back and plunged to the depths of Trinity Bay for 10 or 15 minutes.

Meanwhile, we on the *Arctic Skipper* scurried to a likely spot for tagging our massive quarry with a harpoon when he reappeared. He surfaced near and he surfaced far. He surfaced three times just a tantalizing few yards beyond the gun's 100-foot range. But at day's end our elusive playmate had not been tagged. What might have been a whale of a tale became just another big one that got away.

Iceland's Glacier-fed Gullfoss → Races Madly Down a Giant Staircase

Page 729: Each region of Iceland has its famous waterfall, for the island abounds in rushing rivers.

Gullfoss, or Golden Fall, 60 miles east of Reykjavik, is one of the most beautiful and oft-visited. It takes its name from the play of sunlight on mists rising from the foaming waters.

Here the Hvítá (White River), draining a glacial lake, plunges 150 feet in thundering cataracts.

Next day a 30-foot minke whale, less skilled at aquatic tag than the big blue, surfaced off our port bow. BANG! went the harpoon into his glossy back; eight tons of whale struggled at the end of a taut, three-inch Manila line (page 730). For 10 minutes Captain Iversen and his crew played him, and for 10 minutes the whale fought the harpoon like a bass trying to shake a hook. But a few hours later flensers in Dildo boiled his blubber into six barrels of oil and froze the best of his 6,000 pounds of meat for sale as whale steak. The scraps would be sold to fur farmers in Canada and the United States.*

Leaving codfish and whales behind, Wentzel and I went to Gander, where a Pan American Clipper zoomed us into the Newfoundland night. Below, countless lakes—puddles of quicksilver strewn on a bolt of black velvet—caught the moonlight and threw it back at us. Eight hours later the big plane set us down at Keflavik, and we were off to see Iceland, the North Atlantic's not-so-icy land of Vikings and volcanoes.†

Iceland, which touches the Arctic Circle, is some 1,700 miles nearer the North Pole than New York City (see Atlantic map supplement). But, thanks to the Gulf Stream system's warmth, the average January tem-

* See "Whales, Giants of the Sea," by Remington Kellogg, NATIONAL GEOGRAPHIC MAGAZINE, January, 1940.

† See "Iceland Tapestry," by Deana Clark, NATIONAL GEOGRAPHIC MAGAZINE, November, 1951.

Scaly Mud Lines a Boiling Pot → Heated by Subterranean Fires

Molten volcanic rock slumbers beneath Iceland's crust in many areas.

This old lava field 40 miles southeast of Akureyri bears the poetic name Óðáðhahraun, or Lava of Evil Deeds. Small openings to the underworld pit its surface. When water seeps down upon banked fires, the holes spew steam (background). Other vents, like this small one, bubble endlessly, disproving the old adage that a scratched pot never boils.

"Danger!" says the sign. "Be careful, hot springs."

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perature in Reykjavik, Iceland's capital, is only one degree lower than New York's. If Rockefeller Plaza were moved to Reykjavik, its skating rink would still require artificial freezing!

But it was July, and the young girls in the park opposite my hotel did not skate, nor did they play. They swept the flower-bordered walks. They cut grass. They groomed the flower beds until every plant looked fit for a horticultural show (page 732).

Workaday Reykjavik paid scant attention to the cheerful industry of these vacationing students. But I, an American parent, looked on in rapt amazement and admiration.

North of Reykjavik in Reykholt's Dalur, one of Iceland's green valleys, I saw other girls wielding hay rakes with the same happy zest. These were Thorsteinn Jónsson's daughters: Gerdur, Elsa, Ragnhildur, and Asdis.

Up for Air Comes an 8-ton Bull Whale; Harpoon and Line Fly Out to Meet Him

Norwegian-born Capt. Iver Iversen manages this operation in Trinity Bay, Newfoundland. Author and photographer spent a week aboard his 50-foot *Arctic Skipper*, frequently dining on choice cuts of whale "beef" (page 728).

✦ First Mate Bill Sheppard fires the 50-mm. gun. A split second later the barbed 45-pound projectile hit into the target, a 30-foot minke whale.

✦ The stricken animal sounds; line streaks from its coil in the ship's hold. Ten minutes later crewmen dragged the carcass alongside. Towed ashore, it produced \$400 in steaks, \$55 in scraps for fur farms, and \$70 in oil for oleomargarine makers.

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On this farm Thorsteinn Jónsson was born, and before him his father, and his father's father. For a thousand years, he told me, this land has supported farmers, and, until Thorsteinn, all of them lived in sod huts. But Thorsteinn and his family served us dinner in a new two-story concrete house. Hospitable? Rather! We had stopped only to ask our way (page 733).

Thorsteinn's daughters talked to us in their classroom English and asked us to sign their autograph books under the dates of our birth-

days. There was much laughter from a five-year-old cousin at my futile attempts to pronounce *kattar*, Icelandic for cat. And surely it must always be funny to a child when a grown man can't say cat!

From a radio came Icelandic and American music. I thought I recognized Perry Como. But no, one of the girls corrected me: it was Dean Martin singing "That's Amore."

The friendly word for goodbye in Icelandic is *blesa*. With this sweet parting in our ears and a fine meal in our stomachs, Wentzel and



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↑ Young Vikings Vie for Garden Prizes

Grade-school students of Reykjavik, Iceland's capital, stake out plots each summer in a municipal garden and raise flowers or vegetables. They pay 125 kronur (\$7.70) for seeds, tools, tuition, and ground rental, but may recoup their investments with produce for the home tables. In September officials judge the plots and distribute prizes, often books.

← Gardeners preface their work by raising the Icelandic flag.

→ Page 733. Author (lower right) and photographer paused at this farm home north of Reykjavik to ask directions. With typical hospitality, farmer Thorsteinn Jónsson and his family invited the strangers to lunch. The menu: meatballs, vegetables, and *sýr*, a national dish similar to yogurt.

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Photographer Yelmer Westert





Iceland's First Family Receives the Wandering Author Like a Next-door Neighbor

The island republic's sagas and Eddas, dating from the 9th to 10th centuries, occupy a place of honor in the Presidential home near Reykjavik. So little has the language changed that Icelanders say, "If you can read your daily paper, you can enjoy these works." *Younger and Elder Edda* deal with history, mythology, and poetry. President Asgeir Asgeirsson met President Eisenhower last July when the American Chief Executive paused in Iceland during his flight to the Summit Conference at Geneva.

I drove off down the road thinking the best of good thoughts about our new friends the Jónssons.

One afternoon we drove a few miles south of Reykjavik to Bessastadir. Here by the sea live President Asgeir Asgeirsson and the First Lady of Iceland.

We approached their home just as we had approached the homes of many another Icelandic family. Neither gate nor guard stopped us. Presently a young man stepped out of the house; he was the President's son.

"Won't you come in?" he asked. "Mother and Father are expecting you."

For the next hour we visited and chatted like next-door neighbors. The President told us of the sagas, cultural treasures of Iceland's thousand-year history. Generations ago, when Denmark ruled the little island, many of the

original saga manuscripts were taken to Copenhagen. Now a popular movement seeks their return to Reykjavik.

We compared Bessastadir with the White House in Washington, D. C. "Ours is a white house, too, and it was finished in 1766, years before yours was even planned," joked the President. "And we tried to settle your country long before you, but didn't succeed." He referred to Leif Ericsson's much debated "Vinland" expedition, nearly five centuries before Columbus set sail for the New World.

We talked about children and grandchildren, of which the Asgeirssons have three and eleven. And we talked fishing. Yes, though Iceland's President plays no golf, he does like his fishing!

Next day we said a reluctant "bless" to our friends in Reykjavik and took off for Norway



This Mass of Junk Was the \$100,000,000 *Tirpitz*, Pride of Hitler's Battle Fleet

Lurking in Norwegian waters, the 45,000-ton ship tied up the British Home Fleet for three years. In November, 1944, English bombers dipped into a fjord near Tromsø and sank her (page 740). *Tirpitz* has given up tons of steel. Her guns, removed and greased, lie on the fjord's bottom awaiting possible use. Hundreds of electric motors have come out of the holds undamaged. One salvaged diesel generates power for the village of Honningsvåg.



← Ireland's Serpentine Cliffs of Moher Rise Nearly 700 Feet Above the Atlantic

Page 736: Generations of visitors have acclaimed the frowning barrier as one of the most magnificent seascapes in Ireland. The cliffs extend five miles along the coast of County Clare.

Eons ago the formation was part of the sea bed. Now its layers of sandstone and shale lie exposed to gnawing gale, wave, and rain. So strong is the west wind that it peels back soil and turf along the rim.

Despite dangerous footing and dizzying heights, men of Clare have quarried rock from Moher's brow for centuries, carting it away to serve as roofing and building stone.

in a modern Viking ship, an Icelandic Airlines DC-4. Our way backtracked the route of Iceland's first permanent settlers, noblemen who fled their homeland when Harald I became king of Norway.

Harald began his campaign to conquer with a pledge: Never would his beard be clipped or his hair trimmed until he had made all Norway his. Wars raged. Years passed. At last, in 872, Harald the Shaggy bested the independent overlords of southwestern Norway. After a shave and haircut he changed his name to Harald the Fairhaired!*

We landed in Norway at Stavanger's Sola Airport, at the head of Hafstrfjord, on whose waters Harald won his tonsorial victory. Our bus to Stavanger skirted the fjord's waters, dark and peaceful beside the lush green countryside. But my mind's eye saw Hafstrfjord churned by Viking ships, with helmeted warriors clanging sword against shield in one of Norway's decisive battles.

To make the most of a single night in Stavanger, I walked cobbled streets until the wee hours. Tiny shops, huddled in the stillness, looked as if they had been laughing and talking until the instant I appeared. They were like children in bed who, hearing their mother's footsteps on the stairs, stop playing

← Norway's Foggy North Cape Was Long Believed Europe's Northernmost Land

Old-time geographers regarded the cape, which lies 119 miles inside the Arctic Circle, as the continental point nearest the pole. By 1831 they knew that Knivskjer Odden, a tongue of land near by, extended one mile farther.

North Cape has lost none of its popularity with vacationers, who climb an easy trail to the 1,000-foot summit. At present the cape is accessible only by boat, though a road is being built.

Norway's flag flies from the cruise ship *Nordlys*, from which the author and others went ashore.

and close their eyes tightly—too tightly to fool anyone—and pretend to slumber.

Next morning, in a boat named *Sand*, we sailed from Stavanger to a town named Sand at the head of Bokna Fjord. The passengers, relaxed in deck chairs, aptly demonstrated the theorem that he who reads in toasting sunshine soon falls asleep.

As we drove from Sand through the mountains to Hardanger Fjord, we saw near-perpendicular fields where farmers cut hay at dizzying heights. These farms—mosaics of forests, rocky cliffs, and velvety grass—lack nothing of pastoral loveliness. But the difficulty of wresting a living from land like this goes far in explaining why Norway's history is tied to the sea.

Soft rain greeted us like a gracious host as we drove into Bergen.

"Does it always rain here?" a visitor once asked.

"I don't know," came the answer. "I'm only 18 years old."

Bergensers Dress for Rain

Bergensers of all ages know how to dress for the rain; they do it in colors that suggest a flower garden. Children, waterproofed from head to foot, play in the rain. Mothers wheel "convertible" perambulators equipped with windshields and side curtains. Smartly dressed shopgirls look even smarter in the soft light that filters through translucent umbrellas. I liked Bergen's rain!

Poking about in the lofts of Bergen's Hanseatic waterfront, I found Einar Faannessen putting the finishing stitches in a mizzen sail. He looked up over thick glasses and asked, "What brings you to Norway?"

I told him of my assignment, which stretched around the entire Atlantic from Dublin to Dakar and from North Cape to Cape Horn.

Einar rubbed his bald head and his eyes sparkled.

"I sailed round the Horn in a windjammer in 1910, and in winter, too!" he proclaimed. "We were 139 days from Antwerp to Callao, Peru, and a good many days I wished I'd stayed home. One time around the Horn in winter makes a real seaman of you!"

As a sailmaker, Faannessen roamed the world for almost half a century. When sail

* See "Stop-and-Go Sail Around South Norway," by Rear Adm. Edmund J. Moran, USNR, NATIONAL GEOGRAPHIC MAGAZINE, August, 1954.



Hammerfest Clings to Norway's Bleak Rooftop, 280 Miles Beyond the Arctic Circle

This fishing community of 3,000 is often called Europe's northernmost city. Only a few Norwegian villages lie closer to the pole. Snow fences on the bare hillside guard against winter's avalanches.



Levelled in World War II, the Town Rose from Its Ashes Along the Crescent Harbor

Retreating Germans destroyed all but a chapel. The hardy Norse returned and lived in barracks while rebuilding. Now Hammerfest boasts 700 new dwellings and an increase of 1,500 over its prewar population.

declined, he applied his skills to splicing steel cables in Oregon lumber camps.

Now it's tents and awnings in his native Bergen that he sews. But occasionally Faannessen gets a sail to mend and an attentive ear, like mine, for his tales of the sea.

A waterway threads the islands of Norway's west coast; we skimmed its surface at 500 feet in a West Norway Airlines seaplane. Banking along its twisting course from Bergen to Trondheim reminded me of driving on a superhighway. Fishing villages and cottage-spotted islands approached us slowly, gained speed, then zipped beneath us and were gone.

Tirpitz Wrecked in Norway Fjord

Just before our pontoons splashed to a stop in Trondheims Fjord, we circled the steeple of Nidaros Cathedral, where Norse kings are crowned. And just after—not that anyone told us to in as many words—Wentzel and I went straight to Hell, a pleasant little community of 275 souls on the road to Vaernes Airport. At Vaernes we enplaned again, this time for arctic Norway.

In a fjord near Tromsø sprawled the carcass of the *Tirpitz*, once proud superbattleship of Hitler's navy. She lay bottom up, with armor plate torn open and the talons of a giant crane tugging at her greasy guts. It was here in November, 1944, that British Lancasters caught the monster craft in clear weather without her smoke screen. They pummeled her to death and rolled her over with six-ton blockbusters (page 735).

"I spent a year in the *Tirpitz*," said German salvage worker Walter Kuehtze. "My shipmate was Heinie Troeder. At the end of schooling I was assigned to another ship, but Heinie stayed on the *Tirpitz* and went down with her.

"We found his body in the wreckage and buried it on the hill over there. I took a picture of his grave and sent it to his mother."

Beyond Tromsø's cemetery, in a field apart, I trod between rows of weathered wooden crosses. Beneath them lay a few score of the 1,000 *Tirpitz* crewmen, many still in their teens, who drowned and suffocated in the capsized warship. There among them I found the grave of the salvage worker's shipmate and its wooden cross labeled in faded letters: "Heinie Troeder."

Our route from Tromsø to Hammerfest took us along more of Norway's inland waterway. This time, instead of skimming its surface in

a plane, we plowed its waters in a North Cape cruise ship. At midnight we were still enjoying broad daylight, for this was July in the Land of the Midnight Sun.

Although Hammerfest is 280 miles above the Arctic Circle, I hadn't been there long when I shed my jacket. Minutes later some of Hammerfest's 7- and 8-year-old citizens dashed by in bathing suits.

Here again I was seeing the other side of the drawing board. Red arrows on our Atlantic map depict the flow of warm water to Norway from the Torrid and Temperate Zones via the Gulf Stream, the North Atlantic Current, and the Norway Current.

Suppose this ocean-borne warmth were to be produced by burning coal. The world's entire production since the dawn of history would be required to equal just two years of the ocean's heating effect on Norway alone.

During their scorched-earth retreat before the Russians in 1944, the Germans evacuated Hammerfest's 3,500 citizens and then destroyed the city. Only one small building—a chapel—was left standing. Deep penetrating mines shattered underground pipes and sewers. But war ceased and the Russians never reached the city.

New Homes Spring from War's Ruins

Councilman Erling Jensen, one of the first to come back to Hammerfest, spoke of the desolation. "But for the mountains we would never have recognized the place."

"How did you feel?" I asked.

"We were just tired, not angry. There was a war and we were soldiers about it."

His face glowed as he described the comradeship and backbreaking work of the months that followed. "It was like the Klondike, but we didn't find gold," he laughed.

Nor did I find gold in Hammerfest. But I did find a rich lode of golden dreams come true: 700 new homes, well-planned streets and harbor facilities, fish-freezing and packing plants, shops full of goods for fishermen and farmers, and an eager, swelling population that has already passed the prewar mark (page 738).*

Beyond Hammerfest our ship hove to while we climbed 1,000 feet to the summit of North Cape (page 736). Then followed a night of

(Continued on page 749)

* See "Norway Cracks Her Mountain Shell," by Sydney Clark, NATIONAL GEOGRAPHIC MAGAZINE, August, 1948.

**New Shoes Attract →
Lapp Window Shoppers
Visiting Hammerfest**

Scandinavia is the homeland of about 10,000 Lapps; Norway claims nearly two-thirds of them.

Reindeer herders and fishermen, the Lapps cling to most of their ancient ways. Some, however, abandon their colorful native costume for modern garb.

This young couple, whom the photographer met on the street, were content with mere window shopping. Their homemade embroidered clothing includes moccasinlike *kovrage* of reindeer skin, sewed with sinew and ending in pointed, clin toes.

The man wears a four-pointed headgear called "hat of the four winds." Though only a few inches above five feet, he is taller than many Lapps.

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**← A Norwegian Farmer
Tells of His Trips
into Russia**

Much to his chagrin, Thorolv Storskog is the central figure in numerous minor border crises.

Storskog's farm near Kirkenes adjoins the Iron Curtain. His sheep sometimes decide that Red grass is greener and defect to Russia. Then the farmer reports to Norwegian border guards, who signal the Russians for a conference.

So far Storskog has always received permission to round up his strays.

Here the farmer relaxes with the author. His daughter cooks preserves.

Kodachrome by National Geographic
Photographer Volkmar Wenzel

Geese March Like Obedient Soldiers: → an Irish Farm Lass Drills Her Squad

The author thought the stone-walled fields of his native New England an open plain by comparison to rural Ireland. Limestone gleaned from fields rims plots and pastures near Carraroe on Galway Bay.

Page 743, lower: The author, warming his back at a peat fire, chats with Carraroe folk at the Atlantic View Hotel. Proprietor Barry Lydon (facing camera) recalls his 15 years as a streetcar motorman in Pittsburgh, Pennsylvania. Tea brews in kettles. Rug depicts a Galway hooker (below).

✦ Old-time Hookers Load Peat for Aran

There is little soil and no peat on the three rocky isles comprising Aran. Communities import their fuel across 10 miles of water from the mainland near Galway. These fat-bellied craft ply the route; known as hookers, they take their name from the old Dutch *hooker*, originally a two-masted fishing or coastal vessel. The author sailed to the Aran Islands aboard the century-old *Fancy* (extreme left). Piles of dried peat await loading.

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Kathrynne St. National Geographic Photographers Yolimar Westcott

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✦ A Gaunt Lighthouse Keeps Lonely Vigil

Massive steel cables anchor this nine-story pile to the sea floor off the Ile d'Ouessant. Sometimes, after a severe storm, attendants must tighten the cables with huge jackscrews housed on the first-floor level. The oil-burning light of 22,000 candlepower is visible 10 miles. These departing visitors ride Ouessant's lifeboat (opposite).



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✦ "Who Sights Ouessant Sights Blood"

Thus a mariner's proverb describes the small French island of Ouessant (background), a ships' graveyard off Brittany.

Saw-tooth rocks and reefs surround the île; in storm and fog they have taken fearful toll. Nearly 140 lives were lost when the British ship *Draughton Castle* sank in 1896. Ile d'Ouessant boatmen rescued one of three survivors. Men of neighboring Molene saved the others. Island folk sacrificed cherished Sunday clothes to shroud bodies washed ashore.

Page 744: Volunteers man a Ouessant lifeboat. Her captain, Francois Murin, helped save 61 persons from 21 disabled ships; France gave him 15 decorations. Last summer, while he fished alone at sea, the captain's own boat was wrecked. His body was never recovered.

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 Illustrations by National Geographic
 Photographer Volkmar Weiland



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✦ Portugal's *Sagres* Sails Past the Tower of Belem

This steel-hulled vessel serves the Portuguese Navy as a training ship. German-built, she was launched at Bremerhaven in 1896. Portugal acquired the ship after World War I and re-rigged her as a bark, installing auxiliary motors. Here *Sagres* glides up the Tejo River toward Lisbon.

Finished in 1531, the Tower of Belem marks the spot where Vasco da Gama set sail for India in 1497. Cross of Christ, emblem of a medieval military order, decorates the tower's battlements; it also appears on sails of the *Sagres*.

✦ A Lisbon fisherman unloads his night's sardine catch.

✦ Page 747: Fishmongers, wearing trays like hats, hawk scab-bard fish from door to door in Lisbon.

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Institution of National Geographic Photographs Volkmur Wornel







mountainous arctic seas to Kirkenes, at the Russian border. Though this took us an inch beyond the confines of The Society's new Atlantic map, we were careful that it took us not even half an inch beyond farmer Thoraly Storskog's back pastures, which lie smack against the U.S.S.R.

Storskog's sheep are less careful, and Red grass tastes as sweet as Norwegian. As a result, the flock often defects to Russia, causing minor international crises. To get the sheep back, Storskog must take his woes to a Norwegian border official. A flag is raised, which tells a vigilant Russian sentry that a conference is desired. If the Russians are agreeable, they reverse the process and permission is negotiated for Storskog to visit the Union of Soviet Socialist Republics just long enough to retrieve his wayward flock—but no longer!

From Kirkenes Wentzel and I retraced our way south along Norway's narrow length. We hopped across the North Sea to London, and over the Irish Sea to Dublin. Here, in Trinity College, I saw a harp thought to be 500 years old.

"There's no older harp in all Ireland," beamed an attendant.

Here before me, I thought, is the instrument which, with the shamrock and clay pipe, symbolizes a people known the world over for their big hearts, their quick tempers, and their firm belief that Ireland is the greenest and loveliest spot on earth. And my mother was one of them.

Driving south to Cobh, we found Eire green and lovely. We found it honeycombed with stone walls, too (page 742). My native New England, I thought, is an open plain by comparison.*

In Cobh's harbor stood two transatlantic ships. One, the United States Lines' 33,532-ton *America*, had crossed from New York in six days with a crew of 674 and 975 passengers. The other was the seven-ton sloop *Atea*,

42 days out of New York, with no passengers and a crew of one.

Our host in Cobh was young, jovial Sean O'Brien, the United States Lines' manager for Ireland. As soon as Sean had his big charge safely on its way to Southampton, he took us out to the 33-foot *Atea*.

Her skipper, Sven Joffs, looked up from the sail he was mending. "She's a bit shabby right now," he said, apologizing for a craft that looked clean as a pin to me.

On hand in Cobh, too, was Sven's father, who years ago in Finland taught him to sail and to love the sea. They had not seen each other for 14 years.

Atlantic Crossing Took 42 days

I asked *Atea's* skipper if his father had worried about him during the solo crossing. "No," Sven replied, "I wrote Dad it would take 45 days, and I made it in 42, so he didn't have time to start worrying."

Sven showed us how he rigged the life line which he always wore while on deck. To fall overboard and see your boat sail away over the horizon is the fear of all lone sailors.

"I had pretty fair weather. Some bad blows, but they're to be expected. I never did get a chance to read all the books I brought along. The only ones I looked at were Bowditch's *American Practical Navigator* and Dutton's *Navigation and Nautical Astronomy*. I'm not too good a navigator, and I had to do a lot of studying to make my landfall as well as I did. At that, I missed it by 60 miles."

A few days later father and son set sail together, homeward bound for Finland.

Back in Cobh Sean insisted, "Ye must kiss the Blarney stone." Just to be sure, he drove us himself to Blarney, although we had our own car.

On the outskirts of Cork Sean pointed out the Munster Bottling Company. "That's Jim Farley's plant," he said.

"Not the American Jim Farley?" I asked.

"Yes, but we call him the Irish Jim Farley. He's a very, very popular man here, never passing an opportunity to help Ireland. He's chairman of Coca-Cola's export section."

Looking from the top of Blarney Castle, I was glad it's no longer the custom to hang head downward on the outside, with nothing but thin air between you and the Irish land-

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← Sugar Loaf Looks Out to Sea from Rio de Janeiro's Dark-blue Bay

One of the first television towers in South America crowns Sugar Loaf's crest, 1,296 feet above the sea. Visitors have ridden cable cars to the peak for more than 40 years.

Fashionable homes rim sparsely wooded Urea Mountain, between Sugar Loaf and Botafogo Bay. Pleasure craft flock harbor and sheltered yacht basins.

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Illustration by Charles Allmon, National Geographic Staff

* See "I Walked Some Irish Miles," by Dorothea Sheats, NATIONAL GEOGRAPHIC MAGAZINE, May, 1951.



scape 100 feet below. Too high a price, it seemed to me, even for "the gift of eloquence, the gift of gab, and the witches' charm," to quote Matt O'Shea, who has spent many a year at his post on Blarney Castle.

My turn came and, with Matt's help, I leaned over backward to kiss the lipstick-tinted masonry. Then I stood back to admire Matt's finesse as he took woman after woman in his arms and held her over backward while she put her lips to the magic slab.

"And sure, I've had more women in my arms than any man on earth!" he boasted.

Fiddle Evokes Gaiety and Laughter

From Cork we drove west to Bantry and then north through Killarney, Tralee, and Limerick, then around Galway Bay to a smattering of cottages and quays that make up the village of Carraroe. Here, in the tiny Atlantic View Hotel, we were foreigners among Irish guests who spoke more Gaelic than English. One told us, through an interpreter, and with a twinkling eye, that he couldn't hear English.

The dozen or fifteen guests sat around the table like a big Irish family. Pretty colleens named Sarah, Bridget, and Mary scurried about, bringing food from the kitchen and piping-hot tea from a kettle that simmered over glowing peat in the fireplace (page 743).

The meal done, I spied a fiddle tucked away between the ceiling beams. The colleen who owned it shyly refused to display her talents, but the chap who couldn't hear English tuned it and began to play.

Then followed an hour of spontaneity and laughter in the hotel's sunny dooryard. To the fiddle's lilting strains, Sarah and Bridget whirled dizzily through parts of the "Siege of Ennis" and other Irish dances. Hotel guests clapped hands to keep time for the dancers and sang songs of Ireland.

That evening we warmed our feet by the fire and chatted with the proprietor of the Atlantic View, gray-haired Bartly Lydon. Before the turn of the century he had emigrated to the United States, to work for 15 years as a motorman on a Pittsburgh trolley line. "I went out Fifth Avenue to Forbes,"



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he recalled between furious puffs on the pipe he was trying to light, "turned into Wilkinsburg and came back to the city."

Lydon threw his charred match into the fire. "So you want a hooker to sail you into the islands, do you? I'll find you one. Yep," he smiled, "as long as you're Yanks I will."

Hookers are stubby, heavily beamed little sailing ships that vary in length from 25 to 50 feet. A fleet of perhaps a dozen carries peat to the Aran Islands, 10 miles out in the Atlantic off Carraroe (page 742).

Century-old Craft Showed Her Age

In the vernacular, we would sail "into," not "out to," Aran. True to his word, Bartly made arrangements with Patrick O'Malley, master of the good ship *Fancy*, to take us. The captain wore a comfortably contoured suit of blanket-thick homespun tweed, reinforced with patches at knees and elbows. Heavy brogues, pipe, battered sou'easter hat, and a stoic, stubbled countenance made him look as if he had stepped out of Emile Renouf's painting, "The Helping Hand."

Texas Tower Moves into the Atlantic with Its Legs in the Air

First in a chain of radar stations to rise in the Atlantic between Virginia and Newfoundland, this 6,000-ton adaptation of a Texas offshore oil-drilling rig was towed 150 miles from a Boston shipyard to Georges Bank. There, on the brink of the Continental Shelf, it lowered its caissons to a solid footing 95 feet below the surface. Then the platform shimmied up the legs by means of powerful air jacks.

Today the man-made island stands rock-solid 87 feet in the air, safe from the highest seas. Convinced of its safety, part of its construction crew of 100 refused to flee 1955's hurricane Connie, despite its threatening approach.

Tied into the continent's civil-defense warning system, the tower will unceasingly probe the sky for bombers bent on sneak attack. The radar island's inhabitants will enjoy movies and may also have a fair-weather tennis court and an abbreviated golf course. Helicopters will land supplies and remove ill men in stormy weather.

E. C. Nave, Official

We could have gone to Aran in the comfort of the *SS Dun Angus*, as most people do. But the *Fancy* seemed a more suitable vessel in which to visit men who struggle with the elements for life on these wild Atlantic isles.

Captain O'Malley's *Fancy* was fancy in name only. Her bulbous hull was blackened by tar without and by peat within. Her canvas, a mainsail and jib, was potato-sack brown. In the center of her tiny cabin a peat fire smoldered on a slab of concrete. O'Malley put the craft's age at 100 years, and she looked every day of it. But when the wind billowed her sails she was young again and sprightly.

With a favorable wind the 10 miles between the mainland and Aran take less than two hours for the *Fancy*. This day, bucking head winds, she took five and a half and probably traveled 20 miles in the process.

When Captain O'Malley put us ashore on Inishmore, it was raining and the wind was blowing a gale. But there was no time to lose; we had chartered the *Fancy* for only 24 hours. The driver of a dump cart showed us a path to the inn and then clucked his horse in another direction with our bags toppling his load of sand.

We walked to the inn and were beginning to wonder where our baggage was when a jaunting cart pulled up. Holding the reins was the dump-cart driver—with a change of clothing. And between the shafts stood the same horse—with a change of harness. But, thank heaven, the same luggage. Thus smiling Bernard Kilmartin became our guide.

With Wentzel on one side and me on the other, we drove off to see Aran in wind and rain—the way its inhabitants see it some 200 days out of the year.

Rock, rock, and more rock is Aran. The biggest pile is Dun Aengus, a prehistoric fortification that looks out toward America over a 300-foot vertical cliff. Smaller piles are tumbled cottages, left as windbreaks, said Bernard, beside newer stone houses. Then there is the tidy ribbing of stone walls and even stone gates. To drive cattle from one field to another, one simply knocks down the gate's piled stones and then closes it by building them up again. "It only takes 15 or 20 minutes," Bernard explained.

Much of the soil within these walled enclosures has been put there by frugal islanders. Pat Mullen, author of *Man of Aran*, summed it all up the next morning as he boiled us a pot of tea. "You level off the rough parts of a crag," he said, "and build it into walls. You take clay from under the cliffs, and seaweed and sand from the shore. Your son does it, too, and his son. In time you have a garden, and you get a vegetable and a potato out of it. But the rock is a place to stand on; our living comes out of the sea."

Spot of Purple Ink Casts a Spell

Our next stop on the Atlantic's perimeter was even smaller than Pat Mullen's "rock."

Often during my years as a National Geographic Society cartographer I have found myself gazing at a speck of colored ink on a map—just the dot of an island and a few letters to spell out its name. I would try to magnify it in my mind's eye to its size in real life, the center of the universe for a handful of people.

Working on our new Atlantic chart, my eye fell on Ile d'Ouessant, an islet that dots the westernmost tip of France. Instead of woolgathering, I determined to magnify this particular fleck of purple ink by paying it a visit. Now, months later, it was our next stop (page 744).

As we left the French coast in the fishing smack *General de Gaulle*, Ouessant was a hazy blur on the horizon. Ten miles of rough ocean foamed away at the stern. Finally my purple-ink spot stood before me.

We climbed from the fishing smack to the quay and from the quay to the topside of a truckload of wine. Ten minutes later the accommodating driver set us down in the mid-

dle of tiny Lampaul, Ile d'Ouessant's only village.

The mayor's son, Hippolyte Lucas, immediately became our interpreter and general go-between. Here was an opportunity to use his high-school English, and Hippolyte welcomed it. Whatever our needs—a couple of bicycles, six young ladies to model Ouessant's traditional black-silk-and-lace costumes for our cameras, or the island's 1929 Renault taxi—he smilingly supplied them.

Island History Written by Wind

Ouessant's history is one of howling storms, of lives lost, and of ships pounded to pieces on reefs. Sailors call her the Terrible Isle. Here pastures must be spotted with piles of stone to shelter sheep from the wind's full blast. Ropes hold haystacks against its force, and roof slates are cemented together lest the gale's strong fingers reach under and peel them off.

Lighthouses, two on the island and two offshore (page 745), flash warning beams to passing ships. Hippolyte led us up the seemingly endless spiral stairs of the largest, Phare de Créach, to show us the 5,000,000-candlepower arc that has replaced the oil lamp his grandfather once tended. For his bravery in rescuing British seamen, this same grandfather received a gold medal from Queen Victoria.

Late one night, while Ouessant slept, I walked out to Phare de Créach. Entranced, I watched its shafts of brilliance sweep the firmament like spokes of a gigantic silver wheel, balanced and turning horizontally on the high stone tower. Around and around in silence went the shafts—the same soft silence of the stars that blinked in the sky above. Fields, barns, fences, houses—even the church steeple a mile away—appeared and disappeared in ghostly halos that filtered down from each passing beam.

In four days our circle of Ouessant friends grew to include the talkative innkeeper, his wife, and their dark-haired daughter; the postman, who never failed us with a salute and a smiling *bonjour*; ever-joking Michel Guillot, the baker—Michel the Happy Baker, we called him—and Léone, his wife; vacationing Dr. Pierre-Louis Moreau, a Parisian dentist whose postgraduate studies took him to Northwestern University, and his family; Mayor François Lucas, a retired French artillery captain; and Hippolyte's charming cousin,

(Continued on page 761)



Brazilian Fishermen Beach Their Frail *Jangada*, a Seagoing Raft of Peeled Logs

Jangadas have plied Brazilian coastal waters for centuries. Pegs hold the timbers together. Centerboard, sail, and steering oar complete the primitive design (page 754). This craft lands near Recife.





Recife Takes Its Name, Meaning Reef, from a Knifelike Barrier Paralleling the Shore

The Brazilian port finds its jagged offshore spine more help than hazard; the reef serves as a natural breakwater. Ships, passing through a break in the 575-mile-long barrier, anchor along the protected wharf (center). Two rivers, flowing together, form the shallow inner harbor.

A derelict, the Brazilian freighter *Taubate*, wallows against stone used to reinforce the breakwater. While under tow in 1954 *Taubate* fouled her cable and went aground.

Page 754, lower: *Jangadeiros* spend days far from land. Almost constantly awash, the rafts are safer than they look. Here, at the bow, the author returns to Olinda, Brazil.

✦ River-borne Silt Meets Green Atlantic

The São Francisco's turbid flood near Neópolis, Brazil, smears the sea like an artist's careless brush stroke. Fresh water spreads atop the heavier brine; the two do not mix until far offshore. Haze tints distant land blue.

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Photographer Volkmar Wenzel

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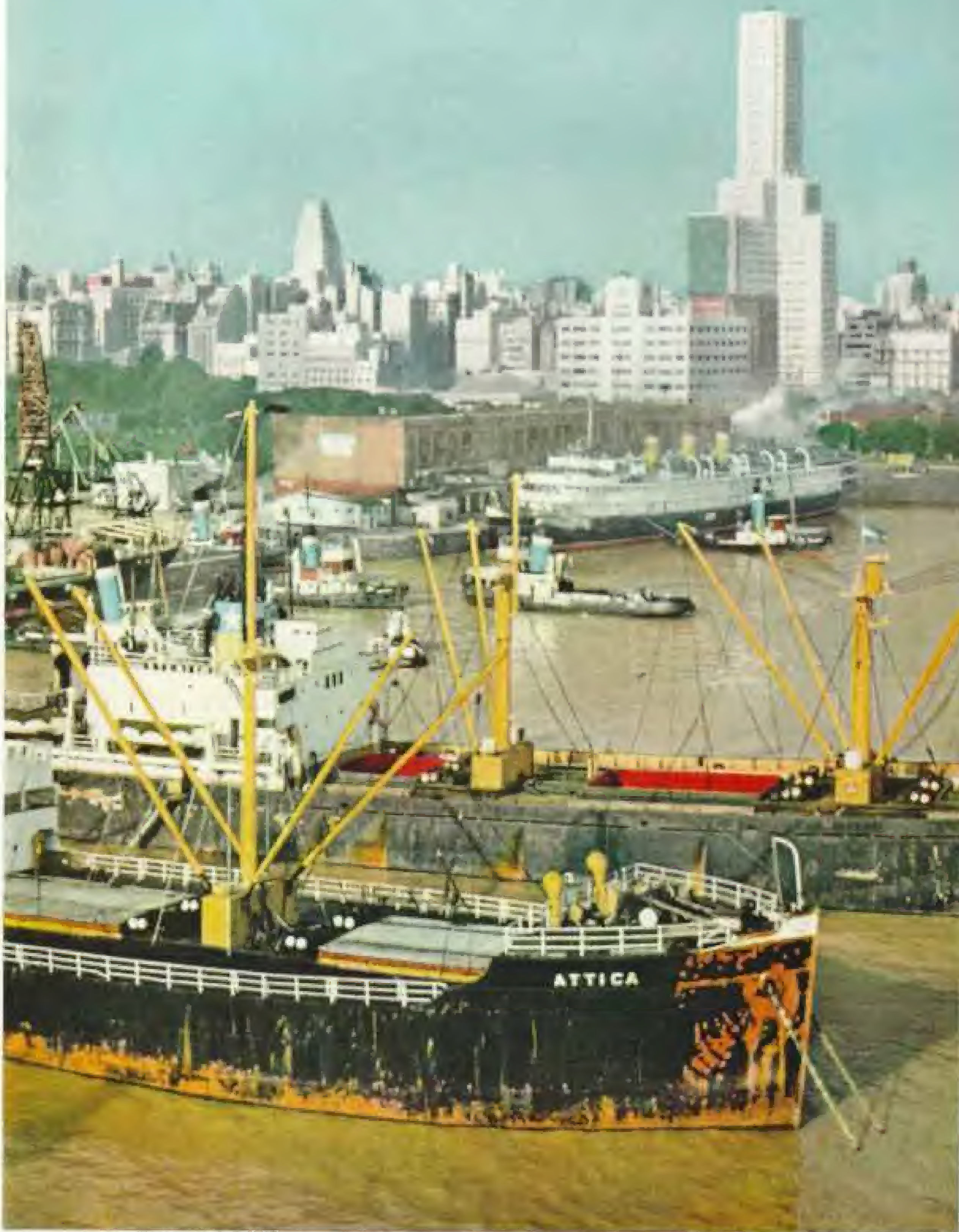
↑ **Young Artists Mix Oils with the Aid of a Master, Benito Quinquela Martín**

Orphaned at an early age, Señor Quinquela Martín became one of Argentina's foremost artists. He has helped scores of poor boys, building an art school for them in Buenos Aires. His specialty: waterfront scenes such as the framed canvas at his back.

↓ **Map Makers, Meeting in Rio de Janeiro, Exchange Shop Talk over Coffee**

Brazil's National Council of Geography provided data for The Society's recent map of Eastern South America. Here the author shows the finished sheet to council officials, Dr. Fabio de Macedo Soares Guimarães (center) and Prof. Alvaro H. de Mattos.





Busy Port and Handsome Skyscrapers Attest the Rapid Growth of Buenos Aires

With some 3,553,000 residents, the Argentine capital is easily the largest city in the Southern Hemisphere. The new 42-story Atlas Building (right), South America's tallest, contains 270 apartments.





Romanche Glacier Hangs Cloudlike Above a Chilean Ship

The frigate *Covadonga* carried the author past Cape Horn to Chile's remote outposts in Antarctica. En route the ship probed icy, tortuous channels in Tierra del Fuego—the Land of Fire—at South America's tip. Magellan named the island group after sighting the signal fires of Indians during the first circumnavigation of the globe.

Actually, ice and not fire characterizes Tierra del Fuego. Here Romanche's frozen crest soars above Beagle Channel. Melted snow cascades from the glacier's flanks.

Page 758, lower: Mr. Bumstead presents The Society's flag to Capt. Raúl del Solar (center), master of the *Covadonga*. Tobias Barros, Chile's Minister of National Defense at the time of the cruise, witnesses the presentation.

✦ Horsemen Herd Sheep

Despite biting, tree-stripping winds, these Corriedale sheep graze all year long beside the Strait of Magellan. They roam the 425-square-mile range of Estancia San Gregorio, which keeps a flock of 100,000.

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Photographer Volkmar Wiestner

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✦ A Chalk Line Splits Beagle Channel; Milky Water Flows from Glaciers

Glaciers slowly grind and carry away particles of stone. When the ice melts, the sediment is carried in suspension as "glacial flour." Here, near Romanche Glacier, *Covadonga* cruises beside a layer of silt-laden fresh water that parallels the shore for miles.

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Reproduction by National Geographic Photographer Vladimir Wozniak

✦ A Sheltered Garden Escapes the Wind That Punishes Chile's Tip

Lashing gales denude much of the countryside about Punta Arenas of all but grass and scrub. These flowers and trees thrive in the shelter of a hillside. The path, bordered by tall lupine, white chrysanthemums, and red heuchera, skirts the Strait of Magellan.



Paulette Malgorn, who smoothed our way for many a photograph.

The day we left they were all in the square to bid us adieu. Suddenly the Happy Baker's face lit up. "*Un moment,*" he called, and ran into his shop. Reappearing with a long pole about which a flag was rolled, he climbed to a low roof and from it to a higher one. Michel steadied himself for a moment, planted his staff in a chimney pot, and stood there grinning as the wind unfurled his banner—the Stars and Stripes!

Now, months later, when I look at the speck of purple on our map of the Atlantic, I see waves foaming on rocks, a beacon's rays cutting the night, kindly people, and an American flag flying from a chimney pot.

Our next port of call was Lisbon, on the broad and lovely Tejo. From neatly cobbled Black Horse Square, at the water's edge, we looked out on a harbor full of ships. Luxury liners towered above stubby-nosed harbor freighters whose sails flecked the sunny air. Passenger ferries scurried across the river. Tugboats, squat and intent, hunched their ocean-going charges to the quayside.*

A few miles down the river stands the Tower of Belem, a landmark as dear to the Portuguese as the Statue of Liberty to Americans. Built in 1521 to guard Lisbon, its ramparts are embellished with carved traceries of ropes, nautical motifs, and Christian crosses that speak of Portugal's golden era of exploration and discovery, of the days of Prince Henry the Navigator and Vasco da Gama.

Beloved Lady Home from the Sea

From the old fortress we watched the bark *Sagres* come home from a month at sea (page 747). The proud three-master is one of the last of the square-rigged sailing vessels that fought through screeching Cape Horn gales with Australian grain for Europe. Cape Horners, they were called. Now she serves the Portuguese Navy as a training ship.

The *Sagres* slipped by the tower under full sail. Then, as we followed in a launch, boys in white middies climbed aloft to furl her canvas. Evenly spaced on the yards, they looked like Monday's wash hung out to dry.

Accepting a shouted invitation from the quarter-deck, we caught a rope ladder and swung aboard. Around us on a shining deck stood bronzed young men. A sail still billowed in the wind, and signal flags snapped smartly in the rigging. Now less than a mile

away, Lisbon rose in pastel hues from the river's banks. Officers scanned the dockside with binoculars for wives and sweethearts. The ship's band played martial music. A beloved lady coming home...the tradition and spirit of the sea that took the Portuguese to the far corners of the world...a majestic, living thing—this old ship!

Oil Drums Make Sweet Music

At summer's end in the Northern Hemisphere, photographer Wentzel and I flew home via the Azores and Bermuda. Then, after just enough winter for contrast, we winged south to tropical Trinidad.†

There we saw men making music by thumping pieces of 100-gallon oil drums. "Looks like a filling station," said Wentzel.

This was one of Trinidad's "steel bands." Instruments are made by hammering wedge-shaped depressions in a heated drum top. Because of variations in size, the depressions give out different tones when skilled musicians play them with rubber-tipped sticks.

Far from the carbon knocks and high-compression pings I expected, steel-band music is full-throated and sweet.

We sat with dusky natives in rude sheet-iron "tents" as they applauded calypso ballads with shouts and laughter. Any doubts I had about the ability of these West Indian bards disappeared when one gave forth extemporaneously with the following lyric:

Mr. Newman Bumstead . . . you will carry
the sway;

Your story will break records through the
world today!

Mr. Wentzel . . . the snaps that you have
made will ever be

Blazing on the pages of history!

The National Geographic Magazine could
never fall

Because you two heroes conquer better
than all!

Flying southeast from Trinidad, our Pan American clipper soared above deserted Devil's Island. Ahead lay the Amazon's mighty mouth—a maze of black land shapes overprinted with a brown drainage system. For years I had known this pattern on maps.

* See "Golden Beaches of Portugal," by Alan Villiers, NATIONAL GEOGRAPHIC MAGAZINE, November, 1954.

† See "Happy-Go-Lucky Trinidad and Tobago," by Charles Allmon, NATIONAL GEOGRAPHIC MAGAZINE, January, 1955.

Now, illumed by the moon's pale light, it looked as cartographic as ever—larger scale, but otherwise much the same.

Eastward, the moon's reflection rode with us on the empty Atlantic. To the west, channels and jungles merged in velvety blackness.

Our destination on this leg of our tour was A Cidade de Nossa Senhora do Belém do Grão Pará—The City of Our Lady of Bethlehem of the Great River. Modern travelers know it more simply as Belém.

Rubber Bounced Belém to Wealth

During the late 19th century and the early 20th, Belém bounced to wealth from the wild Amazonian rubber that flowed in a seemingly endless stream across its docks. Sumptuous mansions, clubs, and public buildings sprang into being. Rubber profits built massive banks. But the boom collapsed with the arrival of cheaper rubber from southeast Asia's plantations. Today Belém leads a tranquil life amid fading grandeur.

The men of Belém, like their Portuguese cousins, conduct much of their business over tiny cups of coffee at sidewalk cafes. Not long ago it became necessary to increase the price per cup above the standard 50-centavo piece. A reasonable price, 70 or 80 centavos, would require the use of 10- and 20-centavo pieces. But there are few of these, and their value is so slight that no one wants to carry them. Belém restaurateurs found a happy solution. They sell their coffee for a 50-centavo piece on even days of the month and for 100 centavos (1¼ cents) on odd days!

We spent two days with the seagoing raftsmen of Recife, where Brazil's shoulder pushes into the Atlantic (page 755). These fishermen brave heavy seas in the open Atlantic on *jungadas*, log rafts equipped with a single sail.

For hours, far from land, Wentzel and I alternately stood and sat on these bundles of logs while waves sloshed up through them. I came back with a new concept of the Atlantic's vastness (pages 753 and 754).

The flight from Recife to Rio de Janeiro paralleled chalk-white beaches fringed with coconut palms and scalloped by lacy combers. Seen from 100 feet, the landscape suggested a fast-moving film strip. Here a fence-like fish trap ending in a point beyond the surf. There a lone *jungada*. A seine in the shape of a horseshoe, beginning and ending in black spots that were fishermen. Thatched huts in the palms. A lone man leading a donkey.

Then darkness, and thunderstorms that abated when we reached Rio.*

Imagine, if you can, all the planets, galaxies, and twinkling stars of creation scattered in wild profusion on a scene of mountains and water already beautiful in its own right. That's Rio!

Wentzel and I rode the cable car to Sugar Loaf's top (page 748) and breasted the breakers at Copacabana Beach. We admired Avenida Rio Branco's smart shops and ultra-modern architecture and glimpsed the awe-inspiring statue of Christ on Corcovado when low-hanging clouds parted to reveal it in the sky above us. Then, reluctantly, we hastened south to Buenos Aires.

In a setting as flat as Rio's is mountainous, Buenos Aires sprawls beside the muddy Río de la Plata (page 757). From the airport, far out in the green countryside, we drove to town over a superhighway that reminded me of the Merritt Parkway in Connecticut. Beside it, ultramodern multistoried apartment buildings seemed to hang in the sky. Actually they rest on slender shafts.

In the metropolis centuries-old cathedrals contrasted with smart glass-fronted shops. Sleek American and European automobiles dodged wagons drawn by horses wearing straw hats, required by law, we learned, to protect the animals from sunstroke.

In Calle Florida, where I bought my wife a handbag delicately fashioned from baby-alligator skin, shoppers mill so thickly that traffic halts several hours a day to give them free rein from curb to curb.

Storms Block Andean Passes

We planned now to dash quickly to Cape Horn. Since the days of the windjamming grain ships, only an occasional commercial vessel has rounded the Horn. Our only chance of doing so was through the courtesy of the Chilean Navy.

Flying from Buenos Aires, we saw the Argentine pampas fade from verdant cattle and grain country to arid foothills. Snow was falling on the peaks of the Andes. Aconcagua and neighboring La Cumbre Pass were in the grip of a raging snowstorm.

"We'll try some of the passes to the south," said Capt. W. J. Sindo, and banked our big Panagra plane to the left. For 150 miles

* See "Spectacular Rio de Janeiro," by Hernane TAVARES DE SÁ, NATIONAL GEOGRAPHIC MAGAZINE, March, 1953.



Naked and Frightened, a Shorn Sheep Explodes from the Clipping Pen

This Corriedale, nine pounds lighter without its fleece, heads for the windy ranges of Estancia Cerro Guido in Chilean Patagonia. Corriedale wool spins well and is prized for its lack of discoloration (page 759).

we paralleled the snow-shrouded Andes. No opening appeared. Back we flew to Mendoza and many miles beyond. There, after some 300 miles of looking, we found a break in the weather; Las Ramadas Pass was in full sunlight. Snowy slopes rose on right and left as we soared through at 18,000 feet. Sixteen thousand feet lower we landed at Santiago.

My fondest memory of Chile's modern capital is the rooftop pool of the Hotel Carrera. There, 17 stories above the streets, I swam and sunbathed against a backdrop of snow-capped Andean peaks.

Between swims I scurried from one government department to another. Finally a marine sergeant wearing white gaiters ushered me into the office of Comdr. Victor Wilson. The name suggested that he might be a foreign military advisor. English or American, perhaps. But no. Commander Wilson's great-grandfather, an Irish shipping merchant—like many another Briton and American of the mid-1800's—sailed to Chile for a short stay, only to fall in love with a fair Chilena and spend the rest of his life there.

Commander Wilson added to the illusion by

greeting me in perfect English, a compulsory subject in Chilean schools.

"It's all arranged," he said. "Report to Punta Arenas, and the first ship returning to port will take you to Cape Horn."

Punta Arenas, the world's southernmost city, was not the cluster of rain-drenched wooden buildings and muddy lanes I had imagined. Instead I found a metropolis of some 34,000 people, with paved streets, sidewalks, and shops offering everything from ladies' hosiery to power-driven sheepshearing rigs.

Southernmost City's Aged Autos

The city's automobiles are of many vintages. Some of them, like a Model T that conjured up the days when it and I were younger, date back to the twenties. And the weather? Less than half as much rain falls on Punta Arenas as on Washington, D. C. Midwinter temperatures average only one and a half degrees colder. Here, on the world's southernmost golf course, I hooked a ball out of bounds into the Strait of Magellan.

On a side trip from Punta Arenas we looked in on Estancia San Gregorio, a 425-square-

mile sheep farm on the Strait of Magellan. Surprisingly, only 21 men tend San Gregorio's 103,000 sheep. But, to keep them mounted, the ranch maintains a herd of several hundred horses (page 759).

Thick fleeces account for most losses among the flocks. In rainy weather the wool becomes so wet and heavy that if a sheep rolls on its back, it may be unable to regain its feet. There it lies, spindly legs in the air, until it dies or is rescued.

We saw mounted *huasos* and scampering collies herding flocks of the woolliest sheep that ever a child dreamed of. Driven into shearing sheds, they emerged nude and woe-begone (page 763).

Then came the wind. It parted the long hair on the collies and spat gravel into my face. Herdsmen and sheep leaned into its blast. This was the wind of Patagonia I had read about, the lashing power that makes much of the countryside barren of all but grass and scrub. Trees cannot stand against it.

Summer Gale Surprises the Author

The Strait of Magellan seethed under the gale's force. Spindrift, torn from the wave tops, caught the sunlight and turned it into a thousand rainbows.

I set out to make a picture of the waves. A hundred yards from shelter I crouched to avoid being knocked over. Finally I had no



choice but to lie on the ground and wait until Wentzel retrieved me with a car.

Punta Arenas was unimpressed when we recounted our experience. "This summer is not as windy as usual," said a townsman.

Next morning Capt. Jorge Bornscheuer, Chief of Staff of Chile's Third Naval District, received us in his office.

"Capt. Raúl del Solar," he said, "is just back from Antarctica with the *Covadonga*. His orders are to replenish stores, refuel, and rush you two gentlemen to Cape Horn."

We had no inkling we would round the Horn in such a substantial craft. Next night the 300-foot *Covadonga* upped anchors and took in her hawsers. The wind moaned in

her rigging and whipped the smoke from her stack, drawing it out into a long horizontal pennant. Like a giant hand, the gale pressed the moving ship against the pier until pilings smoked and screeched with friction. We were bound for Cape Horn!

Astern, the lights of Punta Arenas dimmed and finally disappeared. Mountainous Tierra del Fuego, desolate and dark, silhouetted itself against the southern sky. It was a wild scene, changed not a bit since Magellan and his followers probed its channels four and a half centuries ago.

It was 1 a.m. before I broke away from the spell of the night and went below. Back on the bridge three hours later I found Lt. Comdr. José Radic, the ship's executive officer, sighting shore points and rushing to plot their bearings at the chart table.

Seated in a canvas chair, Captain del Solar slept "with an ear and an eye open."

On the bridge wings vigilant seamen peered ahead into the gray light. I sampled their 4-hour watch. The wind lashed my face and my eyes watered. After 10 minutes I had more than enough.

To starboard rose Gibraltarlike Cape Froward, southernmost tip of continental South America. The dictionary defines froward as "not willing to yield or comply . . . perverse; disobedient." Well named, I thought, as we



These Bleak Shores in Tierra del Fuego Gained Fame from Darwin's Voyage

In 1851 Charles Darwin found 3,000 Yahgan Indians living naked but healthy at the cold, wind-lashed tip of South America. These "abject and miserable creatures," he reported, slept on the bare ground, and mothers nursed infants while alect fell on bare bodies. Reading Darwin's descriptions, sympathetic Englishmen contributed clothes and blankets. Their ships also carried diseases previously unknown to the Yaghans. Decimating sickness followed.

Few members of the tribe survive. A shriveled old woman known only as Julia is believed to be the last pure-blooded Yahgan. The author met her here on Navarino Island.

It was on Navarino that the surveying ship *Beagle* picked up Jimmy Button, a Yahgan, and took him to England for education and a day at the court of King William IV. Jimmy returned two years later. Darwin, who put him ashore, regarded him as a friend and a superior sort of aborigine. Throwing off alien culture, Jimmy 26 years later led a massacre of missionaries.

Wooded Colhue Island and smaller Conejos shelter the harbor of Wulain; the Chilean transport *Micalvi* takes on fresh water.



Like Soldiers at Dress Parade, King Penguins Stand on Eggs: South Georgia Island

Ten thousand penguins inhabit this colony 1,200 miles east of Cape Horn. Mother and father take turns balancing an egg on the insteps and covering it with a warm, feathered flap. Unmated kings steal eggs and brood them.

passed the storm-scoured headland and left the Strait of Magellan.

"Now I'm going to show you one of Chile's scenic gems," said Captain del Solar.

From Magdalena Canal the *Covadonga* swung from her course and entered Seno Chico, a narrow fjord with sheer rock walls that, at its entrance, plunge to great depths. But as we proceeded, the Fathometer showed less and less water under our keel. I watched its pencil strike the graph paper: 251 feet, 248, 243...119, 114, 109...97, 49, 30!

"Full astern!" ordered the Captain.

The *Covadonga* shuddered and stopped in her length. Then we inched ahead. Aware that we were drawing a full 13 feet, I watched the readings decrease: 30, 27, 21...19, 18, 19. We were past the reef with five feet to spare!

The tension over, I looked around. Snow-topped walls scarcely two ship-lengths apart pressed in on us. Spidery cataracts laced through clumps of grass and rank evergreens. A glacier, its ice glowing with translucent blues, curved to the water's edge. Hundreds of white-breasted cormorants looked down on us from the cliffs.

Cautiously *Covadonga* turned around in the narrow passage. Hours later we anchored in Beagle Channel (pages 759 and 760).

"We're going to have mussel cocktails for dinner tonight," announced Captain del Solar. "But first we have to get the mussels."

Down from its davits went a whaleboat. A diving crew loaded leaded shoes, canvas suit, bronze helmet, hoses, and pump. For the next hour a diver gathered mussels in 15 to 20 feet of icy water, while the boat crew pumped air to him with an apparatus resembling an old-fashioned two-wheeled coffee grinder. Not content to wait for dinner, we followed in another boat and ate mussels on the half shell, straight from the bottom.

A Chance to Visit Antarctica

That night Captain del Solar called Wentzel and me to his cabin.

"I have just received a change in orders," he said. "The *Covadonga* is to return to Punta Arenas to pick up the Minister of National Defense and proceed with him to Antarctica. The round trip from Punta Arenas and back will take six days, and we'll pass Cape Horn twice. Do you still want to come along?"

Fearless Young Adélie Penguin on an Antarctic Rock Looks the Author in the Eye



A long week end in Antarctica? Why not!

Back we went through the winds, the currents, and the glacier-hung mountains to Punta Arenas. Defense Minister Tobias Barros and his party came aboard, and we sailed for Antarctica (page 758).

Two nights later a steward reached into my bunk and shook me.

"We'll be standing off Cape Horn in another 10 minutes," he said, "but the weather is so thick you can't see anything. Better stay in bed."

I made my way to the bridge. If I couldn't see the Horn I would at least taste its weather.

Topside, I peered into stormy blackness. Then I turned to the ship's radar and watched a living map of the famed cape move slowly across the screen and disappear. Then the screen was blank. Ahead lay the turbulent waters of Drake Passage and Antarctica.

All the next day we pitched and rolled. On the second night mountainous seas swung the *Covadonga* through an arc of 60 degrees. I clung to my bunk lest I join the furniture that crashed across the cabin. The ship rose and fell violently. Her bottom hit the water with sickening thwacks.

Hot Springs Flow in Antarctic

Somehow I slept. At 6 a.m. a steward shouted "*Antártica!*" into my cabin like a Pullman conductor calling "Hoboken!"

Our first stop was Deception Island, an extinct volcano whose horseshoe crater forms Antarctica's snuggest harbor. Its hot springs flow at 190° F.—hot enough, we heard, to blister paint on whaling ships offshore.

Steaming across the crater, the *Covadonga* dropped anchor off two small buildings that huddled on a cinder slope above the water. These meager structures, with three radio towers and a flagpole, constitute a new Chilean Air Force base. While the ship's company stood at attention, Minister Barros affirmed his country's claim to Deception Island and named the base President Ibañez, after his nation's chief executive. Later, however, President Carlos Ibañez del Campo modestly declined the honor in favor of his predecessor, Pedro Aguirre Cerda, who first defined Chile's claims to the Antarctic Continent.

Argentina and Great Britain also claim the island and maintain bases there.

Clearing Deception Island, we steamed eastward in bright sunshine. I was surprised to see the ship change course for icebergs no

Cape Horn Lifts Its Craggy Head → from a Sea Deceptively Calm

Page 760: Winds and currents at South America's tip, where two oceans meet, brew some of the world's worst weather. Mariners who fought their way around the Horn in sailing ships nicknamed it "old Cape Stiff."

Sparkling across *Covadonga's* bow, the sun yielded to foul weather moments after this picture was taken. The cape, a part of Chile's Horn Island in Tierra del Fuego, towers 1,351 feet.

more than six feet across. Others as big as a city block stood in our route.

"We give them all a wide berth," said Commander Radic. "There's more ice to an iceberg than meets the eye. About nine times as much."

Sleek backs and sharp dorsal fins gleamed momentarily in the sunlight as killer whales rose for air. Hundreds of spouting finback whales suggested the fountains of Versailles.

Five hours out of Deception we reached Palmer Peninsula, a fingerlike projection of the Antarctic Continent. Rising white and sheer like an endless iceberg, its barren coast showed only a speck of bare rock. Here were clustered the huts of O'Higgins Base, where Chilean soldiers and scientists lead a workaday life, completely isolated for months at a time.

While Minister Barros inspected the base, Wentzel and I photographed penguins (page 767).

From Palmer Peninsula we sailed north to Greenwich Island and anchored by cliffs of blue ice that dumped bergs into the sea with thunderous rumblings. Scraping and banging through floe ice, we rowed ashore to visit Arturo Pratt Base of the Chilean Navy. Its complement of eight men had decorated their snug quarters like a college dormitory. On one wall a pennant labeled "Washington, D. C."

(Continued on page 777)

Brisk Winds off Cape of Good Hope → Whip an African Warship's Flag

No air or shipping line connects the southern extremities of the hemispheres. The trip from Horn to Hope, a beeline 4,200 miles, took the author 10 days and a circuitous 11,000 miles.

Despite popular belief, this point of land is not the southernmost tip of Africa. That distinction goes to Cape Agulhas, 33 miles nearer the South Pole.

Here the *Simon van der Stel*, a South African destroyer, turns her stern on the Cape. Good Hope ends at Cape Point (extreme left).

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Reproduction by National Geographic Photographer Yohann Wenzel





Fur Seals Sun-bathe on the Rocks of Cape Cross and Frolic in Boiling Surf

Each summer thousands of the animals rear young in South-West Africa, then disappear into the sea. Named for the Cape of Good Hope, Cape seals are found only in the Southern Hemisphere.



"As We Approached," Says the Author, "Seals Were So Thick They Looked Like Moss"

Soon after settling down, females give birth to young conceived the previous year. Later they join the harems of bull seals and mate anew. Lovable male (beside large rock) keeps a jealous eye on this group.

Diamond Hunters Race a Rising Tide on Africa's Skeleton Coast

To reach the Saddle Hill diamond workings (below), the author traveled 18 miles by truck along a narrow strip of sand between waves and dunes. Two hours behind schedule, his driver missed ebb tide, when the beach is wide and smooth.

As the sea rose, the sands narrowed a few inches with each new comb. Waves broke against the dunes. To avoid an oncoming breaker, the driver cut his speed. Then, as the surf receded, he stepped on the accelerator and dashed across the gap.

Tracks at left are the photographer's.

The Author Fondles \$500,000 in Diamonds

Page 773, lower: This glittering pile at Consolidated Diamond Mines near Oranjemund, South-West Africa, contains 4,445 uncut gems weighing 8,141 carats. Workmen gleaned the 4-pound hoard in three days. ♦ Using tweezers, Saddle Hill miners pick industrial stones from gravel concentrated by a mechanical rocker.

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Photographer Volkmar Wentzel

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Fashion Never Changes for These Women

Dress styles introduced by missionaries nearly 75 years ago clothe natives of Windhoek, South-West Africa. These two are members of the Herero, a Bantu tribe. Their turbans cushion baskets and bundles carried on the head.

Young Portuguese Go to School in Africa

Page 775: Sons and daughters of the mother country attend this handsome secondary school, the Salvador Corroia, in Luanda, capital of Angola (page 776). The tile map plots voyages of Portuguese explorers. These students eat ice cream.

↓ Glazed tiles decorate the school's library. The figure depicts Diogo Cão, who explored Angola's coast in 1482-84.

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Photographer Yellmer Wentzel

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↑ **Primitive Canoe and Modern Hotel
Contrast Dramatically in Dakar**

West African base for the French fleet in World War II, Dakar has become a crossroads of the air age. Passenger routes fan out to Europe, South Africa, and South America. Air France built the Grand Hotel de N'Gor for intercontinental travelers.

↓ **Oars Double as Tent Poles
on Luanda's Sun-washed Beach**

Angola ships tons of coffee, the province's chief export, from Luanda harbor (background). The beach is part of a large, sheltering sandspit that encloses the anchorage. This family on a Sunday outing eludes the hot African sun beneath a fluttering blanket.



recalled a distant tour of duty. Twelve sled dogs, 26 sheep, and 65 hens provided transportation, mutton, and eggs.

Near the base towered a lofty ice cliff. Shifts in its weight caused gunlike reports, followed by a sound that resembled that of tearing canvas as cracks sped through the ice.

Now fog settled on the base. Our hosts gripped our hands in farewells that bespoke the lonely months ahead.

As we rowed into the fog, our world shrank to a gray hemisphere a few boat-lengths across. We could see neither vessel nor shore. To guide us we had only the clanging of the ship's bell.

Aboard the *Covadonga* we nosed north through fog and ice toward South America. For 30 hours we bucked the wind and wild seas of Drake Passage.

"*Cabo de Hornos*," cried the steward, as he awakened me on the second morning out. Ahead in bright sunshine lay the continent's tip, the meeting point of oceans, whose name is synonymous with tempestuous weather (page 769).^{*} As I loafed in the lee of the stack and soaked up warm sunshine, I thought of an old sea chantey:

"I wish to God I'd never been born,
To drag my carcass around Cape
Horn. . ."

A lone albatross skimmed the sea with the tip of one broad wing, adapting his flight to each wave's changing contour. A seal hunter bobbed along under a wind-taut sail. Bird and boat were the only signs of life.

Lighthouse and City Make a Difference

Ten days later, on the other side of the Atlantic, Wentzel and I stared out at another watery landscape that was much the same and yet strangely different. This time we were off the Cape of Good Hope; our ship was the South African destroyer *Simon van der Stel* (page 769).

Seas ran high, and ours was the only vessel, but the scene lacked the profound loneliness of Cape Horn. A lighthouse and bustling Cape Town just 30 miles away made the difference.[†]

The Cape of Good Hope has symbolized the farthest tip of Africa since 1488, when the Portuguese navigator Bartolomeu Dias dubbed it Cape of Storms. Actually, Cape Agulhas, 100 miles southeast of its better known neighbor, is the continent's southernmost point.

The great-circle distance from Cape Horn to the Cape of Good Hope is 4,200 miles. But not one air route spans the South Atlantic. Wentzel and I flew north over the Equator to Dakar and south through the vast African Continent to Cape Town—11,000 miles instead of a mere 4,200.

Deputy port captain Alex Becket spun me around Cape Town's harbor, directing his chauffeur with "right rudder" and "left rudder," to show me the port's new dry dock, largest in the Southern Hemisphere and big enough for the *Queen Elizabeth*. After a ship floats in, gates close. Then the dock—an enormous concrete bathtub—drains dry, leaving the vessel's bottom accessible for repair.

Beach Is Highway of Skeleton Coast

From Cape Town we went north to Windhoek, capital of South-West Africa. Streets labeled Bismarck Strasse, Goethe Strasse, and Kaiser Strasse reminded us that this was once German West Africa. Boys with leather breeches and rucksacks and girls with braided flaxen hair would have looked at home in Frankfurt.

Joining forces with bush pilot Johnny Mentz, we flew across South-West Africa to the Skeleton Coast, a never-never land of diamonds, of wrecked ships riding upright in the sand, and shark-infested seas breaking on desert dunes.

At Luderitz dingy, sun-scorched streets led us to the comfortable quarters of M. E. Kahan, who controls 12,000 square miles of coastal desert known as Diamond Area No. 2. Lorries, tractors, and earth-moving machinery cluttered his dooryard.

"Tomorrow, when the tide is right, I'll send you out to my Saddle Hill workings, 50 miles up the coast," he offered.

"By boat?" I asked.

"No. You'll ride along the beach. There's no road—and at high tide there's no beach."

Next morning we climbed aboard one of Kahan's desert trucks and made ourselves comfortable amid drums of gasoline and water, spare tractor parts, and a couple of natives armed with shovels.

Within five minutes we were rolling along over trackless sand. A spindly-legged stein-

^{*} See "Round the Horn by Submarine," by Comdr. Paul C. Stimson, USN, NATIONAL GEOGRAPHIC MAGAZINE, January, 1948.

[†] See "Safari Through Changing Africa," by Elsie May Bell Grovener, NATIONAL GEOGRAPHIC MAGAZINE, August, 1953.

bok, surprised as we crested a dune, stood for a moment watching us and then bounded away gracefully. We passed rusting mining equipment all but buried in the drifting sand. Jackals eyed us sulkily.

For long stretches the undulating desert seemed as hard as concrete. Suddenly its consistency changed. The big tires broke through into powdery sand, and the truck stopped as if its brakes had been slammed on. Aided by the shovelers, and with its motor whining in double-low gear, the truck pulled out to firm sand.

We came out on the beach at Hottentot Bay. Now for 18 miles our route lay along a narrow strip of sand between waves and dunes. Two hours behind schedule, we missed ebb tide, when the beach was widest. With each successive comber the wet sands narrowed a few inches. At high tide waves would break against the dunes.

The surf rose higher. Sometimes we hit soft spots that stopped us before the driver

Angola Boy Eats Lunch out of His Hat

While following the camera, he used head as table, leaving hands free to pick fishbones.



could change to a lower gear. Waves broke against the truck and seethed back.

Finally, after seven hours, we drove half a mile inland to a few shacks that quivered in the heat beside a 100-foot-wide hole in the dunes. These were the Saddle Hill diamond workings—slight recompense for our long truck ride, I thought. Thirty feet below, tractors and other mechanical monsters growled and snorted as they deepened the excavation.

German manager Friedrich Rosenau greeted us in halting English. Beside him stood his wife and two-year-old son Lothar, who knew no other home than these barren dunes.

Workers Sort Diamonds with Tweezers

In the pit a whirring pump barely held its own against seeping sea water. Another pump raised gravel-laden sludge to the diamond-recovering station a hundred yards away. African workmen sifted the conglomerate free of sand and then shoveled it into mechanical rockers.

"This shaking takes advantage of the high specific gravity of diamonds and the semi-precious stones they occur with," said Rosenau.

In the center of each tray I could see a dark area of pay dirt, mostly agate, zircon, garnet, and bloodstone. Searching it, the workers picked out tiny diamonds with tweezers. White-haired, bespectacled Albert Hoffman kept tally as they dropped the shiny bits into receptacles (page 772).

In his office Rosenau unlocked the outer door of a large safe. Then Hoffman, using a second key, opened the inner door. Neither man could enter alone. Large enough to hold a piano, the vault contained only a half-pound tea tin. From it Rosenau emptied 5,000 tiny diamonds onto his desk. They looked like coarse granulated sugar.

"Sorry you weren't here a while back," he said. "I had a quart milk can full."

A few of the larger stones weighed as much as half a carat and were suitable for jewelry. Most would be used for industrial grinding, cutting, and polishing. Some would become needle points in high-fidelity phonographs.

By the time we left the office for supper, the desert, blanched by the sun a few hours before, glowed in friendly hues. A kettle of rock lobsters simmered on the sand.

Darkness brought a chill to the air and pulled us together around the fire. A tractor

driver strummed his mandolin. Others sang Rosenau, discovering Wentzel's fluent German, plied him for news. Lothar dozed in his mother's arms, and above all the Southern Cross glimmered in the star-strewn heavens.

At low tide next morning we returned by truck to Hottentot Bay, where Johnny Mentz and his plane awaited us on a tidal flat. We took off for Oranjemund. This town of 2,620 people dedicated to digging diamonds is headquarters for Consolidated Diamond Mines of South Africa. The company controls a 70-mile-wide strip of coastal desert extending north from the Orange River.

Security chief Pieter Willers met us as we landed with the blunt and inhospitable question, "Why are you coming here?"

"Didn't you get our telegram?" I asked.

He showed it to me. The telegrapher had garbled Geographic Society into "geological survey." Geological surveyors, other than those of the company, are anything but welcome at Oranjemund.

Convinced of our innocent intentions, Willers drove us to town, fed us, and put us up in comfortable quarters.

"People think diamonds are lying all over the ground," he said, "and that causes no end of trouble. Why, I'll give you a wheelbarrow, sieve, and spade and set you loose on maiden ground, and I'll bet you don't find a diamond in a month."

If a worker should pick up a stray diamond, he has little chance of making off with it. Desert and treacherous seas bar his escape in three directions. The lone road out is patrolled by armed guards accompanied by Alsatian dogs trained to tear a man limb from limb.

Deserts Guard Diamond Mines

A few years ago four outsiders struggled across the desert to this diamondiferous coast, but turned back when they failed to find gems. Guards discovered two of them dead of thirst and arrested a third as he crawled toward the Orange River. The fourth man, tracked to the river, was never found.

Next day mine manager F. C. Davies took me into the desert, where a fleet of earth movers stripped away a 50-foot layer of sand to uncover diamond-bearing gravel.

"For every pound of diamonds we find," said Davies, "we must move 75 million pounds of earth."



Valkmar Wentzel, National Geographic Staff

Africa Meets the Photographer

Valkmar Wentzel in the Belgian Congo

After the gravel is removed, men with brooms sweep every cranny in the bedrock. They get a 35-cent bonus for recovery of any stone exceeding five carats.

In his office Mr. Davies spread before us 4,443 diamonds, the labor of three days. Rough and uncut, the four pounds of stones were worth half a million dollars. Faceted, they would bring several million (page 773).

I sifted the diamonds through my fingers. "Suppose one should slip into my pocket?" I asked. "Could you tell?"

"Yes," he replied. "The exact weight is 8,141 carats. By weighing the pile we could detect the absence of the smallest stone."

Fondling the diamonds, I remarked, "I'll miss them when I leave."

"That's all right," smiled Mr. Davies, "so long as we don't miss them."

"Everyone is X-rayed before leaving Oranjemund," security officer Willers informed us. "We've never found anything except a few kidney stones, but it deters would-be thieves."

I wanted to be treated with full suspicion. "Please pull no punches on our examination,"



Porpoises Follow Fishermen Like Playful Dogs. They Can Pace a Boat at 30 Knots

These sea creatures, also known as dolphins, have warm blood and suckle their young. Seconds after birth in the ocean, the baby must swim to the surface for his first breath. Members of a school communicate by whistling. When seen leaping and dashing, porpoises may be feeding, migrating, or frolicking. Old-time sailors regarded their presence as an omen of fair winds. Author and photographer met this school off Angola.

I said to Willers. Consenting, he warned that our films should be set aside; the X-rays would destroy them.

Wentzel and I concentrated all our film in one suitcase. At the security building we saw our bags unloaded, and then proceeded into the office, followed—we foolishly believed—by the baggage porters.

Thirty seconds later I realized the porters had entered another building.

X-rays Prove Photographer's Undoing

"Where's the suitcase with the films?" I yelled.

"The baggage goes that way and you go in here."

I ran frantically after the luggage, ignoring the attendant's shouted order to halt.

"Come back!" I shouted. "Come back!" The porters paid no attention. I caught up with them just as they passed the first of six suitcases through the X-ray.

Our picture coverage of the Skeleton Coast was wiped out in a flash. Gone were the results of hundreds of miles of travel.

With fresh film flown in from Windhoek we slogged again through desert sands and

diamond diggings, remaking the pictures shown on pages 772 and 773.

Several days later, after flying along Angola's coast to the Belgian Congo, Wentzel and I sat in the lobby of the Regina Hotel in Léopoldville taking stock of our Atlantic odyssey.

In six months, through 14 nations spread over five continents, we had traveled 36,000 miles by plane and another 6,000 by taxi, jeep, truck, log raft, warship, cruise ship, LST, dugout canoe, tugboat, train, horseback, cable railway, bicycle, rowboat, and helicopter, plus many a mile on foot—and we were still 8,000 miles from home. Wentzel had clicked his shutter on 6,300 pictures, and my well-worn notebook bulged with material enough for a book.

As we passed the Pan American Airways desk on our way out of the lobby, my eye caught the flight dispatcher's board: "PAA Flight 151 to New York."

Involuntarily I asked, "Any seats left?"

"Yes."

"When could we be in Washington?"

"In 48 hours."

And we were.

With Atomic Age Tools, Scientists Pick Up the Trails of Nomadic Hunters Who Peopled the Western Hemisphere Thousands of Years Ago

By THOMAS R. HENRY

With Eight Paintings by Andre Durencau

LOST in the cold emptiness of a vast continent, groping their way dimly through wind-tossed glacial mists, the first Americans arrived. Homeless nomad hunters, they numbered a few thousand at most.

They had wandered out of Siberia and across Bering Strait to Alaska, perhaps on a land bridge when the level of the sea was lower than it is now, perhaps on the ice in winter, perhaps even by boat (map, page 786).

Their blood may well run in the veins of living men, for almost certainly they were the ancestors of some, at least, of the American Indians.*

Nomads Hunted Camels and Mammoths

After the first Ice Age men made the crossing, migrations from Asia continued for thousands of years. Ancestors of the Navajos, Apaches, and other Athapascan people of the Southwest perhaps arrived only a few centuries before Columbus. There may even have been some travel back to Asia.

The great glaciers were disappearing slowly, summer after summer, when the first Americans came. In the wake of the retreating ice, forests and meadows were spreading.

A strange assemblage of animals now extinct—mastodons and woolly mammoths, native camels and horses, and a huge species of bison—mingled in the continent's lush grasslands. With them were wolves, bear, deer, antelope, and rabbits, which have survived essentially unchanged to modern times.†

As the ancient Americans who hunted these animals moved from camp to camp, they left behind fragments of weapons, charcoal from fires, and bones of the creatures they cooked and ate, certain evidence of man's presence on the glacier-gripped continent.

Piecing together the story of the first Americans, how they lived and hunted, their migration routes, and above all how long ago they lived, is a fascinating task of scientific detective work, and one that is still going on.

Until recently, we knew only that these Ice Age people must have lived 10,000 or more years ago. We knew it because they hunted animals which existed then but later became extinct. The dart or spear points of chipped stone which they fashioned have been found closely associated with the bones of the mammoth, giant bison, and a species of camel.

These points, chipped from quartzite, jasper, chert, chalcedony, and other materials, are of several distinct types. The best known are called "Folsom points" after the village of Folsom in northeastern New Mexico, near which numerous specimens have been found. The mysterious hunters who made them are often called "Folsom men" (page 785).

When Europeans crossed the Atlantic and began to explore the vast New World, they found the wilderness from Labrador to Patagonia sparsely populated. The first few Ice Age immigrants had increased by scarcely more than a million north of Mexico and 14 million south of the Rio Grande.

The ways of life of these New World men ranged from among the most primitive on earth to the relatively high civilizations of Peru and Mexico. Their cultures and traditions appear to have developed independently through thousands of years.

Folk Tales "Explain" Indian Origins

The Indians were basically a Mongoloid people, closer in appearance to eastern Asians than to any inhabitants of western Europe. For the most part, they lacked anything like records. Stories of the past had been transmitted orally from generation to generation until reality had become hopelessly confused with the supernatural. To explain their

* See *National Geographic on INDIANS OF THE AMERICAS, A Color-illustrated Record*. Just off the press, this 432-page book is obtainable only from the National Geographic Society, Washington 6, D. C., price \$7.50 postpaid in the United States and Possessions; \$7.75 elsewhere. All remittances payable in U. S. funds.

† See "Parade of Life Through the Ages," by Charles R. Knight, *NATIONAL GEOGRAPHIC MAGAZINE*, February, 1942.



Ice Age Hunters Armed with Fragile Spears Sight a Herd of Woolly Mammoths

Stalking big game, the first migrants ventured into glacier-gripped North America some 20,000 years ago, many anthropologists believe. As centuries went by, their descendants mixed with newcomers and peopled the land from Alaska to the tip of Tierra del Fuego. This grizzled patriarch and his family cross a snow-covered rise in Bering Strait. In ancient times a land route probably spanned the shallow sea, because glaciers tied up enormous amounts of the water that filled it in warmer epochs.

These nomads were not mere ape men; they made weapons, almost certainly spoke a language, and wore furs.



America's Pioneer Family Crosses an Ancient Land Bridge Out of Asia

French-born Andre Doreau painted this series expressly for the NATIONAL GEOGRAPHIC MAGAZINE. A student of prehistoric America, he worked closely with scientists to authenticate weapons and animals. Because Ice Age men left few if any of their bones, the artist had to draw on his imagination to portray them. In agreement with scientific thinking, he gave these wanderers a Mongoloid look.

Largest mammoths known stood about 13 feet at the shoulder; longest tusk curled 16 feet. Weapons left among bones prove early Americans hunted mammoths. Muck pits in Alaska and Siberia still yield frozen carcasses.

origins, for example, some of them related how the moon became enamored of the evening star, and how from their union the first men and women were born.

Gradually, however, scientists reconstructed about 4,000 years of American Indian history. By counting the annual tree-growth rings in rafters of ancient dwellings in the Southwest and linking these up with the rings found in trees still growing there, they were able to fix dates for the history of the Indians in this region as far back as the beginning of the Christian Era.

One discovery that helped push recorded Indian history even farther back was the finding in 1939 of a Mayan monument in Yucatan bearing a date equivalent to November 4, 291 B.C. (Spinden Correlation), the earliest known work dated by man himself so far found in the New World. Expeditions of the National Geographic Society made this discovery and also carried out much of the tree-ring dating work.*

Records and relics found in Peru take the story to still more distant epochs—about 2400 B.C. But from that time back, no proved records of man had been found until recently in either North or South America.

Now, with a dating method born of the Atomic Age, archeologists are bridging this gap. Moreover, they are learning to date with greater precision the remains of animals and man-made relics from the Ice Age itself.

How a rare form of carbon is used to fix these dates is truly an amazing story.

The atoms of carbon 14 are radioactive, like those of radium or uranium. Dr. Willard F. Libby, of the University of Chicago, now a member of the Atomic Energy Commission, and his collaborators, Dr. E. C. Anderson, Dr. A. V. Grosse, and others, discovered that this radioactive carbon is created high in the earth's atmosphere by powerful cosmic rays coming from outer space. The rays produce neutrons, which react with nitrogen in the air to create atoms of carbon 14, so named because each has a nucleus composed of 14 nucleons.

How Radioactive Timetable Works

Gradually the carbon 14 atoms descend to lower levels of the atmosphere as a component of carbon dioxide, where they are breathed in by animals and human beings and absorbed by plants in their growing process. In both animals and plants the ratio of carbon 14 to ordinary carbon is the same, about one atom per trillion.

Like all radioactive substances, carbon 14 breaks down at a fixed rate. Half of it disintegrates in about 5,500 years. Half of the

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Discovering the New World's Oldest Dated Work of Man," by Matthew W. Stirling, August, 1939; and "Secrets of the Southwest Solved by Talkative Tree Rings," by Andrew Ellicott Douglass, December, 1929.



Folsom Points Have Edges as Sharp as Broken Glass

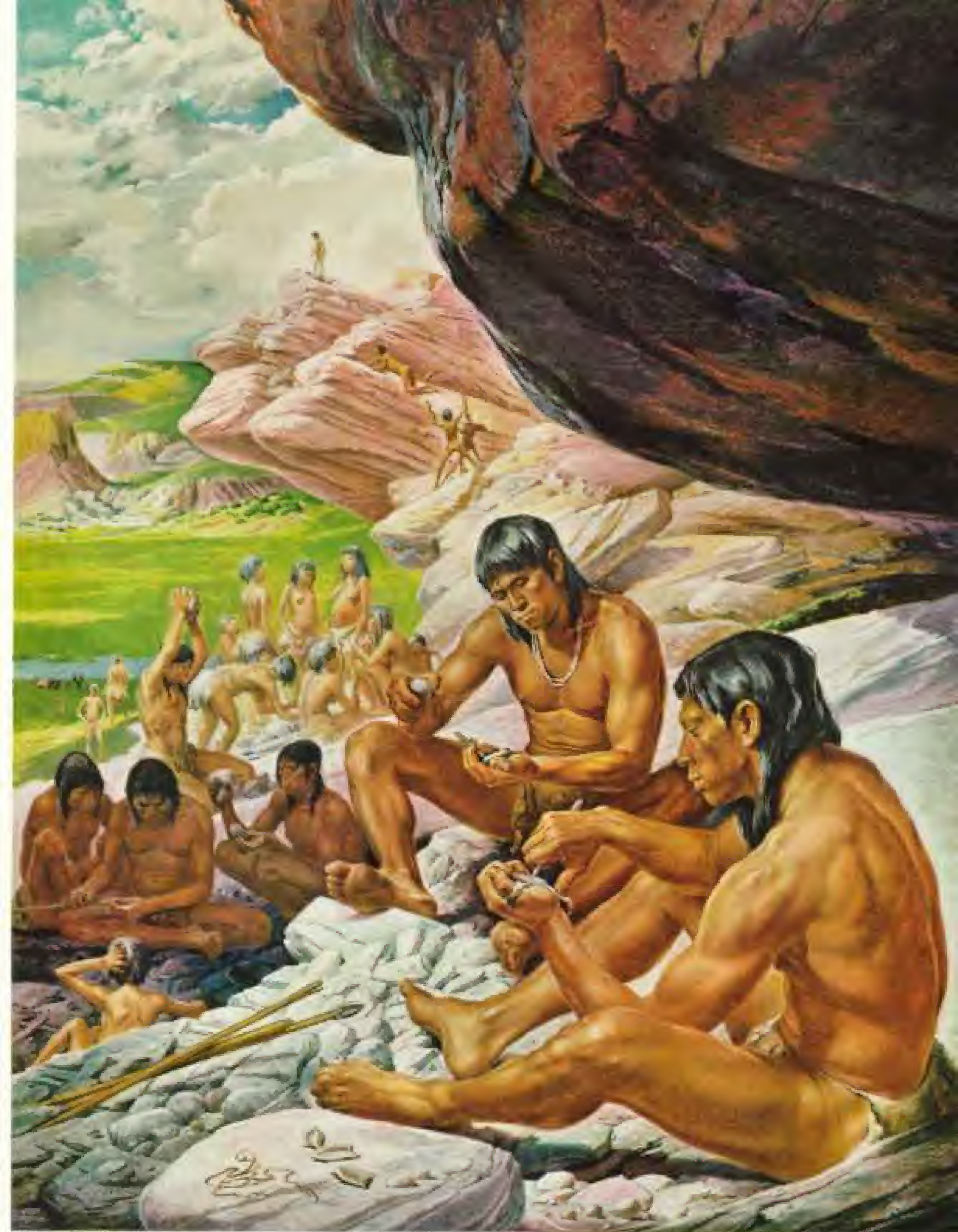
North America's early weaponmakers raised the technique of flaking stone to a science.

These quartz spearheads represent two types shaped by Folsom men (opposite). Long, slender blades taper gracefully to the apex; short, stubby specimens widen near the point. Size of the intended quarry may have influenced the design.

Folsom points are distinguished by a smooth channel extending lengthwise along both faces. Workmen apparently chipped out a single long flake to produce the groove.

Debris at various archeological sites shows that unlucky hammer blows spoiled many a point close to completion.

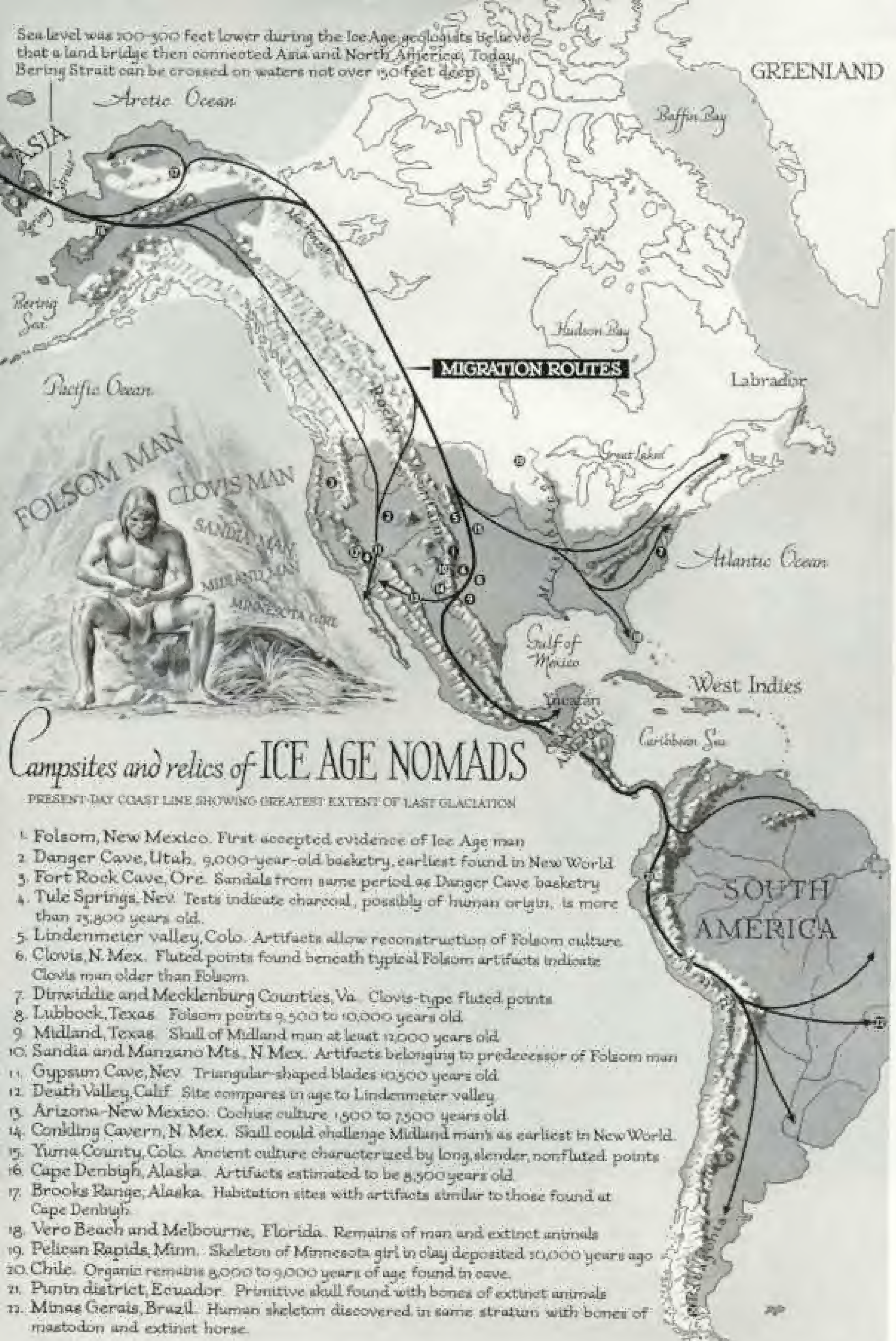
Radiocarbon cannot date these bits of stone; tests of charred bones associated with them fix their ages (page 788).



Using Stone and Bone Tools, Folsom Men Chip Fluted Points for Their Spears

The discovery near Folsom, New Mexico, of fluted spear points, together with the bones of extinct bison, gave a name to these hunters and proved that man roamed the New World millenniums ago. Later, fluted tips came to light across the continent. These craftsmen, flaking crude quartz, shape central grooves that slip snugly into the notched ends of shafts; they bind stone to wood with thongs (foreground). Hammering his bone punch with a stone, the bearded artisan starts a fresh spearhead. A companion, who protects his palm with a hide mitt, sharpens a point with a bone flaking tool. Hunters in the distant valley prepare to skin a bison.

Sea level was 100-300 feet lower during the Ice Age, geologists believe that a land bridge then connected Asia and North America. Today, Bering Strait can be crossed on waters not over 150 feet deep.



Campsites and relics of ICE AGE NOMADS

PRESENT-DAY COAST LINE SHOWING GREATEST EXTENT OF LAST GLACIATION

- 1 Folsom, New Mexico. First accepted evidence of Ice Age man
- 2 Danger Cave, Utah. 9,000-year-old basketry, earliest found in New World
- 3 Fort Rock Cave, Ore. Sandals from same period as Danger Cave basketry
- 4 Tule Springs, Nev. Tests indicate charcoal, possibly of human origin, is more than 15,800 years old.
- 5 Lindenmeier valley, Colo. Artifacts allow reconstruction of Folsom culture
- 6 Clovis, N. Mex. Fluted points found beneath typical Folsom artifacts indicate Clovis man older than Folsom.
- 7 Dinwiddie and Mecklenburg Counties, Va. Clovis-type fluted points
- 8 Lubbock, Texas. Folsom points 9,500 to 10,000 years old.
- 9 Midland, Texas. Skull of Midland man at least 12,000 years old
- 10 Sandia and Manzano Mts., N. Mex. Artifacts belonging to predecessor of Folsom man
- 11 Gypsum Cave, Nev. Triangular-shaped blades 10,500 years old
- 12 Death Valley, Calif. Site compares in age to Lindenmeier valley.
- 13 Arizona-New Mexico: Cochise culture 1,500 to 7,500 years old
- 14 Conkling Cavern, N. Mex. Skull could challenge Midland man's as earliest in New World.
- 15 Yuma County, Colo. Ancient culture characterized by long, slender, nonfluted points
- 16 Cape Denbigh, Alaska. Artifacts estimated to be 8,500 years old
- 17 Brooks Range, Alaska. Habitation sites with artifacts similar to those found at Cape Denbigh.
- 18 Vero Beach and Melbourne, Florida. Remains of man and extinct animals
- 19 Pelican Rapids, Minn. Skeleton of Minnesota girl in clay deposited 10,000 years ago
- 20 Chile. Organic remains 8,000 to 9,000 years of age found in cave.
- 21 Punin district, Ecuador. Primitive skull found with bones of extinct animals
- 22 Minas Gerais, Brazil. Human skeleton discovered in same stratum with bones of mastodon and extinct horse.



Eskimos in Bering Strait Paddle Hide Boats to Another Hemisphere and Another Day

Canopied with ice, Big Diomedes Island has stood for ages as a steppingstone between Siberia and Alaska. When Bering's land bridge was submerged, migrants to North America may have steered boats across the strait or walked the ice in winter (opposite).

These United States citizens come from Little Diomedes Island, a part of North America. Big Diomedes, less than three miles distant, is a Soviet possession in Asia. The International Date Line splits the channel between them. When it is Saturday on Little Diomedes, it is Sunday on Big Diomedes.

remainder disappears in another 5,500 years; and so on. After 33,000 years only 1/64 of the original amount is left. Yet even this minute remnant can be measured with specially shielded Geiger counters (page 798).*

During life, the carbon 14 in humans, animals, and plants is constantly disintegrating and being replaced. After death the carbon 14 in the remains continues to disintegrate but is no longer renewed. Consequently, the time that has elapsed since death can be measured by determining how much carbon 14 is still present in proportion to the ordinary carbon which does not disintegrate. If the carbon 14 has dwindled to half its original ratio to the ordinary carbon in the specimen, the remains are about 5,500 years old; if about one-quarter the original ratio, the relics date from some 11,000 years ago.

This dating method works best when used on wood, animal bones charred in cooking

fires, on the charcoal of such fires, clothing, plant remains, ashes of funeral offerings buried with a body, shells, and organic matter such as animal dung. Uncharred bones are not satisfactory because they contain an insufficient amount of carbon.

Known Samples Verify Method

Accuracy of carbon 14 dating was checked by Dr. Libby and Dr. James Arnold in tests of wood and other matter from Egyptian tombs whose age already was well established by other methods. It also has been tried on a California redwood tree whose age was independently known from the number of its growth rings. The results checked.

The oldest man-made relics in North America dated directly by the carbon 14 method

* See "Man's New Servant, the Friendly Atom," by F. Barrows Colton, NATIONAL GEOGRAPHIC MAGAZINE, January, 1954.



are fiber sandals found by University of Oregon excavators in Fort Rock Cave, Oregon. Their age is about 9,000 years. Basketry fragments from Danger Cave, Utah, dated by charcoal found near by, may be slightly older (page 796).

The oldest American material so far dated which is thought to be of human origin is charcoal from an ancient lake-bed deposit near Tule Springs, Nevada. A carbon 14 test shows it to be more than 23,800 years old.

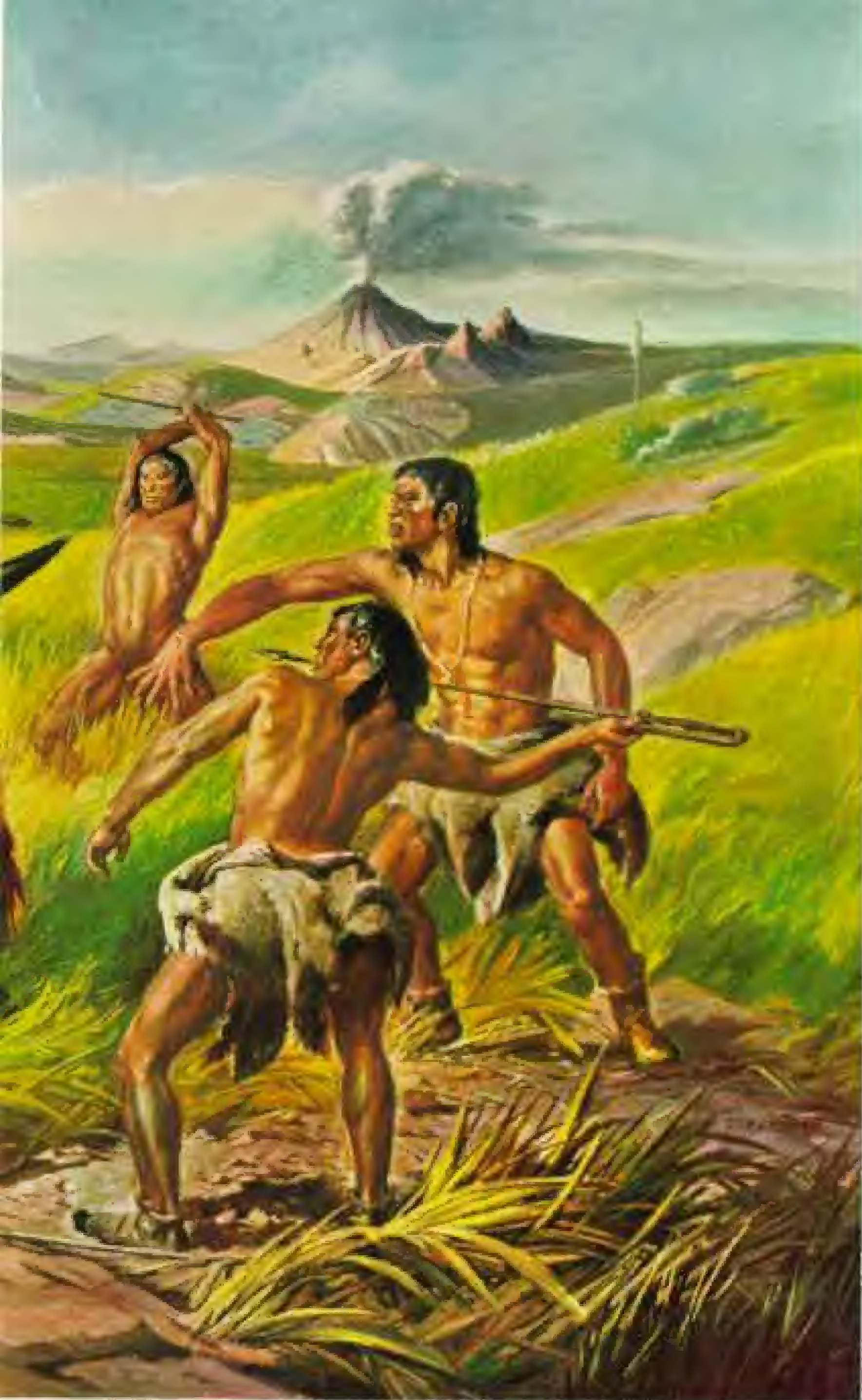
In Europe and Africa, tests bring equally amazing results. Charcoal from Lascaux Cave

in southwestern France, where remarkable paintings were made by ancient hunter-artists, has aged for about 15,500 years.*

A fossil skull, found with many stone implements at the Florisbad site near Bloemfontein, South Africa, has been given a tentative age of at least 41,000 years.

Constantly improving their tools for detecting and analyzing radioactivity, scientists hope soon to calculate tiny remnants of

* See "Lascaux Cave, Cradle of World Art," by Norbert Casteret, NATIONAL GEOGRAPHIC MAGAZINE, December, 1948.



Hunters Spearing an Enormous Bison Suggest *Banderilleros* Placing Darts in a Bull

Bison antiquus fed and clothed early Americans during prehistoric times. Countless herds stalked the plains. They died out mysteriously, as did other Ice Age giants. Today's smaller species, *Bison bison*, commonly called buffalo, survives only in meager, protected herds.

Ancient bison towered over man. A full-grown bull may have weighed 2,250 pounds, or 25 percent more than the present average. Horns of one extinct species measured six feet from tip to tip. Modern bison grow short, curved horns.

These Folsom spearmen spring from ambush at a water hole. One man launches his javelin with a wooden *atlatl*, a throwing stick believed to be older than the bow and arrow. Mexico's Aztecs gave us the word for the device; Tarascan Indians still use the weapon to hunt ducks on Lake Patzcuaro. Other *atlatls* have been found in caves in the American Southwest.

Artist Duroseau depicts Capulin volcano erupting in northeastern New Mexico. Its extinct cone stands eight miles from the hunting site which gave Folsom man his name. Ancient lusus still carpet the terrain.

© National Geographic Society

Painting by André Duroseau

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radiocarbon that will date plant and animal specimens that ceased to live as long as 60,000 years ago.

Several thousand samples of animal and vegetable remains, from most of the 48 States and countries around the world, have so far been tested for age by the carbon 14 method. They include wood from coffins and beams, snail and conch shells, bark, cornucobs, peat, deer antlers, cotton cloth from Peruvian mummies, rope, pine cones, hazelnuts, stems and roots of aquatic plants, wheat and barley, carbonized baskets—and even the linen wrap-

pings from a copy of the Book of Isaiah some 2,000 years old, found in a cave in Palestine.*

In the Old World the human race has been evolving for at least half a million years. There is no credible evidence, however, that any of the higher anthropoid apes or man himself developed in North or South America. Wherever he came from, it was man full-fledged who entered the unpopulated New World (page 782).

* See "Hushemite Jordan, Arab Heartland," by John Scofield, NATIONAL GEOGRAPHIC MAGAZINE, December, 1952.

Sifting Colorado Soil, Diggers Extract Relics and Bones

This valley, called the Lindenmeier site after the landowner, was a temporary home to many of North America's Ice Age nomads. Its appearance 10,000 or more years ago is depicted by the painting on pages 794-795.

Scientists here found the first clues to Folsom man's way of life: charcoal and ashes from campfires, the remains of extravagant feasts, and a workshop where stone workers tediously flaked brittle tools (page 793).

In all, the excavators uncovered more than 5,000 stone implements in the dark layer of soil just above the level where this man pushed his burrow. His companions sift each load of dirt to see that no relic escapes.

✦ As careful as surgeons, diggers pick out bison bones. Before removal each scrap is plotted on a diagram.





Long before, beyond the seas, the human race apparently had developed from creatures like the ape men of Java and southern Africa to the intellectual and cultural level of the pioneers of civilization. By the time primitive hunters were spreading over the Americas, men in Europe, Asia, and Africa may have been approaching the earliest stages of agriculture.*

Meanwhile, impassable seas separated man from North and South America. He came at last out of northern Asia, perhaps a goalless wanderer, perhaps pushed on by population pressures across Bering Strait to Alaska, the nearest thing to a bridge between the Old and New Worlds.†

The possibility that the migrants could have passed dry-footed over such a causeway rests on the geologists' estimate that vast amounts of water were locked in glaciers, lowering the sea level 200 or 300 feet. Even today, Bering Strait can be crossed on waters not more than 150 feet deep.

If man came later, after the glaciers retreated, he may have crossed on the ice in winter; it can still be done. The longest distance between the mainland and intervening islands is little more than 25 miles.

The firstcomers brought with them weap-

ons, a fact that shows they had developed a considerable degree of skill. The weapons enabled them to pursue and slay some of the fiercest and most powerful animals the world has ever known. Before these earliest immigrants, however, lay a vast, terrifying, and unknown wilderness of ice-covered mountains. For generations many of the wanderers doubtless stayed close to the hospitable sea, which provided much of their food.

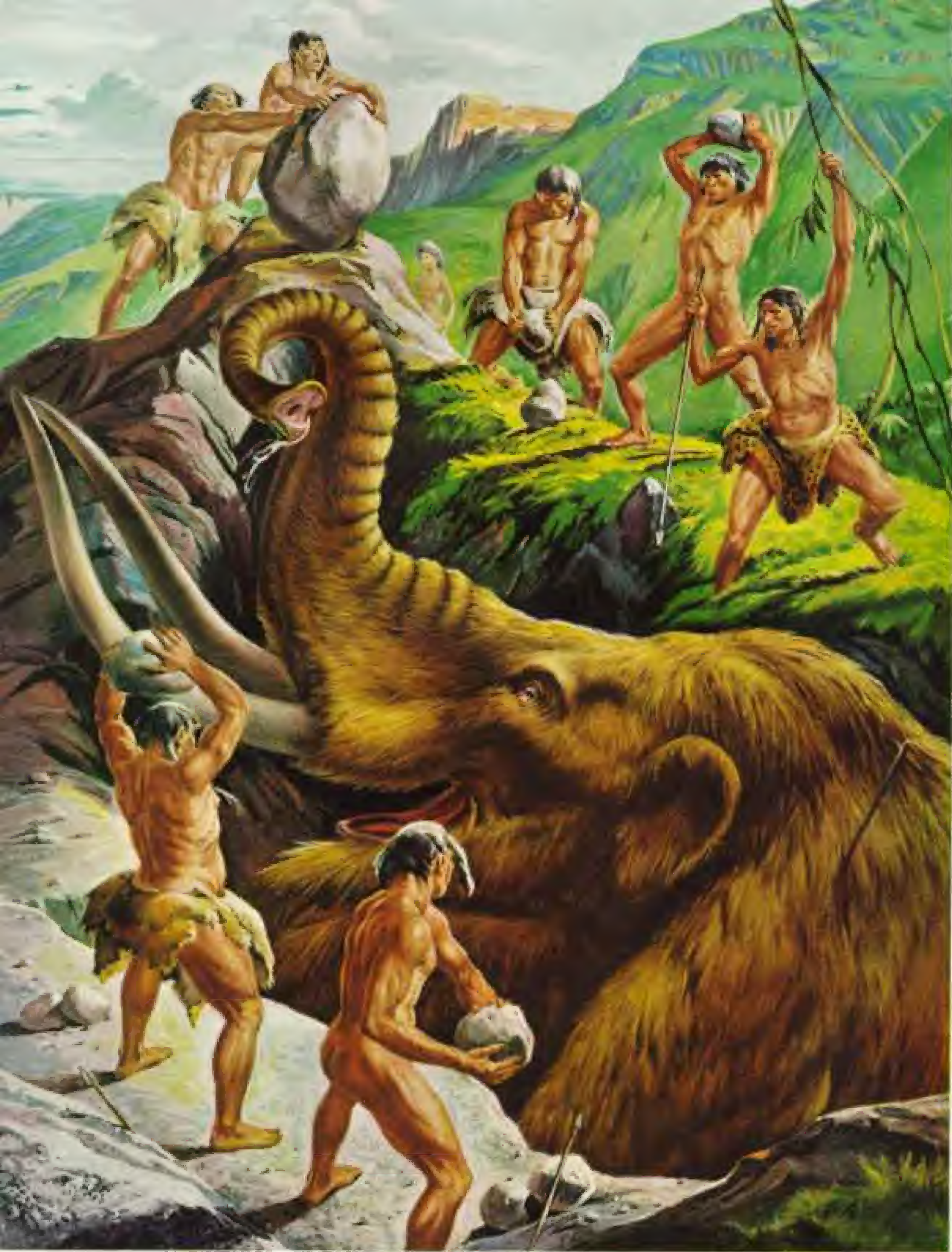
Nomads Inched Slowly Southward

But occasional groups must have ventured inland. Then they moved eastward and northward, drifting through the mountain passes and river valleys which opened before them, always following the game. Eventually a few may have reached the Arctic coast, perhaps somewhere in the neighborhood of present-day Point Barrow, where traces of ancient camps and weapons have been found.

To understand their next move, one should recall that great ice sheets lay over the northern half of North America when man first entered the continent. These glacial sheets

* See *Everyday Life in Ancient Times*, published by the National Geographic Society, 1951.

† See "Exploring Frozen Fragments of American History," by Henry B. Collins, Jr., *NATIONAL GEOGRAPHIC MAGAZINE*, May, 1939.



Primitive Men Use Guile to Trap a Witless Mastodon and Stone It to Death

This flat-headed relative of the elephant arrived in the New World some 15 million years ago. Its dome-skulled cousin, the woolly mammoth, did not appear until the glacial epoch (page 782).

Human relics have been found with mastodon bones from Florida to California. Colonial Americans, discovering the brute's manlike molars, regarded them as the teeth of giants.

Clothed in coarse hair, this beast stands 10 feet at the shoulder. So great is its bulk that spears cannot reach the vitals; hurled rocks kill it slowly. If preserved by cold weather, one carcass could feed the hunters indefinitely.

were at times separated from each other by wide strips of territory free from ice. One of the corridors was just east of the Rocky Mountains and probably embraced the upper Mackenzie River Valley. This passageway from the Arctic into the interior of North America is estimated to have been as much as 200 miles wide.

It was probably this route that the first Americans followed southward. Their long migration could have been only in small groups, for the game would have been too scattered to support large numbers of people traveling together. Beset by hardships in their harsh new homeland, they may well have taken many generations to reach the unglaciated lands to the south.

Although these first humans in the New World left no records, there is little reason to think that they were especially primitive. Not very different culturally from the Old Stone Age peoples of Europe, they made dart points and other implements with skill and ingenuity.

While Ice Age Americans produced no paintings comparable to those made by Cro-Magnon man on the walls of European caves, they can hardly be blamed for it; they must have lived from hand to mouth, continuously on the move, with little leisure to experiment with pictures. It was only when they reached unglaciated regions that they left traces of themselves which anthropologists have been able to interpret.

New Sites Unfold an Old Story

The first generally accepted evidence of the existence of Ice Age nomads in the United States was found buried under a deposit of clay and gravel, 4 to 15 feet thick, near Folsom, New Mexico. Here in 1927 scientists of the Colorado (now Denver) Museum of Natural History, excavating an extinct bison embedded in clay, discovered flaked stone dart points among the bones. They were leaf-shaped and obviously man-made. The implication was that man and bison must have been contemporaries.

Then came discoveries that proved to be a turning point in reconstructing the history of man in the New World. More Ice Age points turned up at Clovis, New Mexico. And for six summers (1935-40) Dr. Frank H. H. Roberts, Jr., of the Smithsonian Institution, excavated at a site located by amateurs in northern Colorado's Lindenmeier valley. Here

he found a gold mine of information left by Ice Age hunters about themselves and their way of life (page 790).

In the near-by mountains were moraines, heaps of earth and gravel left by the valley glaciers of Colorado. By making correlations between these glaciers and the continental ice sheets, geologists were able to estimate the age of the camp site as not less than 10,000 years.

Animal bones scattered in great profusion at the Lindenmeier site showed that the ancient nomads had hunted Ice Age bison and American camels, in addition to deer and several kinds of rabbits.

Folsom Man Left Gaming Pieces

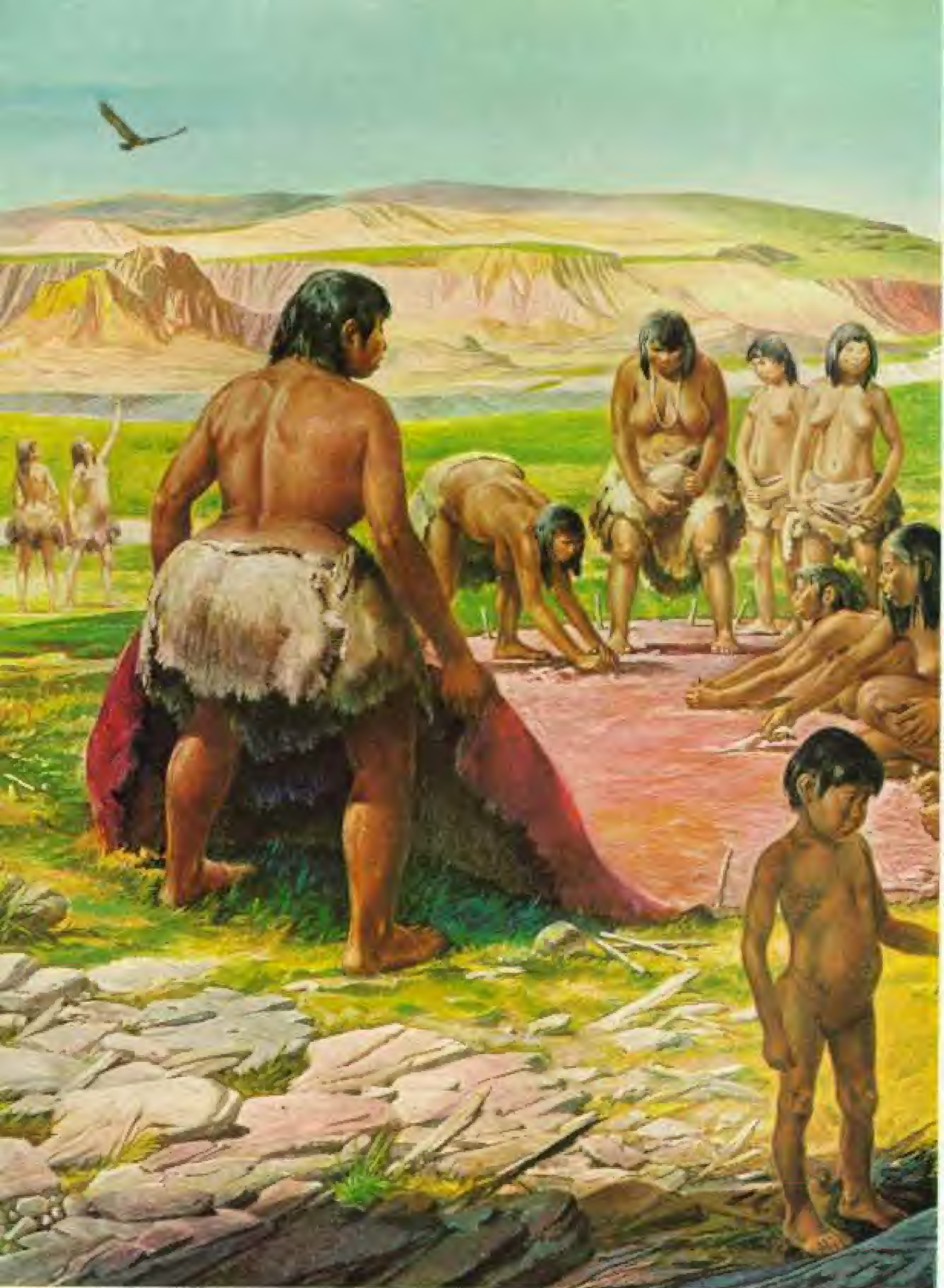
Mingled with these animal bones at the Lindenmeier valley camp site, Dr. Roberts found, were Folsom points in profusion, along with stone knives, hide scrapers, and hammers—more than 5,000 pieces altogether. He found bone beads and even engraved bone disks that may have been gaming pieces with which Folsom man gambled around his campfires. The hunters appear to have set up here a sort of workshop for making dart points.

The Folsom points are marked by fine secondary chipping along the edges of the blades. But their most notable feature is a groove extending from close to the tip along the center on both faces. Perhaps they aided Folsom man in attaching the points to his spear shafts (pages 784-785).

From the abundance of artifacts found at the Lindenmeier valley site it has been possible to reconstruct in some detail the life of Folsom man. This early American, Dr. Roberts reports, was "a typical hunter depending . . . upon the bison for his maintenance and sustenance. He no doubt supplemented his preponderant meat diet with wild seeds and 'greens,' but did not cultivate his own vegetal food.

"He probably . . . traveled wherever the bison moved, in order to support himself. For that reason it is not likely that his dwelling consisted of anything more substantial than a tent made from the skins of that animal.

"Traces of the places where he pitched his shelter will be extremely hard to find at this late date. A hard packed floor and hearth, perhaps some post molds [outlines of post holes], is the most that can be expected.



Mothers and Daughters Stretch a Bison Skin, Stake It Down, and Scrape It Clean

Shaggy skirts and bone beads probably sufficed Folsom woman. Needlelike relics suggest she knew how to sew. Crudely tanned, this hide will provide tomorrow's tent or clothes. Idle girls (left) spy a golden eagle.



Fathers and Sons Hack Steaks from the Skinned Carcass to Roast over an Open Fire

Nomads of 10,000 or more years ago camped in this valley, the artist's conception of a Folsom site in Colorado. They left spearheads, scrapers, choppers, and knives. Distant hunters head off a bison herd.



Paul Holder

↑ Sagebrush Sandals 90 Centuries Old

Pumke, falling into Fort Rock Cave, Oregon, protected these square-toed shoes of shredded sagebrush-bark rope. Radiocarbon tests indicate an age of about 9,000 years.

→ Woven willow fragments survived in moistureless Danger Cave, Utah. Radiocarbon analysis of charcoal near by indicates these textiles were twined some 9,000 years ago—the New World's oldest known basketry.

Weaving thus takes its place in American culture long before the Basket Maker Indians reached their zenith about the time of Christ.

James D. Jennings, University of Utah

He probably tarried as long at the Lindenmeier camp as he did at any of his settlements . . ."

Similar finds near Clovis, New Mexico, were made in a series of dry basins in and adjacent to Black Water Draw and, like those at Lindenmeier, were discovered by amateurs. Fluted points from Clovis are generally larger and somewhat cruder than the characteristic Folsom forms and lack the fine chipping along the edges.

Clovis Points Are Older

The significance of the difference between the Clovis points and those from Folsom was not known until much later. After World War II the Clovis investigations were resumed by Dr. E. H. Sellards and a party from the Texas Memorial Museum in Austin; they found evidence indicating that the differences in the fluted points were attributable to age. The larger examples from Clovis were the older and were found in association with mammoth bones. The Folsom points appear to be refinements of the Clovis type, for use on bison and smaller animals. Together they represent two stages of a general cultural group.

How could a small band of men on foot kill so powerful an animal as a mammoth or bison with nothing but stone-tipped spears or darts? It is unlikely that they used arrows; the bow was probably not introduced until



much later. Obviously, they must have been able to get very close to the great beasts without stampeding them.

Mastodons and mammoths they probably found bogged down in sloughs or caught in other natural traps. As for the bison, the Ice Age hunters doubtless dressed themselves in wolfskins and lay in wait on the slopes of waterholes to which the herds came to drink. Wolves commonly followed such herds and would have attracted little attention. Clovis-Folsom man may even have bowled like a wolf to complete the deception.

Even so, it is unlikely that the early Americans killed bison outright with darts or arrows. More likely they weakened the animal so it was unable to keep up with the herd and eventually dropped from loss of blood. Then the pursuing hunters could rush in with clubs. To cut up the carcass, they had to rely on crude stone implements—a titanic job (pages 788 and 794).

Folsom Man May Have Used Make-up

Clearly, Clovis-Folsom man must have had a high degree of intelligence and courage to pit his feeble body against the mammoth and bison and “make a living” out of them. There is no evidence that he tried to develop agriculture. The large game animals and a few stones gave him all he needed—food, clothing, shelter, weapons, kitchen utensils, and decorations.

Clovis-Folsom man presumably painted his body. A rock with a depression in one side, which may have been a crude paint pot, was found at the Lindenmeier camp site.

He wore ornaments as well. Dr. Roberts found beads made from lignite, tubular beads of bone, and what appear to be pendants fashioned from red hematite. While Ice Age man seems to have appreciated beauty, at least according to his own standards, fragments recovered from the workshop area indicate that he was sometimes careless, lazy, took short cuts, and left his jobs unfinished.

Roasting bison and camel meat over open fires, he had gluttonous feasts. Dr. Roberts uncovered, for example, traces of a large bonfire around which lay a mass of bones that had been charred and cracked, probably to get at the marrow. Among them was a fine assortment of Folsom points, stone knives, and scrapers. Some of the points were burned, as if they had been left in the flesh when large chunks of meat were roasted. Unfortu-

nately for anthropologists, the bison hunters left none of their own bones among those of their game.

The makers of the fluted points wandered far. Their curious artifacts, with slight variations, have turned up over most of the United States east of the Rockies and even near the Atlantic seaboard. Seventy-eight of the points, for instance, have been found in Mecklenburg County, in southern Virginia; 62 were obtained from a site in Dinwiddie County in the same State; and others have been recovered from a site in western Pennsylvania.

Relics from one camp site of Folsom man have been dated by the carbon 14 method. Charred bones from the scene of a large kill near Lubbock, Texas, where finely chipped fluted points were found with the remains of an extinct bison, revealed an age of 9,883 years, plus or minus 350.

The date fits roughly with those of the big Lindenmeier camp site and the original Folsom finds as determined by geologists. Since the Clovis fluted forms occupied a level below Folsom types, they are obviously older. For them a geologic estimate of 12,000 to 15,000 years is credible. Dr. Roberts has suggested.

Ice Age Skull Turns Up in Texas

In 1953 fragments of a human skull were unearthed near Midland, Texas, by a pipeline welder with a flair for archeology. Credited at first to Folsom man because of the tools with which they were found, they were soon revealed to be even older. Skilled analysis of the wind-eroded site proved that the Folsom layer had blown away and its stone artifacts had dropped down to a much older layer of gray sand in which most of the skull fragments were deeply embedded.

Fluorine and other chemical tests showed that the human skull, apparently that of a woman, was contemporaneous with bones of extinct animals found in the same layer of sand. Geological evidence indicates that Midland “man” lived at least 12,000 years ago. Dr. T. Dale Stewart, Curator, Division of Physical Anthropology of the U. S. National Museum of the Smithsonian Institution, fitted some 60 of the Midland bone fragments into a recognizable skull, narrow and similar to that of a present-day Indian (page 806).

Also of apparently greater age than the Folsom remains are artifacts found in a cave in the Sandia Mountains, northeast of Albu-



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† Atomic Clock, a Web of Tubes and Bottles, Dates Ancient Relics

Every living thing contains atoms of radioactive carbon 14. After death these atoms disintegrate at a fixed rate. Scientists, recording the impulses with sensitive radiation counters, can estimate death dates even after tens of thousands of years (page 784).

Glass bulbs here hold carbon dioxide produced from bits of ancient wood at the Lamont Geological Observatory (Columbia University), Palisades, New York. Vapor rises from liquid nitrogen. The gas, at 192° below zero Fahrenheit, solidifies the CO₂ sample so that it may be tested without risk of contamination. Geiger counters gauge the amount of carbon 14.

◀ Wood chips from an archaeological site flame in a combustion tube, producing CO₂.



National Geographic Photographs
Robert F. Sisson

querque, New Mexico. In the floor of this cave were three strata bearing evidences of human occupation.

The uppermost contained artifacts approximately 1,000 years old. Below this stretched a hard crust of limestone sealing a stratum containing Folsom points and bones of bison, mammoth, ground sloth, camel, and wolf.

Sandia Man Used Bolas

Next came a layer of yellow ocher without human traces, and after it a stratum of broken rocks and pebbles mixed with bones of mastodon, mammoth, horse, and camel. In the same stratum cropped up remains of hearths with charcoal, ashes, and fragments of burned bones.

Scattered through this deposit occurred javelin heads which have come to be called

"Sandia points." They vaguely resemble Folsom points and may have been forerunners. Besides these Sandia points, caves in the Sandia and near-by Manzano Mountains of New Mexico yielded stone knives, scrapers, and grooved stone balls suggestive of the bolas once used on the Argentine pampas (page 802).

Similar balls have been found elsewhere in the Southwest and in an Ice Age camp site in Nebraska. In South America the balls, joined by cords in pairs or sets of three, were hurled at birds or animals to entangle their legs and throw them to the ground.

Sandia's artifacts are suggestive of some made toward the end of Europe's Old Stone Age, but were not necessarily produced at the same time. There are indications that the ocher deposit in Sandia Cave was built

Spear Tip and an Extinct Bison's Ribs Bear Witness to Man's Antiquity in America

Embedded in clay between the bones of Ice Age game, this fluted weapon opened a new horizon in North America's past. Evidence of the kill came to light in a fossil pit near Folsom, New Mexico, in 1917. Scientists who inspected the site agreed that bones and spearhead could not have drifted to the same level at different times. Subsequent discoveries confirmed the theory: man had occupied the New World far longer than anthropologists supposed. These relics are preserved within the original earthen matrix.

Department of Natural History



up during a wet period which preceded the last glacial retreat. The fact that the Sandia artifacts, like the Midland bones, were found below the Folsom type indicates they are of greater age or at least as old.

Artifacts like those of this Sandia site have been found scattered rather widely over the Southwest, but have never been discovered in positions which provided reliable geological evidence of their age.

The early Americans also left their calling cards at Gypsum Cave in Frenchman Mountain, east of Las Vegas, Nevada. Long triangular-shaped blades, quite different from the Clovis-Folsom types, appear in strata of the cave floor containing remains of extinct animals. Radiocarbon measurements on sloth dung from the same level give an average age of approximately 10,500 years.

Death Valley's Stone Age

In California's Death Valley Dr. Thomas Clements, of the University of Southern California, and Mrs. Clements have uncovered several hundred stone objects, obviously man-made, on a terrace formed by waves of the long-extinct Lake Manly. Geological evidence indicates that the site compares in age with the Lindenmeier valley camp of Ice Age man—that is, 10,000 or more years ago—and that the artifacts could not have been washed up on the terrace at a later period.

The majority of these items, which were of very primitive workmanship, were evidently designed as scrapers; a few crude knife blades were found, but no points. The users apparently were primitive nomads who caught fish from the ancient lake and lived in part on berries, nuts, and fruits. Perhaps they ate their food raw; no evidence of fire was found.

Other marks of early human occupancy of the Southwest are provided by the so-called Cochise culture. Remains of hearth fires and bones of Ice Age animals have been exposed in eroded gullies in Arizona and New Mexico. The oldest hearths contain hickory charcoal, though no native hickory trees are found in the region today.

The earliest remains left by the Cochise culture include many grinding, scraping, and cutting tools. Possibly these people, too, were largely vegetarian food gatherers.

Charcoal of the Cochise hearths has yielded several carbon 14 dates. The earliest is about 7,500 and the latest about 1,500 years ago.

Presumably the Cochise people lived there all through this long interval.

Perplexing evidence is that of the Conkling Cavern in New Mexico, discovered by Roscoe P. Conkling of El Paso, Texas, and excavated in 1929 by the Los Angeles County Museum.

This "cave" originally was a big, chimney-like hole. Through the ages it had been filled to within eight feet of its mouth with soil and debris.

About 12 feet below the surface was found the claw of a ground sloth. At essentially the same level lay a human skull fragment. The superficial evidence, at least, indicated that the owner of the skull lived at the same time as the sloth. As excavation continued, bones of extinct horse, bear, camel, and sloth were found.

Nearly 10 feet lower, under a seal of water-laid sandstone, was another fragment of a human skull. It seemed to have been gnawed by an animal.

The skulls appear to be much like those of modern Indians. The depth at which the lower fragment was buried, however, indicates that it may challenge the Midland skull as the earliest human relic found in the New World. So far the exact age of the Conkling fragments has not been determined.

Another clue to the early Americans consists of the so-called "Yuma points," named for the county in northeastern Colorado where the first specimens were found. Long, slender blades, they show excellent workmanship, but do not have the facial fluting of Folsom points. The earliest of these may be contemporary with late Folsom types; some sites where they were found have been dated by carbon 14 as being about 7,000 years old. Their use continued almost to historic times.

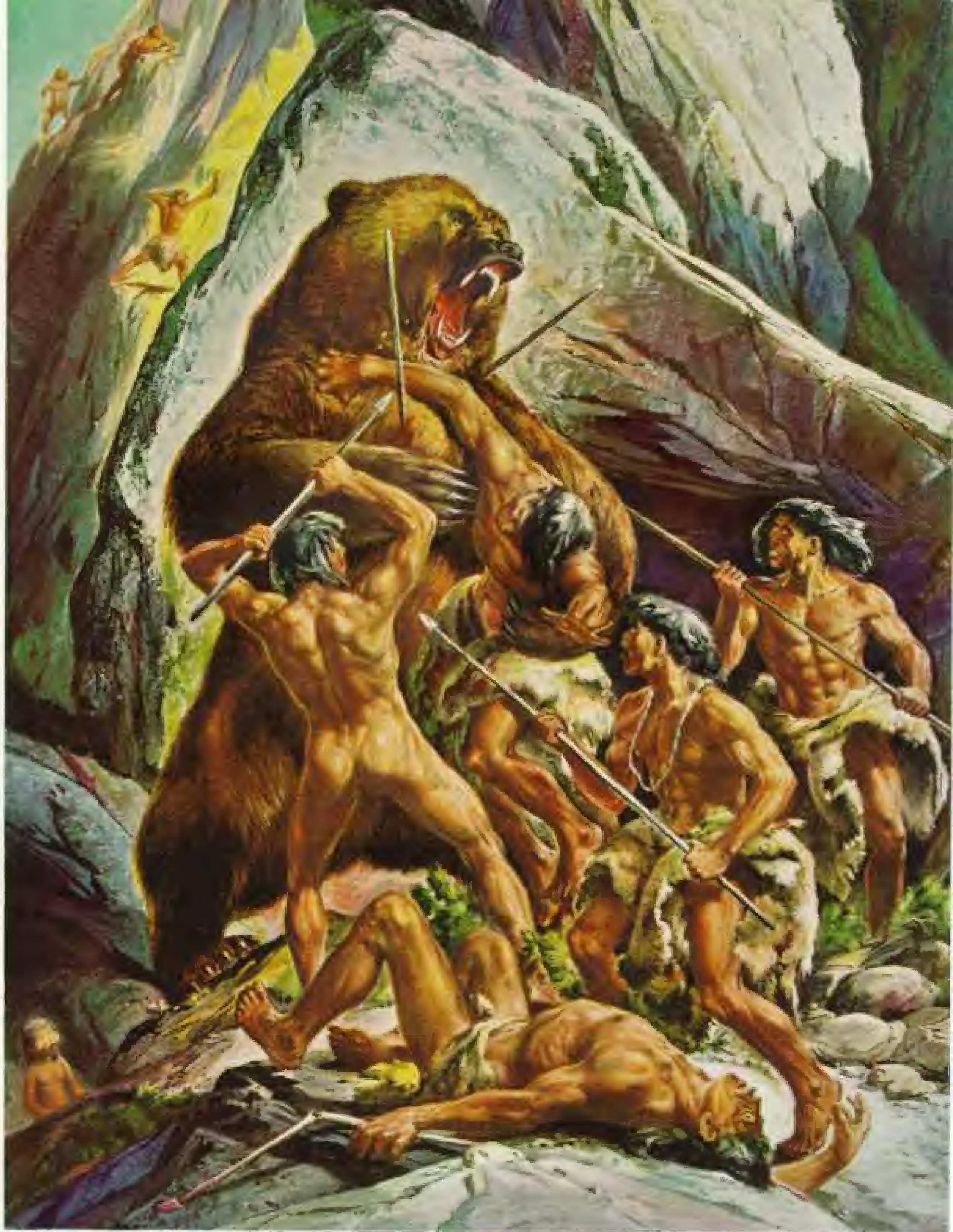
Alaska Yields Stone Age Hoard

Backtracking the ancient trail of the early Americans, archeologists have begun to find what may be evidence of their journey through Alaska.

Deep in a large mound at Cape Denbigh, 115 miles east of Nome, Dr. J. L. Giddings, Jr., unearthed a collection of more than 1,600 small stone tools obviously shaped by human hands. Unfortunately nothing was buried with them which could be used for dating the find accurately by the carbon 14 method.

In the deposit, however, were flint knife blades and missile heads, among them one

(Continued on page 805)

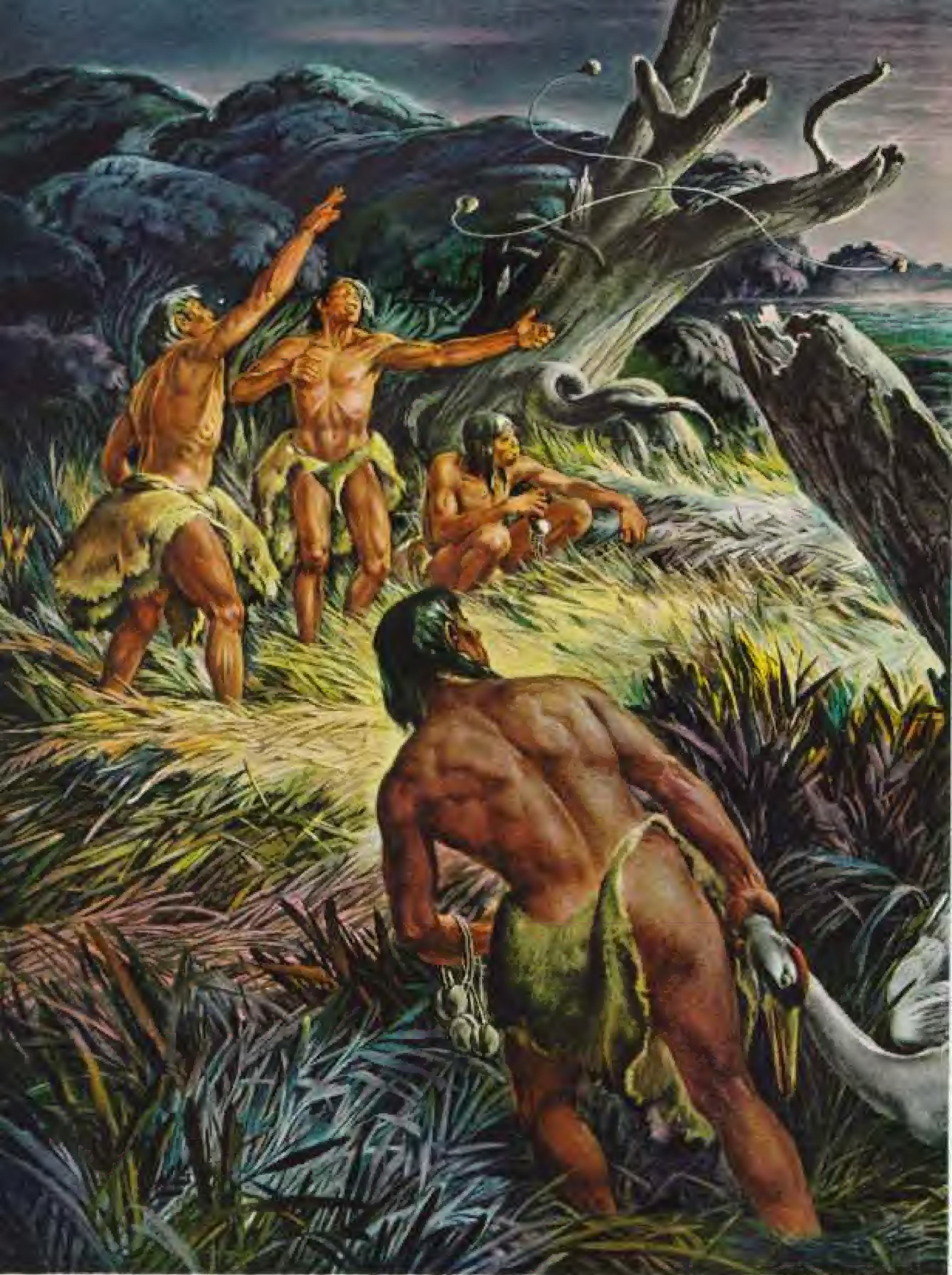


Fighting to Free a Comrade, Mountaineers Jab Lances into a Monstrous Bear

North America's short-faced bears have disappeared. True bears (above) entered the New World in the Pliocene, or Ice Age; a 1,500-pound descendant, the Alaska brown bear, remains land's largest flesh eater.

Early Americans left no evidence that they preyed on the giant bear. Wounded or surprised, the animal must have been too fearsome an antagonist.

Daggerlike claws greet the hunters who blundered into this brute's rocky lair. One rescuer drops lifeless. Reinforcements scramble along a mountain ledge. Spellbound, a child watches the battle.



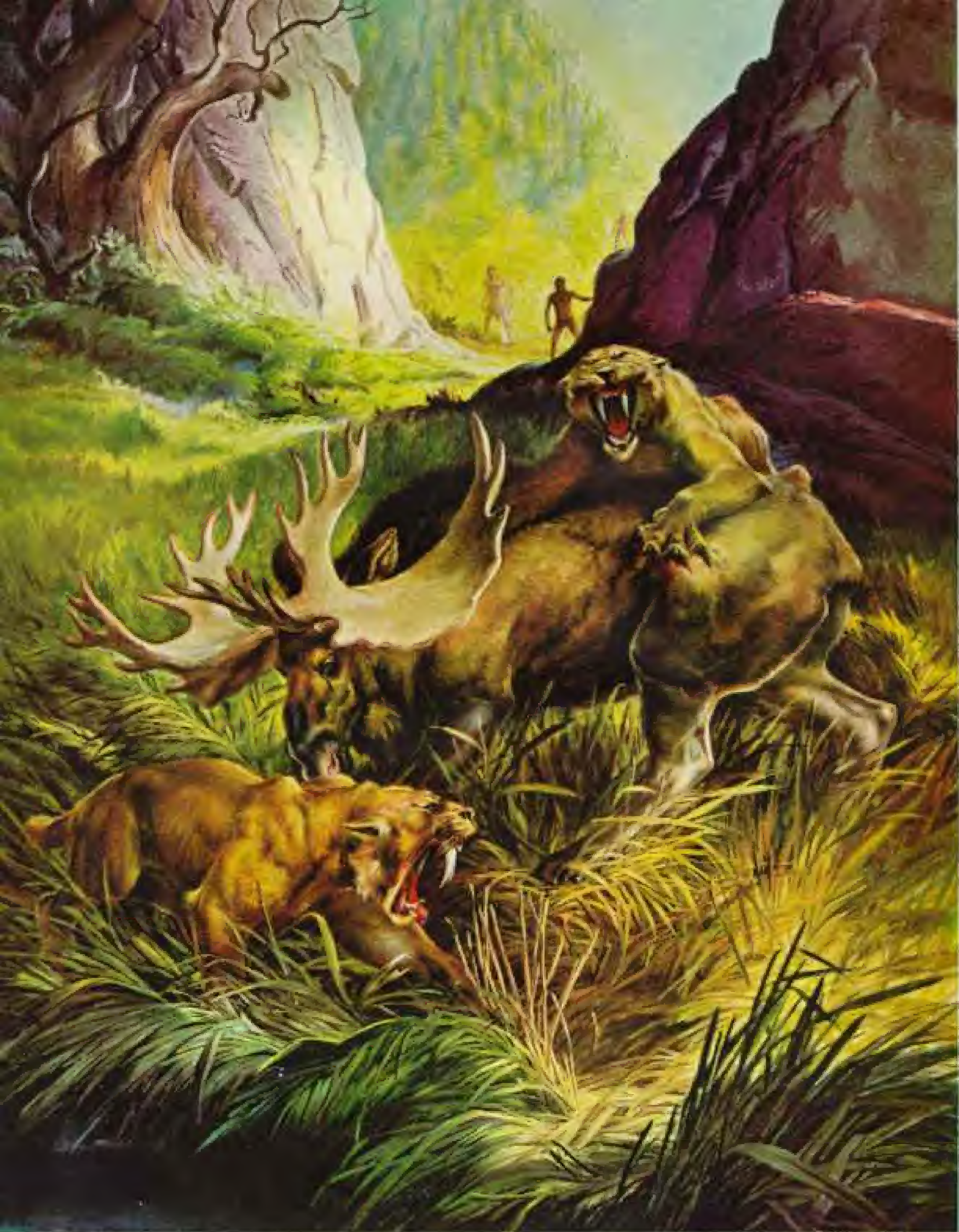
Whirling Balls and Thongs Entangle the Wings and Necks of Whooping Cranes

Grooved stone balls found at prehistoric spots suggest the bolas once used to catch ostrichlike rheas and other game on the Argentine pampas. Spun overhead and released, the missiles rotate like helicopter blades.



Hunted for Thousands of Years, These Stately Birds Now Approach Extinction

Ker-lao, ker-lee-oo! bawled the whooping crane in Ice Age savannas across the continent. Some two dozen birds survive; they winter in Texas. Their secret nesting site in northern Canada was discovered only last May.



Saber-toothed Cats, Terrors of the Ice Age, Strike Down a Mooselike Deer

Bob-tailed *Cervalces* differed from any horned creature now living. The shape of his antlers set him apart from the true moose. Princeton University Museum preserves the only known complete skeleton, discovered in a New Jersey bog. Fearsomely armed with upper canines that sometimes reached a length of nine inches, saber-toothed *Smilodon*—erroneously called tiger—was ideally adapted to preying on ponderous grass eaters. He may have been a victim of his own specialization, becoming extinct when his prey died out.

Here one cat prepares to stab with his tusks. Hunters, not daring to come close, hope to dine on the scraps.

resembling a Folsom point. There were also bits of stone with sharpened edges, known as burins, believed to have been used for cutting ivory and bone.

Similar artifacts, though not burins or Folsom points, have been found in Japan, Mongolia, and northeastern Siberia.*

There is no way of telling whether the remains at Cape Denbigh are those of the first Americans or were left by a later people. Some of the Denbigh artifacts are similar to types made by Eskimos in the Bering Strait region. Geologic estimates of the age of the Denbigh materials, however, place them at 8,500 years ago.

More than 200 human habitation sites have been located along the northward flowing rivers of the high Brooks Range, facing Alaska's Arctic coast. Some apparently are the remains of villages; others are places where stones had been chipped to fashion javelin heads. Many of the artifacts are of modern types, made long since the first Americans crossed Bering Strait from Asia. But others belong to unknown periods. Some are similar to objects found both in the Cape Denbigh mound and in faraway Mongolia.

Fluted points have been picked up near Anaktuvuk Pass, one of the main avenues through the Brooks Range. Perhaps the first Americans pursued game through this pass and thus found their way southward.

Golf Course Yields Human Bones

Though none of Clovis-Folsom man's bones have so far been conclusively identified, scientists are puzzled by several different sets of human remains found in various parts of the New World. About 40 years ago a skull and other parts of a human skeleton were discovered in an old stream deposit near Vero Beach, on the Indian River in Florida. Mammoth and other bones were found near the skull.

A few years later, under a golf course at Melbourne, Florida, some 30 miles north of Vero Beach, a crushed human skull was found in close association with bones of extinct horses and tapirs. Near by were bones of mammoth and mastodon.

This indicates that man and some types of extinct animals were living in Florida at the same time. Perhaps these creatures survived here long after they had vanished elsewhere.

Then there is the mystery of the Minnesota girl, whose remains were brought to light

by a road scraper. Her skeleton was found in clay deposits laid down approximately 20,000 years ago in the bottom of an extinct glacial lake near Pelican Rapids. She may have been drowned after falling through an air hole in the ice of the lake or may have been buried at the spot after the lake dried up.

Found with the skeleton were an implement made of elk antler and a marine shell perforated at one end, apparently worn as an ornament. The shell is of a species now found on the coast of the Gulf of Mexico. This would seem to indicate that at the time the girl lived the country was populated enough for contact between tribes up and down the Mississippi Valley.

When Did Man Reach South America?

South America has yielded a few human remains for which considerable antiquity is claimed, although many scientists disagree. Here man was coming to the end of his long trek from the Bering Sea coast. Made entirely on foot and delayed for long intervals, the journey probably required several thousand years.

Yet carbon 14 measurements of organic remains in one Chilean cave which also contained human artifacts at the same level give an age of 8,639 years, plus or minus 450. This, one of the oldest accurately determined dates for man's presence in the New World, would indicate that the first Americans had traveled all the way from the Bering Strait to the southern tip of South America at that early time.

Notable among South American finds is a skull from the Punin district of Ecuador. It was found in a deposit which also contained bones of extinct animals—an Andean horse, a camel, a mastodon, and a giant sloth.

The nearest bones of extinct animals lay about 50 feet from the human relic. The skull itself has some primitive features, but it could be that of a recent Indian.

Even if Ice Age mammals and man were contemporaries in the foothills of the Andes, the time might not have been as much as 10,000 years ago, for some of the creatures are believed to have survived in South America long after they had become extinct in the north.

A human skeleton found in the State of

* See "Explorations in the Gobi Desert," by Roy Chapman Andrews, NATIONAL GEOGRAPHIC MAGAZINE, June, 1933.



Partial Skull of Midland "Man" Appears to Be That of a 12,000-year-old Woman

Midland, Texas, near which the fragile fragments were discovered, bestowed its name on this early settler. Her sex was suggested by the small size of the cranium, and her approximate age was determined by geological evidence (page 797). The discolored skull of Tepeupan man, another primitive American, rests on the white box. This middle-aged male lost most of his teeth before he died in Mexico 11,000 to 12,000 years ago.

Dr. Frank H. H. Roberts, Jr. (page 791), examines these casts at the National Museum, Smithsonian Institution, Washington, D. C. Dr. Roberts, Associate Director of the Smithsonian's Bureau of American Ethnology, gave freely of his knowledge to assure the scientific accuracy of this article and the paintings.

Minas Gerais in Brazil shows somewhat better evidence of antiquity. Located under a layer of stalagmite in the rear of a cave, it had been buried under about seven feet of sediment evidently washed in by floods from a near-by lake. In the same stratum were bones of an extinct horse and a mastodon.

Time Still Obscures Ice Age Man

Geological evidence suggests that the stalagmite dates from a rainy period which both continents experienced after the last great glacial advance in North America. (South America was never covered by ice sheets except in the high Andes and Patagonia.) Nobody knows how long this rainy time lasted. Bones of some of the animals found in the cave are those of creatures fairly abundant in the same region today. The

human skull is not very different from those of Brazilian Indians of the present. Still, fluorine tests show it is contemporary with the fossil bones in the same cave stratum.

Until new discoveries are made, or new methods are arrived at for evaluating material already in the hands of scientists, the family tree of man in America is doomed to remain a dim tableau of figures glimpsed through the glacial mists of many centuries.

Perhaps we shall never know what Sandia man looked like or when the first Asian huntsman walked into the new hunting grounds of North America. But we have learned a little about these first Americans who came from Asia to people the other side of the world. And, slowly, scientists here and there may continue to clear away some of the mist.

New National Geographic Map Reveals Volumes of Atlantic Lore

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THE world's mightiest range of mountains winds from the Arctic to Antarctica. It is longer and wider by far than the Andes, and its peaks average 10,000 feet high. One giant, Pico in the Azores, rises 24,000 feet.

But human eyes have seen only the loftiest pinnacles of this range. All the rest lies in perpetual darkness, under thousands of feet of cold Atlantic water.

Known as the Mid-Atlantic Ridge, these mountains, along with a whole system of valleys, canyons, and plains, make up the submarine topography of the National Geographic Society's new 10-color map of the Atlantic Ocean, mailed with this issue of its Magazine to 2,150,000 member-families all over the world.*

Map Bares Ocean's Hidden Contours

Within the map's area, from the Gulf of Mexico to the Mediterranean and from Baffin Bay to the brink of Antarctica, lies the entire Atlantic, a vast S-shaped trough covering about one-fifth of the earth's surface.

Never before has so much information been contained on a single map of the Atlantic. Using the latest surveys and weighing facts from a library of scientific reports and historical journals, National Geographic cartographers have painstakingly produced an authoritative and colorful portrait of the ocean that separates the Old World and the New.

Depth soundings, contour lines, and seven shades of color reveal the hidden geography of the ocean floor on the main map. In the graphic inset in the lower right corner, mountains and valleys buried under countless tons of water appear in bold relief, as if the ocean had been drained.

A table at upper left gives great-circle distances between important Atlantic cities. Brown-ink arrows show the paths of prevailing winds; red and blue arrows mark the routes of major Atlantic currents, red for warm and blue for cold.

Pushed westward by the trade winds along the Equator, then blown in the opposite direction by prevailing westerlies to the north and south, the currents form two vast orbits, clockwise in the North Atlantic, counterclockwise in the South.

With the winds, these enormous "rivers in

the sea" affect the climate of huge populations; they help canny sea captains shorten sailing time, and mean life or death to millions of fish. For instance, a minor shift in the Gulf Stream once caused such a drop in water temperature that a 4,000-square-mile area of sea was strewn with the bodies of cold-killed tilefish; it looked for a time as if this popular food fish would be wiped out.

Tiny blue circles strung across the North and South Atlantic indicate the limits of ice drifting from the great polar caps, a grave danger to ocean vessels before radar. Ship symbols indicate far-flung ocean weather stations. "Rugged Is the Word for Bravo" (page 829) dramatically describes life aboard one of these isolated ships.

Seventy-four red-letter notes on the map offer members and their families the opportunity for a fascinating and rewarding armchair cruise. The notes provide a wealth of knowledge about the Atlantic, its islands, and bordering lands.

For instance, what country by gaining its independence changed the limits of a continent? Where is the celebrated whirlpool that put "maelstrom" into the English language? Where are the world's northernmost coral reefs, its highest tides? Where are the "doldrums" and the "roaring forties"? Where do the United States and Great Britain operate an oversea proving ground for guided missiles? The map notes answer these and many other intriguing questions.

First Voyage Around Africa's Tip

Here are recorded the main events in Atlantic history from 600 B. C., when, says Herodotus, Phoenicians rounded Africa's tip, to the laying, in 1955-56, of the first transatlantic telephone cable (page 808).

The Society's Atlantic map presents an up-to-date "progress report" on a subject of wide present-day interest—oceanography, the science of the currents, winds, contours, temperatures, depths, and composition of the sea, the plants and animals in it, and the re-

* Members may obtain additional copies of the Atlantic Ocean map (and of all standard maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices, in the United States and elsewhere, 50¢ each on paper; \$1 on fabric. **Indexes to place names, available for this and most other maps, 25¢ each.** All remittances payable in U. S. funds. Postpaid.



Atlantic's First Telephone Cable Heads for Europe Out of Newfoundland

For the three cable partners, the United States, Great Britain, and Canada, H.M.T.S. *Monarch* laid a 2,250-mile line from Clarenville to Oban, Scotland, June to October, 1955. Returning from Oban next summer, *Monarch* will lay a second cable along the same route. This route had been charted previously with great precision with electrical soundings from a ship. Cable was made in the United States and Great Britain according to specifications worked out by the American Telephone and Telegraph Company.

lationship of each of these to the others.

Though it has many roots in the past, oceanography as a science is less than a century old. In 1872 the British research ship *Challenger* began a 69,000-mile voyage through three oceans with a crew of scientists, studying the seas as they went. Making soundings by the older method—weights on miles of rope—*Challenger* was the first to report in detail on the Mid-Atlantic Ridge.

Echo Sounders Record Bottom Contours

It was a far cry from *Challenger's* early attempts to the expeditions sponsored in 1947-48 by the National Geographic Society, Columbia University, and the Woods Hole Oceanographic Institution. From the steel-hulled *Atlantis*, scientists made hundreds of depth measurements along the bottom from Newfoundland to the Azores and south as far as Dakar and Barbados. To learn more about the geological structure

of the bottom, they recorded the echoes of hundreds of explosive charges. To determine the composition of the sea floor, they raised numerous samples of silt, mud, sand, and rock, using dredges and corers on cables six miles long.*

Based on their findings and those of similar expeditions, the new map presents a three-dimensional picture of the Atlantic far more detailed and accurate than would have been possible even a few years ago.

To present this full-length portrait of the Atlantic and the lands it washes, National Geographic cartographers chose the time-honored projection of Gerardus Mercator, famous Flemish mathematician and geographer of the 16th century. After nearly 400 years it is still the standard for sea navigation the world over.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Exploring the Mid-Atlantic Ridge," September, 1948, and "New Discoveries on the Mid-Atlantic Ridge," November, 1949, both by Maurice Ewing.

By Full-rigged Ship to Denmark's Fairyland

Svendborg Mariners Nostalgically Re-create a Golden Age of Sail
When the Isle of Fyn Sent Its Craft to the Earth's Corners

BY ALAN VILLIERS

809

With Illustrations from Photographs by Alexander Taylor and the Author

ABOARD a full-rigger as upright and graceful as a Balinese girl, I sailed to Denmark's fairyland, the lovely isle of Fyn.

Held gently between silvered arms of the sea, Fyn is indeed an enchanted place. Ram-parted castles and romantic châteaux look down on ordered fields and woods kept as neatly as a park.

Timbered and half-timbered houses stand along the tidy streets of little villages. Some of the buildings were there when Columbus sailed the Ocean Sea. They look on the world with tranquil equanimity, as they have done through many a troubled epoch in Denmark's history.

Beloved Author Born in Fyn

In the port of Odense, Hans Christian Andersen was born; last year the town celebrated the 150th anniversary of his birth. And in the fairyland of Fyn, Andersen conceived some of the wondrous tales that still delight the children of the world.

By the island port of Svendborg loom remnants of thick oak woods, the stuff of which a host of slipways fashioned vessels that knew alike the balsam scent of Viking shores and the fragrance of trade winds along the rolling road to Cathay. Now all the slipways but one are gone, and the shipwrights' sons till the fields. But Svendborg still looks much as it always did.

Christopher I gave the town its charter 700 years ago. Were the King to return today, he would still know his way about the steep little streets. He might even recognize some of the hand-painted signs that have hung above the stores since medieval times (page 816).

By full-rigged ship was the right way to come to Fyn. It was, indeed, the only way for a sailorman like me. Svendborg had called a convocation of sailing ships to celebrate the 700th anniversary of its charter, and I was aboard the Danish schoolship *Georg Stage* of Copenhagen (København).

We had come around from Nyborg, Fyn's

port for the huge ferries that lift automobiles and the Esbjerg-to-Copenhagen trains across the Store Bælt (Great Belt) to Korsør (map, page 812). With the *Georg Stage* boys I had taken an hour ashore at Nyborg to visit a famous castle, where, they say, a pet monkey once carried off an infant king.

Ny means new and *borg* is castle. Nyborg built its castle back in the 12th century to protect Fyn against the Wendish pirates who came marauding up the Store Bælt. Nearly five centuries ago, the legend says, when King Christian II was a babe in arms, the monkey snatched him from his cradle and leaped with him to the highest spot on the battlements.

There it held the infant for hours. Frantic retainers dared not come too close lest it drop the princely bundle to destruction. They need not have feared, for the animal was devoted to the royal child and brought him safely down in its own good time.

I looked at the rugged battlements, so peaceful now, and thought for a moment how much of strife they had seen since the monkey scared the royal family. It seemed only yesterday that British and American bombers, navigating by the Store Bælt as it lay silvered in moonlight, winged their way to Kiel and a hundred other objectives.

Sea Road Like a River

From Nyborg three roads lead south to Svendborg, but it was the sea road for me. It is not far, and the water in the Store Bælt on a summer's day is like a river.

From the ship I saw the pattern of satin-smooth fields, some green like lawns, some brown with the surface soil worked almost to the texture of baby powder. Well-trimmed larch hedges crisscrossed the farms, and the smell of fruit mingled with the perfume of lilacs when the breeze came off the land.

As we came sailing in toward Svendborg, the shipshape homes of the mariners of Taasinge kept watch on us. Some were thatched, some roofed in the modern fashion. All looked so well-kept that I could imagine them sum-





Schooners Shelter at Svendborg, Where Sail Still Survives

Center of the Danish schooner trade, Svendborg is one of the few remaining ports where wooden ships are built.

In times gone by the town's brigs and barkentines carried Denmark's flag to distant waters. Waldemar the Victorious gave Svendborg its trade privileges, and in 1253 Christopher I granted it a charter.

To celebrate the charter's 700th anniversary, Svendborg called a convocation of sailing ships.

The stationary schoolship moored at left has been a fixture in the harbor for years. The three-master at right is *Peder Møst*, a participant in the jubilee. Beyond her stern a vessel awaits overhaul.

Svendborg's sea-borne commerce centers around the ivy-laced customhouse at extreme left.



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← Girls in Denmark Are Bicycle-minded

Page 810: One of every two Danes owns a bike. Most are built locally; a popular make is named Hamlet. Youngsters learn to ride almost as soon as they walk. Adults cycle to and from work. On sunny days the roads and lanes teem with cyclists.

"The bike has ceased to be a means of transport," one observer remarked. "It has become a universal element along with earth, water, fire, and air."

These girls pedaled to Svendborg's waterfront to see the *Georg Stage* (page 823).

♣ Flowers and fruits find a ready sale in Svendborg's open-air market. The Church of Our Lady, capped by a bell tower, crowns a hill in the center of town. Key to the tower door is kept in the firehouse at left.

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Svendborg Stands on the Coast of Fyn, Denmark's Second Largest Island

Outgoing cargoes come from Fyn's neat farms. Safe waterways lead to rich markets in Scandinavian and Baltic countries. Germany's Kiel Canal gives islanders handy access to the North Sea.

moned to the break of the poop at 11 each morning while their old sea-dog owners inspected to see that all was well and everything as it should be!

To port the tidy homes crowded down to the gentle strand. To starboard the leafy walk to Christiansminde was lined with cheering sun-tanned children. Small yachts skipped here and there, leaning to the slightest air, and everywhere the red-and-white flag of Denmark blew nobly against the bluest of skies.

Witch's Broom Marks Svendborg Harbor

Afar, the tall tower of Bregninge Church broke the skyline. From that tower, said the leathery old pilot, who had been a sailorman in the China trade, he could count 20 castles and 60 churches and even see to Germany.

Suddenly the full-rigged ship swept past a tall buoy surmounted by what seemed an outsize witch's broom. Had Hans Andersen designed these channel markers? Then Svendborg stood before us.

Swinging into the wind, the full-rigger halted a moment in her sailing stride while the tide bore her on. High aloft, a hundred pieces of stout cordage rattled on the bleached-white sails, swelling gloriously in the morning wind. Blocks thumped against iron wire shrouds. Lines sang through fair-leads.

Lithe and brawny young arms wrestled with

the task of canting the vessel's yards. Orders in mellifluous Danish rang from the poop.

Soon the little ship with the black hull and golden masts settled decorously to her harbor stride and stood on toward the wharves. The sea lapped smoothly past her steel sides, a hand lead plopped into the blue water, and the youthful leadsmen clanted the depths.

The grizzled old Svendborg pilot permitted himself a smile to see the classic stuff of square-rigged seamanship carried out so well—and carried out by a group of 80 young Danish boys, none of whom had ever trod the deck of a sailing ship a few months before.

The little harbor was full of gaily beflagged shipping. Much of it, I noticed, still stuck to sails, even if only as auxiliaries, and my spirits soared to see it. A great concrete building whose central tower is designed in the form of a ship's bridge—the famed Svendborg Navigation School—dominated the waterfront.

We came alongside between a little black topsail schooner and another full-rigged ship, the stately *Danmark*. A thousand maidens came rushing along the quay on bikes, all lightly clad in gay summer garments. With them were their elders, also on bikes; on many a handlebar and luggage rack, behind many an attractive young matron, rode smiling babes to see the sights.

Big blond men, all wearing black bowler



← Young Sailor
Wears the Togs
of Yesteryear

Peder Most, juvenile hero of a Danish sea story, was celebrated for his red hair.

To publicize Svendborg's 100th anniversary celebration, the town chartered a schooner, renamed her the *Peder Most*, and manned her with town boys. Crew members dyed their hair flaming red and dressed in the style of old-time seamen. Sailing into dozens of Danish ports, they carried news of the forthcoming jubilee.

Schooner *Arden* in the background serves as a basic training vessel for boys at one of Svendborg's sea schools. Old and no longer fit for sea duty, she floats permanently in the harbor (page 811).

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Svendborg Girl Glows
in Sunshine and Salt Air →

Danes are outdoor enthusiasts. In leisure hours they hike or cycle across rolling countryside and swim from the sandy beaches. Sailing is a national sport. Sea air and exercise produce a healthy nation.

The island of Fyn, birthplace of Hans Christian Andersen, is often called the garden of Denmark.

Svendborg, on the island's southwest coast, is a regatta center. Yachtsmen from all parts of the world ply its waters in summer, cruising among the tiny islands that stud the sound.

This wind-blown lass looks out across the water. Over her head the Danish flag snaps in the breeze.





Yachts Crowd the Round Svendborg Marina. Ferryboats Use the Slip at Right

hats like businessmen in London, were on the quayside too. And, best of all, children of every age frolicked beneath the cranes and dockside mill roofs gay with bunting.

This was Svendborg in gala week. We in the ships came in for more than our share of attention. Even here the sight of full-rigged ships was rare, and I think that every merry-maker came at one time or an-

other to bid us cheery welcome to the town.

I had heard of Svendborg, of course. But whereas landsmen thought of it as a summer vacation land, I pictured a Svendborg timelessly wed to the sea.

Here, I knew, was the Kings Point* of the

* See "Kings Point: Maker of Mariners," by Nathaniel T. Kenney, NATIONAL GEOGRAPHIC MAGAZINE, November, 1935.



Pine Homes with Flagpoles and Tile Roofs Reflect Danish Prosperity

Danish merchant service. Here was the center for such schooner trade as survived in Danish and near-by waters. And here was one of the last few ports where artisans still built ships of wood.

Svendborg, Troense, Thurst, and near-by Marstal were big names in the days of small ships, when ocean trade went in sailing vessels rarely registering more than 300 tons. Sailing

into Svendborg, you can see Taasinge and Thurst, wooded islands just across the narrow sound.

All three places, not long ago, rang with the sound of axes felling the giant oaks and the silvery *tonk* of the wooden mallet on the calking iron. This August day no sound of ax or adz rode the summer air, and more than a score of shipbuilding yards were gone.



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Youthful Tars March Past Svendborg Shops...

In medieval times, when craft guilds began to challenge feudal rulers, proud artisans displayed signs above their stalls. The custom lingers in Denmark and other countries of northern Europe. Svendborg shopkeepers, who scorn factory-made neon signs, still display elaborate hand-carved and hand-painted insignia.

Glistening red boot hangs above a shoe store. The chef (left) has been bearing delicacies to customers of a coffee and pastry shop since 1827. A goldsmith's wooden sign (lower left) is gilded with the metal of his trade. A golden *kringle*, or pastry (below), advertises a baker's wares.

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...Whose Signs Proclaim Each Tradesman's Art

Early-rising young sailors from the *Georg Stage* head across town to a shipping and agricultural exhibition. A civilian cyclist momentarily serves as rear guard. Danish flags line the thoroughfare. Roofs, gleaming in the morning sun, are pitched high to let snow slide off.

Grapes swing above a wine merchant's door (upper right). Waiter with tray signals a café. Monogram and wrought-iron scissors announce a men's tailor (lower right). Tobacconist's symbol (below) illustrates an old method of packing tobacco, which was rolled into coils of various thicknesses.

© Reproductions by Alan Siddle (top center) and Alexander Taylor



My friend F. Holm-Petersen, the noted Danish sea historian, stood beside me on deck while we were sailing in and pointed out where the yards had been.

"There was Christian Møller's," he said, but I saw only trees and a shelving strand.

"And there, the yard of the Bom brothers, with another where Nils Nielsen built good ships." I saw a pretty girl dive into the limpid sea, but no sign of any ships.

Few places were ever better suited for building wooden sailing vessels. In this respect Svendborg resembles much of the coast of Maine. Sheltered anchorages on both sides of a deep sound, an abundance of wood, a network of waterways stretching to Germany, the North Sea, and the Baltic—all these were factors in giving the venerable town its pre-eminence in shipping.

Then, as now, the hardy Danes were good

seamen, and the fields of Fyn gave them many a tasty cargo to sell abroad. Across the North Sea, where their Viking forebears used to raid, were the rich markets of England.

Seamen who could build ships to weather the wild North Sea and sail to England soon learned that the North Atlantic was only wider, but little wilder; and a ship that could take the North Atlantic in her stride, summer and winter, could sail anywhere.

Sails Grow Scarce in Svendborg

So the little Svendborg brigs and barkentines and Marstal barks and the Troense schooners and brigantines carried the Danish flag around the world, and they were manned largely by the men of Fyn.

All that is gone now. No one charters a brigantine for a salt-fish cargo, Newfoundland to Cádiz, nor a schooner to Port-

Youths Study the Shipmaster's Arts at Famed Svendborg Navigation School

The school dates from 1852, but its present building is post-World War II. Here in a concrete replica of a steamer's closed bridge, students at left work with a magnetic compass. Another peers into a modern gyroscopic compass. A fourth handles a pelorus, used for taking bearings. Instructor checks time.

Alexander Taylor



madoc to lift Welsh slates for Italy. No brig sails anywhere, except one in the distant East, in which maybe I will sail one day if God wills.

Even in the Baltic there are few if any nonpowered schooners sailing now. But there are hundreds of motor ketches and auxiliary schooners run to a fine economy, often as family ventures, taking some profitable share in the nearer trades. They told me in Svendborg that this was yearly becoming more difficult. Even a motor ketch must be heavily powered, and engines cost money.

With Capt. J. P. Nørgaard of the *Georg Stage* I paid a visit to Fyn's last wooden-shipyard. This was Jørgen Ring Andersen's famous place. The gaunt ribs of a large schooner building for the Greenland trade rose from a heap of wood. Alongside the wharf lay two other wooden schooners.

Apart from power saws and other mechanical equipment, the Ring Andersen yard does not appear to have changed much down the centuries. The Greenlander on the stocks would have been a splendid ship for Sir John Franklin, explorer of the Arctic, or Sir Martin Frobisher before him.

Shipbuilder Ring Andersen himself, still active though well past three-score years and ten, showed us the builders' half-models of the ships he has launched over the years. Polished to a soft glow, they were crowded so thick on the walls of



Swan Spouts a Shower in a Harborside Fountain

Danes regard with tolerance the sight of children paddling in public pools. This functional statue in Svendborg is a copy of a bronze figure near Rosenborg Castle, in the King's Garden, Copenhagen. The sculptor H. E. Freund executed the original more than a century ago.



↑ Paint Shop's Façade Reflects the Merits of Its Merchandise

Bright flowerpots garnished with blooms attract attention to Thorbensens's store in downtown Svendborg. *Sol-Persienner* are venetian blinds.

If the sparkling appearance of Svendborg homes and public buildings is a criterion, the town's paint stores must thrive, says the author.

← Farmers' Carts Brim with Food and Flowers

Townpeople hurry to the market place on Saturday morning. Early arrivals get first choice of meats, fruits, vegetables, and flowers hauled from farms close by.

Wigger's Gaard (House) is a fashionable men's shop that furnished costumes for the crew of the *Peder Møst* (page 813).

The half-timbered building reproduces a Danish style that was common in the 15th and 16th centuries. Carved beams support overhanging stores. Flower boxes brighten generous windows.

his office there was scarce room for one more.

They were not all schooners. Many small barks and barkentine models grace this museum of lovely ships, and in the yard outside were craftsmen who could, if called upon to do so, build from these models more good ships of Danish oak.

As I went back to Svendborg's port, a three-poster came in, a black tall-masted vessel that might have sailed out of the 18th century (page 825). Music sounded from her wooden decks, which were crowded with boys.

And what boys these were! I could hardly believe my eyes. Was this an apparition, come sailing into fairyland? Every one of the forty-odd lads on deck or swarming in the gaily dressed rigging wore 19th-century sailor's clothes: tarred wide-brimmed hat, brass-buttoned seaman's jacket finishing at the waist, stiff canvas trousers, and buckled black shoes (page 815).

Memento of a Seafaring Redhead

The name of the schooner was *Peder Mast*. She secured alongside, and I saw another curious characteristic. The boys all had bright-red hair. Forty young Danes in the costumes of a century ago, and all as red-headed as Highlanders! Who had thought this up?

"The *Peder Mast* is shipowner A. E. Sørensen's schoolship," explained Captain Nørgaard. "This summer he's filled her with lads in costume to sail around Denmark and make some publicity for Svendborg's jubilee."

"But the redheads—I didn't know there were so many in all Denmark. Where did Sørensen recruit them?"

"He didn't recruit them at all," smiled the captain. "He made them. That is red dye on Danish towheads. The sea story here for whom the schooner is named had flaming hair."

"These are local boys on holiday from school. So much do they love being in the schooner for a cruise that they do not mind dyeing their hair!"

Myself, I wondered what their mothers thought of it.

The lads swarmed ashore and formed up behind their band. The hair flashed in the sun—all shades of red from dignified auburn to the crimson that made one 10-year-old look as if he had dipped his head in a tub of paint.

Whump! went the drums, and *oomph!*

blared the horns. Away they marched, through the town and out to the exhibition at near-by Ollerup, where there were festivities and speeches. All the children in town followed them, full of delight and envy.

It was a gay, heart-warming jubilee there in Svendborg. There were open-air theaters, pantomime shows, pageants, and dancing in the streets. There was a flower show and an aquatic carnival.

Denmark's King and Prime Minister came to visit, with other friendly dignitaries. Youths and girls from all Scandinavia hiked in to the town. I met other youngsters who had come from the United States.

Crowds jammed the Navigation School, one of the best in the world. People climbed the high concrete "ship's" bridge to admire the view and to gaze at an array of the latest navigational appurtenances. Fyn's youthful mariners might still be indoctrinated under sail, but they also had to master radar and echo sounders and all the other useful devices of the electronic age.

The keynote of the jubilee was Ships and the Sea. Fyn well knew she would never have prospered without her seamen and her ships!

The King helped to keep the atmosphere nautical by coming to Svendborg in his yacht, the slender clipper-bowed *Dannebrog*. She tied up alongside a wharf, and crowds gathered at all hours to admire her glittering brightwork, her gleaming white paint, and the notables gathered on her capacious afterdeck for official visits with royalty.

Svendborg Richly Flavored by the Sea

Wherever I went—to Sørensen's stately home, to the splendid seamen's school outside the town, to the little homes of Taasinge and Thurø, into the churches and the timbered houses—I was reminded of the sea.*

Mr. Holm-Petersen's thatched house in Troense is filled with priceless prints of the ships of Fyn, most of them built in the local yards. His home is called *Skipperhuset*, the Skipper's House.

Indeed, almost any house in south Fyn might with justice take the name, for hereabouts are more old skippers to the square mile, it seems to me, than anywhere else.

I met some of them, cheerful old-timers who could yarn of being shanghaied out of

* See "2,000 Miles Through Europe's Oldest Kingdom," by Isobel Wylie Hutchison, NATIONAL GEOGRAPHIC MAGAZINE, February, 1949.



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Photographs by Alexander Taylor

Motor Torpedo Boats of the Danish Navy Call on Svendborg. Nazi Flags Flew from Their Sterns in World War II

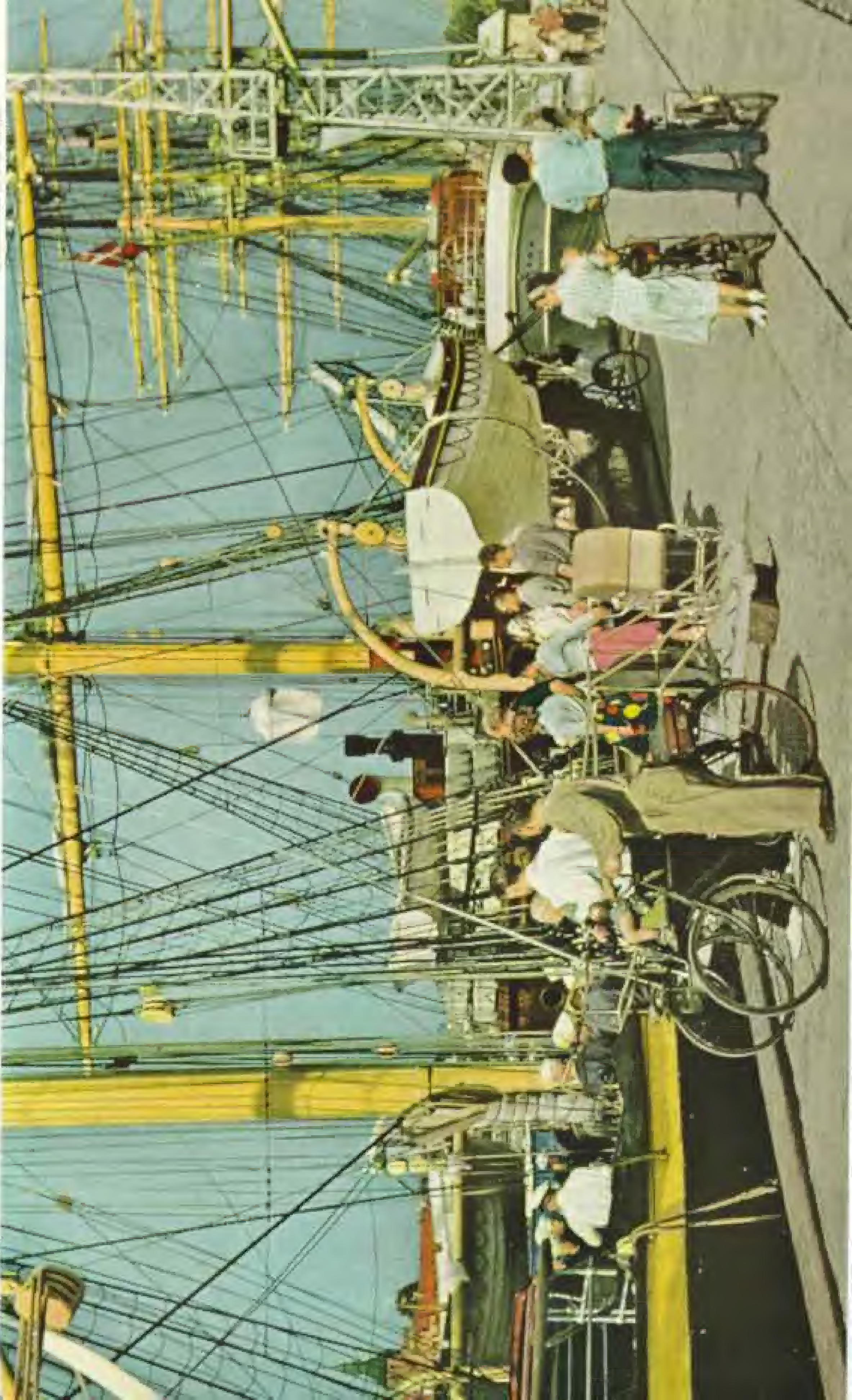
Denmark's fleet includes frigates, submarines, mine layers, and coastal destroyers. The Kingdom purchased these German E boats from U. S. occupation forces.

Square-rigged Schoolships Lie Alongside the Quay. Townfolk Watch Junior Seamen Fall Out on Deck

George Stage (left), a privately owned ship, teaches basic seamanship. State-operated *Danmark* offers further training for officer candidates.

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© Kodak Press by Theo Vithen



San Francisco, and of wild adventures off Cape Horn or in the Arctic ice. They told their stories calmly, these quiet elderly men, for to them the strangest adventures the world could offer were but the ordinary stuff of the only life they knew.

The boys from the full-riggers took a prominent part in the jubilee water carnival. Crews from the *Stage* rowed against the lads from the *Danmark* and the Lauritzen topsail schooner *Lilla Dan*.

There were contests in which the boys stood, dressed in bathing trunks, in cockle-shells of boats and sought to knock each other overboard with great padded swabs on long poles (page 827). Some of the American youths visiting Svendborg told me they played the same rough game at summer camps in their country, only they substituted fragile canoes for the little boats.

Danish Deepwatermen Learn to Swim

The boys swam like fishes when they hit the water. Indeed, the water carnival had swimming and diving contests in which the youngsters took part. They teach swimming at mariners' schools in Denmark today; I remembered how few of the deepwatermen in the Cape Horn square-riggers I once knew could swim.

Finally the youthful crews of the *Stage* and the *Danmark* put their vessels under sail right in the harbor, to show the children and the other citizens who had never before seen such a thing the noble sight of full-rigged ships under sail (page 827).

The *Georg Stage* stayed only a few days at Svendborg. She is a little steel full-rigged ship, built in 1934 to replace the ship I bought and renamed *Joseph Conrad*; the *Conrad* now is at the Mystic Seaport, not far from New London, Connecticut.*

The *Stage* has an American counterpart, the much larger bark *Eagle*, in which the United States Coast Guard Academy trains its officer candidates in full support of the Danish view that seamanship is best learned under sail. I have had the privilege of crossing the Atlantic in *Eagle* as she took a crew of cadets on a cruise to Europe.†

Property of a group of shipowners and leading citizens, the *Stage* commissions in Copenhagen each April and decommissions in September. In those few months life aboard is tough, but few of the boys ever quit her, although they could if they wanted to.

She had come to Fyn after her annual North Sea cruise, a hard sail across from stormy Scotland. Now she had had her bit of rest, and it was time to go.

As we cast off, the gods of the sea favored us with a breeze off the land. No grimy tugs for us! Snowy canvas billowed to life aloft while the *Stage* still touched the wharf, and we moved into the stream with only the wind for power.

Our lads had hoped the *Danmark* would follow and challenge to a race, but only *Lilla Dan*—no match for the full-rigger—put to sea. We raced the little schooner, nevertheless, with our captain using the unequal competition as excuse for hours of exhausting maneuvers and changes of sail.

As Captain Nørgaard pointed out, there is nothing like a square-rigged ship for keeping young boys tired! And 80 boys, all crowded together in a little windjammer, need to be thoroughly tired at the end of each day's work if a skipper is to have harmony and true discipline aboard.

What do the boys think about it all? I asked them—shipowners' sons, stevedores' sons, ship's carpenters' sons, farmers' sons, schoolteachers' sons. One and all, they delighted in it, from the morning "shower" in cold Baltic water to the order sending them to their hammocks at night (page 828).

"This is the life!" they said, these boys from the seagirt land of Denmark.

Sails Glean with Sunset Colors

I stayed with the *Stage* while she and the *Danmark* were getting under way together, finally making ready for their friendly race. Then I left at last, for I had the mundane world to get back to. As the lifeboat set me ashore, both vessels burst into clouds of white sails, piled on majestically one atop the other above the graceful hulls.

It was near sunset as I caught my last glimpse of them against the blue waters of the Bælt and the heather-clad hills of Fyn. The sunset touched their symmetric sails with red and gold. The wind was quiet, and they slipped along with an age-old majesty.

As I watched, I thought them like golden ships from a wondrous fairyland, and I half expected at any moment to see them sail gloriously up to the sunset clouds.

* See "North About," by Alan Villiers, NATIONAL GEOGRAPHIC MAGAZINE, February, 1937.

† See "Under Canvas in the Atomic Age," by Alan Villiers, NATIONAL GEOGRAPHIC MAGAZINE, July, 1955.



Jubilee Visitors Jam Svendborg Harbor. *Peder Most* Breaks Out Holiday Dress

Since this picture was made, Scotland's Outward Bound Sea School has purchased the *Peder Most*. The Duke of Edinburgh renamed her *Prince Louis*. Student seamen from the *Danmark* row the boat in foreground.





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Cadets Stage a Water Carnival; Spectators Crowd the Sailing Ships

Georg Stage boys, aged 15 to 18 (above), rowed against crews from the *Danmark* and *Lilla Dan* and competed in swimming and diving contests. Balancing in cockleshells, they sought to knock one another overboard with padded poles (below).

← Climaxing the festivities, *Georg Stage* sets her sails in the harbor. "She was blessed with a flat calm, else she would never have attempted it," says the author. She lies between the white-hulled training ship *Danmark*, also a tall-rigger, and two smaller windjammers.

Page 826, lower: Children pack the forecastlehead of the *Georg Stage*. Chain stops support the old-fashioned anchor.

↓ *Georg Stage's* cadets watch the water sports from the yards.

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Illustrations by Alan Villiers





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Georg Stage Boys Thrive on the Sailor's Life

The schoolship stayed only a few days at Svendborg. With a strict and full curriculum to carry out, she could not linger long in any port, however attractive.

Following the festivities, the three-master slipped quietly from Svendborg's quay, going under full sail. For a few days she sailed around Fyn, running first through Svendborg Sound with the *Lilla Dan* in company.

She tacked and she wore and she boxhauled, and she backed her main yards to take her way off. Then the ship dropped a lifeboat, which raced back and picked up an imaginary man overboard. She could set every sail in seven minutes and take them all in again in ten.

Her 80 cadets learned to lay out on the high yards in a gale and fight the wind-stiff, rain-soaked canvas like veterans.

Above: A mate on the poop briefs one youngster on the standard compass.

← A shower of cold Baltic water starts each day at 5:30. Fyn lies in the distance.

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Illustrations by Alan Villiers

Weather Patrol Aboard a Coast Guard Rescue Ship in the North Atlantic Calls for Three Weeks of Skill, Stamina, and a Strong Stomach

By PHILLIP M. SWATEK

OUT of the snow squalls and the darkness of weather station Bravo, a towering wave glided down on the U.S. Coast Guard cutter *Half Moon*, a white chip on an empty winter sea midway between Newfoundland and Greenland.

The cutter, an observation outpost for the North Atlantic ocean-station program, lifted her bow and struggled upward to keep from being buried in the avalanche of water. Except for the diesels and the rumble of storm winds above, there was a strange hush in the dark ocean valley.

Then, at the crest, wind tore at radio wires and shrieked through the radar antenna turning at the masthead. Frozen spray rattled over the length of the weather ship.

Green Water Buries the *Half Moon*

On the bridge, Comdr. S. G. Guill gripped the arms of his captain's chair. Lookouts beside him locked their fingers around stanchions and handholds. The helmsman planted his feet wide apart, leaned against the wheel, and stared past the flip-flopping windshield wipers.

In the galley amidships, cooks held anxiously to trays of bread dough ready for the oven. An engineman far below swiped at his greasy hand with a rag and grabbed for the railing. Then it hit.

The *Half Moon*, running down the vast mound, couldn't lift up for the following wave, and her bow plunged into solid water. A deep boom like an underwater explosion rammed back through the ship. The cutter recoiled and shuddered.

Below decks, men caught their breath and waited, their mouths open but wordless. Men on watch edgeted and fumed or gave the trembling ship a soft word or two.

Tons of green water tore across the cutter's crusted decks. A column of sea vaulted from the bow to burst against the bridge and stun the windshield wipers. Free of the blades for a moment, ice glazed over each clear wedge of glass.

Then the cutter rolled wearily from under her load of sea water. The deep vibration

eased out and the wipers thrashed again, as friendly as crickets in the night. Commander Guill fussed with his lighter and pulled the flame down into his pipe. Sailors in their bunks breathed deeply and rolled over. Pen scratching picked up, and the sailor with the red spade beard said, "Come on, play the card."

From wave to wave the black hours passed, deliberate as hours are with nowhere to go. A movie on the mess deck unreeled a bright tinkling dream that vanished with the lights and the noise of the sea. Taps. The lights went out. Sailors who can sleep escape at least for a little while the weight of time on a three-week weather patrol. For those who lie and wait, listening, time presses down harder each day.

This was the subarctic tedium Commander Guill had warned me of when we first discussed the weather patrol back in Cincinnati. When the commander was transferred from the Ohio River to the North Atlantic, I had asked to go along. I felt more should be told of the Coast Guard's role in the international weather project. Too many people had the idea the Coast Guard never went beyond sight of land.

Weather Vessel Built for World War II

Commander Guill's ship was built as an auxiliary seaplane tender for the Navy. The *Half Moon* and vessels of her class transported thousands of Navy flyers in the course of World War II.

As one of those pilots, I made an Atlantic crossing on a sister ship, then the U.S.S. *Unimak*. Now, 10 years later, I came aboard the *Half Moon* and was shown to quarters still marked "aviation officer's bunkroom." For a moment I had the feeling that the war was still on and I had simply been on leave.

It didn't take me long to discover, out on the wintertime North Atlantic, that the intervening decade had made me no heavier, particularly at night. During the day it is possible to muster a little bravado, despite the storm. The familiar routine of the day, the endless whistles piped over the ship's loud-

Sea and Cold Wind Batter Men and Ship on Weather Patrol

No matter how fierce the elements, vessels of the United States and other nations keep constantly on the move in their 210-mile squares of ocean. Day and night they measure the weather and sample the atmosphere; findings, radioed to forecasters ashore, help make safer passages for ships and aircraft.

Here the U. S. Coast Guard cutter *Panckharstein*, wallowing in the trough of towering seas, battles the kind of blow encountered regularly on the North Atlantic's station bravo. Seamen, struggling to secure gear on the ice-strewn bow, seldom venture away from lifelines strung along the deck.

U. S. Coast Guard official

speaker system, and the directives that always start with the strident "Now hear this!" were somehow reassuring.

But at night it is difficult to borrow casual courage. Lying flat on your back in the darkened bunkroom (you roll too much on your side), listening to a locker door creaking and banging and waiting for the booming forward and the long, unhealthy shudder, you find that pessimistic thoughts are hard to dismiss.

If anything did go wrong, there would be no chance to launch lifeboats in these waves, even if the launching blocks and tackle weren't frozen and caked with ice. Average winter temperature of the sea water is 51°. A man adrift without special immersion gear—something considerably more special than my tweed jacket—could stay in it only five minutes and live. Any kind of human help was hundreds of miles away. The Coast Guard cutter was expected to take care of herself.

Loran Aids Atlantic Navigators

Up on the *Half Moon's* shadowy bridge the night of the storm, one of the sailors on watch made his way to the captain's chair and said, "It's midnight, sir."

The cap with the gold braid bobbed. The pipe glowed briefly. "Aye," Commander Guill said, and moved back to the navigator's table.

Lt. Albert Frevola juggled the tuning knobs of the loran set and then flipped the electronic navigator off. "Loran" is a contraction of "long range navigation." Powerful transmitting stations in the loran chain are fixed on the mainlands and islands bordering the Atlantic. Navigators get their bearings by picking up signals from two of the widely spaced transmitters.

The signals are translated into numbers which correspond to lines drawn on the loran map of the Atlantic area. The navigator finds one line from his first reading and an-



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other from his second. His position is where the lines cross.

"We're still on station, Captain," Frevola said, after he had plotted his position on the navigation chart. "But I figure we'll be blown off in another hour."

"What's the wind velocity?"

"It's between 50 and 60 knots, with gusts up to 75. The waves are running up to about 40 feet, as nearly as I can tell."

Commander Guill straightened. "Hold your course until morning if you can, Mr.



Frevola, but keep her into the sea. I don't want to take any of this broadside."

"Aye, aye, sir," the navigator replied. He looked down at the spot on the chart he had seen a thousand times. Ocean station Bravo—a 210-mile square in the frigid storm track between Newfoundland and Greenland (see the National Geographic Society's new 10-color map, "Atlantic Ocean," a supplement to this issue). Except when storms buffet the vessel, she stays within a 10-mile square at the station's center.

Bravo, named after the second word of the international phonetic alphabet, is appropriately if accidentally titled. Hands down, it is the coldest weather patrol of them all.

Going out on deck is something everyone avoids if possible, particularly when the wind carries spray back over work areas. Men who participate in the old sailors' pastime of beard-and-mustache growing suffer out of all proportion when they have to work on deck under these conditions.

Lt. Comdr. Walker Noe, the *Hall Moon's*



Home from Weather Station Bravo, *Half Moon's* Crew Mans the Rail off New York

Masts bristle with radar antennas and other complex gear designed for spotting planes and measuring speed and direction of winds aloft. Such ships patrol Atlantic and Pacific stations for 5-week stretches. Coast Guard's 2,592-ton *Half Moon* is one of 17 Navy seaplane tenders converted into floating weather observatories.

executive officer, developed a magnificent handle-bar mustache. A busy "Here, let me show you" officer, he took vigorous charge of the first ice-breaking party, forward of the five-inch gun. It was cold and there was a good sea running.

After half an hour Commander Noe barreled up to the bridge to report to the captain. His great mustache, which had always been white, was droopy and lifeless. It was frozen solid. Because his face was numb from the bitter wind and spray, Commander Noe hadn't known what was happening.

Commander Guill took the report and then ordered his executive officer below and into a steaming shower before the iced mustache could frostbite his upper lip.

"There's no Coast Guard regulation against having a beard or mustache on patrol up here, but it's not a wise thing to do," Commander Guill said. "If you were caught in an open boat, you'd have a better chance with a clean-shaven face."

Commander Noe preserved his mustache,

however, and wore it back to New York when the ship returned from Bravo.

The *Half Moon* is one of 21 U. S. Coast Guard cutters fitted out to patrol four Atlantic stations assigned to the United States. Ships of Great Britain, France, the Netherlands, Norway, and Sweden man five more, with financial assistance from about seven other countries. All appear on the National Geographic's new Atlantic map.

Ships Stand By for Rescues

Positions of Bravo and other stations were fixed by the representatives of the participating nations with four things in mind.

First, the ships stand by in their assigned areas of the ocean, ready for immediate rescue work. Thus, if trouble develops, ships and aircraft crossing the North Atlantic have a friend somewhere near. Logs of the weather ships contain terse accounts of fishermen taken from sinking trawlers, disabled ships towed to the nearest port, critically injured seamen transferred from their ships to mainland hos-



pitals, and aircraft crews rescued from the sea after ditching.

And if all goes well on the Atlantic, navigators, especially those in the air, can use the cutter's radio beacons as signposts, the second consideration in setting up the stations.

A third and valuable reason for their existence is as a communications relay, to assist in transmitting messages through difficult atmospheric conditions.

But most important is the weather. There are tumultuous areas where, partly because of winds, ocean currents, and contrasting sea temperatures, much of earth's bad weather gets its start. The Davis Strait and the sea between Iceland

Balloon Away! A Helium Bubble Lifts Instruments Aloft

Every 12 hours observers aboard a Coast Guard weather ship send up a radiosonde, a balloon-borne box containing devices to gauge high-altitude temperature, humidity, and pressure, and a tiny radio transmitter to send back readings to the ship. Here a weatherman launches a balloon. His partner holds a radar target (left) and radiosonde.

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Coast Guard Crewmen Battle a Weather Ship's Grim Enemy: Crippling Rime Ice

Blanketed in frozen spray, vessels become sluggish and hard to handle. In heavy seas, when a ship may roll 60° out of the vertical, the added weight brings danger of capsizing. These seamen on North Atlantic patrol assault the foe with mallets, picks, and shovels. Sometimes they use steam jets (page 841).

and Greenland are two such storm rookeries. Meteorological data collected in these regions fill forecasting gaps that can't be filled any other way.

Four U. S. Weather Bureau observers were aboard the *Half Moon* for the January patrol. They worked in pairs around the clock. Regardless of conditions, they made observations every three hours and dispatched radio reports to Washington, D. C.

Weathermen Work Despite Storm at Sea

The storm battering the cutter was not allowed to disrupt the weather schedule. Two hours past midnight, James Bagnell, supervising observer aboard, and his partner, Walter Sutton, forced themselves up the swaying ladderway to the bridge and stood uneasily while their eyes opened to the gloom and the stare of green-eyed dials. They watched how the rolling ship was taking the seas and on which

side the wind carried the heaviest spray.

"I don't think there's much choice," Sutton observed, "unless it's getting back in the sack."

They checked another wave pounding over the bow and then agreed the port side was taking less of a beating. Leaving the bridge, they went below and stood before the watertight door between them and the open deck.

The two men waited to hear the booming forward and the following rush of water go past. Then they hurriedly unbolted the door and slammed it shut behind them. Pulling themselves along on a heavy foul-weather guide rope, they made their way aft toward the weather shack, a garage-sized box built over the fantail of the cutter. Buffeted by wind and sleet, the two men got to their pitching office and tumbled in through the heavy door.

They went right to work. Sutton, in the

back section of the building, hooked a helium gas nozzle to a limp yellow balloon. When the sphere had swollen to seven feet in diameter, he sealed it shut and left it anchored to the deck.

From a storage shelf he took down a radiosonde, an airborne observation device encased in cardboard, no larger than a shoebox. Inside the cover were instruments to gauge temperature, humidity, and air pressure, and a miniature radio transmitter that would send the readings back to an automatic receiver inside the weather shack (page 833).

After the radiosonde and recording instruments were checked, the observers returned to the balloon. Bagnell attached the radiosonde at the bottom of it and, below that, two crosses of aluminum foil, which would serve as targets for the ship's radar. Before opening the overhead door to the storm, they discussed their launching strategy.

Take-off Crash Amuses Crew

Launching in pleasant weather often drew a small audience of seamen working on deck. It was, after all, one of the events of the day. There was something compelling about an enormous balloon and cargo being deliberately allowed to escape. Furthermore, there was always the possibility of a faulty balloon and a take-off crash, a hilarious thing for the sailors, even if a rankling one for the Weather Bureau men.

But high wind and waves, compounded by ice and darkness, make launching a less attractive event. The night of the storm Bagnell and Sutton, one holding the delicate radiosonde, the other with the gas bag at leash, had to get out to the end of the balloon-release platform near the cutter's stern to make sure the balloon would have a clear ascent. They also had to judge the ship's roll perfectly and get the rig aloft before a wave could race in to smash it down.

With their plan set, Sutton spun the door chain through its block, the overhead door creaked up on its tracks, and the night storm spread before them.

Sutton side-stepped his way out to the balloon-release platform, keeping just ahead of Bagnell and the thrashing yellow ball. The senior observer held the balloon high with one hand to keep it from pounding on the ice crusts, and with the other gripped the bridge railing.

At the end of the platform the weathermen

squinted over their shoulders and saw the bow rise to a crest. "Now!" Bagnell shouted. Both men, in a slow-motion arc, boosted the rig up and away from them. The heavily loaded balloon hung for an instant and then swept away. It dipped and rose and was lost in the black sky. The pair scrambled back again.

Inside the weather shack a continuous rec-

A Specter Moves Along the Deck

Masked and goggled against biting cold, a Coast Guard man uses pressure hose to sluice snow.

C. R. Coast Guard Official



ord of temperature, humidity, and air pressure was already started on the graph. The shipboard receiver would continue to get signals from the dangling radiosonde until the balloon exploded in the reduced pressure of the stratosphere. Then the whole rig would plummet into the sea. "Balloon burst" is anywhere from 70,000 to 100,000 feet.

"CIC to weather," the radar operator called back on the intercom from his guarded cell deep in the center of the ship. CIC—combat information center—is the ship's most vital

Epic Rescue: Weather Ship *Bibb* Saves 69 Aboard a Downed Airliner

While bucking Atlantic head winds in October, 1947, the flying boat *Bermuda Sky Queen* found its fuel insufficient to reach Newfoundland or return to Ireland.

The *Queen* came down on a storm-tossed sea near the Coast Guard cutter *George M. Bibb*, patrolling ocean station Coxa (then Charlie), 840 miles east of Newfoundland. *Bibb's* men took all passengers and crew aboard; the job required 24 hours (page 839).

Here a loaded lifeboat heads back to the cutter from the doomed plane.

☛ Coast Guard crew members lower a lifeboat in rescue drill, a daily routine when weather permits.





spot, its nerve center. A little blip of light had just popped up on the operator's screen.

"Weather. I just picked up your toy balloon," the radarman went on. "Don't know how long I can hold it tonight. Man, is this vile!" And he began calling off every 60 seconds the distance and direction of the climbing wind-driven sphere.

From this progressive plot the weathermen determine the wind at any altitude the balloon reaches while still in radar range. Under average conditions radar can follow the targets attached to the sphere some 50 miles. However, the balloon may still be climbing long after it escapes the electronic eye.

By the time the radar plot and graphs were computed and the weather report was ready for transmission, about two hours had passed. Bagnell, tired and drawn under the stark light, was working on the last page of the report. He typed furiously when the carriage

tilted down-wave, then plunked deliberately when the rolling ship made the carriage work slowly uphill.

Radioman Relays Storm Report

When Bagnell finished typing his report of the storm conditions, he stuffed the paper into his parka. He and Sutton checked to see that all the instruments were off and that the chairs, the stool, and everything else not welded to the deck or bulkhead were secure. Then the two weathermen clambered back over the open deck to the cabin area forward.

At a half-door barring the way into the radio room, Bagnell fished the typed sheet from his coat pocket.

"If you've got nothing to do later on, send this singing telegram, will you?"

The radioman looked at the haggard observer and grinned. "Yeah. Might even do it right now!"



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STAFF PHOTOGRAPHER

♣ **Bridge Watch on Station Bravo
Can Be Cold Duty**

Seaman Charles R. Wise uses his headset to relay messages between the bridge and all parts of the cutter *Half Moon*. He and fireman Robert S. Williams, both wearing special cold-weather clothing, converse under the ship's bell.

♣ George, an old sea dog whose amiable disposition belies a fierce countenance, has made many voyages as the *Half Moon's* mascot.

W. Irving Tuttle, Newark News



While the observer's struggles and the resulting weather reports affect everyone, they are vital to those in aviation. The ocean-station network was developed primarily to benefit Allied flying in World War II. Hundreds and eventually thousands of American-built warplanes flew east across the Atlantic in the course of the conflict.

To get these planes over safely, weather forecasts for landing fields in the British Isles had to be reliable. It was also important, of course, for the Allies to have accurate forecasts for bombing missions over the Continent. Storms generally move from west to east, and forecasters had to know what was happening over the ocean. This meant observation stations scattered across the Atlantic.

Three weather ships—two British, one American—were lost, presumably to enemy action, during the war. In view of the ships' extreme vulnerability, so few losses could be considered fortunate for the Allies' cause—unless the Germans had devised some means of picking up the meteorological data for their own uses.

With the armistice the weather ships were withdrawn and the project abandoned. But it was already apparent to many, particularly transatlantic aviators, meteorologists, and scientists in related fields, that the international project would be immensely useful in peacetime.

A year after the war's end, on September 17, 1946, representatives of Belgium, Canada, France, Ireland, Iceland, the Netherlands, Denmark, Norway, Sweden, Portugal, Spain, the United Kingdom, and the United States met in London and agreed to establish a network of ocean weather stations in the North Atlantic.

With the pressure of war gone, the program got off to a slow start. A year passed and fewer than half the planned stations were manned. Congressmen began wondering about the project's value.

The weather patrols might have been dropped then and there. But one October afternoon in 1947 a heavily loaded flying boat, the *Bermuda Sky Queen*, labored into the air with 69 persons aboard, bound west from Ireland to Newfoundland.

Over the sea in the early morning hours the bulky flying boat was all but stopped in her tracks by violent head winds. The plane droned on into the storm, each long mile over the ocean costing more and more in gasoline.

Freight Plane Picks Up *Queen's* Distress Message

Before dawn, Capt. Charles Martin asked his navigator to get one last position fix. He got another painstaking reading on what was left of his 20-hour fuel supply. Then he knew. They were not going to reach Newfoundland. And they didn't have enough fuel to return to Ireland. Captain Martin decided to come down at sea beside the Coast Guard Cutter *George M. Bibb*, patrolling station Coca (then Charlie), 840 miles off the Newfoundland coast.

Because of radio trouble, *Bermuda Sky Queen* couldn't contact either the *Bibb* or Newfoundland.

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The Coast Guard Says "Well Done!" to a Shipmate

Officers and men of the cutter *Rockaway* watch as the skipper reads retirement orders to Chief Warrant Officer Gordon L. Hill (saluting), who leaves the service after 30 years. Ceremonies were held at the cutter's base on Staten Island, New York.





A North Atlantic Blizzard Stuffs *Half Moon's* Lifeboats with Ice

The pilot sent out a general distress message, which was picked up by a passing freight plane. An eastbound airliner joined in the rescue operation. Together they shepherded the *Queen* to the *Bibb* and then circled while Captain Martin put his plane down on waves two stories high.

Plane Alights Three Miles from *Bibb*

Feeling his way down, waiting for the right moment to cut the flying boat's four engines, Captain Martin hit the sea three miles from the *Bibb*. Skillfully he worked his way through the rough waves toward the ship's side. Then the touchy job of getting off passengers and crew started (page 836).

Almost eight hours after the plane put down, this progress report was sent out from the *Bibb*: "Darkness approaching. Plane leaking. Passengers mostly prostrated by seasickness. Winds of gale force. Rough sea. Three persons removed unharmed with small life raft. Continuing operation with boat

and rafts. Second successful boat and raft operation brings total saved thus far to five men, two women, two little boys, one baby. Baby appears to have stood the ordeal better than the rest."

Again and again the Coast Guard men went out over 30- to 40-foot waves to the hulk, bringing back loads of as many as 16 passengers at a time. Twenty-four hours after the *Queen* came down, every person had been transferred to the *Bibb*. It was one of the most celebrated rescues in recent years, and the importance of having rescue ships on the spot was apparent to all.

Last year at a conference in Paris, the participating countries agreed to cut down the number of stations from ten to nine. But the more critical, and rugged, northern stations like Bravo will be continued.

Rugged is the word for Bravo. Constant buffeting, sometimes for 10 days or two weeks straight, makes winter life aboard a 311-foot cutter a wearing adventure.

There is always a struggle for balance, a struggle to get across a room safely, to get up the ladderways, and to stay put after arrival.

Taking a shower in a rough sea is seldom worth the effort. Even if for a brief moment the ship is level and steady, only a novice would let go the shower-stall handrail. With no ceremony the stall will lurch suddenly, tumbling you into a soapy heap. And to make it more challenging, the temperature of the water changes from cold to scalding hot and back again with each roll of the ship.

In foul weather eating becomes an unpleasant game of balance and gobble. Hot coffee and soup require genuine agility. While seasickness supersedes this unpleasantness for some in rough weather, I found it far more satisfying to eat during the pitching and banging of a storm than with the ship wallowing from side to side, without letup, all day long.

Soda Crackers Conquer Seasickness

There have been first-time sailors on these patrols who got it into their heads that they were seasick. Nothing helped them, including calm days. None were aboard the *Half Moon* this trip, but Commander Guill told me of sailors who were willing to lie in their bunks half-starved and half-dead for three weeks.

In cases like these the captain and the doctor decide whether or not it is a mental situation. If it is, they send the man out to chip paint on the weather side of the deck. They also give him a box of soda crackers.

After an hour or two of hard work in the cold wind, the patient is more hungry than he is sick. He eats the crackers, keeps them down, and the problem is licked.

Although seasickness, and especially prolonged seasickness, can be grim indeed, the nightmare of a North Atlantic patrol is ice. Not icebergs or pack ice, but rime ice, which forms on the ship itself.

With breaking spray turning to ice the instant it hits the ship, the captain watches the cutter's response to each wave with mounting attention. A heavy load of ice in a rough sea can capsize all but the biggest ocean vessels (page 834).

For three weeks the *Half Moon* was able to shed the ice before it became critical. But in a storm, the first night off patrol, the

cutter was taking 12 seconds instead of seven to recover from a 55° to 60° roll.

Everything forward, the gun turret included, was locked under a white mound. Decks lay under one to two feet of solid ice. Lifeline cables were a foot in diameter. Whistles were frozen tight, and the lights at the tops of the masts were frozen over. The starboard lifeboat was split and its sides crushed. Commander Guill ordered the ship hove to.

Ice Slab Carries Away Lifeline

With the vessel stopped, less spray broke over the bow and rime didn't accumulate so fast. The commander wanted to break the ice away immediately, but no crewman could have survived on deck in the 75-knot wind. We could only try to pick up as little ice as possible and pray that the next day would be calm enough to allow work parties topside.

Commander Guill got the break he asked for, to the relief of everyone aboard. The following day was gray and raw, and the sea was reasonably flat.

Every sailor not on watch was sent forward with steam jets, hot-water hoses, and dozens of the most dependable weapons of all—two-fisted wooden mallets.

All day sailors smashed away at the ice. Great chunks crashed down from the rigging. A slab loosened from the gunhouse by hot water took into the sea with it an entire section of lifeline. By nightfall the *Half Moon* had lost her ugly, top-heavy sluggishness of the night before. The commander estimated there had been 400 tons of ice aboard.

Boat Drills Break Monotony at Sea

The Coast Guard knows these patrols are tough, with crews isolated below decks and taking the worst kind of weather for three dreary weeks. To help shake off the futile feeling of just being "on station"—not going anywhere and not getting anywhere—crewmen are encouraged to do a lot of studying for advancement. Movies are shown every night, and special attention is given to food, particularly on holidays.

Emergency drills are ordered periodically to keep the crew from being dulled by routine. Sailors rarely display much enthusiasm for rehearsals, but Commander Guill knows how to put zip into winter boat drills, a cold, un-



comfortable occasion and a most unpromising situation for enthusiasm.

A stop watch keeps time as crew members dash from all parts of the ship, get aboard and lower the lifeboat, cast free of the davits, and row off. A few seconds can mean a life someday. After 20 minutes the red-nosed, shivering men are hoisted aboard again.

"Have the doctor treat each man for chill and exposure," Commander Guill orders from the bridge, if the crew has done well. The lifeboat crew then troops down to sick bay where each man is solemnly given one ounce of bourbon.

Standing deck watch is naturally unpleasant in January, despite abundant and advanced foul-weather gear. Parkas, face masks, lined gauntlets, and boots make it bearable, at least, but usually there is nothing to relieve the gray monotony of life at sea, except for the fulmars.

These sea birds, resembling small albatrosses, stir up quite a bit of interest, apart from ornithology. Bets are made on which way the birds will turn after their ponderous take-off run. Wagers usually amount to a nickel; most of the men on deck, from the captain down, indulge in a little fulmar betting during quiet days on station.

By the middle of the second week, some of the early moodiness aboard the *Half Moon* had dissipated and spirits were jauntier. Such obvious remarks as "We're over the hump"

and "Got 'er back broke now" popped up in conversation. Things turned testy again in the third week. But the last night on station, when Commander Guill had the *Half Moon* pointed south and primed to run, there was enough high-pitched conversation escaping through the vents to float the ship two inches higher.

Spirits Soar on Homeward Run

Everybody aboard takes great interest in the engines, shafts, and propellers during the run home. Members of the oily clan below, engineering officer, chiefs, engine-men, and strikers included, become very important people. Suddenly they are gentlemen with a guaranteed, sympathetic audience whenever they discuss their work.

Inside the Ambrose Channel Lightship off New York Harbor, four sailing days away from Bravo, another change takes place. Channel fever, they call it, and it reaches its peak as the mooring lines are being secured. It isn't in the nature of seamen to feel reflective and full of lofty purpose when hurrying down the gangway for shore leave. Nor was it in the nature of our crew.

Crowding one upon another, they whipped salutes at the quarter-deck, turned down the gangway and were gone, to forget for a while the life of wobbly bunks, smashed lifeboats, and malignant ice they had known for three weeks aboard the *Half Moon*.



"Always Ready," Coast Guard Lives Up to Its Motto in Stirring Rescues

← Off Cape Cod, Massachusetts, in February, 1952, with the wind blowing at 70 knots and seas running 60 feet high, the tankers *Fort Mercer* and *Pendleton* broke in two.

Distress messages sent the Coast Guard into action. From Boston sped the cutter *Eastwind*, while her sister, the *Vakutat*, rushed from Provincetown. Smaller surface vessels and aircraft converged on the scene. Within a few hours the cutters rescued 70 men from the two ships.

Here *Eastwind* circles *Fort Mercer's* stern half to flatten seas before shooting a lifeline.

↓ An Ordeal Ends for Downed Airmen

On February 27, 1953, this radio message came to the Coast Guard's Search and Rescue Control Center in New York: "One engine out. Must ditch. Trying for ocean station Echo." The signal came from a Navy Neptune bomber flying between Bermuda and the Azores; orders were sent to the cutter *Cook Bay*, just starting a 21-day patrol on Echo. The cutter guided the plane down for a landing and rescued its 10 crew members.

Coast Guard men here help survivors climb a cargo net from a lifeboat to the cutter's deck.

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C. G. From Coast, 10/10/52



Christmas in Cookie Tree Land

Peggy Poodlehead, Sylvester the Ominous Cat, and Rosebud the Elephant
Unite an American Family in a Joyful Holiday Tradition

BY LOUISE PARKER LA GORCE

With Illustrations by National Geographic Photographer B. Anthony Stewart

EVERY year there is a time just before Christmas when my husband comes home and says, "So, you're at it again!"

Caught on another cookie-baking spree, I grin at him half apologetically. Fragrant, still-warm Christmas cookies are everywhere—on the dining-room table, under the table, on chairs and chests, on the refrigerator. They have, in fact, taken over the house.

For a week I have cut out patterns, prepared dough, carved figures, made repeated individual bakings. Finally my little people and animals—the Christmas Angel, Sylvester the ominous cat, and Peggy Poodlehead—have received their ultimate decorative touches, their brilliantly colored icings, and such last-minute embellishments as strike my fancy. A frantic search through the house unearths barely enough boxes to store the cookies until the tree trimming.

Now, at last, my favorite guests have arrived, sprung to life from the baking pan to preside genially over another Christmas season. With good grace my husband bows to the inevitable. He knows that this annual invasion was foreordained a long time ago.

For to me, as a child, Christmas was anything that came out of an oven. My mother is Pennsylvania Dutch, and my memories of our home in Mount Vernon, Ohio, retain the warmth equally of the heart and of the hearth.

Christmas Cookies Will Out

Mother's sweets and treats more than lived up to the gastronomic tradition she inherited. Being the youngest of six children, I was thoroughly tutored in how to smell out the cakes, cookies, and beautifully decorated candies that she prepared weeks in advance—and tried to hide from us.

These recollections of Christmas I kept to myself long after I had grown up. But five years ago I could stand it no longer. Time was going on a bit, and if my children were ever to have the same things to remember I would have to act.

After seven days of feverish experimenting, I emerged from the kitchen with some 150 individually designed, iced, and gaily adorned cookies. To bear them we picked a beautiful, heavily branched balsam fir and placed it on top of our piano in a container weighted with three gallons of water.

By the night before Christmas Eve the tree was up, the children and I had decorated it, and our friends and their families had come in to inspect.

I was so smart. Here I had all of the next day left to finish odds and ends and attend midnight services. Oh, but I was smart, I said to myself.

From Soggy Disaster a Tree of Joy

At one a.m. the house was quiet, my family in bed asleep. I was sitting in the living room beside the tree, glancing up now and then to admire Rosebud, the pink elephant, as he waved his trunk gaily.

On the lower branches, as a sort of focal symbol, I had placed a Santa Claus cookie. Noticing that his little feet were touching the piano top, I hung him on a higher branch. When I looked again he was lying almost flat. "How can this be?" I asked myself.

Before I could move, the whole tree came swishing down!

Over the shattered mess of iced cookies poured the three gallons of water from the stand. No tree has ever looked so flat on a rug, or so wet.

At my scream the family tumbled down the stairs. But there was no comforting me. I sobbed for two hours.

My husband and daughter finally went back to bed after dragging the soggy tree to the side porch. Our son, John, sat quietly near by, watching me.

"My tree, John! My beautiful tree! I wanted you kids to have this tree from me."

"You can do it again, Mother."

"I can't. There isn't time."

"Yes, you can." And our philosophical 14-year-old went quietly to bed.



Leing Runs Down a Honey-bear Cookie. Debbie Lou Paul Gasps, "He's Spilling Milk!"

There was no other answer. I had to do it. By three a.m. I had finished mixing both the light and the dark dough. At seven I was back in the kitchen, my fingers aching. No one dared come near me or speak to me. By eight o'clock that night the tree was up again, and a new family of little folk and animals made their bows.

Naturally, the story of my near-fiasco spread like wildfire among our friends. Again it was philosophical John who said:

"It's much better having it happen that way, Mother. It will give you something to talk about."

That was the beginning of the cookie Christmas tree, which is now a part of me.

Where do I get the patterns for the cookie characters?

Well, at first I searched through old copies of children's magazines. Then one day I came across a tattered coloring book that my daughter had had as a baby. Among its pages I found a dear little dog just begging

to be carved out and brought to life in gay cookie form.

That did it. Quickly I found other appealing figures in the same book.

Now, when we pass bookstands and I stop to paw through the coloring books, my husband looks everywhere but at me. From one corner of his mouth he mutters, "For Heaven's sake, Grandma, don't let people see you enjoying those children's books!"

Once I've settled on a pattern, of course, my work has just begun. Take my Christmas Angel (page 848). First I cut a silhouette of the entire form in paper. With carbon paper I draw the parts of the angel's body that will be in relief—her hair, upper body, arms, and hands in one piece, then her little feet. Snipping these out, I place them on the rolled dough and trace the pattern with a sharp-pointed knife.

On a greased tin I lay a flat piece of dough about the size of the head and press into it the looped cord from which the whole figure



will eventually hang. Upon this I place the silhouetted body of the Angel herself.

To give her dimensional relief, I then add separately the hair, wings, upper body and outstretched arms, and the tiny feet. With a toothpick I carve the facial expression that makes her a person. Sequins, beads, artificial flowers, laces, and candies embellish her gown. Baked, she is ready to receive her brilliant icing.

As I carve these little people and plan just how to garh them for the tree, they become real to me, and I find myself talking to them. But it was John who thought of making them tell a story.

One day he took hairpins and some little cotton balls and inserted them into the smokestacks of our cookie locomotives, making them seem to puff and snort. Why not, he suggested, have them run into each other?

Before we were through rearranging the tree, the two funny square locomotives with their little wooden engineers in the windows had just missed colliding, thanks to a cookie signal with red iced lights flashing "Danger." The trains they were drawing had emerged from a green-cookie tunnel, paused in front of a red station, and puffed away.

Curving around the tree, they seemed to steam by a little village with people walking



Flowers Hide Sylvester's Broken Neck-toward a church, then by houses on a hill, and on to a farmhouse complete with rail fence, horses, and dogs.

Since there must be education, though the children deny it, the train also passed a coun-

← The Author Sculptures Dough for the Pan,

Horatio the Cat Gets Hairpin Whiskers ↘

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try schoolhouse with three little heads sticking out the windows, intently watching a horse break from the door of a near-by barn. A wooden bee buzzed overhead, and below him a skier zoomed down a snow-frosted hillside.

Over the whole scene the Christmas Angels looked down, with understanding smiles.

Every day from Christmas until the end of January our friends troop in to see what is new on the tree and to renew their acquaintance with old friends. The children dance about and point out their particular favorites.

"There's Puggy! Look, mamma, remember him?"

"That darling little bunny! I'm going to call him 'Whiteface'!"

"Did you see the turtle? Oooh, there's my cocker spaniel!"

And the everlasting cry: "Mom-

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- ← Lamb Shakes Cotton Curls
- Pink Elephant Is a Pin-up Girl →
- ↓ Angel's Skirt Takes Frosting

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Illustrations by Marilee Anagnostis
Photographer D. Anthony Howard







"Merry Christmas!" Says the Cookie Tree

mie, please, can't I have that pretty pink one?"

Evidently I am committed indefinitely to this tree. Upon leaving our daughter's house in Michigan two years ago at Thanksgiving, I remarked innocently: "I don't think I will make that cookie tree again this year, Elizabeth;"

Her reply was quite precise: "If you don't, Mother, I am not coming home!"

So perhaps I shall go on. But I shall feel less like a martyr than a thief. The only satisfaction I receive for my work, if you can call it work, is to steal



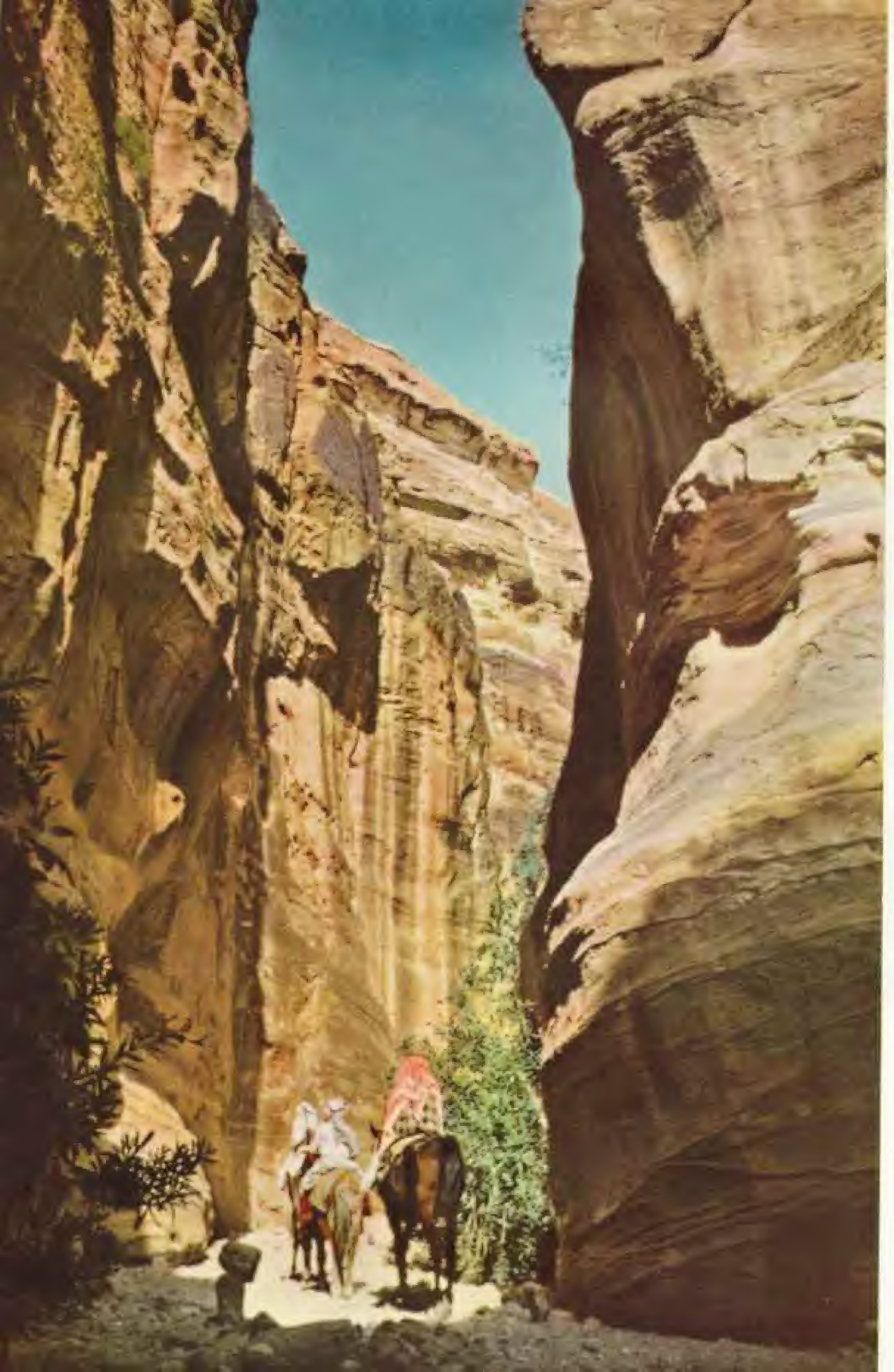
Debbie Lou Opens and Samples Every Package

the expressions from the eyes and faces of my friends, as they look at the tree each Christmas, and lock them inside my heart. From my 85-year-old mother to our two-year-old granddaughter the expressions are the same.

What is the main ingredient needed for making these cookie folk? Well, our friend, the late Marjorie Kinman Rawlings, author of that lovely tale, *The Yearling*, had a word for it. When I asked her the secret of her own wonderful cooking, she said:

"You have to put a lot of love into it."





Petra, Rose-red Citadel of Biblical Edom

In a City That May Have Sheltered St. Paul, Unique Rock Carvings
Have Defied the Elements for 2,000 Lonely Years

By DAVID S. BOYER

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Foreign Editorial Staff, National Geographic Magazine

With Illustrations from Photographs by the Author

THOUGH I had spent months in Bible lands, I had never heard a camel roar until the evening I entered Petra through the Siq.

As we rode into this mile-long gorge that slices the mountains of Old Testament Edom, sunlight penetrated weakly from a ribbon of sky 250 feet above us. On the canyon's dark floor sparks glinted from the hoofs of my weary, underfed horse.

Ibrahim, my 12-year-old guide—underfed too, but apparently tireless—jogged on foot beside me, singing a tedious song on four high-pitched sorrowful notes. The melody and the rattling of stream-worn stones reverberated from the sheer walls of the passage.

Suddenly from around a bend came a roar. I knew only one such sound—lions! The noise vibrated down the narrow corridor. I scanned the vertical cliffs that hemmed us in; there was no ledge or handhold within reach. My only "weapons" were cameras. I took a Leica in each hand.

When camels appeared, I almost dropped \$700 worth of photographic equipment!

Fifty of the ungainly animals strode by us in the gloom, brushing the opposite wall of

the Siq. Behind them came a lone Arab driver. The beasts were probably headed for new grazing grounds on the plateau east of Petra, but it took little imagination to visualize this empty caravan heavy with silks and spices, jewels, and frankincense, and to pretend that this was 2,000 years ago, when the mysterious City of the Rock was in its glory.

Instead of a lone driver, there would have been dozens. Arab warriors would have ridden in the convoy, and slaves might have trudged before it. The caravan would have been setting out from Petra, in what is now the Hashemite Kingdom of Jordan, for Gaza, or Damascus, or desert-ringed Palmyra.*

Desert Brigands Became Brokers

At the time of Christ and for several centuries before and after, rock-girt Petra was the capital of the Nabateans. Thousands of Arabic-speaking desert dwellers must have occupied the city and its suburbs. From their mountain stronghold these nomads-turned-merchants ruled a domain that stretched from Madain Salih, in present-day Saudi Arabia, all the way to Damascus (map, page 856).

The Nabateans are first heard of as nomadic marauders, plundering caravans carrying the luxuries of Arabia, India, and East Africa. When punitive expeditions were sent by their victimized neighbors, the brigands retreated into the desert, surviving on water drawn from hidden cisterns in the rock. Meanwhile, the pursuers' tongues would parch, and they would turn back.

As their wealth and territory increased, the Nabateans cached their loot in caves at Petra. Once astride the caravan routes, their kings adopted a wiser policy, guaranteeing safe conduct to the merchants and exacting tolls for protection. The desert marauders became

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Hashemite Jordan, Arab Heartland," by John Scofield, December, 1952; "Arab Land Beyond the Jordan," 13 illustrations in color, December, 1947; and "Petra, Ancient Caravan Stronghold," by John D. Whiting, February, 1935.

Page 852

◀ Horsemen in a Canyon Approach Petra, "Rose-red City, Half as Old as Time"

Thus British poet John William Burgon described the rock-carved tombs and temples of Petra, once-populous capital of the ancient Nabatean kingdom in what is now Jordan.

Travelers since New Testament times have entered the ruins through the Siq, a mile-long slash in the mountains of Biblical Edom. In Arabic, siq means "pass." Hundreds of feet deep, the passageway often narrows to a few yards; at places, overhanging masses of flaming sandstone almost shut out the sky.

Paved by the ancient Nabateans, the defile served as a highway to their cliff-girt capital. Moslem legend attributes the cleft to a mighty blow from the rod of the Prophet Moses. Water from near-by 'Ain Musa, Spring of Moses, occasionally flows along the Siq's gravelly bed.

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Illustrations by David S. Boyer, National Geographic Staff



**"Pharaoh's Treasury" →
May Have Been the Tomb
of a Nabatean King**

Hewn in colorful sandstone, the 130-foot-high mausoleum survives as one of the best preserved monuments of the ancient world.

Statue in center of upper story is thought to have represented Isis. Christian iconoclasts or early Moslems battered the figure beyond recognition.

Bullets damaged the urn at the top; Arab riflemen tried to shatter it and release the treasure they believed hidden there.

**←Mountains of Edom Rim
the Altar of a Sun God**

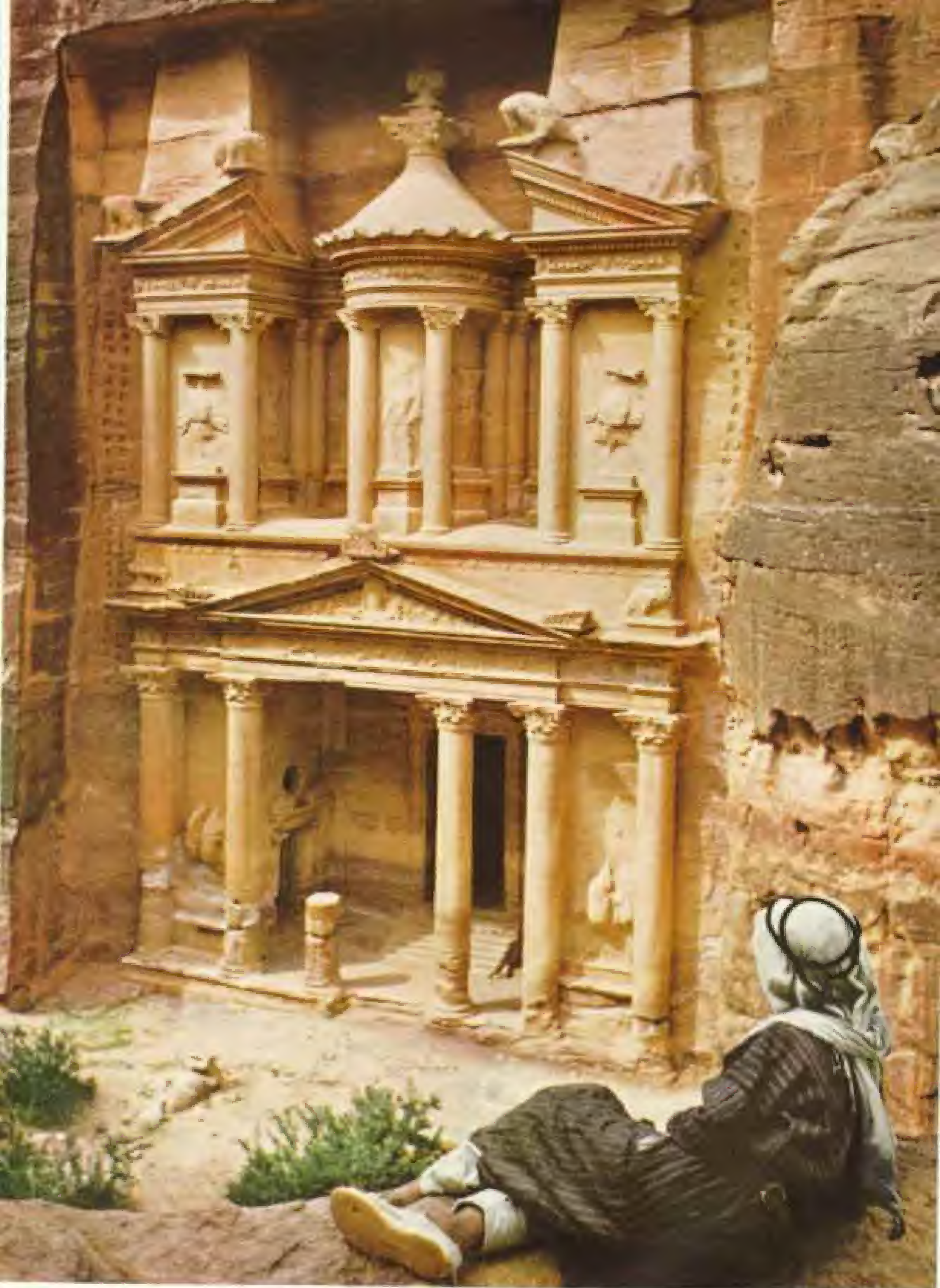
This stone block at Petra's Great High Place suggests that priests here offered blood sacrifices to Dushares, chief deity of the Nabateans. Square indentation probably held a black stone or meteorite in which the god was thought to reside.

↕ Seen from the porch of Pharaoh's Treasury, weathered column frame Petra's entrance to the Siq (page 852).

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"From the Rock as if by Magic Grown, Eternal, Silent, Beautiful, Alone"

So wrote the poet Burgon (page 853). Pharaoh's Treasury ranks as Petra's masterpiece. Its towering façade is believed to have sheltered the body of Aretas IV, who reigned during the 1st century B.C.



Biblical Lands Ring Petra's Crumbling Ruins

Nabatea's 2,000-year-old capital sprang up near the route over which Moses led his people to the Promised Land. North of the rock-cut city, beyond the Dead Sea, lie three of Christendom's holiest shrines: Bethlehem, Jerusalem, and the Jordan River. Massive Crusader castles stand at Karak and Shaubak.

warehousemen and brokers. Petra developed into a thriving commercial capital, with thousands of warriors to garrison its outlying settlements and guard its trade routes.

The governor of Damascus at the time of St. Paul was a subordinate of a Nabatean king, Aretas IV. Paul, after his miraculous conversion on the road to Damascus, preached in the city, but fled when a warrant was issued for his arrest. Some writers have suggested that Paul, after being "let down by the wall" in a basket, took refuge in Petra. He may even have passed there the unrecorded years of his life before he appeared again in Jerusalem.

Nabatean Capital Lost for Centuries

Now, some 20 centuries later, we were watching a caravan out of the past as it wound through the stream-bed exit from this fabled Oriental city. My companions were a reconnaissance party bent on turning Petra's sculptured temples and tombs into a drawing card for 20th-century tourists.

For hundreds of years the Nabatean capital had been literally lost. Hostile tribes and barren lands had made it unapproachable. Rediscovered by Western explorers in the last century, Petra remains lost in a way, for a

visit still requires a long and fatiguing desert trip, climaxed by a jolting ride through the Siq on pack animals.

In Jerusalem for the Easter observances, I had met two photographers, Banks Murray and Paul Harder, of the Foreign Operations Administration (now succeeded by the International Cooperation Administration). Their assignment was to publicize Jordan's many Biblical sites in an attempt to draw more tourists to the Holy Land. They were leaving for Petra in the morning and invited me to go along.

With us went Ahmed Saba, director of the Department of Tourism of the Hashemite Kingdom of Jordan. As guide we had the best in the country—Arabic-speaking Gerald Lankester Harding, director of the Jordan Department of Antiquities.

Harding is a quiet Englishman who has spent three decades in the Near East and knows every trail and archeological site in the Jordan Valley. He had written a booklet on Petra, which we took turns reading as we jounced over the parched desert road.

Our station wagon stirred a cloud of dust as we came to 'Ain Musa, pointed out by Moslems as the spot where Moses caused a spring to gush from the rock. To this day its

Bedouin Girl and Baby Gazelle Animate Petra's Ruins

The Roman Emperor Trajan put an end to Nabatean autonomy A.D. 105; a year later the kingdom became an eastern province of Rome. Eventually, changing trade routes tolled a death knell for its fortified capital.

Petra was gradually abandoned. It lay crumbling and forgotten until 1812, when the Swiss traveler John Lewis Burckhardt made his way through the Siq and rediscovered the city's wonders.

Today only a handful of Bedouin make Petra their home. Most of them eke out a living herding goats or peddling ancient coins and bits of pottery to an occasional party of tourists.

This tattooed cave dweller tries to sell her homemade beads to the photographer. Behind her, sunlight glints from the sheer wall of the Siq.

✦ Captive baby gazelle seeks the shade of a gaily decorated tent. Bottles hold bright-colored sands arranged by Arabs in geometric patterns.

Ancient pottery (left) includes two oil lamps that call to mind Jesus' Parable of the Ten Virgins: "They that were foolish took their lamps, and took no oil with them: But the wise took oil... And the foolish said unto the wise, Give us of your oil; for our lamps are gone out." (Matthew 25: 3, 4, 8.)

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Rimming Peaks Cap Petra in a Natural Amphitheater

Sheer sandstone cliffs towering hundreds of feet protected the caravan city's lavish buildings and rich warehouses. Man-made walls guarded its north and south approaches.

water flows generously in an otherwise arid wilderness. Then we rumbled down a slope to the police station at Elji, where horses were waiting. Ahead of us the crags of Petra made a jagged silhouette against the sinking sun.

Some of the animals carrying our equipment from Elji were more stubborn than others, so we traveled the Siq in separate little contingents; mine consisted of one man, one horse, one donkey, and one Arab boy. Ibrahim and I were alone in the gloomy chasm, and I hurried past, almost without seeing some of the first evidence of the ancient Nabatean civilization.

The eroded traces of a watercourse, chiseled in the soft sandstone, still cling to the wall of the Siq; in Christ's time it gurgled with water from the Spring of Moses.

In the darkness, too, I almost overlooked the tributary watercourses, also cut in solid rock, that collected rain water from the cliffs above. Clay pipes, remnants of which we found on later exploration, carried the water across fissures in the canyon walls. In the area occupied by the city they converged at cisterns, where water once was stored against summer drought.

Some scholars conjecture that Petra's network of rain-water courses was in part a measure of defense. Should the city be besieged, the waters of 'Ain Musa could easily be cut off by the enemy at the entrance to the Siq. Whether this was taken into account by the Nabatean engineers is a moot question. Whatever the answer, the problem of providing a year-round water supply in this uncharitable climate was met with imagination and skill.

Façade Glows Like a Cameo

Now the défile had twisted and narrowed, and the cliffs almost came together overhead. The gloom deepened, and the crunch of hoofs echoed between the sheer walls.

Abruptly the Siq opened into a broad, transverse chasm. There, framed through what was almost a tunnel, rose the first of Petra's rock-hewn monuments. Carved in the lower part of a sheer cliff, its 130-foot façade of soft sandstone retained the luminosity of the dying sun. Delicate and beautiful, the structure was cut like a cameo into the rock (page 855).



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Arabs call this lofty monument *Khaznet Firaun*, the Treasury of Pharaoh. Possibly a place of worship, it was more likely a mausoleum for some Nabatean king. If St. Paul came to Petra, he may very well have seen the *Khaznet* being carved. Stonecutters must have labored for years to create this towering façade in the living rock of Edom.

The name arises from legend. Arab shepherds believed that Egypt's pharaohs were gods and magicians, who alone could be responsible for such a phenomenal edifice. The marvels of Petra, to these simple nomads, seemed quite beyond the capacities of men.

Pharaoh's treasure was thought to be hidden in the disfigured urn that tops the façade. For many years Bedouin riflemen took pot shots at it, hoping to see the urn split and spill into their hands a shower of gold and



jewels. Now, thanks to the efforts of archeologists like Gerald Harding, stringent laws have been passed to protect Petra's monuments from vandalism.

The exact date of Pharaoh's Treasury has not been established, but we know it is from a later period than much Nabatean carving, for the architects were clearly influenced by Greco-Roman styles. One authority, Sir Alexander B. W. Kennedy, believes Petra's classical monuments, about 25 of them, came into existence after the Roman Emperor Trajan took over the kingdom, A. D. 106.

Night closed in rapidly, and the glow on the Khaznet faded. The vision lasted until my guide and I emerged from the darkness half a mile farther on, where the friendly light of fires and lanterns guided us to the white tents of a camp.

Ahmed Saba and I were awake next morning at dawn. Above us, unseen in the darkness of the night before, towered the most imposing rock mass of Petra, the great castle-like prominence of Umm el Biyara. A fortress within the fortress of the mountains of Edom, its vast bulk gleamed golden in the early light.

Crusaders Once Ruled Petra

Having a cup of tea all alone before this magnificent setting, and wondering loudly when the photographers were going to come alive, was Gerald Harding.

The Nabateans, Harding told us, looked on Umm el Biyara as a last-ditch defense. To reach its top, they carved a narrow path or staircase that was closed by a gate. On top

(Continued on page 863)

Petra's Ceremonial Dining Hall: the Rock-hewn Triclinium

In this richly pillared interior, the only hall in the city not severely plain, commemorative feasts were probably held for the dead at which diners reclined Roman-style around low benches in the sunken area. Archeologists believe the niches once held statues.

✦ High in the hills of Edom lies this mountainside pool perennially full of clear water. In addition to a conduit through the Siq, which carried the flow of 'Ain Mûsa into the city, Nabatean engineers built many such basins to catch and store water for Petra's thousands of people.

Here visitors from the United States pause on their way to the Deir (page 867) to bathe tired feet in the venerable pool.

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Illustration by Travis S. Dwyer,
National Geographic Staff



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Youth Makes Light → of Araby's Ancient Caves

Page 861: Childhood games span barriers of time and language as a young American plays hide-and-seek with his teen-age guide in this centuries-old labyrinth of veined sandstone. The Arab boy wears traditional costume, topped with a square headcloth secured by a circlet of goat-hair rope; his playmate sports sailor cap and striped T-shirt.

Petra's sandstone formed the floor of a prehistoric sea. Raised thousands of feet by earth movements, it created Edom's mountains. Iron oxide, carried by water, stains the rock with tawny reds and browns.







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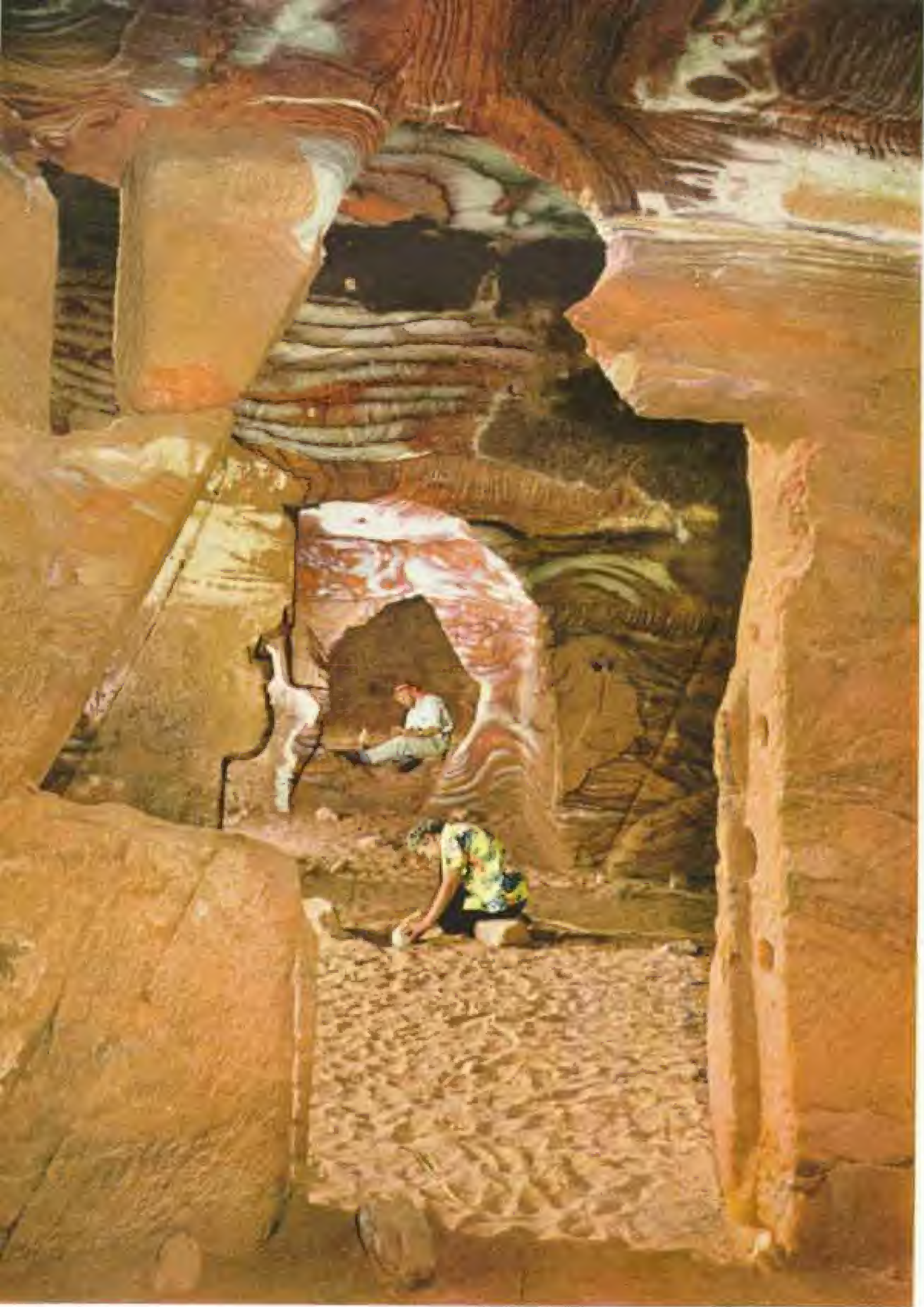
Three-story Tomb Copies the Facade of a Roman Emperor's Palace

Ranking with the largest of Petra's rock-carved monuments, the Palace towers above camel-mounted soldiers of Jordan's crack Arab Legion. The structure's four doorways open into separate chambers.



Time Has Dealt Savage Blows to the Corinthian Tomb's Delicate Tracery

Dating from the city's classical period, these façades are thought to have sheltered the remains of Nabatea's last kings. Entrances to other chambers pierce rock at right.



Amateur Archeologists Search for Treasure in the Debris of a Nabatean Cave

Rooms like these served as homes or warehouses. They still yield an occasional coin or bit of pottery.

they dug enormous cisterns and lined them with plaster. As their ancestors had done in the desert, they covered the reservoir mouths with stones, effectively hiding them from all who did not know the secret. The present-day name of this castle of nature, appropriately, means "Mother of Cisterns."

The rest of the expedition came sleepy-eyed out of their tents, and we breakfasted in the bright light that glanced from the near-by face of El Habis. To our surprise Harding had already made a hike up this Petran acropolis, to the ruins of what some archeologists believe is a Crusader castle.

Whether or not the Crusaders built the fort, it is certain that Baldwin I of Jerusalem extended his kingdom to this area in the early 12th century. The Christian knights penetrated farther into the interior of Saracen territory here than at any other point in their narrow Bible Lands empire.

Baldwin wanted to control the north-south caravan route. After having been crowned on Christmas Day, A. D. 1100, the Crusader king crossed the Jordan; his warriors may have stumbled upon Petra, probably finding it in much the same state of ruin as it is today. Within a few years he established garrisons at Karak and near-by Shaubak, formidable castles which travelers still pass on their way to Petra.

Baldwin's network of strong points across the Jordan was not long in Christian hands. The Saracen chieftain Saladin recaptured them in 1188-89. From that time until the 19th century Petra disappears from history, just as it had before the Crusaders briefly lifted the curtain of time.

Smaller Caves Housed Families

Breakfast over, we trooped to the façades of caves hollowed in the base of El Habis. Authorities disagree as to whether the more imposing monuments were primarily tombs, suggesting that the Nabateans conducted a cult of the dead, or were temples. The evidence is that there were some of each.

The smaller caves we visited now, however, were probably the homes of families. Some perhaps were storehouses for goods awaiting sale and transshipment by camel caravan.

Harding pointed out to us how clean and square was the rock cutting of the cavernous interiors. Few are ornamented in any way, in contrast to the elaborate exterior façades.

From an unfinished tomb on El Habis we

studied the engineering methods of these ancient stonecutters. In carving a tomb or temple, the Nabateans first chiseled a vertical face into a cliff. At its top they cut a ledge wide enough for workmen, who fashioned the highest part of the façade.

When work had progressed downward to where a door or window was desired, the stonecutters tunneled all the way to the proposed depth of the interior rear wall. It might or might not be necessary to tunnel upward to the ceiling before cutting out blocks of stone downward to the floor. Carving of the façade proceeded simultaneously at the same level.

City Vanishes, but Tombs Survive

From our vantage point on El Habis, Harding waved an arm over the bowl-shaped valley before us. Here, said our archeologist-guide, was Petra proper.

All that remained of the heart of the city, which had been built rather than carved, was a scattering of stones and a lone crumbling temple, its arches and columns clearly indicating construction under the patronage of the Romans. The area's present Arab inhabitants know it as Qast Bint Firaun, the Castle of the Daughter of Pharaoh.

From El Habis we could see the mountain ranges that guard the city. High stone walls had protected the northern and southern sides of the desert metropolis from attack (map, page 856).

Comparatively little is known of the tumbled metropolis itself. Early efforts to excavate were discouraged by inhospitable Bedouin, who regarded archeologists as treasure hunters and resisted every intrusion into the area. Turkish rulers of the 19th and early 20th centuries were little more inclined to sanction digging. In our own time, the remoteness of Petra and its intense summer heat and winter cold have limited exploration.

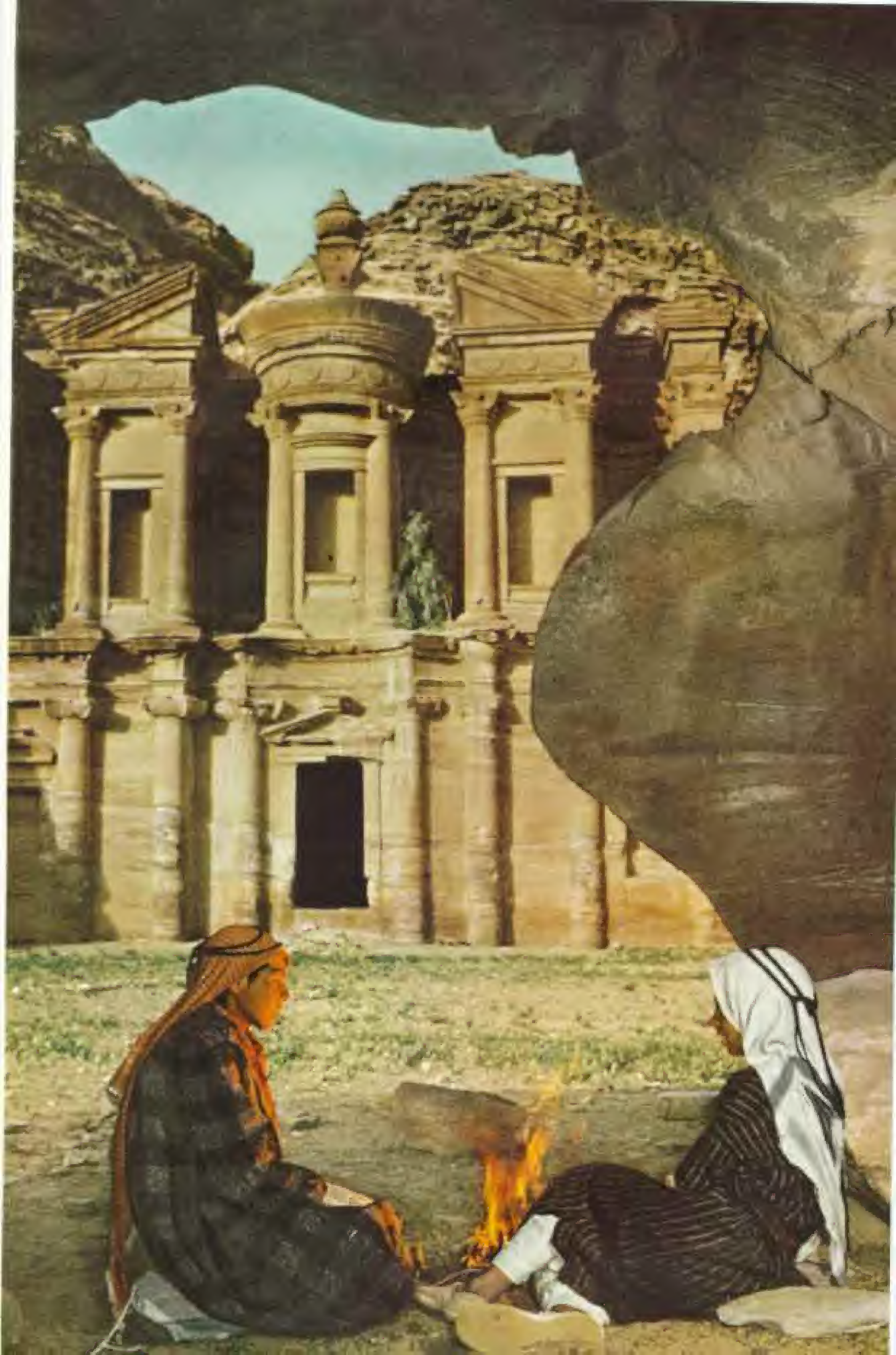
Harding spoke of great Roman baths that may one day be uncovered. We could tell from his tone that he was longing to see the grave of this ancient civilization laid open and its mysteries revealed.

It was apparent from our lookout on El Habis that a paved highway had followed one side of Wadi Musa where it crosses the valley. The base of a triumphal arch lies beside the route, and remnants of bridges remain on the banks of the stream. Stones from other temples, also of the Roman era, clutter the ancient way.



↑ **Sightseers Climb to the Urn of the Deir, a Temple Carved from a Mountainside**

→ Page 867: The Deir is a copy of Pharaoh's Treasury, even to the urn at its top (close-up above). Its name, meaning "monastery," may come from a cross painted in the inner chamber. Door is 26 feet high.





A Stone Beast Stands Guard Amid the Silence of Petra's Ruins

Archaeologists can only guess at the significance of this huge rock carving, which seems to represent a lion. To add to the mystery, Nabatean sculptors shaped a channel that directs rain water straight to the figure's head. Over the centuries the stream has reduced the face to a shapeless blob.

Across the valley, back-lighted by the rising sun, rose an outcropping of rock dotted with caves. Here is Haret en Nasara, the Christian Quarter, so-called because of the number of crosses carved on walls and doorways. We saw crosses at other places as well, and there is evidence that bishops who presided at Petra rededicated some of the Nabatean temples to Christian use.

Christianity apparently came to Petra during the fourth century. By this time the power of the Nabatean city had seriously declined. The newly Romanized city of Pal-

myra to the north was acquiring more and more of the east-west caravan trade. Meanwhile, the trade routes were shifting eastward from Petra. Transport by sea increased, further reducing the number of caravans.

Eventually the city's inhabitants followed their fortunes elsewhere. Many, no doubt, faded back into the desert, whence their ancestors had come. By the 12th century, when Moslem warriors had driven the Crusaders back to Europe, Petra was virtually deserted. As far as the Western World was concerned, it was not heard from again until

1812, when John Lewis Burckhardt rediscovered its ruins.

The young Swiss traveler had heard tales of a vast city of monuments. To reach it, he knew, he would have to brave the jealousy and superstition of hostile tribes who guarded the ruins for the riches thought to be buried there, and who resented with religious zeal any trespassing near the region's holy places.

For years Burckhardt lived among the Arabs, learning their language and customs. Finally he could pass as one of them. Disguised as a Bedouin, he penetrated the wilderness, ostensibly to sacrifice a goat at the Mosque of Aaron on the sacred mountain Jebel Harun, just southwest of Petra, identified by Moslem tradition as the Biblical Mount Hor.

On his way young Burckhardt glimpsed the valley's tombs and temples, and the secret of the lost city was out.

Over the years an increasing number of explorers and tourists has reached the monument valley. Now, as a result of our expedition, change seemed imminent again. Americans were talking about airline facilities and an improved road through the desert. More visitors would come, and little Jordan's economy would be bolstered by the pounds and dollars they would spend in this venerable land.

Pilgrims Pause at Age-old Cistern

In point of size, the Deir is Petra's most impressive monument. It is also the least accessible.

Climbing one day to this massive relic of the Nabateans, we visited what is perhaps the one cistern in Petra that remains perennially full. Seeping down through the rocks, the water drips through ferns and moss into a grotto of overhanging sandstone. The Nabateans had funneled the precious drops into open square-cut pools (page 860).

Thousands of Nabateans must have stopped here to drink as they climbed toward the Deir. The route had once been a ceremonial way. It is paved where it passes through a wadi and chipped into steps where it mounts a cliff; in places great slices of rock have been quarried away to dignify the path for whatever strange processions may have wound their way to the holy temple.

The Deir itself is a copy of the Treasury in the Siq, but its location is not so striking nor is the color of its rock so charming and deli-

cate. It is larger than its model, however, and its position commands a breath-taking view of the Edomite mountains and the vast Wadi Araba to the west (pages 866-867).

The very name of the Deir, which means "convent" or "monastery," testifies to its having been taken over from the Nabateans by Christian priests. The newcomers would have destroyed any statues or idols on the façade of the Deir; an empty niche in the square-cut interior, Harding surmised, must once have contained the most revered emblem of Nabatean worship.

Christians may have erected an altar here, he conjectured, as they did in some of the other temples, but no trace of it remains today.

Ibrahim Gets a Job—and a Bath

Throughout my stay in Petra, 12-year-old Ibrahim, who had attached himself to me at Elji, was a constant companion, mule, and luggage carrier. He had posed for an American photographer once before; his reward had been about \$6 for two days' work. With recollections of this fortune dancing through his head, the youngster stayed with me like a shadow.

Unknown to me, Ibrahim slept outside my tent the first night. I supplied him with blankets and arranged for him to get three meals a day at the camp's cave kitchen.

On a hot, dusty afternoon, Ibrahim guided me to a waterfall in a near-by gorge. He hadn't had a bath for three weeks, he admitted, and it was much too soon, he assured me, to think of it again. But when I made another bath a condition of continued employment, he grudgingly scrubbed himself under the bitterly cold spray.

Wherever Ibrahim's donkey would go, his job of transporting my equipment was easy. When we climbed steep mountains, he shouldered my camera case himself. He hired a youthful subcontractor (at some ridiculously low wage, I'm sure) to carry the heavier case of flashlight reflectors and stands.

I paid Ibrahim at the end of each day, and we became fast friends. He ostentatiously bought English cigarettes with part of his wealth; his biggest moments were when he could flash a packet of Players before some of the grown Arabs at the camp or offer a smoke to one of his new American friends.

We learned more of the religion of the Nabateans next day at the Great High Place, which may have been the scene of Petra's

most sacred blood rites (page 854). Here are open altars and a court, or triclinium, where priests may have gathered to feast and participate in sacrificial services. Whether the sacrifices were of animals alone, or of humans as well, there is no record.

Emblems of the Nabatean sun god, Dusares, in the form of black stones, probably were smeared with the sacrificial blood. Cisterns near by provided water to wash the blood away. Such sacred stones are believed to have been located at all of Petra's high places, as well as in niches in the Siq and in homes.

Among the Hebrews and other ancient Semitic tribes, stones were long considered the dwelling places of deity. The Black Stone of the Kaaba in Mecca, the kissing of which is part of the Moslem pilgrimage ritual, is similar to the blocks which graced these altars,* and such a stone is still in use beside the traditional tomb of Aaron.

Two gigantic tapering pillars, shaped like obelisks, stand in solitary splendor near the Great High Place. They were not erected; the Nabateans simply quarried away the mountain around them. Like the two altars, they may have been dedicated to Allat, the mother goddess of Arabia, and to her son, Dusares.

Triclinium Feasts Honored Dead

From the Great High Place we descended to a triclinium. This monument alone among Petra's rock-cut structures is richly ornamented inside (page 860). Funeral services were probably held in banquet halls such as this. Other dining halls, though none so elaborate, exist among Petra's ruins.

There is no way as yet to determine the nature of the ceremonies held in these banquet chambers. If they resembled those of related religions of the Near East, a family might have gathered here to honor the deceased. Archeologists surmise that the feasting was preceded by such ceremonies of mourning as a period of fasting, the shaving of heads, and the ritual slashing of hands.

Back at camp in the evening, we would watch the last rays of the sun turn to gold on El Khubtha across the deserted city. At the foot of the mountain the façades of a trio of classical monuments—the Palace, the

Corinthian Tomb, and the Urn Temple—would finally disappear (page 862).

Unhappily, our days at Petra came too quickly to an end. There was much left unseen on the morning we broke camp.

A party of Foreign Operations officials, who had followed photographers Murray and Harder to Petra, felt the same way. Yet they were consumed with ideas on how to make the ancient city available for tourists. Assuming they could build roads and airfields, they would require running water, sewage disposal, electricity. And, to house these modern conveniences, a hotel!

Shriek of Car Horns Not for Petra

I turned to look back from my horse as we passed the amphitheater, carved from a hillside for a gathering of some 3,000 people. Above the stone steps rose tombs and temples and silence. And I thought of what Gerald Harding had written as the conclusion of his booklet on the Nabatean capital:

"No motor car has yet disturbed the silence of Petra, and it is doubtful if one ever will. The aeroplane can only fly over; there is nowhere to land. The whirr of engines and the shriek of Klaxons is not for Petra. The gaunt red mountains and vast mausoleums of a departed race have nothing in common with modern civilization, and ask nothing of it except to be appreciated at their true value—as one of the greatest wonders ever wrought by Nature and Man."

Already, despite Harding's assurance to the contrary, Petra's solitude has been invaded by air. From a Royal Air Force base near Amman, Wing Comdr. F. O. Soden succeeded more than two decades ago in landing beside the ancient city itself. Perhaps this is an omen of the Nabatean capital's future.

I looked ahead at Harding. He was riding alone, straightforward in the saddle, looking neither to right nor left as he entered the winding Siq. And I wondered what this English archeologist would think when tourists and hotels, perhaps even helicopters, broke the lonely silence of Petra's ancient valley.

* See "From America to Mecca on Airborne Pilgrimage," by Abdul Ghafur Sheikh, NATIONAL GEOGRAPHIC MAGAZINE, July, 1953.

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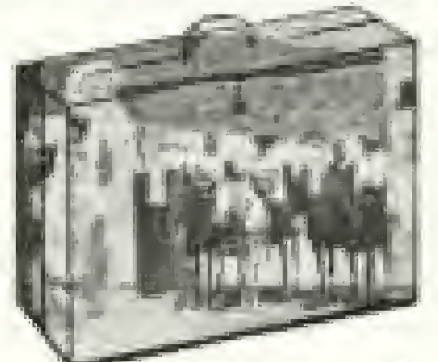


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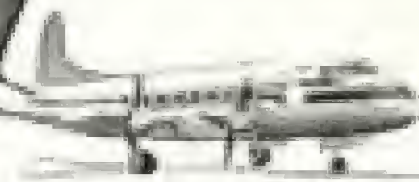
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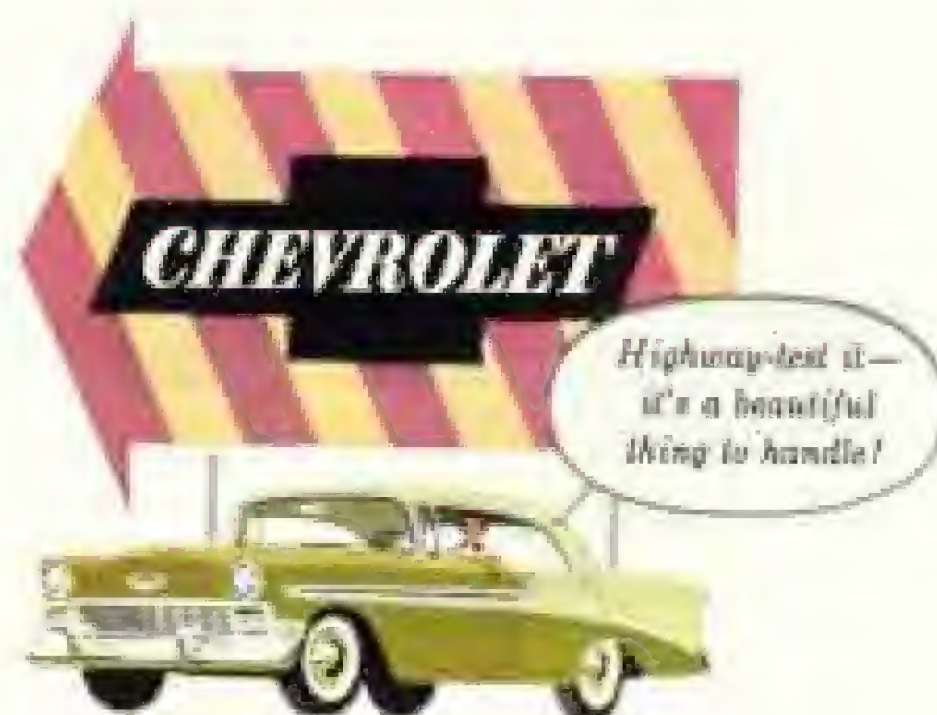
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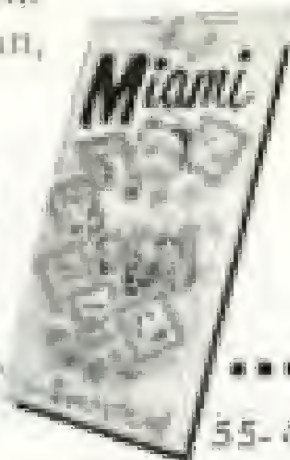
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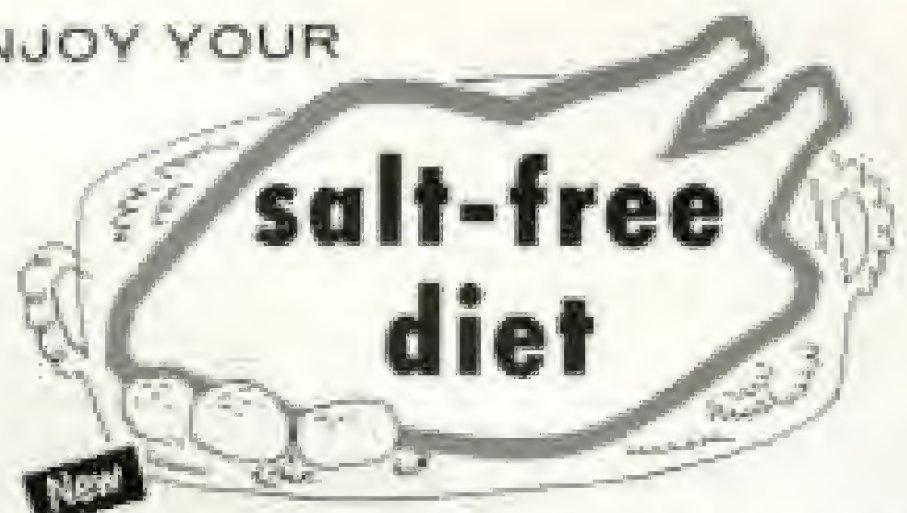
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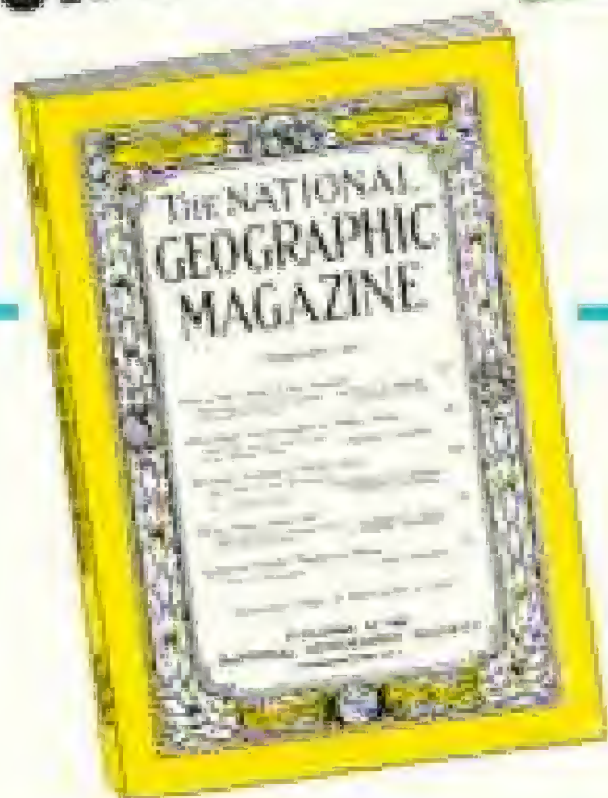
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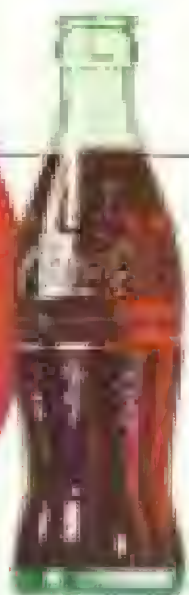
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