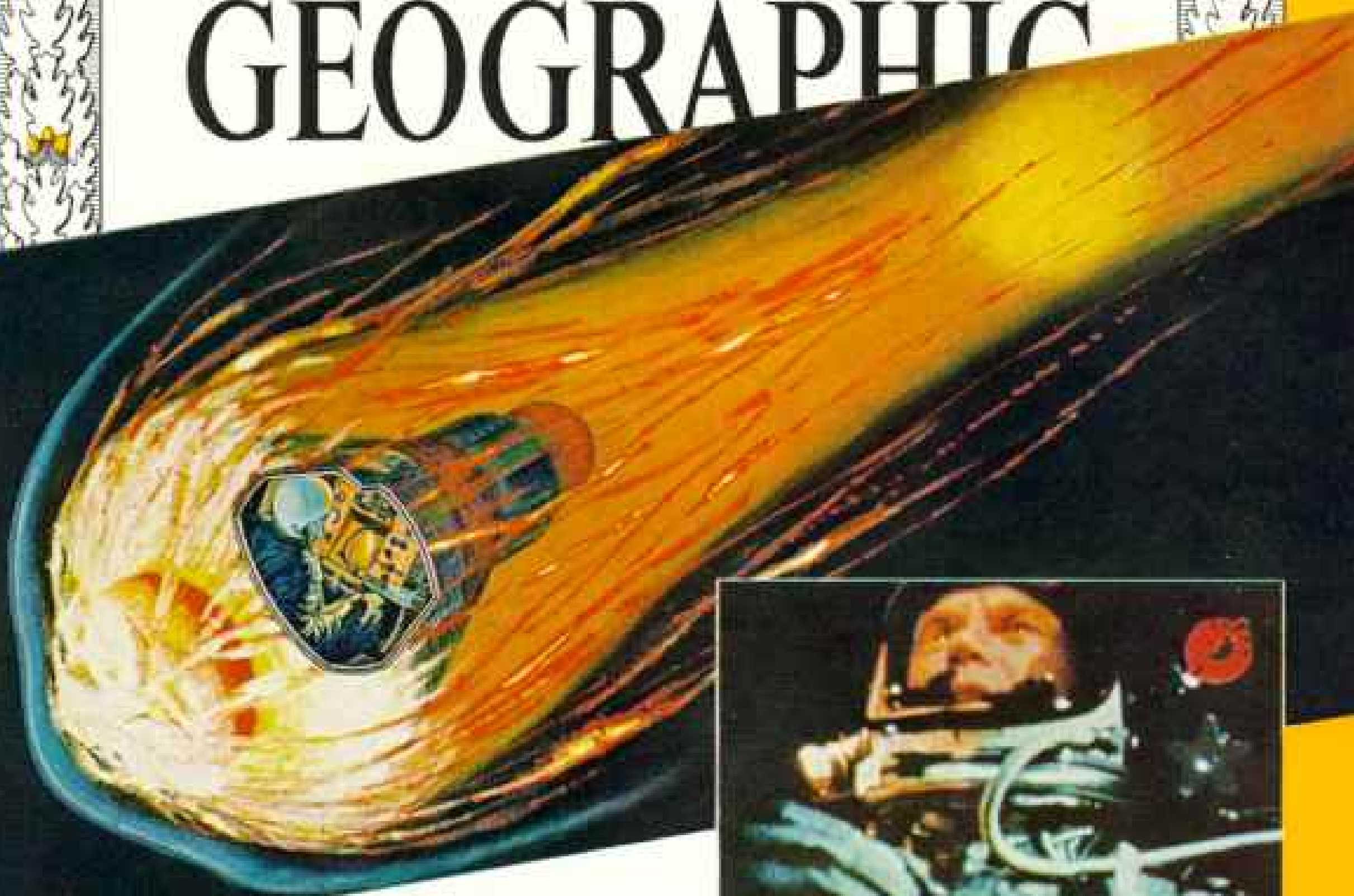


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MISTS OF THE DARK AGES were beginning to lift on that November day in 1095 when Pope Urban II stood before a hushed multitude outside the French village of Clermont. To the massed thousands—and to all Christendom—he cried out an appeal and a challenge that dispelled those clouds forever.

Urban was preaching the First Crusade, a campaign to return the holy places of Christianity to the followers of Christ. Historians dispute the exact words the Pope uttered, but the response of the scores of thousands assembled there is beyond doubt.

"Deus lo volt!" they cried. "God wills it!"

Nobles and Peasants Answered the Call

With that cry and that conviction they launched a movement that would change not only the maps of Europe and Asia but history itself. The strange magnetism of a devout pontiff had stirred a response greater than even he could have prayed for. For two hundred years men would take the cross, leave home and worldly wealth behind, and march toward the unknown in fulfillment of one of mankind's proudest dreams.

The tightly drawn lines of feudalism vanished before that spontaneous response. Knights and bishops answered; so did peasants and tradesmen, serfs and freemen, and the sons of kings. The lords of the church were first astonished, then frightened by the enthusiasm. Some even tried to discourage it.

As well try to hold the wind. The Crusaders marched, some to death and some to glory. Men died, so did armies, but the dream would not die. It lived and grew, and in the end it conquered. Christians could walk freely in the steps of Christ and worship at His tomb.

But the Crusades accomplished much more than that. Within a few generations they carried European civilization forward hundreds of years. They carried ideas to the East with them, but they brought back more than a fair exchange. All the arts and sciences and



EDUCATION BY THOMAS NEBBIA © NATIONAL GEOGRAPHIC SOCIETY

Cathedral and knight symbolize the Crusades, which began here at Clermont-Ferrand.

IN THE Crusaders' Footsteps

BY FRANC SHOR
Senior Assistant Editor

Photographs by THOMAS NEBBIA
and JAMES P. BLAIR





even the skills of government profited.

There is an irresistible contagion in such a dream. So strong, in fact, that reading of it 865 years later I found the old lure new once more. On a spring day in 1961 I set out to follow the path of those First Crusaders, to see what they had seen. The world had changed, but the land had not, and it was possible, I thought, that men might not have changed too greatly either.

I left Clermont-Ferrand on an April morning when the yellow blooms of the genet brushed the French countryside with a golden glow. Behind me stood the gaunt figure of Urban II, arm upraised, urging the Crusaders forward on their mission of faith. Ahead stretched the long road they followed.

There is more than history on that highway. It winds to the Holy Land through some of Europe's most magnificent terrain. It carried me across the Loire, up the Rhine, and down the Danube. Through the green fields of France it rolls, past the bustling industries and fat farmlands of West Germany, into a Vienna reborn to life and laughter.

The way pierces the Iron Curtain at Hungary, probes through Yugoslavia, and stretches across Bulgaria and into Turkey (map, pages 736-7 and 10-color Atlas Map Supplement, **Europe**, distributed to members with this issue). And everywhere I walked or rode, it introduced me, as it did the Crusaders, to the people who live beside it. Some welcomed me; others were surprised—or frightened—to find a Westerner in

Free Jerusalem! Pope Urban II Exhorted Crusaders at Clermont

On November 27, 1095, a golden-tongued pontiff preached the First Crusade to a vast throng in the French city known today as Clermont-Ferrand. Liberate the Holy Sepulcher from the infidels! he besought prince and pauper, knight and knave alike; and his eloquence kindled a fire that burned in the hearts of Christians for 200 years.

One hand uplifted, the other clutching a staff, Urban's statue recalls the city's proudest hour. Around the silhouetted figure, pigeons wheel like lost souls.

HEADLINE BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS HEERH © N.G.S.



HE EXTERIOR BY THOMAS NEBBIA © NATIONAL GEOGRAPHIC SOCIETY

Candles of hope burn in Clermont's Church of Notre Dame du Port, as they did the night following Urban's impassioned plea. "God will be your guide," he promised the Crusaders, "and whoever shall go on this journey shall wear the sign of the cross."

their land. But that happened also to the Crusaders, and like them I learned from the journey:

Clermont-Ferrand was simply Clermont when Urban II made his historic call for the First Crusade in 1095, and the city has changed in more than name. True, there is still a street named for him, but there is also a busy store called "Big Chief" with a large sign announcing "Surplus Americains" and featuring not only used army goods but cowboy boots and "Genuine Levis."

A notice in English was designed to make me feel at home in my hotel room. The direction had the pleasure to inform the client that a washing and drying service was at his disposition, that linen and vestments were recollected by the lady's maid, and that delicate linen and silk linen were tarified according to the work.

I should not be amused by errors in English, though. My own fractured French brought no laughter but only an eagerness to help me. French provincial cities, like the French countryside, have a friendly warmth that the Paris visitor may miss.

Most of the Crusaders who blazed the trail

that I followed did it on foot, but I had neither the time nor the legs for such a walk. Still, I wanted the intimate view of the countryside and the people that only a hiker can find. So on most mornings I started early, walking a few miles before NATIONAL GEOGRAPHIC photographer Tom Nebbia picked me up in our station wagon. These strolls, and the friends I made by the roadside, were the best part of the five-month journey.

Farmer Risks Fortune on Apricots

It is remarkable how different the roadside looks to a man on foot. In a speeding car, kilometer markers race by; to the hiker each one becomes an event. And the busy little figures one sees from a car window become men and women with something to tell you about their lives.

One such was Alexi Rodier, who tills four hectares—ten acres—not far from Clermont-Ferrand. He was picking strawberries when I passed, and hailed me to ask if I would like a cooling drink. We walked to his springhouse, on the edge of a grove of fruit trees, and sipped a fresh white wine from his own grapes while he answered my questions.

The price of strawberries was high at the moment, he announced with considerable pleasure—but, he added with the pessimism characteristic of the French farmer, it was certain to drop soon to a ruinous level. Optimism got the better of him again, however, and he confided that he really didn't care much about the price of strawberries; apricots were the thing for him.

"It is the new grafts," he explained. "These trees produce marketable fruit in a lot less time than the ones my father planted. I gambled on the new method, and this year I'll have the best crop in the countryside."

His brow furrowed once more. "But the pig of a tax collector will take it all. I do not know why I work my fingers to the bone."

We walked to his comfortably furnished stone house and met his buxom wife and handsome red-faced, white-haired father. Proudly the younger Rodier showed me his new gasoline tractor-cultivator. "Things could be worse, he admitted reluctantly.

"But you, why do you walk this road?" he asked. "You are an American, you must have an automobile."

I admitted the charge, explaining that I had set out to follow the First Crusade, with

Shields at their breasts, lances ready, an army of knights headed by Godfrey of Bouillon, Duke of Lower Lorraine, sets out for the East in 1096. Godfrey's brother, Baldwin of Boulogne, rides with him in this medieval illumination.





THE FIRST CRUSADE



V.J. Kelley, cartography; J.W. Luthers, art; E.M. Schuel, research
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particular attention to the trail of Peter the Hermit. Peter, I added, had led one of the first armies of the cross-bearers across Europe to Constantinople.

"Where did this Pierre l'Hermite get an army?" M. Rodier demanded. "Who paid them, and who fed them?"

"Most of his followers were men much like yourself," I replied. "He preached a cause, they listened, and they followed. Farmers in this very district left their land to follow him without thought of pay."

M. Rodier poured another glass of wine and shrugged as only a Frenchman can shrug.

"If the pigs of tax collectors were the same then as now," he laughed, "I am not sur-

prised that many farmers left their farms."

I do not know about the tax collectors, but I am sure that the French farmers of Peter's day were the same as they are now: always willing to complain about their lot—yet willing to defend it with their lives.

Back in our car, Tom and I rolled northward from the Massif Central, where patches of snow melted beside meadows blanketed with wild flowers. Gray stone chateaux stood among manicured fields; ancient churches rode the hilltops, and men plowed behind oxen as they had in the time of Peter the Hermit. But in the towns glass-fronted shops displayed clothes and manufactured goods as modern as any Paris offers. Even in the cities,

though, old customs linger. Bread is bought fresh from the bakery oven, for instance.

France is not a nation of early risers. Even in country villages I met few people on the streets when I set out shortly after dawn. But the bakeries were open, and so were the little family-owned bistros, most of which had small signs announcing that "*Ici vous pouvez apporter votre pain.*" I did bring my own bread—I brought croissants hot from the oven in the fragrant bakeries and savored them with steaming café au lait in tiny cafes where the proprietress scrubbed the wooden floor while her husband rubbed the zinc-topped bar. There is no better breakfast in the world.

No record exists of Peter and his growing army of followers passing through Paris, but most historians agree that the cross-bearers came by way of Poissy, a sleepy suburb on the banks of the Seine. Tom and I paused there too, to visit the church, which was new in Peter's day (page 743). It

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PHOTOGRAPH BY THOMAS HERRIN © NATIONAL GEOGRAPHIC SOCIETY

Soil warmed by the spring sun feels the bite of a plow near Le Puy. Through rolling hills of France rode Peter the Hermit, an itinerant monk who took up Urban's cry for a crusade. Thousands heeded his summons. Men of the soil, they plowed behind oxen, just as does this Auvergne farmer today. Deeply religious but restless and adventurous, they strode away from their fields and headed eastward.

Cathedral spires loom above shoppers on the Rue des Gras in Clermont-Ferrand.

Author Shor, lunching in a vineyard overlooking Clermont-Ferrand, retraced the Crusaders' march from France to the Bosphorus. A reporter with a penchant for seeking out earth's lesser-known peoples and places, Mr. Shor has traveled nearly a quarter of a million miles on NATIONAL GEOGRAPHIC assignments: from Finnish Lapland to Tierra del Fuego, from shell-torn Quemoy Island to the world's-end kingdom of Hunza.





Lava Plugs From a Dead Volcano Rise Like Skyscrapers in Le Puy

In this lacemaking town of red-tiled roofs, Pope Urban II convoked the Council of Clermont that proclaimed the First Crusade. Later, Le Puy's



EDUCATION BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS NEEBIA © N.G.P.

bishop, Adhemar de Monteil, joined one of the armies. A 10th-century chapel caps the Needle, the 280-foot pyramid at left. Distant Corneille Rock

bears a Madonna and Child cast from Russian cannon seized during the Crimean War. Churchtop statue of St. Joseph crowns the pinnacle at right.

displays beautiful gargoyles and a stained-glass window that says the church was consecrated on the eighth of June, 1093, with the help of King Philippe the First. Philippe's younger brother, Hugh of Vermandois, led an army in the Crusade, fought at Dorylaeum and Antioch, and was one of the few to return.

The church, like so many in France, has a lived-in air. There is a magazine stand, run on the honor system with a coin box. Another of the many collection boxes seeks funds to heat the church. From the chill of the gray stone that spring morning, it was apparent that the burghers of Poissy cared more for their faith than for their comfort.

Neatly typed cards on a bulletin board in the vestibule announced the banns of a dozen local couples. Pierre Dalgé and Geneviève Regnard would wed on June 3, one was informed, and so would Jacques Moreau and Micheline Caillé. I dropped a coin in the box marked *chauffage*—heating—and hoped it would be warmer on that happy morning.

Look of a Donkey, but a Pillar of God

Peter's exact route through France is disputed by the best historians of the period, and, for that matter, little is known of the man himself. Sir Steven Runciman, whose great *History of the Crusades* is perhaps the definitive work on the subject, draws upon half a dozen sources for an unflattering description. Peter was "of short stature, swarthy and with a long, lean face, horribly like the donkey that he always rode." He ate fish, abstaining from both bread and meat, and beneath the ragged and soiled hermit's cape which gave him his name, his feet were always bare.

Peter's person may have been unimpressive, but his voice wrought magic. Men heard his call for help in regaining the Holy Land for the religion of Jesus Christ and they obeyed. Too, it was a troubled time, and the countryside he passed through was poor; peasants felt they had little to lose in following this strange and compelling figure.

Cologne, the great city on the Rhine, saw Peter and his followers on Holy Saturday, in April of 1096. When he left, less than two weeks later, some 20,000 believers followed him up the riverbank. The People's Crusade left behind a city that was already one of the great commercial centers of the West.

In Cologne's city museum Dr. Edith Meyer-Wurmbach re-created for Tom and me the town of Peter's day. Scholarly and quiet when

our conversation began, she grew more and more excited as she talked of the period that is her specialty. As she led us about the museum, darting from a case of 11th-century coins to a display of seals of the same period, pointing out artifacts used in the Crusaders' time, she turned back the calendar and took us with her into the Middle Ages.

Antiques Forged in 11th Century

"Look at these," she laughed, opening a catalogue of seals used in Peter's day. "Forgeries, nearly all of them. You see, when there was a dispute over a piece of property, the oldest document was usually accepted. So people copied seals from an even earlier period and put them on their titles."

Dr. Meyer-Wurmbach showed us silver coins called denars. Such coins as those must have been in the treasure chest Peter filled with donations to feed his devoted thousands—when there was food to be bought.

"That coin was stable for 350 years," she said. "From the middle of the 10th to the early 14th century it would buy about the same amount of goods. And you can tell how important Cologne was as a trading center by the fact that these denars have been found as far away as Finland and Russia."

In those times, however, prices were so low that the denar was seldom used to purchase everyday needs. What the burghers used, Dr. Meyer-Wurmbach told us, was a piece of wood called a *Kerbholz*. And the *kerbholz* was certainly one of the world's first credit cards.

Split Stick Keeps Account

Assume that you are a citizen of Cologne in 1096 and you go to the bakery to buy a loaf of bread. You have a denar, but the bread costs only a twentieth of that, and no smaller coin is available. What do you do?

What you would have done in Cologne was to split a stick down the middle, keep one half, and give the other to the baker. Every time you buy a loaf, you hold the two halves together and put a notch in both. Neither you nor the baker can add or whittle away a mark, or the split sections won't match. And when you have twenty notches in your *kerbholz*, you give the baker a denar and split a new piece of wood.

"The word is still used in German," Dr. Meyer-Wurmbach added. "Today we say '*Ich hab' ein Kerbholz,*' when we mean

that we have something on our conscience."

Outside the museum there is little to remind the traveler of Peter's Cologne. The city was almost completely destroyed during World War II—little but the great Cathedral was left standing (page 744). But from the rubble has sprung one of the most modern metropolitan centers in Europe. Glistening structures of glass, steel, and concrete house a populace which once again does a world-wide business.

It does a lot of business with itself, too. Streets and shops are crowded during business hours, and after closing time the tardy shopper can still find almost anything he may need in the many vending machines that appear on every wall. In one block I noted glass-fronted vendors of sandwiches, fresh fruit, aspirin, handkerchiefs, nylon stockings, fresh flowers, electric-light bulbs, and souvenirs.

One contrivance, resembling a penny-in-the-slot weighing machine, fascinated me. You step on the platform, insert the equivalent of a nickel, and get a one-minute foot massage.

More than the machines, however, I remember the hospitable people of Cologne. Tom and I arrived late at night, got lost, and asked directions of a policeman who had a huge boxer dog on a leash. The officer was willing, but my German limps badly. When he saw

my confused look, he tried gestures, but every time he swung his arms, he jerked the leash, the dog jumped forward, and I jumped backward, losing whatever sense I had made of the last gesture.

A young man sitting in a car parked nearby saw the problem, came over to ask what we wanted, and then got in his car to lead us to our hotel. It took him 20 minutes. He was



Crusader king, Louis IX stands with stone sword in hand before the Church of Notre Dame in Poissy, France. Twice during his reign (1226-70), Louis journeyed to the Holy Land. King Philippe I dedicated this church in 1093. His brother Hugh, Count of Vermandois, led an army in the First Crusade.



Cologne Cathedral, treasure of Gothic splendor, lifts twin towers 525 feet above



Rome of the North, Crusaders called Cologne. Preaching here in 1096, Peter the Hermit won recruits for his army.

Following World War II, the city lay in ruins, but the ener-



ILLUSTRATED BY THOMAS HEWITT © NATIONAL GEOGRAPHIC SOCIETY

the Rhine, Lights of passing ships burnish the waters in this time exposure



getic Germans lost no time in rebuilding. Today Cologne boasts smart shops (left) and glass-walled railroad station (right). Children above romp outside the restored Cathedral.





typical of his fellow citizens; if I stood on a street corner looking at a map, someone invariably stopped to help. If I took out a dictionary in a restaurant, a fellow diner would offer to translate the menu. We left Cologne feeling very happy about its friendliness. Throughout Germany this feeling continued.

The weather was a different matter. We drove up the Rhine on a foggy day, and foggy it remained during most of our trip. There were, of course, days when the fog was washed away by downpours of rain. And there were a few sunny periods when Tom photographed the magnificent Rhine scenery. However, the valley of the Rhine is no place to acquire a suntan in springtime.

It was raining, in fact, when we drove into Remagen, a small town which gained fame on an earlier gray and miserable day—March 7, 1945, to be exact. That day American GI's seized the Ludendorff Bridge at Remagen and became the first invaders since the days of Napoleon to cross the Rhine. Although the bridge collapsed ten days after it was

captured, it allowed the Allies to establish a permanent bridgehead.

It was hard, sitting in a comfortable restaurant and looking out at the blackened ruin of the bridge tower, to realize its importance. Tom and I were discussing it when a couple of youngsters appeared beside our table, one holding a bunch of wild flowers and the other a collection box. I decided that ignorance of German was our best defense.

"Ich spreche nicht Deutsch," I said, and turned back to Tom.

"Then you speak English," said the blonder of the two, "and so do I. I am English and this is my German cousin and I am here visiting him and his mother is sick and he wants to buy her a present and we have picked these flowers and we are selling them for 20 pfennigs a bunch so he can get money to buy the present for his mother and will you please buy some, please."

It was obvious that American luck in Remagen had all been used up back in 1945, so we bought the flowers.



Ragged robin blends its delicate pink with the lush green of Rhine banks in May. Nicknamed *Franzhosen*, or French britches, the perennial was one of 22 different wild flowers the author picked in a day's walk.

ILLUSTRATIONS BY FRANK DURO (BELOW) AND THOMAS KIBLER © W.A.G.

Sun-kissed vineyards terracing the Rhine south of Mainz produce some of Germany's finest wines. Connoisseurs believe that morning sunlight which reflects off the river imbues the grapes with extraordinary flavor.

Under spring skies of 1096, Peter the Hermit rode his donkey through this fertile bottom land. Sleeveless robe flapping about his ankles, bare feet dangling in the grass, he implored Rhinelanders to leave their homes and follow him. His streams of converts grew into a flood that rolled south beside the river.

Mother and son, a relief team for father, head home after a day's work in the vineyards.



If the histories of the Crusades don't mention Remagen, neither do they pay any attention to Rudesheim, some 75 miles up the Rhine. This is in the heart of the Rhine wine district, and the road signs read like a rathskeller wine list. A dozen of the world's finest white wines—both Rhine and Moselle—are grown within an afternoon's drive, and the cellars of Rudesheim offer everything from a glass of unnamed open wine at 20 cents to a bottle of Graf Egon von Francken Sierstorpff Rudesheimer Kirchenpfad Spatlese 1959er at—well, at a good deal more.

The Rhine: Germany's Busiest Highway

Herr Edmund R. Madel, who serves as Rudesheim's press representative, piloted us through narrow streets and in and out of a dozen wine cellars (opposite). He also stuffed us with hot *Würste* and smoked eel, for which this section of the Rhine is famous. But interested as he is in tourism, Herr Madel was anxious that we realize the Rhine's importance in commerce.

"It is the highway of this part of Germany," he emphasized. "Many of your Crusaders passed this way by boat, and much of our industrial production still depends on the cheap transportation the river affords."

Ships must take on a special pilot between Rudesheim and Kaub, some 15 miles downstream, Herr Madel told us. The dreaded Binger Loch, a threatening combination of rocks and shallows, makes the river dangerous for any but the most experienced. Insurance companies, he said, refuse to pay damages if an accident occurs without the special pilot aboard.

"If it's that much trouble," I queried, "why don't you simply blast a clear channel?"

Madel laughed. "That idea was considered a long time ago," he explained. "Engineers made a careful study and concluded that if they knocked out the Binger Loch, the flow of the Rhine would increase so much that the level of the whole river would be lowered."

The best way to see a river, our friend insisted, was to ride on it. He arranged a charter vessel for the afternoon. It was nearly lunchtime, and we suggested we have a quick bite before leaving.

"Never mind," he said. "I'll have a little snack put aboard. Meet me at the railroad dock in 15 minutes."

I thought we had made a mistake when we reached the dock. I saw nothing but a 100-

foot passenger steamer. But while we looked, Madel appeared on deck with the captain.

"Come aboard," he shouted. "Couldn't find anything smaller."

Discreetly I suggested that we couldn't afford anything quite so substantial.

"Never mind," he laughed. "Meet Heinz Dormann, the captain. He's my friend and he'll charge you just about what a motorboat would cost."

Herr Madel explained that a luncheon date kept him from accompanying us, and raced down the gangplank. Captain Dormann signaled the engine room, and we made a wide turn and headed downriver.

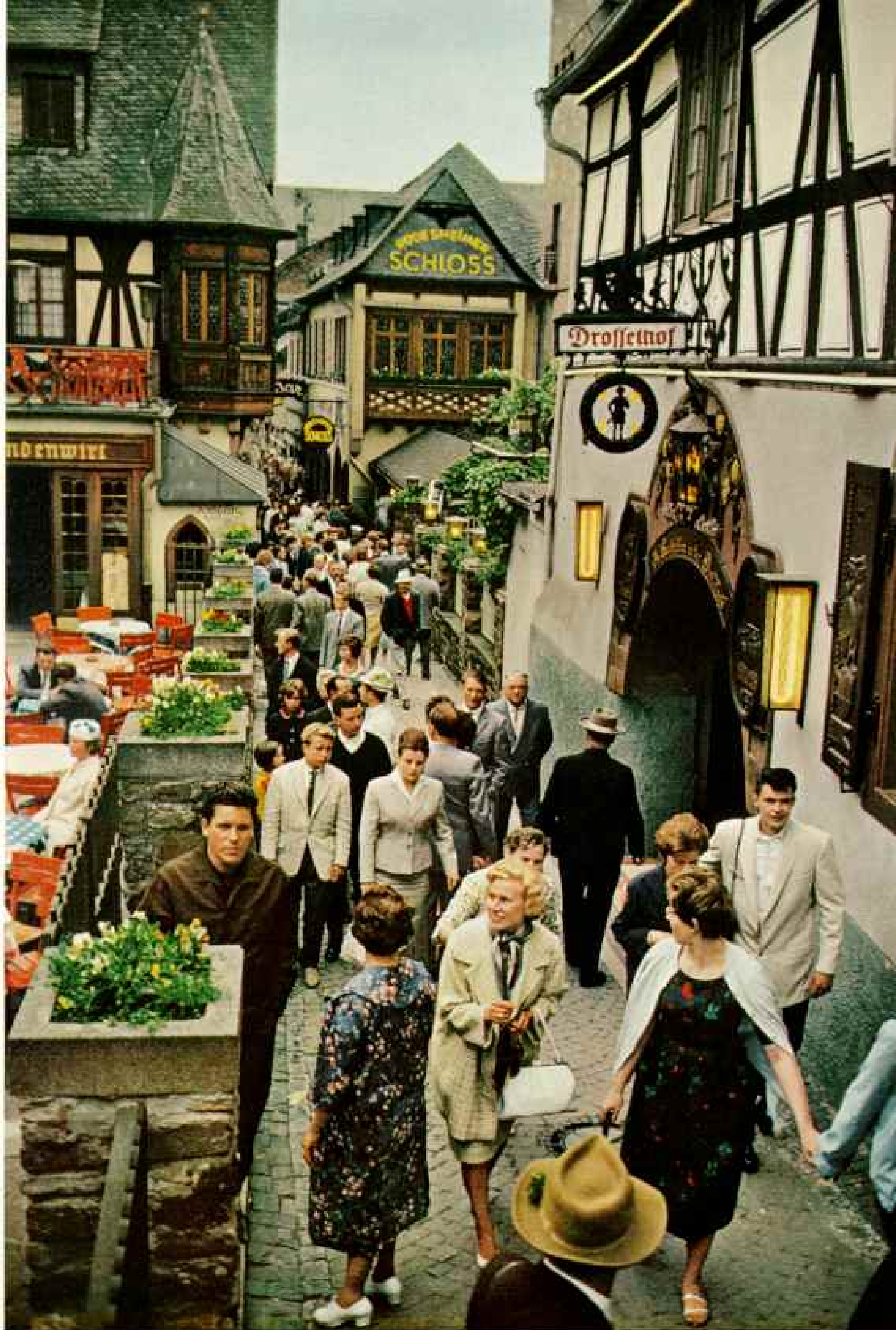
The castles of the Rhine are magnificent from either bank (page 750), but seen from the surging river itself they take on a fairy-land beauty. I had planned to count commercial vessels as a measure of river traffic, but there were so many tugs, barges, passenger steamers, pleasure craft, and launches, and I spent so much time gazing entranced at the soaring stone piles atop rocky crags, that I soon gave it up. Suffice it to say that the Rhine is one of the world's busiest and most beautiful rivers.

Captain Dormann comes of a family that has been on the Rhine for nearly 50 years; his father owns an interest in seven passenger vessels. Heinz is a tall, lean 34, and has been on the river since he was 18. The *Vaterland*, his command, ordinarily carries 160 passengers. I found a certain elegance in being one of two passengers on such a craft—able to dictate its course and take any seat I wanted.

Wine, Smoked Eel, and Jellied Tongue

The "snack" Madel had promised was in the cabin below, in a basket slightly smaller than a bathtub. When we unpacked it, I was convinced that our host had expected the full complement of 160 passengers. There were roast chicken and roast beef, two kinds of ham, smoked salmon, shrimp in mayonnaise, smoked eel, roast pork, jellied tongue, assorted sausages, stuffed eggs, a jar of *pâté de foie gras* with truffles, a Rhine wine, and a bewildering variety of small cakes. We made little impression on it, but it made a great impression on us.

So swift is the current below Rudesheim that it took us nearly five hours to retrace our two-hour journey downstream. It was dark when we docked, and Herr Madel greeted us as we stepped ashore.



PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS HERRER © N.G.S.

Every day is carnival day in Rudesheim on the Rhine, holiday town in the heart of the vineyard country. Cafes and hotels line narrow streets honeycombed with wine cellars.







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Steins clink a toast to Heidelberg in one of the famous students' rathskellers. Walls smothered with signs, photographs, rapiers, fencing pads, and helmets keep alive the lighthearted but strenuous past of a city famed for music, romance, and dueling. Students of Heidelberg University, Germany's oldest, crowd these inns nightly.

"It's late," he said. "You must be starved. Won't you join me for dinner?"

We thanked him and explained that something had happened to our appetites. I hope he didn't see what was left in that basket.

Peter the Hermit followed the Rhine and then the Neckar River to Heidelberg. We did also. Unlike most Rhineland cities, this famous university center was little touched by the war, but American troops stationed there since have left a definite impression. In a

famous beer cellar, for example, the great majority of the customers were German students, but when the piano player rendered Heidelberg drinking songs, hardly a voice was raised. When he swung into "I've Been Working on the Railroad," the ancient beams shook with the lusty singing of local lads.

In many rathskellers, one sits on benches at community tables. The tables are so close together people must walk on the benches, stepping over other customers, to get a seat. We found ourselves with four German students and a couple of older men, one with two dueling scars on his cheek. When the students called for a *Stiefel*, and the waiter brought a glass boot holding about two quarts of the strong Heidelberg beer, my scarred neighbor explained the custom.

"They drink from the boot in turn," he said. "The next to the last man buys the drink—slightly more than a dollar. The trick, of course, is either to leave a little more in the boot than the next man can drink without stopping for breath, or to finish it yourself."

◀ Barges Churn Past Cat Castle on the Stately, Storied Rhine

Burg Katz, with its imposing round keep and cone-capped towers, soars above the village of St. Goarshausen and its cross-river neighbor, St. Goar. Wooded Lorelei Rock, on the distant left bank, looms 470 feet above the narrowest part of the middle Rhine. Legend tells of a golden-haired siren who sat atop the crag and lured boatmen to their doom in the bend's swift current.

REPRODUCED BY THOMAS MORRIS © N.G.S.

We watched fascinated as the boot went clockwise around, each young man studying the level carefully, then taking a measured sip. Finally one contestant gave the container a long look, loosened his collar, and tipped the boot ceilingward.

Slowly the dark liquid eased from the glass; the student's Adam's apple rose and fell until the last drop disappeared and the foam followed. The loser carefully turned the boot upside down over his hand, then shook his head and paid the reckoning.

We left the Rhine near Heidelberg, as Peter had done, to follow the valley of the Neckar south to the Danube. Public campgrounds were plentiful, and there seemed to be more tents than houses along the banks of the winding river. We spent a night in Günzburg, where a cobbler was making shoes by hand next to a shop which featured a stainless-steel ice-cream machine.

I left Günzburg late the next morning and walked six miles along the Danube without seeing a soul. But the path wound through infinite varieties of wild flowers, and the trees housed a million birds. The river was wide and placid, but not a boat passed. Trains, often loaded with new automobiles, whistled on the opposite bank. I was sorry when the path joined the road to Offingen, where I was to take a train for Augsburg to meet Tom.

Offingen was almost as restful as my walk through

the woods. Few people strolled the streets, and those I met spoke the ancient greeting "*Grüss Gott*" as though they meant it. I lunched at the Krone Gastbaus and chatted with owner Franz Seidl and his pleasant wife. He inquired of my journey.

"If you want a new Crusade," he said, "start one against the next war and I'll join you. I was wounded four times in the last one, and I don't want any more."

When we left the dining room, all the other

ILLUSTRATED BY THOMAS HERRIS © NATIONAL GEOGRAPHIC SOCIETY



Spiked helmets cap Old Bridge Towers, gate to Heidelberg, where the Crusaders left the Rhine Valley and followed the Neckar River south toward the Danube. A tourist's delight, Heidelberg escaped destruction in World War II.



guests looked up to bid me goodbye—a pleasant custom common in southern Germany. And as I opened the front door, Frau Seidl came hurrying after me with a package. I had left a piece of chicken on my plate, and she had wrapped it for me to take along.

Leisurely, Tom and I worked our way down the Danube, through Donauwörth with its ancient Roman walls that were already in ruins when the cross-bearers passed this way, through Rain and Unterhausen and Grossmehring, then into Regensburg.

Here we climbed a steep bluff for a magnificent vista overlooking the city, which lies in a fork of the Danube, and I stopped a passerby to ask the name of a church-dominated village in the distance. My German was improving, and I was proud of my almost correct grammar. Then the inevitable happened.

"I don't dig you, Mac," came the answer. "But from the TT plates on your car, you must be an American. I'm stationed at the radar set-up just over the hill. Now play that back in English and maybe I can help."

Surprise From a "Wild Man of Borneo"

In the city below we joined the crowds at the Regensburg fair. We had our choice of many amusements: death-defying rides and a House of Thrills, a sideshow featuring a Wild Man from Borneo, booths where a well-thrown ball would win a gaudy prize, and a midway crowded with youngsters cautiously licking great clouds of cotton candy.

I noticed a tall, carefully dressed youth from India standing beside me. His long and glossily pomaded hair was done at the back in the best duck-tail fashion. But when he



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Passau Sits Astride a Narrow Tongue of Rock Where Three Rivers Merge

Here the dark waters of the Ilz mingle with the golden-green Danube (center). The Inn joins the two just out of sight to the left. St. Stephen's Cathedral dominates the skyline of this Bavarian town.

Crusading armies followed the Danube for more than 350 miles. Thousands marched along the banks; others took to boats and drifted down between forest-clad slopes and precipices crested with castles and cloisters. Entering Bavaria, they found themselves watched by men in sheepskins who spoke a strange tongue.

Everywhere, new contingents joined Peter the Hermit's growing flock. All were resolved to follow their shepherd to Jerusalem, where they would walk among its gardens and orchards, and to the Jordan, where they would bathe in sacred waters.

spoke, his voice was soft and his English excellent. He came from Madras, and when I told him I knew his home town, he joined me in a stroll about the grounds.

We paused before two trailers with picture-window glass sides, packed with a glittering display of television sets, electric washing machines, and other household appliances. Our talk turned to the miracle of Germany's industrial revival,* and he spoke knowingly of production techniques and India's need for industrial growth. Suddenly he stopped, looked at his watch, and grabbed my hand.

"Must run along," he said. "I go on in ten minutes. I'm the Wild Man from Borneo. Do drop over and catch my turn."

Passau, like the other cities we had visited on the Danube, proved a traveler's dream. Ancient buildings, steep roofs, and narrow

stone streets make it a perfect example of a medieval German town. Even the names—The Street of the Holy Ghost, The Street of Mary's Help—brought the Crusaders constantly to mind.

Here the rivers Inn and Ilz add their waters to the Danube's flow, creating a mighty stream which is one of the highways of Europe's commerce (above). So swift is the current that passenger steamers make the 185-mile run downstream to Vienna in 12 hours. Tom and I boarded the luxurious *Stadt Passau*, sailed past more castles than we could count, through narrow gorges where the muddy river twisted between evergreen-covered cliffs, and reached Vienna at dusk.

Godfrey of Bouillon led a powerful army

*See "Modern Miracle, Made in Germany," by Robert Leslie Conly, NATIONAL GEOGRAPHIC, June, 1959.



Camera fans focus on scenic Passau as their excursion steamer glides down the Danube en route to Vienna. Old Episcopal fortress of Oberhaus crowns the height at extreme right.



Danube dilemma: How to eat cotton candy on a steamer's breezy deck.

Schoolboys in leather shorts, *Lederhosen*, trudge to classes along the glass-smooth Danube. Austrian castles and storybook villages frame the river.

in the First Crusade. According to Viennese chronicles, he waited three weeks in Vienna for permission from King Coloman of Hungary to cross that land. We had the same problem—a ten-day wait for a visa to enter today's Communist-ruled Hungary. I hope Godfrey and his followers enjoyed their delay as much as Tom and I did.

Vienna was crowded when we arrived; it was the eve of the meeting between President Kennedy and Premier Khrushchev. Hotel rooms, always hard to come by in one of the world's great tourist cities, were almost impossible to obtain, but the famous Imperial found



space for us, and we had a ringside view of many of the more important participants.

Austria is officially a neutral country today, and the shop of V. A. Heck, dealer in old books and prints, presented a window display during the conference that pointed up the middle-of-the-road position. There were two beautiful 18th-century maps—one of Russia, one of the United States. A history of Russia printed in 1792 balanced an 18th-century history of the American Colonies, and a 1760 color print of the King's Street Wharf in Boston was carefully placed opposite a contemporary view of Smolensk.

Vienna: City of Music, Food, and Fun

The Viennese public seemed less concerned with strict neutrality. I stood in the same spot on the same street when both the American and the Russian leaders drove past. Mr. Kennedy drew dense crowds and echoing cheers. Mr. Khrushchev got polite applause from a notably smaller number of citizens.

It is difficult to be concerned with politics, however, in Vienna. Here is a city which has

perfected the art of living and is happy—even eager—to share its delight with visitors. In the suburb of Grinzing, where wine flows with the songs Vienna never forgets, Tom and I were adopted by local citizens and made to feel instantly at home.

The Viennese love their city and its food, but they are a critical lot. Tom and I were seeking a local restaurant in the downtown area one night when we were accosted by a beggar. I offered him a few schillings if he would take us to the cafe we sought.

"I'll take you there if you insist," he demurred, "but the food is terrible."

He was right. But that was the only bad meal we ate in the city of waltzes. I will long carry with me the memory of the boiled beef at Sacher's, the incredible variety of hors d'oeuvres at the Drei Husaren, the venison at the Imperial, and Grinzing's fried chicken. I will also, I fear, carry something more substantial than a memory. Vienna is no place for a man with a weight problem.

Prof. Walter Minarz, whose Vienna tourist bureau is one of the most efficient and cer-



**Bronze Charger Atop Vienna's Parliament
Frames a City as Ageless as Her Songs**

Though spending millions to modernize, Vienna still belongs to the past. Her streets echoed to the steps of Roman soldiers 20 centuries ago. By the time of the Crusades, she was Central Europe's most important city. This view looks east across the Volksgarten toward St. Stephen's Cathedral.

Vienna's waltz king, Johann Strauss, sends melodies across Stadtpark. "Musician's holy city," Johannes Brahms called Vienna, whose charm inspired Haydn, Mozart, Beethoven, and Schubert.



Prodigious yawn relieves the languor produced by Vienna's warm June sun and cool air.

Couple lingers in a Vienna coffeehouse; Emperor Josef II surveys the Josefsplatz ▶



48. ST. STEPHEN'S CATHEDRAL AND COACHWORKS BY THOMAS KIBBEK © W.C.E.



tainly the most hospitable in Europe, called my attention to the forthcoming Viennese Culinary Week. The visitor is given a card listing some 30 famous restaurants, from which he chooses five. After each meal the name of the restaurant is recorded. When he completes the fifth meal, he presents the filled-in card to the proprietor, and:

"A solemn ceremony of inaugural will be held, and the new Gourmet Viennois will be handed an attractive certificate of his gastronomic proficiency."

I suspect that solemn ceremony might be one of interment. No one could survive the profusion of five Viennese gourmet repasts.

Vienna's love of food and fun has not changed, but some things have. In the famous Cobenzl nightclub, high above the city, I noticed that the band played cha-cha-cha tunes to a crowded floor, but that only a few dancers, mostly tourists, were on their feet for

Motor trains whisk sightseers through Vienna's new showcase airport. More than 50 airliners wing in daily; 22 international lines serve the city.

Giant Ferris wheel with boxcar-size gondolas whirls passengers to a city-viewing height of 210 feet above the Wurstelprater, Vienna's amusement park. "For Holy Confirmation," read the vendor's balloons, presents for young churchgoers.



the waltzes. I asked Renate Nickel, a charming guide assigned to us by Prof. Minarz, if modern-day Viennese girls no longer knew how to waltz.

"Of course we know how," she replied, "but we waltz at formal balls. In a place like this we want something more exciting. Can you do the merengue?"

I hope the next American who came Renate's way was more up-to-date.

Not that American influence hasn't been felt in Vienna. On a street-corner kiosk I saw placards advertising an all-Beethoven evening by the Vienna Symphony, a concert of Schubert's chamber music, a performance of *Oedipus Rex*—and an appearance of the Harlem Globetrotters. Attendance at the



EDZACHRONES BY THOMAS HERRIN © NATIONAL GEOGRAPHIC SOCIETY

American basketball exhibition, I learned later, topped every other entertainment attraction in the city that week.

Vienna's coffeehouses have undergone a decline in patronage. "People just don't have time any more," a friend explained. "Once a man would leave his office for an hour or more both morning and afternoon to enjoy his coffee, read a newspaper, and chat with his friends. Today business won't wait. He runs out for a cup of espresso and is back at his desk in 15 minutes."

My grandfather was a Viennese, and I sought out a coffeehouse where he spent many a happy hour in the last century. It is still in business, but its patrons that June morning included three tables of women playing bridge and a few youngsters sipping soft drinks and watching a documentary film on TV.

The façade changes, but the spirit remains. I have heard that money talks, and in Austria it tells what the Viennese consider important. The 1,000-schilling bill (\$38) bears the picture of a composer. A Nobel Prize-winning physician is honored on the 500-schilling bill. The 100-schilling note is graced by a poet, and an inventor is on the 20-schilling bill. Mozart

appears on the 25-schilling coin. Politicians? Well, you can find a picture of an Austrian Bundespräsident on the 1½-schilling stamp.

Peter the Hermit and his followers left the Danube not far from Vienna and took the overland route to Belgrade. Part of that road lies in what is today a restricted zone just inside the Hungarian border; so Tom and I followed the Danube to Budapest, as had German Emperor Frederick Barbarossa, a great Third Crusade leader.

I knew Budapest before World War II, when its gaiety was famed throughout the world. It is a far different city today. Its baroque beauty was scarred by the war and further marred by the tragic revolution of 1956.* But new buildings are going up in every section, the markets are full of food, and the biggest problem the citizens face is not how to find work but how to get to it. The traffic jam is monumental.

Until nine at night, that is. Then the streets are deserted. There are theaters and a few nightclubs—but most Budapesters stay home. A Hungarian friend explained: "We're

* See "Freedom Flight From Hungary," by Robert F. Sisson, NATIONAL GEOGRAPHIC, March, 1957.



ILLUSTRATIONS BY JAMES P. BOYD © NATIONAL GEOGRAPHIC SOCIETY

Crusaders Battled Byzantine Warriors on Yugoslavia's Sava River

Though inspired by religious fervor, Peter's legions lacked money and supplies. Hunger often turned them into marauders.

When the cross-bearers reached the Hungarian Kingdom outpost of Zemun, they met their first major resistance from townspeople. In fury, the pilgrims sacked the town and killed thousands of its citizens, then built rafts to cross the Sava. In mid-stream, Byzantine mercenaries attacked with arrows. The Crusaders routed the bowmen, but not before many had drowned.

Once across the Sava, Peter's band found Belgrade deserted, its residents having fled in panic. The Crusaders pillaged and burned the city.

Open-air market in Zemun spreads beneath flowering trees. Men in high, soft hats and women in kerchiefs display the fruits, vegetables, and flowers from Serbian farms.

too tired to go out at night. Husbands and wives must both work to support a family. We can't play until midnight and be on the job at eight. Besides, there isn't enough money. We have friends in, or visit them at their homes."

Night life may have disappeared, but the spirit has not gone from Budapest. This is a city that can joke about anything—and does. There was a pork shortage when we arrived, and housewives had to stand in line for hours in the hope of getting a roast or a bit of ham. Budapest created a riddle:

"What is ten yards long, has a terrible disposition, and eats potatoes?"

The answer: the queue outside a pork store.

There was no shortage of foodstuffs in general, however. In fact, Tom and I ran into an argument when he attempted to picture a line of housewives waiting to buy country-fresh chickens in back of the well-stocked central market. An angry group of women left the queue to protest.

"Why don't you want pictures taken here?" we asked.

"Because we don't want people in America to think we have only chicken to eat," came the surprising answer. I explained that eating chicken wasn't regarded as a hardship in America, but the housewives were adamant.



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Budapest shopwindows are well-filled with electric equipment, including short-wave radios and TV sets. While Tom took pictures inside the city's ornate Parliament building, I asked a cleaning woman, half in jest, if she had a TV set in her home.

"Not now, but we'll have one in seven months," she replied. My surprise must have shown, for she laughed and explained.

"I get 1,000 forints [\$22] a month here for a 48-hour week," she told me, "and my husband makes 1,800 as a machinist in an elevator factory. Our son works in a foundry and gets 1,200 a month. Out of that 4,000 a month we can save 800. We're putting aside about 500

of that each month for a TV set. The one we want costs 5,200, and we already have 1,700 in the TV fund.

"Come back in January and I'll show you our set. But I've got a 13-year-old son, so you'll have to watch cowboys and Indians!"

The Budapest families I met were well-fed and adequately clothed, although all had to crowd into single rooms or small apartments. But none seemed afraid to take me into their homes. Some tuned in the news broadcasts of the Voice of America—and didn't bother to close their windows.

Tom returned to Washington, D. C., for another assignment, and I drove alone south



Sheep and skyscrapers: Yugoslavia blends the old and the new. Apartments soar in

along the Danube to Belgrade, where photographer James Blair was waiting for me. The summer harvest was in full swing, and Czech- and Russian-made combines were busy in the wheat fields. Truck crops, however, were still being harvested by hand, usually by women. Hungarian farms have been collectivized, but most families have small plots where they can grow food for their own use and for sale. Those privately tended plots were the best cared for I saw in Hungary.

Crusader Blood Shed at Zemun

I had rather hoped, I must confess, to have trouble of some sort at Zemun, in Yugoslavia. The Crusaders knew it as Semlin. It was in this ancient city, facing Belgrade across the River Sava, that the Crusaders first shed blood. Runciman's account of the trouble lays the blame entirely upon the cross-bearers.

Walter the Penniless, one of Peter's lieutenants, had refused to wait for his leader at Cologne. Marching fast, he and a few thousand comrades-in-arms had come to Zemun in May, 1096. The Byzantine governor at Belgrade was dumbfounded when Walter demanded food for his multitudes. He sent to Constantinople for instructions, but Walter was in no mood to await the reply. His men pillaged the countryside.

This is rich country and six weeks later might have been able to feed the hungry Crusaders. But the harvest was not yet gathered, and there was little food to spare. Walter's men not only plundered the surrounding farms, but in Zemun a handful of them tried to rob a bazaar. They were captured, stripped, sent naked across the river to Belgrade, and their weapons and clothing hung upon the walls of Zemun as a warning to others.



PHOTOGRAPHS BY JAMES F. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

Belgrade, the mushrooming capital

Then, on June 20, Peter and the main body of his men reached Zemun. The Belgrade governor had been astonished by the size of Walter's advance guard; the more than 20,000 men who followed Peter threw him into a state of utter terror. He tried to delay their crossing the river.

Zemun Sacked by Crusader Army

The strange assortment of human beings who made up Peter's army were not to be stayed. They were saints and zealots and charlatans and simple folk fired with a holy image, and they carried the momentum of their long march. Too, they had heard distorted rumors of what had happened to Walter's men, and to them the weapons of the 16 criminals on the city walls might have been the trappings of martyrs. One Geoffrey Burel led the inflamed rabble against the town; they

killed 4,000 citizens, captured the citadel, and liberated a considerable supply of food. Wrecking the homes of Zemun, they built rafts and crossed the Sava.

But that was not to be all. Nicetas, the governor at Belgrade, ordered his troops to police the pilgrims' crossing. Having issued the order, he prudently retired 120 miles south and east to Niš, where the principal garrison of the province was stationed. The inhabitants of Belgrade, suspecting that their leader's departure was something less than a vote of confidence in his troops, fled the city.

Peter's army, supremely confident after its victory in Zemun, forced a crossing and entered Belgrade on June 26. Then, in most un-Christian fashion, it set fire to the city and marched on to Niš.

Hospitality Awaits Modern Crusaders

To return to my own hope for a little difficulty: I had no desire to rob a bazaar, even less inclination to leave my clothing on the walls of the local police station (the walls of Zemun have long since disappeared) and do a September Morn entry into Belgrade. But I had heard rumors of the local gendarmerie cautioning photographers, and I thought that some slight inconvenience might add color to my journey. I had reckoned without the native hospitality of the Yugoslav in general, and the family Lepšanović in particular.

Jim Blair and I came to the Zemun market place on a Saturday morning in mid-July and found it laden with the fruits of the Sava plain. Long wooden tables under flowering trees were heaped with peppers and tomatoes, potatoes and vegetables, apricots and plums and peaches (page 763). Farmwomen in homespun offered eggs and live chickens and freshly killed lamb, and Serbs wearing ferocious mustaches held out bouquets of carnations and gladioli.

Only two days out of Hungary, I had yet to learn a word of the local language, but my bad German found frequent response, and we fared not too badly. Then a curly-haired youth, holding a plump younger sister by the hand, appeared from behind a pile of apricots and smiled at us.

"Are you English?"

"No, American. Do you speak English?"

"Please, I am a student. I speak English very badly. But if I can help you, I will be happy."

Miroslav Lepšanović spoke English very well. He was 21, had finished a year of his four-year course in mechanical engineering,



Fair Yugoslav cowherd leaves her flock long enough to be photographed near Belgrade.

and was obviously the idol of 11-year-old Gordana, who never relaxed her grip on his hand. Thanks to him, we know a little more about life in Zemun today.

Miroslav spent the morning with us in the market. Then he insisted that we come to his home in Belgrade. Not at all reluctantly, we drove him and the attached Gordana to an ancient pale-green house where his knock opened the gate into a courtyard filled with bedding airing in the warm summer sun.

His mother, an attractive woman in her forties, made apologetic noises and hustled us through the quilts and mattresses into the back of the garden. Dušan Lepšanović, the youthful-looking 48-year-old father of Miroslav, acted as if nothing were more natural than that his son should appear at high noon on a Saturday with two strange Americans in tow, and invited us to sit on stools placed around a wooden table. The grandmother, 80-year-old Zorka, stopped beating a feather mattress just long enough to wish us a

most gracious "*dobro jutro*"—good morning.

Gordana released Miroslav's hand and raced into a shop at the end of the garden to bring Uncle Dimitrije. As if he had been waiting for us all morning, he appeared with a handful of glasses and a bottle of slivovitz, the plum brandy that is the traditional drink of Yugoslavia.

Engineer Remembers Red Cross Gifts

Dušan Lepšanović is a civil engineer who works on public housing for the Belgrade city government. His brother Dimitrije is chief purchasing agent for the large tractor plant in the city and also operates a sign and window display shop. The family income is well over \$250 a month. The six members were crowded in the five rooms of their 200-year-old home, but happy because in a few months they would move into a flat in one of Belgrade's new public-housing projects.

After the slivovitz came freshly baked bread, heavily buttered, tomatoes ripened to the moment of delight, and local cheese. When we protested, Dušan stopped us.

"For four and a half years I was a prisoner of the Germans in the second World War," he said. "Your American Red Cross sent us packages of food. I don't know what we would have done without them.

"Ah, that peanut butter. I will never forget that! Wonderful. And do you know, you are the first friends from America who have ever been in our home. It is yours."

Uncle Dimitrije disappeared and returned with presents: a bottle of slivovitz and a desk calendar from his shop. Mother Radmilla bustled about, but when we urged her to sit with us she laughed, and Miro laughed with her as he translated her answer:

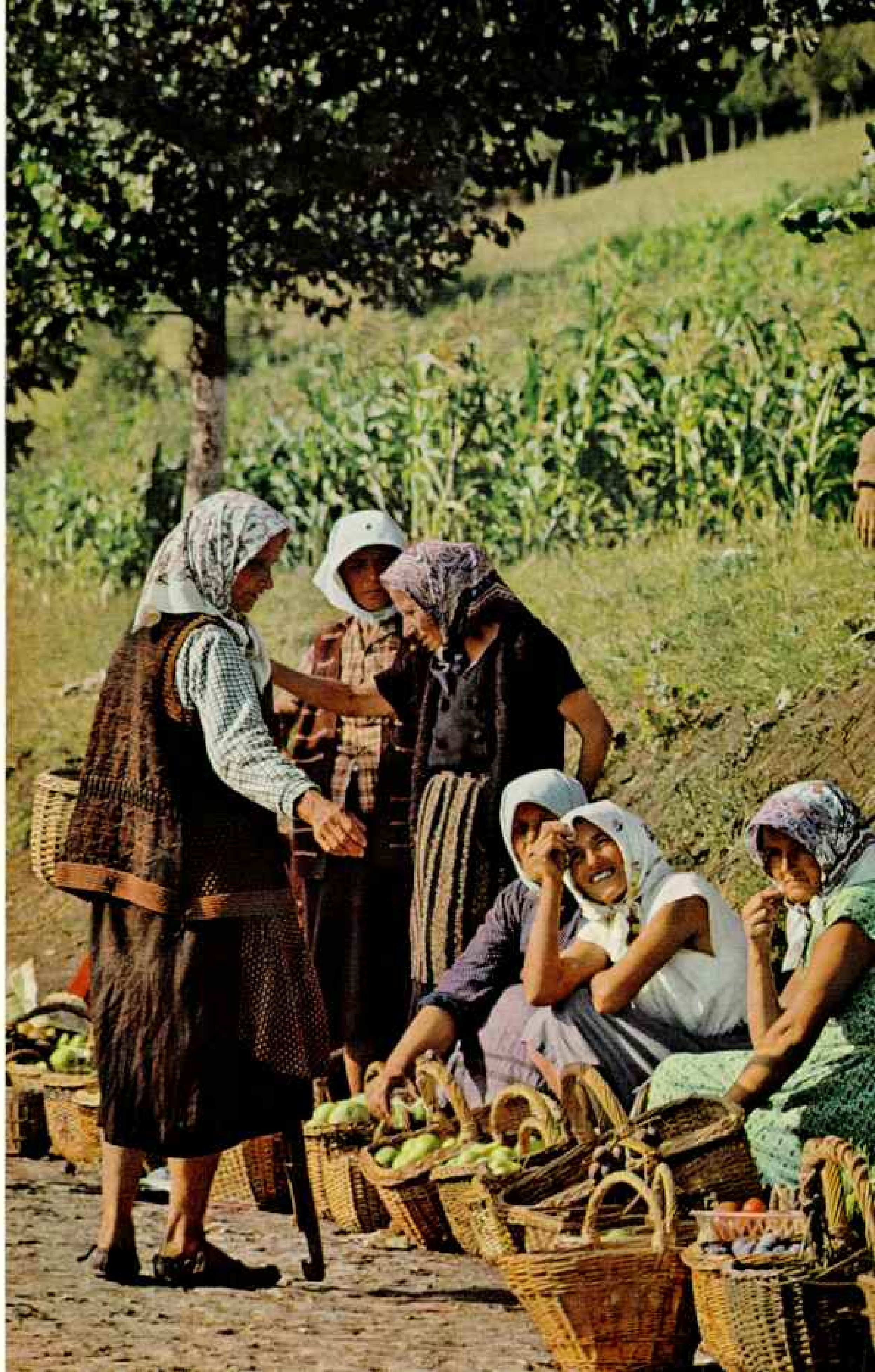
"As a girl, I grew up in a village where the Turks still ruled. And we learned Turkish ways. The woman waits on the man. I think my husband likes it that way."

The mention of Turkey brightened Mrs. Lepšanović's handsome face.

"If you could come back this afternoon, I would love to have you taste a special dish of mine—*gibanica*. It is Turkish in origin and a Serbian speciality today. Please try it."

We made polite and quite insincere gestures of refusal and returned at five that afternoon to find the bedding gone and a table set beneath a plum tree in the front garden.

Kerchiefed against the August sun, farmwomen sell fruit, eggs, cheese, sausage, tomatoes, and thimble-size onions at a bus stop market south of Belgrade.





Serbian farmers harvest wheat with machines. Hungry legions of Peter the Hermit cut

Gordana wore a freshly starched pinafore, Miro a crisp white shirt; Mrs. Lepšanović had visited a hairdresser and looked considerably more fashionable but not a bit less hospitable. Gibanica came to the table in a great pile on an oval platter, thin layers of crisp pastry interlaced with a creamy cheese-and-egg filling.

Progress Breeds Embarrassing Questions

Miro's English improved rapidly as he interpreted for us all. We talked of life in Belgrade, of Miro's university, where school fees come to less than a dollar a year, of Mr. Lepšanović's work and his wife's housekeeping problems.

The picture that emerged was one of a family content with their lot. They work hard, but by the standards of Central Europe they

live well. Mrs. Lepšanović enjoys her electric refrigerator; when I told her that in Budapest I had found not even an old-fashioned icebox in my visits to a dozen homes, she was surprised, but even more pleased.

Our days in Belgrade convinced us that the Lepšanović family was typical. Yugoslavia is proud of its progress these days. A high-ranking American foreign service officer with extensive experience in Communist areas thinks the gains made in the local economy may soon trouble the governments of Yugoslavia's Russian-dominated neighbors.

"Hungarians and Rumanians aren't accustomed to seeing the Yugoslavs live better than they do," he told me. "If this progress continues, the Moscow-run governments will find themselves trying to answer some pretty embarrassing questions."



SYNCHRONIZED BY JAMES P. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

grain by hand as they trudged through the hills.

The road the Crusaders took south from Belgrade is today one of the principal highways of Central Europe, rolling from Yugoslavia across Bulgaria to Istanbul. It is not crowded, but it is busy, and we passed cars from Great Britain, Norway, Finland, France, Turkey, Lebanon, and Bulgaria.

International traffic, however, has made little change in the countryside. Brightly painted farm wagons still carry crops to market, and the women in the fields wear gaily patterned homespun. Many men still walk in handmade shoes with curled toes, and personal possessions are carried in shoulder bags of woven wool. Cooking habits, too, are little changed from Crusader times.

Jim and I stopped in the little village of Beli Potok at a restaurant where four young pigs roasted on hand-turned spits over a fire



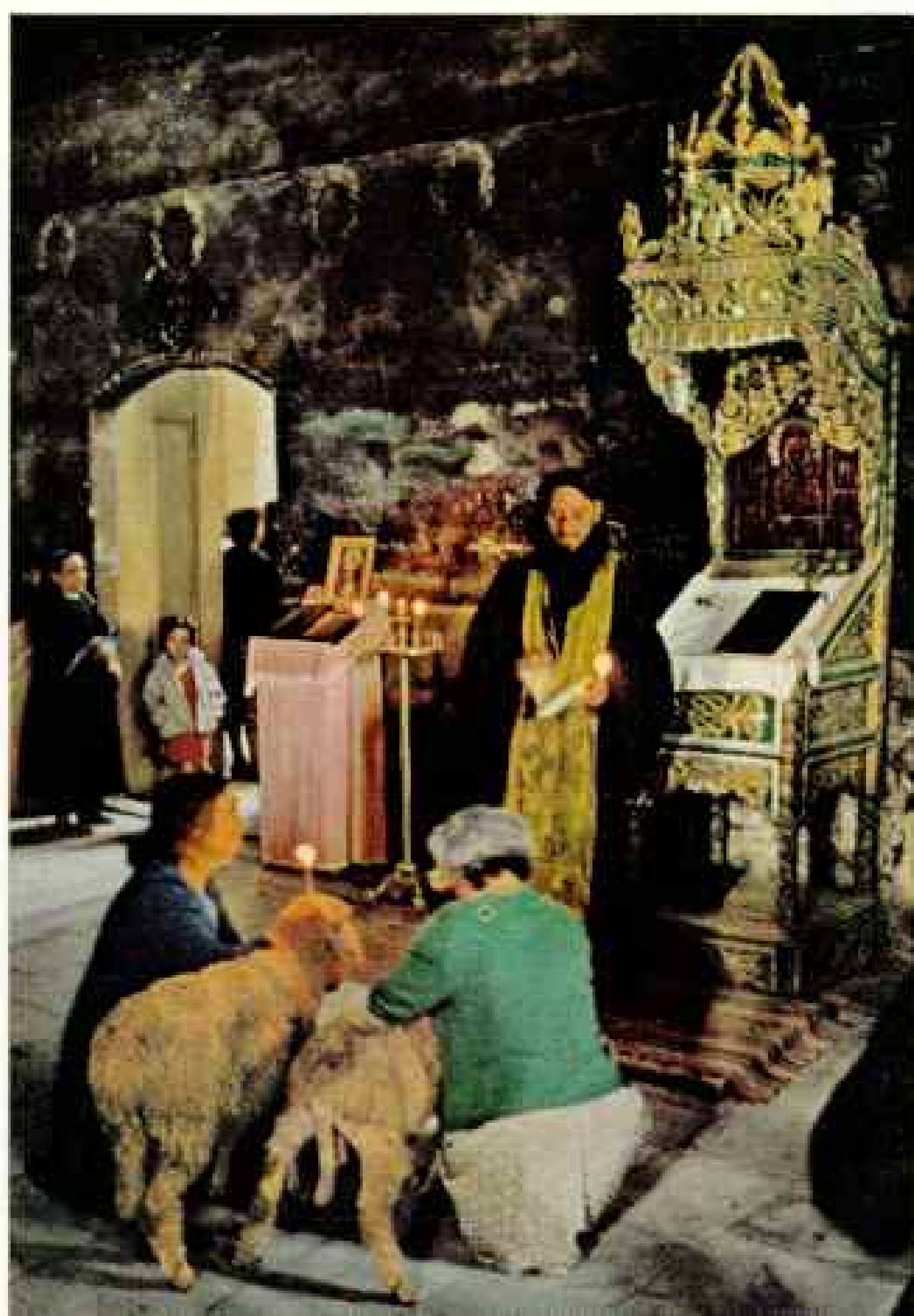
Blob of clay becomes a graceful jar under the potter's fingers in Bela Palanka, Yugoslavia. Near this village Byzantine horsemen attacked Peter's army, killing or capturing 10,000.

Fruits of the potter's wheel tempt these window-shopping farmwomen in Bela Palanka.





PODACHROVES AND HIL ESTALCHROME (OPPOSITE) BY JAMES F. BLAIR © NATIONAL GEOGRAPHIC SOCIETY



Bulgaria's Bachkovo Monastery nestles in a gorge amid the wooded hills of the Rhodope Mountains. Its chapel, built in 1083 and still in use, predates the First Crusade. Greeks who inhabited this land welcomed Peter's army with gifts of money and horses.

Behind the Iron Curtain, religion still lives, though it does not flourish. Despite Communist discouragement, some 90 percent of Bulgarians belong to the Orthodox Church. These worshipers celebrate St. Mary's Day at Bachkovo. The monastery attracts pilgrims from all parts of the country. As many as 20,000 take part in a ceremony here each spring.

"Bless these sheep." Bearded abbot of Bachkovo invokes the benediction over farm animals. Only about a dozen monks dwell in Bachkovo Monastery. At one time it housed 50. Their lands supply virtually all their needs.





Bread for the brothers of Bachkovo. Monks themselves planted the grain and harvested the crop.

"Peace!" proclaims a sign in eight languages near Plovdiv, Bulgaria. Reading clockwise from the lower left, the word appears in English, Bulgarian, Slovene, French, Spanish, Greek, Turkish, and German. Villagers ride to jobs on a cooperative farm.



at the front door. It was early for lunch, and the mustachioed proprietor explained that the roast pig wouldn't be finished for half an hour; so we munched on good home-baked bread and ripe red tomatoes while the main course browned and crackled over the coals.

When the cook decided lunch was ready, he took a wicked-looking knife from his belt and sliced generous portions from the back legs. The meat was sweet and tender, and the crisp skins made gluttons of us both. A few chickens wandered in and out, pecking at crumbs on the floor, but the top of our wooden table was scrubbed clean. We finished with a plate of peaches and apples from trees which stood in the dooryard. Then, reluctantly, we took the road to Niš.

We hurried because the previous night we had confirmed reservations by telephone in the modern Park Hotel. When we arrived, no one had ever heard of us or our reservations. There wasn't another room to be had in or near the town, and we finally parked in

a field and slept in the back of our station wagon. There was ample space, but unfortunately the sun rose at four-thirty; so we got little sleep. Peter and his men, however, had fared far worse.

After the disaster at Zemun, the Byzantine authorities had decided that the Crusaders must be kept under constant escort. Under orders from Emperor Alexius in Constantinople, the governor had strengthened his garrison at Niš, and when Peter appeared, the Crusader was asked to give hostages for the good conduct of his army.

Peter's Army Slaughtered at Niš

At first the Crusaders' reception was friendly. Local farmers not only helped them purchase food but also donated from their own stores; some even joined the Crusade. Then a clash between townsfolk and a group of marauding pilgrims grew into a pitched battle, the governor unleashed his garrison, and shortly Peter's army was a beaten mob.



PHOTOGRAPHS BY JAMES F. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

Many Crusaders were slain, others were captured. Peter's money chest was looted, and the Hermit himself, with a few hundred followers, escaped up a mountainside in the darkness. Runciman estimates that another 7,000 survivors joined Peter the next day, but the army was never the same again. Albert of Aix, a principal chronicler, says more than a quarter of the group was lost.

Jim Blair and I lost nothing more than a night's sleep in Niš, but we also had money problems on the road to Sofiya. Ours were of our own making. I knew that Jim had a considerable sum of Yugoslav currency, so I spent most of mine for souvenirs in Niš. He, thinking I was adequately supplied for both of us, used his cash to mail film home for processing.

After a morning of picture-taking along the road, we arrived late and hungry in the Yugoslav village of Bela Palanka. Runciman reports that the harried Crusaders found the village deserted and stopped to gather crops

left by the farmers who had fled. Jim and I found the town anything but deserted.

Good clay is plentiful near Bela Palanka, and the town has a thriving pottery industry. Potters shape vessels on wheels turned by foot power, and the windows are full of their brightly painted products (page 769). There are shops where shoemakers hand-peg heavy brogans, and wool-carding plants where peasant women bring great bags of wool to be prepared for spinning. We spent a pleasant two hours with the friendly farmers and tradesmen, and then found our way to the village's only restaurant.

"By the way," I said to Jim, "I'm all out of local currency. You'll have to buy my lunch. I'll pay you back tonight in Sofiya."

"I'd love to say 'Be my guest,'" he laughed, "but airmail postage is high, and I've got only a little small change."

We looked for a bank to change United States dollars. There wasn't any. Apprehensively, we emptied our pockets. Between us

Caravan of Farm Wagons Wends Across Western Turkey's Tawny Plains

Families riding home from a fair in the village of Haysa call to mind the Crusader baggage carts that rolled over these undulating grasslands in 1096. Ancient Greeks called this part of Europe Thrace. As in olden days, it supplies grain and dairy products to populous İstanbul, 125 miles to the east.



Voluminous black mantle conceals all but face and feet of an Edirne woman. She has discarded the muslin veil, or *yağmuk*.



Turkish border city, Edirne welcomed the First Crusaders, who passed through under Byzantine escort. Five years later other Crusaders sacked the town, then known as Adrianople, after the Roman Emperor who founded it. Edirne was the gateway for another mass movement in 1950 and 1951, when more than 150,000 Turkish residents of Bulgaria fled Communism.



Fairgoers view the sights from a truck that serves as a mobile grandstand. Vendors laden with urns wander through the crowd, dispensing sweet beverages. Turkish equivalent of America's county fair, the once-a-year *panayer* at Havsa features horse races and livestock auctions.



we had the Yugoslav equivalent of 80 cents.

The waiter had watched the performance with interest. I handed our fortune to him, explaining as best I could that we had no more local currency, and that we would like to eat whatever came on for that price. He tossed the coins in his hand, studied the menu on the blackboard hung beside the kitchen door, and disappeared.

He returned with two steaming bowls of excellent soup, a pint of cold white wine, and a football-size loaf of bread. Not fancy, but adequate. We finished the soup and prepared to leave. But now our waiter changed the soup plates for two more heaped with thick pork chops, fried potatoes, and fresh tomatoes. Finally, he brought fruit. Either living is very cheap in Bela Palanka, or we, like the men of Peter's army, were beneficiaries of local generosity.

Surprise in a Bulgarian Wheat Field

Bulgarian border officials, to our amazement, opened no luggage. Our passports were carefully examined, our visas stamped, and we were on our way to Sofiya over an excellent stone-paved highway. No one objected when we stopped to take pictures of the harvest, but I did restrain Jim once. We had passed a number of combines in the rolling fields of wheat, and he wanted a shot of the mechanized harvest. We caught a glimpse of a number of machines a few miles away and followed a side road for a closer view. Then I decided a picture would be unwise.

The machines we had sighted from a distance were not combines; they were eight heavy Russian-made tanks, maneuvering in an open field. We wasted no time getting back on the main road and speeding on to Sofiya.

Bulgaria's capital city has streets that are wide and clean, wartime damage has been almost erased, and there are comfortable hotels and well-designed restaurants. But there is a forbidding sameness about the unpainted concrete structures the Communist Government is raising. Not so the people of Sofiya, however.

Here, as in Budapest, I was astonished by

the friendliness which the word *Amerikanski* produced. In coffeehouses and restaurants patrons would come to our table, ask if we were Americans, and sit down for a chat. When they found that I was studying Bulgarian, they were anxious to help, tried hard to understand my halting phrases, and when they did correct my atrocious pronunciation, they implied that it was not my fault—that the language really *should* have been pronounced my way.

Sofiya is a city of 700,000—almost 200,000 more people than in 1950. Housing is still tragically short, although the government reports that 50,000 new dwelling units, averaging a little more than two rooms each, were built in 1960. I visited some of those apartments; the rooms are small and grim by American standards, but they have bathrooms and running water, and the fortunate few assigned the new quarters seem delighted with their lot.

Dr. Ilija Iconomov lives in one of those new apartments with his wife, who is also a doctor. Jim and I were taking pictures of a line of Sofiyans waiting to buy groceries in the little store which is part of the development, when the doctor spoke to us in perfect English. He had, he told us, attended the American College in Sofiya.

Doctors' Salaries Paid by State

"I'd invite you to my flat, but I know my wife hasn't had a chance to straighten things up this morning, and you know how women are," the doctor laughed. "Anyhow, we can talk here in the store."

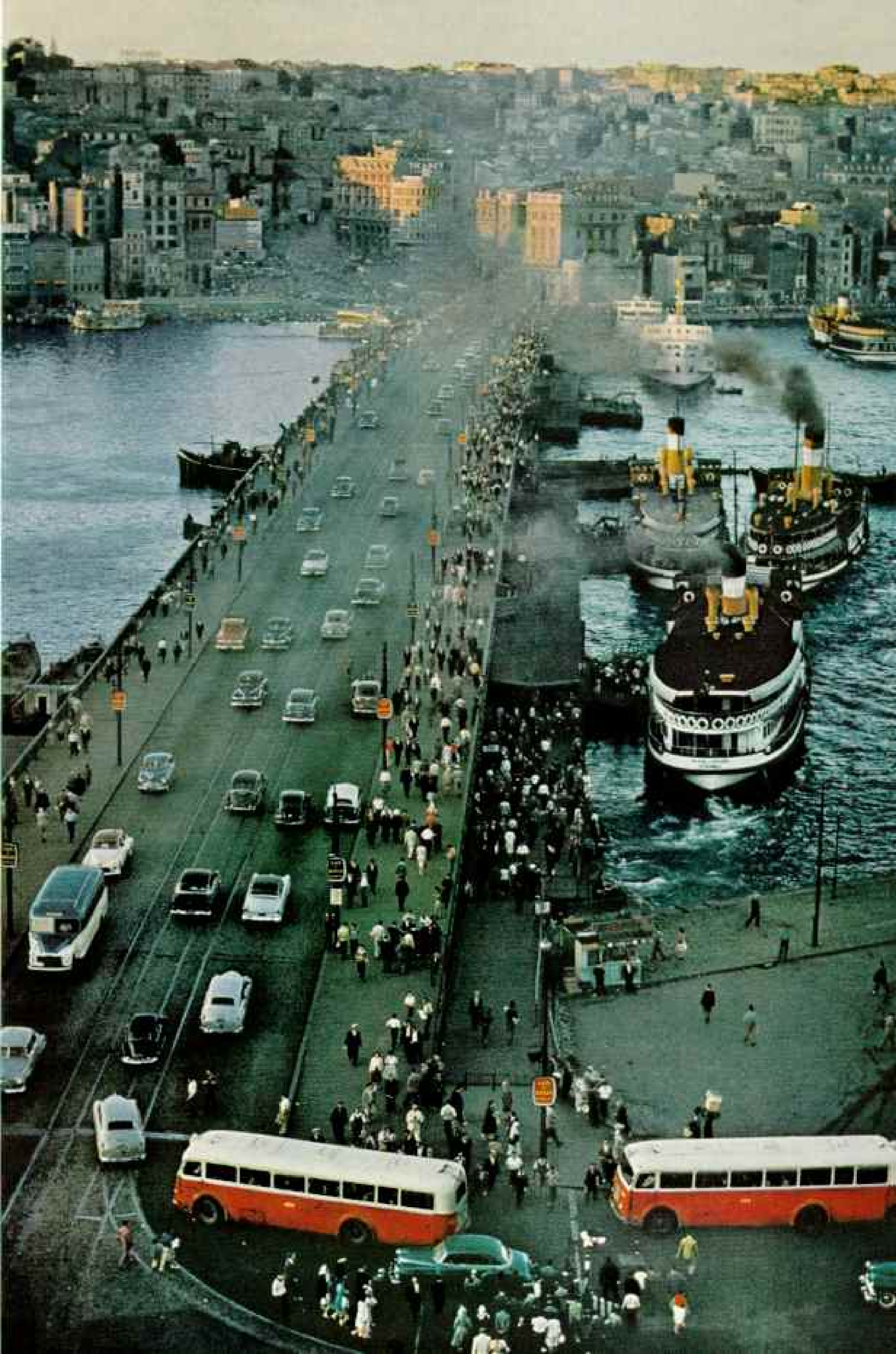
We did. Dr. Iconomov discussed every detail of his life and brushed aside my apologies for asking personal questions.

"I know your magazine," he assured us. "You want to tell Americans how we live, and I want them to know."

The doctor's salary is 1,750 leva per month (\$183 at the 1961 tourist rate), and his wife earns 1,500. He gets more partly because of his additional experience—at 41 he has practiced for 15 years—and partly because he took graduate work in orthopedic surgery.

Istanbul's Evening Exodus Flows Across the Golden Horn on Galata Bridge

"Oh, what a noble and beautiful city is Constantinople! . . . How many extraordinary things to be seen!" So Fulcher of Chartres, a First Crusade chronicler, rhapsodized over the capital of Christian Byzantium, then Europe's largest and richest city. The Golden Horn, an arm of the Bosphorus, divides the old city and the Galata mercantile section. Commuters board ferries beside the pontoon bridge.





778 Swirling past İstanbul and the Golden Horn (left), the Bosphorus pours into the Sea of Marmara.



PHOTOGRAPH BY JAMES P. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

September sun gilds minarets and bubble domes of the Blue Mosque (right) and St. Sophia



WOODSHIMMER BY JAMES P. BLAIR © NATIONAL GEOGRAPHIC SOCIETY

Floating Taxis Ply the Golden Horn

For these patient boatmen, business peaks at dawn when the floats of Galata Bridge swing open to water traffic sailing the narrow Horn. Bulged handles keep oars in balance and prevent rope locks from slipping.

Hillside Housing Opens Windows to the Sea

Istanbul's population—more than two million—has doubled since World War II days. In an ambitious face-lifting project, armies of workmen leveled slum districts and raised modern developments. The height of new buildings in the heart of the city is restricted, lest they mar one of the world's loveliest skylines. But suburban apartments, free of height limitations, reward tenants with that most cherished of features: a glimpse of the water.

only 100 leva. He prefers to visit his wife's relatives at Varna on the Black Sea.

A crowd gathered as we talked. Suddenly there was a stir, and a neatly dressed stranger approached the doctor and said something to him in a low voice.

"I'll be right back," the doctor assured us, and followed the newcomer to the

street. He returned in a couple of minutes, "Now then, what were you asking?"

"You've been so outspoken," I said, "that I thought it might be all right to ask you if you felt that your government is a representative one, and that you have a voice in it."

"I do," came the quick reply. "I vote in every election and I believe that my vote counts. And I don't feel that anyone is dictating my way of life."

We thanked Dr. Iconomov and prepared to leave. "By the way," I queried, "who spoke to you a few minutes ago? A patient?"

"No," the doctor said with somewhat less

"I bought my apartment here three years ago for 65,000 leva," he told us. "The state bank loaned me the money. I have about 118 square yards of space, and I pay 200 leva a month for both principal and interest."

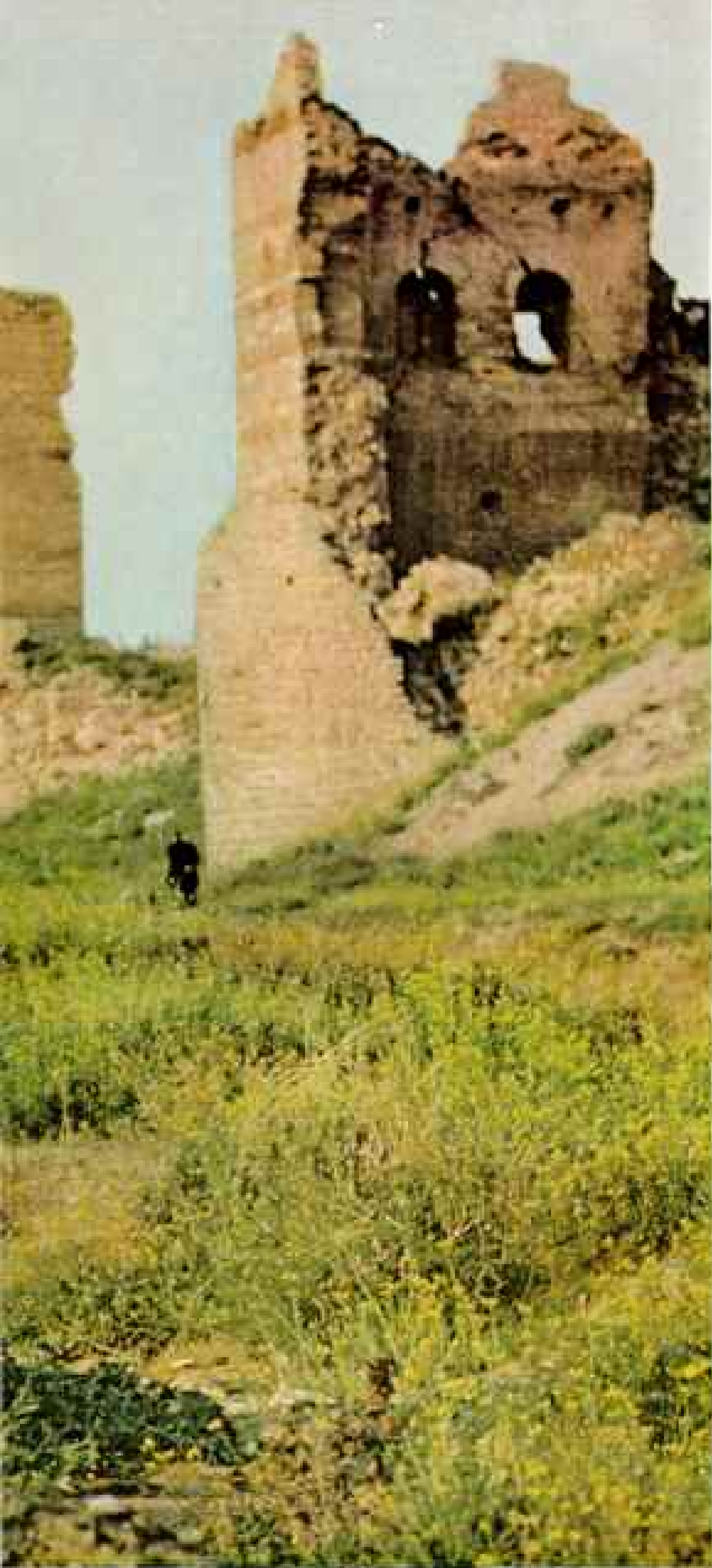
The Iconomovs have a son, Nikolai, 12, and a five-year-old daughter. Mrs. Iconomov's mother cares for the children while the parents work. The doctor drives a new Russian-built Moskvich automobile—it cost him 15 months' salary—and gets 38 days' vacation a year. If he wants to spend it at a resort maintained by the Union of Medical Workers, he and his family can go for 20 days and pay





Fire and earthquake crumbled Istanbul's walls. The city's fortifications repulsed invaders for 900 years before Crusaders stormed them in 1203. Emperor Theodosius built these 15-foot-thick ramparts in the 5th century.

Tile mosaics once paved a court in the Great Palace of medieval Istanbul. Visiting knights of the First Crusade admired the hunting and domestic scenes by 6th-century artists. The decorations lay buried for centuries until uncovered during excavations begun in the 1930's.



RECONSTRUCTED BY IRVING P. BLAIR © NATIONAL GEOGRAPHIC SOCIETY



readiness. "He was from the neighborhood police station. Someone had reported that I was talking with foreigners, and the gendarmes wanted to know what was going on."

Sofiya's gendarmes will be pretty busy the next few years if they keep that attitude. For Bulgaria is staging an all-out campaign to bring visitors from both East and West. The director general of the government tourist office told me confidently that he expected travelers to bring 100 million leva in foreign currency to his country in 1962.

"It's easy for Westerners to get visas," he assured us, "and once here they can move without supervision. We even grant visas at the frontier posts. We not only want the money that tourism brings, we want foreigners to see our country. We think that's the best way for people to understand each other."

Director Petur Ignatov is 41, getting a bit gray, and, on the morning he received us, unshaven. His office is in the new Balkantourist building on one of Sofiya's main streets, and the plaster in the halls was already falling, even though the building was not yet completed. Mr. Ignatov, like many young Communist officials, is a graduate economist. His knowledge of the tourist industry is mostly theoretical, but he doesn't lack confidence.

"We will replace Switzerland as a leading tourist nation," he assured us. "We have everything: a beautiful Black Sea coastline, magnificent mountain resorts, and we're rapidly building new hotels. We're certain to succeed. Our government plans . . ."

At that point, I must admit, I stopped taking notes. It was a refrain I had heard too often in Bulgaria. "Our government plans to improve the quality of window glass." "Our government plans to double steel capacity." If plans were horses, Bulgaria would be a nation of cavalymen.

The country, it is true, is of great geographical beauty. A visit there is worthwhile in many ways. But I see no need for Swiss chalet owners to seek new employment.

I drove down across the Thracian plain through fields of ripe sunflowers bending their seed-laden heads to combine harvesters, and past village dooryards where green-gold leaves of ripe tobacco cured in the August sun. Between Plovdiv and the Turkish border I had a strange and moving experience, one I do not pretend to interpret.

A very old Turkish farmer was walking my way, and I stopped to offer him a lift. He explained in Turkish that he had no money; I replied that he needed none. He told me



"Meet me at the fountain." Talk gushes like water at this rendezvous.

his destination, a Bulgarian village a score of miles along the highway. Then we rode in silence, his dark eyes constantly searching my face, observing my clothing, the contents of the car. Finally he spoke:

"*Russki!*" he asked, his voice uncertain.

"*Ne, Amerikanski,*" I replied.

He stared in disbelief. Then he gently took my hand from the wheel and kissed it and pressed it against his furrowed cheek. For the remaining few minutes of our ride together he held my hand in both of his, and wept.

I know his name, and the name of his village. But I do not think they need be told.

Rescued by Bulgarian Soldiers

It was long after dark when I passed the last Bulgarian village and approached the Turkish border. The excellent road disappeared, and I found myself hub-deep in soft sand on a detour. The car could go no farther. Then a lantern appeared a hundred yards up the road. Four Bulgarian soldiers, fresh-

faced youngsters in obviously new uniforms, approached. All carried rifles.

I tried to explain my nationality, my destination, and my plight in Bulgarian. Finally they understood, and they laughed. I laughed too. Shouting, they put their shoulders against the car and got me rolling again. They pointed out the route, and walked half a mile beside the car until I was once again on solid ground. I offered them money, but they would have none of it.

"*Cigaretten!*" they asked. Unhappily, I explained, I didn't smoke cigarettes. They laughed again, clapped me on the shoulder, and waved farewell.

Dawn was breaking when I reached the Turkish city of Edirne, and I sped across the Turkish plain, again through ripe fields of wheat, and skirted the Sea of Marmara until I entered the narrow gate piercing the ancient walls of Istanbul.* I had driven that road often.

*See "Crusader Lands Revisited," by Harold Lamb, NATIONAL GEOGRAPHIC, December, 1954.



ADDUCTIONS BY JAMES P. BLAIR © M.G.E.

for Turkish teen-agers:



Dark eyes glint like jewels in a clear pool; swift smiles shatter a stranger's reserve; the pensive frown belies an innate liveliness. These are . . .

. . . the faces of Turkey





PHOTOGRAPHS BY JAMES P. BL

the last time only three years before. But it was hard to recognize the towns and villages through which I passed. New buildings were everywhere, streets were well-paved, and shopwindows were loaded with consumer goods. In the fields I saw more tractors than horses. Turkey's economy was flourishing.

Peter and his men entered İstanbul—then Constantinople—in August of 1096. The Byzantine Emperor Alexius Comnenus received the Hermit at court, supplied him with funds to feed his followers and quarters for the army across the Bosphorus from the imperial city.

Peter in İstanbul: Prelude to Disaster

Alexius's motives were not entirely altruistic; Peter's men were undisciplined, and their constant looting was insufferable in a city such as Constantinople. At Civetot, where the bulk of the army encamped, they would face less temptation.

Too, Alexius was an experienced military man, and he knew the strength of the Turkish armies who held the country through which Peter must pass. He urged the Hermit to await the arrival of the Western princes, some

of whom were already on the road with formidable armies of well-trained men. Hugh, Count of Vermandois, younger brother of King Philippe of France, was marching through Italy; Godfrey of Bouillon, Duke of Lower Lorraine, followed Peter's route. Bohemond of Taranto would soon be on his way.

Most important, Raymond IV, Count of Toulouse, one of the first great knights to take the cross, was about to set out across the Alps, accompanied by Adhemar of Monteil, Bishop of Le Puy, whom Urban II had named spiritual leader of the Crusade. There was every reason, Alexius urged, for Peter to rest and train his men at Civetot, then take his place in the mighty movement of which he was an advance guard.

I cannot criticize Peter's impatience, or that of his men, for I know little of the conditions under which they were encamped. I know that, for my own part, I should happily have waited long in İstanbul.

There was no Byzantine emperor to receive me in that storied city, but there was an old friend, Rudy Basler, General Manager of the İstanbul Hilton Hotel. The Emperor Alexius could not have been more hospitable, and



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Ipraz refinery lights the evening skies near İzmit, Turkey, a town known as Nicomedia to the First Crusaders, who camped here in August, 1096. Less than three months later and a mere 30 miles distant at Civetot, the people's army of Peter the Hermit was annihilated by Seljuk warriors. To the knightly hosts who later passed that way, bleached bones offered grim evidence that from here to Jerusalem their path would be perilous.

Side by side, the Stars and Stripes and the Turkish flag fly above a NATO military installation on the Gulf of İzmit.





© GAZETTE (REVUE) A

I am certain nothing in the palaces of the day equaled the comfort of the İstanbul Hilton, magnificently situated on a hill overlooking the beautiful Bosphorous.

Peter's men, whether because of bad quarters or bad judgment, were not content to wait as they had been ordered. While their leader was in Constantinople, seeking further aid from Alexius, hotheaded lieutenants led more than 20,000 men out from Civetot for an attack on Turkish-held Nicaea, two days' march to the south. The Turks, and martyrdom, awaited them.

An hour's march from Civetot, a Turkish

army lay in ambush for Peter's men. A hail of arrows unhorsed the mounted knights who led the Crusaders; cold steel followed to complete the rout.

The Turkish victors pursued the broken army into Civetot, and there the People's Crusade drowned in a bloody, nightlong massacre.

Peter heard the news in Constantinople. Alexius sent men-of-war to return the survivors to the capital. Anna Comnena, daughter of Alexius and herself one of the great historians of the Crusade, tells us that Peter attributed the tragedy to the ungodly behavior of his followers. The reasons are unimportant



RE-ENTRANCE BY JAMES P. ELAIE © R.S.L.



Scimitar shreds the night as a turbaned dancer performs on an outdoor stage in Istanbul. Costume and pose call to mind the fierce tribesmen who battled Crusaders.

Floodlit battlements of Rumeli Hisar fortress overlook the narrowest point of the Bosphorus, where Crusaders crossed the 2,000 feet of water that separates Europe and Asia. Mohammed II built the bastion in 1452.

now. What is important is the fact that while Peter's army perished, the cause it followed lived and triumphed.

Last summer I stood at the site of ancient Civetot, where the tents of the People's Crusade once spread as far as eye could see: I walked to the wooded valley where the dream seemed to die. There is nothing there today to recall the tragedy which took place nearly nine hundred years ago. But an arrow's flight away, on the lovely shore of the Bosphorus, there is a reminder that time turns full circle, that no man reads the future.

Within the guarded gates of a NATO mili-

tary base, I stood at attention while a bugle sounded retreat. Two flags came slowly down their staffs, one Turkish, one American. Troops representing both nations, comrades in a new cause, saluted (page 787).

The notes of the bugle died away. I walked slowly back to my car.

Peter's Crusade ended here, but my journey was only half completed. Ahead lay the long, hot stretches of the Turkish desert, then on through Syria, Lebanon, Jordan, and finally the Crusaders' goal: Jerusalem. Peter could not delay; I could. That second stage would wait another spring.

THE END



Paris in the spring. Soft breezes rustle the leafing trees, and the cries of boys at play ring out below the Eiffel Tower.

Revitalized



View from the 984-foot Eiffel Tower embraces

I DO NOT SEE," wrote Benjamin Franklin to a French friend in 1787, "why you might not in Europe . . . [form] a Federal Union and One Grand Republick of all its different States and Kingdoms. . ."

Old World statesmen today are moving toward fulfillment of Franklin's vision—in the field of trade at least—through the thriving European Economic Community (EEC), or Common Market.

Dramatizing this unity, the National Geographic Society's latest Atlas Series Map, **Europe**, records a new name—**Europoort**—on a mouth of the Rhine River below the modern Dutch port of Rotterdam.*

Built on former wasteland, Europoort already channels oil, ore, and other raw materials to the heart of the Common Market and exports finished products. According to EEC blueprints, Europoort—meaning "Gateway to Europe" in Dutch—will be handling more than 10,000,000 tons a year by 1965 and, combined with Rotterdam, may one day become the world's largest maritime center.

The new map, with a scale of 150 miles to the inch, frames revitalized Europe in the full sweep of its geographic setting. The map stretches from ice-capped Iceland on the west to the wilds of Siberia on the east. Its lower edge encompasses the southern fringes of the Mediterranean Sea and runs from Morocco to the Persian Gulf.

Europe Enjoys an Economic Renaissance

On the left of the map, the six EEC nations—France, West Germany, Italy, Belgium, Luxembourg, and the Netherlands—form a giant "T" sprawling from the Bay of Biscay to the Baltic Sea and from the English Channel to the tip of Italy.

By welding the economies of these nations into a single whole, the EEC has sparked the greatest boom in Europe's history. Industrial production within the vast market area has leaped 88 percent since 1953, and today the six member nations together rank as the world's largest importer, absorbing some 30 billion dollars' worth of goods a year.

Europe Portrayed on New Map



REPRODUCED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS REYER © N.G.S.

Paris in all her magic beauty, from the placid Seine to the spires of Sacré-Coeur in Montmartre

The EEC nations are working toward completely free movement of men, capital, and goods within the community. Planners envisage a common citizenship, common currency, and, ultimately, political union.

This peaceful revolution reaches even into the kitchen. Crossing the English Channel at the Strait of Dover, a new submarine cable links the power grid of Great Britain—an applicant for EEC membership—with that of France. Since the French obtain half their power from hydroelectric stations that harness rivers swollen by spring snowmelt and autumn rains, surplus electricity is available. This extra current now flows, via the integrated system, from the Alps and Pyrenees to the factories and kitchens of Britain.

In turn, energy generated in Britain's coal-fired plants takes up the summer and winter slack in French production.

The map keeps pace with political changes. In Algeria an administrative boundary separates the long-troubled northern departments from those of the mineral-rich Sahara. Once

administered directly from Paris, the Sahara will now be jointly exploited by France and Algeria.

The map shows, too, how the Soviet Union has dotted the Volga River with huge hydroelectric installations. The waterway now appears as a chain of interconnected lakes reminiscent of the Missouri River in Montana and North and South Dakota.

De-canonization of the late Soviet dictator has caused Stalingrad to be rechristened Volgograd. Stalino is now Donetsk. For a different reason, Russia has given the new name of Tselinograd, or Virgin Land City, to a community of 100,000 in the northeastern Kazakh Soviet Socialist Republic; its previous name, Akmolinsk, meant White Tomb.

**Europe*, thirty-first in the series of uniform-sized maps issued as supplements in the past five years, becomes Plate 30 in the Society's Atlas Series. To bind their maps, a quarter-million members have ordered the convenient Atlas Folio, at \$4.85. Single maps of the series, at 50 cents each, or a packet of the 28 maps issued in 1958-61 at \$8.80, may be ordered from the National Geographic Society, Dept. 7, Washington 6, D.C. A combination of the 28 maps and folio is \$12.25.

John Glenn's Three Orbits in *Friendship 7*

A MINUTE-BY-MINUTE ACCOUNT
OF AMERICA'S FIRST
ORBITAL SPACE FLIGHT

By ROBERT B. VOAS

Training Officer, Project Mercury

EARLY ON THE MORNING of February 20, when I followed John Glenn to the launching pad, the Canaveral sky was obscured by clouds and darkness. The bright red gantry and its silver rocket seemed lashed to the ground by a cobweb of arc lights against that somber background. But by 9:47 the air was diamond clear, and with thousands of others I watched *Friendship 7* begin its historic orbital voyage.

I was privileged to observe the flight in the Mercury Control Center, listening to John Glenn's voice as he reported in to tracking stations around the globe. At the end of his first orbit he told us all was well except for a minor problem with the automatic controls, which he was solving by flying the spaceship manually.

From our technicians in the back room, however, came a different story. A radio signal from the spacecraft indicated that the landing bag, which would act as a cushion when the capsule hit the water, had been deployed prematurely. If this signal proved valid, it would mean that the heat shield, which is attached to the landing bag, had also come free and would not protect the spacecraft from the fiery heat of re-entry.

For the next three hours, while Glenn rode through two more space days and nights, scientists of the National Aeronautics and Space Administration huddled to determine what action to take. Tension rose sharply as time ran out. As always, the answer was, "Take no

The Author: Few men other than the astronauts themselves have lived so closely with the man-in-space program. Dr. Voas helped select Lieutenant Colonel Glenn and his six colleagues. For three years he has supervised their training for operation of the Mercury capsule and for coping with such space-flight conditions as weightlessness and the perils of traveling 23 times as fast as sound.



Second orbit sunset gilds John Glenn's face as *Friendship 7* soars over the Indian Ocean, nearing mid-



STITCHED BY NASA

point of his 83,450-mile odyssey in space. Automatic camera photographed the astronaut every 12 seconds in orbit and six times a second during

climb and re-entry. Clock at right pegs each picture to the time in flight. Looping tube carries oxygen under pressure to inflate the visor seal.

chances." So Glenn was advised to re-enter the atmosphere with his empty retrorockets still strapped to the capsule, in the hope that they would hold the heat shield in place.

The agony of waiting grew nearly unbearable when radio communications temporarily blacked out—as we knew they would—during the period of intense heating. While we waited, Glenn faced his own moment of truth inside a fireball.

This story I did not hear until after the flight, when, as a member of the debriefing team, I joined the astronaut on Grand Turk Island. There I listened to him tell how it felt to be hurtled beyond the earth's horizon—where the noon sky is midnight black, where the days are measured in minutes, and where nothing falls without a push—and finally to return in a shooting star.

You followed parts of Glenn's flight on TV, and you have read extracts from the astronaut's on-board tape and his pilot's report. Now, after weeks of study, the entire history-making event can be pieced together:

IT IS only seconds before lift-off. Seventy feet above Launching Pad 14, John Glenn lies strapped in his capsule. In the block-house, backup pilot Scott Carpenter has just sent his parting message: "May the good Lord ride all the way!" Now Glenn hears Astronaut Al Shepard in the Mercury Control Center: *3, 2, 1, zero!*

Glenn feels the engines fire up. The whole bird shakes—not violently, but solidly. Now, two seconds later, the Atlas booster releases its last link with earth. A gentle surge tells him he is under way.

00:00:03* *Roger. The clock is operating. We're under way!* Glenn reports.

Hear [you] loud and clear, Shepard acknowledges. In the little rear-vision mirror at the bottom of his window, Glenn can see the horizon turning as the Atlas rocket rolls to the right heading. Vibration is building up.

00:00:13 *Little bumpy along about here,* he reports, but then it smooths out a bit, though the bumpiness never does disappear during powered flight. There is a dull roar from the engines, much like the noise simulated during centrifuge training. Chalk up one, he thinks, for the training-program engineers.

00:00:32 Time now to begin regular reports to the ground. *Fuel 102, 101; oxygen 78 [%], 100 [%]; amps 27.*

Loud and clear. Flight path is good, Shep-

*00 hours, 00 minutes, 03 seconds after lift-off. Italics indicate quotations from the spacecraft's flight tape.



Gleaming like a ruby against the black velvet of night, the 14-story gantry at Pad 14 holds stage center awaiting Glenn's arrival. Titan and Atlas service towers lining Cape Canaveral's ICBM Road add lights to the spectacle. This unusual photograph was taken from the new Saturn gantry.

Waving to his co-workers, Glenn strides out of Hangar S where he lived in seclusion for weeks prior to the flight. A van stands by to take him to Pad 14, four miles away.





ROCKETRY (ARROW) BY JAMES W. HINDLE, NATIONAL GEOGRAPHIC STAFF, AND HIS DETACHMENT BY RALPH WORTH, LIFE



Gingerly Easing Through the Hatch, Glenn Shoehorns Into His Spacecraft

Time: 6:03 a.m.—3 hours and 44 minutes before lift-off on February 20, 1962. "United States" and flag would have identified Glenn in case he landed on foreign soil. The astronaut selected the name "Friendship"; the "7" refers to America's seven spacemen. Plastic prevents scratching of corrugated shingles below hatch and single window.

Finger-tip lights, powered by batteries on gloves, proved valuable during periods of darkness in orbit. Chest mirror reflected instrument panel for flight photographs. Mirrors on wrists enabled pilot to see anywhere in capsule with minimum movement.



ard says, to let Glenn know he is on course.
00:00:55 Vibration is more intense; the whole rocket shudders. The spacecraft encounters its maximum air resistance. It plows out of the atmosphere like a ship breaking through high seas. Out the window the pilot sees a contrail—white condensation.

00:01:12 *We're smoothing out some now,* Glenn informs the Mercury Control Center as he feels a noticeable reduction in vibration. Those on the ground are as relieved as he is that the spacecraft has come through this period of maximum stress.

00:01:26 Next problem is to make sure that

the cabin air pressure holds at the proper level. The needle drops past 7 pounds per square inch, then slows to a stop. *Cabin pressure is holding at 6.1 okay,* he announces.

00:01:56 Glenn feels the weight of his chest pressing him back into his seat as acceleration builds to the point where he will weigh close to half a ton. It is not too bothersome—he has often experienced it on the centrifuge, and his couch is specially molded for comfort.

00:02:12 Acceleration drops off rapidly as two of the three main Atlas engines cut off. The spacecraft shakes for a moment as the spent engines are unhooked and slide away.



HE IS EXTRAPOSED BY BILL TAUB, NASA

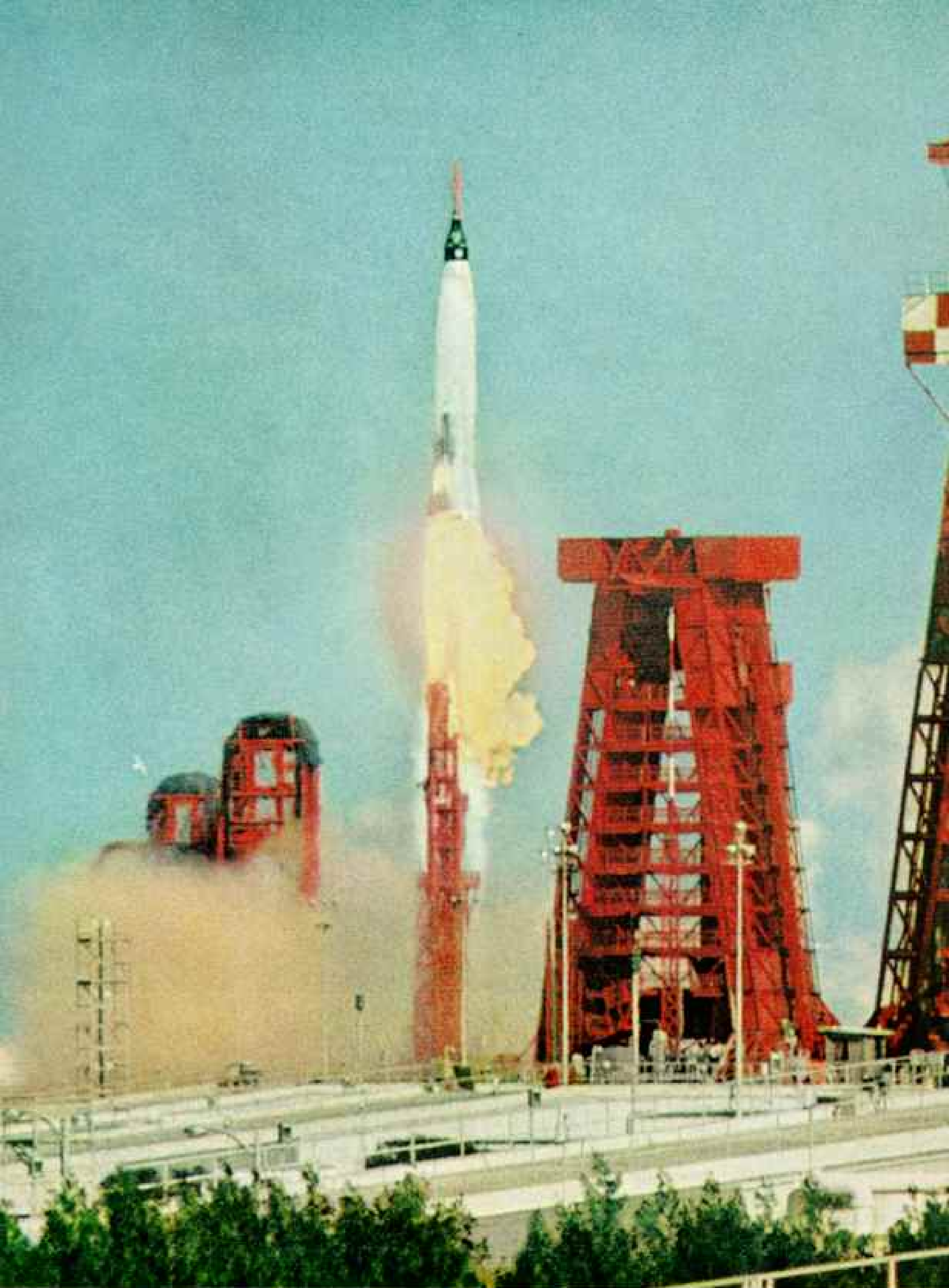
Glenn sees smoke going by the window.

The tower fired, he reports, but he sees he is mistaken. The smoke was from his engines, deflected upward when the boosters slid away. Now he sees the escape tower clearly. Had trouble developed, the tower would have whisked him and the capsule out of danger, but now he is outside the atmosphere and does not need it. He touches the switch that will release it if the automatic programmer does not jettison it on schedule. He watches the tower through the window, counting the seconds.

00:02:34 With a belch of smoke the escape

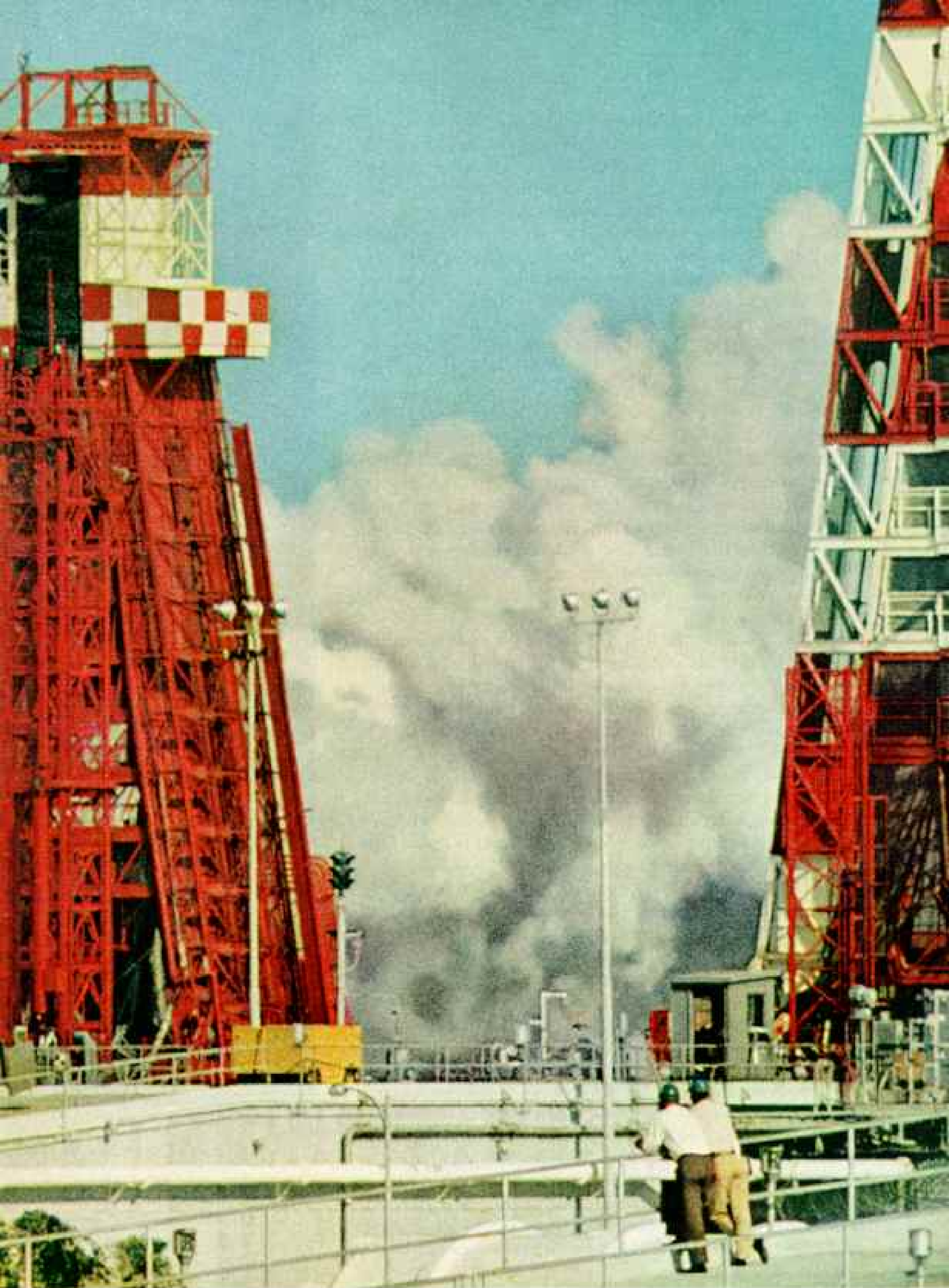
tower scoots away, a rocket-propelled dart with a long gray tail. Now, according to plan, the spacecraft pitches down briefly, and Glenn gets his first view of the earth. The sky is black above, and below there are clouds out across the Atlantic. The spacecraft pitches up again.

00:02:50 Glenn is down to about normal weight, but he can feel the acceleration pressure building once more. "I remember my backup pilot, Scott Carpenter, saying that he thought it would be pleasant to experience acceleration in a straight line for once, instead of always going in circles on the centri-



Friendship 7 Sheds Earthly Shackles:
A Hope Becomes History

With a triumphant roar, Mercury-Atlas 6 vaults heavenward, leaving its umbilical tower bathed in a blast of flame. Liquid oxygen at nearly 300°



PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER OTTO JIMMEL

below zero F. frosts the rocket. Clouds of steam billow as fire strikes cascading water in a metal deflector under the pad. A seagull (left) gets a close

bird's-eye view, while men in hard hats watch from a safe mile away. Telephoto lens squeezes together gantries that stand 2,000 feet apart.

fuge. He was right—I felt I was accomplishing something this time,” Glenn says later.

00:04:00 Here is an experience the astronaut is not expecting. The fuel tanks are almost empty, and the whole rocket becomes limber. The Atlas is a stainless-steel balloon with walls thinner than a dime, held in shape only by internal pressure. It feels as if the nose is waving back and forth. Glenn has the sensation of being on a springboard.

00:04:20 *Seven, Cape is GO; we're standing by for you.* As the Mercury vehicle approaches the end of powered flight, Shepard lets Glenn know that everything is O.K. on the ground. The pilot tells them he is ready too.

00:04:25 *Roger, Cape is GO and I am GO. Capsule is in good shape. Fuel...; oxygen...; cabin pressure holding steady... All systems are GO!*

00:04:49 Glenn's weight is back up to half a ton. Then suddenly it drops off, and he feels he is pitching forward head over heels. This always happens on the training centrifuge when the wheel stops turning, but it is less here.

At the same time there is a loud report as the clamp ring that holds the spacecraft to the Atlas is released by explosions severing the bolts. The craft lurches forward. The small posigrade rockets that are separating *Friendship 7* from the Atlas are stronger than Glenn expects. “They really boot you off.”

00:05:12 Now for the first time he feels himself being lifted slightly out of his seat. *Zero g, and I feel fine*, he reports. The capsule yaws 180° to assume the normal backward-facing attitude he will be in during orbital flight. As he comes around, he sees the rocket right behind and a little above him. “An impressive sight!” The rocket just hangs there, slowly moving lower and farther away. It is important that he note how long and how far away he can see it. In the future, in advanced spacecraft like Gemini and Apollo, space pilots plan to rendezvous. They want to know how well a pilot can judge distance in space.

00:05:30 *Seven, you have a GO, at least seven orbits.* “Probably the best words I have ever heard!” They mean that the Atlas has performed well; the spacecraft is in orbit more than a hundred miles above the earth and could maintain its course for seven circuits. From now on it is up to *Friendship 7* and Glenn.

00:05:44 Almost out of contact with Cape Canaveral, *Still reading you loud and clear*, calls Shepard. *Next transmission, Bermuda.*

Roger, Friendship 7. That is Astronaut Gus Grissom, capsule communicator at Bermuda. Each tracking station has its own cap com, who handles communications with the spacecraft.* *Orbit check list.* Grissom is calling for the check of switch positions. Glenn makes the checks; then it is time for Grissom to send the schedule for firing the retro-rockets in order to land where the recovery ships are waiting.

00:06:58 *Friendship 7, stand by for retro-sequence times.*
Roger. Ready to copy.

Grissom reads off the time for the end of the third orbit, when Glenn plans to come in, and also times for contin-

*See “Tracking America’s Man in Orbit,” by Kenneth F. Weaver, NATIONAL GEOGRAPHIC, February, 1962.



REUTERS/PHOTO BY AP/WIDEWORLD

Glenn's Cometlike Rocket

For some three miles of its climb, beginning at about 35,000 feet, the booster trails a snowy wake, as does a jet. Winds aloft will quickly twist the contrail like a pretzel. Here,



REARRANGED BY THOMAS H. SMITH, NATIONAL GEOGRAPHIC SOCIETY © N.G.S.

Heart-stopping suspense grips watchers on Cocoa Beach, Florida. Thousands viewed the climb from as far as 100 miles away. So jammed was Cocoa Beach that it took many spectators longer to reach the nearby highway than it took Glenn to circle the earth.

Radio with rabbit's foot epitomizes the mood at Cocoa Beach after the Atlas soared out of sight and crowds switched from looking to listening. For the next five hours countless people throughout the world tuned in to space on radio and television.

Streaks a Flawless Sky

the rocket accelerates toward the 17,500-mile-an-hour speed needed for orbit. In the first minute of flight it burns more fuel than a jetliner needs to cross North America.



gency recovery areas if anything goes wrong.
00:08:01 Time for a critical test of the elaborate system for maintaining the spacecraft's correct attitude. Most of the time it wouldn't matter. But when the retrograde rockets fire to start you back from orbit, correct attitude is essential or you don't get home!

Starting controls check.

Glenn reaches up and pulls the handle that feeds fuel to the manual system. He can see the nose come up as he pulls back on the control stick. His manual system is working on pitch. Now he pushes the fuel handle back in and watches the automatic system slow the capsule motion. Methodically his right hand moves the control stick forward, back, left, right. With his left he switches from one control to another. The instruments move just as they did in the trainer. Capsule and pilot function as smoothly in this new environment as they did on the pad during simulations.

00:09:58 Grissom's voice fades as *Friendship 7* passes out of range. Next are the Canaries and the coast of Africa.

00:11:16 The booster is still in sight, about a mile away and below him. Glenn never sees it again, but pieces are found later in South Africa. Now Glenn has time to take out his special equipment for scientific observations. He lifts the flap of the canvas ditty bag at his right arm and pulls out the pistol-grip camera he will use to photograph the earth on the daylight side.

The inside of the capsule hatch is covered with a pad of fabric lined with thousands of miniature loops. Each piece of equipment has its own pad with countless tiny hooks.

On the ground the camera would be too heavy to hang on the door, but, weightless, it needs only to be pushed against the pad, and it sticks like a burr in lamb's wool.

Next out of the ditty bag is a small photometer device, which he can use for 16 different astronomical and physiological tests.

The ultraviolet spectrograph and field glasses are next, each trailing a white cord which fastens to the ditty bag frame. Without that cord, even the heaviest piece could float out of reach, possibly to fall on the astronaut when gravity returns with the re-entry.

00:12:52 *Friendship 7, this is Canary cap com. Could you get started with your station report?*

00:13:10 *This is Friendship 7. Stand by. I am getting out some equipment.*

Glenn sticks the last piece of equipment in

place and reaches for the three flight-plan cards in the map case under his periscope. These are the program of his flight. They tell him what stations he will be talking to, when he will cross the continents, when he will enter darkness, and when the sun will rise.

00:15:12 *Friendship 7, Friendship 7. What is your spacecraft status report?*

The Canaries want the first of the regular half-hourly reports on switch positions and the readings on major instruments.

Glenn looks to the left. Above his arm is a bank of fuses. He mentions only those that are not in normal No. 1 position. Some he has turned off to make sure they will not function at the wrong time.

He moves on to the switches on the left of the center panel. Next comes a report on his two supplies of reaction-control fuel, one for automatic and one for the manual system.

Control fuel is 90, 98.

He continues with the capsule's attitude: *Roll, zero [degrees]... Yaw, 2 [degrees] right... Pitch, 33 [degrees].*

Now he moves to the upper right and the important environmental-control valves, calling off oxygen supply, cabin and suit temperatures, and similar factors.

Below is the electrical panel. He reports on each battery and distribution system.

00:18:04 As he completes his status check, he glances through the periscope.

The horizon is a brilliant, brilliant blue. There, I have the mainland in sight at the present time... and have the Canaries in sight out through the window.

He left Cape Canaveral 18 minutes ago; now he is approaching Africa!

00:18:26 *This is Canary cap com. Repeat blood pressure check.* The doctors are checking blood pressure in addition to the electrocardiogram, a constant record of the heart's activity. They hope the blood pressure will help them analyze how the circulatory system works under weightlessness.

People long in bed sometimes get dizzy when they get up. The doctors fear that weightlessness might leave a pilot weak and dizzy at the vital moment of re-entry.

Glenn picks up the little rubber bulb, just like the ones physicians use, and pumps up the cuff around the upper part of his left arm. He releases it, and the pressure drops slowly. A tiny microphone picks up the sound of the blood coursing through the artery for radioing to the ground by telemetry.

Friendship 7, your blood pressure is 120 over 80, the Canaries tracking station reports.

Well, that should make the doctors happy. That's just about normal for Glenn under these circumstances. No apparent effect of weightlessness so far.

Glenn is traveling backward. Everything comes into view first in his periscope, and then about 40 seconds later he can see it through the window. The difference between land and water is very clear. Ground colors show up just as they do from a high-altitude airplane.

00:21:16 He is over Africa now. *I can see dust storms down there blowing across the desert. A lot of dust. It's difficult to see the ground in some areas,* he reports to the Canaries. He takes a picture out of the window (page 811).

00:21:59 Glenn checks his flight-plan card. It's time now to take the xylose pill. He reaches into the ditty bag for the malted-milk tablet case. It's a little bigger than a roll of nickels. At the top is a single white sugar pill with a radioactive content that will help the doctors determine whether weightlessness affects digestion and ability to absorb food.

To eat, he opens his face plate and pops the tablet into his mouth. Then he closes the visor.

Hurting through space at nearly five miles a second, Glenn works at a variety of scientific tasks. Nearing Africa on his second orbit, he consults his map.

At approach of second sunset, he peers through a photometer. A filter enables him to look directly at the sun. Patch of sunlight on forehead bears shape of window just above Glenn.

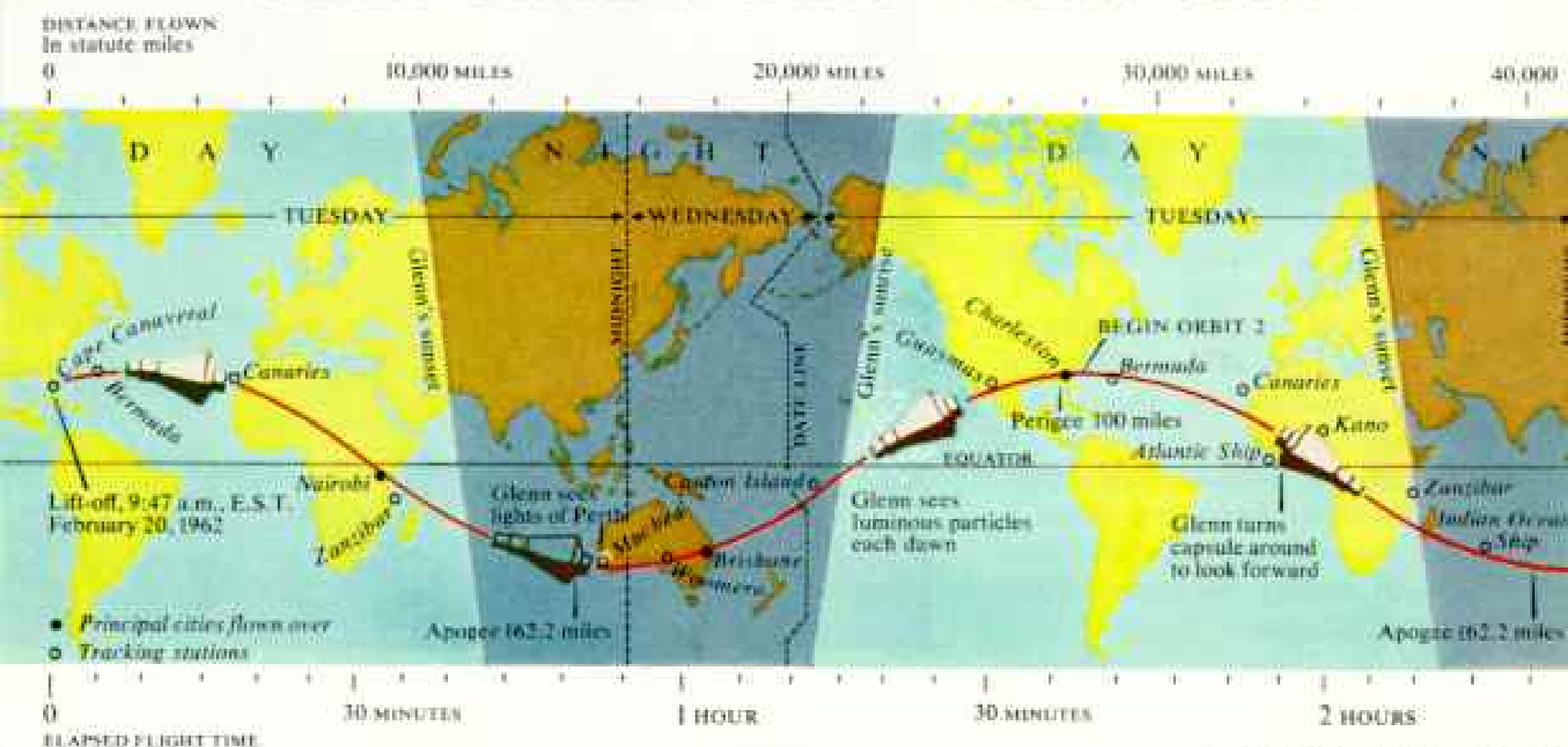
Weightless applesauce tube floats free following a snack over the Pacific on first orbit.



REYNOLDS, NASA



John Glenn's three world orbits



Epic flight of *Friendship 7* shuttled Glenn three times from winter to summer, and from Tuesday to Wednesday and back again. Repeated Mercator projection pinpoints the principal cities that the astronaut passed over. His orbit was fixed in space, but the world below turned on its axis 15° every

hour. Thus his track passes over Charleston, South Carolina, on the first orbit; El Paso and Dallas, Texas, on the second; San Diego, California, and New Orleans, Louisiana, on the third.

Daylight portions of the flight are longer than periods of darkness because Glenn's 900-mile view

00:30:13 He has left the desert behind now and moved over eastern Africa, covered by wispy, high, cirrus-looking clouds. He cannot see much except the cloud decks, but he catches sight of the ground once in a while. An orbiting weatherman would sure have a great advantage, he thinks.

The U. S. Weather Bureau had asked that Glenn determine whether he could tell kinds of clouds and cloud heights from orbit altitude. He finds that he can easily tell cloud heights from their shadows, and there is little difficulty in distinguishing cumulus, cirrus, and other types.

00:30:58 Glenn makes his regular report to Zanzibar, under the clouds below.

Friendship 7, Friendship 7, this is Sir John [nickname for flight surgeon], Zanzibar. You've got a good blood pressure trace.

Good. Now that they have a blood pressure measurement, it is time to do the standard exercise. This is another one for the medics. They are trying to find out how the effect of exercise under weightlessness compares to the same amount of exercise on the ground.

Between Glenn's knees is a handle attached to an elastic cord. He grabs it with

both hands and pulls it to his chin. Fully extended, it exerts a pull of 62 pounds. He lets it spring back to his knees, then pulls again. Once each second for 30 seconds. Now another blood pressure measurement.

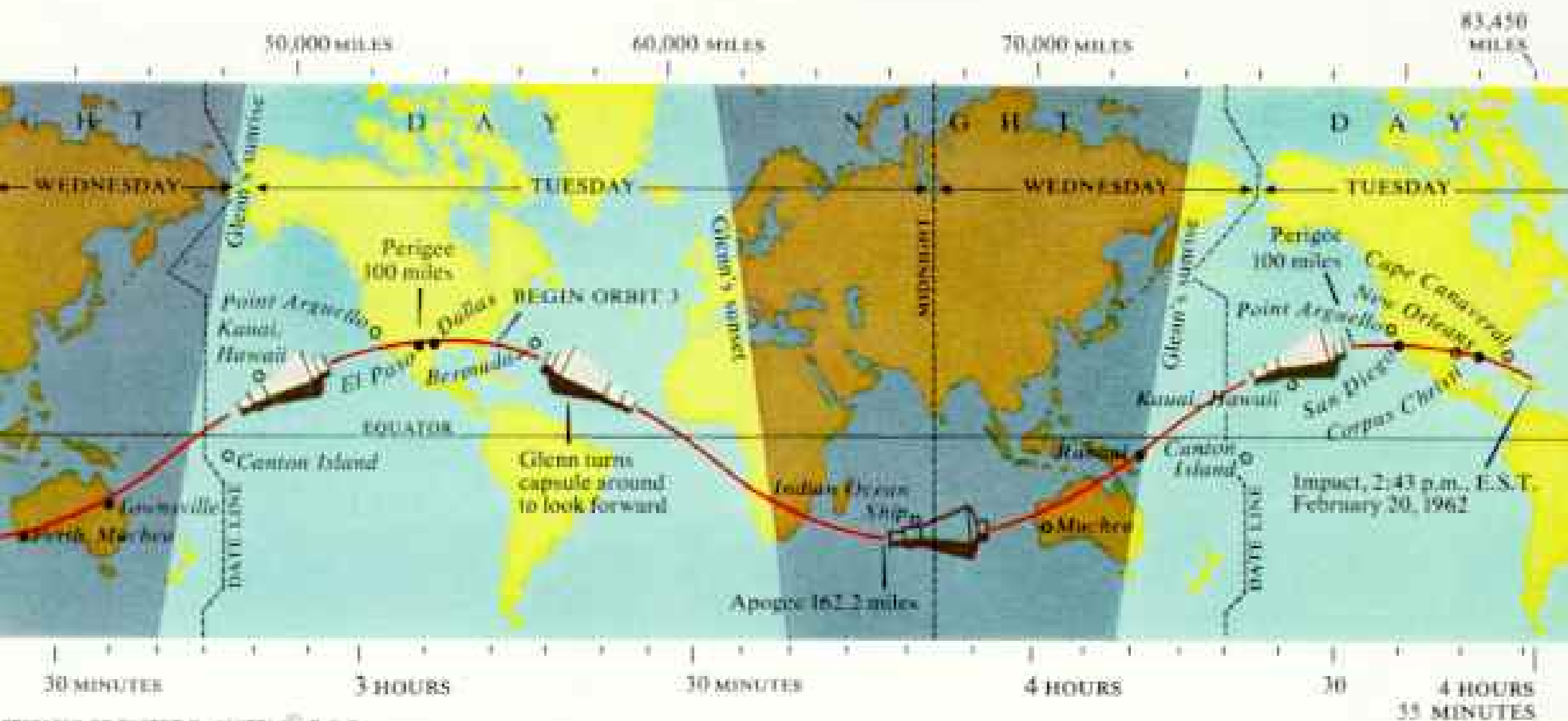
Friendship 7, this is Sir John, Zanzibar. Your blood pressure was 129 over 76 before exercise. Blood pressure 129 systolic after exercise. Recording well and coming down now to 74 for diastolic. . . . Everything on the dials indicates excellent aeromedical status.

Good enough. Now it's time to see if he can notice any of the effects of weightlessness that Russian Cosmonaut Gherman Titov is reported to have experienced on his 17-orbit flight.

According to the medical reports, Titov felt dizziness and nausea—much like seasickness—after six orbits, when he moved his head or watched rapidly moving objects or made reaching motions that forced him to move his body and head.

Glenn tries the same thing, very cautiously at first, making head movements slowly, side to side, up and down, then rolling the head back and forth. He reaches out about the cabin, first with his left, then his right hand,

83,450 miles in 4 hours 55 minutes



ahead and behind the capsule enabled him to see the sunrise long before the first rays of light touched earth beneath him and the glowing sun long after it set on earth. Map's areas of night are wider above the Equator, where winter grips the Northern Hemisphere, making nights longer than days—

seeing if he can hit any knob or switch. He checks his vision with a small eye chart stuck on the instrument panel.

He throws the beam from one of his fingertip lights back and forth across the cabin, following it with his eyes.

So far he feels nothing at all. He will test himself again in 30 minutes.

00:38:00 The flight plan reminds Glenn that it is time to prepare for passage into the earth's shadow.

He covers the two cabin lights to his right and left with red filters. He reaches down and turns off two extra cabin lights that are used for the cameras. On the night side the photographs of himself in the spacecraft will be lost, but it is more important that his eyes become adapted to night vision. Then he can see outside as soon as he enters darkness.

Next the eye patch. He has red filters he can slide over the windows before the sun goes down. But then he would miss the colors of the sunset, since all he could see out the window would be red. So he puts a patch over one eye. That way he gets a double benefit: He can watch the sunset with the open eye, and, as soon as the sun is down, he

exactly the opposite of conditions in the Southern Hemisphere. Glenn reached the apogee—highest point of orbit—three times, each at night. Perigees, lowest points of orbit, occurred in daylight. Actual orbital time totaled 4 hours, 28 minutes; launch, re-entry, and parachute descent added 27 minutes.

can take off the eye patch and the other eye will already be dark-adapted.

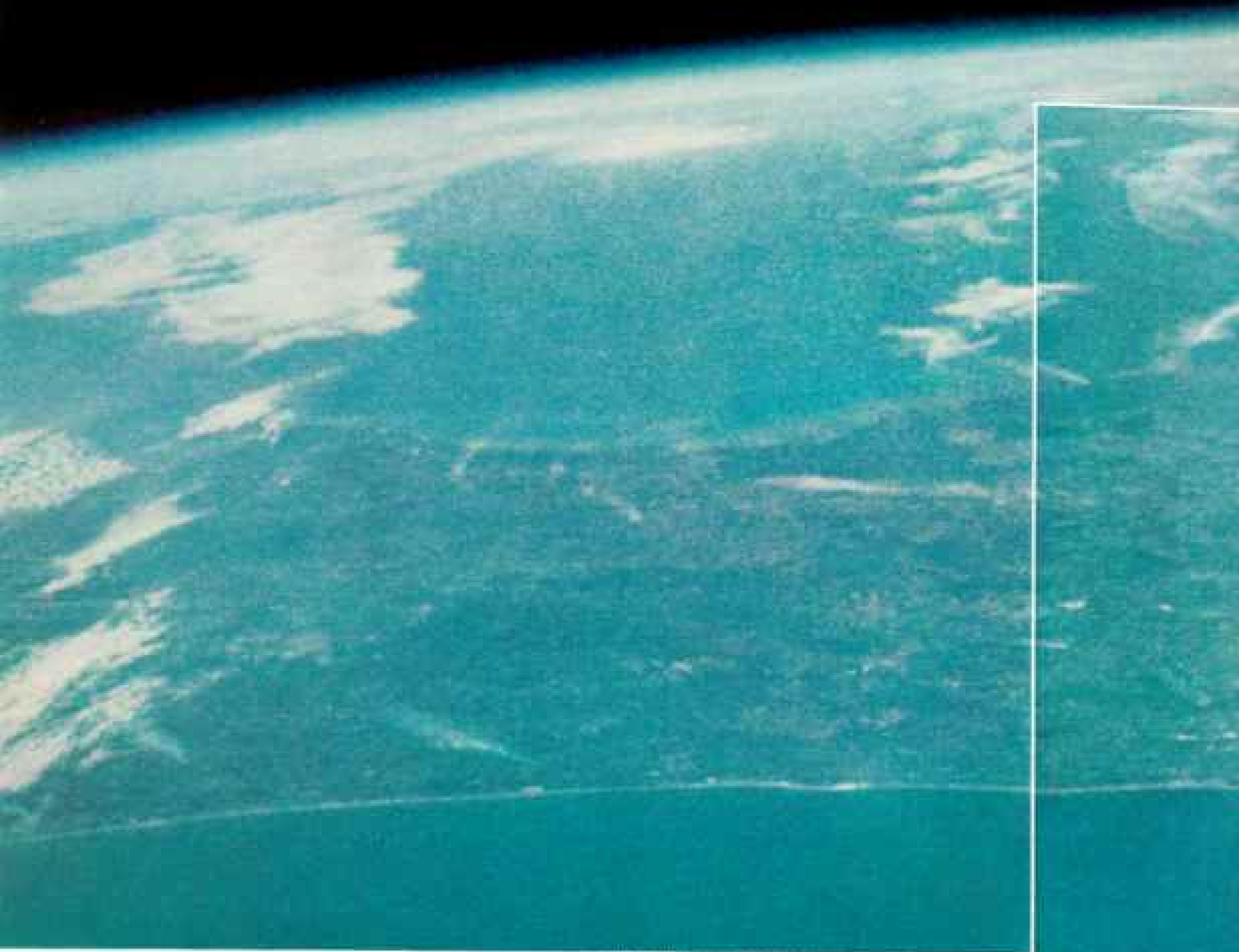
He opens his helmet. The patch is molded to fit the left eye, and tape holds it there. But it slips. He adjusts it, but it slips again.

Last night the tape stuck tight, even hurt his eyebrow when he took it off. But up here today it will not stick. Well, no help for it. He will just have to try to keep one eye closed.

00:40:28 He is out over the Indian Ocean, turning left to watch the sunset. He takes the miniature photometer from the door.

On the front is a polarizing filter through which he can look directly at the sun as it goes down. The sun is perfectly round as it approaches the horizon. The horizon on each side of the sun is extremely bright, a bright arc stretching as far as he can see. It is made more intense by the darkness of space above it and the dimness of the earth below.

The sun remains a ball until the last moment before it disappears. At this point it seems to melt into the bright white band and spread out. At the capsule's speed the sun sets 18 times faster than on earth. This is orbital twilight—one of the unique sights of space travel. The horizon is marked by a striped



FROM EARLIER COLOR NEGATIVE BY JOHN W. SUTHERLAND, 1958



"I can see the whole State of Florida just laid out like a map . . . clear back along the Gulf coast," Glenn reported at the beginning of his third orbit. He made these sequence photographs showing both Atlantic and Gulf coasts. Cape Canaveral lies just out of the picture at left.

"I was surprised at what a large percentage of the track was covered by clouds," Glenn observed. He found most of the United States under a cloud blanket, which precluded photographs of other areas.

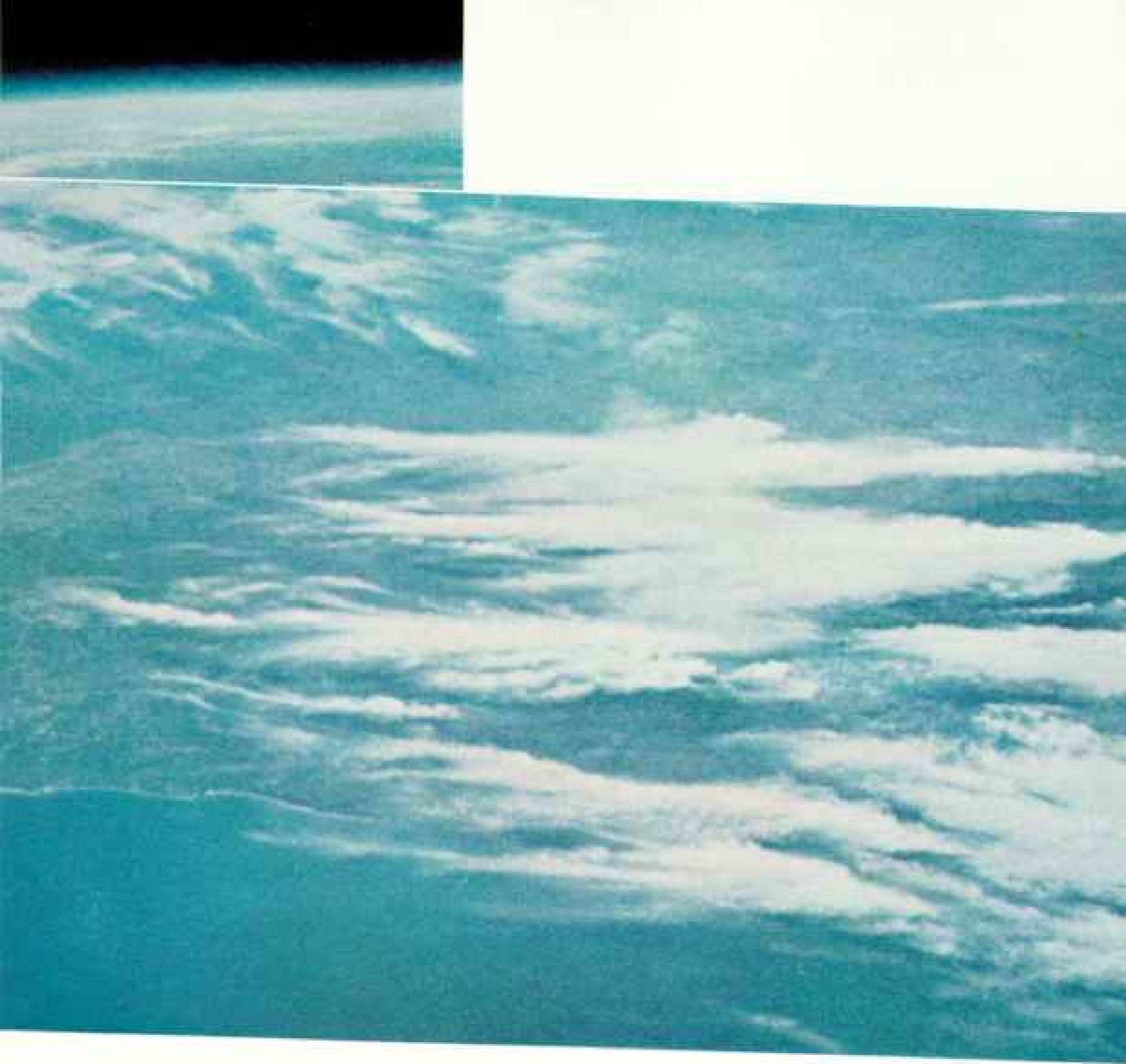
ribbon of light from north to south, unlike on earth where the sky gradually darkens.

The sky has been black throughout the day and is, of course, the same now.

Looking down at the earth, Glenn's still light-adapted eyes see nothing. It is like the Black Hole of Calcutta. The only light is the band at the horizon. The bottom layer, once a bright white, has faded to orange. As he watches, it fades into red, and then above these layers into darker colors, and finally off into blues and the blackness of space.

As he keeps moving away from the sun, now below the horizon, the strip of light keeps shortening, getting smaller, smaller, until it occupies just the area on either side of where the sun went down (pages 808-10).

After the redness fades, a brilliant blue band still remains at the horizon. This is the period that most excited the imagination of



the astronomers who briefed Glenn before the flight. Many phenomena associated with the sun cannot be seen well from the earth, because when the sun is high it is too bright to see, and before sunrise or after sunset the twilight interferes. Even during an eclipse the sky is not completely dark.

Up here there is practically no air to scatter the light, and if the direct rays can be blacked out, it should be possible to see the sun's corona and zodiacal light, a band of light visible on dark nights along the sun's path through the sky. Only the zodiacal light beyond 20 to 30 degrees from the sun has ever been seen from the earth. Glenn hopes to see it close to the sun against the black background of space as soon as the sun has set.

But he has not realized how long the bright band of space twilight will last. Also, since the eye patch failed, he has not sufficiently

adapted to the dark. So the spectacular close-in view of the corona and the zodiacal light must wait for the next astronaut's flight.

00:44:42 Now to check the periscope. Can he see the earth and horizon through it? He sees a bright light and thinks the moon is probably coming up behind him. Yes, it is in the periscope. It's making a very white light on the clouds below.

00:48:55 Now that the last blue band has faded out, Glenn can see the horizon clearly silhouetted against the stars. He takes his star navigation device from below the map case. Laid out in a strip about a foot long is his path through the stars. There is a transparent slide over the face of the chart. When he lines up this slide with a time scale to one side, he can find the stars he should be seeing through the window at any time.

He checks the clock and lines up with an



elapsed time of 49 minutes. Let's see, Triangulum should be in the upper right-hand corner of his window. Yes, there it is. And, just at the top of the window, Aries. All right, now he knows where he is. Tomorrow's space travelers will be able to use such star paths to navigate by.

But there is something strange. He sees the horizon clearly, but slightly above that, perhaps 7 to 8 degrees, is a luminous band, tan to buff-white in color. As he watches the stars moving toward the horizon, they seem to dim as they pass through this band; once below it, they brighten again before disappearing below the horizon. This band is well above the clouds, separated by a dark area of space. There's one for the astronomers to explain.

00:49:55 *Hello, Muchea. This is Friendship 7. Reading you loud and clear. We're doing real fine up here. Everything is going very well.*

Astronaut Gordon Cooper answers from Muchea in western Australia. Gordo has been waiting there for more than a month. It's good to hear him down there, halfway around the world from where the trip started.

You had an excellent cutoff, John. Your velocity was eight feet per second low. Eight feet out of more than 25,700 feet per second. That means an error of only about 20 inches in a mile!

00:51:51 Cooper calls again: *Shortly you may observe some*

"Orbital sunset is tremendous . . . a truly beautiful, beautiful sight," Glenn reported. This extraordinary photograph made by the astronaut in flight shows the sun shaped like a sausage cake as it slips below the horizon. Glenn himself did not see the phenomenon, caused by refraction of light rays in the atmosphere; definition of the sinking fireball was lost even when viewed through the photometer. The two streaks above the sun are reflections from the capsule window.

Setting sun wraps a scarf around earth's curving face. "The speed at which the sun goes down is remarkable," Glenn observed. "The white line of the horizon, sandwiched between the black sky and dark earth, is extremely bright as the sun sets. As the sun goes down a little bit more, the bottom layer becomes orange, and it fades into red and finally off into blues and black as you look farther up toward space."

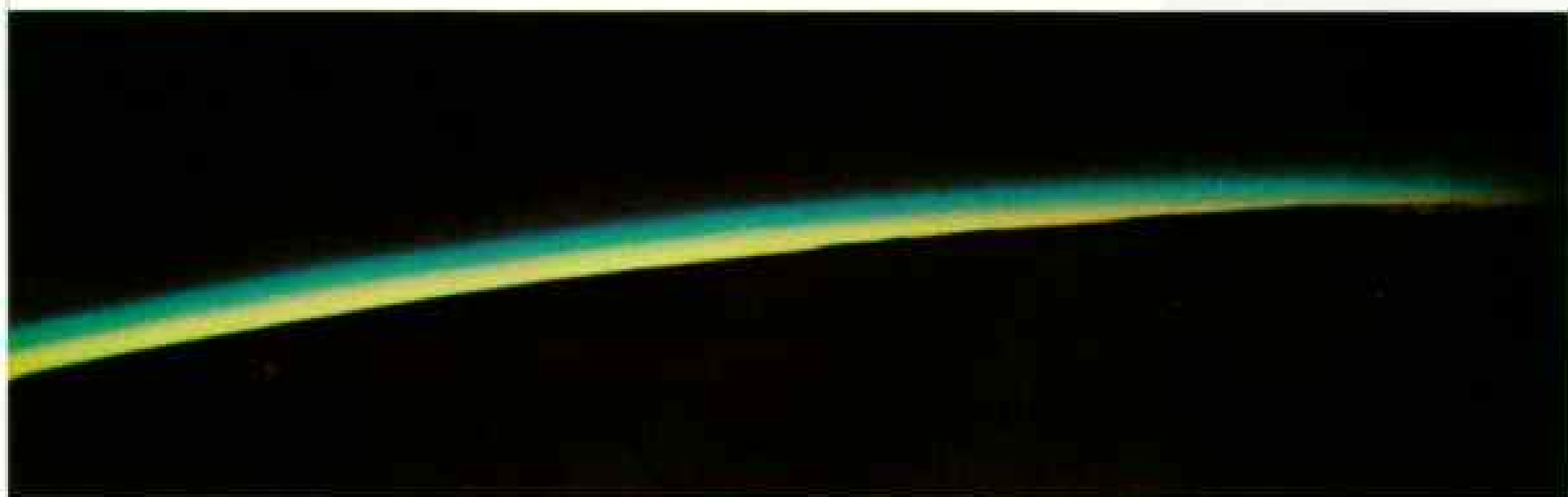


FROM GLENN COLON NEGATIVES BY JOHN H. GLENN, JR., NASA



FROM EXTREME COLOR RESOURCES BY JOHN H. GLENN, JR., NASA

With a final burst of gold, the sun drops below earth's disk...

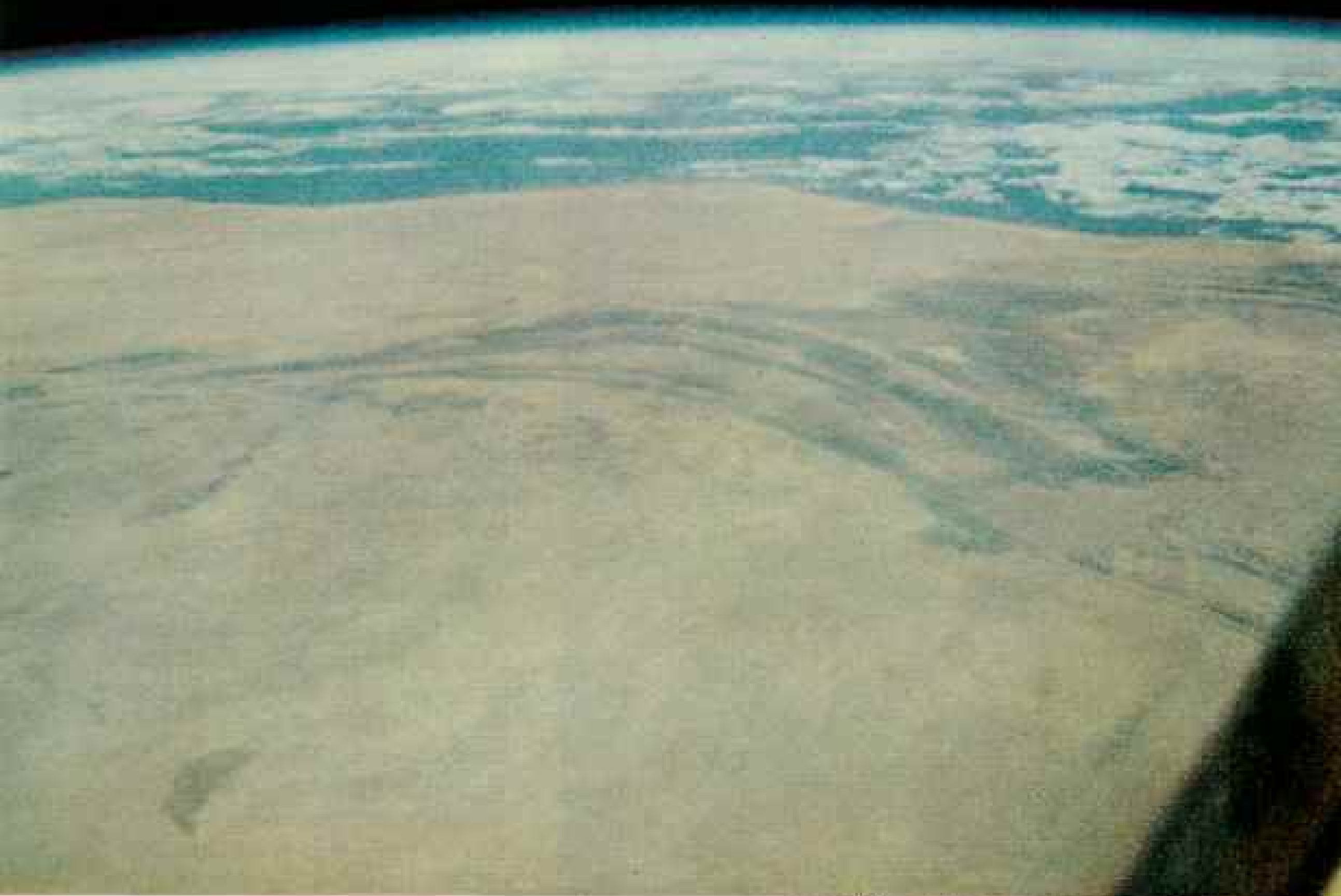


... leaving in its twilight wake bright ribbons of color...



... that fade into blue before the curtain of darkness falls.





FROM EASTMAN KODAK NEGATIVE BY JOHN H. GLENN, JR., 1962

"Have beautiful view of African coast," Glenn reports, looking back 900 miles over Spanish Sahara 19 minutes after lift-off. Capes Bojador (left) and Jubay hump the shoreline beyond the Anti Atlas Mountains. Rocks of Fort Trinquet mark desert at lower-left. The view is a southern extension of the photograph made from an unmanned capsule and published in the *GEOGRAPHIC*'s February, 1962, report on orbital tracking.

lights down there. You want to take a check on that to your right? The people of Perth and nearby towns are turning on all their lights as a beacon.

Roger. That was sure a short day....

Kinda passes rapidly, huh?

Yes, sir... I have the Pleiades in sight out here, very clear.

Picking up some of the star patterns now a little better than when I was just off Africa.

Now he sees the lights of coastal Perth. At his altitude they resemble the lights of a small town seen from a high-flying airplane. As he looks very sharply, he can trace a slight demarcation between land and sea.

The lights show up very well and thank everybody for turning them on, will you?

We sure will, John.

00:59:32 Eastern Australia is cloud covered. Woomera reports they have turned on the airport lights, but Glenn cannot see them.

01:03:59 Out over the Pacific now. The flight plan says that the first radio check is coming up to test how far he can transmit on his high-frequency radio system. The ultra-

high-frequency transmitter which he uses most of the time can be received only when the tracking station is on his side of the horizon, within 900 miles. High frequency is erratic, but sometimes it can be picked up half-way around the world. He calls all the tracking stations on high frequency.

This is Friendship 7, broadcasting in the blind to Mercury network. 1, 2, 3, 4, 5.

He waits 15 seconds.

This is Canaveral cap cam testing the HF. I did not read the capsule. Cape out.

Fifteen seconds. Next should be Bermuda, then the Canaries, then the Atlantic Ship, but he hears nothing. Finally he gets Kano, Nigeria, and Zanzibar.

01:12:00 Flight plan says eat, so eat he does. Strange banquet. He pulls out a shaving-cream-size tube of food and breaks the seal. He opens the visor and squeezes the apple-sauce into his mouth. Tastes good. He has no trouble eating. He lets go the tube; it floats.

"I wish now I had brought along that ham sandwich someone once put in the ditty bag as a joke," he muses. "I'm sure I could eat it



WILLIAMS, NASA

Tension mounts in Canaveral's Mercury Control Center during a 4½-minute communications blackout at time of re-entry. Dr. William K. Douglas, physician and personal friend of Glenn, waits to hear as silence shrouds the flight.

with no trouble. Only crumbly food would be a problem—no crackers in space." Crumbs, of course, would float, weightless, and might get into his eyes and lungs.

This is Friendship 7. Have eaten one tube of food. Shutting the visor. I've had no problem eating. Oh, the sun is coming up behind me in the periscope—a brilliant, brilliant red.

He reaches down to throw a dark filter onto the periscope. The sun's light through the scope is blinding.

The Canton Island communicator responds to his enthusiasm over the magnif-

icent sunrise: *You are very lucky.*

You're right. Man, this is beautiful, Glenn says.

01:15:23 Looking up from the periscope, he is surprised to see the window filled with stars. At first he cannot see the horizon at all. He glances at the attitude indicator; all is normal. Looking back, he sees that the brilliant specks are not stars.

"It is as if I were walking backward through a field of fireflies," he notes. The particles are luminous and yellowish-green in color. They drift back slowly at three to four miles an hour.

Occasionally they swirl up around the capsule and across the window, drifting very slowly. Close to the window, in the shade of the capsule, they look white—like a piece of fluff, or a snowflake. Glenn wonders if they might be water formed by the hydrogen peroxide jets that control attitude. But he tries his jets, and he cannot see any particles being formed. He reports this unusual sight to Canton. They want to know if he can hear any impact on the capsule.

Negative, he assures them.

01:19:30 He has been watching little luminous particles for more than four minutes now. As the sun rises, the earth background becomes brighter and brighter, making it more difficult to see them. At first there were literally thousands. Now he sees only a few.

[Scientists refer to the particles as the Glenn Effect. Dr. John O'Keefe, astronomer at the Goddard Space Flight Center, Greenbelt, Maryland, believes the larger

particles are snowflakes from water vapor released into space by the capsule's cooling system. The smaller particles may be paint or other material from the capsule. Like dust motes in a sunbeam, they become visible when lit against a dark background. Infinitesimally faint air resistance gradually slows their forward movement and makes them drift behind the capsule.]

01:23:19 Glenn has made contact with Guaymas, Mexico. Soon he will be coming in over North America. He decides to change the film in the camera for his next pass over

NORMAL

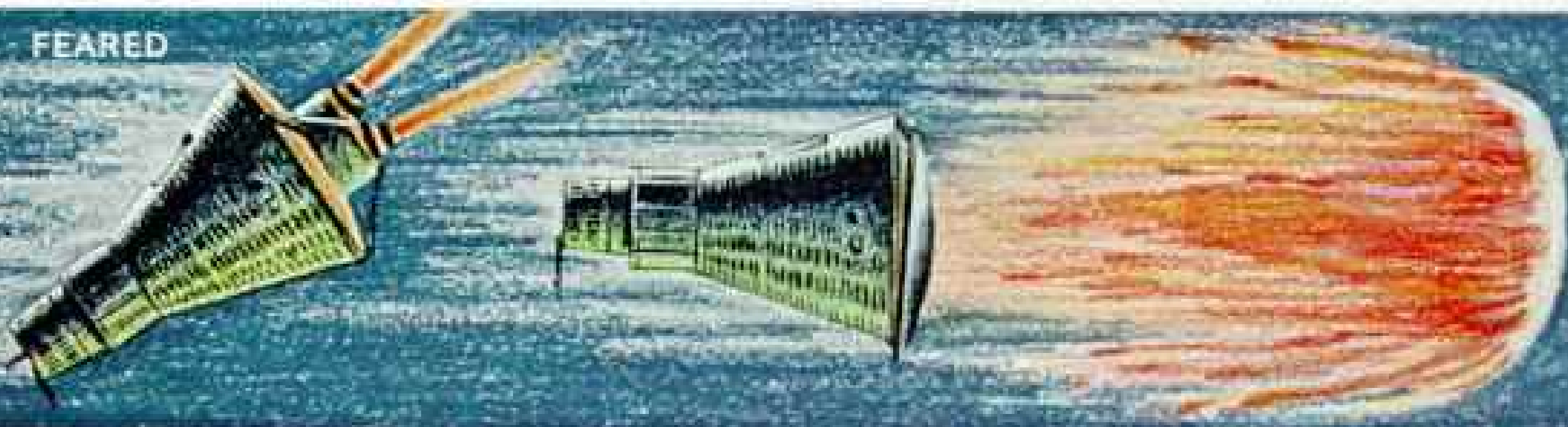


Retrorockets fire to slow the capsule and push it earthward

Retropack jettisoned, exposed heat shield faces re-entry friction

Heat shield glows at 3,000° F., but ablation protects the capsule

FEARED

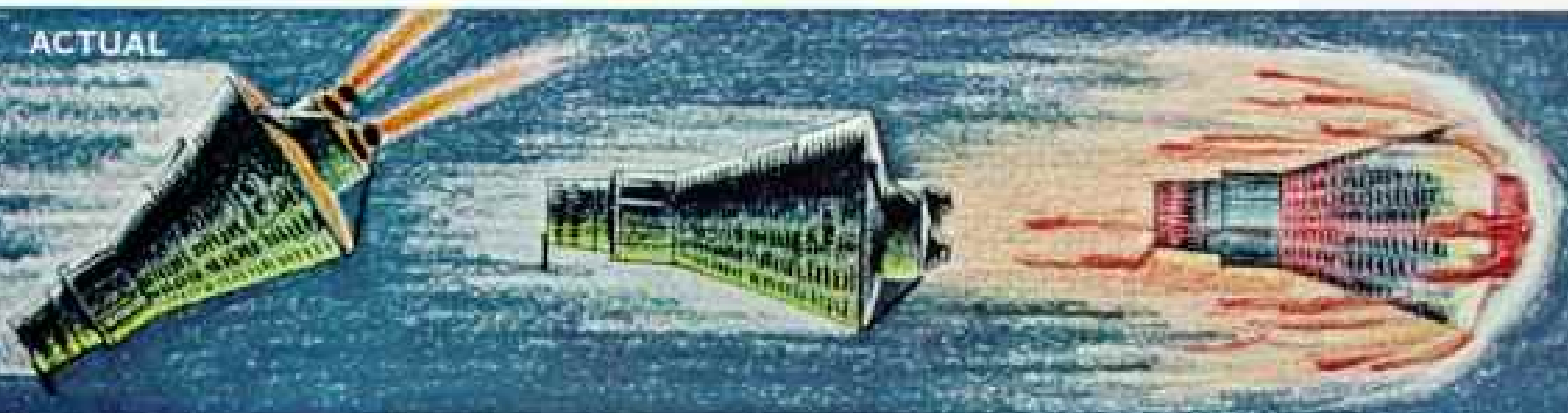


Retrorockets fire; rocket cases leave the capsule as planned

Retropack's bindings gone, the heat shield slips out of position

Heat shield sheared off, the astronaut's capsule incinerates in seconds

ACTUAL



Rockets fire; pack is kept after false signal that heat shield is loose

Retropack straps help hold the heat shield in place for re-entry

Retropack burns away and the intact heat shield saves the capsule

DRAWINGS BY STAFF ARTIST ROBERT W. WINDLESON © N.A.S.A.

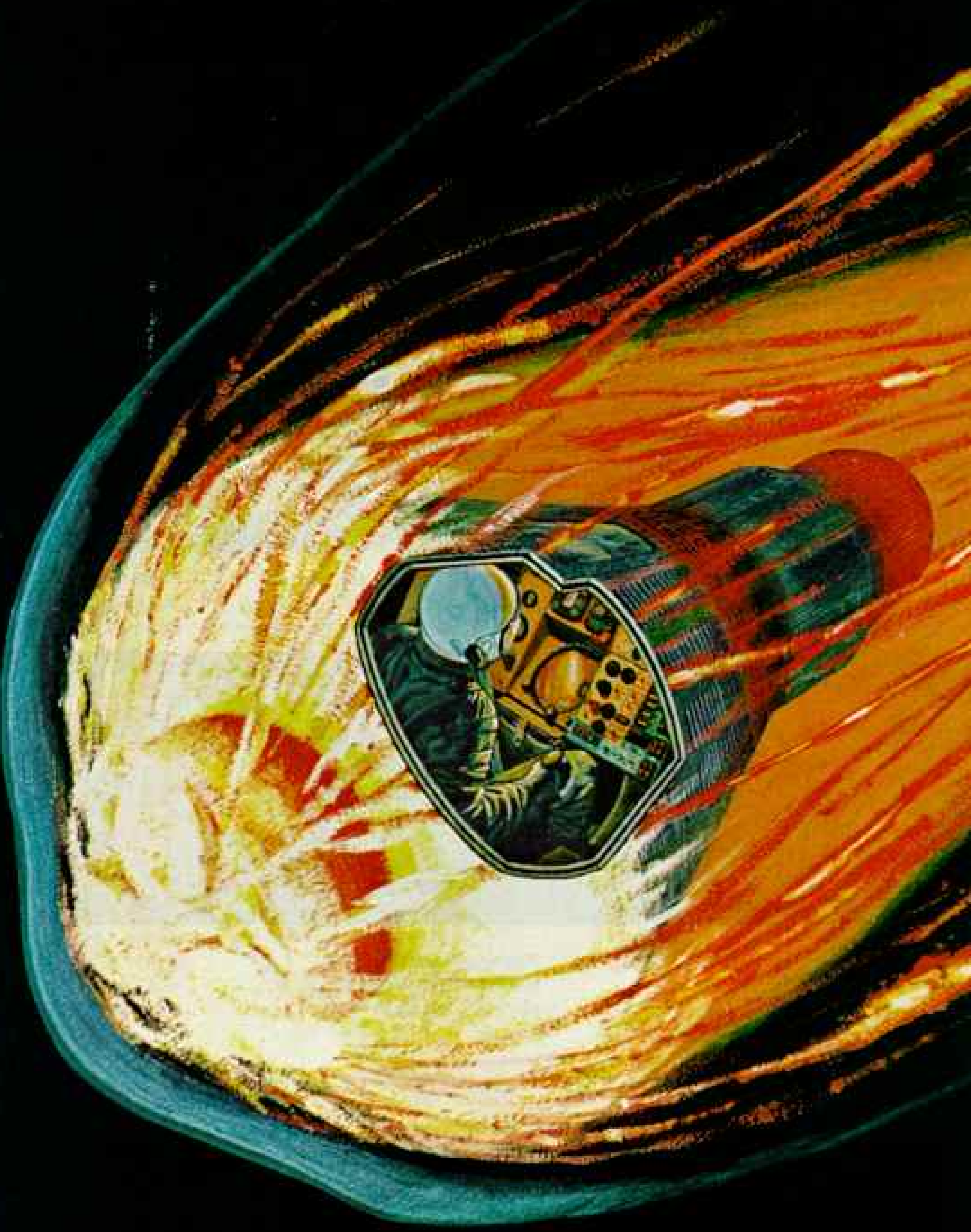
the lighted side of the earth. He takes the exposed roll from the camera and makes sure it is secure in the ditty bag. But he fumbles the new film and, weightless, it scoots behind the instrument panel. It is out of reach, so he gets another roll.

01:26:53 He is over the coast of Mexico. Too much cloud cover to see land.

The capsule is drifting, turning toward the right. The autopilot should hold the proper attitude, but the capsule continues to drift. It yaws to about 20°, then is brought back rapidly. Glenn hears the pulse of steam as the

Like a man in a meteor, Glenn rides *Friendship 7* down through the fiery friction of the atmosphere. This unique cutaway painting owes its accuracy to the guidance of Astronaut Glenn and to laboratory re-enactment of the spectacular scene by NASA scientists at Ames Research Center, Moffett Field, California, using a model with retrorocket pack attached. For simplicity the artist has omitted the astronaut's couch.

Here flaming pieces of the retropack streak past Glenn's window, and the heat shield boils away as planned. Converging gases form a golden ball. "A real fireball outside," Glenn records. The shock wave less than a foot ahead of the capsule glows at 50,000° F., nearly five times the temperature of the sun's surface.





**Plucked From the Atlantic, *Friendship 7*
Rides the Deck of U. S. Navy Destroyer *Noa***

Four hours and 55 minutes after launching, the capsule splashed down near the *Noa*, one of more than 20 ships patrolling Atlantic recovery areas. When the capsule re-entered the atmosphere at terrific speed, it had caused a "sonic boom" clearly heard aboard the ship.

Steel cable from one of *Noa's* lifeboat davits secures the bobbing capsule (below). The periscope, its door open, extends just above swells stained coppery green by a floating dye marker.

With the astronaut still inside and hatch cover still closed, *Friendship 7* swings aboard the *Noa* (center, opposite).

Minutes later Glenn talks by phone with the President of the United States (bottom, opposite).



(HE LIFEBOAT) U. S. NAVY (BELOW AND OPPOSITE, CENTER AND





NATIONAL GEOGRAPHIC PHOTOGRAPHER DEAN DORRIS FOR NASA



large attitude-control thruster comes into action. Since the big one consumes so much hydrogen peroxide fuel, the original plan was not to use it to hold attitude. If this keeps up, he will run out. Apparently the small one-pound thruster is stuck.

Shepard asks for a report on the difficulty with the autopilot. Glenn gives him a run-down and switches to "fly-by-wire."

In fly-by-wire he controls the capsule's attitude himself, using the same electric signals that the autopilot uses. This system worked well for roll and pitch, but he had to use the manual control for yaw throughout most of the rest of the flight.

01:37:00 Back over the Cape now. The first orbit is complete, and he is off on the second.

01:51:13 *This is Friendship 7. He is speaking once again to the Canaries. The sun coming through the window is very warm where it hits the suit.*

01:53:46 He has been fighting the problem of the autopilot all the way across the Atlantic. The problem is still with him, but now the capsule is drifting off to the left. He reports this and gets ready to make a 180° turn.

As he arrives at 180°, the ground comes directly toward him. "Just like sitting up front in a Greyhound bus. Boy, that's beautiful. I like this attitude better than flying backward," he says to himself.

02:08:38 Over Zanzibar once again. He is back in the old attitude, looking at where he has been. He peeks around the edge of the window at the setting sun. It reminds him of the arc lights on the pad, just like one of them shining in the window.

Below he can see lightning zipping around a large storm to the north. The cloud tops glow "like a light bulb wrapped in cotton."

The Weather Bureau scientists will be interested in this. They want to improve the Tiros satellites so that they can see weather phenomena on the dark side.* The human eye is a better optical device than the one their satellites use.

02:14:22 Glenn hears a buzzing in his earphones, and a bright amber light comes on at the right-hand side of the panel, warning that the fuel for his autopilot and fly-by-wire control system is down to 60 percent. Nothing to worry about. He has now switched to the manual system.

02:19:10 The Indian Ocean Ship calls: *We have message from Mercury Control Center*

*See "Our Earth as a Satellite Sees it," by W. G. Stood, NATIONAL GEOGRAPHIC, August, 1960.

for you to keep your landing bag switch in off position.

He glances down at the switch. It is off.
02:25:28 He is having trouble with his attitude indicators. When they show normal, he looks out and notes that he has rolled about 20° to the right.

02:26:36 *Friendship 7, will you confirm the landing bag switch is in the off position?* Cooper calls from Muchea.

Affirmative. Landing bag switch is in the center off position.

You haven't had any banging noises or anything of this type?

Negative.

Control Center wanted this answer.

02:27:34 Glenn checks his sky map again. He should be seeing Orion. And there it is. He pitches the capsule up slightly and centers on Orion's belt. It is time to try pictures with the ultraviolet spectrograph, an optical device with a special quartz lens and prism.

He holds the instrument against the visor of his helmet and sights on the center star of the belt. His exposures last about 15 seconds. After each exposure he brings the spacecraft back to the right attitude, centers on Orion, and starts again.

02:43:00 Approaching sunrise again. The morning twilight band spreads around the edge of the grapefruit-size disk of the earth in the periscope. As it brightens, it becomes a miniature copy of the sunset band.

Once again he is in a swarm of fireflies. They drift by slowly, glistening.

02:47:14 *Friendship 7, this is Canton. We also have no indication that your landing bag might be deployed.*

Roger. Did someone report the landing bag could be down?

Negative. We had a request to monitor this and to ask you if you heard any flapping when you had high capsule rates [motions].

Negative. . . . I think they probably thought these particles I saw might have come from that.

02:53:06 The tracking station on the island of Kauai, Hawaii, is calling. *Do you still consider yourself GO for the next orbit?*

That is affirmative. I am GO for the next orbit.

03:03:54 Over California, Astronaut Wally Schirra, cap com at Point Arguello tracking station, confirms that the Control Center is GO. He adds, *John, the aeromedics are real happy with you. You look real good up there.*

All right, fine, glad everything is working out. I feel real good, Wally. No problems at all.

Glenn crosses the United States in eight minutes. At **03:11:37** he is talking to Bermuda again. *This is Friendship 7. I can see the whole State of Florida just laid out like a map. It's beautiful. I can see clear back along the Gulf coast.*

He reaches for the daylight camera and takes pictures of the Florida peninsula (pages 806-7). His flight plan reminds him to check the recovery area, "Area Hotel," where he will land at the end of this orbit.

This is Friendship 7, checking down in Area Hotel on the weather, and it looks good down that way. Looks like we'll have no problem on recovery.

Very good. We'll see you in Grand Turk, calls Grissom.

03:36:00 Glenn is approaching the sunset again. The sunlight reveals a lot of dirt on the window, probably from the smoke of the escape tower when it was jettisoned. Some of it looks like smashed bugs on the glass.

Now at **03:42:00** he ought to be passing over Johannesburg, but southern Africa is covered with clouds. He can see lightning flashing like firecrackers on the horizon.

03:48:14 *Friendship 7, this is Indian cap com [Indian Ocean Ship]. What is your control mode?*

This is Friendship 7. I'm on the ASCS [autopilot], but it is operating very erratically. I'm backing it up with manual at the present time. I'm trying to get it set up so it will be in a decent ASCS attitude for retrofire.

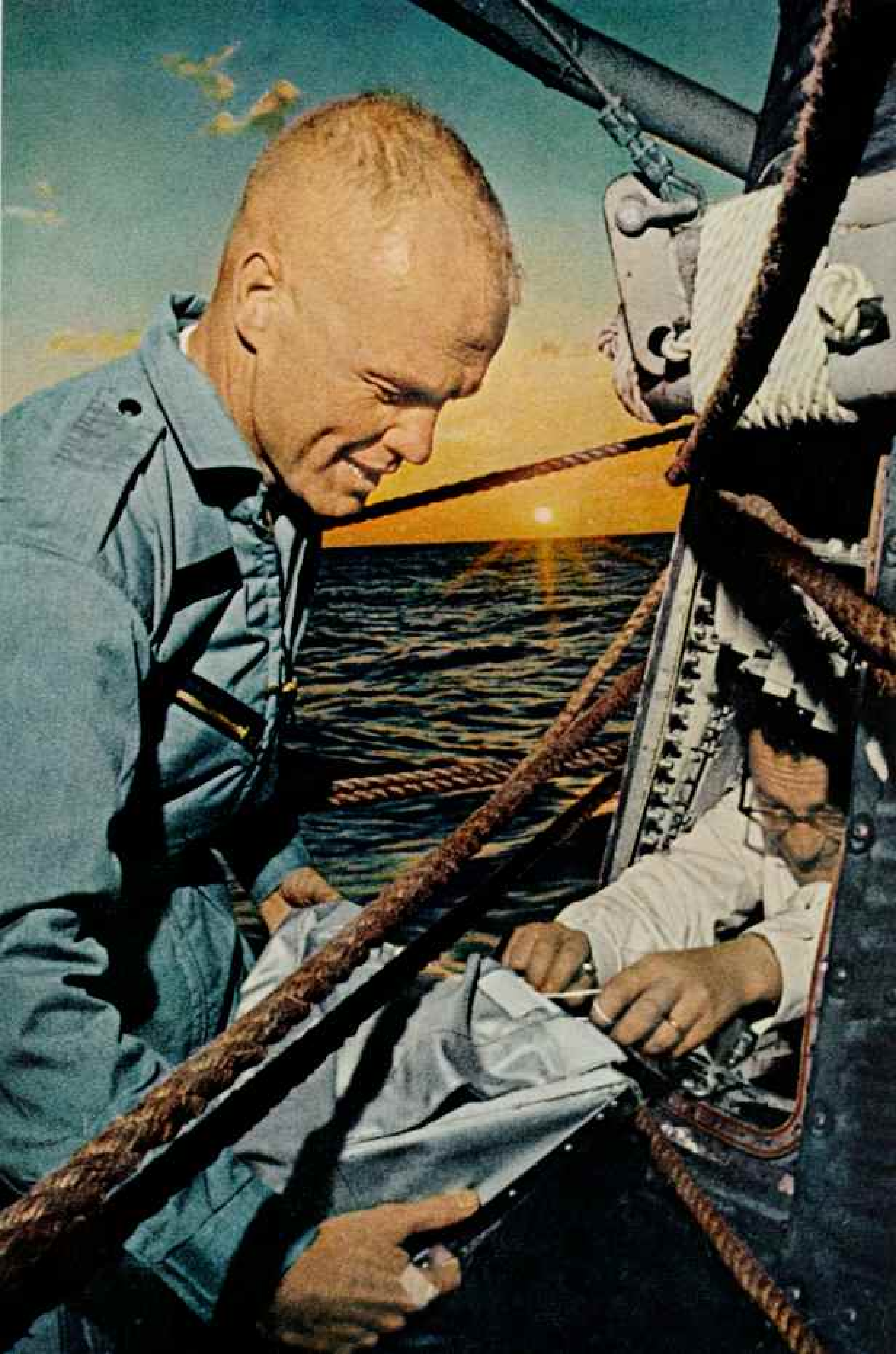
03:59:15 Muchea again. Glenn calls to Cooper:

This is Friendship 7. . . . I want you to send a message to the Commandant of the U. S. Marine Corps, Washington. Tell him I have my four hours required flight time in for the

On a Secluded Corner of Noa's Deck, Glenn Debriefs Himself

After a shower, a glass of iced tea, and a quick medical check, Glenn props his feet on a "hedgehog" depth-charge mount and talks into a tape recorder while memories of his space journey are still fresh. "My condition is excellent. I am in good shape; no problems at all," he summarizes. "I think the fact that I could take over and show that a pilot can control the capsule manually . . . satisfied me most."







BY EXTRAORDINARILY NATIONAL GEOGRAPHIC PHOTOGRAPHER DEAN CONGER FOR NASA

Second lift-off whisks Glenn from the *Noa* into a Navy helicopter for transfer to the carrier *Randolph*. The astronaut clutches his ditty bag, containing film that he exposed in orbit; several of his pictures appear on pages 806-11. NATIONAL GEOGRAPHIC photographer Dean Conger, on loan to NASA, made many of the recovery pictures published by magazines and wire services. A helicopter carried him from the *Randolph* to the *Noa* minutes before Glenn came aboard. Returning by copter to the *Randolph*, he filmed the astronaut aboard the carrier. A plane sped him to Grand Turk, a British island near Haiti, to photograph Glenn's arrival there. At midnight a tired Conger reached Canaveral.

"It Is Hard to Beat a Day in Which You Are Permitted the Luxury of Seeing Four Sunsets," Says Glenn

Bound for a two-day debriefing at Grand Turk, the astronaut parts with the capsule that served him so well. Beyond, the sun sinks to the horizon for the fourth and final time in his never-to-be-forgotten day. Ralph Gendiellee, a spacecraft engineer, hands out the ditty bag containing camera, film, field glasses, and other flight gear. Bandage on Glenn's hand covers knuckles cut slightly when he blew the capsule's hatch cover.

month and request flight chit be established for me.

*Roger. Will do. Think they'll pay it?
I don't know. Gonna find out.
Is this flying time or rocket time?
Lighter-than-air, buddy.*

04:13:00 He has turned around to watch the sunrise, this time to find out if he can see the small particles ahead of him. And he does. But with the bright sun in front he cannot see as many. They are coming from ahead, and they are spread out all over the place.

04:18:02 *Friendship 7, this is cap com. We are not receiving your transmissions.*

Roger, Canton. I was busy maneuvering here. . . . Getting lights set up and trying to slow everything for retrofire.

He shoves all the equipment back into the ditty bag and turns on the bright lights to see his instruments. As he comes around to the backward-facing attitude, he notices the dials are still inaccurate. He holds attitude by the view through the window.

04:22:38 *Friendship 7, Hawaii cap com. We have been reading an indication on the ground of . . . landing bag deploy. We suspect this is erroneous. However, Cape would like you to check this by putting the landing bag switch in auto position and see if you get a light. Do you concur with this?*

He thinks this one over. *Okay, if that's what they recommend, we'll go ahead and try it. Are you ready for it now?*

Relaxed Glenn jokes at Grand Turk with Scott Carpenter, his backup pilot and the scheduled pilot for the next orbital flight.



PHOTOGRAPHS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER OTIS INGOLDEN

Yes. When you're ready.

Ah, negative; in automatic position did not get a light, and I'm back in off position now.

Roger, that's fine. In that case re-entry sequence will be normal.

Glenn attempts a final check on time before retrofire, but Hawaii fades.

04:31:18 *Friendship 7, this is California, reading you loud and clear.*

Roger. This is Friendship 7. My capsule elapsed time is 04 plus 31 plus 35 on my mark . . . 2, 3, 4, mark. Will you relay that immediately to Cape? I think we're several seconds off. Over.

Roger. We have you on that. Will give you the countdown for retro-sequence time, John. You're looking good.

Roger. We have only 50 seconds to retrograde.

John, I'll give you a mark . . . 45, mark.

He checks his clock again. Yes. He is right on.

I'm on ASCS and backing it up manual. Thirty seconds, John.

Once again he hears a buzzing, and the yellow light on his right flashes on. It is the retro-warning light, notifying him that in 30 seconds the retrofire sequence will begin.

Retro-warning is on, he advises Schirra.

Good. John, leave your retro-pack on, through your pass over Texas. Do you read?

Roger.

Fifteen seconds to sequence. . . .

On his right the retro-sequence light on the control panel flashes green. A second green light tells him he is in the proper attitude.

Schirra is counting: *5, 4, 3, 2, 1, fire!*

04:33:08 Suddenly there is a roar behind Glenn. *Roger, retros are firing.*

Yeah, they be.

Are they ever! It feels like I'm going back toward Hawaii.

Don't do that. You want to go to the east coast.

The pilot focuses on the instruments. As the capsule swings slightly from side to side, both the autopilot and the man fight the motion. After five seconds Glenn is kicked in the back again as the second retrorocket comes on. The needles swing away very slightly again, and he counteracts the motion with his stick.

Five more seconds and he feels the final kick.

The first rocket is almost burned out now—it lasts only 12 seconds. The needles are very little off center. Between the autopilot and the astronaut, the craft is holding its own.

Seventeen seconds, and the second rocket is burning out; about five seconds to go.

Twenty-two seconds and the third one has burned out. The needles settle down. Glenn can look up and out the window now and see that he is still going toward the east.

His feeling of backing up during retrofire was pure illusion: the retrorockets slowed him down only slightly. He is still going at more than 17,000 miles an hour toward his landing area in the Atlantic.

Keep your retropack on until you pass Texas, Schirra repeats.

That's affirmative.

Check. Pretty good-looking flight from what all we've seen.

Roger. Everything went pretty good, except for all this ASCS problem.

It looked like your attitude held pretty well. Did you have to back it up at all?

Oh, yes, quite a bit. Yeah, I had a lot of trouble with it.

04:34:15 To Glenn's right the next sequence light comes on red, telling him that his retro-package has not been jettisoned.

Jettison retro is red. I'm holding on to it, he reports.

Good head.

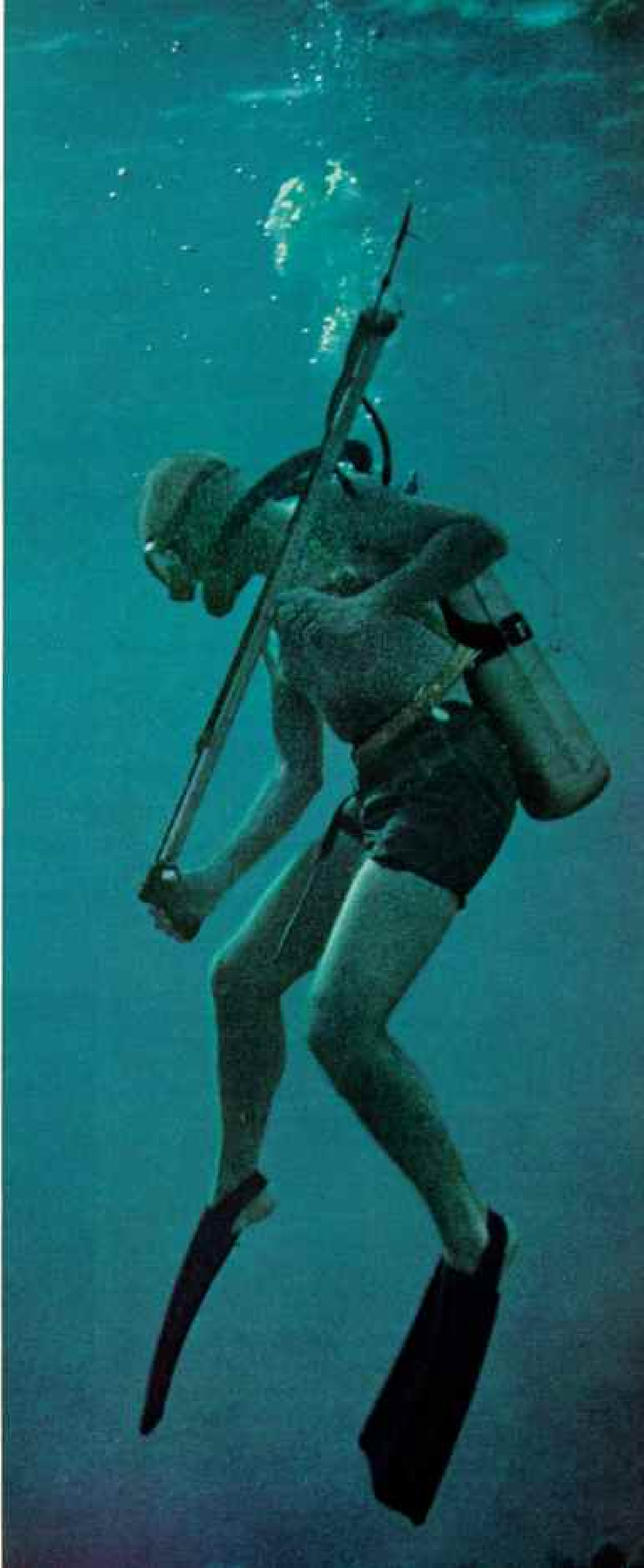
I'll tell you, there's no doubt about it when the retros fire.

Gathered that from your comments.

Do you have a time for going to jettison retro?

Texas will give you that message.

From outer space to inner space, Glenn floats weightless in a different medium while spearfishing off Grand Turk between debriefing sessions. The interlude was not without drama: Fellow astronaut Carpenter rescued a skin diver who had lost consciousness 80 feet down. Glenn and others hauled him into a boat.



The autopilot still is not working properly. The astronaut takes over control of yaw himself, bypassing the autopilot. He is passing over the west coast.

This is Friendship 7. Can see El Centro and the Imperial Valley down there. Salton Sea very clear.

It should be pretty green; we've had a lot of rain down here.

It is. He can see the patchwork of irrigated areas standing out against the brown of the desert. Now he is over clouds again. The autopilot is still acting up. He switches to full manual control on all three axes.

04:38:25 *This is Texas cap com [Corpus Christi]. We are recommending that you leave the retropackage on through the entire re-entry. This means you will have to override the .05 g switch [a device to sense the beginning of air resistance and start the program of spacecraft operations for re-entry]. This also means that you will have to manually retract the scope.*

This is Friendship 7. What is the reason for this? Do you have any reason?

Not at this time. This is the judgment of Cape Flight.

Roger. Understand. I will have to make a manual .05 g entry when it occurs and bring the scope in manually.

That is affirmative, Friendship 7.

Roger. This is Friendship 7. Going to re-entry attitude then in that case.

With his hand controller he brings the nose up until he can no longer see the horizon. The instruments indicate that the capsule is straight and level with the earth, ready for re-entry.

04:40:23 *Friendship 7, this is Cape. Recommend you...retract the scope manually.*

Roger. Retracting scope manually.

With his right hand he pumps the scope retract handle. The periscope goes out of focus; the door closes and it goes dark.

While you're doing that, we are not sure whether your landing bag has deployed. We feel that it is possible to re-enter with the retropackage on. We see no difficulty at this time in that type of re-entry.

During re-entry the heat shield, as its name implies, protects the pilot from the friction-heated air that slams against the capsule with a force of 8 g's. The shock wave not three feet from his back incandescences with a temperature nearly five times that of the sun's surface.

He makes a quick check to be certain that everything is in readiness for re-entry. The manual fuel is low.

This is Friendship 7. Going to fly-by-wire. I'm down to about 15 percent on manual.

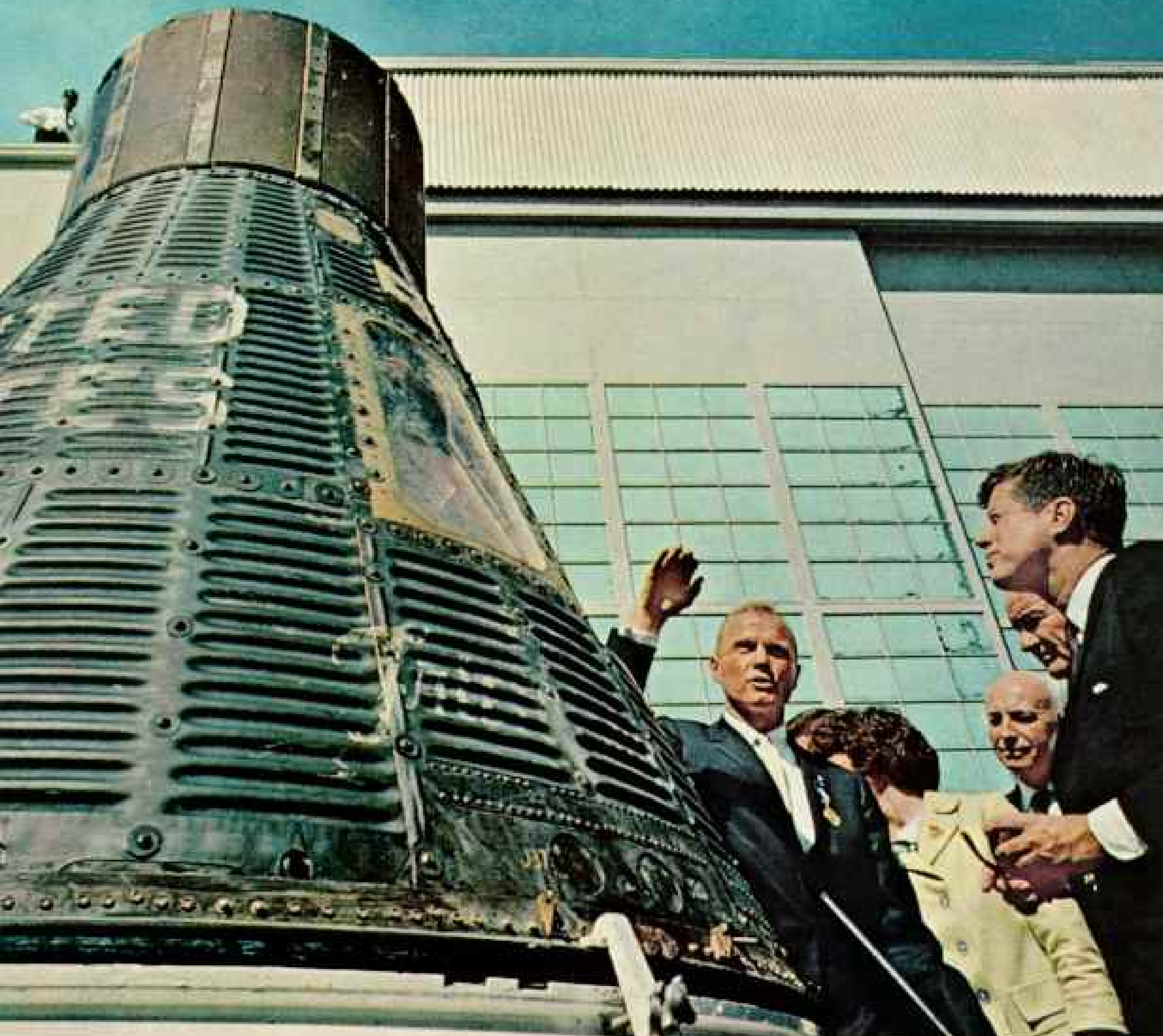
Roger. You're going to use fly-by-wire for re-entry, and we recommend that you do the best you can to keep a zero angle.

With his left hand he throws a switch that puts him on a double manual system. He is flying with the control jets that are used by the autopilot, and he has available the manual jets as well.

04:42:52 *Seven, this is Cape.... We recommend that you....*

Shepard's voice fades away as the com-





RESEARCHER BY FLIP ROHLEK © N.A.S.

"Re-entry was the most impressive part of the flight," Glenn explains to President Kennedy following award ceremonies outside Hangar S. Words "Friendship 7" and "United States" appear scorched; the flag can still be made out beneath the letters "TAT" in "United States." (Compare with pages 796-7)

Glenn's children, Dave and Lyn, inspect the capsule for the first time (left). Cobalt-nickel shingles show no distortion although they endured temperatures as high as 1,000° F.

munications blackout begins. Glenn wonders what his message was.

Manually he starts the capsule rolling. Like a rifle bullet, the capsule must revolve slowly during re-entry for maximum accuracy in hitting the landing area.

Suddenly he hears a report: one of the stainless-steel retropack straps is hanging directly in front of the window.

This is Friendship 7. I think the pack just let go. His message goes unheard.

The needles on the indicators begin to move back and forth slightly. Glenn counters with the control stick to keep the capsule from oscillating too much.

Outside the window he sees an orange glow. Its brilliance grows.

Now the orange color intensifies. Suddenly large flaming pieces of metal come rushing back past the window. What can they be? He thought the retropack was gone. For a moment he feels that the capsule itself must be burning and breaking up. Deceleration holds him, pressing him back into the seat, or he would involuntarily rise up, expecting at any moment to feel the first warmth as the heat burns through the capsule to his back. But it doesn't come.

He keeps moving the control handle, damping oscillation. He peers out through the win-



ALL ESTABLISHED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEDALES © N.G.S.

Proud Annie Glenn and her hero-husband beam at rain-drenched thousands who line Washington's Pennsylvania Avenue for the February 26 parade. Vice President Lyndon B. Johnson, Chairman of the National Aeronautics and Space Council, escorts the couple.

Glenn rode bareheaded in the 38° temperature, with water dripping down his face, but he smiled all the way from the White House to the Capitol. There he addressed a joint meeting of Congress.

bit. The astronaut fights it as best he can. But his control stick no longer seems effective. He is out of manual fuel. He switches on the automatic damping system. It helps for a while, but now the capsule is oscillating again. Is he out of automatic fuel, too?

He decides he had better deploy his drogue chute early.

As he reaches for the switch, he looks through the window—the drogue is already out. He feels the drogue jerk the capsule into alignment, and the oscillations are reduced. Now he is getting uncomfortably warm. The heating during the fireball has finally soaked through the double wall of the capsule. He begins to sweat.

04:49:46 *Standing by for main [parachute] at 10 [thousand feet].*

An amber light and the warning bell in his ear tell him that the snorkels have opened and that fresh air is being brought in from outside. He is watching the window now, waiting for the main chute.

The drogue pulls away. Out comes the long red and white streamer of the main chute.

Main chute is on green. Chute is out. In reef condition at 10,800 feet—and beautiful chute. Chute looks good . . . chute looks very good. Rate of descent has gone to about 42 feet per second. The chute looks very good!

The red and white canopy has filled. He feels its jerk. He is swinging back and forth slightly on the end of the line. He has slowed

dow from the center of a fireball. All around him glows the brilliant orange color. Behind, visible through the center of the window, is a bright yellow circle. He sees that it is the long trail of glowing ablation material from the heat shield, stretching out behind him and flowing together.

04:43:39 *This is Friendship 7. A real fireball outside.*

04:47:22 The fireball is fading. He hears the Cape calling, slightly garbled, *How are you doing?* He answers, *Oh, pretty good.*

The deceleration is dropping off, but as it drops, the capsule oscillates more, and he must work harder.

Seven, this is Cape. What's your general condition? Are you feeling pretty well?

My condition is good, but that was a real fireball, boy! I had great chunks of that retro-pack breaking off all the way through.

Now he notices that the altimeter, which records only below 100,000 feet, is beginning to wind down. He is back in the atmosphere.

Seven, this is Cape. Recovery weather is very good.

Out the window he can see contrails at 55,000 feet.

At 45,000 feet the capsule rocks quite a

down to a safe landing speed. Time to check on the recovery ships.

04:50:40 *Hello, Mercury Recovery. This is Friendship 7. Do you receive?*

Mercury Friendship 7, this is Steelhead [radio code name for destroyer Noa]. Loud and clear. . . . We are heading for you now.

It is time to make final preparations for landing. He looks back at the check list.

The recovery ship repeats a message from the Cape. *Do you have landing bag on green?*

He has just come to that item on the list. Since the automatic sequence has been overridden, he must deploy the bag manually. He reaches down and pushes the switch. He feels a bump as the landing bag is released and a green light appears on the panel.

Well, that proves that the landing bag was not loose up there in space.

Somehow the telemetry was giving the wrong signals to the stations. It no longer matters. He is only a few feet from the water.

He completes the landing check list, loosening his restraining harness so that he will be ready to get out quickly once he hits the water.

04:55:24 He braces himself. There is a sudden solid impact. The capsule sinks slightly, then pops back up and begins to rock with the waves.

He is sweating profusely.

05:01:07 *Friendship 7, this is Steelhead. We have you visually. I am closing now. Should be ready to effect recovery in approximately four minutes.*

This is Friendship 7. I'm very warm. I'm just remaining motionless here trying to keep as cool as possible. I'm extremely warm at the moment.

Friendship 7, Steelhead. My speed now is 10 [knots]. I am commencing an approach.

05:04:02 *Friendship 7, this is Steelhead. . . . My engines are all stopped. Coming alongside at this time.*

He can feel a very gentle rubbing against the side of the ship, and now he is being hoisted up. There is a pause while the water drains out of the landing bag. He is moving up slowly, rocking with the ship. Suddenly the capsule swings against the side of the ship. There is a good solid bump. He is jammed over against the side of the couch, but then he is being pulled upward again. He can feel himself being swung over onto the deck. He listens for voices but he cannot hear them.

It is hot and he is pouring sweat. It seems the best thing to do is go out the side hatch.

He calls the ship and asks them to clear the area around the door, so that when it is blown off no one will be hurt.

He gets the word that the area is clear. He turns his head away from the door, and with the back of his hand hits the firing pin. There is a loud report, and he feels a momentary pain as the firing pin handle rebounds and cuts his knuckles. Then men are reaching in to help him out.

And now he stands on the deck and feels the fresh ocean breeze and sees the blue sky.

He is back on earth. The adventure is over.

John Glenn Receives the Society's Hubbard Medal



TO ASTRONAUT John H. Glenn, Jr. . . . for extraordinary contributions to scientific knowledge of the world and beyond as a pioneer in exploring the ocean of space." reads the inscription on the Hubbard Medal, highest honor the National Geographic Society can bestow in the field of research and exploration. On behalf of the Society, the Vice President of the United States presented the award to Lieutenant Colonel Glenn on April 9, 1962, during ceremonies in Washington, D. C.

Bearing the name of Gardiner Greene Hubbard, a founder and first President of the Society, the gold medal has been given to many of the world's most distinguished scientists and explorers—from Peary and Amundsen to Byrd, Siple, and Fuchs.



Pick-and-shovel students probe a bog near Bawlings for remains of a five-ton mammoth.

Wyoming Muck Tells of Battle:

*Geographic dig
unearths
a tusked giant of
11,000 years ago*

THE MAMMOTH WAS TRAPPED in the black mud of the bog. On the bank, hunters watched as the struggling animal sank deeper. When they saw that the beast was hopelessly bogged down, they stoned it with boulders (painting, page 833).

They could not crush the massive skull, but finally, after continual pounding, the mammoth weakened. Then a brave hunter perhaps finished the battle with a well-placed spear. The men swarmed over the giant carcass with sharp knives of stone, hacking off chunks of still-warm meat. They fought against the sucking mud that eventu-



KODACHROME BY DAVID S. BOYER, NATIONAL GEOGRAPHIC STAFF © N. G. S.

Cutting and chopping tools of stone found on the site show that early men butchered the beast

Ice Age Man vs. Mammoth

ally engulfed the hulk, leaving only the black ooze—and silence.

The silence lasted 11,000 years—until August, 1960. Ivan Hayes, operating a dragline near Rawlins, Wyoming, for a gas-well drilling crew, was clearing a spring to hasten the flow of water. Suddenly his scoop struck a snag, and he stopped to investigate. He found large bones of a kind he had never seen before. Sensing their importance, he phoned Dr. George Agogino, Professor of Anthropology at the University of Wyoming in Laramie, 150 miles from the site.

Accompanied by his friend Richard Lane, a student, Dr. Agogino

*By Cynthia Irwin
Henry Irwin
George Agogino*

Joint Leaders, Wyoming
Mammoth Excavation



Nearly intact, the skull of *Mammuthus columbi* emerges from a muddy grave. Prompt action by the National Geographic Society, in cooperation with Dr. George Agogino of the University of Wyoming, saved the relic. Harvard's Peabody Museum and the University of Wyoming supervised the unearthing of one of the best-preserved mammoth skeletons ever found in the United States.

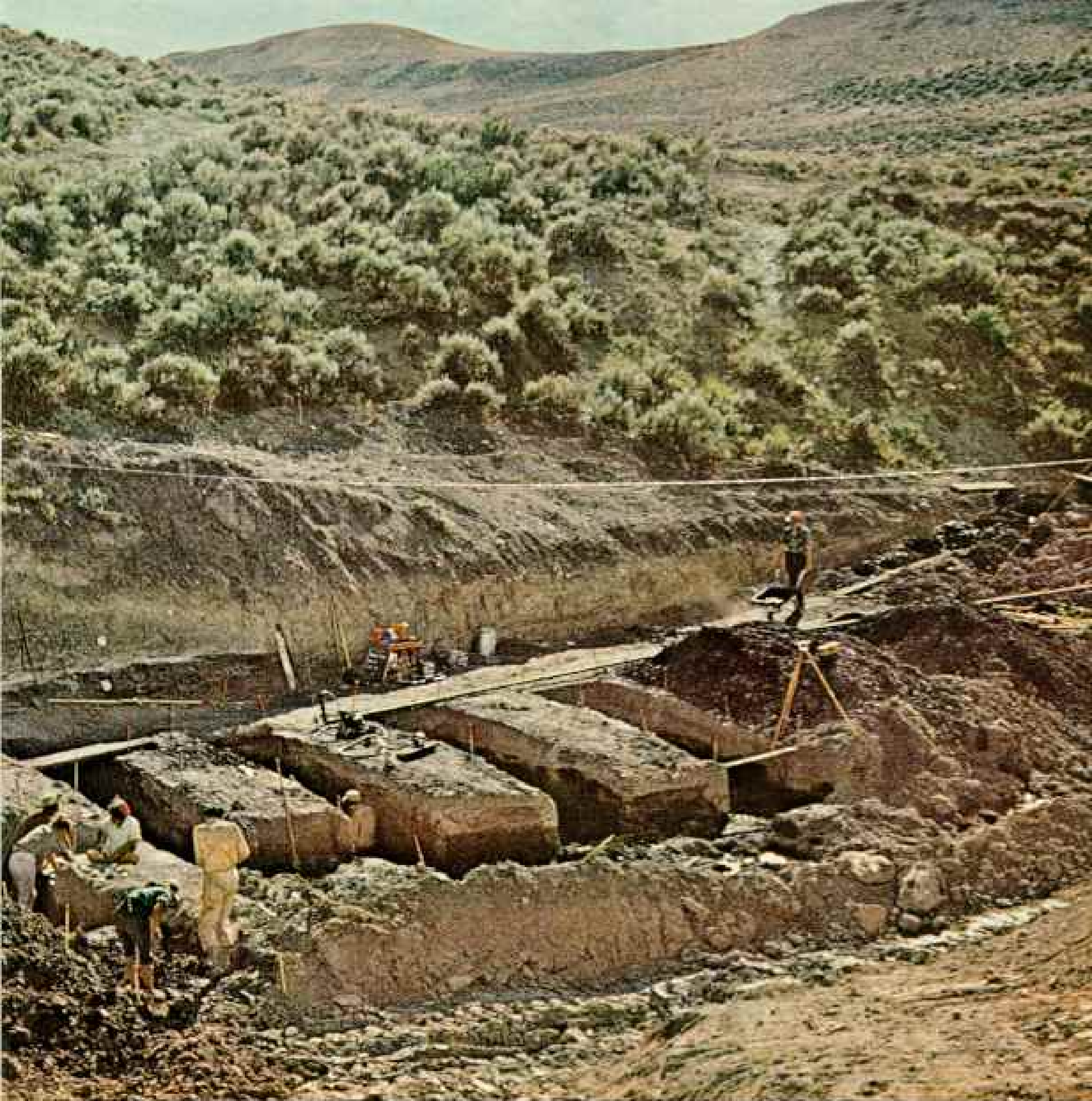
College Crews Trench an Arroyo in Search of Ice Age Relics

Students prospected to depths of 30 feet for bones and tools left by hunters who feasted on the monster. Exposed springs constantly flooded the dig; balky pumps barely kept water in bounds. Sagebrush surrounds the site.



Western highlands, where hunters once stalked prehistoric elephants, now lure skiers with snowy slopes. The U.P. Mammoth Kill Site takes its name from the Union Pacific Railroad, on whose property the Ice Age remains were found.

The last mammoth vanished from North America some 8,000 years ago. In Siberia, however, a smaller strain may have survived for another 3,000 years.



KZBZ/CHRONIC (IMAGE) AND HIS EXTERIOR/CHRONIC BY GUYTON HARRISON © NATIONAL GEOGRAPHIC SOCIETY

reached Rawlins that evening. One glance told him the bones belonged to a mammoth, an Ice Age elephant that became extinct about 8,000 years ago. When the bones were identified, the beast proved to be *Mammuthus columbi*, which in life reached the size of the present-day Indian elephant.

Stone Knife Betrays Man's Presence

The Delta Drilling Company, clearing the spring, agreed to postpone operations 48 hours. That night Dr. Agogino sent out an appeal for help. By morning he had a pickup crew from a United States Geological Survey team, high school pupils from Rawlins, geology students and even janitors from the University of Wyoming, in addition to Richard Lane. The hunt was on.

Beginning with the original bones, the excavators began unearthing and piecing together other parts of the skeleton. In mid-afternoon a shout from a geologist brought crew members on the run. It was the mammoth's skull, a real prize.

The next day evidence appeared of a new creature—man! Dr. Brainerd Mears, Jr., a University of Wyoming geologist, felt his shovel strike something hard, and he bent to investigate. It proved to be a large, worn stone knife—a man-made tool in direct association with the mammoth remains.

At once the picture changed. Mammoth remains alone were well worth excavation and study. But seldom in history—perhaps less than a dozen times—had scientists excavated evidence of man and mammoth together in

North America. With trembling hands, Dr. Agogino examined the priceless discovery.

Time was running out; more money and a trained crew were desperately needed.

Dr. Agogino moved fast. First he begged the gas company men for more time. They generously agreed. Next, he obtained permission to dig from the Union Pacific Railroad, owner of the site. Then he called the National Geographic Society in Washington with an urgent request for financial support. The Society's Committee for Research and Exploration quickly provided a small emergency fund; after further investigation, it voted a larger sum and promised full cooperation.

It was at this point that my brother Henry and I entered the picture. We had met George Agogino the previous year on a project in Wyoming. At the time the mammoth was discovered, we were excavating an early man site in eastern Wyoming for Harvard University's Peabody Museum of Archaeology and Ethnology in Cambridge, Massachusetts.

George put in an urgent call. Would we come and bring our trained crew with us? Henry and I needed no persuasion. With permission of Dr. J. O. Brew, Director of the Peabody Museum, we joined George that night.

It was hardly a luxury expedition. The food consisted largely of peanut butter, canned meat, and tomato paste. Rain fell constantly and some mornings the sleeping bags were coated with ice—even though this was August!

Ten exhausting days followed, but they were worth it. Little more of the mammoth skeleton came to light, but evidence of man's encounter with the great beast continued to pile up. We unearthed a chopper, a scraper,

a few flakes chipped from some stone utensil, and quartzite rocks the size of bowling balls—all intriguing clues to the people who had frequented that prehistoric spring.

September came, and reluctantly George, Henry, and I disbanded our crew. We knew, however, that our mammoth dig had only begun to yield its secrets. We would have to come back. Peabody Museum and the University of Wyoming agreed to direct the work jointly, and the National Geographic Society offered continued support. We began making next season's plans even as we broke camp.

Too Much Water, But None to Drink

It was a far better equipped and organized crew that assembled the following June at the U. P. Mammoth Kill Site, as our dig is called. We had two shifts of diggers, mostly archeology students bent on gaining practical experience. Our most precious pieces of equipment were two large tanks for hauling water from a ranch nine miles away. For, although we had a surplus of water in the dig area itself, we could not drink it because it was contaminated.

Once we began digging, we cut our trenches at right angles to the stream that ran from the spring and that had created the prehistoric bog (page 831). We knew at the outset that the most important work of the season would be to determine in which layers of mud the mammoth had lain. By identifying these layers in areas adjoining the skeleton—a task carried out for us by Colorado geologist Vance Haynes—we hoped to find additional bones and perhaps even the tools used to butcher the beast.

I should pause here to explain two things.

Five-inch knife, harder than steel, retains its keen edge after centuries of burial. Excavators applied the flinty blade to a camp-cooked roast six inches thick and cleaved it in two strokes.



Stones and Spears Subdue a Shaggy Giant

Mired in muck, the Ice Age elephant struggles to disarm an attacker. Hunters finally slaughtered it and stripped away edible portions as the quagmire swallowed the carcass. Retiring to higher ground, they gorged themselves on meat and marrow.

NATIONAL GEOGRAPHIC artist Peter V. Bianchi reconstructs the mammoth's final moments, as suggested by the expedition's findings.



First, readers may wonder how we can be so confident of the date for our mammoth and its primitive executioners. The answer, of course, lies in the carbon-14 dating process, which established the age of the mammoth's tusks at 11,280 years, give or take about 350 years.*

Second, when I speak of bones, I do not mean fossils. Our mammoth's skeleton was unaltered bone, beautifully preserved by the bog, which had kept out both air and bacteria and thus prevented decay.

One morning, almost seven feet upstream from where the main mammoth skeleton had lain, we found a new clue: the animal's axis vertebra, that is, the neck bone that lies second back from the base of the skull. Had our primitive hunters severed this section of the neck for their feast? Clearly it had not been shifted by water, for the bone lay upstream from the skeleton.

We had hardly begun cleaning off the newly discovered vertebra when an even more exciting find turned up beside it. This was a large knife, a piece of handsome flinty ma-

*For the story of radiocarbon dating, see "How Old Is It?" by Lyman J. Briggs and Kenneth E. Weaver, NATIONAL GEOGRAPHIC, August, 1958.

terial well flaked and in perfect condition. Here, we felt sure, was the very knife used to cut through the neck. Some students doubted that the knife could have cut meat, so George and Henry decided to teach them respect for our Ice Age toolmakers.

That night they used it to slice a roast. To the students' amazement, the flaked, sawlike edge made short work of meat and gristle.

Hunting Party Camped by the Bog

In the ensuing days came times of high excitement. Everywhere we were getting down to the early level of the bog. In one section of the pit we discovered what turned out to be the most significant find in the site—a pile of split and broken bones, almost all of them mammoth.

Here, about 9,300 B.C., our hunters had unquestionably camped. Among the remains, we found battered stones clearly used to crush the bones to extract marrow for food (opposite). In this heap, and scattered in a line in a gravel shelf along the ancient streambed, we began to discover tools and bits of bone in surprising quantity.

One was a beautiful little borer, or graver, made of a long flake of stone. The point had

Inky mud bath engulfs students struggling to clear a clogged pipeline. Where the site lay below water level, pumps labored around the clock to dry pits for daytime spade-work. Fearing unattended motors might fail, all hands shared cold night watches.





REPRODUCED BY DAVID E. DOZER (ARTIST) AND GEORGE F. WOBLEY © NATIONAL GEOGRAPHIC SOCIETY

Treating a rib, a field worker glazes its surface to prevent flaking. Other bones, crushed by the hunters for their marrow, protrude from a pedestal of soil. Medieval Europeans who recovered such relics believed they belonged to a lost race of giants.

been carefully worked. Did our hunters use this little implement to manufacture clothing, or was it used to incise crude scratchings on bone? Equally fascinating were two polished stones that appeared to have been used for smoothing hides. Then there were a number of bone tools, apparently scrapers.

Night Pump Watch Saves the Dig

August rains raised the water table so high that the flow from the springs became a menace. Only 24-hour-a-day pumping prevented the banks of our trenches from collapsing. The pumps could not be left running unattended, for if they clogged and began sucking air, they would burn out. Thus began our "night pump watch," an unpopular duty involving frequent cold foot baths.

More smashed mammoth bones turned up every day, and our collection of ancient tools grew. The pit yielded flakes of quartzite and chert chipped into hide scrapers, perforators, and cutting edges. One day we discovered a splinter of bone ground and polished to a point—an awl for working leather.

This was followed by a highly significant find—the incisor tooth of an Ice Age horse! The association of man with either the horse or the mammoth is exceedingly rare. Our

whole camp rang with celebration that night.

Finally the summer drew to a close, and we made preparations to leave. We turned off the pumps for the last time and watched the inexorable rise of the water which would soon cover everything.

We drove up a slight rise, took one last look at the mammoth pit glowing in the rays of the setting sun, and rattled down the other side. The dig was over.

What had we accomplished?

First, of course, we had the mammoth skeleton. Three-fourths of it we shipped to the University of Wyoming for display and further study (next page). Bones showing evidence of humans—the marks of scrapers and knives—went to Harvard's Peabody Museum.

We had the stone tools made and used by our Ice Age hunters, and geological data to tell us something of the time and circumstances they had lived in. Bog conditions had preserved bits of leaves and pollen from plants that were alive at the same time as the mammoth, and these allowed us to reconstruct its environment.

Scientists, of course, already know a great deal about North America 11,000 years ago, when thick ice masses covered the northern part of the continent and vast fresh-water

Chipped stone tool, a chopper, may have split bones for the banquet. Failure to find any projectile points, by which scientists classify early man, prevented identification of the hunters.



lakes filled present-day deserts in Utah, Nevada, and California. The land abounded in game: giant bison, lumbering mammoths, sturdy horses, camels, clumsy ground sloths—as well as many of today's species.

Our mammoth itself was a huge beast with a rough coat of shaggy, reddish-brown hair. It was 17 or 18 years old, stood 11 feet at the shoulder, and weighed about five tons!

Our knowledge of the men is less complete. Their forebears had migrated from Asia, no one knows exactly when. They existed in pitifully small numbers, and probably resembled American Indians of historic times. Possibly they were a little more rugged. Their society may have focused on a tiny band of a dozen or a score—several families bound together by ties of blood kinship. Life was uncertain, especially as to food. With only stone, bone, and wooden tools, our early men limited their hunting to ambushes, drives, or careful, patient stalking.*

To them, the mammoth was a windfall, a veritable mountain of meat. It meant the difference between mere survival and plenty for weeks, perhaps even months.

Clues to an Ancient Drama

Although we can never reconstruct the mammoth hunt precisely, the evidence points to an ambush, followed by a drive of the panic-stricken animal into the muck. Despite the presence of stone knives, we found no stone spear points in the bog. It is possible that our hunters had only fire-hardened wood points, effective only at close range on a weakened beast trapped in the mud.

The mammoth's skull shows two crushed areas and three vertebral spines show fractures, according to Dr. Paul O. McGrew, University of Wyoming staff paleontologist. Only boulders could have done this, and certainly they were at hand. The severed neck joint and the knives and stone hammers—all found near the main skeleton—attest to the feast.

A chance encounter between a dragline operator's scoop and a mammoth's ribs, relics of Ice Age America, thus has led to important discoveries about our continent and its prehistoric inhabitants.

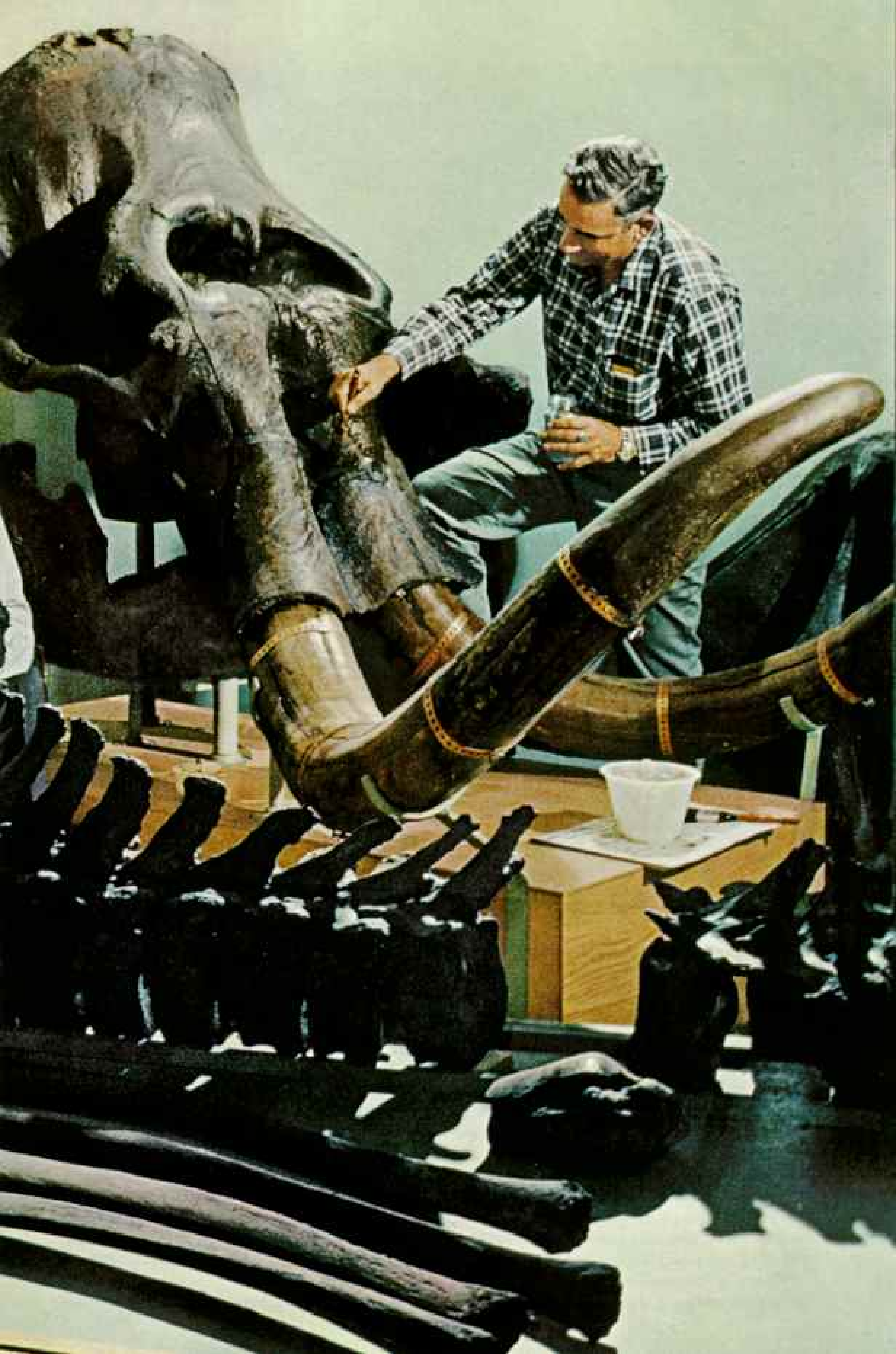
The fascinating tale of our mammoth discovery would never have unfolded without the cooperation and generous support of the University of Wyoming and the National Geographic Society, and also the work of our many students, whose names only lack of space prevents us from listing. It is by such vision and hard work, with an occasional touch of luck thrown in, that archeologists slowly unlock the secrets of our past.

THE END

*See "Ice Age Man, the First American," by Thomas R. Henry, NATIONAL GEOGRAPHIC, December, 1955.

Huge handlebar tusks distinguish the Columbian mammoth. Kin to the present-day Indian elephant, this specimen towered 11 feet at the shoulder. Fractured skull and broken vertebral spines indicate that hunters attacked it with boulders. Dr. Paul O. McGrew (left) and Dr. George Agogino prepare the skeleton for exhibition at the University of Wyoming in Laramie.







PHOTOGRAPH BY JOHN W. TAYLOR, CA

Guarding four offspring, a stork surveys the rooftops of Ketsch, Germany,

UP THE DIMLY LIT STAIRS of the old church tower we climbed, Wolfgang and I, crunching under our feet the dust and debris of time and the tiny bones of a thousand dead mice. Ahead of us, something moved. Perched on a rafter was the mousetrap: a white-faced barn owl.

From the loft, a rickety wooden ladder led up to a hole in the floor of the belfry. The narrow opening was just wide enough to admit my shoulders, but once through it, I could see why Wolfgang had led me here.

"There is the best nest for photographs," he said, removing a slat from the belfry wall.

I peered down onto the roof, where two sedate adult storks stood guard over a big nest on the nave, 40 feet away. They were unaware of our presence—until I blundered.

In my excitement I snagged a wire leading to the clapper of one of the huge church bells. The bell clanged deafeningly, inches from my ear, and its reverberations shook the tower. I looked out, expecting to see the storks in frightened flight. But they moved not a feather.

"It takes more than bells to scare storks," Wolfgang laughed. "They have nested on churches for centuries."

If a poll were taken throughout continen-



AND ROGER TORY PETERSON © NATIONAL GEOGRAPHIC SOCIETY

and a serene oxbow of the Rhine River

tal Europe to determine the most popular bird, the white stork (*Ciconia ciconia*) would win by a wide margin. This long-legged bird, with its snowy plumage, black wing feathers, red bill, and red legs, holds a special place as the legendary bringer of babies from heaven and as a harbinger of good luck.

Man's "Wirescapes" Imperil Storks

As man became fond of the stork, the stork grew accustomed to man and adjusted to civilization. He lives on man's rooftops and, to some extent, depends on man for food.

Yet the hard truth is that modern civili-

White Storks, Vanishing Sentinels of the Rooftops

*A FAVORITE EUROPEAN
BIRD DWINDLES BEFORE
CIVILIZATION'S MARCH*

BY ROGER TORY PETERSON

Photographs by the author

A parent brings fresh leaves to the nest



zation—too much crowding and progress—is killing off the storks at an alarming rate. Drained marshes reduce their food supply. The roofs of new buildings make inhospitable nesting sites. And today's "wirescapes"—television antennas, telephone lines, high-tension wires—present flying hazards unknown a few years ago.

Fortunately, storks are not game birds and are considered inedible, but during the long migration flights over Europe, some are lost to trophy-seeking hunters. Ornithologists also suspect, though they have no positive evidence, that storks die of insecticide poisoning in Africa, where they winter.

In little Rhine Valley villages off the beaten path, however, the traveler can still see the great nests and their statuesque owners standing guard. Some of the old nests are six feet or more in diameter.

During the past decade I have observed at least 100 white stork nests. I have climbed rickety staircases of ancient churches and groped my way into cobwebby belfries. I have visited Danish dairy towns, Dutch villages where special 40-foot-high stork poles are sometimes erected, Spanish groves of cork oaks where the birds often breed in loose colonies, and even a remote Japanese valley where a tragic remnant of a stork population

Banding a youngster atop a church near Freiburg, Germany, Wolfgang Schnetter helps track the dwindling population of white storks (*Ciconia ciconia*). To reach the nest, he removed the shingles. Later he carefully replaced them. By banding young storks, ornithologists can follow their migration between Europe and Africa.

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ILLUSTRATION BY RIGGS JOHN PETERSON © NATIONAL GEOGRAPHIC SOCIETY



lays infertile eggs. But I know best the upper Rhine Valley nesting grounds.

My odyssey began in southern Germany one spring morning near where the Bodensee—the Lake of Constance—pours into the Rhine River. I drove from the town of Radolfzell to nearby Castle Möggingen, whose medieval towers look out over the silver waters of the lake toward the Swiss Alps.

Moated Castle Houses Bird Research

This Graustarkian castle is now an ornithological station conducting the major stork research in western Europe. Crossing the drawbridge, I met Dr. Rudolf Kuhk, a leading German authority on storks.

Dr. Kuhk showed me a map of the upper Rhine plotting all the area's known stork nests—about 440 of them, on both the French and the German sides of the river.

"Solid red dots indicate nests in use, open red circles are former sites," he said.

I counted only about 200 solid dots. "Have more than half the traditional nesting sites been abandoned?" I asked.

Dr. Kuhk nodded. "At the present rate of decline," he predicted, "there won't be any storks in the Rhine Valley by 1980; we count the birds through censuses and ringing—banding, as you Americans call it."

Throughout Europe, tens of thousands of white storks have been banded—some of them with color-coded rings, so ornithologists can track specific birds. A record is forwarded to Dr. Kuhk or other officials; anyone who later observes the banded bird does the same.

On the German side of the Rhine, the champion stork bander is my young friend Wolfgang Schnetter, whose father directs the natural history museum at Freiburg. By June, Wolfgang had ringed more than 50 young storks. He still had many nests to visit.

The birds usually return from South Africa during early March. After the long winter,

The Author: Roger Tory Peterson's field guides to the birds have been a boon to bird watchers everywhere. His *Field Guide to the Birds of Britain and Europe* appears in several languages.

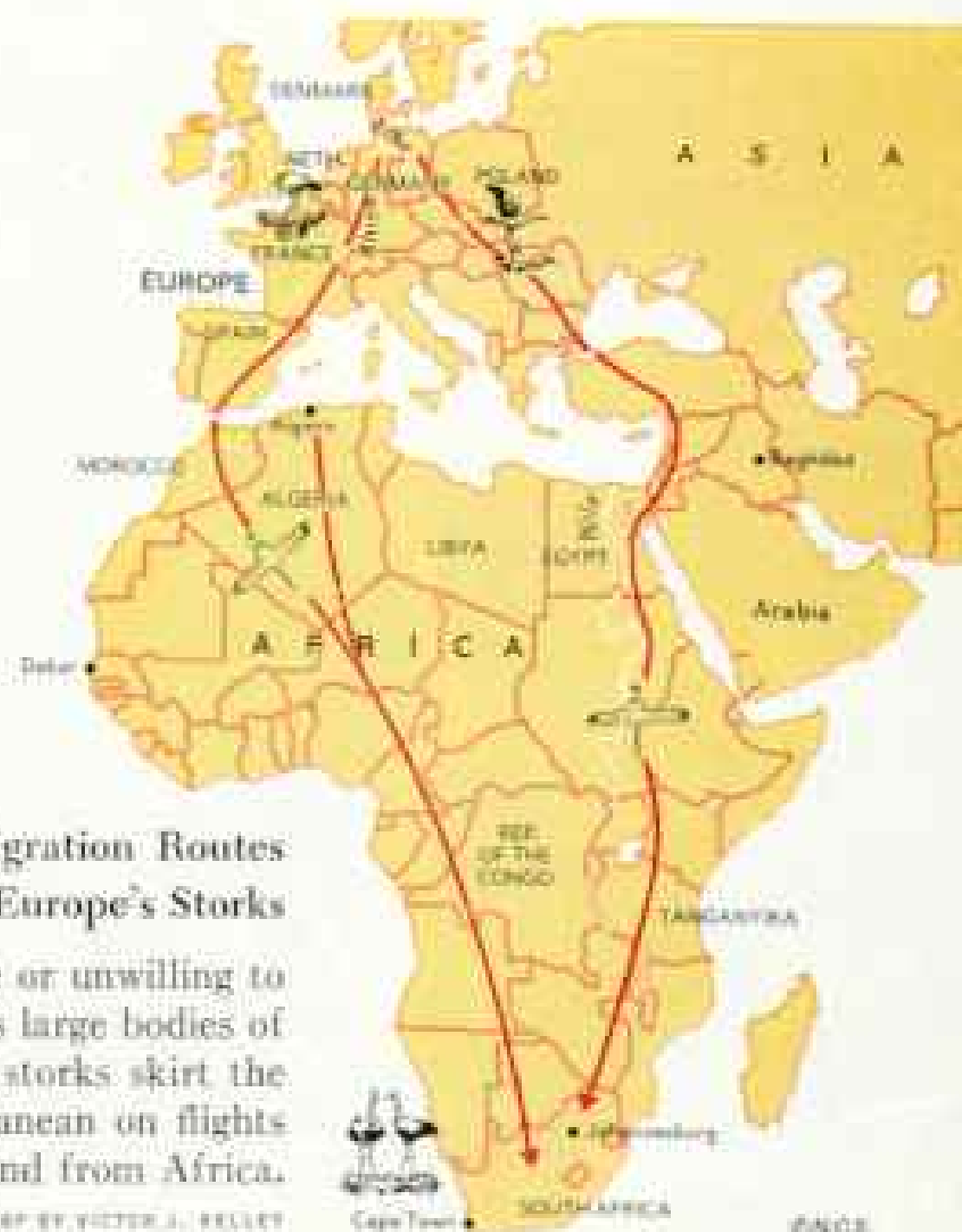
In *NATIONAL GEOGRAPHIC*, the noted American ornithologist has brought to members his observations of Spain's bird life (March, 1958) and recorded the spread of the Old World's cattle egret to the United States (August, 1954).

Recently, he told a little joke on himself. Finding that his eyes became tired after too much reading, writing, and bird painting, he consulted a doctor. The oculist prescribed glasses and a change from close work. "Have you ever," he inquired, "considered taking up bird-watching?"



FORERUNNER BY SOLEHAB WERTZEL, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Soloing from a twiggy flight deck, a fledgling at Rust, Austria, prepares for the long journey to its wintering grounds. Others on the chimney nest await their turns.



Migration Routes of Europe's Storks

Unable or unwilling to cross large bodies of water, storks skirt the Mediterranean on flights to and from Africa.

MAP BY VICTOR J. KELLEY

everyone welcomes their arrival. If no pair nests in a village by May, the townsfolk deplore their luck.

In most villages, platforms or shallow baskets are erected to lure prospecting birds. But usually a stork's nest will crown the highest pinnacle, especially church clock towers.

Banding Storks Atop Lofty Belfries

To reach one such nest, Wolfgang received a priest's permission to remove several slate shingles from the roof. He crawled through the hole and pulled himself up to the ridgepole. I watched as he edged along the crest of the steep roof to the bulky clump of sticks where three young storks nested (page 840).

Immediately the adult stork flew away

and watched from afar. The young birds, about a month old but already half grown, submitted tamely as Wolfgang banded their legs with bright aluminum bracelets. Then Wolfgang retraced his steps and replaced the shingles. The whole job took 15 minutes.

Later, in the charming town of Umkirch, where I accidentally tripped the bell wire, I told Wolfgang that I wished to observe and photograph the nest. It was a large, round mass of sticks and twigs, lined with grass, leaves, straw, and scraps of paper.

The parent storks looked quite alike, the male being slightly larger. The four youngsters already had adults' plumage, but their bills were black, not red.

All day I watched as the old birds alternat-





PHOTOGRAPHS BY BOBBER TONY PETERSON © NATIONAL GEOGRAPHIC SOCIETY



Minding their manners, birds greet each other politely with bows, head twists, pirouettes, and clacks. Ceremonies last two or three minutes and occur every time a mate returns to the nest. Storks are mute except for an occasional hiss; the bill's castanetlike clatter, emitted after the head is thrown back or thrust forward, substitutes for a voice. This pair summers in Umkirch, Germany. Storks stand more than half as high as a man.

ed their activities. One always guarded the nest while the other foraged widely over the countryside. The changing of the guard was a spectacular ritual.

"*Achtung!*" Wolfgang whispered when an absent parent reappeared, "Watch this!"

When the on-guard bird spotted its returning mate, it practiced an important rule of stork etiquette. Flinging its head backward until the crown touched its back, the bird rattled its big red bill noisily. Then, throwing its head forward with a stiff, formal bow, it rattled some more.

The returning adult also began to clatter. The duet built to a climax. Bowing and head throwing were accompanied by tail cocking and pirouetting with half-open wings (above and left).

This rigid greeting ceremony is a sort of mutual courtesy that probably strengthens the bond between the pairs. However, storks, unlike geese, do not mate for life. Banding shows that while the birds may return to a nesting site, they usually change partners annually.

The young birds squatted motionless, their bills all pointed to the center. The fuss died down after two or three minutes, and the bird that had guarded the nest left. The youngsters then poked at their remaining parent's bill, entreating the adult to regurgitate the food in its crop.

With an oddly stiffened neck and an almost agonized look, the parent bent lower and lower, until its daggerlike bill pointed to the excited youngsters (opposite). Then out came

the meal—a collection of frogs, mice, and small snakes—which the young storks eagerly gobbled up. Never have I seen this procedure vary.

After feeding the young, the parent on duty walks around the nest on an inspection tour, tidying up a bit and adjusting a stick here and there. While waiting for the absent parent, about an hour for the morning shift but often two hours or more during the hot, sunny afternoon, the adult bird preens and

preens endlessly. Occasionally an eager youngster grabs at the parent's bill, hoping to find another morsel of food.

About noon that day, I observed that the bill rattling also serves as a challenge to strange storks. When a group of birds—perhaps unmated storks from nearby fields—soared overhead, the Umkirch pair kept up their machine-gunlike clatter for minutes.

As they grow, young storks exercise more and more, flapping their wings and jumping on the nest platform (page 841). At eight or nine weeks they learn to fly and finally leave home to forage for themselves. Soon the flocks assemble for the long flight back to southern Africa.

Across the Rhine, the champion stork bander of Alsace is Alfred Schierer, a young man who lives in Strasbourg. Judging from old engravings, Strasbourg roofs had plenty of

Row-house dwellers, storks occupy successive chimneys on a street in Rust. Flying to Europe in early spring, the birds often return to the same vicinity, sometimes to the same nest, but usually not with the same mate.

PHOTOGRAPH BY VOLKANAR BERTZEL, NATIONAL GEOGRAPHIC STAFF © N.A.S.





PHOTOGRAPH BY ROGER TONY PETERSEN © NATIONAL GEOGRAPHIC SOCIETY

Dinner coming down! Pecking at its parent's bill, a nestling stimulates it to regurgitate a meal of snakes, mice, and frogs. The stork's neck stretches and stiffens for the serving process. Its mate will bring home the next snack. A German farmer mowing hay once counted 36 frogs snatched by a stork and stored in its crop. Draining of marshlands where storks hunt food limits the numbers of youngsters that survive.

storks a century ago. But I saw none when I traveled there recently to meet Schierer.

"Strasbourg is now a modern city," Schierer explained. "The largest in Alsace."

"And storks just don't mix with modern cities," I suggested.

Schierer nodded. "But I'll show you plenty of nests tomorrow," he promised, "in the rural towns, away from the bustling city."

That next day in mid-May was one of the most idyllic in all my four decades of bird-watching. Leaving the busy Strasbourg traffic, we headed toward the misty Vosges, that loose mountain chain separating the lowlands of Alsace from the rest of France. The picturesque roads wound through a rural landscape unmarred by billboards, wirescapes, or other appurtenances of modern life.

Storybook Alsatian Villages Welcome Storks

Above the bright fields of sprouting grain, skylarks poured forth their incredible bursts. In the orchards serins and goldfinches lilted and tilted among the snowdrifts of white blossoms. Round, dulcet notes of golden orioles floated in the clear air.

One storybook village followed another:

Hohwiller, Hermerswiller, Hoffen, Hunsbach. The architecture was repeated, dark timbers making a bold pattern against white walls. Small shops were decorated with the medieval insignia of their trade—the sign of the crown, the wagon, the key.

In the village of Lampertheim, Schierer spied a stork's nest, a huge pile of sticks, high up in a tree.

"Every year I start my stork-banding operations here," he said. "These young birds get their rings in another two weeks. Then the local firemen help me."

In some villages, Schierer explained, the fire department insists on a fee for putting up its ladders. But not in Lampertheim.

At Hochfelden we saw only scattered sticks and the remains of two or three eggs in the roof gutter of a house where storks had always nested. A prospecting pair of birds had challenged the established storks and apparently ousted them. Such territorial struggles are frequent, and occasionally a bird may be killed in the fight.

In a single nest at Dettwiller we found six young. Schierer commented that one or two were doomed. The usual brood is four, al-



though the birds often lay five eggs; occasionally six have been observed in a nest.

Practically every nest had at least one pair of house sparrows living in its crevices. Ten or more species of birds are known to sublet stork nests in this way. I once watched a pair of jackdaws that had set up housekeeping in such a downstairs apartment. When the storks' nursery was momentarily unguarded, the ungrateful tenants promptly slipped up and stole an egg from the unsuspecting birds.

Townfolk Provide Food and Housing

From town to town and nest to nest we traveled. These foothill villages have changed little during the past three or four centuries. Only the rebuilt villages along the Rhine that had felt the full fury of World War II had that inevitable mass-production look; unfortunately these modern communities have lost their storks.

However, Alfred Schierer seemed more optimistic than Dr. Kuhk about the future of the Rhine Valley storks. In 1951 there were only 113 occupied nests in Alsace, he told me. But by 1960 they had increased to about 145. The aroused public was working to keep the trend moving upward.

I had heard of Ribeauvillé, a town which once boasted a dozen pairs of storks. During the early 1950's only three or four nested there, until the citizens formed an emergency stork committee for the area.

They erected nesting platforms in places free of wires. They wove seven new nests and renovated 30 old ones nearby. The following season, 19 nests were occupied in the area.

This municipal housing project for storks

also provided two food reservoirs stocked with frogs, frog eggs, tadpoles, and some species of fish, such as carp. "We want our storks contented," commented a townsman.

Schierer told me about an even more ambitious project in 1957, when 100 young storks were flown from Algeria to Alsace villages. Placed in existing nests or man-made ones, the birds were hand-fed until they were old enough to fend for themselves. It was hoped they would return after mating, in four or five years, but thus far none has done so.

Importing Algerian storks reminded me of a similar prewar British project. Devoted bird lovers, the British deplore their country's lack of storks to grace the rural landscape. So they flew 23 young storks from the bird-ringing station at Rossitten in East Prussia, now Rybachiy in the U.S.S.R., to Croydon on June 25, 1936. Four were sent to Scotland; the others were put in artificial nests and raised on mackerel and rabbits. They grew quickly on this unstorklike fare, and within a few weeks were undertaking trial flights across the countryside.

English Channel Bars Migration

In late August or early September the birds' inner time clock urged them to start for Africa. They appeared at Folkestone and other places on the south coast of England. Some reached the Isle of Wight. But none, apparently, was willing to risk the English Channel crossing—20 miles wide at its narrowest. Several were found dead, and some were shot by trophy hunters. The experiment failed.

England, it seems, must remain without storks. The birds cannot survive the English

Showing no fear of man, two fledglings await the rake of stork bander Stephan Aumueller in Rust. The birds live atop an inn known as Zum Storchen (To the Storks), whose owner built the false chimney to entice them. Old Germanic tribes regarded the bird as sacred.

Aluminum bracelet rings the leg of an unprotesting youngster. In a recent season Mr. Aumueller banded some 60 birds in Rust. In odd years, he puts a ring on the left leg; in even years, on the right.



PHOTOGRAPHER BY VOLKMAR WESTERL, NATIONAL GEOGRAPHIC STAFF © N. G. S.



PHOTOGRAPHS BY J. BAYLER ROBERTS, NATIONAL GEOGRAPHIC STAFF © N.G.S.G.

Spring in Baghdad, Iraq, finds storks settling down after their trek from Africa or the southern tip of Arabia. Nesting atop a dome, this pair drives off an intruder.

winter, nor will they attempt the risky flight across the English Channel and the southward migration to Africa.

During migration, storks conserve their energy by soaring. Ascending spirally on thermals (rising columns of warm air), they gain altitude, then glide to the next thermal. Over the sea, proper thermals are lacking and they must resort to flapping during the flight. This is exhausting—and many times fatal—should

the birds encounter storms or adverse wind conditions.

Banding reveals that storks take two routes to their South African winter home. Birds of the Netherlands, the Rhine Valley, and Spain fly over the Strait of Gibraltar. After spiraling to an immense height on the Spanish side, they glide the scant ten miles across open water to North Africa (map, page 841).

But Europe's storks east of the Elbe River

take a southeasterly route. They cross the Dardanelles and the Bosphorus, traverse the Mediterranean's eastern shore, pass over Turkey, Syria, Lebanon, and Israel, and on into Egypt. Flock joins flock, until a single flight may number thousands.

The storks follow the Nile southward, over the land of the Pharaohs and through the Great Rift Valley of Kenya and Tanganyika to the fields of the Boer farmers in South Africa. For Danish storks, the trip is more than 8,000 miles to southern Africa, but they then enjoy two summers each year. They know scarcely a hint of winter.

Some of these birds do not fly north again, however. I have seen storks on the plains of Kenya in June, when they should have been raising families in Europe, and stray pairs have been known to nest in Orange Free State and the Rhodesias.

Perhaps these half-domesticated birds will colonize parts of southern Africa alongside man if he will nurture them as the Europeans do. In Africa, storks follow grazing cattle and snatch up grasshoppers disturbed by the cows. They also stalk frogs there, just as they do in Germany.

If European life becomes more hazardous for storks, why shouldn't some take up permanent residence in rural Africa?

Hail, Drought, and Poison Menace Birds

But the relentless march of civilization is not the birds' only hazard. Long migration also takes its toll. In 1931 a violent hailstorm hit a large flock in South Africa, killing at least 172 storks.

Severe droughts cause even greater disaster. Thousands of storks perished in 1912 while crossing the western Sahara during oppressively hot August weather. At one oasis natives killed more than 500 downed storks, half dead from thirst. They believed that the birds were gifts from heaven to compensate for the loss of their date crop!

This desert catastrophe coincided with a sudden drop in western Europe's stork population. Could the recent decline be traced to such migratory disasters?

Another theory is that migrating storks eat spray-poisoned African locusts. But this

Like a muezzin calling the faithful to prayer, a stork walks the rail of a minaret on Baghdad's Maradiya Mosque. Moslems, too, consider the bird a good omen.



is only an educated guess; Dr. Kuhk says that it is unproven. He wishes to autopsy a few storks that have died in Africa.

Some traveling storks are shot before they leave Europe, but this seldom happens in regions where they nest, for popular sentiment protects them there. Other birds are killed in Africa; one stork flew to Europe carrying a three-foot spear in its body.

Shiny Bands Tempt Tribesmen

A Dutch conservationist has proposed stopping all stork banding. The shiny aluminum bands, he argues, tempt African tribesmen, who use them as earrings. Also, misguided European hunters regard the bands as prize trophies. But other conservationists contend that the massive banding program is necessary to determine stork habits; where and when a given stork was hatched, where it traveled, how long it lived. Effective protection, they agree, must be based on such knowledge.

To further that knowledge, thousands of volunteers participated in an international white stork census in 1958, covering 17 countries, two-thirds of the European range of the species. Early returns indicated an estimated 94,000 pairs on the Continent. Each pair successfully raised an average of 2.4 nestlings. Thus, more than 400,000 birds assembled for the migratory exodus to Africa.

This may seem like a multitude of storks, but conservationists were shocked.

The Netherlands, where storks were once as symbolic as tulips and windmills, had only 56 nests. Denmark, which boasted 4,000 nests in the 1890's, counted just 186 in 1958. Germany, with 4,558 pairs, reported a 50 per cent decline since 1934.

The greatest stork densities are in eastern Europe: Greece, Hungary, Lithuania, Latvia, and Poland. Yet Poland experienced a 30 per cent decrease.

Spain reported a 50 per cent reduction in ten years; but it still had 13,400 pairs.

Fortunately, the estimated 30,000 pairs in North Africa show no decrease. In Morocco and Algeria, storks still nest on mosques and the crumbling battlements and walls of towns.

Some 6,000 miles east of the Rhine Valley, an outpost population of white storks is making its last stand on Honshu, not far from the Sea of Japan. This subspecies, *Ciconia ciconia boyciana*, is reduced to 20 or 21 birds, approximately the number that our whooping crane reached at lowest ebb.*

*For the story of the efforts to save the whooper, see "Whooping Cranes Fight for Survival," by Robert Porter Allen, NATIONAL GEOGRAPHIC, November, 1959.

Spanish sojourn finds a pair nesting on cactus. Besides its thousands of nesting storks, Spain is also a way station for birds migrating between Africa and Europe. Storks summering in eastern Europe fly via Turkey, Syria, and Egypt.

PHOTOGRAPHS BY JESSE TONY PEDERSEN © NATIONAL GEOGRAPHIC SOCIETY



This Asiatic race was originally described from a live pair kept at the British Consulate at Shanghai. The birds died en route to England. Not even their skins were preserved to become type specimens.

Certainly the subspecies, if it survives, could evolve into a full species. It differs markedly from the European race. The bill is black, not red; the eyes are yellow, not dark. It is a large bird, with primary wing feathers that show much white in their webbing. *Boyciana's* behavior, however, betrays its true blood relationship. The bird greets its mate with the same contortions and beak clattering as its Rhine relatives.

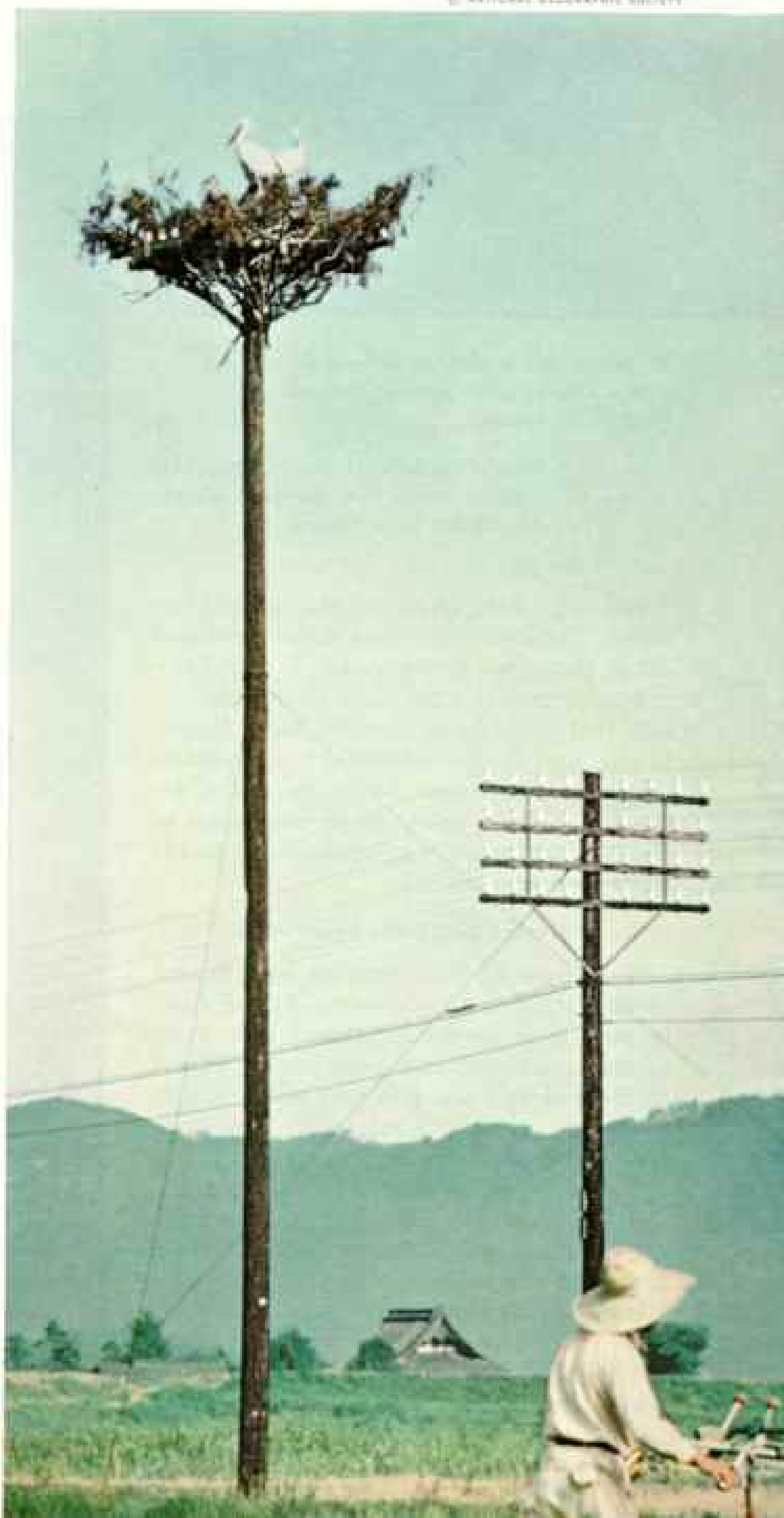
Having observed more than a thousand white storks in six countries, I had to complete my education with a pilgrimage to Hyogo Prefecture to see the Japanese birds. An English friend, Stuart Keith, who is interested in cranes, storks, and other long-legged birds, joined me.

We arrived in Honshu in the spring of 1960 and discovered that practically none of my Japanese ornithologist friends had ever seen a live stork, not even Hiroyuki Morioka, a distinguished young zoologist at Kyoto University. It takes about four hours by train, he informed us, to cross the mountains to Toyooka where the storks are. It was off the beaten track for foreign tourists, so Morioka-san became our guide and interpreter.

Once in Toyooka, we visited the Stork Preservation Association headquarters. Mr. Tatsuo Sagawa, the mayor of Toyoo-

ka and also president of the Association, told us that recently a male stork was found with both legs broken, its tarsi almost in shreds. Apparently it had been mangled by a rabbit snare. As mayor, Mr. Sagawa could—and did—decree that rabbit snares would henceforth be outlawed.

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Japanese survivors of a rare subspecies inhabit an aerie made by men to save them from dangerous high wires near Toyooka. Only 20 or 21 black-billed, yellow-eyed *Ciconia ciconia boyciana* remain. In 1961 two chicks hatched, but three adults died.



At home on a church ridgepole, storks watch traffic passing through Singrist, in Alsace.

Wheel anchored to the roof provides a foundation for the nest. Vosges Mountains loom mistily.

We were soon off to see the birds themselves. The lovely Japanese valley reminded me of the upper Rhine Valley. A placid river flowed through a flat plain. To the east rose hills that could have been the Black Forest; to the west the mountains corresponded to the Vosges. But there the illusion ended, for the Rhine Valley grew green with fields of hops and wheat, while in Japan watery paddy fields cover the land.

Infertile Egg Falls From Nest

Near Toyooka there were six nests known to the Japanese ornithologists, five of them in pine trees bordering rugged hills. Pairs of storks claimed tree nests earlier in the spring, but only one pair had laid eggs. Unfortunately, these eggs must have been infertile because no young had hatched.

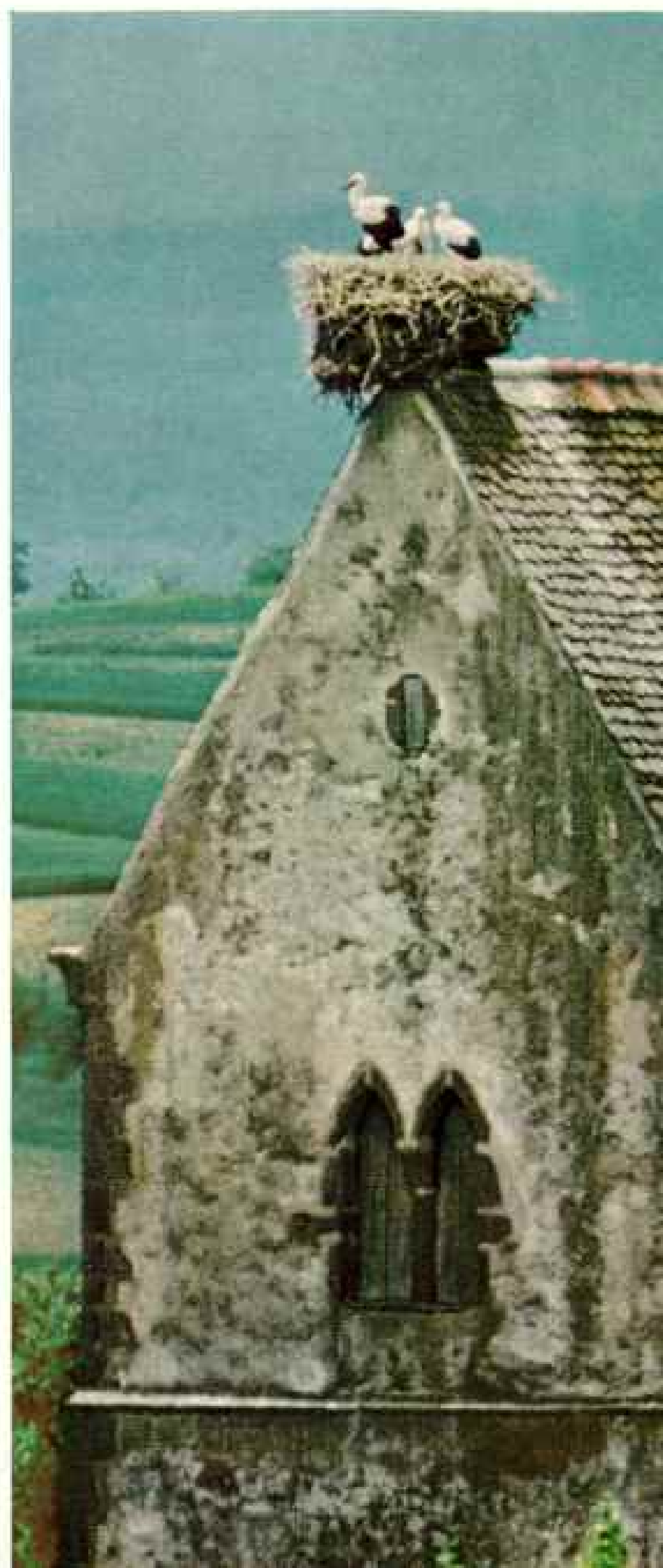
The sixth nest was artificial, woven of pliable branches. The townsfolk had erected a special stork pole. The structure towered above the original nest, atop a telegraph pole where storks faced constant danger from short circuits and skeins of wires (page 851).

This pair had laid eggs too, but hatching, which should have taken place on the 33d or 34th day, was long overdue. One of the eggs

had apparently been tossed out, for it lay on the ground, broken.

Although the birds no longer incubated, they did use the high platform as a rendezvous. Mutual greetings were less ardent than normal. The bill rattling was short and perfunctory. Could this population, inbred and near the end of its line, have lost vitality?

The farmers believe that the new insecticides sprayed on the rice fields reduce the storks' fertility. Frogs and other small aquatic life are affected, meaning less stork food. The



Japanese became alarmed and formed a citizens' committee to establish feeding ponds stocked with catfish. The pattern of protection at Toyooka, Japan, was almost precisely that of Ribeauvillé, France!

Storks' Future in Man's Hands

Taking the long pessimistic view, a Dutch ornithologist points out that a stork similar to the Eurasian species once lived in the Western Hemisphere. Its fossilized bones, dug from Pleistocene deposits in California, were

given the name *Ciconia maltha*. Such evidence supports the view that the white stork or its ancestors once had a much wider world distribution and that it is now gradually waning in most areas of the world.

There is a terrible finality about the extinction of a species. Dedicated ornithologists throughout Europe and Asia have redoubled their fight to preserve the popular white stork—and, if possible, to increase the population. Only time can tell if their efforts will prove successful.

THE END

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RESEARCHER BY BOGUS TONY PETERSON © NATIONAL GEOGRAPHIC SOCIETY





*An Andean glacier
snaps from its
sky-high perch,
and 3,500 Peruvians
perish in seven
minutes of horror*

Article by
BART McDOWELL

Photographs by
JOHN E. FLETCHER
National Geographic Staff



AVALANCHE!

Deadly peak before the tragedy: Menacing giant, Nevado Huascarán straddles the roof of Peru. Snow-fed glaciers wrinkle its granite face and screaming winds constantly buffet its body. Last January the mountain turned executioner, hurling down an avalanche that destroyed eight villages and towns.

Remembered terror and grief, reflected on the faces at upper right, endure as an aftermath of white death.

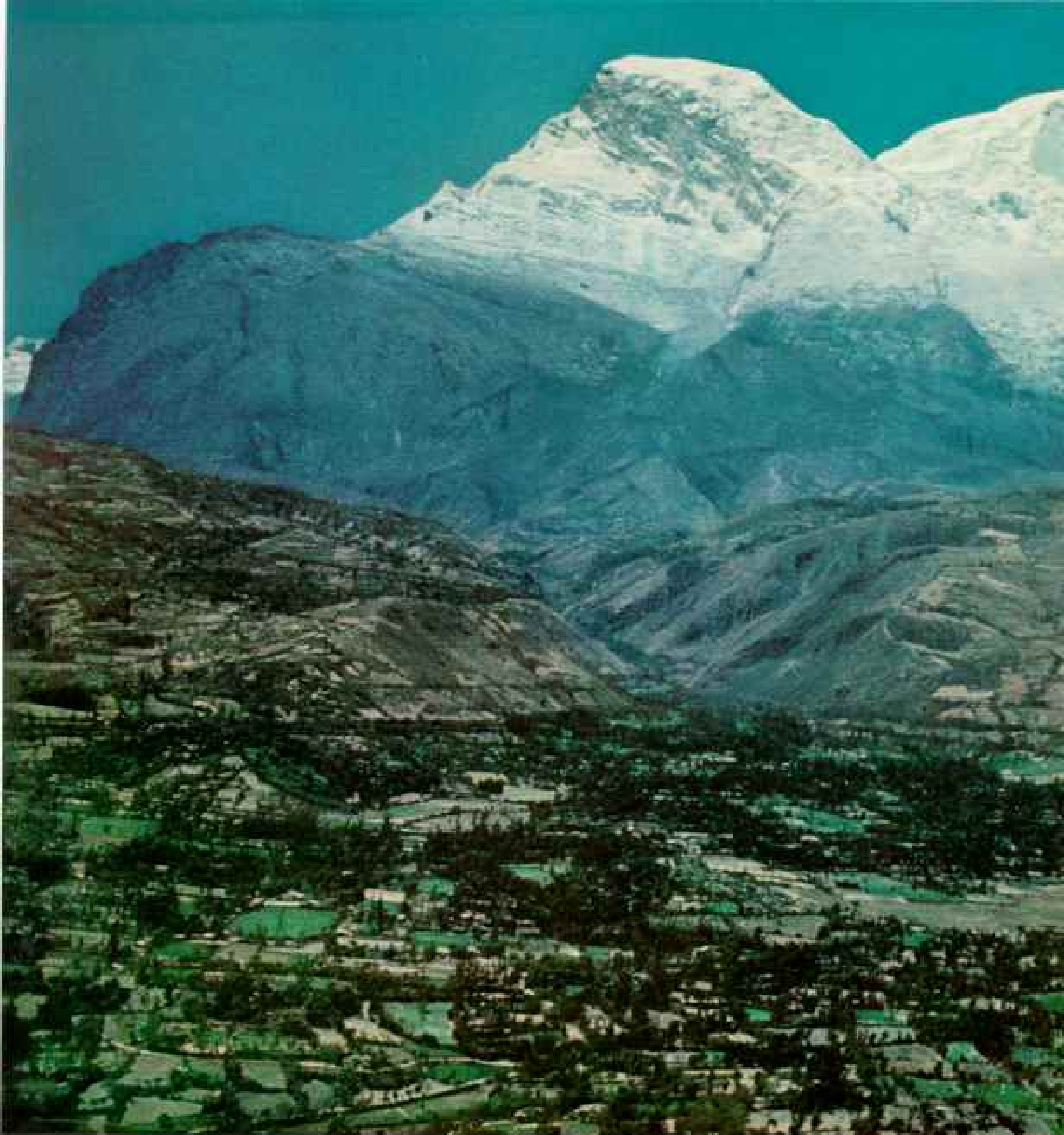
FOODCOURTESY BY JOHN E. FLETCHER
(ABOVE) AND PAGE 84 (PAGE 84) B. & C.

ON THE NORTHWEST FACE of Peru's tallest mountain, Glacier 511 absorbed the amber warmth of a setting Capricorn sun. The mass of ice was huge. Droplets of melt seeped into its cracked surface, and the water lubricated its cliffy footing. Heat, cold, and gravity were writing a fatal equation. It was 6 p.m., January 10, 1962; violence was still thirteen minutes away.

Beneath the 22,205-foot glacial grandeur of Nevado Huascarán, shepherds hurried to finish the day's chores. Chilled by the shadows of the Cordillera Negra, they drew ponchos about their shoulders and tossed stones at their flocks to herd them home.

In the valley village of Calla, Señora Montoro de Narcisa found she would need more bread for supper. "Watch the baby until I return," she instructed her older daughter. Then she walked briskly toward Ranrahirca, two miles away.

Prosperous townsfolk of Ranrahirca were relaxing.



ENTRANCE (LEFT) AND RANRAHIRCA

Alberto Méndez, wealthy owner of a trucking line, had a moment ago arrived home tired from Lima; now he was resting in his comfortable house. Over cobbled streets Lamberto Guzmán Tapia, a barrel-chested mountain climber of 26, walked with happy impatience to a large family party. In the schoolyard teen-age sisters Lira and Wanda Giraldo gossiped and giggled with passers-by.

Others worked. In a nearby garden 13-year-old Herminia Mejía hurried to dig the last of the day's potatoes. And at the stroke of 6, town electrician Ricardo Olivera arrived at the power station for his vespertine ritual: throwing the switch to give Ranrahirca five nightly hours of electricity. Olivera welcomed

a distinguished caller, Ranrahirca Mayor Alfonso Caballero. The mayor, whose house stood across the street, stayed only long enough to say "*buenas noches*" and stroll on.

"A Roar Like 10,000 Wild Beasts"

At 6:13 p.m., two and a half miles overhead, Glacier 511 shuddered. A man in Yungay first thought it was a cloud turning golden in the sunset. "But I saw that the cloud was flying downhill."

The first long fall was quiet and quick. Then the ice mass, equaling the weight of 1,200 navy destroyers combined, crashed wildly into a troughlike gorge. A crushing sound echoed the length of the valley. Then came a



PHOTO BY ARTHUR J. COOPER © NATIONAL GEOGRAPHIC SOCIETY



ENLARGED AREA OUTLINED

Doom overhangs the peaceful farms and villages of Callejón de Huailas—corridor of greenery—in the “Switzerland of Peru.”

When disaster struck, ice and snow fell away from the tongue of the glacier, here licking the head of a gorge beneath the north summit of Huascarán (center of opposite page).

The avalanche scoured the zigzagging canyon, crushed Indian villages, and rolled across the fertile bottomland and its towns. Compare “before” picture at left with “after” photograph on pages 858-9.

Serenity blessed the valley before the catastrophe. Here, near Huarás, a woman spins wool while tending flocks.

roar “like that of ten thousand wild beasts,” as one man described it. “Like an earthquake,” said another. “I could feel the rumble in the walls of the belly.”

Mountain climber Lamberto Guzmán Tapia heard the noise and knew at once what it was. He had just arrived at his aunt’s house. Inside some forty guests clapped and sang the happy Peruvian songs called *huaynos*.

“*Alud!*” he shouted. “Avalanche!” No one could hear him. They only laughed and clapped all the harder. With





**Frozen Flood Engulfs the Valley as
Huascarán "Hides His Face in Shame"**

Thus a Peruvian soldier spoke of the cloud-hung
peak that spewed wild desolation across the land.
Gathering rock from the sides of the distant gorge,



PHOTOGRAPH BY JOHN F. FLETCHER, NATIONAL GEOGRAPHIC STAFF © N.G.S.

the avalanche thundered into the Callejón at express-train speed. It crushed the houses of Shacsha (left) and claimed the lives of all who stood in its

path. Here, a week later, survivors cross the wilderness of frigid mud, rubble, and rivulets of melt on a temporary footbridge.





a final shout of "Save yourselves!" Lamberto ran up the street; the happy music receded into a hollow thunder of avalanche.

From her potato field little Herminia Mejia heard the fearful sound. In terror, she began to run uphill across garden plots, "even stepping upon the little plants."

Electrician Olivera sprinted down into the center of town, but realized he could never reach his home in time. People were panicking. Scores were running toward the church, a haven for body and spirit. In the crowd Olivera saw Lira and Wanda Giraldo.

"Here!" he called, seizing each by the wrist to pull them toward safety.

Mayor Caballero stood in speechless awe before his adobe house. He tried to call his sister, but the roar obliterated his words.

Doom Roars Down on Ranrahirca

From its first fall off the cliff, the avalanche had struck an uninhabited slope. Then the whole flotilla-sized ice mass had actually bounced. Surveyors later counted five impact points—an insane zigzag ricocheting from the sides of gorges (following pages). The mass, stirring tempests of shrill wind, carved and collected its own debris: topsoil, crushed houses from four mountain villages, flocks of sheep, granite boulders.

As it approached the valley floor, the roaring avalanche flattened to a mere 60 feet in thickness. It slowed to a mile a minute. By this time it had already taken perhaps a thousand human lives. Now the icy, muddy, rocky mass bore down upon some 2,700 people of

(Continued on page 866)

Living remnant of Ranrahirca huddles beside a monstrous graveyard 30 to 60 feet thick at its center.

Keeping lonely vigil, a militiaman guards the dead-end street (above and left). Here at twilight last January 10, children played while mothers cooked supper. Then, with frightful rumble, the avalanche struck. And the silence of a tomb prevailed.

Battered clockface shows approximate time of death. The avalanche hit Ranrahirca at 6:18, burying the church and those who took refuge in it. Found nearly a mile away, the clock must have "sailed like a stone skipped across a pond," said the mayor.



NINE-MILE

C o r d

AVALANCHE

MINUTE BY MINUTE

Callejón de Huailas

Yungay

Shacsta

Huarascucho

Ranrahira

Chuquibamba

Uchucoto

Calla

Santa

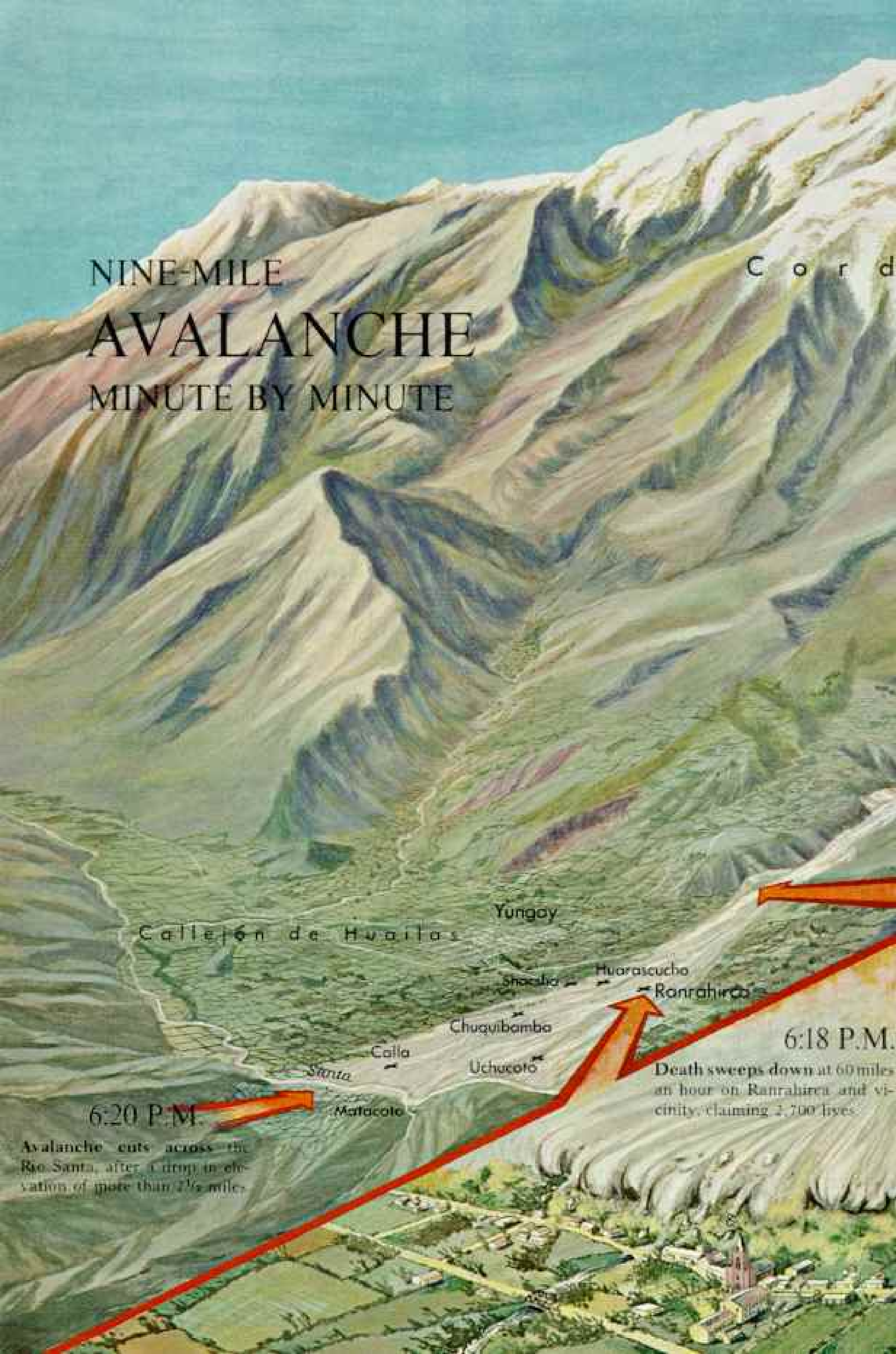
Mafacoto

6:18 P.M.

Death sweeps down at 60 miles an hour on Ranrahira and vicinity, claiming 2,700 lives.

6:20 P.M.

Avalanche cuts across the Rio Santa, after a run in elevation of more than 2 1/2 miles.



Nevado Putoco
19,639

Nevado Huandoy
20,981

Nevado Huascarán
21,834
22,205

l l e r a B l a n c a Glacier 511

Llangurru's
Lakes

Rio de
Shacsha

Pacucco

Yanamachico

6:13 P.M.

Triggered by thaw, snow
pitches headlong from Huan-
scarán's north summit, jarring
loose 3 million tons of ice from
Glacier 511.

6:15 P.M.

Caroming off canyon walls,
the lethal barrage devastates
Yanamachico and nearby vil-
lages, leaving 800 dead, 8 alive.

6:16 P.M.

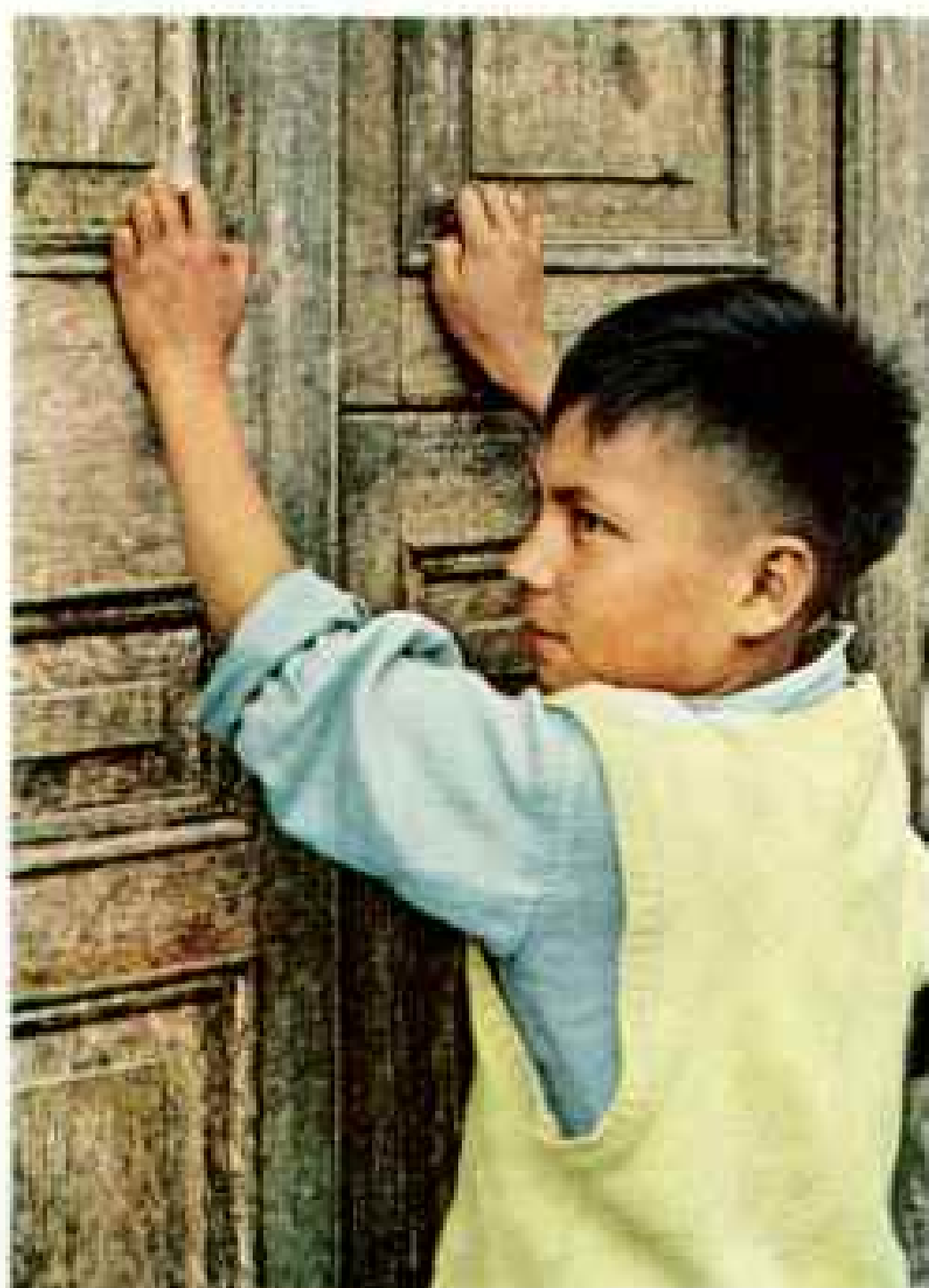
Titanic torrent, churning with
boulders, fans onto the plain.
Hills flanking the gorge divert
slide, saving town of Yungay.





"How much damage and where?" Author McDowell (center) questions Col. Humberto Ampuero Pérez, who uses a map to explain.

"I was here when the avalanche hit," says 12-year-old Jorge Hilario Vásquez of Huarascucho. Hearing the roar of approaching oblivion, Jorge and his Uncle Carlos ran out of the house. "But Uncle Carlos always tells me to shut the door when I go out," Jorge recalls. "I remembered and hurried back." The avalanche sliced the house like cheese, but left Jorge and the door unharmed.



Home and kin gone, refugees huddle in the basketball court of Yungay's Santa Inés Colegio beneath the banners of clubs that contributed to its construction. Isolated by the avalanche, Yungay subsisted for a time on food flown in from Lima. Relief workers provided this lunch for the survivors.

Game youngsters grin as nurse Hilda Olivera administers typhoid shots at a makeshift clinic in what was left of Ranrahirca. Dr. Raul Paredes Tito (left) directs the health program, which included spraying with DDT against typhus and *verruca*, a deadly Andean disease spread by sandflies.



BOURCHOMES © NATIONAL GEOGRAPHIC SOCIETY





Jagged scar, white as bone, marks the avalanche route where grinding ice, cutting into dark-skinned granite, bared unweathered stone. Rolling out of its bed beyond the clouds, the glacier splashed into the Río de Shaesha Valley, then changed course with a bounce.

Mountain-eye view shows site of Yanamachico (foreground). Slide ends in the Santa River, whose waters carried bodies 100 miles to the sea. The photograph, looking southwest, shows features from a different angle than the painting on pages 862-3.

Ranrahirca and vicinity. In the next few seconds this avalanche would complete one of history's great human disasters.

Yellow dust engulfed the mayor's view and gritted the eyes of electrician Olivera.

"The girls were torn from my hands—by the winds or by a wall of mud, I do not know," said Olivera. "Electric wires had fallen around me. The girls were gone. Somehow, I came free."

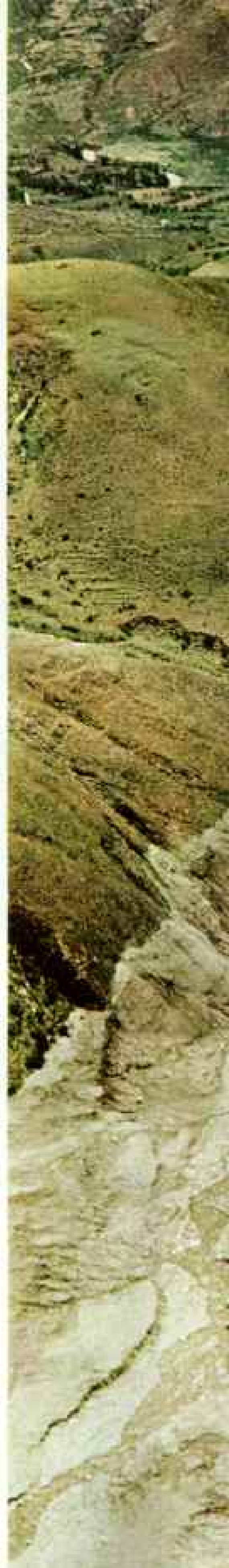
The avalanche had now reached the valley bottom, nine miles from its mountain perch, where it crashed into the Santa River, damming it with debris (opposite). It was 6:20.

From the hillside, Herminia Mejia saw the Santa River spill out of its banks to seek a new course; her potato patch was flooded.

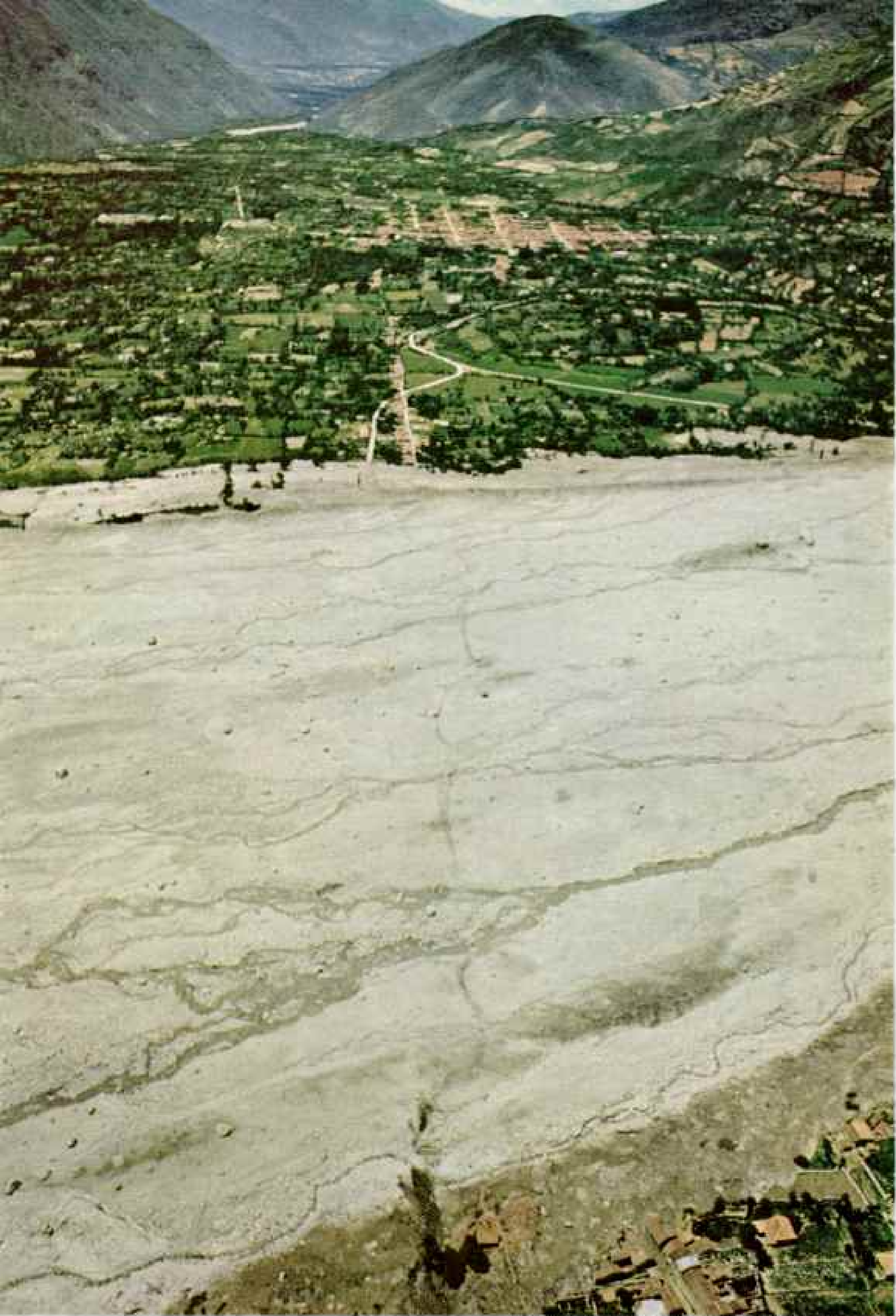
As the yellow dust sifted to earth, Mayor Caballero stood mute. "I could speak neither an oath nor a prayer."

The Señora de Narcisa would never return to her children. The party at the Guzmán house, the rich Señor Méndez and his fine home, the church and its worshipers—all were gone.

"I regained my senses," said Olivera. "Looking toward the village, I saw only a waste of mud and ice. I was impressed by a profound silence. Realizing that my wife, my children, my parents were all buried under the debris, I suddenly found myself sobbing."







PHOTOGRAPHED BY JOHN C. FLETCHER, NATIONAL GEOGRAPHIC STAFF © W.S.A.

Mile-wide gulf separates Yungay from the remains of Ranrahirca (foreground). The forbidding sea swept away roads and bridges, leaving Yungay a mountain-rimmed island.

Toward this valley of sorrow, we drove a few days later. We were four: NATIONAL GEOGRAPHIC photographer John E. Fletcher, our experienced mountain driver Serafin Lagos, guide Claudio A. Navarrete, and I. We came to record this monumental disaster in which, by official estimate, 3,500 people perished.

Peruvian Peaks Dwarf the Matterhorn

I had visited the valley 13 years earlier, and remembered it as one of the world's most beautiful spots. Travel folders call this area the "Switzerland of Peru." Actually the magnificent peaks here are more than a mile taller than Mont Blanc or the Matterhorn.

This Andean valley is called the Callejón de Huailas, meaning "corridor of greenery." To the west, the Cordillera Negra stands dark and dry; eastward, the Cordillera Blanca is drenched and glazed. On the valley floor, royal palms contrast vividly with the glaciers overhead. Here flows the Santa River, vested in white by the froth of rapids (map, page 857).

From the Pacific coast we had climbed steeply, ears popping; then we faced the vast, vague sweep of high Peruvian flatlands. Below us, at an altitude of 13,451 feet, sprawled snow-fed Lake Conococha, source of the Santa River.

We followed the river down. Our road was laned by eucalyptus trees, stone fences, slanting fields. Foggy clouds hid the mountaintops; a rainstorm overtook us. I dozed, then awakened to find the Callejón again sunny,



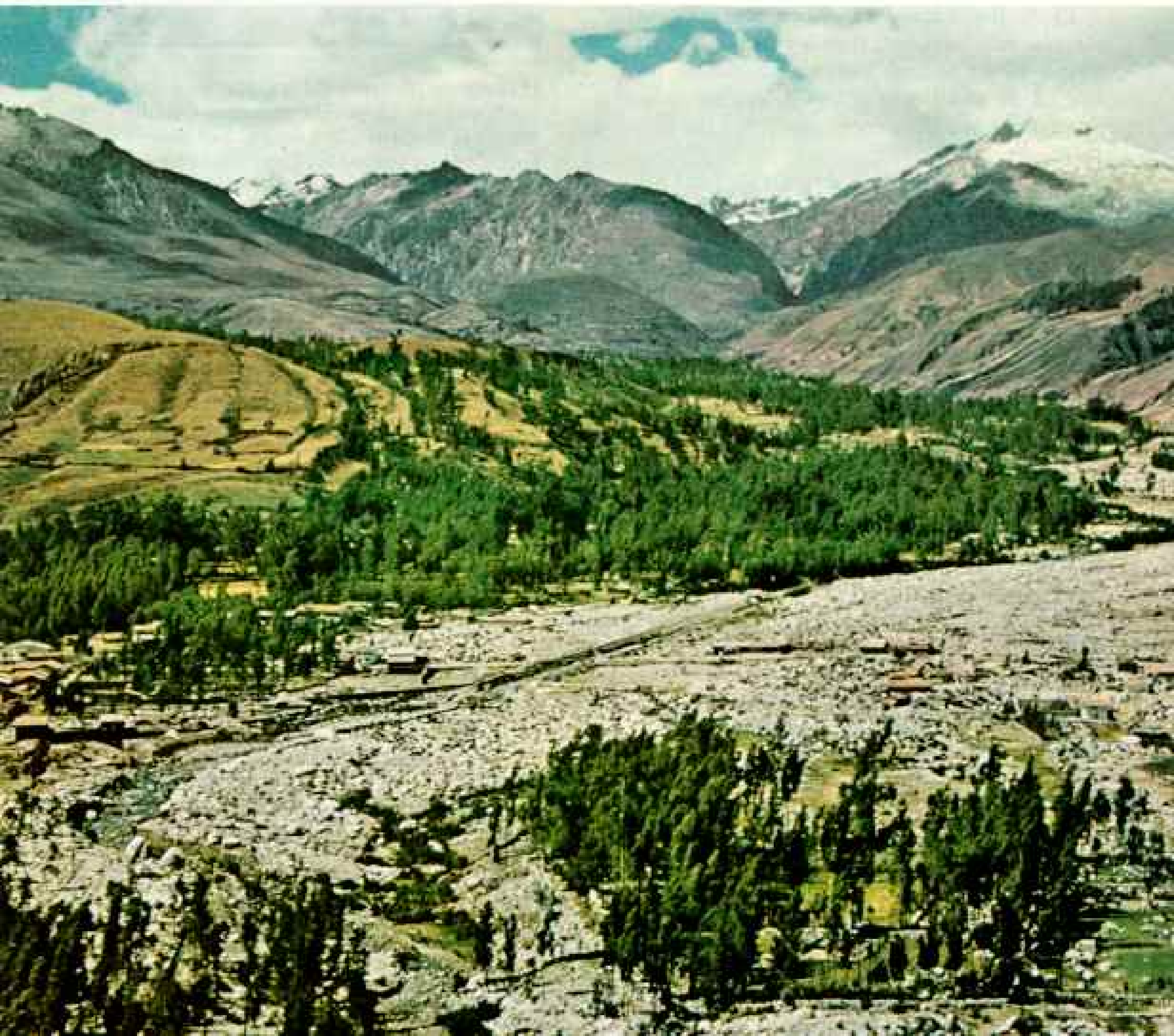
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Hope gone, despair abides. Haggard with grief, Señora Donatilda Infantes Castillo searches the rubble burying her sister's house. "Tears bathed her face," said photographer Fletcher. She paid her last respects in Quechua, her Indian language.

Threading a flimsy walkway across the mud, survivors carry all that is left of their possessions—sheep and sacks of clothing.

869





In a happier day, glaciers served as ice factories. Chips fly as this Indian harks at a glacier on the flanks of the Cordillera Blanca. He will sell the block he cuts to stores and restaurants in the valley.

King-size cube bows the back of an ice collector. To retard melting, she will wrap the chunk in grass for the trip down the mountain.

Blanket of boulders perpetuates the memory of an earlier disaster at Huarás, where the author and photographer stayed while preparing this GEOGRAPHIC report. Here in 1941 more than 4,000 people perished when a natural dam gave way high in the Cordillera Blanca, releasing a deluge of glacial melt. Stones swept by the flood obliterated much of the town (center). To prevent repetition of the catastrophe, Peruvian officials keep watch over some 160 glacial lakes.



PHOTOGRAPHER BY FRED D. HINES © N.C.S.

and its mountain walls both steep and close.

"Perhaps the stories about the ancients were right," said Claudio. He referred to the Chavin culture which flourished here 3,000 years ago. "Legend says that in those days of the jaguar-faced gods called *huaca* the Andes were split apart and the Callejón was formed, when the sky made war on the earth."

Peruvian soldiers stopped the car near the disaster area. Assured that we were not looters, they waved us on. We passed two fields, then a row of adobe houses—and the road ended in the debris of the avalanche. This was the living fragment of Ranrahirca.

Debris Stands 60 Feet Deep

Bulldozers were pushing at loose mud; we left the car and picked our way to a little whitewashed building—the electric power station—and looked out over the ruin.

No one spoke; the scene resembled an Old Testament visitation (page 860). White rock and pale mud stretched a mile across the valley. Below us it fanned into a wide and deadly delta. No ice was visible on the surface. Boulders were mortared together by a crusty mud of granite dust; across the rubble spilled small, disoriented brooks of melt.

"How deep is the debris?" I asked a slender

youngster standing nearby. He shrugged.

"Thirty feet in spots; 60 in others."

On the rim of the ruin I met César Barrios, subprefect from the provincial capital, Huarás. "Come, I'll take you to the command post," he said, turning with a limp that favored a bandaged leg.

"You are injured?"

"I fell upon the ice. Ours was the first party to cross the avalanche debris the morning after the disaster. It was very early—5:30, in fact, and somewhat dark. When I stepped upon a rock, it was not rock at all. Ice. I slipped, and a sharp corner cut my leg. Painful, but it could have been worse."

"Out on the avalanche, did you find any injured survivors?" I asked.

"Survivors? Of *that*!" He glanced at the wasteland where so many people had been stoned to death. "No. The avalanche either killed a man or spared him—totally." He was right. In the whole disaster, fewer than two dozen people had been hospitalized.

The command post was one tent, one table, and a telephone. Col. Humberto Ampuero Pérez, heading the Ranrahirca operations, held a map sketched by his staff (page 864).

"Here was Glacier 511 on Mount Huascarán," he said. "Geologists numbered the glaciers a few years ago."

It was a classic textbook story of an avalanche. Fattened by freak snows ("even the Cordillera Negra had a sprinkling of white"), warmed by unseasonal sunshine, the glacier had broken from its steep, rocky perch.



Clouds wreath the eternal snows of Huascarán, a vision of splendor looming over fertile fields south of the peak. Grains, fruits, and vegetables flourish in equatorial sunshine that offsets the Callejón's 10,000-foot elevation. Sheep provide wool for hand-woven blankets and clothing. The countryside around Ranrahirca resembled this before the disaster.

Harvest helpers near Huarás frolic in a pile of grain.

Thumping drums and wailing flutes spur on Andean threshers. Oxen trample the grain to separate seed from husk. Men winnow the grain by tossing it into the breeze. Many farmers live on vast haciendas. In exchange for services to landowners, they receive the right to till small plots of land for themselves.



RECONSTRUCTED BY FRED D. ARDS © NATIONAL GEOGRAPHIC SOCIETY





Weeks-long wake: patient mourners watch from a hillside as mud yields Ranrahirca's dead.

"Ranrahirca was the largest town destroyed. But—Pacucco, Shacsha, Yanamachico, Chuquibamba, Calla, Huarascucho, Uchucoto." The guttural Quechua sounded a harsh litany.

"Now, see: It reached the Santa River—and dammed it. The water temporarily rose more than 15 feet. Much debris and ice flowed downstream. A few miles down—way off this map—two bridges were wiped out by the flood.

"That is our problem. The towns of Yungay and Caras are isolated. The avalanche cut off the road from the south; floods washed out the bridges in the north."

Survivors Mourn a Buried Village

And how were these isolated towns being supplied? "Airlift. There is a strip in Caras. Of course, this is the season of rain, and the Callejón is narrow. . . ."

A lieutenant approached: "My colonel, the priest has arrived from Carhuás."

"Excuse me," said Colonel Ampuero. "A mass for the dead. I should attend."

Wilted wreaths of gladioli, daisies, and roses adorned an altar against the raw adobe of the mayor's house. There was no bell to summon them, but the people all arrived at

once: old women with faces like tooled leather, young women quieting their infants with milk from the breast, men in brown ponchos holding hats in gnarled hands, townsfolk clad in the decent black of mourning.

Thin and bent, Mayor Alfonso Caballero squinted toward the altar. Little Herminia Mejia knelt beneath a tree; saved by her work in the potato field, she was now an orphan. The electrician Olivera stood bareheaded in the sun; stapled to his shirt pocket was a small black ribbon for his loss of 27 kinsmen.

As the priest intoned the Latin words, some women wept, quietly and without sobbing. Their faces seemed numb beyond the curing salt of tears.

"All of them are stoics," said Dr. Raúl Paredes Tito when we visited his temporary clinic (page 865). "We are giving injections, but look—not even one child has cried.

"These shots are for typhoid. With so many dead still undiscovered—and perhaps 10,000 head of livestock decomposing, too—water sources could be corrupted."

Was typhoid the only epidemic he feared?

"Perhaps even typhus. We are spraying DDT throughout the area. And here in the



PHOTOGRAPHER BY JOHN E. FLETCHER, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Stretcher-bearers lift a sad burden and wring a cry from watchers: "Another of the lost ones"

mountains, of course, we might have an outbreak of *verruca*—a dreaded disease."

Verruga is endemic to parts of the Andes. Spread by a sandfly, it produces symptoms like pernicious anemia. It can kill. "We need to be pessimists," said the doctor.

A cry went up: "*Camillas! Stretches!*"

"Apparently the men have found more of the dead," the doctor explained. "You should see them work, though it is not pleasant."

Bugle Sounds a Note of Death

Jack Fletcher grabbed his camera bag and I my notebook to follow the stretcher-bearers.

"The helicopter pilot sighted many bodies—seven or eight," a soldier explained. The soldier carried a bugle; he would sound a blast if he sighted a human form.

We walked out onto the ruin, stepping carefully from stone to stone, then onto the plasterlike surface of the drying mud. At first the crust was so hard that our feet left no track. Then, quite without warning, I broke through and sank thigh-deep into mire. Here buried ice had melted, making a messy, fragile honeycomb in the debris.

I looked over my shoulder for Jack. He had

Working to rebuild the highway at Ranrahirca, the tractor at far right uncovered a body preserved eleven days in thawing mud. When these men placed the remains on a crude stretcher, one called out to anxious onlookers, "It is a woman in a blue skirt."

Ragged Indian digs in slushy debris. Sandals made of an old tire hang from his belt.





REX CHOWLES © NATIONAL GEOGRAPHIC SOCIETY

"All our people! All our people!" cries the Indian woman at center upon identifying the body of her niece, Teresa Montes, in the Ranrahirca morgue. "The aunt's voice rose in a high, thin wail of guttural Quechua," writes the author. "She began chanting stories about the life of her niece, how she had played as a child, how she had lived as a young woman. This traditional Indian incantation over the dead was short, like the life of the girl Teresa, who had recently celebrated her twentieth birthday."

Bereaved father in the morgue patio tenderly washes the face of his dead son, 10-year-old Homero Jiraldo Montes, in a stoic Andean Pietà.



sunk into another spot; with good photo-reflexes, he held his camera overhead.

We found firmer footing, and took new bearings. The stretcher brigade pulled well ahead of us, so we stopped to catch our breath. Augusto Vásquez, a young carpenter from Mancos, a mile south of here, joined us.

"Are you a rescue volunteer?" I asked.

"No," he said. "My parents are here, and my brothers." He still used the present tense. "I could have saved them—I heard the great noise. I tried to borrow a car. I wanted to drive, drive to Ranrahirca and bring them out of the path of the avalanche!"

"You knew the danger of the valley?"

"Everyone knew. In Quechua, the name Ranrahirca means 'Hill of Many Stones.'"

"But was the valley known for its stones before the avalanche?"

"Neither hill nor stones," Augusto Vásquez said. "Only the name with its prophecy."

Up ahead of us the stretcher-bearers had now stopped. "They have found nothing," said Augusto with a sigh. "Now they return." He looked out over the pale rubble. "It was such a beautiful town. Every September we had a great feast. Music, lights! People came from far away—very beautiful, very happy."

There were two ways to get to the isolated town of Yungay: walk across the avalanche debris or ride a helicopter. Jack and I tried our luck at Ranrahirca's improvised heliport.

The Peruvian Air Force had flown three little French helicopters up here. Blankets, clothes, food, and refugees had priority. But at midday one spare seat turned up.

"We need aerial photos," I said, shoving Jack aboard. "Meet me in the Yungay plaza."

After our stint with the stretcher-bearers, this walk across the avalanche rubble seemed easy. Soldiers had marked a firm, winding path with whitewashed stones; across the rivulets of melt and the oozing mud, army engineers had built footbridges out of wooden scraps from the rubble (page 869).

Unreal as the panorama seemed, the avalanche area was alive with activity. A long line of refugees streamed toward me from isolated Yungay. Beyond the path telephone men adjusted a line across the boulders. Near them soldiers gathered samples to test the soil for replanting fields.

Yungay had lost none of its charm since my last visit. The royal palms had grown taller,



Andean faces mirror grief



but the cobbled streets, the whitewashed houses, the superb view of Huascarán—all were the same. Even the church remained as I remembered it, unfinished.

Jack was seated on a bench in the plaza talking to my old friend Lamberto Guzmán Tapia. He had been a porter in the guesthouse where I stayed on my last visit. Now he was a veteran mountaineer and a guide for European and North American climbers.

We talked about Lamberto's own narrow escape from his family party, and his scouting trip next day up the base of Huascarán.

Village and 800 People Buried

"The village of Yanamachico felt the full impact," he said. "Once some 800 people lived there. I counted eight still alive. But who can say all the others are dead? Some of the Indians may have run away in terror. Whether we have 8,000 dead or only 1,400—we may never be sure. The official estimate of 3,500 is as good a figure as any."

Lamberto directed us to Yungay's Santa

Inés Colegio, or high school (page 865), now a refugee center. A truck, just arrived from the airstrip, was unloading a shipment of bedding. Inside the front patio, a crowd of brightly clad Indians sat on the tiled floor.

"*Padrecito!*" exclaimed an old woman—and rushed up to take my hand affectionately in her own. She had mistaken me for a priest.

"An easy mistake," said a voice in English. "You're an American and so are we."

The voice belonged to Father Frederic Cameron, of Boston. He and four other U.S. priests of the Society of St. James the Apostle had been put in charge of disaster relief by Peruvian President Manuel Prado.

Father Rudolph Masciarelli showed me around the school; 160 of the homeless slept here beneath the blackboards. Those who lived on the Ranrahirca side of the avalanche had similar facilities there.

"The survivors are called *damnificados*, those who suffered loss. They represent quite a cross-section," said Father Masciarelli.

"We were worried about the food. Indians prefer one diet, the townsfolk another. The same with clothing. We couldn't give ponchos to the prosperous people of the valley or city garments to Indians of the heights—so everyone gets overalls."

Some 400 people were eating lunch here. The kitchen was a smoky patio animated by the chopping of wood and the stirring of sheephead soup. Señora Olivera supervised the activity while carrying a baby in her arms.

"No, not my own child," she explained. "This is Teodosia Narcisa Montoro—two months old. Her mother died in the avalanche, but her father lives, thanks to God."

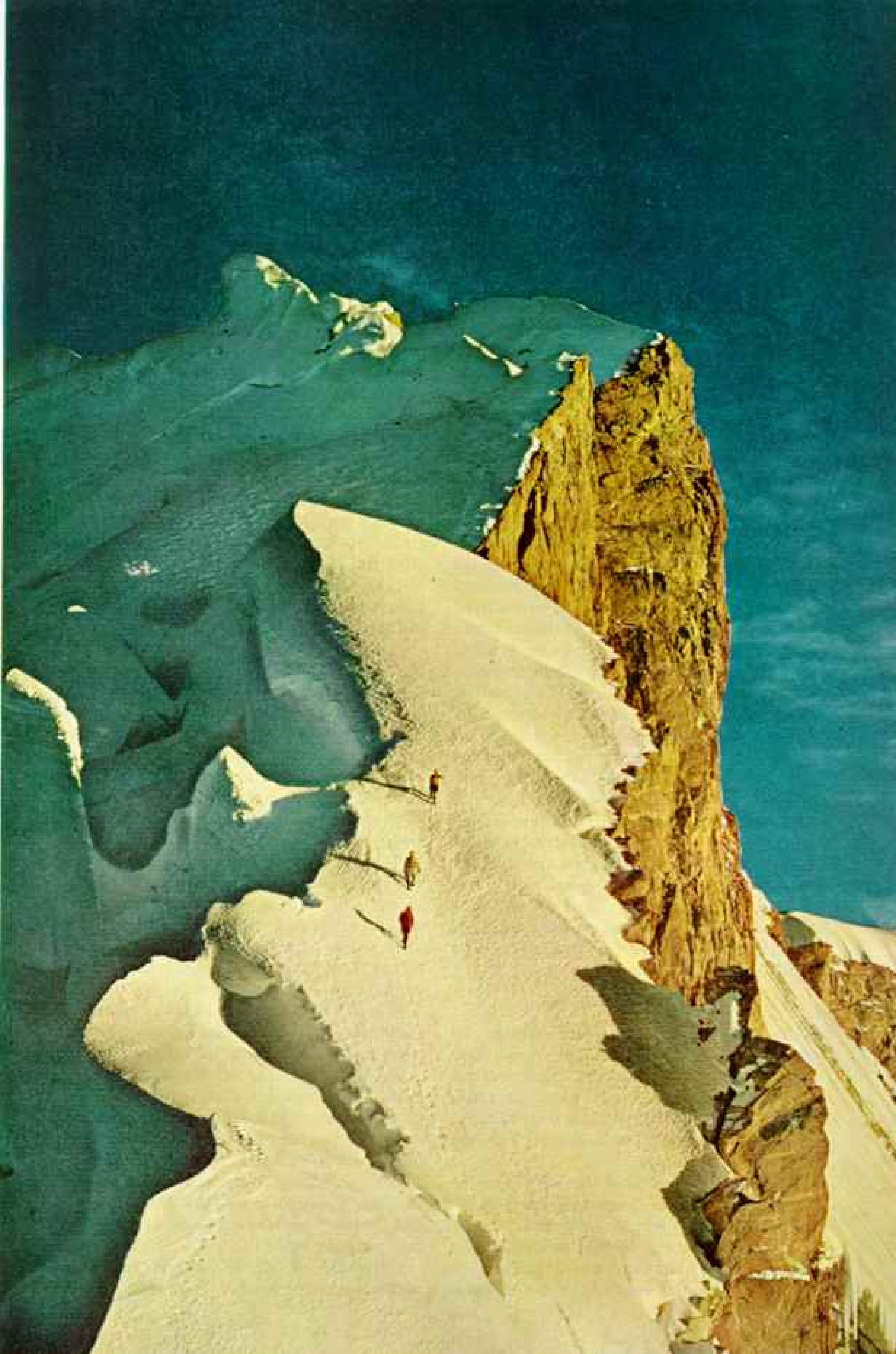
From the child's harsh wails, from the way she drew up her tiny feet, even I could see that Teodosia Narcisa Montoro had colic.

Life goes on. The open-air market at Huarás still stands open to serve shoppers, and skilled needlewomen bring out their embroidered finery to sell. But the horror of the avalanche lives on as a recurring nightmare, only to be eased by time.

Will the Executioner Strike Again? Huascarán Climbers Tempt Fate

No one knows when the mountain will again conjure the fatal formula that sends ice and snow crashing into the valley. Mighty Huascarán, vaulting 22,205 feet into the sky, keeps counsel only with itself.





"Milk from the bottle does not rest well with her," said Señora Olivera. "She grieves for the breast of her mother."

During the next few days, Jack Fletcher and I shared in the valley's life of mourning and repair. Now and again, in the distance, we heard an insubstantial and windy sound like the falling of a tree. "Another avalanche—a small one," said Serafin casually.

Valley of Mud Yields Victims

With the villagers, we looked into the horror-frozen faces of the dead. Most of the bodies were torn beyond recognition, beyond belief. Stretcher-bearers carried the grotesque fragments, the arms, legs, heads. The valley wore a sickly-sweet stench.

"I wonder how long it will be before we quit dreaming about these things," said Jack one evening, as we left the disaster area and began the daily 30-mile drive upriver to an inn in Huarás. Abundant hot water would wash away the mud if not the memories.

Even Huarás had its reminders. Our dining room window overlooked another boulder-strewn gorge. Twenty years ago, people lived peacefully in this ravine; but on the mountain slopes above, a natural lake gradually filled with glacial melt. When the weight of water broke the natural dam, a rainless flood crashed down, scouring away half the town (page 870).

Each day the bulldozers progressed. "In a few weeks," one engineer told us, "the road will be restored across the avalanche path."

Then, pushing into the snow-chilled mud near a stream, the tractors encountered bodies partly protected from the full force of the stones. There were several; preserved by the cold, they seemed to be sleeping.

One was a little boy; lying on the man-sized stretcher, he seemed pitifully small.

"It is one of the Jiraldo brothers," said a child, perhaps a playmate.

A Father Finds His Son

The morgue superintendent directed the stretcher-bearers to his patio, pointing a hand dusted white with quicklime; lime was his only disinfectant, his only balm for quick burials. He looked closely into the little face. "Call Señor Jiraldo," he ordered. "Tell him it is one of his sons."

We waited. They lifted the body from the stretcher to the floor. Something fell from the child's pocket; I bent to see. It was a Yo-yo.

A crowd entered; in the middle stood a stocky man with a tense, unshaven face.

"The father?" I inquired of the morgue-

keeper. The man nodded and remained silent.

Señor Jiraldo bent down to the figure of the boy: "It is my son Homero." He repeated carefully the whole name for the morgue-keeper's records. "Homero Jiraldo Montes. Please bring water."

A woman fetched a pail. Carefully, the father poured water upon the face of his son, washing away the mud in a brusque liturgy of ablution (page 876). The man's face showed no emotion, but his voice was hoarse.

"Homero was my youngest," said the father tonelessly. He took the muddy little shirt and began to undress the child. Carefully, he eased the small arm out of the sleeve. The father paused to look at his son's shoulder; it was marked by a purple bruise. The man said nothing; but gently, and only for an instant, he covered the small bruised shoulder with his own square hand.

"Homero was 10 years old," the father said, his voice growing clear. He continued to undress the child, but more quickly now. He lifted the small body to a bed of boxes, and with his own hands sprinkled the lime. The stoic Andean Pietà was finished. The Yo-yo still lay upon the patio floor.

New Town Honors the Old

Before we departed, we took a last high look from the little helicopter. We circled through the gusty gorges around Huascarán, surveying a battleground in the ancient war between sky and earth; this time the heavens had inflicted a mortal wound.

When we landed, Mayor Caballero greeted us; he seemed more cheerful.

"I have made a proclamation," he said. "We will build a new town—the site will be chosen soon." In an old account ledger the mayor had penned his manifesto. The new town would also be called Ranrahirca, the Hill of Many Stones. The main avenue would be the Street of January Tenth.

"Could I ride with you as far as Huarás?" asked the subprefect, César Barrios. "My leg feels worse and I should see my doctor."

We made room and Serafin started the engine. The Cordillera Blanca peaked above its rainy-season pall; sunshine was working upon the glaciers. I began to read Father George Flynn's official report.

"The people are adjusting to this huge scar that lies across their land and their lives. . . . But they say the Huascarán is a villain who may yet have more to say."

Gratefully, we left the Callejón, the valley of the shadow of death. THE END

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Geographic team reports disaster in Peru

On Peru's highest peak early this year, a falling mass of ice triggered an avalanche that took thousands of lives. Headlines and broadcasts had barely announced this tragic example of geography on the rampage when NATIONAL GEOGRAPHIC staff men Bart McDowell and Jack Fletcher flew to the Andes to bring back the detailed story.

They arrived in the remote mountain-walled valley even before the news had trickled to all the local Indians. Here, at snow-fed Lake Conococha, McDowell (left)

and Fletcher are the first to bring details of the disaster that struck only 70 miles away.

To prepare their vivid account (page 855), the men drew on a rich background of past assignments in Peru. At the scene they waded in icy debris, viewed the destruction from a helicopter, and talked to refugees.

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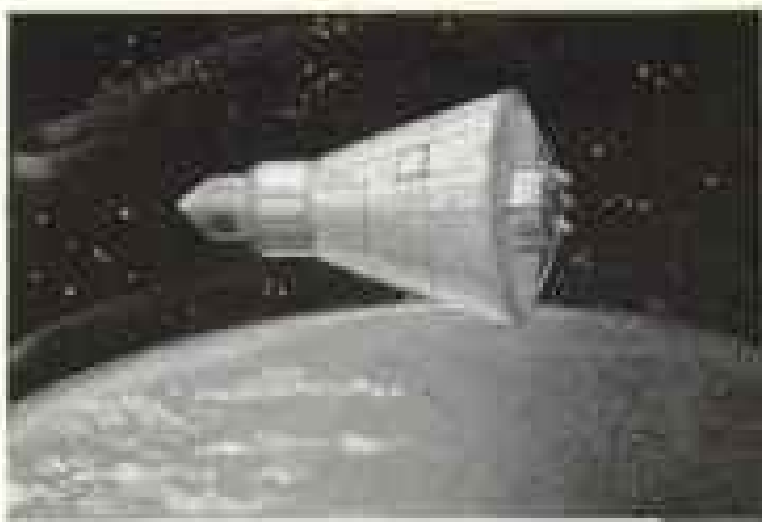
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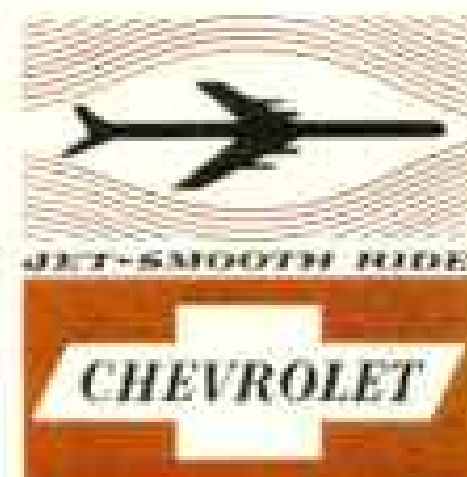
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This Doomsday is nothing to scoff at. It is not the work of crackpots. It is a carefully considered estimate published in *Science* magazine by three serious scientists.

These men have been studying the rate at which people have been giving birth to people since 5000 B.C. Then they calculated ahead and concluded that on November 13, 2026 the planet earth will contain 50 billion people (current total: less than three billion). And that, unless our world's production of food is stepped up immeasurably, these people will almost certainly starve.

If our heaping dinner tables make Doomsday seem absurd; if our highly publicized crop surpluses make the Starvation Age seem remote, ponder this:

If those 50 billion future citizens were invited to share our plenty, they could eat their way through America's gigantic stored surpluses in less than one day.

That's the population explosion you've heard about.

Cyanamid has heard about it, too. That's one reason why several hundred Cyanamid scientists and technicians are at work in a new Agricultural Research Center—a rolling, 640-acre laboratory-farm

near Princeton, New Jersey.

There, they work, read, talk and sometimes stare out at the countryside. They consider, as the autos roll by, that New Jersey now has 800 persons per square mile (and so, incidentally, has Japan). And that in 2026 it will have 10,000 per square mile (and so, incidentally, will Japan). All of which makes them search a little harder for ways to match that population explosion with a food explosion.

These scientists know that agricultural science must hurry. It must replace two ears of corn with four, four chickens with eight, eight hogs with sixteen. Then they must do it again. And again.

The people of Princeton are confident that they can do it. Already they are discovering which nutrients produce the biggest, healthiest livestock. They are growing plants in man-made, man-controlled temperatures ranging from arctic to jungle; in humidities ranging from desert to New York in August.

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we really won't be able to afford that kind of free-loading much longer.

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And much progress is being made today. A new insecticide called **CYCOX®** dimethoate is stopping our old friend *musca domestica*, the common house fly, in his tracks. Fly-free cows, science knows, will grow fatter and give more milk.

Cyanamid subscribes to the often-ignored axiom: Look after the future in the present. That's one reason for the new multi-million dollar Princeton Agricultural Center.

Another reason is that agricultural research is sound, profitable business. Good ideas that have reached their time usually are.

This is the story of one research effort by one Cyanamid division. Eleven other divisions operate in the United States and eighty-seven foreign countries. Working together they create an atmosphere charged with diversity, alertness, and progress.

CYANAMID

AMERICAN CYANAMID COMPANY

Agricultural / Building Products / Davis & Geck / Fibers / Formica Corporation
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Nova 400 4-Door Station Wagon—one of three Chevy II wagons.

One whale of a wagon... at a low, low price

Totes up to 76.2 cubic feet of game, gear or anything else! A rugged breed, Chevy II with Body by Fisher and mechanical simplicity, that's long on dependability, short on service costs.

Here's a man-sized wagon—with a load deck that extends over 9 ft. with the tailgate down. Yet, generous as Chevy II is with cargo space, it's a miser on maintenance. Front-end components, fenders included, bolt on for easy repair. Mono-Plate rear springs never need lubrication. And that plucky gas-sippin' 6 is the next best thing to perpetual motion. Check your dealer and see. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Chevy II
Nova





Whenever you leave home, carry money only *you* can spend: **BANK OF AMERICA TRAVELERS CHEQUES.** Loss-proof, theft-proof, cashed only by *your* signature. Sold at banks everywhere.



Has transistors ...will travel!



Micromatic Record Player with
10 YEAR DIAMOND STYLUS GUARANTEE



... the same precision mechanism as in Magnavox consoles! Because discernible record and stylus wear are eliminated, the Diamond Stylus is guaranteed for 10 years!

The **Stereograph Deluxe**—all components in one case; looks like fine luggage. Nothing to set up, just plug in and play—\$125. Other models from \$69.95.

Now—you can enjoy true Stereo-High Fidelity from a **REVOLUTIONARY POWER TRANSISTOR PORTABLE!**

No tubes to replace...no record or stylus wear...your records can last a lifetime.

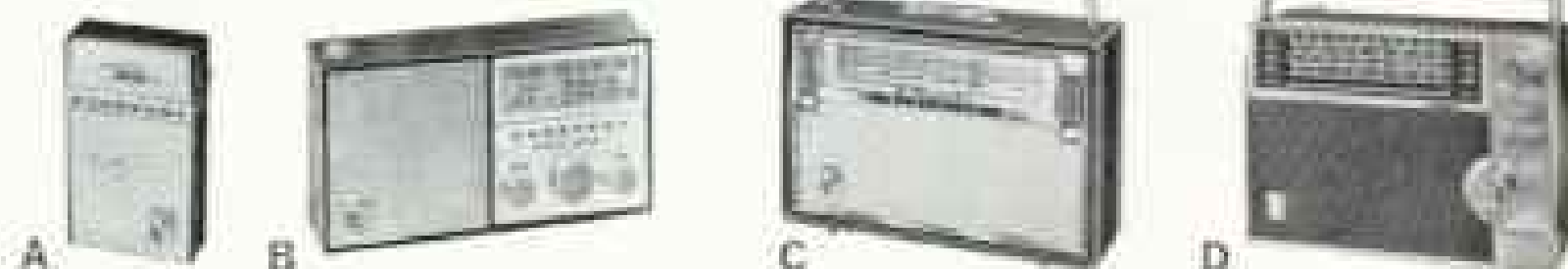
Never before—such deep, resonant bass—such beautiful, distortion-free music from a portable! The compact new Magnavox **POWER TRANSISTOR AMPLIFIERS** not only give 5 times the distortion-free power of ordinary tube amplifier portables—but also permit use of bigger, high-efficiency Magnavox speakers. You've never heard a portable sound so great!

It's the most reliable portable ever built—no chassis heat to shorten the life of components. The Micromatic Record Player is foolproof; cannot be jammed. In addition to the 10 year Diamond Stylus guarantee... all parts are guaranteed for two years, and carry-in service for one year.

Also, the only power-transistor **PORTABLE RADIOS** that combine **FM—AM—Shortwave and Marine bands!** Wherever you go, they bring you the rich, crystal clear beauty of FM music... exciting programs from the far corners of the world... Marine bulletins... plus the greatest selection of AM stations. Each offers a standard of excellence and tonal fidelity you expect and get only from Magnavox. Dealers are listed in your Yellow Pages.

the magnificent
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truly the finest... and your best buy on any basis of comparison

Select from a wide variety of beautiful styles and colors, from only \$19.95.



A. The Companion. Tiny, pocket-sized B transistor model with remarkable fidelity and station pulling power. With battery, earphone and carrying case—\$24.95.

B. The Surfside. Most compact (6 1/4" w, 3 1/4" h, 1 1/4" d) noise-free FM, AM radio ever! Big set features and tonal beauty. B transistors. With carrying case, earphones, batteries—\$59.95.

C. The Diplomat. Enjoy the beauty of FM wherever you go. 10 transistor FM/AM radio. Tone control, large speaker; superb fidelity you must hear to believe! With battery—\$79.95.

D. The Celestial. Brings you thrilling FM, AM, Marine and worldwide Shortwave reception—\$139.95. Same models with FM, AM... plus choice of either Shortwave or Marine band—\$125.



Firestone

Your Symbol of Quality and Service

You and other Firestone customers have accepted this name as a symbol of quality and service, and a mark of value for over 62 years. But have you ever wondered why? What it means to *you*, personally? And what Firestone does to keep this name so meaningful to you? It's worthwhile knowing . . . especially before you buy your next tire.

"I've had good luck with Firestone tires." That's how many steady customers explain their loyalty. While "good luck" is a natural way of expressing satisfaction, we'd like to point out that Firestone's reliability is anything *but* a matter of chance. *No part of your car is more thoroughly*

proved than its Firestone tires! Millions of test miles a year see to that. Many tire companies would be happy if their total tire sales brought in the money that Firestone puts into testing! No wonder Firestone keeps coming up with features that stretch tire mileage and add to driving safety. Sure, people

have "good luck" with Firestones. You will, too—when you buy, terms or charge, at any of Firestone's 60,000 Dealers and Stores where experienced tire men know tires and tire service best. *They know because tires are their business. You know what you're getting when you buy Firestone!*

The Firestone DeLuxe Champion, illustrated, carries a GUARANTEE for the life of the original tread against defects in workmanship and materials PLUS a 24-MONTH GUARANTEE against road hazards. Both guarantees provide for replacements prorated on tread wear, and are honored by 60,000 Firestone Dealers and Stores throughout the United States and Canada. Copyright 1962, The Firestone Tire & Rubber Company



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Within the month, you and your colleagues in the legal profession will be offered personal use of a new Imperial for a thorough driving test.

You will be asked only to specify an hour of appointment. Our dealer will deliver the car at your home or office; he will brief you on operation of its controls; he will answer any questions you may have.

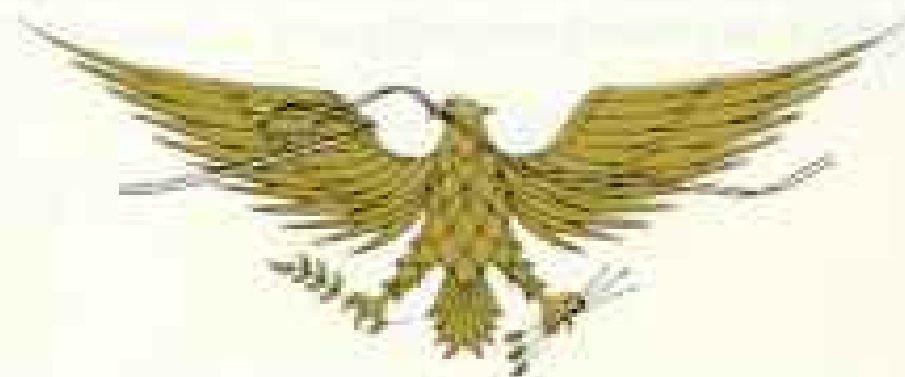
Then the Imperial is yours—not for a quick drive, but for as long as you need to make full and private evaluation of Imperial motoring.

You will learn much that will help you in selecting your next fine car. The extraordinary handling and roadability made possible by torsion-bar suspension, for example. And the satisfying sense of command you get from the most powerful engine and largest brakes in any American fine car.

So we propose that you alert your secretary for the arrival of our invitation. Should it fail to reach you, and you find our road-test offer intriguing, simply write to: General Manager, Imperial Division, 12200 East Jefferson, Detroit, Michigan. Arrangements will be made promptly.

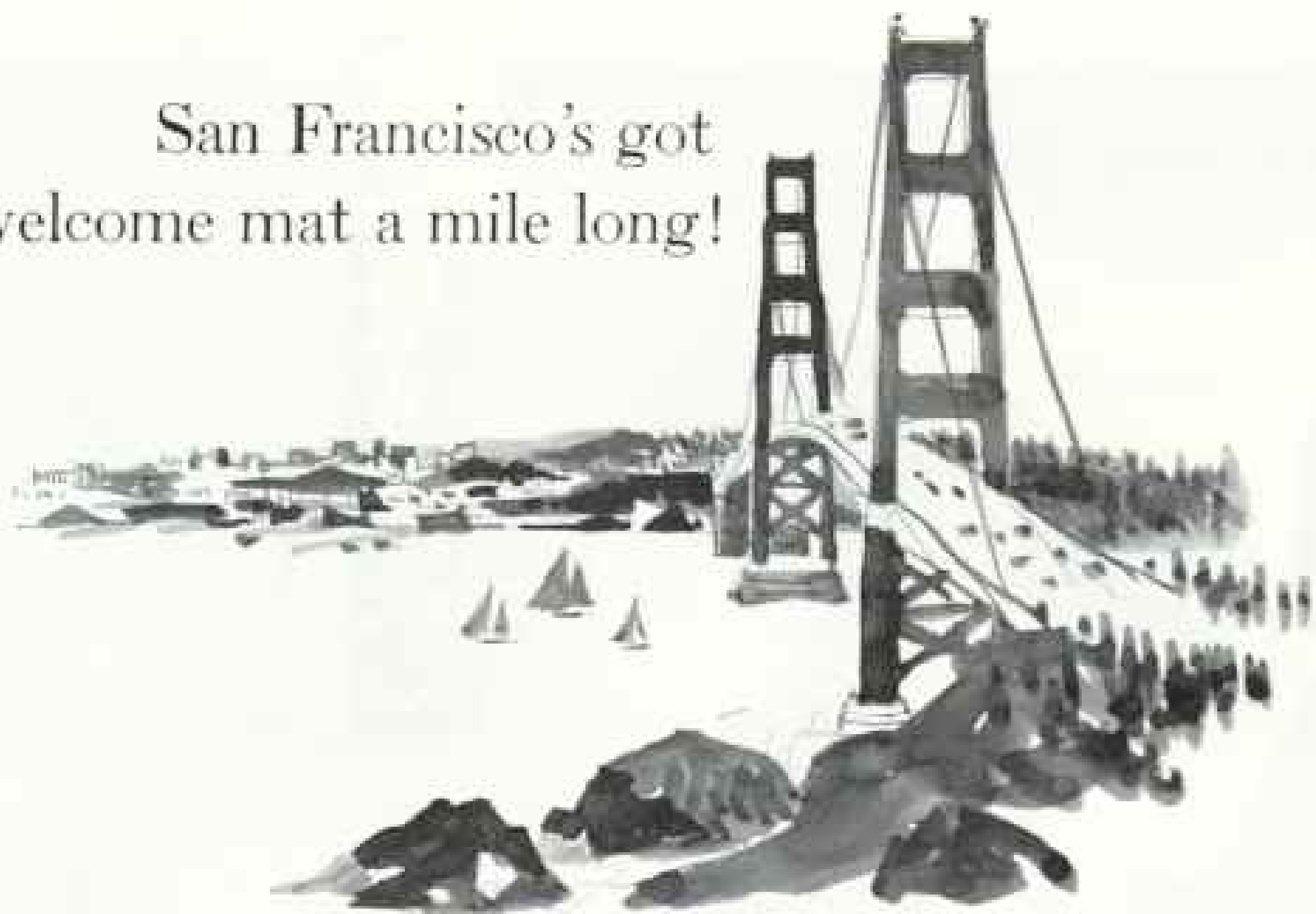
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You come from the north around the curve of a high hill, and there it is—mighty Golden Gate Bridge, a near mile between its great towers, welcoming you to this fair city, inviting you to share the life it loves. See how San Francisco's romantic past lives on in the richness of its present. Enjoy the city's worldliness and gaiety, its atmosphere of adventure. Stroll about rollicking Fishermen's Wharf. See the colorful sights of Chinatown. Visit the fabulous shopping,

hotel and theater district around downtown

Union Square. Dine in every language in San Francisco. Explore beyond the

City and Bay, through the Monterey Bay Country, Yosemite, the Redwood

Empire. *This* is the wonderful year to come out and enjoy San

Francisco (and see Seattle's Century 21 Exposition, too!). It's the year you and your family are going to remember for a long time!



Doug Kingman

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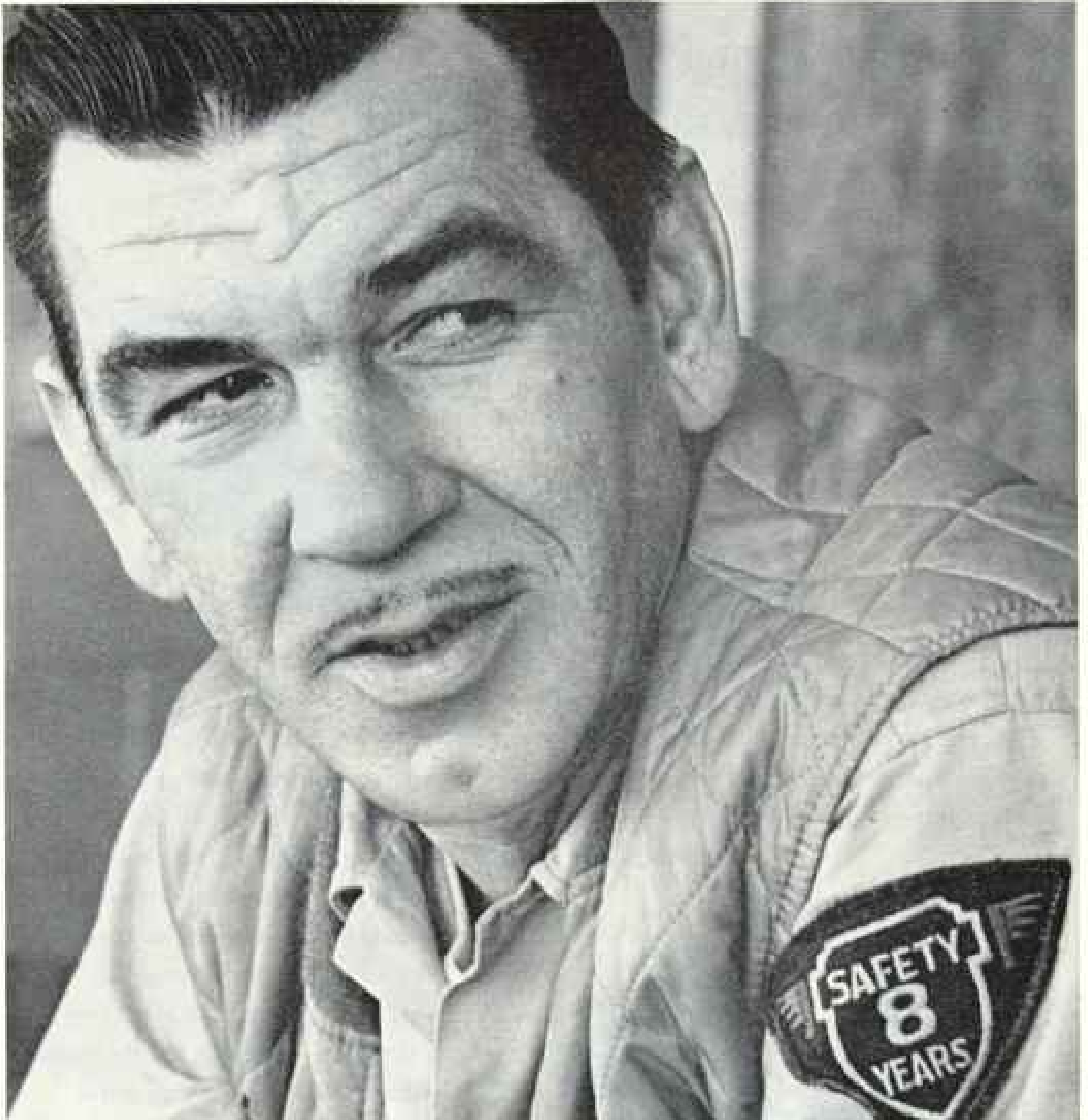
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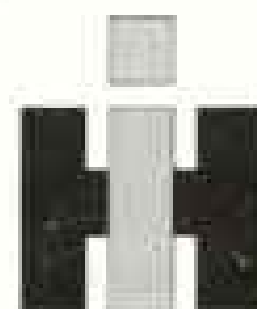


One of America's best drivers—William K. Johnston of F. J. Boutell Drivesway Co., Inc., Flint, Mich.

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Many a life has been saved by a truck driver's heroism and quick thinking. Many a stranded motorist has been aided by a passing trucker's road flares, first-aid equipment, knowledge of routes or mechanical skill. The trucking industry trains its drivers to *think safety* 365 days and nights a year ... to make our highways safer for all who travel.

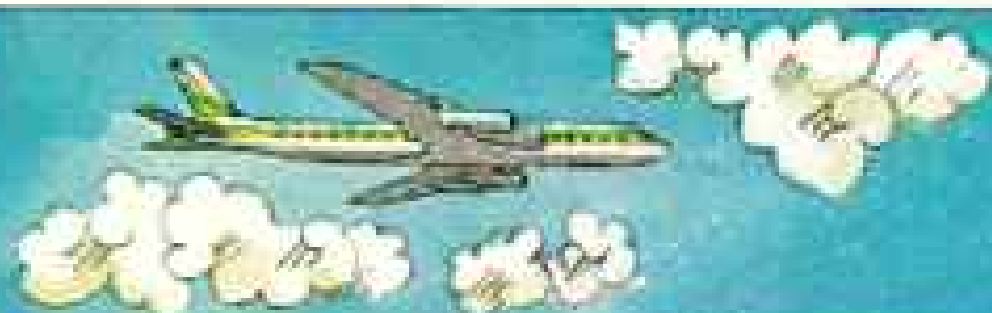
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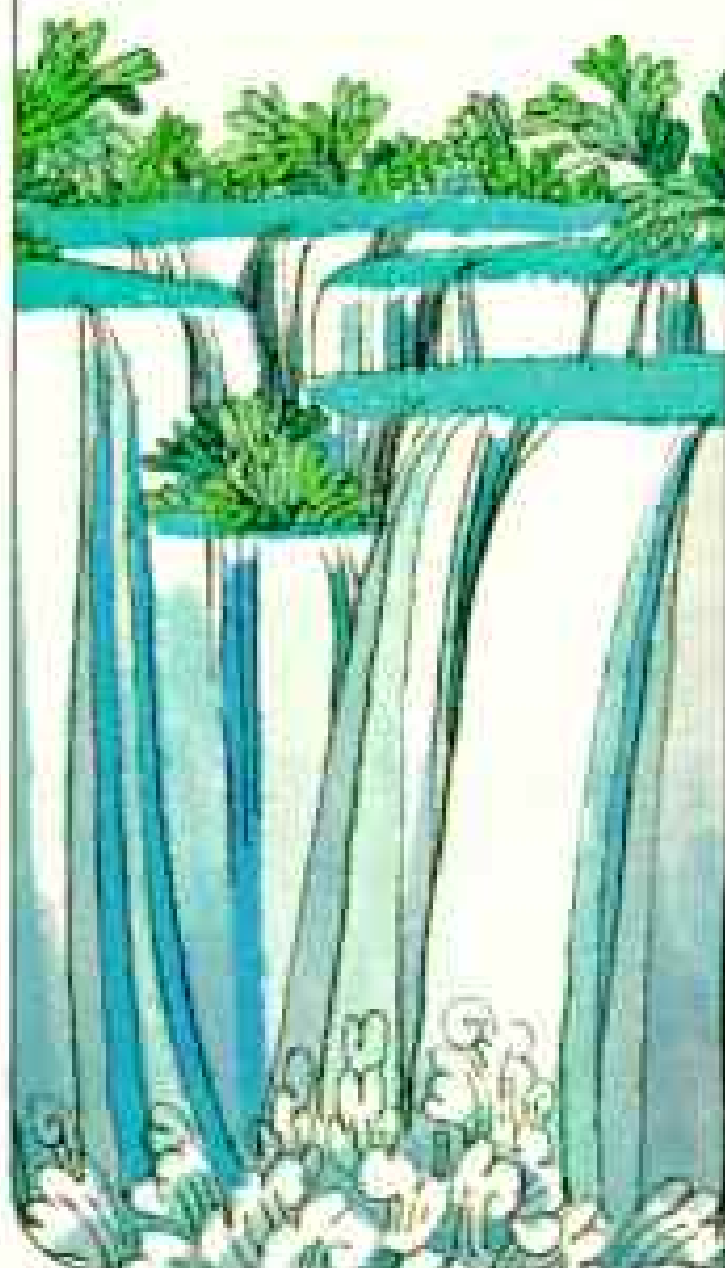
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FEEL THE MIST OF WATERFALLS HIGHER & WIDER THAN NIAGARA. Iguazú Falls rage on the Brazil-Argentine frontier. Below you'll meet the dorado, a famous game fish. Tying on to this torpedo is like going over Iguazú in a barrel.



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MID-ATLANTIC:
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GREAT LAKES:
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SOUTHWEST & SO. CENTRAL:
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Mo., N. Mex., Okla., Tex.

N. W. & GREAT PLAINS:
Idaho, Iowa, Minn., Mont., Nebr.,
N. Dak., Oreg., S. Dak., Wash., Wyo.

CALIF. & THE WEST:
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The new 1962-1963 Mobil Travel Guide is published in six editions by Simon and Schuster. Each volume is 5½" x 8", by about 1" thick. \$1 per copy except the Calif. and the West edition—\$1.50. Available at most Mobil stations, and bookstores.

Why does an oil company break all precedent to sponsor the first frankly rated travel guide in the U.S.?



Incredible as it sounds, every year 50% of the average American's vacation budget is spent for food and lodging.

"The country has been begging for a handy 'travel encyclopedia' for years," says Jason C. Berger, Vice-President, Simon and Schuster. "Listing places to eat and sleep isn't enough. Families planning a vacation want to know more than who, what, where and when. They want to know how good the food, service and accommodations really are—how much they cost.

"That's what you get in a new kind of Travel Guide sponsored by the Mobil Oil Company," he continues. "It comes right out and, for the first time, frankly rates—with a 1 to 5-star system—11,800 hotels and motels and 3,200 restaurants. Not just

the best, but the 'best buys' for every vacation budget.

"In six separate volumes—it tells you how good food and accommodations are; the prices; where to phone or write for reservations; even covers baby sitters and pets."

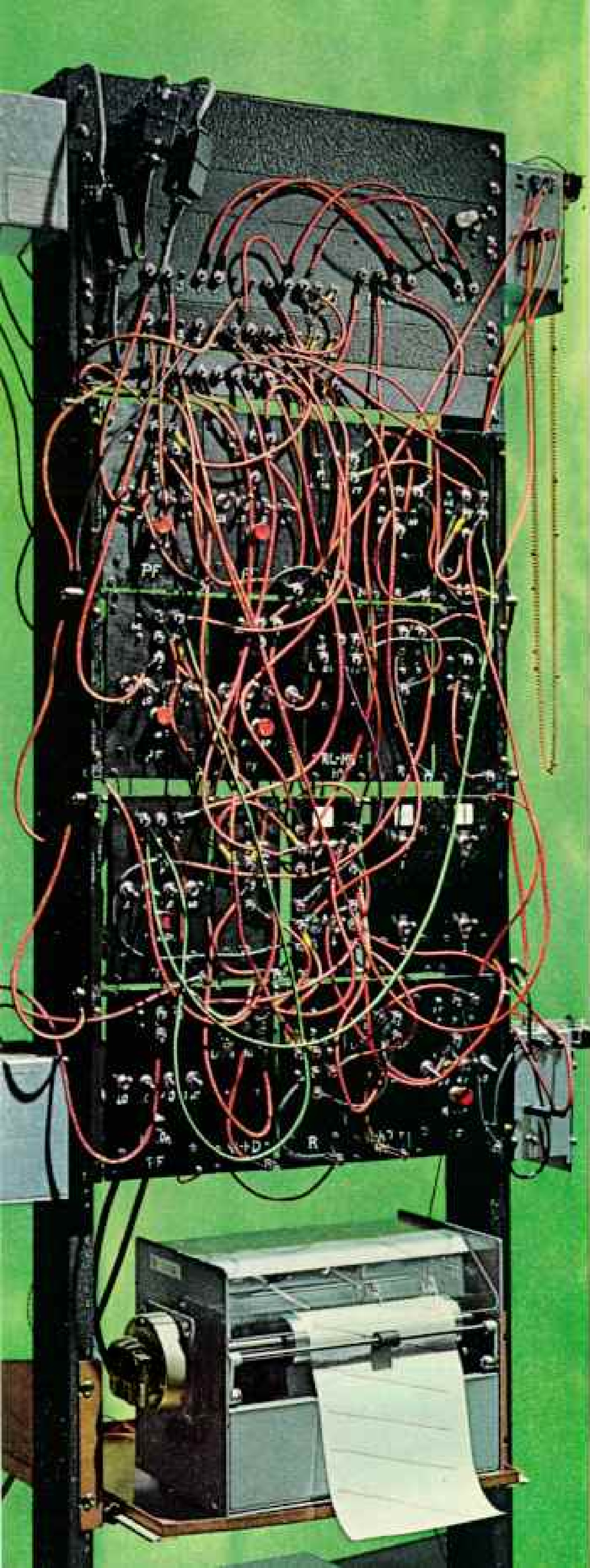
If you're planning a vacation, we urge you to get a copy of the Travel Guide now for the region you're interested in. You'll have fun going through it, you'll be planning wisely ahead, you'll find its frankness refreshing. *And, of course, we hope you'll look for the friendly Mobil Sign as you travel!*

Regional editions of the Guide sell for \$1 a copy—\$1.50 for the special California and the West edition—at most Mobil stations, and bookstores. If you do not find the edition you want, send correct amount plus your name and address to: Mobil Oil Co., Box 332-B, N. Y. 11, N. Y. No charge or C. O. D. orders.

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TRAVEL GUIDE
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Left to right: CLEMENTINE PADDLEFORD, N. Y. *Herald Tribune*. TED PATRICK, *Holiday Magazine*. SILAS SPITZER, food expert. ROBERT W. DANA, N. Y. *World-Telegram and Sun*. HERB CAEN, *San Francisco Chronicle*. Not pictured: TERRY HUNTER, *Chicago Sun-Times*. QUENTIN AULT, gourmet consultant, New Orleans, La.



IT KEEPS A MOST UNUSUAL DIARY

This intricate machine is being used by Parke-Davis scientists to measure patterns of learning, strength of motives, and the effects of new drugs on these aspects of behavior.

It is but one of many methods used in Parke-Davis research to discover new drugs that will act on the brain and other parts of the nervous system.

Mental and nervous illnesses hospitalize more patients at any one time than all other causes combined. For this reason, Parke-Davis has assigned more and more of its research capacities to searching for medicines useful in this field.

We started such work many years ago. Our efforts played a key role in developing the most successful drug to control epilepsy. Millions of sufferers from this disease can now lead near-normal lives.

But millions more are afflicted by other nervous disorders still uncontrolled. The need for help in this field is urgent. At Parke-Davis, special forces of scientists continue to devote their full energies toward the discovery of better medicines for these disturbed minds.

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PARKE-DAVIS

... PIONEERS IN BETTER MEDICINES

How to save money on a wagon without really trying

Economy comes built-in with these '62 wagons from Chrysler Corporation. Here's how they save you money . . . automatically.



DODGE CUSTOM 880

You get a lot more action on a lot less gas
Gas bills don't have to go way up when you switch to a wagon. At least not with these. While Chrysler engineers have increased acceleration as much as 10%, they've also improved gas mileage—as much as 7%!

Along with better economy, you get better ride—Chrysler Corporation's Torsion-Aire Ride. It's still rated by most experts as the finest suspension system on any American car.



PLYMOUTH FURY

Exclusive Alternator lengthens battery life

The batteries in these wagons will keep their "kick" a lot longer, especially in city driving. The reason is the Alternator. It provides up to 10 amperes of charge even when the engine is idling. So there's no drain on the battery; more power in reserve. And the longer battery life will save you plenty over a few years—around \$15.00 or more for each new battery you *won't* have to buy.

Unibody Construction means fewer squeaks and rattles

What's the secret of strength? Unity. That's exactly what makes Unibody Construction a far superior way to build wagons. Unibody makes body and frame a solid, one-piece unit. It eliminates the major cause of squeaks and rattles—it's *100 per cent more resistant* to twisting forces than the conventional body-bolted-to-frame construction. And Unibody trims away useless bulk to give more spread-out room inside!



LANCER 770

There's a lot less maintenance

You go 4,000 miles between oil changes . . . 32,000 miles between major lube jobs. That means you'll only have your wagon up on the rack about eight times in three years of average driving. You'll save over \$60 in lubricants alone.

You'll also save on repairs and replacements. Mufflers are aluminized to last twice as long as uncoated steel mufflers. Distributor points are ventilated to run cooler and last much longer.



CHRYSLER NEWPORT

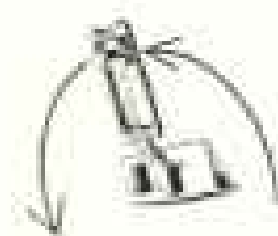
7-soak rustproofing guards the finish

We put these wagon bodies through the industry's most thorough rustproofing to help keep them brand-spanking new. They go through 7 giant tanks and get more than 20 different rinses, sprays, and dips. When they leave the 7th tank, they're set to fight off any cause of rust—whether it comes from salted streets or the mud and gravel from a rugged hunting trip.

Practical features for wagon people

One push and the seats fold flat

In most models you just push the back seat forward. Hinged panels automatically make a flush, flat cargo bed. (Tailgate swings down easily, has no braces to interfere with loading.)



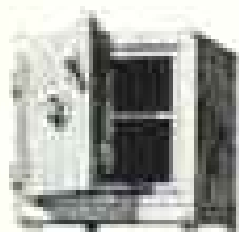
The rear window rolls down

And it rolls down from the outside, where the kids can't reach. With power windows (standard on some models), you can control the window from the driver's seat with the push of a button.

The third seat faces the rear

You'll find this in all our 9-passenger wagons. It's convenient for grownups (enter from the rear) and a good, safe place for the kids. Everybody likes the view.

128



Hidden luggage compartment

In some wagons, there's a luggage bin concealed under the rear floor. An optional lock keeps your valuables safe.



DODGE DART 440

The upholstery can take it

You won't have to baby this upholstery when you're hauling kids, tools, lumber or furniture around. Most vinyl-and-fabric interiors have more than 50% of nylon warp added to them to make them last. They're treated with special conditioners that ward off dirt and grime. And they're sewn with extra overlap to keep the seams from popping out. These fabrics will wear up to *twice* as long as ordinary upholstery fabrics.

Try them for size! Take a demonstration drive at your favorite dealer's next weekend. Take the whole family and see how much room is left over!

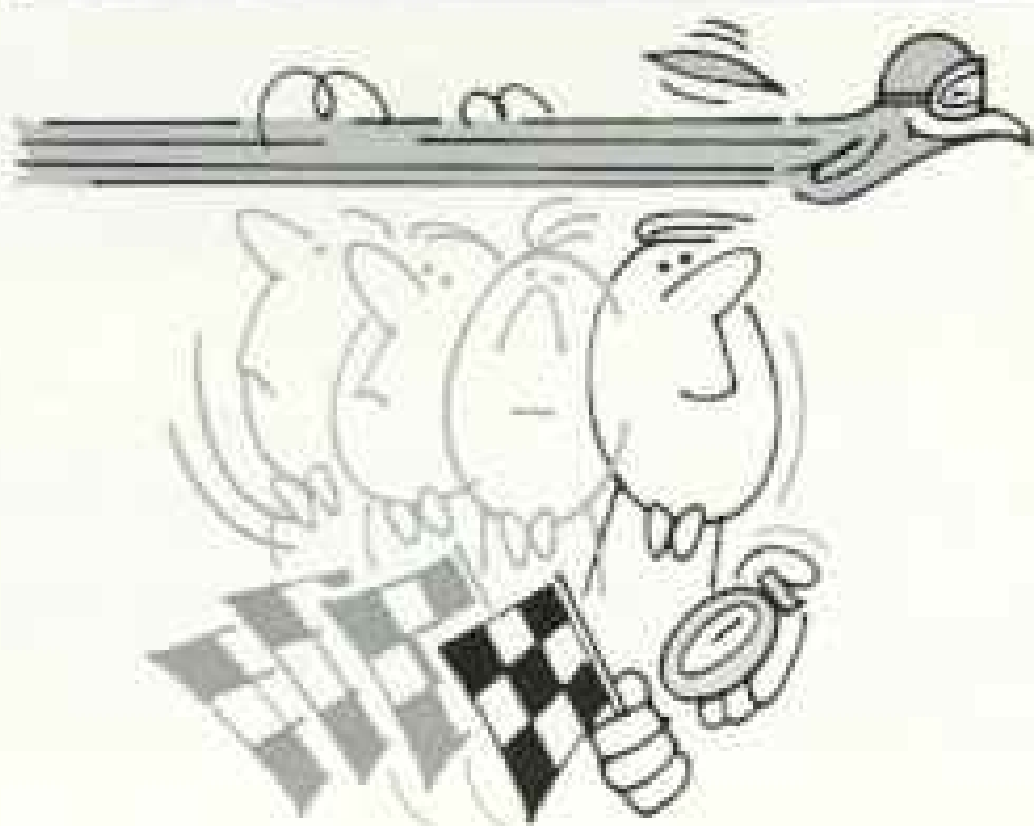
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Where engineering puts something extra into every car

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TRAVEL QUIZ



Birds called "swifts" have been timed at 200 MPH in:

- Borneo India Canada

Bird watchers traveling in India have trouble keeping track of the slowest of the swifts. But bird lovers never need ruffle their feathers keeping track of their money. First National Bank of Chicago Travelers Checks are money that's protected. Only you can cash them.

World's largest columnar structure was built in:

- Egypt Athens Turkey

It took ancient Egyptians two thousand years to complete the great temple at El Karnak. Today, in Egypt or anywhere else, it takes just minutes to complete and cash a First National Bank of Chicago Travelers Check. Each denomination has a color of its own (\$10, \$20, \$50, \$100) for fast identification. It's the safe, convenient way to carry money.

The only WWI shells falling on U.S. soil fell on:

- New Orleans Cape Cod Ft. Lauderdale

A German submarine left a few shells as a calling card on Cape Cod during World War I. Before you visit the site, visit your bank and ask for First National Bank of Chicago Travelers Checks.

The First National Bank of Chicago

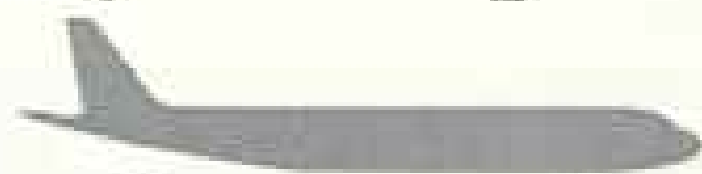
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the calm beauty of Japan



at almost the speed of sound

You feel you are "in Japan" the moment your hostess welcomes you to your seat aboard a sleek DC-8 Jet Courier of Japan Air Lines. All around you is the traditional atmosphere of Japan. In the pinebough brocade of your seat cushions, the raked-sand texture of the carpeting, the symmetry of a sliding shoji screen, you catch glimpses of the calm beauty that is Japan.

But on Japan Air Lines, your introduction to the Orient is more than visual. The service, too, is delightfully Japanese. In her colorful kimono, your hostess pampers you so graciously you feel like an honored guest in a Japanese home. As she serves you a refreshing o-shibori hot towel, warmed sake or a cocktail, a tray of Oriental delicacies before your gourmet dinner, you relax in a wonderful timelessness, beyond all cares.

Yet so swift is your flight aboard one of JAL's magnificent Douglas DC-8 jets, it is little more than one long sunset beyond Hawaii before you arrive in Tokyo. JAL now provides this unique preview of the Orient ten times every week—from Los Angeles, San Francisco, Honolulu. See your travel agent, and fly amid the calm beauty of Japan at almost the speed of sound.



JAL hostess Sachiko Hyakumura



JAPAN AIR LINES DC-8 JET COURIERS

Why do
so many
professional
eye men
recommend
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Sun Glasses



Professional eye men, of all people, know that sun glasses should be something more than ordinary glass, set in attractive frames. That's why so many fine optical offices recommend Ray-Ban Sun Glasses. They're made from genuine optical glass, ground-and-polished-to-curve. They filter out the harmful rays of the sun, cut down glare without distorting your vision. In short, Ray-Ban Sun Glasses keep your eyes cool, calm and *protected*. Plain (non-prescription) Ray-Ban Sun Glasses are available at optical offices and fine stores everywhere. Priced from \$4.95 to \$24.95. Try on a pair... you won't settle for less. For free folder, write Bausch & Lomb Incorporated, Rochester 2, New York.

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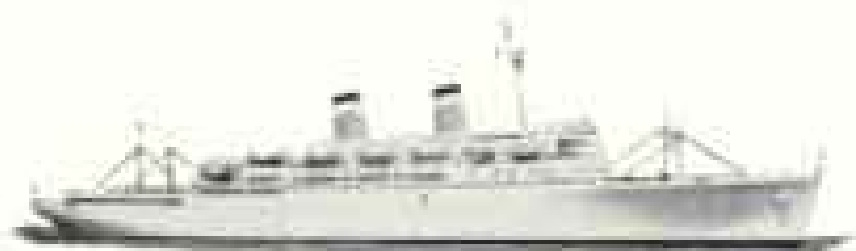
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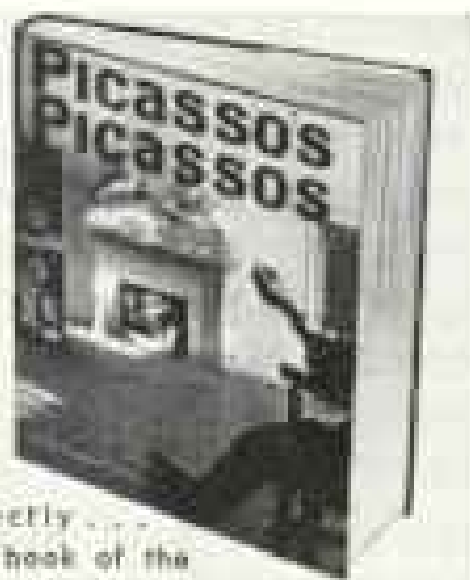
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CHICAGO SUN-TIMES

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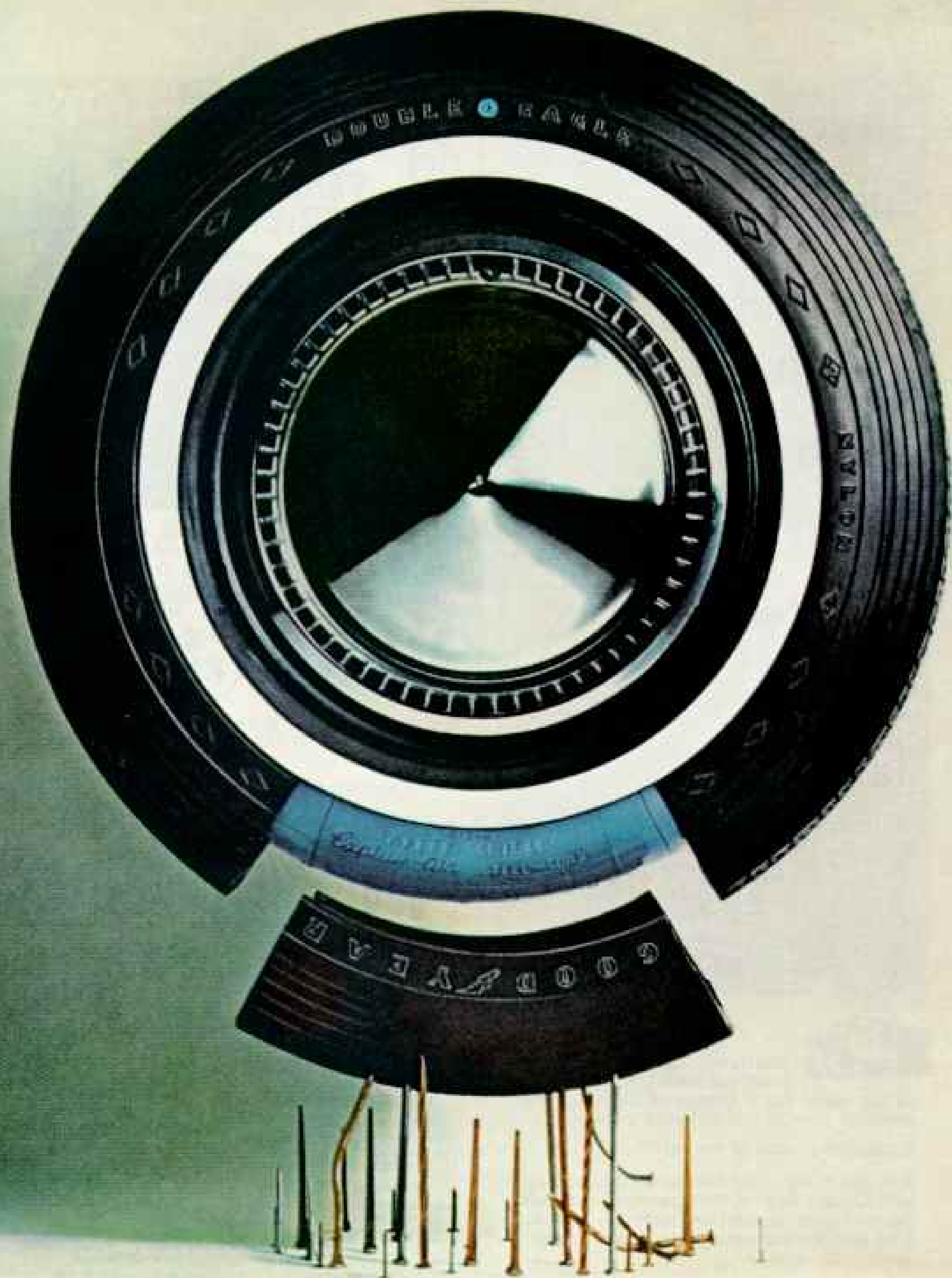


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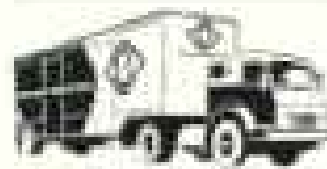
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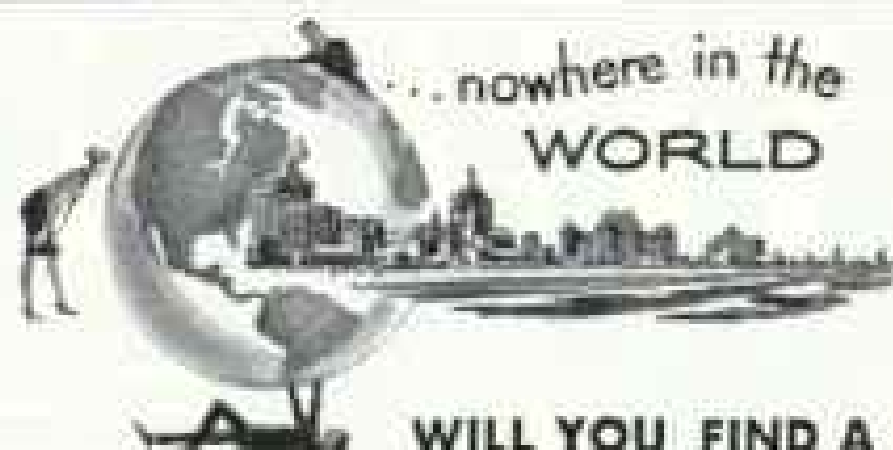
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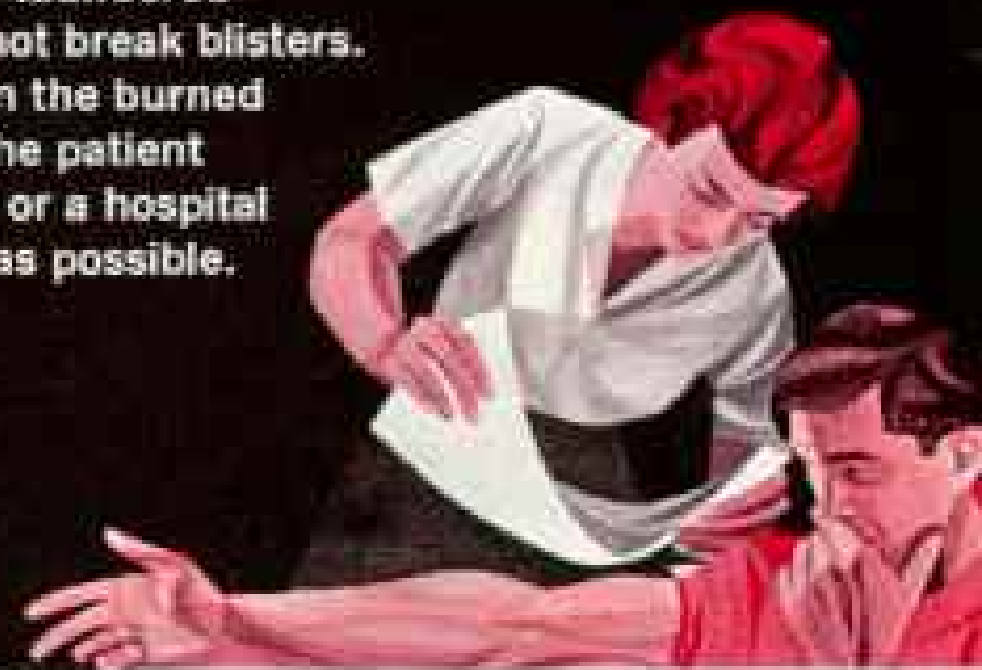
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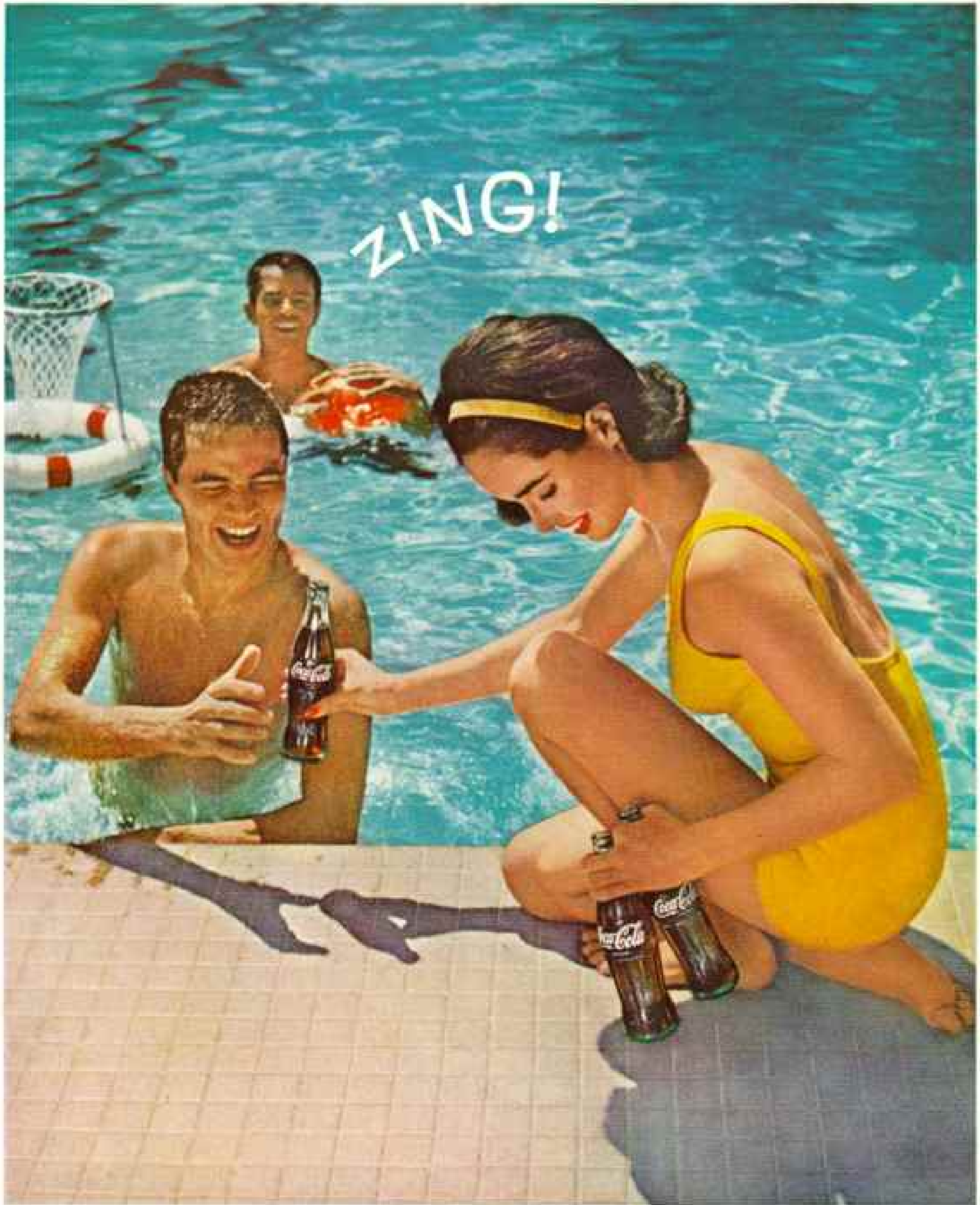


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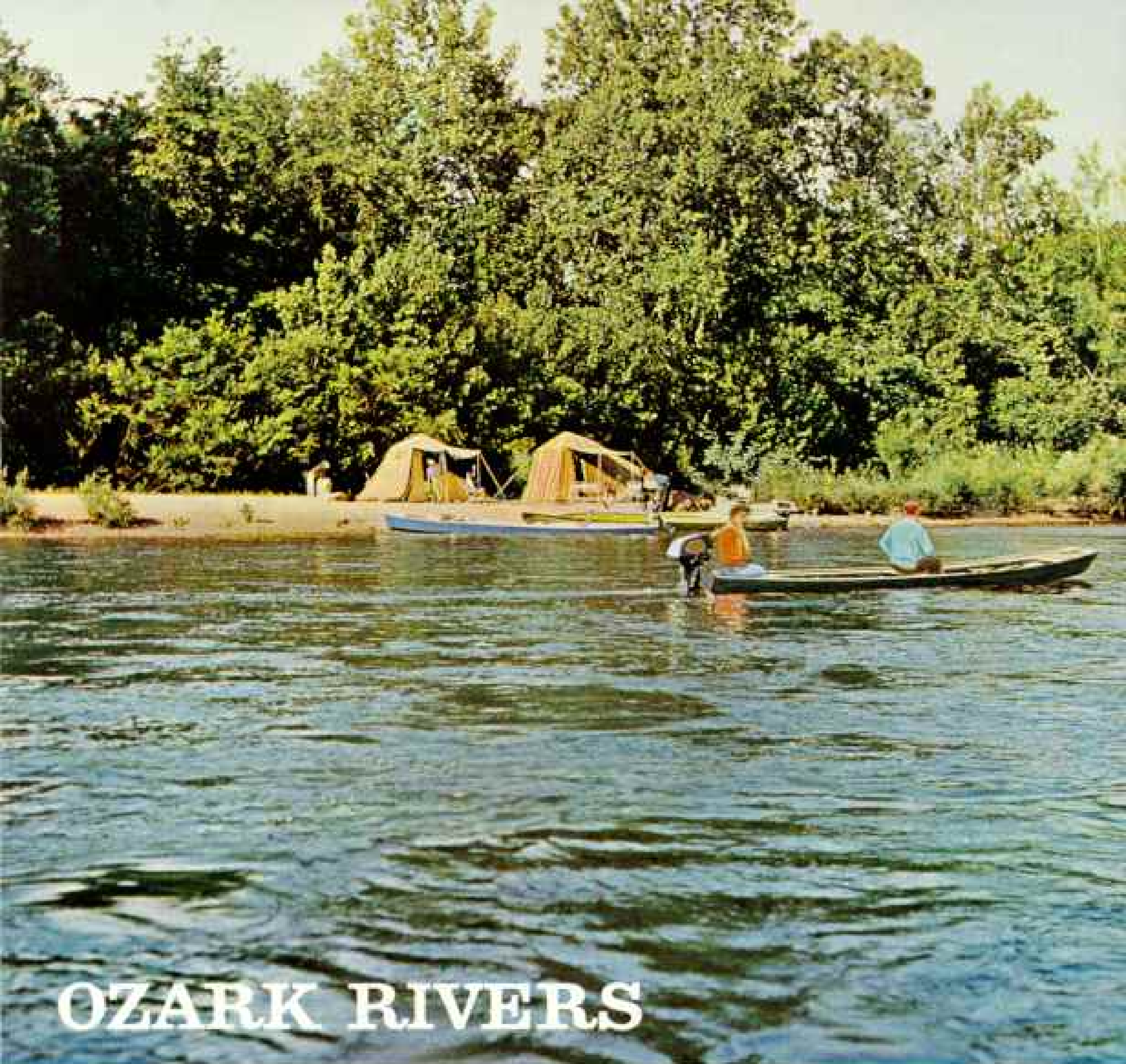
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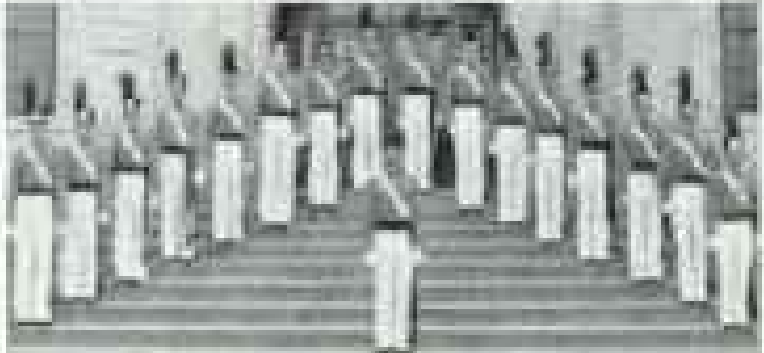
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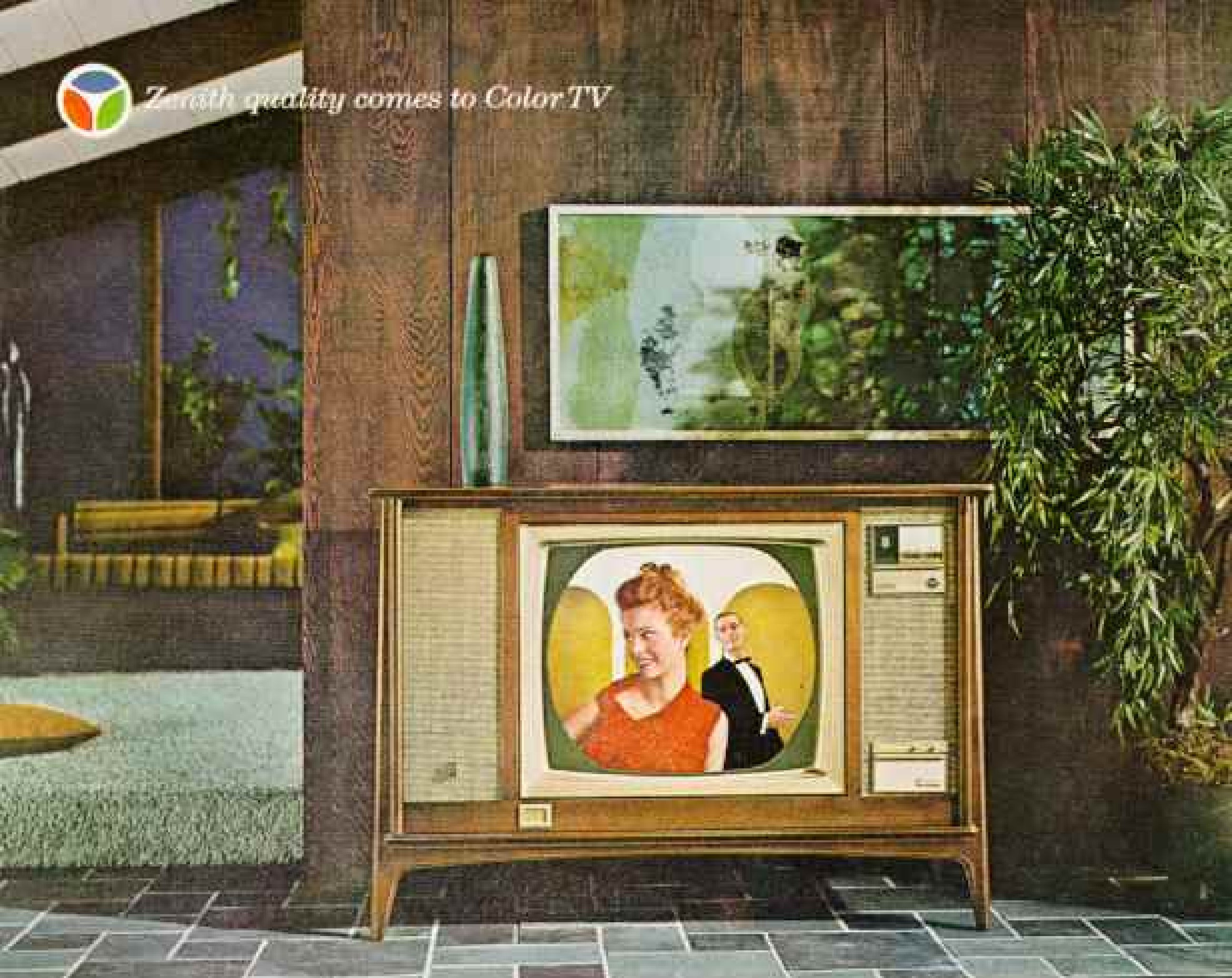


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