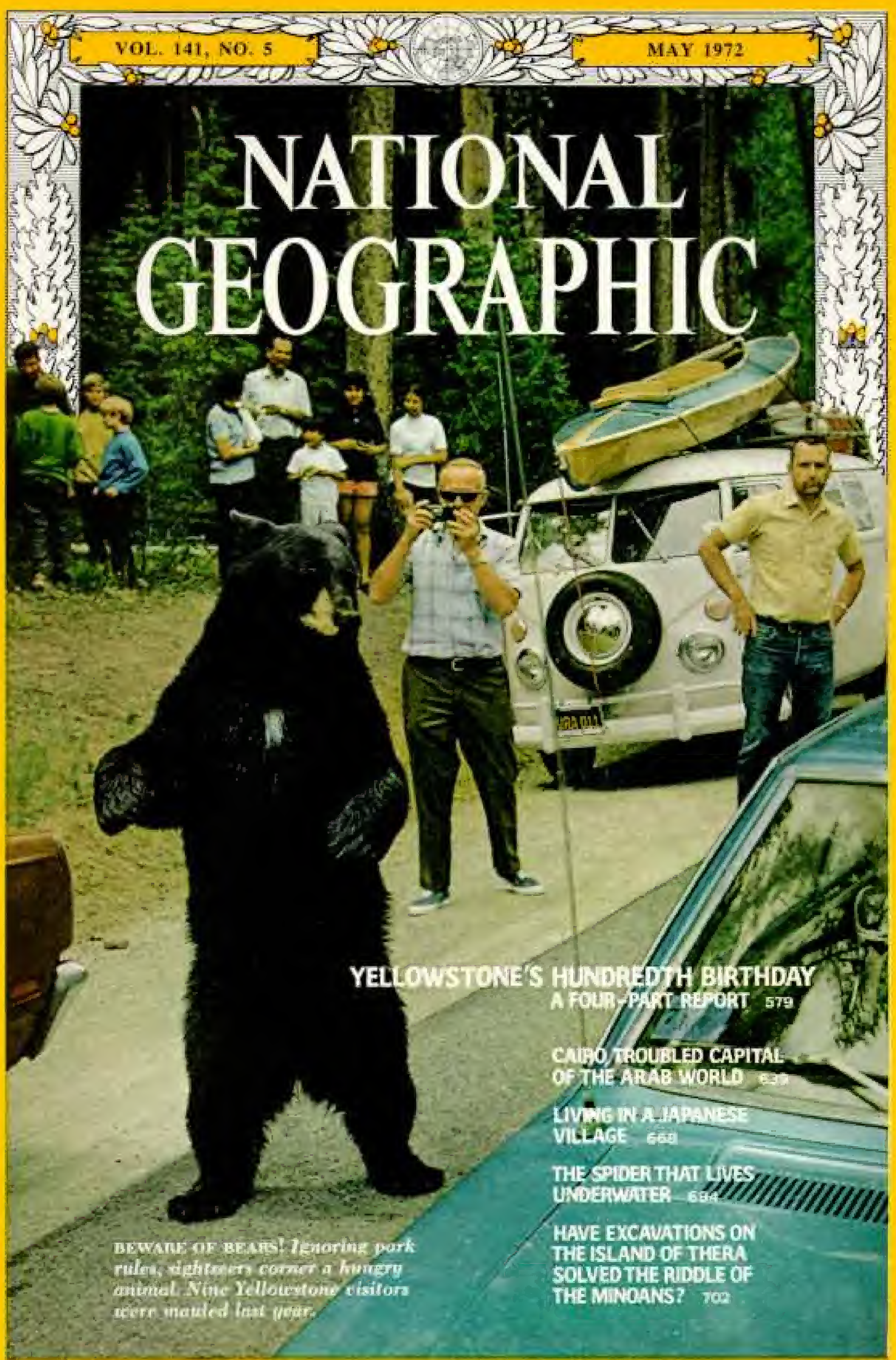

OFFICIAL JOURNAL OF THE NATIONAL GEOGRAPHIC SOCIETY WASHINGTON, D.C.

NATIONAL GEOGRAPHIC SOCIETY

WASHINGTON, D. C.

Organized "for the increase and diffusion of geographic knowledge"

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After you've convinced him what an economical gift you've given him, why not go back to the store and buy another 75 Classic for yourself? After all, you're economy-minded too.

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Enlisting the bushbaby in science's service

BUG-EYED AND FLUFFY-TAILED, the African bushbaby has recently taken on a big job. A primitive primate whose ways have changed little over the past 50 million years, the animal promises to throw new light on the development of all the other primates, including man.

Aided by National Geographic grants, Professor Gerald A. Doyle (below, right) studies bushbaby courtship, territoriality, communications, and other behavioral traits. Here the psychologist and Dee Pinto, a research assistant at South Africa's University of the Witwatersrand, observe the nocturnal creatures in red light, which is invisible to bushbaby eyes.

Enable friends to join in supporting the Society's wide-ranging research projects. Nominate them for membership on the form below.

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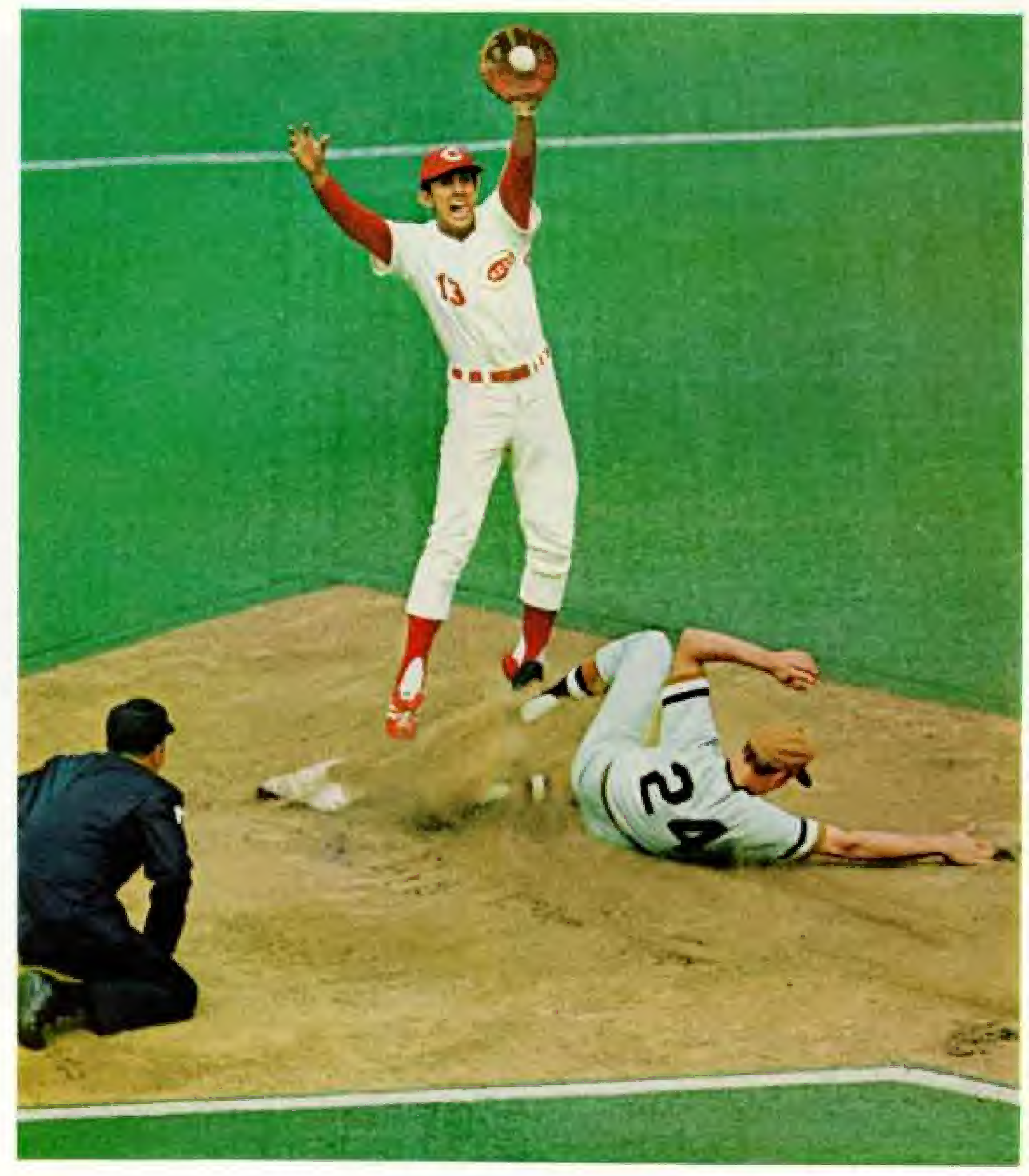

Which one is

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the night game?

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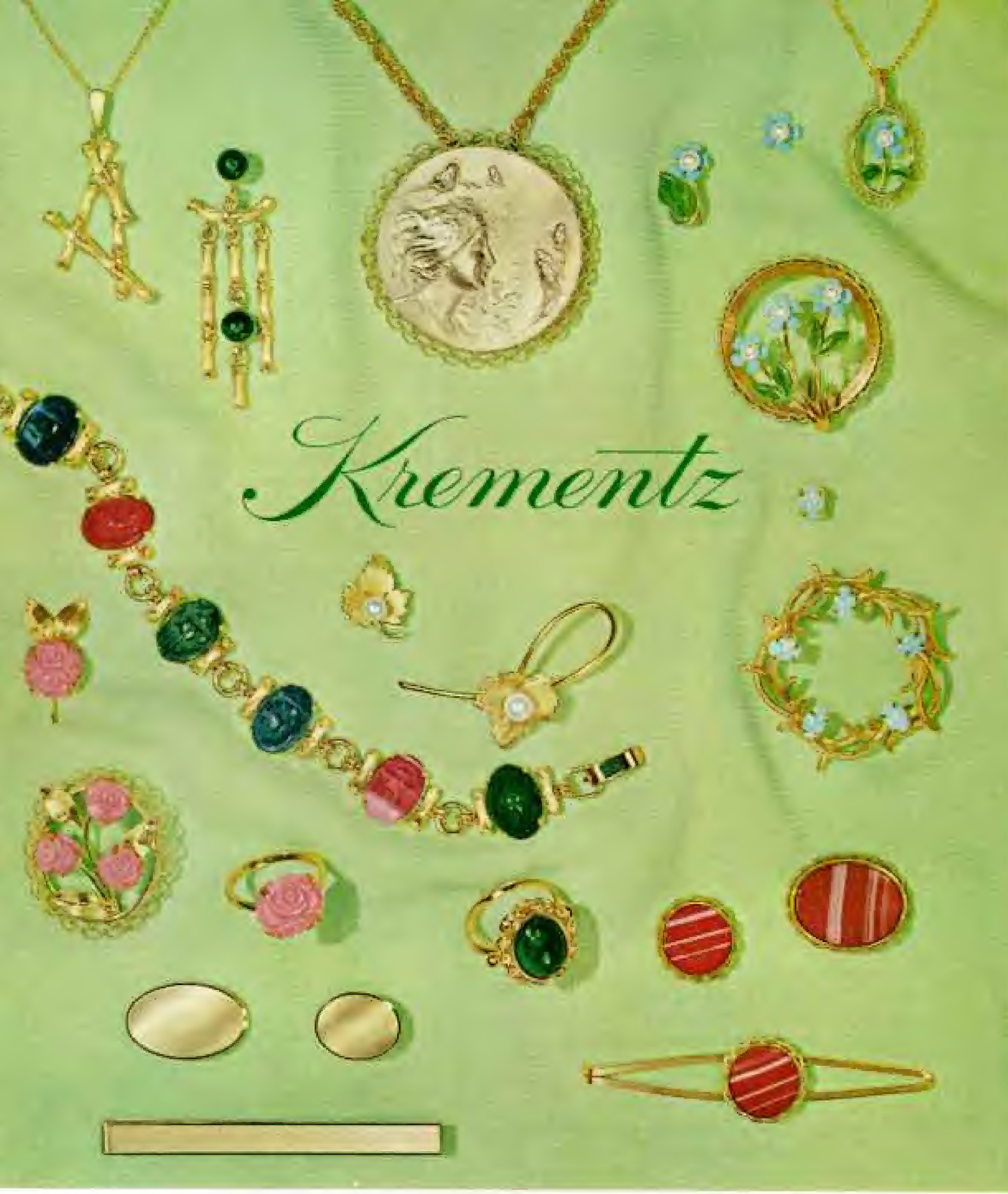

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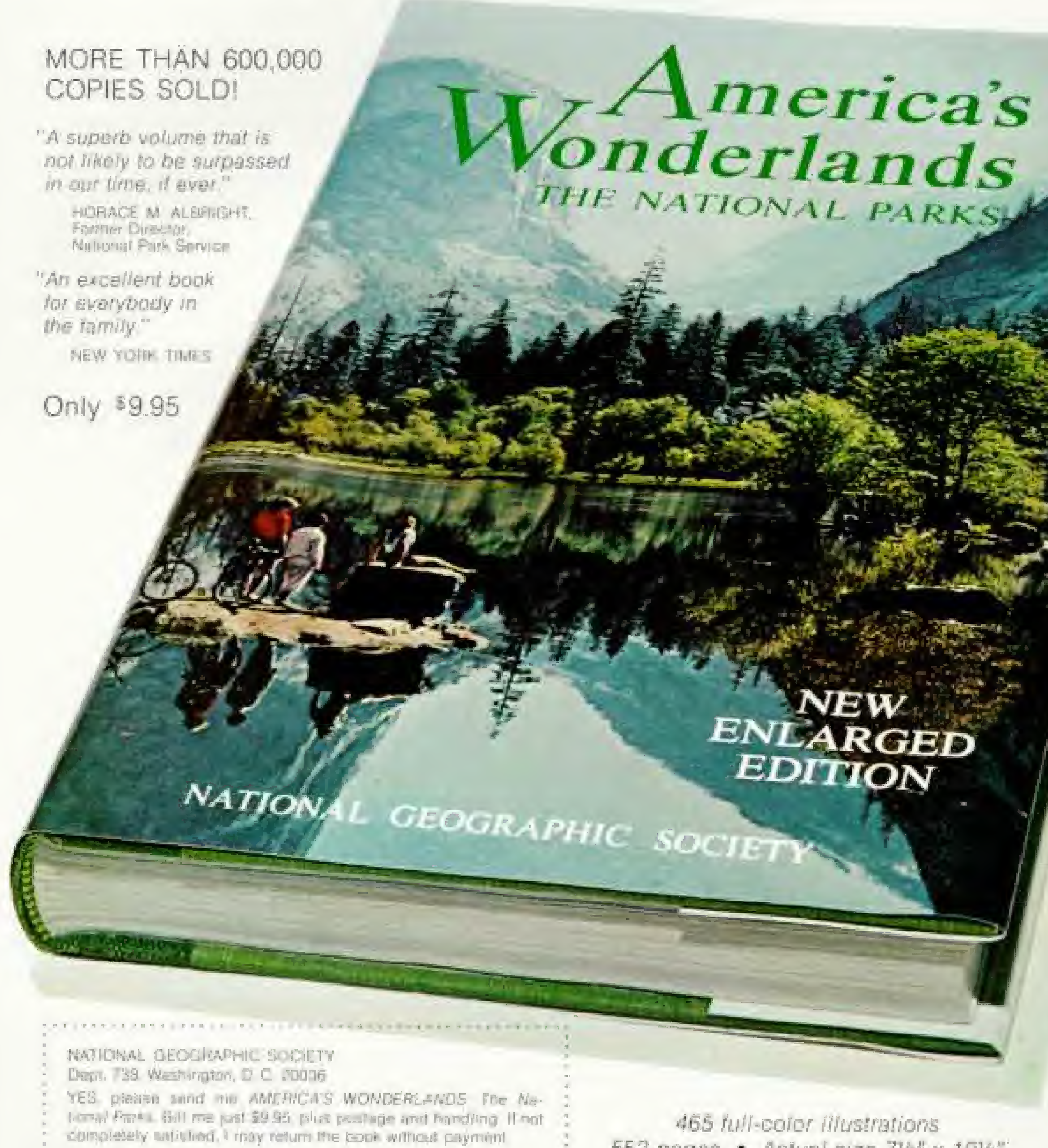

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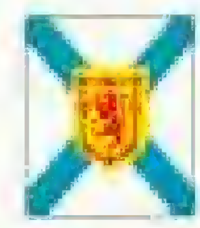

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NATIONAL GEOGRAPHIC

May 1972

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YELLOWSTONE AT 100

A Walk Through the Wilderness

By KAREN and DEREK CRAIGHEAD

Photographs by SAM ABELL

YOUNG JOHN CRAIGHEAD ON THE TRAIL

THE CRAIGHEADS: Three generations of this remarkable family have pursued the same high goal, the preservation of wilderness and wildlife. At 81, noted ecologist Dr. Frank C. Craighead, Sr., strives to protect Florida's Everglades. His sons Frank and John, both respected wildlife biologists, have written for NATIONAL GEOGRAPHIC since 1937. Their years of Society-supported grizzly bear research in Yellowstone were vividly described in magazine articles and the award-winning TV documentary "Grizzly!" Now their children—each has three—follow the same wilderness paths, the two families starred in the Geographic television special "Wild River."

A FOOTFALL awakens me in my sleeping bag in the small hours of a starbright August night. Fearfully I search the dark. A bulky hump-shouldered animal moves ominously toward me.

We are camped deep in grizzly bear country, exploring Yellowstone National Park's primeval back of beyond. My brothers—Derek, 22, and John, 17—and I have spent many summers and winters roaming this uninhabited wilderness, helping our father and uncle on wildlife research projects. Attack by grizzly, we know, is very unlikely. But it can happen, and I do not care for this moment.

Then I hear an indignant snort, and our visitor ambles up the trail. I see him better, silhouetted on the ridge. His antlers blank out the stars and release the tension in me.

"I'm glad it's you, Mr. Bull Moose," I whisper, and drift back to sleep.

My seven companions and I are visitors here, but we share a partnership with nature, and a curiosity too. Our trek aims to make a wide circuit of Yellowstone's vast, little-known backcountry. What values and obligations, we want to know, does this great preserve hold for today's young people, its inheritors?

At dawn I rouse to the crack of splintering wood; Derek is laying the breakfast fire. John walks into camp with our food, cached last night several hundred yards away as part of what we term "bear discipline." The other part is to sleep under a good climbing tree.

"Did you see the moose last night?" I ask.

My brothers laugh. They lead me and our fellow backpackers to the trail. There, superimposed on the moose's hoofprints, are the tracks of a grizzly.

Despite my earlier apprehension, I enjoy the sight. It makes me feel a growing oneness with this wild and unspoiled land.

Our trek began at Gardiner, Montana, the park's northern gate (map, page 587). Completing our wilderness circuit will take more than a month of all-weather, all-terrain hiking. We'll come off the trail only briefly to renew our food supply.

We shall meet few people in the vast area of backcountry we must circle: a handful of other backpackers, perhaps half a dozen horseback trains. Yet there are people, thousands of them. Miles away, locked in traffic jams in the "civilized" part of the park, they thrill to glimpses of bear, moose, and elk and marvel at Old Faithful's eruptions.

This motorized cavalcade of humanity visits less than 5 percent of Yellowstone. Few

Gloved by algae and minerals, fingers of rock thrust from steaming hot springs beside Ferris Fork in the seldom-visited outback of Yellowstone National Park. On a 34-day, 250-mile backpack trek, the authors and their companions sought out remote trails instead of paved roads, and raised their tents in lonely glens instead of crowded campgrounds. Their rugged journey introduces a four-part look at Yellowstone, the great "pleasuring-ground" that Congress set aside for all Americans a century ago.

have ever seen the rest; to do so one must walk. I am both sorry and glad.

We are hiking nearly 250 miles to view the part nearly everyone misses. All of us already have discovered this much: Each mile will test the body and broaden the mind. Yellowstone's wilderness is an adventure of the soul as well.

No adventure gets far, however, on an empty stomach. "Breakfast," shouts husky Bob Cole, 16, a friend and neighbor from Missoula, Montana. We turn away from the bear tracks to gather around the campfire.

Bob carries water from a creek in fire-blackened pots. Seventeen-year-old Mary Berthrong, a hardy 100-pounder from Colorado, boils cereal and dried fruit. She stirs this lumpy mush and ladles it out. We add brown sugar and set to.

Morning and night, our diet consists mostly of freeze-dried food reconstituted with water. At lunch we snack on jerky (dry beef), cheese, kippers, sardines, gingersnaps. Along the trail, we munch candy bars or "gorp"—a mixture of raisins, nuts, and sweets. We drink hot tea, chocolate, and coffee, and take our water where we find it.

Most of us rate this fare tolerable-to-good. You can't be choosy in the wild. A tenderfoot from Maryland, tousle-headed Robbie Jordan, only 14, always scowls at the breakfast mush with its globs of raisins, apples, and apricots. He won't be a tenderfoot long, but he'll never like this porridge.

Hikers Grew Up in a Huge "Backyard"

We eat breakfast perched on logs around the fire. Then we douse the fire, police the area thoroughly, fold our three tents, divide the food, and reload our packs.

Each of us carries a sleeping bag and pad, a change of clothing and long underwear, rain gear, medical supplies, and insect repellent. And there are hunting knives, cameras, fishing rods, binoculars, and flashlights. We each haul 30 to 40 pounds on our backs. Happily, the burden lightens with every meal, and we toughen with every step.

Derek, our guide and manager, wants to step off at least a dozen miles today. It is seven o'clock. "Let's go," he yells.

We sling packs. In minutes we string out single file and take up the rhythm of the trail.

Derek ranges ahead. Now a senior at the

University of Montana majoring in wildlife biology, he has hiked over much of Yellowstone doing research on grizzly bears.

Our perky friend Mary paces near him; she can keep up with—or outdo—almost anyone. Bob Cole and John follow; both are high school athletes. Off to one side, camera cocked, strides photographer Sam Abell, 26, an experienced backpacker from Virginia. Sam and Derek are recording our trek on film. Young Robbie walks in front of me.

I have just turned 24, a University of Montana graduate in zoology. I have known Yellowstone in many moods and all seasons; to me and my brothers, it has been a $2\frac{1}{4}$-million-acre backyard. I too am physically fit, except for one thing. You might think, with all the hiking I've done, that I'd be immune to blisters. Not so. My feet are killing me.

Actually, blisters beset all of us but one, and he bears other woes. Robbie's father, Robert Paul Jordan, who is more than twice my age and accustomed to sea level, stretches his lungs painfully to obtain the oxygen his muscles demand. Bob will acclimatize.

Good climbing tree, a wise precaution in grizzly country, looms above a nylon tepee fashioned from parachute panels.

Birthday breakfast, a fresh-caught cutthroat trout comes from a sizzling skillet. Twenty-four-year-old Karen Craighead cooks it herself.

"Joys" of the Trail Include Mosquitoes

I survey the bobbing line of hikers; it moves well, morning-fresh and aggressive. My mind slips into private thoughts and the solitude that binds hiker and wilderness.

The early hours are best, I decide. Fields of wild flowers glisten with dew, the sun paints with pastels, water makes lovely talk in the rills, the very air blesses us. For fleeting seconds a band of elk stands motionless on the skyline, fixed against flowing clouds.

We are hiking where Indians once walked. Parties of Crows and Bannocks moved through this mountain-rimmed bowl of meadows and forests, and saw streams flowing forever east here, west there. They called the region the "top of the world."

Mountain men also walked this way, and looked at the region differently. They goggled at what the earliest of them had described: earth trembling and rumbling, seething infernos, boiling waters fractionating into millions of tiny cascading diamonds.

An inferno it can be, at times. All too soon the day's heat arrives, and the mosquitoes. We ache with the discovery of new muscles. We grow thirsty, then cotton mouthed; that snow patch high on the flank of Amethyst Mountain will be our first water.

We strike upward. Footing is treacherous. Break a bone, and help will be long hours in

"A quest for the unspoiled and the unseen," Karen calls the backcountry expedition. Few of Yellowstone's hordes of visitors venture from the roads to reap the park's full bounty of beauty.

Carrying 30- to 40-pound packs, the authors' party crosses a meadow atop Specimen Ridge, whose cliffs contain layer upon layer of fossil trees. In the distance rises Amethyst Mountain.

coming. We carry no radio; one of us would have to walk out for aid.

Survival of the fittest rules here. The other day, in the Black Canyon of the Yellowstone, we found elk antlers and bones. Hundreds of elk had wintered here on dry grass and shrubs. There wasn't enough for all. Starvation cut down the old and weak.

Later, slogging up a dusty, sagebrush-dotted stretch of Specimen Ridge, we contemplated the boneyard of antiquity itself. We stood in the midst of 40 square miles of fossil forests. Petrified wood lay everywhere, scattered remains of ancient redwood, sycamore, hickory, oak, magnolia, walnut, pine.

The most dramatic display of all waited not far off the trail. Partially exposed by cliffs, 27 buried fossil forests rest one atop the other in about 2,000 feet of compressed volcanic ash and mud.

Wilderness Speaks With a Gentle Voice

An eerie slice of 50-million-year-old earth, Specimen Ridge. Sam Abell cheered us by recalling the jaunty words of Jim Bridger, famed trapper of the early 1800's:

"Yes, siree, thar's miles o' peetrefied hills, covered with layers o' peetrefied trees, and on 'em trees air peetrefied birds a singin' peetrefied songs."

How nice, I thought. Songs for forever. And then I snap out of my reverie.

My ear picks up the forever sounds of Yellowstone, all about us. We have crossed Amethyst Mountain and left the trail, plotting our way by topographic map and compass through dense forests of lodgepole pine. Forests cover four-fifths of Yellowstone. We scramble over the silvery jackstraws of long-fallen trees; in a delicate balancing act on their trunks, we bridge gurgling streams.

Overhead, slim green pines creak in the soft breeze. Our presence alerts a great horned owl; he hoots with a resonant baritone and flies away. Soon a nameless waterfall offers both music and welcome water therapy—bathing, drinking, playing.

The next day, rested, we cross Mirror Plateau. Golden eagles and goshawks command its skies, scanning earth for grouse, squirrels, chipmunks, small birds, gophers, and snowshoe hares. "There's a porcupine," Mary announces. We watch him waddle into a thicket. He will go unchallenged unless by a hungry grizzly bear or coyote, which occasionally accept a mouthful of quills as the price of a full belly.

In the distance we see an old bull bison; he limps across the meadow, alone, no longer able to keep up with the herd. Badly crippled, he will not live out the winter. When he dies, coyotes and ravens will feed on the carcass. It is nature's way.

Maintaining such natural balance is a principal goal of park management. Yet changes in the wilderness ecology take place, and the system falls out of balance.

Most of Yellowstone's large carnivores long ago were trapped, shot, or poisoned. The wolf is all but extinct in the park, mountain lions so rare that it is doubtful if a self-sustaining population exists.

Of other wildlife, however, the park holds more than most people realize. Some 16,000 elk, 600 bighorn sheep, 600 bison, 1,000 moose, 300 to 500 black bears, and perhaps 200 grizzlies inhabit Yellowstone, moving in and out from national forests and private lands in Idaho, Montana, and Wyoming.

The elk, in recent times, have posed the greatest problem. Herds grown too large for available winter range have had to be reduced to prevent overgrazing and extensive starvation. Until 1967, the National Park Service accomplished this by periodically driving elk into corral traps with helicopters and transplanting them by truck to areas where they once were more abundant. Now, however, park policy is to rely on natural controls—chiefly weather and the availability of food—as well as migration and hunting outside park boundaries, to keep the size of the herds in check.

Skull Returned Amid Ghostly Howls

In spite of serious game management problems, Yellowstone remains an invaluable outdoor laboratory. New studies in many fields of science can provide information the Park Service needs to protect the land and wildlife. Here lies a challenge young people can help meet.

My companions and I talk about these things around the campfire. We are now a week into our trip. Our small tents are pitched at the head of Pelican Valley, a land of pungent sage sweeping to the distant Absarokas. Out of the cloud-blackened north a coyote howls, then another, and another.

"Eight years ago," says Derek, "I heard a lot more howling in this same valley in broad daylight, when my cousin Charles Craighead and I met the great spirit god of the coyotes."

Robbie is incredulous. "The *what*?"

"In a water hole not far from here," Derek goes on, "we found a bleached bison skull. We started down the valley with it.

"We hadn't gone 50 yards when coyotes began howling everywhere. It was spooky. They were talking to us. We returned the skull to the hole. The howling stopped. Then I knew that we had disturbed their spirit god."

Bob Cole tosses a handful of sticks on the fire. It blazes up, and the thin chorus of the night fades away.

Supply Stop – Then Serenity Again

The new day brings us to Lake Butte, on the highway leading in from Yellowstone's east entrance. Civilization. I resent the sound of speeding vehicles even before we sight them. But we must pick up supplies. This chore takes until after dark.

Our spirits are as restless as the moving moon. At last we shoulder our packs, heavy once again, and step into the coolness of the summer night. Beside the road waits the forest, a curtain we draw behind us.

Thick tree roots and rocks vanish and appear along the trail as the moon plays in the clouds. Bob Jordan plunges from a slick log waist-deep into a chilly creek. We laugh; it is part of the game.

A light rain distills forest fragrances. Our noses tell us of pine needles, ripe huckleberries, meadow hay, and bedded elk. In the dark, we feel our way down the path to Park Point and camp beside Yellowstone Lake.

I sit there counting shooting stars. To the west, sheet lightning silhouettes mountains. Serenity reigns—a peace of mind we all feel and enjoy in our own way. I gaze over the vastness that stretches forever and forever before me, hoping that this wilderness will be here always for people to enjoy.

Morning. The turquoise waters of 139-square-mile Yellowstone Lake spread before us, rimmed by forests and fed by runoff from snow-clad mountains; at 7,733 feet, it is among the highest lakes of its size in the world.

Casting dry flies, Derek, John, Bob Cole, and Robbie Jordan take a dozen cutthroat trout in minutes. That night we feast like mountain men and, tired from a day on the lake, go to our sleeping bags sated.

A good night's rest involves precautions.

(Continued on page 593)

Largest U. S. national park—three times the size of Rhode Island—Yellowstone holds some 10,000 geysers, hot pools, and other thermal features, the greatest concentration in the world. Most are accessible to motorists and hikers by 400 miles of roads and 1,000 miles of trails. Average summer temperatures vary with altitude and range from the 30's at night to the 70's by day. Lowest ever recorded in winter was 66° below zero. Only a few miles south lies another spectacular park, Grand Teton.

Surprisingly unafraid, a young mule deer investigates the hikers' camp. It lingered for almost an hour before slipping back into the woods. Munching aquatic plants and lush grasses, moose cow and bull (**above**) browse Beaverdam Creek. The backpackers saw many of the animals that inhabit the park—elk, moose, bison, pronghorn antelope. But their closest encounter with any of the 175 to 200 grizzlies that roam the sanctuary was the sight of tracks near camp one morning.

More beautiful than its name implies, Ragged Falls tumbles into stair-step Bechler Canyon (**turn the page**).

You try to find a level spot. Your bag should lie beneath a tree, not only for bear security but also to protect you from a heavy dew. You rake the site with your fingers, removing twigs, branches, pebbles, pinecones, and the ever-present elk pellets. You brush the ants away and trust that the mosquito repellent works.

This done, you crawl into your bag, adjust a sweater or whatever you wish for a pillow (one of us uses his moccasins), and contemplate the star-popping blue-black vault of the universe.

Tomorrow arrives like a reward. Southward we hike, and two days later leave Yellowstone, crossing into Teton National Forest (map, page 587). Here we sample foods the Indians once enjoyed. Derek digs yampa; Robbie bites into a crunchy root and announces, "I hate parsnips."

Sam spies white sego lilies, Utah's state flower, brightening a hillside. "Indians ground the bulbs and made bread," Derek tells us. "The Mormons," he adds, "ate the bulbs during their first lean years in Utah."

Mary points to a silvery-green thistle towering above the other vegetation. "I'll bet nobody ever ate that."

Our flora expert calmly cuts, peels, and hands her a section of the stem. "It tastes like celery," Mary observes. Elk thistle was eaten by early explorers of the region and perhaps by the 150 or so Sheep Eater Indians who lived here before white men came. Like the old-timers, we also find that chopped wild onions greatly improve the diet—in this case, reconstituted ground beef.

Two Ocean Plateau Rides the Continental Crest

In Yellowstone, most people cross and recross the Continental Divide swiftly in cars. We negotiate it on foot just south of the park. Here a stream splits into two branches; we kneel and drink from adjacent creeks named Atlantic and Pacific, and watch their waters dash toward the opposite sides of a continent.

More hard climbing. We take a narrow, winding trail, steep and dangerous with yielding rocks. Past a thunderous waterfall our procession files, into slanting meadows vibrant with purple asters and pink monkey flowers, around cliffs, beneath snow patches, through forests.

At noon we stand atop Two Ocean Plateau. I feel a humbleness of spirit as we gaze from the top of the world at Yellowstone Lake to the north, the Absaroka Range sweeping the eastern horizon, and the Wind River and Teton Ranges thrusting southeast and southwest.

Toward evening we reenter Yellowstone. With food running low, we make for the park's south entrance. We wade the meandering Snake River more than a dozen times, squishing the miles away. Three days later, we ford a swift, full-scale river at the south entrance.

All of us anticipate civilization's amenities: a malted milk or two, a hot bath, a rare steak, a bed with a mattress. These provided, and food supply replenished, we can't wait to get back on the trail.

Our team alters. Bob Cole has returned to Missoula for

(Continued on page 599)

Ice-cold shower gives a lift to aching muscles. Karen splashes in a cascade on Raven Creek.

Solace for tired feet: Hikers perch on rock warmed by a thermal pool beside the swift-flowing Snake River (**left**). The author's younger brother John and Robbie Jordan use great caution, since many such pools are scalding hot. Rangers warn visitors against bathing in any of Yellowstone's thermal areas.

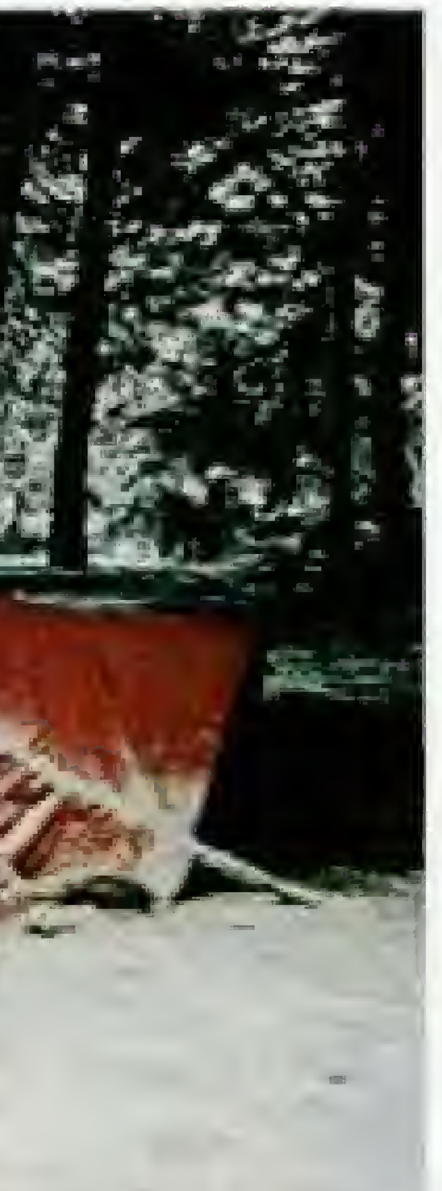
Jeweled by mist, cat's whiskers of grass nod beside one of Yellowstone's thousands of thermal pools.

Snow-slick log bridge offers Karen precarious footing as her father helps her over a stream. John Craighead joined the party near journey's end.

Warm wet boots are better than cold wet boots. Toasting around the morning campfire, the footwear will dry only partially before hikers again take to the trail.

Slipping and stumbling up a rock-strewn slope, backpackers toil

to the high point of their tour, the crest of 10,336-foot Mount Holmes.



Slammed by 40-mile gusts atop Mount Holmes, John and Karen Craighead and Mary Berthrong, right, dry rain-soaked sleeping bags.

World of white greeted surprised campers when they awoke on the slope of Quadrant Mountain. A sudden drop in temperature toward the end of the trip turned gentle rain to wet snow.

early football practice. Influenza levels Robbie Jordan; he and his father will rejoin us after several days. I consult a doctor about my badly blistered, aching feet. "Stay off them," he advises. The group goes on without me. I meet it by car a day later at the Pitchstone Plateau trail head, sorry to have missed even eight miles.

The path up Pitchstone is a joy, padded with pine needles and vegetation. Beside Phantom Fumarole, we eat our lunch on a thick mat of steam-heated moss. Pitchstone Plateau at 8,700 feet seems a moonscape with frozen waves of black sand and gullies jumbled with gigantic boulders, oddly graced by fields of purple elephant-head flowers. Beneath the plateau, steep-walled Bechler Canyon (pages 590-91) provides a warm-water pool to soak in. It feeds into an icy creek.

Warm water? Suddenly it feels scalding hot, and Mary and I bolt from our improvised tub. "You could cook a trout in that," she exclaims. There are, in fact, several places in the park where on other trips we have caught fish and then cooked them in pools only a few feet away.

Frost Signals Change of Season

September draws near. Frost sometimes rimes our sleeping bags these mornings; mosquitoes and other biting pests have gone. They are not missed.

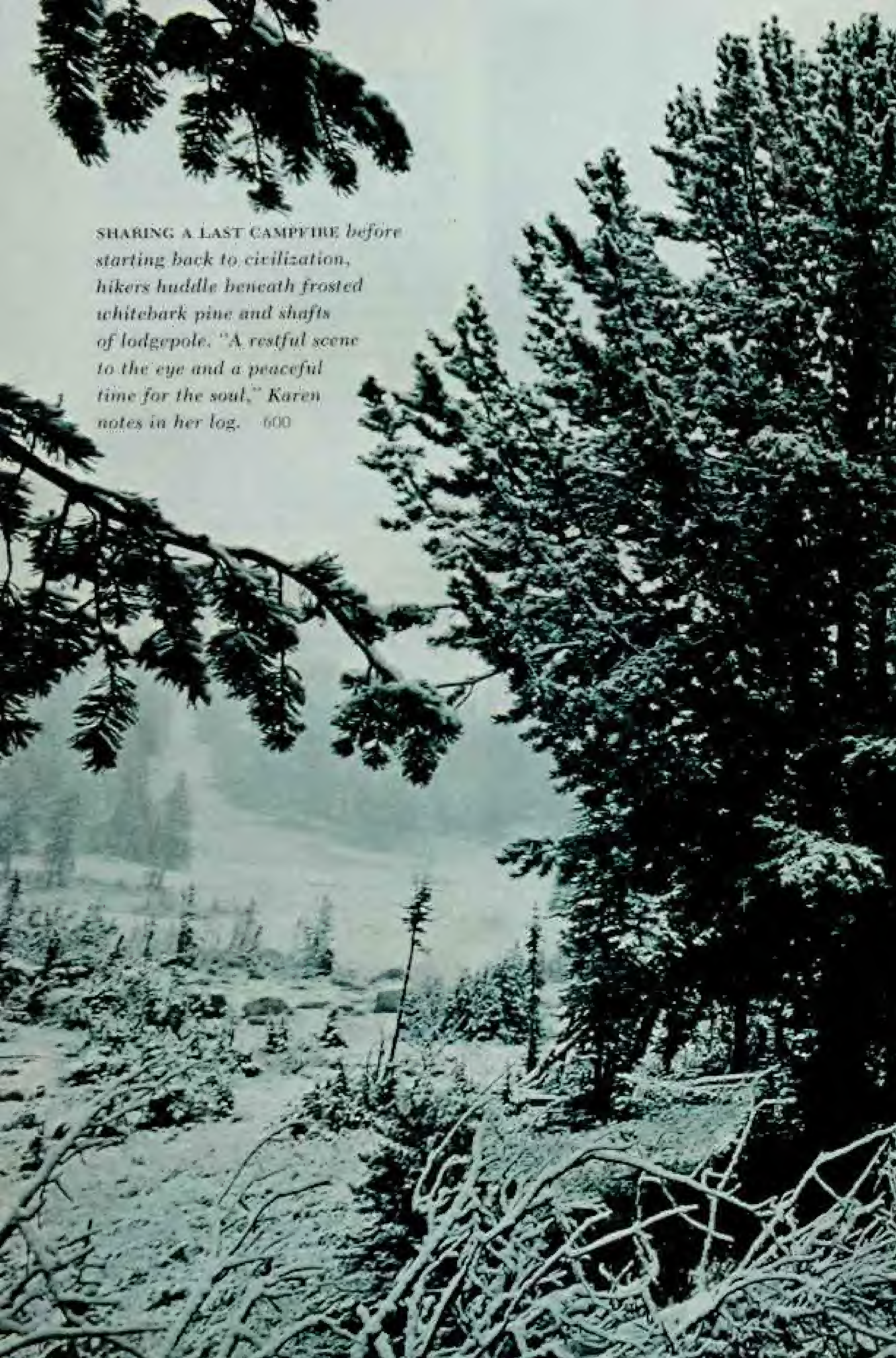
We push on through trackless country near Shoshone Lake. Shoshone Geyser Basin is a major backcountry thermal area. We examine finely formed miniature terraces and cones the waters have deposited as they cooled and evaporated.

"I feel as if we're the first to discover this place," Sam remarks thoughtfully. "Nobody has tossed pennies into these pools, or left any candy wrappers or cigarette butts."

By afternoon we reach Old Faithful, where man and raw nature meet head on. It is rewarding to see the wonder on the faces of a thousand people as the world's best-known geyser erupts (pages 616-17). I only wish they could see the rest of Yellowstone as we have seen it.

When the new day arrives, we restock our depleted larder and continue north—Robbie and Bob Jordan again with us—on the last rugged leg of our journey.

Derek leads us along the Firehole River through the Upper, Midway, and Lower Geyser Basins, finally cutting east across a marshy flat to camp on Nez Perce Creek. The



SHARING A LAST CAMPFIRE *before starting back to civilization, hikers huddle beneath frosted whitebark pine and shafts of lodgepole. "A restful scene to the eye and a peaceful time for the soul," Karen notes in her log.* 600

chill breath of an approaching storm envelops us.

I welcome it. In a month of backpacking, the weather has been ideal—too ideal, for that is not the true Yellowstone. We fall asleep to steady pattering, and wake to it.

Walking in the rain is fun; it exhilarates—but only after you resign yourself to being soaked. Then you enjoy the feel of rain matting your hair, filling your eyes, dripping off your nose, running down your neck.

I don't talk much about my fondness for the rain; certain mutterings indicate that not everyone sees it my way. Starting the dinner fire proves agonizingly difficult. Spending the night in a soaked sleeping bag is better only than trying to sleep in the rain without one.

Hikers "Crowd" a Mountaintop Eyrie

We now have walked up to the foot of the Gallatin Range, and the drizzle has ended. Mount Holmes looms over us, an ancient, bald, crumbling pile of rock 10,336 feet high (pages 596-9). I note that Bob and Robbie climb steadily. Both are in top shape; for father and son there is a new awareness of what their bodies can do, a pride in knowing that they can take the mountain.

On top, the cold wind lashes us with gusts up to 40 miles an hour. We put it to great use. Our wet bags dry out in minutes.

The Mount Holmes fire-control aide, Kevin Hoofnagle, invites us into his snug eyrie. An old iron stove warms the room; a 360-degree panorama of Yellowstone spreads before us. "There are about as many people here now," the slim young lookout tells us, "as I've seen all summer."

He has seen few bears, too, we learn; only two grizzlies and four blacks. We have spotted none in the more than 200 miles we have covered. This is the one disappointment of our trip.

And yet we make discoveries to compensate. We scramble down Mount Holmes's west ridge buffeted by gusts, slipping and sliding along a tricky talus slope—let no one tell you that descending such a mountain is easier than climbing it. At a gem of an unnamed lake, we find the charcoal of long-dead fires. We have come upon an old Indian camp.

"Walk over here," Sam directs me. "Sit on this rock. Now—look beside your feet."

My eyes fasten on a neat pile of black stone chips. I let my imagination work: A small band of Bannocks finds shelter here. An Indian sits in this place, chipping obsidian into an arrowhead. Other braves fashion projectile points and tools while squaws cook yampa roots and stir an elk stew.

Sam hands me a chip. I turn it in my fingers. It may be well over a hundred years old. These people, I reflect, lived in harmony with nature and left it unmarred.

Another day, and I wake with a pang. Our time grows short. The winds of yesterday return to pummel us anew. We angle upward into Bighorn Pass; a prairie falcon soars above us, knight of the sky. Derek decides that the most direct route to Bannock Peak requires us to follow the spiny ridge. We do—and spy two tiny figures far above.

On the summit, my father and Jay Sumner, his research associate, greet us. They have searched this high country for several days, looking for grizzlies but seeing none. I tell them about the Indian camp we found. Dad tells of a perfect arrowhead he had seen the night before; he and Jay found the camp too.

To Be a Voice for Wilderness

Northward we hike, climbing Quadrant Mountain and camping in a steep-walled hollow called the Pocket. On this last night of our little expedition, I think back.

Yellowstone, we have learned, challenges the body, stimulates the mind, fulfills the soul. It is a dynamic but intricately fragile world. Those who need wilderness such as Yellowstone must help to spell out its meaning. To be a voice for wilderness, I feel, is a responsibility of today's youth.

Warm rain falls as I grow drowsy. It turns to snow as the temperature drops; at dawn we emerge into a world encased in white. This early warning signals the elk that soon they must make for their winter ranges. It triggers the movement of bears to their den sites.

We, too, heed the warning. We head down snow-muted slopes to the valley below. □

In swirling, thickening snow, John Craighead nears the end of the long journey. For those willing to get off the beaten track, the hikers have demonstrated, solitude and unspoiled nature can be found even in a park that plays host to two million visitors a year.

YELLOWSTONE AT 100

Ageless Splendors of Our Oldest National Park

THE VALLEY FLOOR IS QUIET. Wisps of vapor from scattered fumaroles flutter in the breeze. Suddenly, rumbling and burbling and spewing water and steam, the geyser erupts.

For millenniums Yellowstone showed such wonders in a lonely theater, with only an occasional bear, an elk, or an eagle as audience. Today many of its star performers lie near roads and walkways. What was it like in those long-ago days before the visitors came? In the following portfolio, the camera recaptures that pristine spectacle.

Dawn silhouettes a crenellated tower (right). Vapor rises from its center like an early-morning cook fire. Then, with an explosion, water shoots 90 feet into the air and plays erratically for 20 minutes, followed by an hour's display of billowing steam that almost obscures the risen sun. Slowly the exhibition ends, and Castle Geyser sleeps again.

Nearby, 370-foot-wide Grand Prismatic Spring (pages 606-7) steams incessantly at a temperature near 150° F. The blue-green spring wears a raveled collar of yellow, red, and brown algae in this eagle's-eye view. An empty boardwalk rimming the pool is the only mark of man's presence.

Like sugar frosting, limestone encrustations decorate Minerva Terrace at Mammoth Hot Springs (pages 608-9). Mineral-bearing water bubbles up from the depths and trickles from terrace to terrace, shimmering in the sunlight.

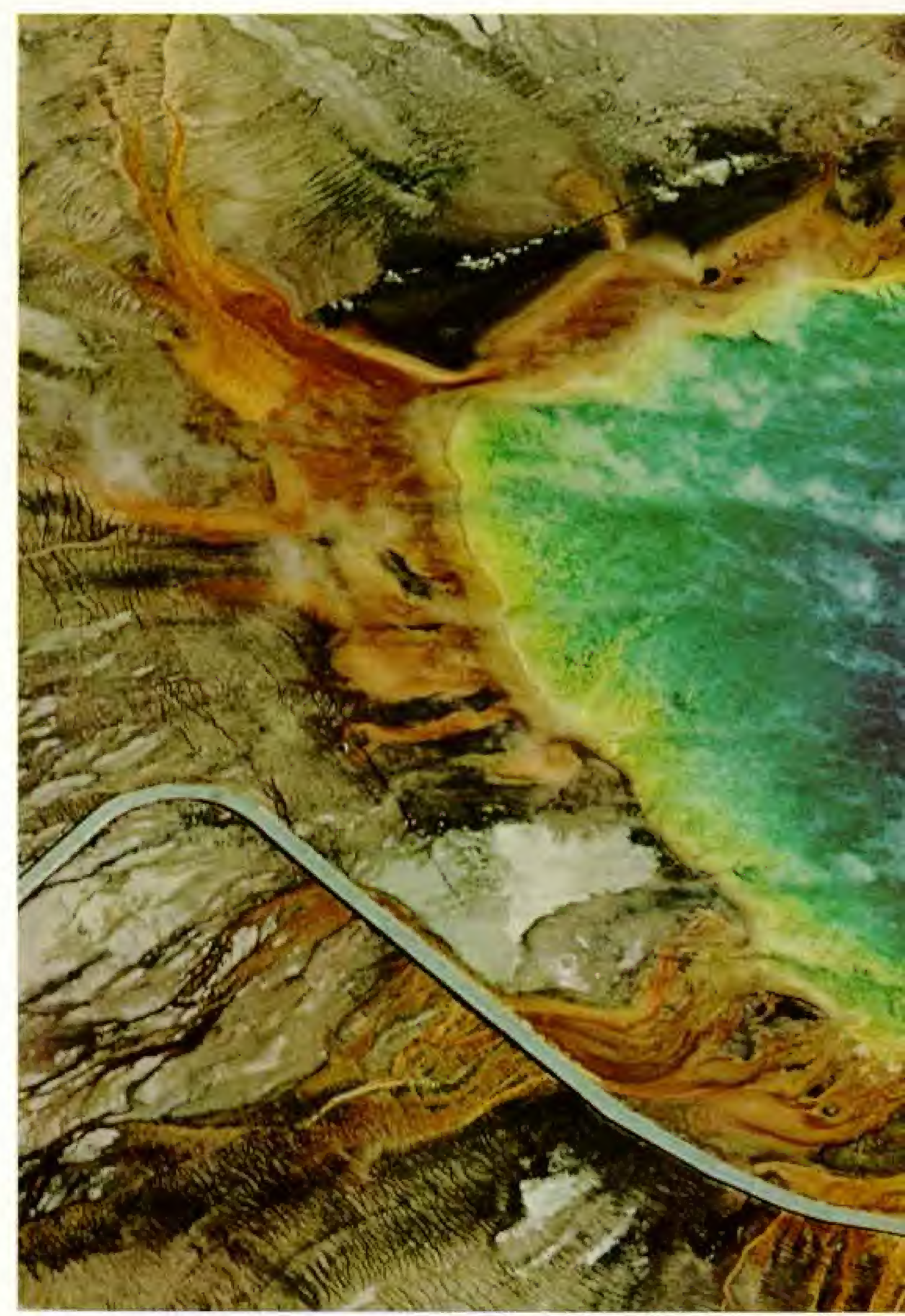
As darkness settles over Biscuit Basin, only the hoot of an owl or the yelp of a coyote disturbs the silence. Then the moon rises (pages 610-11), to burst through the boughs of a spruce and cast a broad shadow on golden mist.

The Grand Canyon of the Yellowstone is never silent. Thundering day and night, the Lower Falls (pages 612-13) plunges 308 feet to beat itself to spray upon the rocks below.

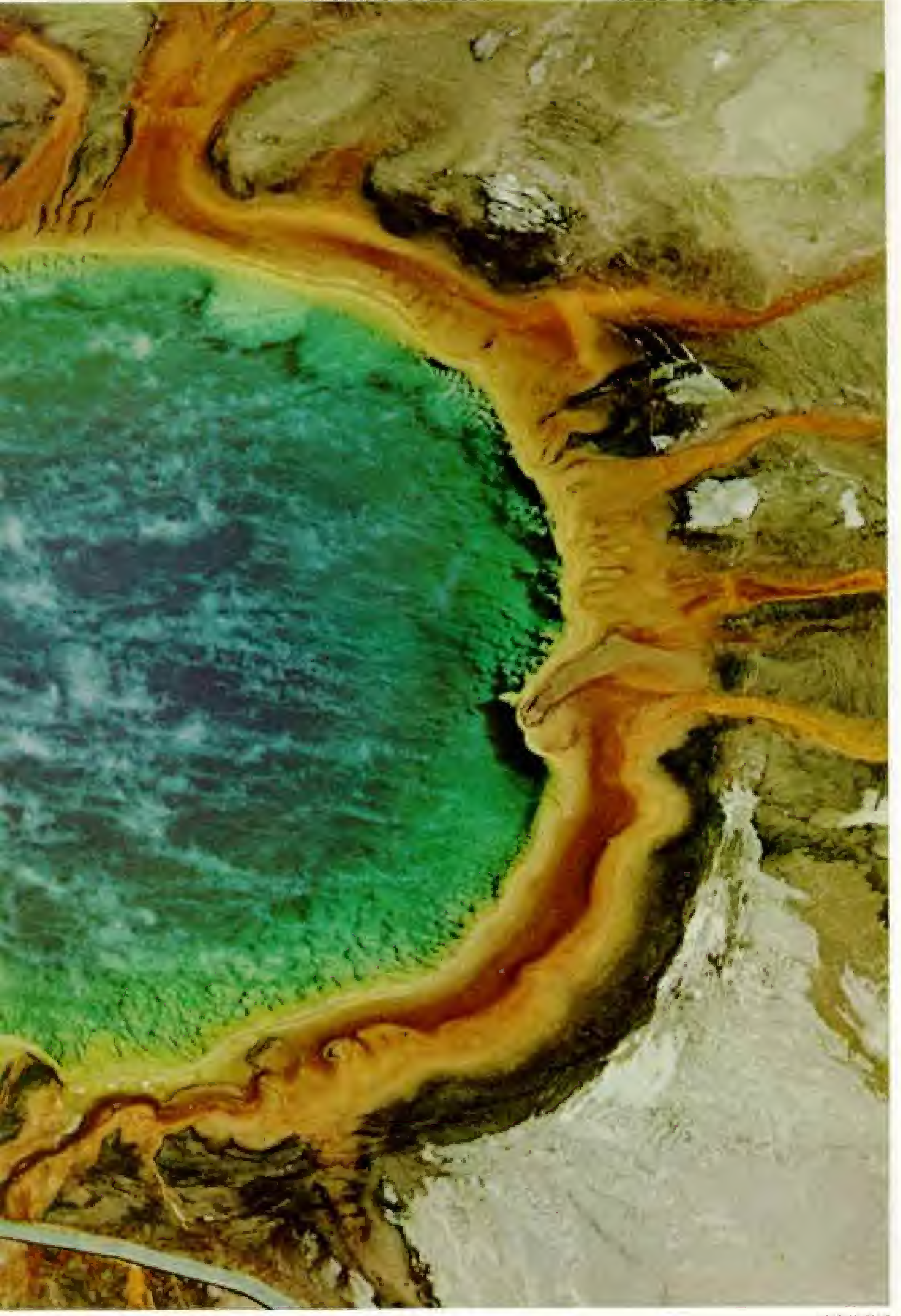
Spectral fog haunts Norris Geyser Basin when the moon highlights the steaming pools (pages 614-15). Gaunt skeletons of trees killed by ever-changing thermal activity point at the wheeling stars above.

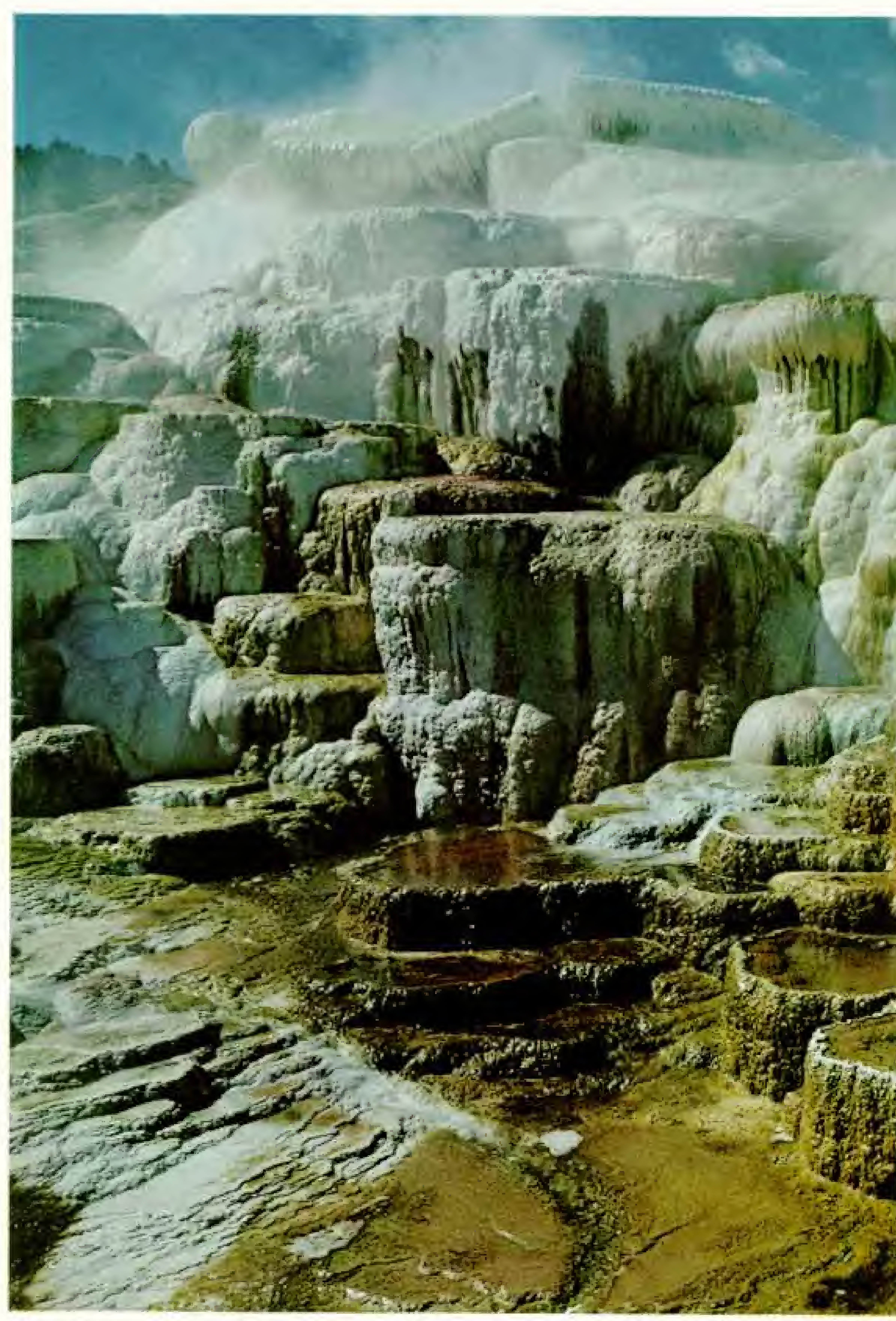
And so the drama is played every hour, every season, year upon year. It will never lack an audience again.

Castle Geyser, Upper Geyser Basin

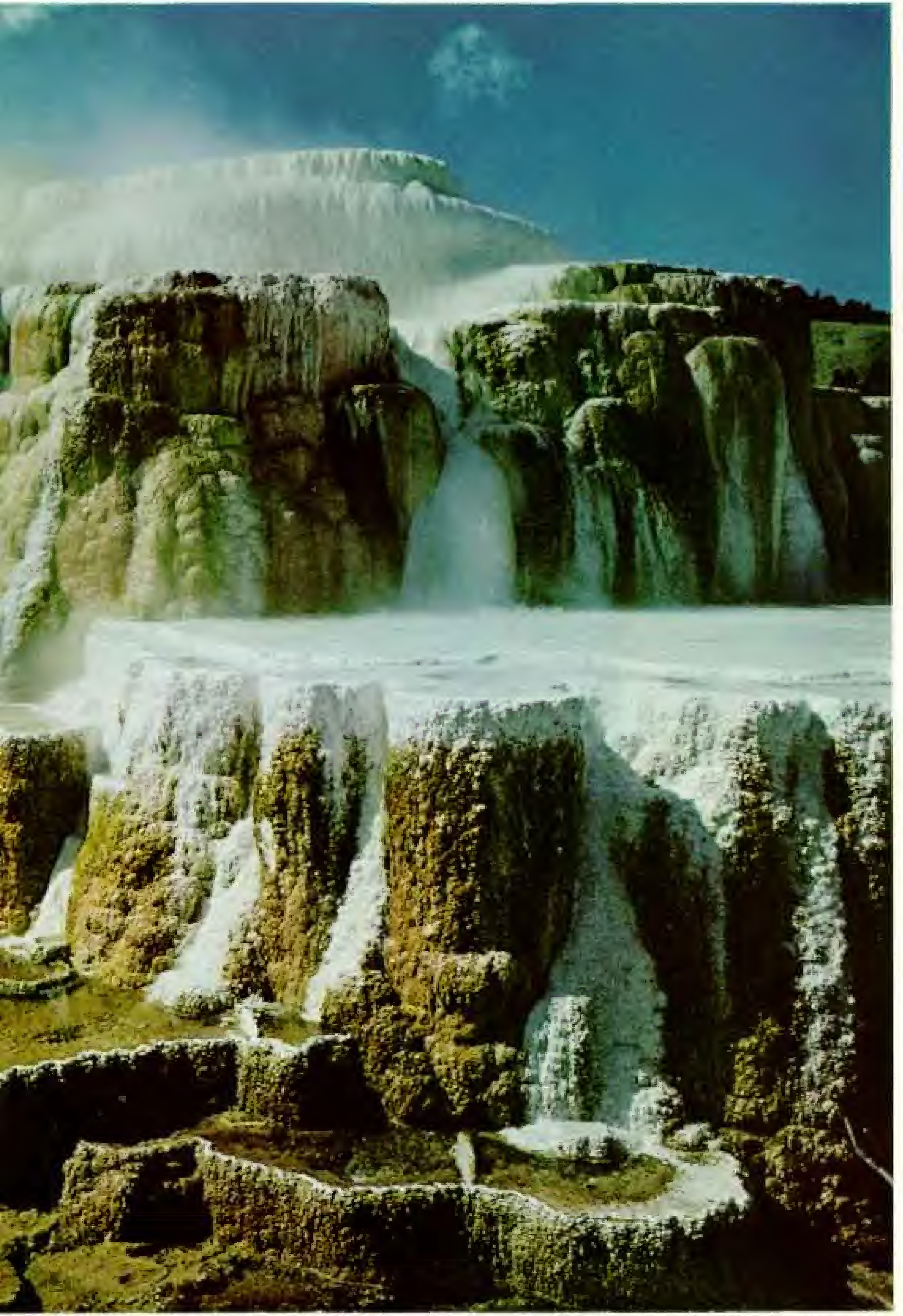


Grand Prismatic Spring, Midway Geyser Basin

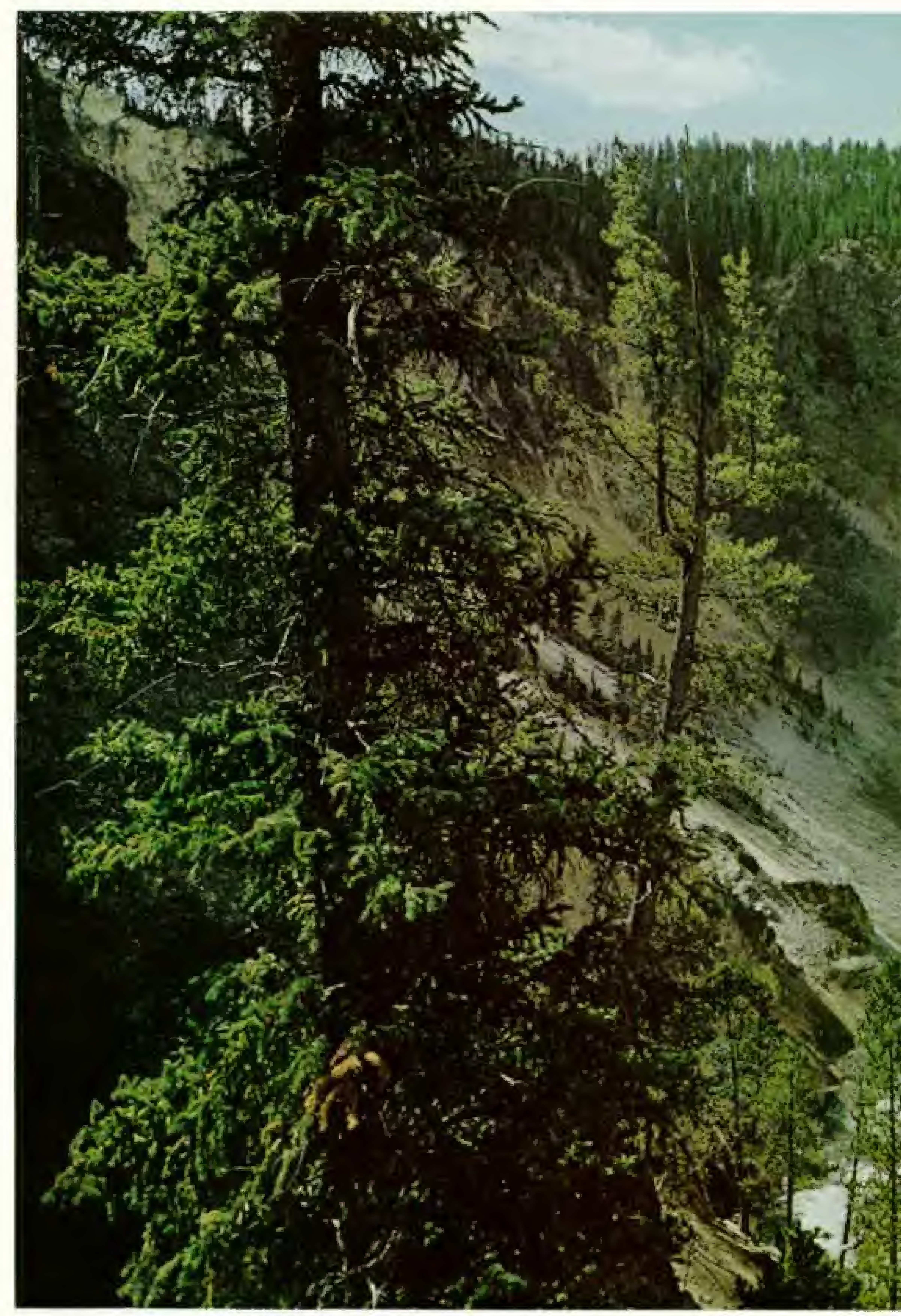

JONATHAN BLAIR



Minerva Terrace, Mammoth Hot Springs



Moonrise on Biscuit Basin



Lower Falls, Grand Canyon of the Yellowstone

JOSEPH J. SCHERSCHEL

Norris Geyser Basin at night

YELLOWSTONE AT 100

The Pitfalls of Success

By WILLIAM S. ELLIS

SENIOR EDITORIAL STAFF

Photographs by JONATHAN BLAIR

The problem: people. Thousands gather to watch as Old Faithful, most popular of Yellowstone's attractions, seems to nudge a passing cloud. Such summertime congestion points up the dilemma of the National Park Service—how to provide for the public while preserving the things that people come so far to see.

THE LAND ITSELF is raw and timeless, a wilderness realm seemingly set aside at the creation. But as a national park—the oldest and largest in the Nation—Yellowstone measures its age, and 1972 marks a century.

During these hundred years, more than 48 million persons have visited the vast federal preserve in northwest Wyoming. For millions of others, the name alone has offered a sense of identity with America. No matter that, among all the national parks, attendance is higher at Great Smoky Mountains, and that the scenery, many claim, is more spectacular at Glacier. Yellowstone continues to stand as the doyen of national parks in this country and, indeed, in the world.

As I drove through the west entrance of the park on a day stifled by August heat, my thoughts were of a time, years ago, when an aunt returned from a vacation and, as aunts are given to do, distributed souvenirs of places she had visited. For me there was a coin bank in the shape of a moose, with the name "Yellowstone" burned into its wooden base. The bank is still among my belongings, having become, like bronzed baby shoes, one of those possessions kept through sentiment.

Such mementos of the park are found in homes across the country: pictures of Old

Faithful erupting and black bears panhandling for food along the roadside; lamps with trick shades that depict the flow of the Lower Falls of the Yellowstone River; samplers with embroidered sketches of trumpeter swans treading through the shallows of a park lake.

That is one legacy of the first hundred years. A more significant one is the runaway success of the national parks concept. But there is now concern that this success may be defeating itself.

Highway Clogs at Sight of a Bear

"Campgrounds all full," the ranger informed me, though I had not intended to camp. Unfolding a map, he directed me to the nearest commercial accommodations within the park. Ahead lay Yellowstone's famed Grand Loop Road, with many of its 142 miles laced through forests of lodgepole pine. At some points the road skirts geyser basins where the earth steams and belches with infernal indigestion. It straddles mountains, crosses the Continental Divide twice within a few miles, and snaps like a taut string across gentle meadows (map, page 587).

There are two lanes and a speed limit. Traffic signs and the flashing red eyes of patrol cars, wrecks and wreckers, breakdowns and tie-ups and rush-hour frustrations—these too are present (pages 622 and 624).

Thirty-nine miles to Canyon Village.

I drove slowly, savoring the feast of scenery spread all around. The Madison River ran beside the road, whipped to froth in some places, and, in others, placid and sequined with reflected sunlight. A fisherman stood waist-deep in the waters, his arm a blur of action in putting a fly on target.

Several miles along, the road passed through the shadows of cinnamon-colored cliffs. Then, by a patch of forest where tall,

shallow-rooted pines rose from a floor of rotting snags, I came upon dozens of vehicles, all stopped in a road-blocking tangle.

I asked one of the motorists what the problem was. "Bear," he replied. He pointed, and I saw the animal lumbering along from car to car, accepting all handouts (cover picture).

"Crazy, ain't it, all this fuss to see something you can see in a zoo anytime." He paused to watch the bear vacuum up a plug of bologna. "I'll tell you something else you can see without coming to Yellowstone. Traffic jams. So who needs this?"

Thus is Yellowstone beset by its own popularity. Established in March 1872 as a "pleasuring-ground for the benefit and enjoyment of the people," the park has fulfilled its mandate. But it was also set forth that provisions would be made for "the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within

City woes invade the park. More than a million and a half visitors come from mid-June through August. They bring dogs, cats, and even a macaw to a region rich in wildlife. Loaded with luggage, they arrive by bus, by motorcycle, and by car. Traffic stops at the sight of a bear.

People must eat, so some park areas resemble suburban shopping centers, complete with supermarkets. Laundromats and service stations are essential, too. Gift counters offer other "essentials": giant pencils and incongruous busts of Dickens's characters.

Courting disaster and breaking the law, a visitor feeds a young black bear. Should it become angry or frustrated, its claws could be deadly. Despite constant warnings, people feed these animals everything from marshmallows to Limburger cheese.

Such recklessness, as well as the carelessness of campers who leave food and garbage exposed, have forced the Park Service to move some bears out of populated centers. Rangers (**right**) handle a tranquilized grizzly trapped at Canyon Campground, where tenting had to be barred because of frequent bear invasions. Wrapped in a bag, the 250-pound sow is flown by helicopter to Mariposa Lake (**below**), an ideal habitat with plenty of grass and berries—and a minimum of people. Bears that keep returning to populated areas for handouts are shipped to zoos or destroyed. Thus visitors who persisted in feeding the animals must share responsibility for the death of 78 bears since 1968.

Two-mile backup crawls through the park. Yellowstone's traffic problems stem from too many cars near popular attractions, "bear jams," or, in this case, road-construction machinery moving to a work site.

said park, and their retention in their natural condition."

The two aims—providing enjoyment for the people, and preserving the environment—are now in conflict because of the record-setting number of visitors. They come now in winter as well as in summer. They come from large cities many hundreds of miles away, eager to escape the press of urban living. Often they come prepared to stay not just for a night, but for several days at least.

And, alas, they come in cars.

"In July and August, between 600 and 800 cars come into the Old Faithful area every hour between 11 and 3," said James Brady, who is in charge of the rangers at the famous geyser. "We spend much of our time with traffic matters."

Tallyhos to Traffic Jams in 50 Years

Covering 3,472 square miles, Yellowstone, of course, has room for many more millions of visitors than the 2,126,346 who registered at the five park entrances during 1971. But not for their cars.

In the early years of this century, most visitors to the park traveled in horse-drawn carriages. Those arriving by train were transported from the station at Gardiner, Montana, in six-horse, double-deck coaches, locally called tallyhos (page 631).

The first engine-driven vehicle officially permitted in the park was a Model-T Ford. The year was 1915. In the summer of 1917 some 5,000 cars entered. The number rose until in 1971 it was 573,742.

Accidents on the 22-foot-wide loop road are now commonplace, averaging three or four a day in summer.

To many park purists, one of the most distressing aspects of cars in Yellowstone is the assault on the aesthetics of the setting, such as exhaust smoke wafting over grassy roadside meadows that once knew nothing more noxious than the bad breath of buffalo. Or the headlights that scar a Yellowstone night like a knife slash in a priceless painting.

Yellow dust filtered through the screen door of Park Ranger Brady's office. Outside, great swirls filled the air as heavy machinery leveled a large area for parking lots. At a nearby intersection a ranger entreated a driver please to move his bungalow-size camper back a few yards so pedestrians could cross. A frisky Airedale broke his leash and raced off, as the owner took up the chase with a cry of "Heel, boy, heel!" An ice chest fell from the

roof rack of a car, sending cans of soft drinks rolling along the road.

Jim Brady finds a challenge in all of that. "We need to know more about what people want, what they expect when they come to a park," he told me. "And in that regard, rangers today must have a feeling not only for nature, but also for people. We must be able to communicate."

Raised in an urban environment, Brady has an understanding of the problems that have arisen in Yellowstone and most of the other national parks. He is, at 32 and with ten years of service as a ranger, a man of many skills and wide knowledge. He knows why and when a bull elk sheds the velvet on its antlers. He also knows how to investigate matters as sensitive as drug use in the park.

Rangers are now given such specialized training as narcotics control, because many of the social and environmental ills of the city have spread into the national parks. There is crime in the campgrounds and the threat of pollution in the forests.

"The rate of increase of crime in the parks now exceeds the national average," I was told by Lawrence C. Hadley, an assistant director of the Park Service. "There are assaults and robberies, but mostly they're crimes against property, such as vandalism and theft."

Within the past year, Hadley said, the Park Service has developed a program of highly sophisticated training in law enforcement for rangers. The 12-week courses are held in Washington, D. C., and cover such tactics as judo and karate. In addition, there is a special force of U. S. Park Police ready to be flown from the Nation's Capital anywhere in the country; they can help regain control of situations such as the one that occurred in Yosemite on July 4, 1970, when 500 youths battled with rangers—and won, until reinforcements arrived and arrests were made the following day.

Young Wanderers Flock to Yellowstone

Unlike Yosemite, Yellowstone is too far removed from urban centers to be plagued by motorcycle gangs on weekend outings. Also, troublemakers seem drawn to parks in areas blessed with more sun and warmth. Thus has Yellowstone been spared some of the more serious problems.

"A lot of footloose youngsters come to Yellowstone, but relatively few give us trouble," Brady said. "Unfortunately, many of the young people in the park expect to be harassed when they see a ranger. That's why he must know how to communicate, to let the kids know they'll be treated fairly."

The surge of young people into Yellowstone began several years ago. Some arrive by motorcycle, others in anything from old hearses to stand-up-drive vans once used for milk and mail delivery. But many hitchhike. On almost any summer day, the roads of Yellowstone are fringed with uplifted thumbs.

I talked with many men and women of college age there and found that, with few exceptions, they share a keen appreciation of the gifts offered by this giant among national parks. Shouldering packs, they strike out along the more than 1,000 miles of trails with the exuberance of frontiersmen. And seldom does a summer night pass without a guitar plunking somewhere in the hinterland.

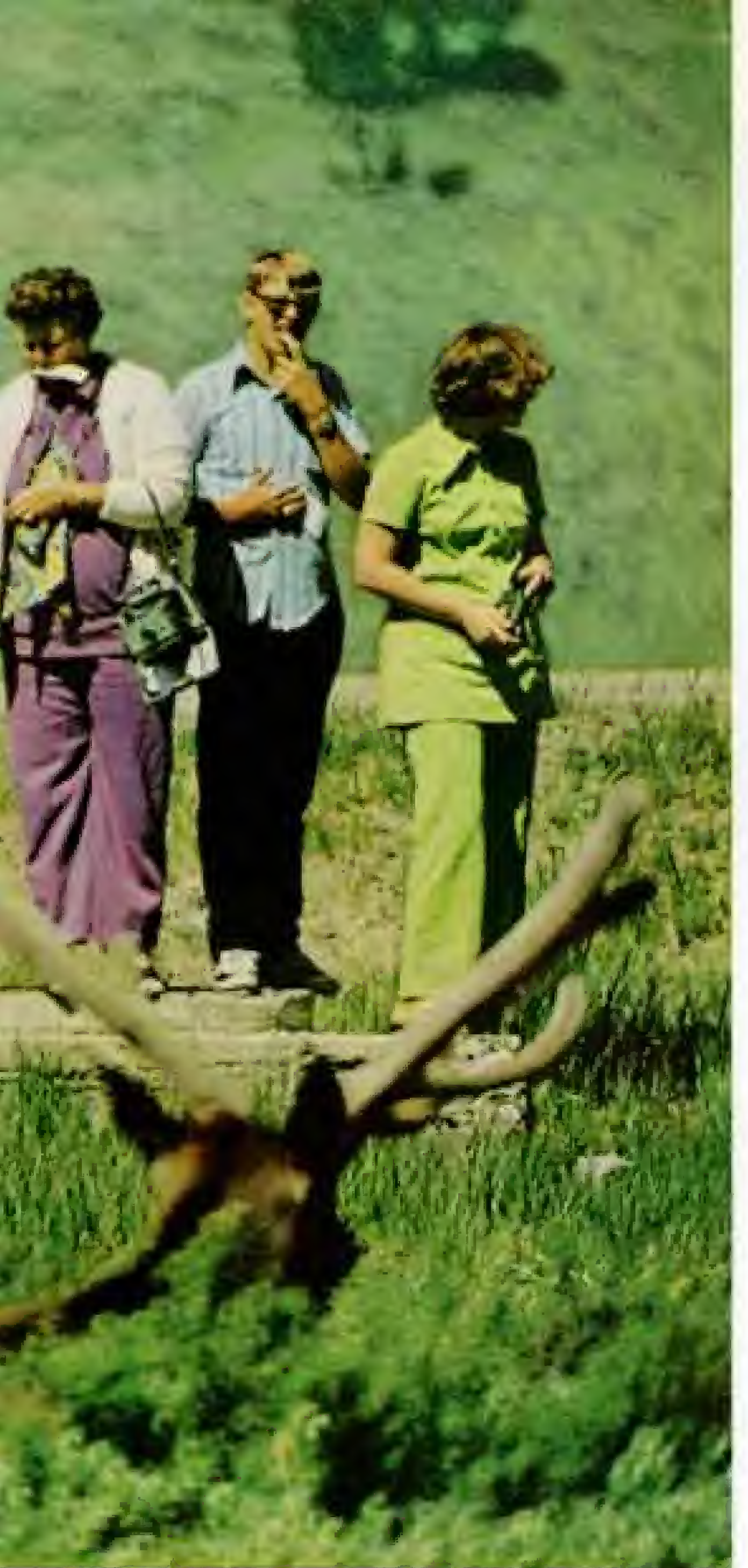
Backcountry Beckons to Only a Few

Except for these young people, not many visitors venture away from the roads and established campgrounds. Rather, they concentrate activities within an area covering no more than 5 percent of the park. In conversations with dozens of people who entered Yellowstone in the summer of 1971, I came to realize that the great majority prefer the company of others. The choice is for a campsite in the midst of 200 other campsites instead of a sleeping bag back where nothing stirs save sweet grasses ruffled by the wind.

"You hear it all the time now, that the crowds have ruined the park," said a middle-aged Californian with whom I shared a table in the dining room of the venerable Old Faithful Inn. "But the people who say that forget one thing. It's not ruined for those who like crowds."

Still, Park Superintendent Jack K. Anderson is making great efforts to disperse the visitors over a larger area of the preserve. In 1971 some 7,000 visitors hiked off the main roads to camp out at least one night. "The number is increasing," he said, "and that, really, is what the future of Yellowstone is all about." One-way and bypass roads have been created to ease congestion around such attractions as Old Faithful, where more than 2,000 persons may gather in summer to watch an eruption (pages 616-17). For motorists passing but not wishing to stop, delays are now reduced.

"And when the three new parking lots are completed," he told me, "the situation will



be even more improved. I think we're getting to the core of the traffic problem."

A tall, chesty man with a leathery voice, Jack Anderson became superintendent of Yellowstone five years ago. He oversees the park with firmness, but without forgetting the words of the founding Congress: ". . . for the benefit and enjoyment of the people."

The task is rarely easy, especially with budgetary restrictions that limit the staff of permanent rangers to 25. There were more stationed in Yellowstone 30 years ago. In 1961 there were 135 permanent Park Service employees in the park. Today there are 100.

This handicap, I found, does not prevent a marvel of housekeeping from being performed. No traces of the nearly 6,000 tons of garbage generated by the crowds each summer are found along the roadway. A candy wrapper in a field draws attention to itself. Animals that scavenge in the night greet the dawn with empty stomachs.

Garbage dumps are no longer open to bears, for the Park Service wants the animals to live under totally natural conditions. It wants to wean them from the artificial feeding which generations of Yellowstone bears have enjoyed.

Some authorities claim that the denial of food should be gradual rather than sudden. Glen F. Cole, Yellowstone's chief research biologist, does not agree, arguing, "Bears have been here for thousands of years. They got along very well before there was a tourist in the park. There's lots of food in the wild."

Baited culvert traps are placed in areas of heavy use. When a bear is caught, it is tranquilized and then transported by truck or helicopter to the backcountry (page 621). If it persists in returning (and some make it back

Best show on the road: Elk with antlers still in velvet draw a camera-clicking crowd. Yellowstone animals will tolerate humans—as long as they keep their distance.

Wilderness collision between truck and bull elk ends tragically for the animal. Flipped over the top, the elk died; luckily, no one in the crumpled pickup was hurt. Visitors are cautioned to drive slowly and stay alert in this animal-rich domain.

Fleeing an elk that challenged onlookers, this girl stumbled and fell, injuring her thigh. A visiting doctor applied a bandage before she was hustled off to the hospital.

"Sorry, all campgrounds are full."

WILDERNESS, WILDERNESS, but not a place to park! Yellowstone has 2,453 campsites, plus a 365-space trailer park at Fishing Bridge (**above left**). Yet, in summer all are usually filled before noon on a first-come, first-served basis. Tents, truck campers, travel trailers, and motor homes crowd amid the lodgepole pines at Grant

Village Campground (**top**)—to the seeming astonishment of two mule deer.

Makeshift accommodations on wheels range from a converted school bus (**above**), complete with curtains and clothesline, to pallets on the bed of a pickup truck (**right**). Sleeping overnight in a parking lot is forbidden, a ranger reminds two young men in the Old Faithful area. When campgrounds are full, visitors may stay in one of the 2,290 rooms available in hotels and inns operated by the Yellowstone Park Company, a concessionaire, or look for accommodations outside the park boundaries. Backpackers may camp in roadless areas, but must obtain a permit to build a fire.

with startling speed), it is either sent to a zoo or, in some cases, shot. Since 1968, rangers have reluctantly destroyed 33 grizzlies and 45 black bears.

The results are now apparent: Yellowstone's bears are vanishing from view. Not every visitor is happy with this development. I sat for a full afternoon in a ranger station and recorded some of the comments:

"Do you realize I came all the way from New Jersey to see two things—Old Faithful and a real live bear in the open? I mean, look, buddy, seeing a bear running free may not mean much to you, but when you live in Weehawken, it can be a big thing in your life."

When I raised this matter with Superintendent Anderson, he told me, "Of course it's great to see a bear, but in his natural habitat, not under conditions where this noble animal is degraded by being fed scraps along the road. We were averaging 75 to 100 injuries a year to people trying to feed bears. In 1971 we had only nine."

Naturalists estimate that 175 to 200 grizzlies, and from 300 to 500 black bears, live in Yellowstone today. In the past century, however, only two persons have actually been killed there by grizzlies. Provocation of the animal was involved in both cases, as it usually is when a bear does bodily harm. Stressing that the grizzly is basically shy, Anderson said, "If he *enjoyed* conflict, we'd lose a lot more people."

"We used to have names for a lot of the grizzlies," Ranger Wayne Replogle told me. "There was Caesar, King Henry VIII, and one that we named Ickes, for the Secretary of the Interior at that time. And Old Scarface—he must have weighed 1,000 pounds—ruled the park for a long time."

Replogle has seen many changes during the 42 years he has served in Yellowstone as a seasonal ranger. "When I first came here," he told me, "there were so few visitors that we'd hail down a car just to say 'Hello!' "

Wayne Replogle comes alone to Yellowstone

Shoulder to shoulder on Fishing Bridge, anglers try for Yellowstone's fighting cutthroat trout. Lures sometimes snare passing cars.

now. His wife, who accompanied him to the park each season for 34 years, died last spring. So he takes walks by himself in late evening, when the hush breathes life into happy remembrances.

Wayne doesn't have to walk far to be where no change has come, where the awesome bigness of the land overwhelms the visitor as it did Jim Bridger more than a century ago.

Jim Bridger. Liar! That's what they called him when he told of seeing wondrous things in the region that would become the park, things such as a column of water as big around as his body spouting 60 feet in the air.

"Tall Tales" Were True – at First

Born in Richmond, Virginia, Bridger made his way to Indian country in the West before his twentieth birthday. He could neither read nor write, but he was shrewd and wise, an expert guide and trapper who knew the Rocky Mountains as well as anyone of his time.

Jim Bridger was also a man who liked to embellish his stories. At first, however, his reports of Yellowstone were accurate. He did see "a mountain of transparent glass"—we know it today as Obsidian Cliff, a mass of black volcanic glass—and bodies of water that were "boiling hot." But since few believed him anyway, he lent his imagination to the Yellowstone tales, until the truth was stretched almost to the vanishing point.

Another fur trapper, John Colter, is believed to have been the first white man to see the Yellowstone country. He, too, told of the marvelous and eerie features of the land, and he too was ridiculed.

With civilization moving closer, and with prospectors verifying at least some of Colter's and Bridger's early reports, expeditions were dispatched to explore the area. The first set out in 1869, but it was not until 1870 that national interest was stirred by the findings of a party headed by Henry D. Washburn, surveyor-general of the Territory of Montana. One member, Judge Cornelius Hedges, is credited with being among the first to propose that the region be made a national park.

In 1871 an expedition under Dr. Ferdinand V. Hayden of the U. S. Geological Survey visited Yellowstone (pages 632-3). A photographer named William H. Jackson was along, and the pictures he made have survived as classics that captured both the splendor of the country and the drama of its exploration.

Members of the Congress found Jackson's pictures on their desks when they assembled to debate the proposal to establish Yellowstone as a park. The impact of the brilliant studies in black and white no doubt helped the proposal pass.

At first, Yellowstone was a park in name only. Trappers and hunters continued to operate there. The Army assumed control in 1886, but in 1916, with the establishment of the National Park Service, Yellowstone was placed under its administration.

I spent many hours in the library at park headquarters, browsing through superintendents' annual reports and uncovering such morsels as, "On September 7, 1927, Col. Charles A. Lindbergh was seen circling over the Upper Geyser Basin in the *Spirit of St. Louis*, at about 2:30 p.m." He was barnstorming the country after his historic transatlantic flight that May.

To my surprise I also discovered that Yellowstone's thermal pools have accounted for as many serious injuries as have its bears.

In August of 1927, for example:

- A doctor from Oklahoma was seriously burned when he backed into a pool. He remained in critical condition for ten days.
- A woman from Brooklyn stepped into a pool and received first-degree burns.
- A man from Salt Lake City died after falling into a pool near Firehole Lake.

With more than 10,000 thermal features, Yellowstone is indeed hazardous country. Two years ago a 9-year-old boy died when he fell into the bubbling waters of Crested Pool in the Upper Geyser Basin, not far from Old Faithful. Following this tragedy, a railing was built along the pool, where temperatures reach close to 200°.

Study Probes Future of All the Parks

There are similar pools scattered over a large area of the park. Are all to be enclosed in barriers? Or are the thermal pools to be left as they are, without alterations to their settings, but with rigidly controlled access? When does providing for "the benefit and enjoyment of the people" have to stop because of the heavy burden it places on preserving the environment?

The answers to such questions are being sought during this Yellowstone centennial year. Members of the National Parks Centennial Commission, an advisory body, have

been charged to use the anniversary to evaluate and make recommendations for the next century of national parks.

Meanwhile, Yellowstone is geared as best it can to handle what may be an all-time high number of visitors during this, its hundredth summer. And once again, Old Faithful will occupy the center ring of attractions.

I first saw Old Faithful perform on a Sunday afternoon. Two thousand other persons watched that eruption, too. As the tower of hot water surged out of the earth, I looked around and saw wonder reflected in nearly every face. Yet I heard only one voice—a rasping whisper urging the geyser to "Go, boy, go." An elderly couple next to me held hands, as if the hissing waters were pronouncing a benediction of happiness and good health for their late years.

Eruptions occur on the average of once every 65 minutes. Geyser experts concede that the complicated system of subterranean plumbing may one day cease to function. Chances are, however, that when Yellowstone's second century rolls to a close, Old Faithful will be working its sorcery as usual.

The Grand Canyon and falls of the Yellowstone River are also favorite attractions. Viewed from the rim of the canyon, where the depth varies from 800 to 1,200 feet, the

Recipe for Western nostalgia includes a visit to Old Faithful Inn (**left**), or a ride on an old park coach from Tower Junction that may culminate in a chuckwagon cookout.

Old Faithful Inn—known as "the world's largest log hostelry"—soars more than 90 feet in the central lobby. If plans to discontinue all overnight accommodations at Old Faithful materialize, the 68-year-old inn, built of native fir and lodgepole pine, will become a daytime visitor center.

river flows like a swirl of frothy confection.

I walked along a trail that descended 600 feet in less than half a mile to reach the Lower Falls. There the water tumbled 300 feet to crash and then move on through a screen of spray (pages 612-13).

"Fairest Dream Which Ever Came"

Of all the stretches of water in the park, the one holding the most appeal for me is Yellowstone Lake. Sitting at an altitude of 7,733 feet, the lake takes snowmelt from the serried peaks of the Absaroka Range pressing in from the east. Far to the southwest, but still visible, rise the Tetons.

Of this lake with a shoreline of more than 100 miles, a member of the Washburn expedition wrote: "It was like the fairest dream which ever came to bless the slumbers of a child. How still it was! What silence reigned! How lovingly it laid its hush upon you!"

That same hush was laid upon me one afternoon when I took a small boat out on those jadelike waters, and sat for hours while cutthroat trout played soccer with the lure on my line. Silence in our time, however, can be perishable even in the remote reaches of Yellowstone. High overhead, a military jet sent down a sonic boom that fell on the lake like a burst of divine rage. □

THE NEXT 100 YEARS

A Master Plan for Yellowstone

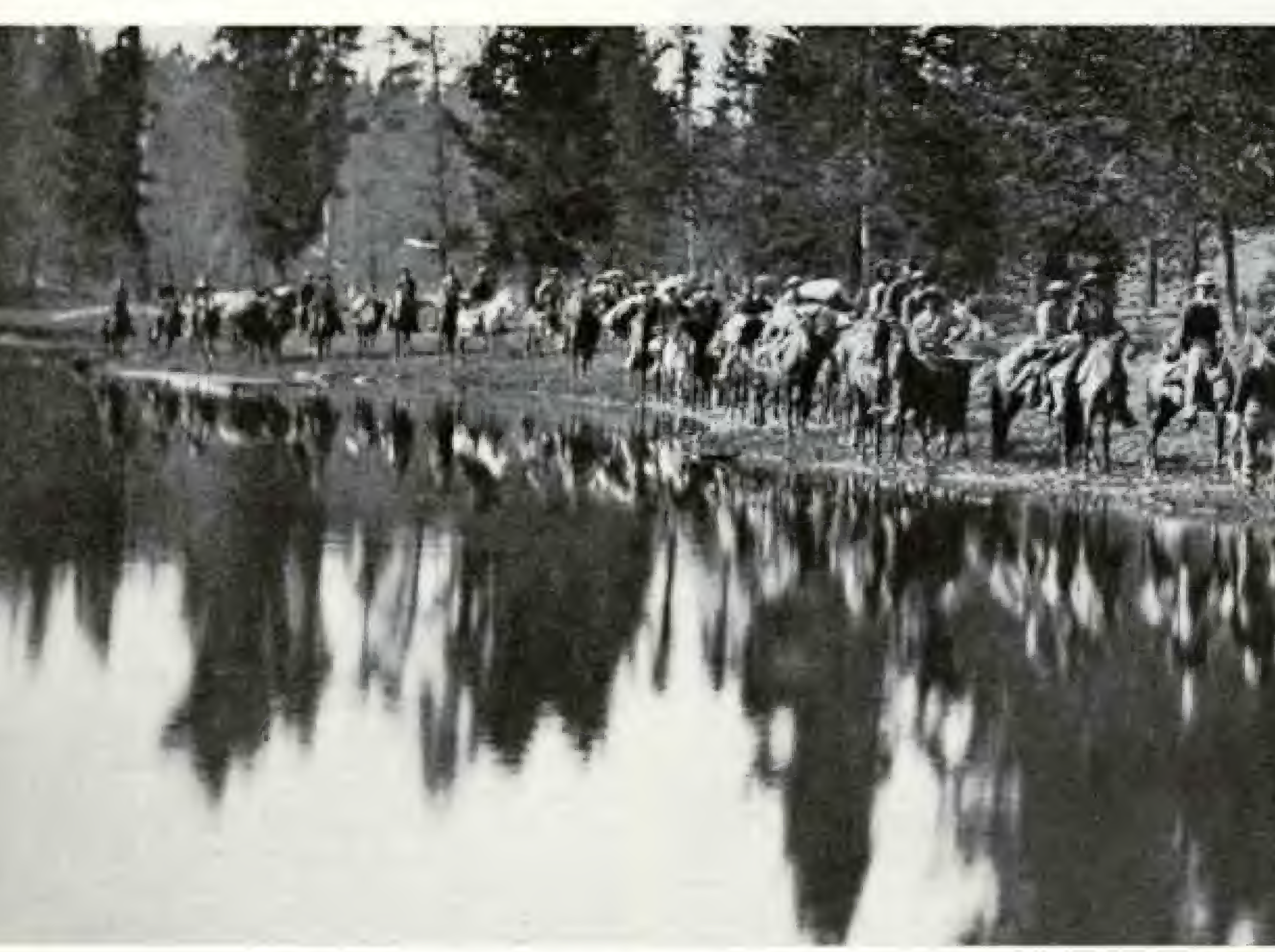
By GEORGE B. HARTZOG, JR.
DIRECTOR, NATIONAL PARK SERVICE

THE MOUNTAIN MEN—trappers and guides—saw it first, this country called Yellowstone, but their reports were quickly put down as just so many tall tales. William Henry Jackson, however, took his cameras along on the 1871 Hayden expedition, and his clear and beautiful photographs were accepted as proof that this vast garden of nature's wonders did indeed exist.

Certainly, members of the Senate and House of Representatives, when voting to make Yellowstone our first national park, must have been impressed by the pictures.

Equally impressive was the official report of 2nd Lt. Gustavus C. Doane of the 2nd U. S. Cavalry, who accompanied the Washburn expedition of 1870. Yellowstone, he wrote, "is probably the greatest laboratory that nature furnishes on the surface of the globe."

One hundred years later, we face the grim realization that without prudent planning the



Some 30 strong, the Federal Government's 1871 Hayden expedition heads toward

future of Yellowstone is in jeopardy. The problem, ironically, is an outgrowth of the park's success—the threat of overuse.

If this great natural resource is to be protected from destruction over the centuries to come, we must base our plans on the realities of today and the potential of the future. For example, the park road system and facilities for overnight accommodations were built to meet the requirements of the horse-and-wagon era. Neither is sufficient today.

Enjoyment Without Risk of Destruction

What can we do to ensure that Yellowstone will continue its service to mankind—service, that is, to meet the demands of the times?

Yellowstone must be preserved and protected, but it also must be used. We cannot seal off its borders, any more than we can open the park to all comers without regulation. The park exists to serve the public, but the public cannot be allowed to damage or destroy it. Unlimited development would mean the eventual end of Yellowstone. And that destruction would mark the absolute failure of what the National Park System stands for.

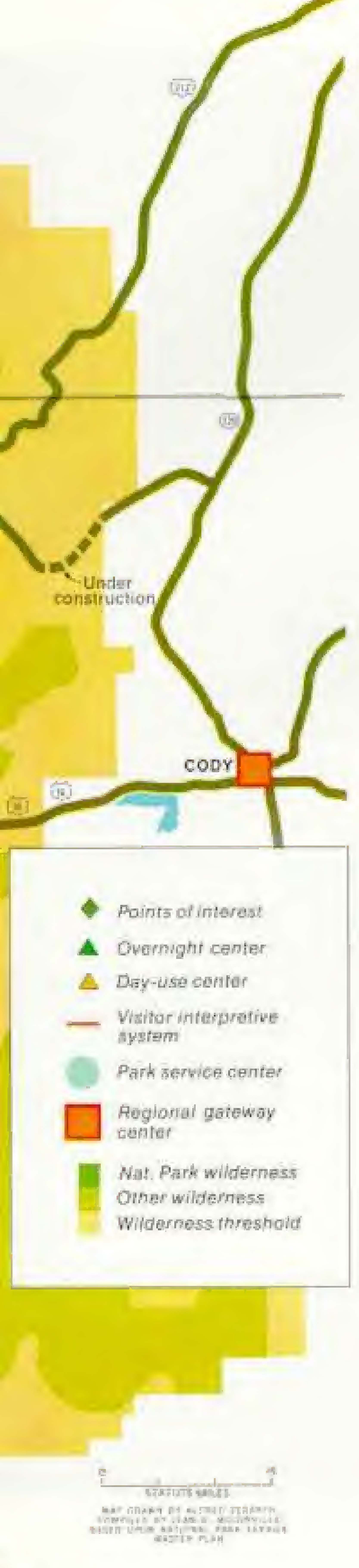
Thus we must strike a new balance, providing maximum enjoyment of the park's many treasures without contributing to their destruction.

To do this, the National Park Service has drafted a new "master plan." This is not a set of rigid blueprints and precise specifications. Rather, it is a philosophical statement on how we can recognize and overcome the challenges to the future of Yellowstone. It contains suggestions to be implemented according to the realities of time, population, the state of scientific knowledge and technological developments, and, of course, the availability of public and private funds.

WILLIAM HENRY JACKSON, FROM THE NATIONAL ARCHIVES

Yellowstone. Pictures it brought back helped convince Congress to create the national park.

GARDINER
COOKE CITY
MONTANA
WYOMING
MAMMOTH HOT SPRINGS
ROOSEVELT LODGE
YELLOWSTONE
NATIONAL
PARK
NORRIS
CANYON VILLAGE
WEST YELLOWSTONE
Hebgen Lake
MONTANA
IDAHO
WYOMING
LAKE - BRIDGE BAY
PAHASKA
Yellowstone Lake
OLD FAITHFUL
Shoshone Lake
WEST THUMB - GRANT VILLAGE
Yellowstone
Snake
BECHLER
ASHTON
FLAGG RANCH
Under construction
GRAND
TETON
NATIONAL
PARK
JACKSON LAKE
LEEKS LODGE
COLTER BAY VILLAGE
JACKSON LAKE LODGE
MORAN
Jackson Lake
SIGNAL MOUNTAIN LODGE
Jenny Lake
JENNY LAKE
IDAHO
WYOMING
MOOSE
AIRPORT
Snake
JACKSON
DUBOIS



The plan recognizes that one of the most serious threats to Yellowstone—and to most other parks as well—is the automobile or recreational vehicle. There will be an emphasis, then, on getting people out of their cars and into actual contact with nature.

This does not mean that everyone will be expected to shoulder a pack and cross the park on foot. Rather, it means that much of the transportation inside the park should be by unobtrusive mass transportation. This would allow the visitor to get easily from place to place, spending as much time as he desires in any one area.

The visitor of the future could approach Yellowstone on any of the highways serving the preserve. At the "gateway," where the highway meets the park border, he would find a complete service complex with food and lodging according to his budget, parking lots, a bus staging area, and a visitor center where he could plan his trip.

Overnight accommodations retained inside the park would be changed in character from traditional lodge or hotel atmosphere to wilderness threshold communities. Here the visitor could make the transition from urban dweller to naturalist, learning from and enjoying close contact with the natural world.

Park Visitors Would Travel by "People Movers"

The master plan would change one of the most famous of Yellowstone's lodges—Old Faithful Inn—to a daytime visitor center.

Facilities at West Thumb, which encroach on significant natural features, would be phased out and the area returned to a natural state.

At Old Faithful and other areas of visitor concentration there would be shuttle buses to take visitors to points of interest. At Canyon Village, cars would be barred from the drive along the rim of the Grand Canyon of the Yellowstone. Buses or other means of mass transit would allow visitors either a look or a longer stay, and then return them to the visitor center, where another people-mover system could take them on to the next destination within the park.

The combination of mass transit and gateway centers for parking and lodging would allow the National Park Service to concentrate within Yellowstone on interpretive services to help people get the most out of their visits.

Many of our interpretive services—visitor centers, exhibits, displays, and ranger talks around the campfire—could be performed very well in a gateway area. The visitor would

Blueprint for the future calls for Yellowstone and Grand Teton National Parks and five adjoining national forests to work together in providing the best possible recreational facilities without sacrificing the wilderness. The Park Service hopes to encourage full-scale development of gateway centers where visitors would live, eat, and learn about the park. There they would board "interpretive vehicles" of a mass-transportation system that would drastically reduce use of private cars in the park.

be better prepared to enjoy his visit once he gets into the park, and less likely to miss something simply because he didn't know where or how to look.

With fewer cars and roads and less construction within the boundaries of Yellowstone, there would be a better chance for nature to restore a natural ecosystem—a major objective of the master plan.

Lieutenant Doane reported that his 1870 party was serenaded by "the melancholy voices" of mountain lions. I hope that before the end of Yellowstone's second century this serenade can be heard again.

Yet Yellowstone cannot stand alone. It will share the fate of its region. Planning must involve the park's neighbors, which, happily, include Grand Teton National Park, five adjacent national forests administered by the U.S. Forest Service, and a number of towns and ranches.

There is already much significant cooperative planning being done through the Joint National Park Service and U. S. Forest Service Coordination Committee. This cooperative work must be increased, for our success will depend upon the cooperation and the contributions of all concerned, both in government and in private enterprise.

Man Must Leave Nature in Control

For the centuries to come, we hope to make Yellowstone National Park a peerless example of wilderness preservation: an area controlled by the basic forces of nature, yet available to all the people.

At Yellowstone we shall be able to see and understand the beauty of those forces and how our lives—in any environment—depend upon them. A major attraction will always be the natural phenomena of geysers, hot springs, and bubbling paint pots—pools of mineral-colored mud—which amazed the first explorers to see them.

Further, Yellowstone will effectively demonstrate the best of man's efforts to sustain his natural heritage and will be a living tribute to the origins of the worldwide national park movement.

In a nation with a life-style of transience and mobility, Yellowstone can be a permanent symbol of conservation that will enrich and sustain all who visit there.

With creative development and management, Yellowstone—the world's first national park—can become the exemplar of an environmental ethic in action. □

A mother moose and her calf wade in

peaceful Rainey Lake. Man's ultimate responsibility is to preserve their wild realm.

TROUBLED CAPITAL OF THE ARAB WORLD

Cairo

By WILLIAM S. ELLIS
Photographs by
WINFIELD PARKS
BOTH NATIONAL GEOGRAPHIC STAFF

Peddling history, a vendor outside the Egyptian Museum in Cairo unfolds postcard reminders of the glories of his nation's past. Near his right hand gleams the portrait mask of King Tutankhamun, who reigned 3,300 years ago, during Egypt's golden age. More than two millenniums later, Cairo was born. Today the city struggles with internal problems amid the explosive discord of the Middle East.

SPRING'S LAST RAIN here in Cairo was a brief and gentle shower that left no legacy save a fresh blush on the bougainvillea. And even that had vanished by the following morning, as a desert wind pushed up from the south to nail a pale yellow tapestry of sand and dust to the skyline.

The wind is called the khamsin, translated from the Arabic as "fifty"—for the number of days, more or less, that the hot and gritty gusts tumble across this largest of African cities. At such times the patched sails of the old feluccas on the Nile beat out a tattoo of whiplash ruffles. A withering dryness chews on the soil until, like brown talc, it rises and scatters. Trees bend with the blow and shake their branches free of the fat and fuzzy bugs of May.

Cairo endures it all. Indeed, the age-old history of this leading city in the Arab world is a catalogue of sufferings borne in good grace: the bloodletting repression of mad militarists who came and conquered (Egypt was never easy to defend); the arrogance of European colonialists, who proclaimed Cairenes second-class citizens in their own city; and flood and fire, plague and hunger.

Now, three years into its second millennium, Cairo is once again with pain. Austerity has rolled in like some crushing tide of self-denial, and that, coupled with overpopulation, has left too many with too little. Equally troublesome has been the long incendiary quarrel with Israel.

Yet, for all present and past challenges to its survival, Cairo has retained the strength of character by which the greatness of cities is judged. *Character.* The streets throb with it.

"Hey, I show you something nice for 25 piasters, huh? Never mind, I do it for 10." He was at my side, an aged man, dark and stooped. "Ten, that's all, just 10 piasters."

All right, I said, show me something nice, whereupon he retrieved a fencing sword from beneath his galabia and let it slide, quickly and with little effort, down his throat. Then, dropping to one knee, he raised his face toward the heavens and spread his arms wide in vaudevillian triumph.

This encounter occurred in an old quarter of Cairo, on a narrow winding street darkened by the shadows of ancient buildings. It was there that I first came to feel the full press of the city's vitality.

It began in early morning with the appearance on the street of a teen-age boy riding a bicycle while balancing a tray the size of a surfboard on his head. (I would see him again later that day, still pedaling, only this time with loaves of unleavened bread stacked at least two feet high on the tray.) Then, as window after window became filled with light, I heard muted noises, like those of a parade band still three blocks

away. Soon, however, it was all cymbals and brass as metal roll-down doors clanged open and bugle-throated vendors went to work.

By midmorning the street was clogged. Cars and trucks and donkey-powered carts pried through the crowds, brushing arms and legs. Men and women carrying incredible cargoes on their heads (in one case, 48 shoe boxes lashed together) dodged and darted, seeking the openings needed to keep moving lest the weights of their burdens start to settle like hardening concrete. A funeral procession appeared and was quickly engulfed by the mass of people, leaving only the coffin, carried high, as a position marker for the mourners.

Squeezed into the middle of all this, I was prepared for the jostling I took, but not for the sharp tuggings on my pants leg. I looked down to find a baboon with a toothy, lippy grin fixed on me.

He danced, he rolled over, he even imitated the staggering walk of a drunk, and when I gave his keeper a coin, the animal thrust out his right hand. By then the swell of life all around had subsided as hundreds watched. It seemed a pity to spend such a wealth of attention on something no more lasting than a handshake with an old and scruffy ape.

More than anything else, Cairo's streets and the life on them reflect the diversity of

the city's origins. There is a medieval Cairo, and a European Cairo, a Cairo of Arabian Nights ribaldry, and a Cairo of polo and silver-service teas. The city is a collage of influences brought to bear by a succession of foreign conquerors, but it is from the East that the dominant life-style is drawn.

Astrologers Upstaged by a Raven

Cairo as it exists today had its beginning in A.D. 969. On an August day of that year a conquering general named Jawhar, who soldiered for the Fatimid dynasty of Tunisia, had his troops rope off a site northeast of what was then the capital of Egypt, El Fustat. The ropes were strung in a square, about 1,200 yards on each side, and on them were attached many bells. At the auspicious moment when the planets were properly aligned in the sky, the bells would be rung as a signal for workmen to start turning the sod for this new seat of government and military power.

Less than a mile to the west the Nile flowed past, running high, as the mother of Egypt began to nourish the delta with an embrace of silty flooding. Pressing down from the east were the Muqattam Hills, honey colored in the sunlight and rising high enough to look out on the Great Pyramids in the desert (map, page 647). Elsewhere there were many green

Building blocks for health: Vitamin ampules, sealed with jets of flame, are checked by a laboratory technician. Until 1952 Egypt imported 90 percent of its pharmaceuticals; today a rapidly growing industry produces enough for home use and export.

Fly-killing fog hangs over an open food market in Cairo's old quarter. Youngsters romp in the cloud of insecticide. The city's plague of flies contributes to gastrointestinal infections, a leading cause of death.

fields in which to graze the goats and lambs.

Ah, what a prize Jawhar had plucked for his caliph.

The bells rang and the workers dug into the earth with their mattocks. However, this was premature, as the astrologers were still making their calculations. A raven was responsible. Coming to perch on one of the ropes, it had set off the signal—and just when the planet Mars was rising.

Clearly, this was no time for seizing on good luck and fortune, not with Mars believed to be raining down a curse of black forebodings. Too late to turn back the devils of the ill omen, it was decided to appease them by naming the place El Qahira (The Victorious) after El Qahir (Mars).

So goes the legend. True? Probably not. But for Cairenes to assign the history of their city's birth to anything less dramatic would be at odds with their bent for the fanciful. Here, even simple conversation is frilled with the embroidery of emotion. Two friends meet on the street and the greeting becomes a playlet of action and dialogue: embraces, kisses, the laying on of benedictions, clinical reports on current ailments (faulty livers seem to predominate), and finally adjournment to the nearest café for coffee.

No matter how it came by its name, for 500 years after its founding Cairo flourished. As a center of cultural influence in the Islamic world, it had no rival. The city was extremely wealthy, too, due in part to its strategic position on the trade route to India and the Far East.

This importance diminished when man discovered in the late 15th century that he could sail around the Cape of Good Hope. By then Cairo was ready for a rest. The years had been filled with exhausting busyness—years that saw the rulers of the great city honor their Prophet with magnificent architectural monuments.

Barking battle cries, students at a new police training center brandish Soviet-made submachine guns. Another group smashes bricks (**lower left**) in a karate demonstration. Though labeled police training, the paramilitary drills emphasize the continued rebuilding of Egypt's armed forces after three disastrous encounters with Israel in less than 25 years. Military costs claim 30 percent of the nation's budget.

In the spotlight: Anwar Sadat (foreground, left), President of the Arab Republic of Egypt, arrives at a Cairo conference to discuss Middle East hostilities. One of the army officers who overthrew King Farouk in 1952, Sadat has combined harsh war threats with talk of compromise with Israel. Since the death of Gamal Abdel Nasser in 1970, he has strengthened individual freedom under a new constitution, and hopes to double national income through industrialization.

Cairo raises new monuments of concrete and steel by the banks of the Nile. A crescent-shaped hotel dominates the tip of the city's Roda Island. Nearby, an apartment tower rises in a residential area whose wide streets and

modern buildings contrast with the winding alleyways and courtyards of medieval Cairo. Gezira, the island in the foreground, contains the Exhibition Ground, where Egypt's growing industrial community displays its wares.

Among mosques built in Cairo at that time, and which continue to stand as some of the finest Islamic structures anywhere, was one called Al Azhar. It would soon be expanded into a university, the foremost institution for Islamic studies in the world.

"We now have more than 20,000 students studying in 11 faculties," said Dr. Badawey Abd El-Latif Awad, rector of 1,000-year-old Al Azhar. He took a sip of orange juice and went on to tell me that nearly 3,000 of those are women, including a few from the United States. "There are still two basic requirements for entrance. Applicants must be Moslem and they must be thoroughly familiar with the Holy Koran."

Graduates Increase—But Jobs Do Not

Al Azhar takes youngsters between the ages of 12 and 15, puts them through preparatory schools and then through one of the higher-education faculties. From enrollment at this age, study for a doctorate covers a period of about twenty years. In 1961 the university expanded on its three traditional faculties of Islamic law, theology, and Arabic studies to offer degrees in such fields as medicine and engineering.

Dr. Awad spoke with pride of Al Azhar's new curricular thrust, but he emphasized that "the foundation of all study here is still theology and the traditions of the Holy Prophet Mohammed."

In another section of the city, west of the Nile, is Cairo University, with an enrollment more than double that of Al Azhar. Thousands more study at Ain Shams University and the American University. There are not enough good jobs to absorb the outpouring of graduates. I met one man with a recently acquired degree in engineering who makes a living checking manhole covers to see that they are in place. For many others the only choice is to take up a stamp-and-ink-pad station in a government office.

Liberalization of some of the fusty traditions regarding the role of women in Egyptian society has also swelled the ranks of job seekers. Mrs. Amina el Said, editor of *Hawaa*, a women's magazine published in Cairo, told me that there are now 3,000 married women studying at Cairo University.

"The old tradition of marrying at 16 and having babies right away is going," she added. "There was an old saying about the Egyptian woman: She makes only two outings in her lifetime—the first time from her parents'

Stumbling block to progress, nearly two and a half decades of conflict between Arab and Israeli have kept Middle East nations preoccupied with defense. During the six-day war of 1967 sunken vessels closed off the Suez Canal. It has been out of use ever since, depriving Egypt of an important source of income.

"Garden of the world," the 14th-century historian Ibn Khaldun called Cairo, in tribute to the city's debt to the Nile Valley's generous soil. Conqueror Jawhar chose the site in A.D. 969. It was named El Qahira—"The Victorious"—which has been Anglicized as Cairo. More than five million Egyptians—about 15 percent of the country's 34 million people—live in the city. Cairo, like many other capitals, has become an overcrowded and problem-wracked metropolis.

Cairo
Qalyub
Balaqs
Abu el Gheit Island
Abu el Gheit
Mit Halfa
Burtus
Bahtim
Musturud
Nile
Siqeil
Basus
Ausim
Shimbara
El Zeidiya
Damanhur Shubra
Warraq el Hadr Island
Shubra el Kheima
Warraq el Arab
Warraq el Hadr
El Amiriya
Ain Shams
El Matariya
Shubra el Balad
Statute Miles
Elevations in feet
El Qubba Palace
Heliopolis
Shubra
Madinet Nasr
Cairo Stadium
Imbaba
Cairo Main Station
Bulaq
El Gezira
Gezira Sporting Club
Exhibition Grounds
American University
CAIRO
El Duqqi
Cairo University
Zoological Garden
El Roda Island
Citadel
Muqattam Hills
Madinet el Muqattam
City of the Dead
Old Cairo
El Giza
Ruins of El Fustat
Academy of Arts
El Haram
Nahiya
Bulaq el Dakrur
Saft el Laban
Minshat el Bakkari
El Basatin
Cheops
Sphinx
Chephren
Mycerinus
Pyramids of Giza
El Harraniya
El Maadi
Abu el Numrus
Manyal Shiha
Nazlet el Ashtar
Shabramant
Tammun
Tora

home to the home of her husband, and the second from her husband's home to the grave.

"Now the most respected women in Cairo are those who are educated and working. Of course it wasn't easy at the beginning. I was the first woman journalist in Cairo. That was in 1934, and the reaction was as if I were going to work in a striptease cabaret."

To Many, Cairo Is More Than a City

Students from villages are urged to return home after graduation, but once in Cairo they seldom leave. I have spoken with fellahin—Egyptian peasants—in dusty settlements and heard them refer to the capital not as Cairo, but rather as Misr, meaning Egypt itself. Especially to the young, who face a future of strangling poverty, the city is a Valhalla where the gods open the floodgates of the mind to let the dreams of youth gush to life.

So they crowd into Cairo, raising the population (now in excess of five million) by something like one every 90 seconds. Some live on rooftops, others in alleyways, or in straw huts set up along the Nile. A high official of the General Administration of Planning and Urban Development told me that there are about 600,000 family housing units in the city. "But we estimate the number of families living in these units to be 900,000," he added. "Overpopulation is by far our most serious social problem."

I asked about transportation, and he conceded that something had to be done. "We are in the final phases of planning for a subway, and with no further delays, it could be completed in a few years," he said optimistically. Meanwhile, stubby little trolleys—woven straw seats and all—continue to trundle through the streets, seldom stopping and therefore setting off chaotic decathlons of running, jumping, and vaulting among boarding passengers. The buses, for the most part, are battered and decrepit.

Cairo in many respects is a showcase of the 1930's—the trolley cars, cathedral-shaped radios with cloth-fronted speakers, kids foraging in the cool catacombs of unattended ice trucks, families out for a walk. And a lack of concern about crime.

"We have very little major crime because Cairo is a city with strong Islamic traditions," said Dr. Ahmed M. Khalifa, Chairman of the National Center for Social and Criminological Research.

"Crime here reflects rural motives, such as defending—sometimes violently—an attack on a person's honor," Dr. Khalifa continued. "We have no drug problems among our young people, and what juvenile delinquency there is usually results from need. Egyptian children regard their parents with great reverence and want to do nothing to bring dishonor to the family."

When crime is committed in Cairo, it is often done with a certain flair; nothing redeeming, to be sure, but ... well, consider these cases gleaned from police records:

• A group of pickpockets boards a bus. One yells that there are scorpions loose in the vehicle. In the ensuing panic, the passengers are relieved of their valuables.

• Three rustlers are quickly apprehended after snatching a cow. The choice of a vehicle in which to transport the stolen animal proves to be their downfall. It's not easy to hide a cow in a Mercedes-Benz.

• After each of his robberies, one burglar writes to his victim, apologizing and promising to make restitution. As if that weren't unusual enough, the burglar always breaks into the home of a judge to steal stationery on which to pen his letters.

Movie Script Calls for 3,000 Camels

Not all the theatrics in Cairo draw the attention of the police. There is legitimate theater, as well as opera and ballet. The best of the world's belly dancers still appear in the city's nightclubs and cabarets (page 665). Of course, Karyoka no longer performs, but as Egypt's premiere dancer before and during World War II, she is remembered as the Cairene who could best lure an audience into the ineffable dreamland of the Orient.

Of all the fields of entertainment, none is more active in Cairo than the movie industry. Films made here have a history of excellence. Distributed throughout the Arab world, they are often grand and breathless, with gushes of

"Smelling the breeze," an Egyptian mother and a friendly brood visit Cairo's Zoological Garden for Sham el Nessim. Thousands of Cairenes take part in this annual outing to celebrate the coming of spring.

Almost airborne with anger, a tourist guide charges toward photographer Parks. Paid for steering customers to a photographic concession at the Pyramids, the Egyptian feared competition from the Geographic cameraman

Ghostly glow bathes the Sphinx and the Pyramid of Chephren as loudspeakers recount Egyptian history. The 1967 war cut tourism drastically, but Cairo last year welcomed some 400,000 visitors, most of them from Arab countries. Because of the break in diplomatic relations between Egypt and the United States, only about 25,000 Americans visited Cairo in 1971.

Arab rhetoric. At other times they are sparse and lean and etched with subtle humor. I was invited to look in on the filming of *The Sister of the Prophet* at the Al Ahram Studio. Here, truly, was an epic in the making.

"We'll use 25,000 persons in this picture, plus 3,000 camels and an equal number of horses," Abdel Salam Moussa, general production manager, whispered to me as we watched the cameras record a scene in a tent. "We are now in the seventh week of production and have another four to go. Tomorrow we move to location on the desert."

Smoke curled from incense pots as dancing girls re-created the tented gaiety of 1,400 years ago. The leading man, Ahmed Mazhar, turned half-face to the camera to deliver a line, and his bearded profile printed on the light like a strong woodcut.

When I next saw Mazhar, he was lying in the desert, about 20 miles from Cairo. "Blood" by Max Factor covered his left arm. As an Arab warrior, he had just been wounded in battle, and now they were trying to get his agony on film.

When Souma Sings, Most Arabs Listen

Mazhar has hundreds of thousands of fans in the Middle East. Almost all Arab performers with such followings live and work in Cairo. But of these, only one commands a reverence of near fanaticism. Her name is Um Kulthum, and she sings.

On the night of the first Thursday of each month, this 70-year-old woman appears on the stage of a Cairo movie house and sings just two songs. However, each lasts for two hours. The songs are stories of love. Delivered in the throaty, semi-wailing Arabic manner, they are heard by a radio audience estimated to number in the tens of millions throughout the Arab world.

Although the theater had been sold out for four months, I was allowed to attend one of her spring concerts. In the audience were Kuwaiti and Saudi sheikhs, Lebanese millionaires, Sudanese graduate students, and Ethiopian airline personnel. Many had traveled to Cairo for no other purpose than to see and hear the one they call Souma.

As the curtain began to open, an elderly man rose to his feet and yelled, "*Ya habibi, ya habibi*—My sweetheart, my sweetheart." More shouting followed: "Souma, Souma," and "*Ya qalbi*—My heart." Then she was in view, smiling and evoking full-blown frenzy.

She stood before a 25-piece band, fingering a pink chiffon handkerchief the size of a pillowcase. And minutes after she started singing, Souma had reached out to tug at the gentle Egyptian soul until, like a kite with a tail of music, it was soaring and gliding in a sweet sky of rapture.

In 1953, Souma developed a serious throat ailment. Black borders framed the story when it appeared in the newspapers.

Egyptian surgeons are among the most skillful in the world, but none would dare operate for fear of doing harm to the famous voice. The United States Government offered her treatment at the Naval Medical Center in Bethesda, Maryland. She accepted, and the operation was a success. Nearly 20 years later, I met many Cairenes who still think kindly of Americans because of that.

Uncle Sam Blamed for Cairo's Sandbags

For other reasons, too, an American visiting Cairo is made to feel welcome. Yet diplomatic relations between Egypt and the United States are severed. Nearly every day one newspaper or another lays the ills of the world on the doorstep of Washington, while the government radio coos endearments to Moscow. Carried by voice or print, the message is the same: Uncle Sam is a boogeyman.

Because of Egypt's heavy dependence on the Soviet Union for military and technical assistance, the Russian presence in Cairo is strong. However, this is not immediately apparent. The Russians, for the most part, have set themselves off in social isolation, and only occasionally are they seen on the streets.

What are seen are the sandbags, stacked in front of the entrances to buildings as a precaution against Israeli air attacks. Many windows have been taped (page 666), as have the treasure-laden showcases in most of the museums. The headlights of automobiles and other vehicles shine dimly through half-drawn shades of blue paint.

I have walked the streets of Cairo and been told by strangers that, as an American, I must take some of the blame for the sandbags. But the strangers smile—they always smile—and call me a friend. I have wandered through the Egyptian Museum and been told by a guard that it is partly because of me, my government, that the gold coffin of Tutankhamun is in a secret bombproof place. But he smiles and calls me a friend.

I have sat on the railing of the wide and handsome corniche that borders the Nile for 20 miles and been told by a balloon vendor

that because of the "Zionist-controlled" press in my country, Americans are never told the truth about the Middle East. And he also smiles and calls me a friend.

The paradox lies in the average Egyptian's shallow capacity for hate, his belief that life is too short to be cluttered with bilious debris.

"It takes a lot to make an Egyptian angry," Dr. Youssef Idris told me. "It pains me deeply when this tenderness is interpreted as cowardice." Dr. Idris is a physician who quit his

practice to write. He is now one of Egypt's leading authors. As we spoke, his thoughts reflected the heavy concern he holds for his city and country. But then, in typical Cairene fashion, he set out to enlist my laughter by outlining his strategy for defeating Israel.

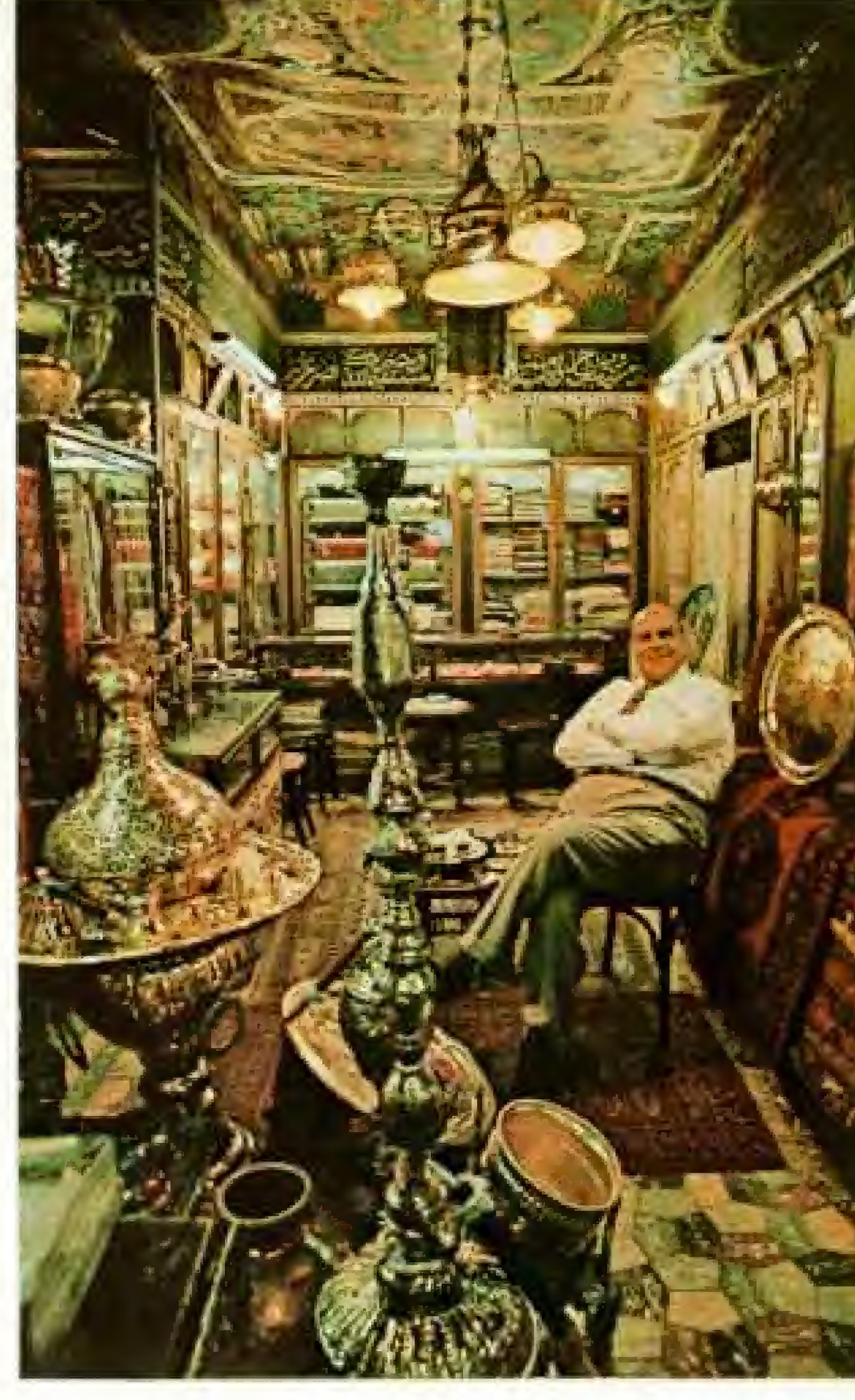
"We'll get all 34 million Egyptians together and march them to the Suez Canal. On a given signal, when we are face-to-face with the enemy, all 34 million of us will smile. Are you aware of how disarming it would be to look on 34 million smiling Egyptians?"

A few minutes later he was again serious, saying, "I'm sorry you have to see Cairo as it is now. It was much better before the 1967 war." Dr. Idris was talking about European

Britons once took their leisure where Cairo's own elite now sip Turkish coffee. Until 1952 few Egyptians were admitted to membership in the Gezira Sporting Club, a bitter reminder of centuries of foreign domination. Ottoman Turks held the city for nearly 300 years before Napoleon invaded in 1798. Three years later a British-Turkish alliance returned Cairo to Turkish rule. Late in the 19th century the British took over the bankrupt nation's financial affairs and occupied its capital. In 1922 they established a monarchy, which survived until the Nasser-led revolt 30 years later.

Shreds of sunshine reach into a darkened metalworking shop where two youngsters shape trays to be sold in the Khan el Khalili bazaar. Despite labor laws prohibiting child exploitation—increasingly enforced—many children hold jobs to help their families stay afloat.

Surrounded by his treasures, proud merchant Zaki Boutros waits for customers in his Khan el Khalili store. His offerings include rich brocades on the far shelves, Oriental rugs and a hammered copper plate to his left, and a tall water pipe and a brazier in the foreground. A shopper's appearance may trigger the exaggerated spiel of Middle East salesmanship along with an offer of tea, coffee, or even lunch.



Ornate brass tray takes shape under the skilled hands of a craftsman at Khan el Khalili. From such backyard workshops come most of the handicrafts that have drawn buyers to the bazaar since the 14th century. In earlier times the crowded marketplace also attracted scores of thieves, who often paid for shoplifting with the loss of hands.

Cairo, a section of the city marked by wide streets and grassy parks and the click of croquet balls on velvety greens. That part of Cairo has indeed changed—change that, in fact, started in the wake of the 1952 revolution when, for the first time since before the birth of Christ, Egyptians took complete control of their own country.

The once-famous shops no longer stock Paris fashions. The old Shepheard's Hotel, where Englishmen at ease took their gin and tepid Scotch on the veranda, is gone. Bastille Day passes now without scores of French nationals gathering in Ezbekiya Garden for a joyous celebration.

Following the fall of the line founded by the Kurdish conqueror Saladin, the Mamluks ruled Egypt from Cairo for 267 years. In 1517 the Ottoman Turks stormed into the country, hanged the last Mamluk sultan, and nailed his body to one of the massive gates in the city wall.

Bonaparte came to Egypt in 1798, together with 55,000 troops and an armada of nearly 400 vessels. The French stayed for just three years—long enough for the soldiers to scratch their names in the stones of Cairo's buildings. It wasn't until half a century later that the Europeanization of the city began.

This came about when major banking houses on the Continent got a financial stranglehold on Egypt through what may well be the greatest swindle in history. From 1849 to 1882 Egypt had four rulers; all were descendants of the Turkish viceroy Mohammed Ali, an Albanian who built a mosque of alabaster on a spur of the Muqattam Hills, and all were in need of great sums of money. Advancing the funds under conditions calculated to make repayment impossible, the bankers collected the collateral, which was—in effect—the country.

Europeans came to Cairo in great numbers and laid the burden of East-West adjustment on the city. In 1882, with Egypt weakened by internal strife, the country was occupied

Hanging room only marks rush hour in Cairo. Injuries abound as outriders mount and alight amid heavy traffic—often while the vehicles are moving. Once a city of pedestrians, Cairo now endures the clamor, congestion, and chaos of motor traffic. Reflection on a taxicab window produces the ghost image at the top of the picture.

by the British, and the stamp of Europe pressed down on Cairo.

The Suez Canal had been opened in 1869, during the reign of the Khedive Ismail, and what a grand moment in the city's history that was. Ismail had a road built from Giza to the Pyramids so that the Empress Eugénie of France and other royal personages, together with such notables as writers Émile Zola and Henrik Ibsen, could travel there in comfort. Invitations had gone to 1,000 persons in Europe for the all-expense-paid visit to the Egyptian capital. Little wonder Ismail had to turn to the banking houses for help.

Aïda Was Late, But Worth the Wait

New hotels were constructed to accommodate the visitors. The Opera House was built, and Giuseppe Verdi was commissioned to write the music for a work with an Egyptian theme for the first performance. The opera wasn't completed in time for the opening. But, surely, *Aïda* was worth waiting for.

The Opera House was one of the most impressive monuments to that splendid event. Built by forced labor in less than six months, the white wooden structure was small but elegant. The seats were upholstered in red velvet. Horseshoe tiers of box seats rose four deep along the walls, and from the richly decorated dome hung an enormous chandelier.

I attended a performance there by the Cairo Ballet Company. The conductor was a Russian, identified as "Professor Mukhtar Ashrafi, People's Artist of the U.S.S.R." The medals on his tuxedo tinkled when he raised his baton to begin the performance.

And then, for the next two hours, the lovely old building was like a jeweled music box, still wound up and running after a hundred years. Not long afterward, in October 1971, the Opera House was destroyed by fire.

Lining one of the sidewalks that border the ruins of the Opera House are stalls jammed with secondhand books. It is said that down through the years some rare volumes have been plucked from the dusty stacks. I rummaged through the collections for most of one day, but, alas, my discoveries carried little value and not much more enlightenment. Still, I suppose they would have been a bargain—less than half a dollar for *Buff: A Collie*, Jellett's *A Short Practice of Midwifery for Nurses* (10th Edition), and an English-Arabic phrase book so old that among the entries is "Coachman, commence the journey."

Although the Opera House area was the heart of Cairo at the time of strong European influence, the parklike island of Gezira was where many of the wealthy built their imposing villas. Framed by the Nile, Gezira today is still a shaded and quiet haven from the ceaseless crush of activity in other sections of the city. More than 150 acres of the island are given over to the Gezira Sporting Club, for many years one of the world's great gathering places for fun and games.

"The club was started in 1887," I was told by the secretary, Maj. Ahmed Mourad. "In the old days the membership was 80 percent British. Most of the other members were also foreign. Of the 4,500 families we now have as members, almost all are Egyptian."

Old Club Spared by Frenzied Mobs

The Gezira Club has stood above politics. Even on "Black Saturday," January 26, 1952, when mobs inflamed with revolutionary fervor burned Shepheard's and other fixtures of a non-Egyptian Cairo, the club was spared. The food is not as good now as it once was, and the turf of the polo field needs attention, but for elegant leisure, nothing in Cairo can quite compare with this place (page 653).

Given temporary membership, I spent many hours at the Gezira Club. Late spring is a good time to be there, for the club grounds become a jamboree of color. Jacaranda, bougainvillea, and jasmine are all in bloom and washing the air with their perfumes. The swimming pools are full, the croquet matches spirited, and the waiters properly aloof. All is right with both the members and the ghosts of British colonels.

Some of the villas on Gezira remain in private use. But many are now embassies, and others have become apartments. Most people who can afford luxurious living have little choice in housing except for the expensive flats.

Pantry for Africa's largest city, Rod el Farag market chokes at midmorning after produce of the Nile Valley arrives for distribution to food stalls throughout Cairo (**following pages**). Women stevedores bearing crates of tomatoes wind through the throng. Despite overpopulation and widespread poverty, few people go hungry.

Covered face and curtained booth tell the past and present of women's rights as a shrouded figure shows her voting credentials in the suburb of El Harranya. Officials take a quick look at another voter's face (background) for identification. Women gained the vote in 1956, but the veil recalls their centuries of seclusion from public life. Veils have all but disappeared in the city. Co-eds like these students in an English class (**below**) make up a fourth of the enrollment in Cairo's universities.

In one such apartment to which I was invited for lunch, an old Flemish painting covered a dining room wall. Priceless Persian rugs cushioned the floors, and roses filled rare vases on every table. Finally (and I suspected this would happen), the mistress of the household clapped her hands as we sat down at the table, and a giant Nubian appeared bearing our lunch.

A more typical living arrangement, which I also visited, was an apartment several blocks from the Egyptian Museum. The 14-story building was erected in 1941 by an Armenian who had made a living shining shoes until he picked a string of winners at the racetrack. One enters through an alley and then goes up to the fourth floor in a malfunctioning elevator. The apartment is actually on the third floor, but the elevator, for some reason or other, doesn't stop there.

In this apartment the wall decorations are inexpensive icons and religious pictures, indicating that the tenant is a Christian, a member of Cairo's Coptic community. The dining table is in an alcove between kitchen and living room. There is no place in the apartment where sunlight makes a strong entrance, but this becomes an advantage during the frequent times when Cairo swelters in desert temperatures. The rooms of the apartment are all small. But so is the rent: about $18 a month.

Car-door Opener Earns Scant Living

Of course, for many of the 25 percent of Cairenes who can neither read nor write, home is a single dingy room. Those even less fortunate have nothing but the streets.

Ali Ahmed is 29 years old. He and his wife and three children live in a shedlike structure attached to the rear of a building where dozens of young boys hammer out designs on brass plates. The furnishings include two thin mattresses on the dirt floor, a small kerosene burner for cooking, and little else.

Ali earns a few piasters each day by opening the doors for drivers when they park their cars in one of the public parks. Each afternoon he lies in the shade of one of the banyan trees in the park and naps for several hours.

I visited the park often and became friendly with Ali. Once, in late afternoon, I gave him a ride home, and he told me that someday he would like to get enough money to buy a cart and tank, and sell kerosene from door to door. As for his present economic status, he felt no bitterness, attributing it to the indisputable will of Allah.

Invited in for coffee, I saw his wife cradling a child whose diseased eyes attracted many flies. I asked him why she didn't shoo the flies away. "Because," he replied, "they would only come right back."

Auto's Influence Threatens the City

Hassan Fathy is a Cairene with yet another life-style. He resides in a 17th-century house near Saladin's Citadel in the old city. It is a house of extraordinary character and charm, and it reflects the genius of Arab architecture. Of course, being an architect at whose knee other architects sit, Fathy knows full well the aesthetic value of his place.

At one time he was head of the Fine Arts Department at Cairo University. He now is an adviser to the Ministry of Culture. Hassan Fathy is also a kindly man, but when he stands on the roof of his house and looks out over Cairo, his despair borders on anger.

"This city was originally for pedestrians," he told me. "It was a city with introverted architecture—buildings opening into courtyards. Those open spaces, the courtyards, were for circulation and ventilation, and also for insulation. You step off the hot, crowded street into one of these yards, and immediately you are in another world, a cool and green suburb where the street atmosphere is shut out completely."

He waved to a man on a nearby roof and continued: "Now they are building with an emphasis on outer space. This is mainly for the benefit of the automobile. The automobile! Look what it's doing to this city."

I asked Mr. Fathy what must be done to prevent Cairo from destroying itself, and he replied, "First, the planners must stop thinking in terms of Western city planning."

Certainly that. The West can offer nothing to a medieval section of a city where 200,000 persons come to a central marketplace every morning to buy and sell fruits and vegetables in one of the most colorful tidal waves of confusion seen anywhere on this earth (pages 658-9); where all the shops on one street sell nothing but fire extinguishers, where a crowd of people gather to watch an old man paint a pictorial history of his journey to Mecca across the front of his house, and are happy for him because they

know he can now die in peace. Or where a man named Mohamed Sadek can make a living doing what he does.

I first came across the 70-year-old Cairene while exploring one of the streets near Al Azhar. In truth, I didn't notice Mohamed Sadek so much as I did the piece of equipment he was operating. It was a wonderful thing to see—big as a bathtub, all shiny brass and copper, and busy with dials and knobs and levers and banks of gas burners that offered up little halos of blue fire.

Sadek worked hard at whatever he was doing, turning this, pulling that, making all kinds of adjustments until that beautiful thing started to steam and hiss. And then I knew. I moved in closer to make sure. No question about it—Mohamed Sadek is a fez blocker. "I've been doing this work for 52 years," he told me, "right here in this shop all that time."

Today, perhaps one out of every thousand male Cairenes wears the red "flowerpot" hat, and even that number is falling off. When I asked Mr. Sadek if he feared for the future of his trade, he shrugged. Another worker in the shop said there was no cause for concern. "Before long, women will start wearing fezzes. It'll be the new fashion."

Until I met Mohamed Sadek, I thought

that the mattress fluffer I had come across three days earlier was the man with the most unusual trade in Cairo.

Sadek's shop is in a section where the years roll back to the late 14th century. It was then that the Khan el Khalili bazaar was built, and it has been preserved as well as anything in the city. A hundred shops line the narrow streets, offering everything from samovars to spices. One leading businessman in the bazaar is Zaki Boutros (page 655), a masterful merchant who once sold two women tourists more than $4,000 worth of goods in a single day.

I sat in Zaki's shop one morning, observing

Yesterday's splendor crumbles and sags in an old section of Cairo. With living space scarce, some people set up housekeeping on open rooftops. A student, lower right, finds solitude to bone up for spring examinations. From the birdcage cupolas of the minarets, muezzins summon the Moslem faithful to prayer. In some mosques, the criers have replaced traditional lungpower with electronic amplifiers.

After fasting all day, Moslems eat and play into the night during the month of Ramadan. For 30 days the devout commemorate the night when Allah sent down the first portion of the Koran to his Prophet Mohammed. Food and drink must be avoided during daylight or "as long as a white thread can be distinguished from a black one." A cannon booms the end of abstinence, and food vendors stoke up fires for shish kebab (**right**) to feed the hungry faithful. A festive atmosphere prevails as Cairenes listen to folk singers under a tent (**above**) or try their skill at carnival booths.

Practitioner of an ancient art, Egyptian belly dancer Hanan performs for tourists in a Cairo nightclub

Striving for grace in a city that yearns for normalcy, ballet hopefuls practice at the Academy of Arts. They drill before a Russian instructress, a member of a well-known but seldom-seen Soviet colony that advises Egypt on cultural, technological, and military matters. Sign of the times: Tape crisscrosses windows to restrain flying glass in case of air attack.

and listening as he gently beat his way through walls of resistance:

". . . so please, madame, let us stop this haggling over a few piasters. Come, I shall buy you lunch, a nice shish kebab."

". . . but my dear sir, you simply cannot expect to satisfy your champagne tastes with beer expenditures."

". . . that is correct, dear lady. If you can purchase this item, for which I am asking only $125, for less than $200 any place else, please come back and I shall present it to you as a gift. Come now, let me buy you lunch, a nice shish kebab."

Later, when I had occasion to do business with Zaki, I too was carried painlessly over the threshold of hesitancy on an air cushion of words. "Stop, stop. Before we discuss price we must have tea, mint tea." He sat in his chair behind the counter, hands folded over his stomach, smiling. I made my purchase, and Zaki Boutros told me to drop in again. We'd have lunch, a nice shish kebab.

Out in the streets of the Khan el Khalili, I saw a cluster of tourists. Among the foreigners who now vacation in Egypt are Eastern Europeans, residents of Communist-bloc nations. As always, the main attraction is the Great Pyramid of Cheops. There, platoons of Egyptian dragomen, or guides, still stand ready to swoop down on a bus loaded with tourists. Thus are Bulgarian matrons seen today being joggled around on the backs of camels while dragomen affect enthusiasm in the rote of their spiels.

There was a time (Zaki Boutros recalled 1922 as an exceptionally good year) when great waves of visitors from the West swept through the city, buying and buying, and paying in dozens of different currencies.

No longer. Not in a Cairo groping for socialistic stability. Not in a Cairo with nerves frayed by the uncertainties of a shadow war. Not in a Cairo still trying to assess the legacy of a man whose name personified Cairo and all Egypt for almost 20 years.

Col. Gamal Abdel Nasser was the power behind the revolution that overthrew King Farouk in 1952. Leading his people in a search for dignity, the tall, moustached son of a postal clerk ignited the fire of Egyptian nationalism. Suddenly, the Cairene decided that he would no longer allow himself to be called a "Gyppo" by Europeans. He decided that it wasn't dignified to beg, so the beggars vanished from the streets of Cairo. He decided that never again would millions of Egyptians go hungry or homeless while the ruler of the country rattled around in a 360-room palace.

No matter what others thought of him, Abdel Nasser embodied all the hopes and dreams of Egyptians eager to escape from the bonds of ignorance, poverty, and disease.

Today in Cairo there are those who maintain that Abdel Nasser lost sight of revolutionary goals when he turned his attention outward. "He brought about land reform, he expanded education, he put doctors in the villages, he did many things," said a former professor at Cairo University, "but neglect at home set in when the nationalism was exported to other Arab countries. You know, after our defeat in the 1967 war, President Nasser announced to the people that it was his fault, that he was to blame. We cheered him for that. Know why? Because, all of a sudden, he was human again, a human being admitting a mistake."

Palace Holds Key to Nasser's Strength

Abdel Nasser died in 1970, and his body lies in a new mosque near the Cairo suburb of Heliopolis. He was succeeded as President by Anwar Sadat (page 643), who was a fellow revolutionary in 1952. Sadat has indicated that he will concentrate on Cairo's pressing problems—the telephone system that breaks down with distressing frequency, the city's undisciplined sprawl, the austerity that makes it illegal, except with government approval, for an Egyptian to leave his country with more than $22 in cash.

"Of course we have problems, but stop and think of the problems we had before the revolution," I was told by a patron of a café where dominoes are played from early morning to night. "Go to Abdin Palace and look at that. See how our king lived, and then you'll know why we followed Nasser."

I went to Abdin Palace, in the center of Cairo, and was shown through some of the 360 rooms by Mohamed Ahmed, who had worked as a waiter in the royal household. This was the palace used by King Farouk (he had others) for official functions.

Ahmed insisted that I examine the medicine chest in what was the king's private bath. "It is just as he left it when he was made to depart Egypt," Mohamed said. Among the contents was a half-full bottle of Yaffi's Hair Restorer.

Abdin Palace, sections of which are now used for government offices, is of course a museum of opulence. The walls are heavy with masterpieces of art. The sparkle of crystal is everywhere. One of the baths has walls of salmon-colored alabaster, and an oven in which to warm the bather's robe.

King Comes Home to Share a Tomb

Following Farouk's death in Europe in 1965, President Nasser decided to grant the king's wish to be buried in Egyptian soil. There was only a brief mention of this in the government-controlled press. The body was laid to rest early one morning, and the location of the grave was never publicized.

Even now not many Cairenes know where their onetime ruler is buried. But in the part of Cairo called the City of the Dead, where mausoleums and tombs are crowded together in silent, dusty fields (map, page 647), there is a man who wears a galabia of brilliant red. If you ask him where Farouk is buried, he will take you to a place where Ibrahim, one of Mohammed Ali's sons, lies in a tomb. Ibrahim was Farouk's great-grandfather.

"He is in there, with Ibrahim," the man in the red galabia told me. A government official later confirmed this.

It was early evening when we walked away from the tomb, and the man said he had to go up into the Muqattam Hills to pray. He was in love with a girl too young for him, he told me, and each evening he implores Allah to let him forget her.

He left me and moved slowly into the hills, up toward a veil of smog that had impaled itself on the pencil minarets of Mohammed Ali's alabaster mosque. □

Living in a Japanese Village

By WILLIAM GRAVES

Photographs by JAMES L. STANFIELD

BOTH NATIONAL GEOGRAPHIC STAFF

THE HIGH POINT of Aunt Fusayo's day was my scheduled visit to the bath. Precisely half an hour before dinner she would call upstairs from the kitchen, *"Graves-san, ofuro, dozo*—Mr. Graves, bath, please."

With misgivings, I would don a light cotton kimono and pad down the corridor to my ordeal. At first I cherished a secret hope that Aunt Fusayo might be low on firewood. She never was. No Japanese innkeeper would be guilty of such an oversight. A cold meal, perhaps, but a lukewarm ofuro—never.

To most Japanese, Aunt Fusayo's bath would seem primitive: simply a cast-iron caldron perched on an old-fashioned wood furnace with a notable lack of controls. In Aunt Fusayo's remote island of Futagami Jima, the familiar arrangement is known as a *Goemonburo*, or "bath of Goemon," named after a legendary robber who was cornered in his tub by local law officials and slowly boiled alive. I have often suspected a policeman among Aunt Fusayo's ancestors.

As gingerly and briefly as possible, I would face the challenge, while Aunt Fusayo listened from the adjoining kitchen. Later, at dinner, she would ask mischievously, *"Kyō wa, dono kurai?*—How long this time?" Regardless of my answer she would shake her head sadly and remark, *"Karasu no gyōzui*—Merely a crow's bath."

In other respects Aunt Fusayo overlooked my failings, perhaps because I was the first American she had met. Incredibly, the villagers knew of only one other foreigner who had ever set foot on Futagami Jima before National Geographic photographer Jim Stanfield and I arrived on the small island last spring. Our predecessor was an Englishman who had spent a day or two at Aunt Fusayo's inn and who left on short notice, possibly haunted by visions of Goemon.

In a sense, the whole of Futagami Jima is a vision, an ancient Japanese wood block come to life. Many of the everyday scenes and events that take place in its single small village have long since vanished from the huge urban areas that dominate modern Japan. In the hope of recording such scenes before they disappear forever, Jim and I had come to Futagami Jima.

Our route was a roundabout one, for in the beginning neither of us knew that the island existed. Nor, for that matter, did Captain Ueda.

We met him at a small port near Matsuyama, on the west coast of Shikoku, one of

Zest for life lights the face of innkeeper Fusayo Tokunaga, one of some 640 residents of tiny Futagami Jima. "Call me *obasan*—aunt," she told Japanese-speaking author Graves and photographer Stanfield. Amazingly, they were the first Americans to visit the island. For six weeks they shared a way of life vanishing elsewhere under the impact of Japan's technological revolution. Sometimes the experience proved painful. Here Aunt Fusayo carries wood for the evening bath—"a steaming torture," says Mr. Graves, "that we never quite got used to."

Dawn's golden glow veils Futagami Jima. The name, shown above in Japanese characters, means "twin gods island." It refers to a pair of mountains worshiped as Shinto deities.

A fine natural harbor, further protected by jetties, shelters the island's fishing fleet from autumn typhoons. The superb seamen of Futagami once lived by piracy, preying on the rich traffic through Japan's Inland Sea. Today they fish and raise citrus.

Japan's four main islands, along with Honshu, Hokkaido, and Kyushu. In our search for a Japanese village substantially untouched by recent change, we had already visited a dozen small islands of the great Seto Naikai, or Inland Sea, and much of Shikoku itself.

Although my day-to-day Japanese is passable, it is not good enough for detailed interviews, so we were joined in our search by Kunio Kadowaki, a likable young English-speaking Japanese from the city of Kyoto.

Everywhere we turned, we encountered evidence of Japan's extraordinary industrial and technological growth, and little of the picturesque rural life that it is fast erasing. Now, near Matsuyama, we made contact with Captain Ueda, master of a small charter boat, and arranged to explore the Kutsunas, a seldom-visited group of islands in the Inland Sea stretching northwestward from Shikoku (map, page 668).

Spring in the Seto Naikai is a time of rare beauty, a resurgence of life both above and beneath the sea. As we steered north and west of Matsuyama among the islands, we passed countless small boats gathering an early harvest of mackerel, abalone, squid, shark, sea bream, and octopus. Like some vast armada of larger ships, the islands rose dark and sheer from the sea, each flying the pale white ensign of spring—a profusion of flowering cherry trees.

BY LATE AFTERNOON we were well among the Kutsunas, moored in ragged formation across the great roadstead between Shikoku and Honshu. Debating over shelter for the evening, we spied an island only two or three miles long, dominated by a pair of almost identical peaks. Near the foot of one, a cluster of gray tile roofs spilled down to the shore from terraced fields above, like a miniature earth slide come to rest.

I asked Captain Ueda the name of the island, and he unfolded a battered navigation chart. Locating our position, he finally placed his finger on a sliver of land and announced: "Futagami Jima."

Twin Gods Island. It was a place that Jim and Kunio and I would come to know well in the weeks that followed.

Once inside the island's small harbor, we found ourselves far removed from the frenzied atmosphere of previous weeks. Lining the quiet waterfront, a row of frame and earth-walled houses faced onto a massive stone quay sloping gently to the water's edge in the manner of a launching ramp. Some fifty graceful fishing boats, ranging in length from a few feet to 35 or more, lay neatly berthed rail to rail or stood above water on the quay, braced upright with heavy wooden chocks (pages 680-681).

Here and there the waterfront shone orange red and jade green with the bright tapestry of drying nets and thin carpets of edible seaweed carefully spread in front of doorways to dry in the sun.

Groups of women in *mompe*, the traditional baggy work trousers worn in rural areas, shifted the seaweed by hand to catch the late afternoon light, while their men chatted in twos and threes aboard the boats. Over all hung the faint pungence of pine and cedar smoke from houses where the evening bath fires had been lighted.

It was a scene reminiscent of the works of Hiroshige, the great 19th-century artist whose superb prints reflect the color and variety of Japanese village life. It appeared to Jim and me that our search was over, and the only problem left was one of lodging. Aunt Fusayo quickly saw to that.

We had come prepared, if necessary, to stay in the local Buddhist temple, long the traditional guesthouse for many a small community. Instead, one of the village women escorted us to a modest inn on the waterfront and introduced us to its beaming owner, Mrs. Fusayo Tokunaga—or, as she prefers to be called, "*obasan*" (aunt).

With a welcoming "*Irasshaimase*," Obasan exchanged our shoes for the customary slippers and showed us to three plain but comfortable rooms overlooking the waterfront. Soon after we had said good-bye to Captain Ueda, she called us to the kitchen for dinner.

Serving us herself, Obasan offered up sliced raw fish, in the style known as *sashimi*, followed by seaweed soup with soft-boiled egg, pickled radishes, steamed rice, and finally the Futagami specialty, *mikan*, a tangerine-like citrus. Within half an hour I turned in, slipping between the heavy padded quilts laid out on the straw-mat floor of my room, and drifted off to the rustle of waves against the quay.

As welcoming committees go, the delegation next morning was charming and slightly underage. Roughly a dozen children averaging 8 years old stood in a semicircle outside the doorway of the inn as we emerged.

Twelve solemn pairs of eyes surveyed us for a long moment, and then, in the silence,

I caught a half-whispered, "*Honto no gaijin!* —Real foreigners!" It seemed the proper time for an introduction.

"No," I answered smiling and in my best Japanese, "we are Americans, and *you* are the foreigners! Our names are Bill and Jim. What are yours?"

Momentary silence again, then an explosion of laughter followed by a chorus of shouted names—Keiko, Shinji, Hiromi, Utako—liberally mixed with the Japanese version of our own names, "*Bi-ru*," and "*Ji-mu*." As we made our way along the waterfront, we were preceded by a boisterous escort chanting, "*Bi-ru, Ji-mu, herro, herro!*"—the only three words of English we were ever to hear on Futagami Jima.

HAVING DISPOSED of the welcome, our young friends treated us to a guided tour of the village under the direction of Shinji Nakata (page 685), a 10-year-old with a blinding smile and an obvious love for Futagami Jima. With the instinct of a born tour director, Shinji began with a brief introduction to his island.

"We have only one village, also called Futagami, and 630 people—631, including myself," he announced as we skirted a harbor now almost empty of boats. "Our fishing season has just begun, and people go out very early, men and women together.

"On Futagami Jima everyone works *asaboshi yoboshi*," Shinji added, using the Japanese expression meaning "from morning stars to evening stars." He waved toward a sheltered corner of the harbor. "Now let us have a look at the fish."

Together we all trooped to the main pier, an arrangement of heavy floating crates lashed together, with removable planks on top of each. Shinji and his friends lifted these one by one, revealing a dazzling aquarium of octopus, squid, and a dozen kinds of fish.

"Everything is sold to the big cities by our fishermen's cooperative," Shinji explained, "and then each person receives the money for what he has caught. My father says that in a good year the island earns 70 million yen [about $227,000] from fishing, but our mikan crop brings in twice that much."

Circling the waterfront once more, we encountered the same group of women who had been at work the day before, now boiling masses of seaweed in heavy iron tubs beside the quay. Shinji explained that Futagami Jima harvests four or five different varieties

Framed in glowing mesh, a seagoing wife repairs a net. Islanders believe the dyed strands look like seaweed to fish; red appears almost black when the net is set at depths below about 35 feet.

Sea harvests come hard for a fishing family retrieving a gill net (**left**). Most villagers are *kengyo*—"work two ways"—meaning that they both farm and fish. Women work alongside men in the fields and on the boats.

Adrift with the current (**below**), a fleet fishes for *tai*, or sea bream, which is eaten raw in Japan. So highly prized is the fish that villagers say of it, "*Kusattemo tai*"—roughly, "Even a rotten tai tastes better than other fish."

Walking the plank in reverse, a fisherman boards his beached vessel while scorching the hull briefly to rid it of marine borers. Some villagers use propane torches, but Futagami's old-timers insist on a pine-needle blaze.

of edible seaweed, to be used directly as food or in several types of gelatin.

Despite the warmth of a spring day, the women were swathed from head to foot in work clothes and sunbonnets drawn tight around the face, exposing only sets of friendly brown eyes that were narrowed in greeting, accompanied by an occasional "*Ohayō gozaimasu*—Good morning," as we passed.

I noticed that each woman wore a pair of curious half mittens attached to her long sleeves, covering the backs of the hands completely, while leaving the fingers free to work. I asked Shinji about them.

"They are *teoyi*," he answered, obviously surprised at my ignorance. "What good would it do a woman to shade her face and arms from the sun if her hands were burned as dark as any laborer's?" He turned from the waterfront toward an alleyway between two houses. "Now let us see the rest of the island."

WE SAW ONLY PART OF IT, in fact, for despite its minute size—roughly 2½ square miles—Futagami Jima is not easily covered in a morning. Like most islands of the Inland Sea, it is more vertical than horizontal, with a narrow border of coastal land rising to steep mountain slopes. As we followed the shoreline, Shinji supplied further details about his home.

Lacking not only cars and trucks but paved roads as well, Futagami is laced with narrow dirt trails that cling precariously to its steep hillsides. Here the villagers cultivate their major crop, mikan, in beautifully terraced fields. Postponing a tour of the groves until another day, we concentrated on the village proper. With considerable pride, Shinji showed us the major points of interest—a typical small temple, the village boatyard, and the elementary school, which was closed for the weekend. In addition there was the fishermen's cooperative building, and beside the water's edge a quiet cemetery filled to capacity with weathered granite markers.

On the waterfront at the noon hour, we found the harbor filling up with boats. Each

Bundled up for beauty, a Futagami wife avoids unfashionable suntan while working in the fields. The island has little level land; gardens and citrus groves are carved out of mountainsides in terraced plots known as *dandanbatake*—"step-step fields."

Delicacy from the deep, edible seaweed awaits processing. Gathered amid offshore rocks at low tide, the ribbonlike *wakame* is boiled in heavy caldrons, and then dried in the sun before being packed for shipment. Villagers harvest several varieties of seaweed for use in jelly, ice cream, soy sauce, or as a wrapper for rice balls. The author found wakame, generally used in soups, "delicious, like tender young spinach."

husband-and-wife team took a turn at the main pier, unloading the morning's catch and receiving credit from the fishermen's cooperative.

Once the fleet was moored, Shinji introduced us to a 32-year-old fisherman, Toshiharu Maeda, and his wife Miharu. With quiet courtesy, the Maedas invited us aboard and presented each of us with the sweet winter citrus called *unshumikan*. As we peeled and ate the gifts, I explained our purpose on the island and described the tour with Shinji.

"You could not find a better guide," Toshiharu said, nodding approval. "Our children know corners of the island that even we rarely see." He smiled. "But now it is our turn to help—what can we do for you?"

Within half an hour he did a great deal, tracing the history of Futagami Jima for us from early times up to the present and describing life on the island today.

THE FIRST RECORDED MENTION of Futagami Jima, Toshiharu told us, occurred in the eighth century, when the tiny outpost—then called Matsushima, or Pine Island—belonged to a wealthy Buddhist temple in the distant city of Nara. Little is known of Futagami Jima until three hundred years later, when a powerful clan from Kyoto gained control of the Kutsuna archipelago and bestowed one of the smaller of its seven islands on a family by the name of Futagami, meaning "twin gods."

"Some say that the family gave their name to the island," Toshiharu remarked, "and others insist it was just the opposite—that our twin mountains were worshiped since ancient times as Shinto gods, and that the family merely borrowed the title.

"In any case," he added, "the Futagamis came to stay: The family has lived continuously on the island through 39 generations—900 years."

Unfortunately for the island, such permanence is a dying tradition. Today's young people are leaving en masse.

"We cannot blame them," Toshiharu said, "for the life here is hard. With the help of a wife, and by both fishing and farming, a good man may earn a million and a half yen [about $4,900] a year. Industrial jobs in the cities pay an experienced worker almost that much, and the hours are only half as long." He shook his head.

"As a result, our population has shrunk

(Continued on page 684)

Focus of village life. Futagami's crescent-shaped waterfront functions as main street, launching ramp, and freight terminal. Here the villagers ship fruit and seafood to markets on the island of Honshu, 20 miles away, and receive manufactured goods in return. In fair weather old people and children gather to chat or play along the walkway, the only pavement on the island.

At the harbor's main pier (**upper left**) a woman staff member of the fishermen's cooperative weighs and records a neighbor's catch. Neatly arranged *tamori* (**left**) await shipment to nearby Hiroshima, dramatically rebuilt since World War II.

Emigration by young people to the cities has reshaped island life; the decrease in population has cost the community its post office, policeman, hospital, resident doctor, high school, and junior high school. The last marriage on Futagami took place in 1964, and births have become rarer with each passing year.

Evening drops anchor on a copper sea, as fishermen of Futagami call it a day (**following pages**). Though rarely visited even by Japanese, the island lies along one of the world's busiest water routes. Every day more than 6,200 ships, plus thousands of fishing boats, ply the Inland Sea.

by half since 1945, and we have lost many of the services we once took for granted. Of course we have electricity, thanks to an undersea power cable from Shikoku, and now even television. But we no longer have our own hospital or doctor, our junior high school or senior high school, our post office, or even our own policeman. Most services are provided by the city of Matsuyama, or by one of the larger islands."

He nodded toward Shinji. "This is his final year in elementary school, and then he must leave Futagami Jima. Next spring he will begin boarding at a junior high school on the neighboring island of Naka Jima, and later at a senior high school in Matsuyama. After that, few of our children return home. Today there are no more than a dozen islanders still in their 20's. We are slowly becoming a village of old people."

As we talked, the muffled thunder of diesel engines started up across the harbor, and I realized that we had cost the Maedas their lunch hour ashore.

"It is no matter," Toshiharu said. "Very often we do not come in until after sunset. Perhaps you would care to join us some day, or go out with another boat. We have many kinds of fishing here; you have only to choose, and one of us will take you."

IT WAS A GENEROUS OFFER, and we accepted it. Both Jim and I were familiar with net fishing, so we decided to begin with a method that was new to us—the art of catching *tako*, the octopus.

Before sunrise the next day, we joined Tatsuo Hisano and his wife Takiko aboard their 30-foot boat, *Tatsu E Maru* (Dragon Prosperity), to haul their string of offshore traps. As we ran south toward the small island of Yuri Jima, Tatsuo explained the age-old Japanese technique of octopus fishing.

"Our 'traps' are actually not traps at all," he said, "but merely earthenware jars [page 689] without lids or bait, tied at intervals to a long rope and laid across the ocean floor. Tako likes dark crannies for his home, and he crawls inside the jar and stays there, even when you haul the jar up."

No buoys marked the location of Tatsuo's jars, which lay in more than 150 feet of water three miles offshore. Estimating his position with reference to several distant mountain peaks, Tatsuo shut down the power and threw a grappling hook overboard, dragging it along the bottom. Within two minutes he snagged the rope connecting the jars and hauled it to the surface. Transferring the rope to a wooden winch at the stern, he hauled the jars aboard one by one and explored the inside of each with his gloved hand.

At first the results were disappointing, but before too long it seemed as if every other jar held a squirming three- to four-pound octopus. Tatsuo deftly plucked each one from its hiding place and tossed it forward to Takiko, to be dropped into a salt-water holding tank below deck. Presently she handed me one to inspect.

I admired the perfect symmetry of white suction cups studding each of the eight mottled-brown arms, and carefully avoided the beaklike mouth that can pierce a man's finger, or amputate its own or other octopuses' arms.* Takiko then showed me another specimen, a full-grown octopus with seven perfect tentacles but only a tiny stump where the eighth had been. Takiko blamed hunger for the loss.

"It can happen when he is starving," she said. "When there are no snails or mussels for food, he may turn on himself, and he will eat until he is crippled—my husband and I have caught tako with only two of their eight arms left. Such helpless creatures rarely live long enough for the arms to grow back.

"It is not a pretty thought," she added. "In the village we have an expression for those who use or injure their loved ones for selfish reasons—*tako no tomogui*, meaning to devour one's own, like an octopus."

Despite the early season we did very well: 40 octopuses from some 200 traps, a haul worth about $45. Returning to the island in midafternoon, we transferred the catch to the fishermen's cooperative, and I thanked Tatsuo and his wife for a fascinating day. But it was some time before I learned to enjoy that island delicacy, boiled octopus arms dipped in soy sauce.

Our first invitation led to many others, and we were soon involved in village life. Jim and I spent one memorable morning with the *funadaiku*, or village boatbuilder, Tadayoshi Maeda. A cousin of the couple who had welcomed us the first morning, Mr. Maeda is one of the few villagers who neither farms nor fishes. With tools little changed since his father and grandfather followed the same trade, he provides Futagami with its sturdy cypress-and-cedar fishing boats, at the rate of

*Dr. Gilbert L. Voss wrote of the "Shy Monster, the Octopus," in the December 1971 GEOGRAPHIC.

four or five new ones a year. He was completing work on a 50-foot hull when Jim and I visited his crowded shop beside the waterfront. Welcoming us with the inevitable gift of mikan, he continued to smooth the seams of the planks as we talked.

Like the few other craftsmen remaining on the island, Mr. Maeda generally works alone, having lost an apprentice as well as a son to construction jobs on the island of Honshu.

I asked if he had ever considered a city job himself, and he nodded.

"During the war with your country, I worked for a time at a shipyard in Kobe. Among other things, I learned what many Japanese are learning now: that there must be something more to life than noise and factory smoke. Here I am my own master, and I live among friends." He swept a hand across the boat. "What is more, they pay me for what I enjoy doing."

I asked what a 50-foot boat cost on the island, and Mr. Maeda answered 750,000 yen, roughly $2,400—a ridiculously low price by Western standards. My surprise must have shown, for he added apologetically, "Of course that does not include the engine."

BY VILLAGE CUSTOM the boatbuilder has the additional duty of building the coffin whenever an islander dies. The task is always performed in the home of the deceased, and the funadaiku must have a partner—usually the *yadaiku*, or village house carpenter. Together the two men fashion a plain cedar box 2½ feet square by 3 feet high, allowing for the body to be arranged in crouching position, requiring a minimum of burial space.

Two craftsmen seemed an excess of talent for such a simple job; Mr. Maeda explained that it was not a question of manpower.

"One person would be very lonely performing such a task," he said. "Two people provide company for each other. It is the same when members of the family go out to announce the death to the village—they always go in pairs."

Among the many graves in the cemetery on Futagami Jima, only a few contain bodies that have been cremated—the traditional Japanese style of burial that the islanders somehow never adopted. During World War II, though, the villagers had no choice, for many of their loved ones died far away.

In those catastrophic years Futagami Jima paid dearly, with the lives of more than 40

Japanese Huck Finn, 10-year-old Shinji Nakata swaggers along the waterfront with a morning's catch. A sixth grader in the village school, he will have to board next year on a neighboring island in order to continue his education, mandatory through the ninth grade.

Bent by the bounty of their citrus groves, Tesshin and Emiko Nakata (**left**) trudge home after a day spent picking tangerine-like *mikan* (**right**). Accustomed to hard work, Futagami's women think little of hauling 70-pound sacks of fertilizer hundreds of feet up the island's steep slopes.

On a more memorable occasion (**above**), Tesshin, in kimono and *haori*, or outer jacket, posed with his bride in 1955. Emiko wears the traditional flowered kimono and headdress; powder stylishly whitens her face.

Informality prevails today. In the sitting room of their home (**above right**), the Nakatas advise their son Shinji on construction of a plastic model of a tank.

young villagers who went off to war and who came home in ceremonial white boxes. Mercifully, the shipments finally ended, but only after the most terrible day the villagers can recall—August 6, 1945.

Early on that morning Obasan stepped from the doorway of her inn to buy rice in the shop next door. At that moment a brilliant flash lit the northern horizon in the direction of the city of Hiroshima, 30 miles away. For a moment Obasan thought it was the morning sun glinting on the windows of a distant ship. Then the sound reached her, and she realized her mistake.

Even today, 27 years later, Obasan's voice trembles slightly at the recollection. "The sound," she told me, "was like two giant boulders being crushed together—though at a great distance, so one somehow knew there was a terrible explosion."

Not until nine days later would Futagami Jima learn the exact nature of the explosion—*genshi bakudan*, the atomic bomb. Newspapers and radios at first carefully avoided any mention of the fearful new weapon.

Futagami Jima, however, needed no confirmation of the horror that had engulfed Hiroshima. Some time after the explosion a grisly rain commenced to fall on the island—bits of clothing, houses, and furniture that had been hurled into the stratosphere by the incredible force of the bomb. Obasan recalls a particular *fusuma*, or sliding door panel, that fell on the slope behind the village.

"It was quite new," she told me, "with scarcely a mark or a burn on it. We were a desperately poor village then, but no one could bear to touch it—it lay there until it finally rotted away."

FROM MEMORIES OF WAR, I turned to a more cheerful side of island life, farming and the technique of raising mikan. With Tatsunosuke Nishino, a veteran farmer in his 50's, I spent a day among the terraced groves that scale Futagami Jima's green slopes like stairways carved in solid jade.

Following a series of narrow dirt trails worn smooth and rock hard by generations of islanders, we climbed 600-foot-high Komeyama—the eastern of Futagami Jima's twin peaks—whose name means "rice mountain."

The title is a misnomer, for like most islands of the Inland Sea, Futagami lacks the space to impound the great quantity of water needed for flooded rice fields. In former days the villagers grew sweet potatoes and wheat for their own use, switching after the war to mikan as a cash crop.

"In a good year mikan may bring us as much as 140 million yen [some $455,000]," Mr. Nishino said. "For us that is a great deal of money, but by city standards it would be considered, as we say, 'no more than a sparrow's tears.'"

Halfway up the mountain we paused to enjoy the view. Below us the miniature tile roofs of the village winked gunmetal bright in the sun, bordering the harbor like a narrow strip of polished gravel washed ashore by the tide. Beyond stretched the glistening crucible of the Inland Sea, its dark islands flecked with white clouds as though the gods were dusting the mountaintops.

WHEN KUBLAI KHAN'S FLEET sought to invade the Japanese home islands in 1281, the skilled seafarers of Futagami sailed out with their countrymen to meet the enemy off the coast of Kyushu. Aided by a violent typhoon—the legendary kamikaze, or divine wind, invoked centuries later by Japan's World War II suicide pilots—the defenders scattered the fleet and ended the khan's ambitions.

"Nowadays," Mr. Nishino observed as we resumed climbing, "the *taifu* is a mortal enemy, capable of destroying our crops, and even an entire fishing fleet, in a single stroke. Fortunately, we are not on 'Taifu Ginza' [Typhoon Avenue], which runs along Japan's Pacific coast. Even so, we must guard against high winds, as you can see."

He indicated the dense borders of cedar trees sheltering each narrow grove from wind, while allowing sunlight to reach the trees.

Fingering a nearly ripe fruit, he remarked, "This is our summer crop, and it will be only an average one because of the gales last autumn. But perhaps the main winter harvest will be better. Among neighboring islands the mikan is sometimes called a lazy or shiftless tree, because every few years it produces either poor crops or none at all. Once that was true here, but we have learned to take better care of our trees. A good one well tended will bear fruit for more than half a century."

For all its frugal ways, Futagami Jima now buys insecticides and chemical fertilizer for its fields, having gradually abandoned the traditional use of night soil. Other modern developments include the construction of cableways scaling the steeper slopes to help

carry the harvest down undamaged. The luxury applies only to mikan, however, for the cables are too slender to haul passengers safely. After a lifetime of negotiating their steep hillsides on foot, it is little wonder that the islanders' vision of Buddhist hell is a land called Harinoyama—Needle Mountains—where not a square inch of level ground exists.

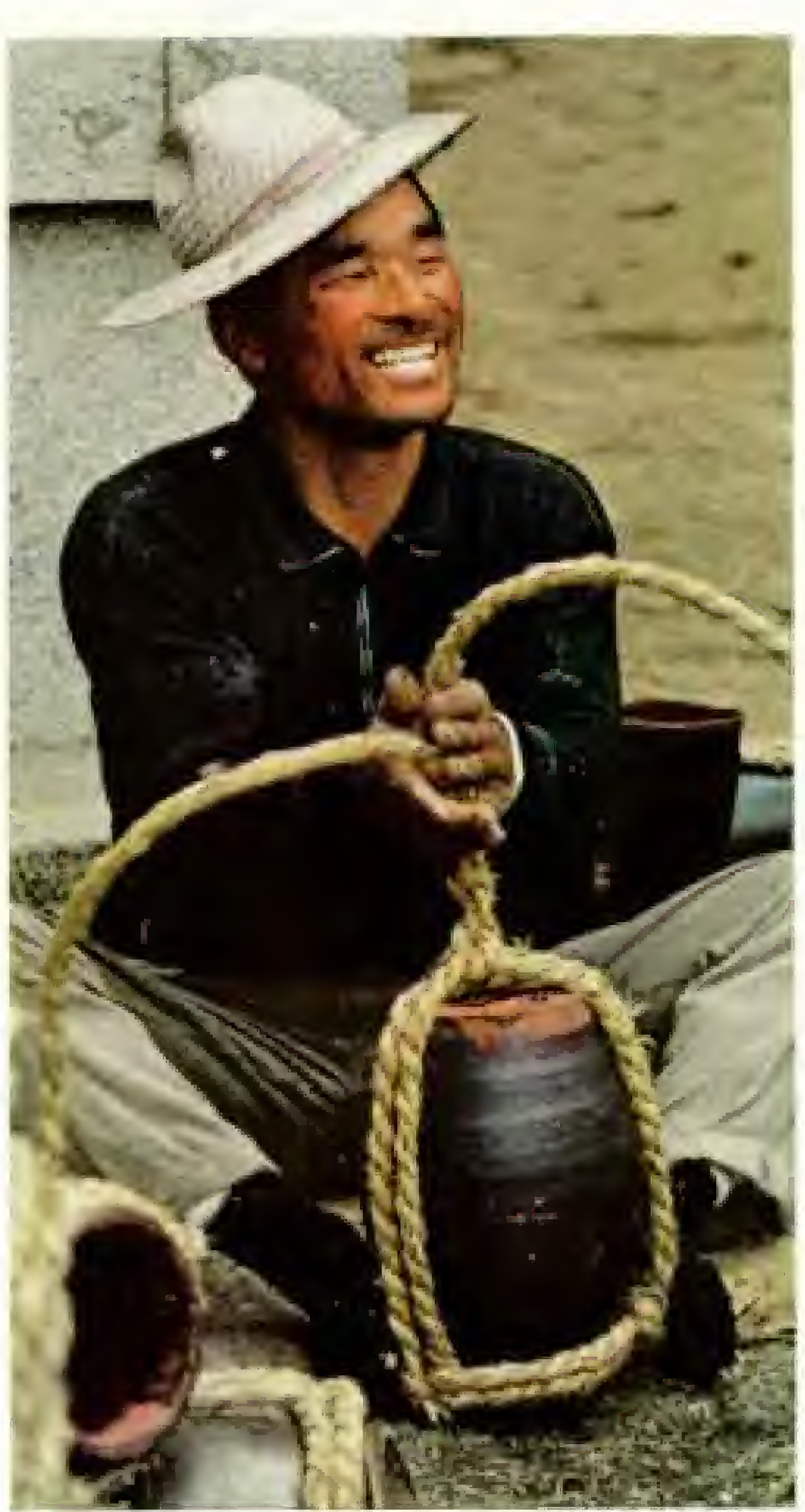
But thoughts of such an inhospitable place fade at day's end, when the islanders return from the fields and the sea. Having lived in Japan before, I was struck by the unusual ease and informality with which the villagers always received us on the many evenings we spent with families in their homes. Every member of the household was invited to join in, ranged in a circle on the straw-mat floor of the largest and best room—the husband and wife, a grandparent or two, an unmarried sister or aunt, and the children, often with a neighborhood friend.

Even in the poorest household there was always refreshment, if only *ocha*—green tea—and sweet cakes filled with bean paste. And there was the ritual with children of *jan ken pon*, a game in which fist and fingers represent paper, rock, or scissors. Our young friend Shinji had drilled it into us from the beginning as a necessary social skill.

In many respects Futagami Jima's 173 households are identical. Every home is protected by a high wooden wall with a single gate opening onto the *nakaniwa*, or central garden, a space doubling as a playground and work area, with the frequent addition of an open-air kitchen. The latter consists of a charcoal brazier or two and a washtub sink with cold-water faucet.

Island houses conform in other, more subtle ways, among them the avoidance of *kimon*, the devil's gate. After a week or two in the village, it gradually dawned on me that not a single doorway faced in a northeasterly direction, and that walls on that side had few if any windows. I assumed it was simply a matter of shelter from prevailing winds, until Mrs. Matsuzaki corrected me.

A charming woman in her 70's, Haruyo Matsuzaki is the retired *sambasan*, or village midwife—whose services are now provided, on increasingly rare occasions, by a modern hospital in the city of Matsuyama. Mrs. Matsuzaki remains available for advice on raising children and on various matters pertaining to spirits. During a visit one day in her home near the waterfront, she gave me a brief course on their habits.



Octopus setline takes shape in the hands of Tatsuo Hisano. Requiring neither lid nor bait, the earthenware jar is linked by rice-straw rope to about a hundred others and lowered to the ocean floor. Attracted to the dark refuges, octopuses crawl inside and usually remain there as the jars are raised. Octopus flesh, an island delicacy, seemed rubbery and tasteless to the GEOGRAPHIC team. Villagers teased the Americans for their reaction to "Futagami chewing gum."

"All good spirits," she explained, "travel in a northwest-southeast line, and evil ones approach from the northeast—the devil's gate. To build a house with the entrance, or with windows, facing northeast is merely to invite trouble. I have known such houses to be destroyed by earthquake, while the buildings on either side were untouched."

I remarked that I had been through a number of earthquakes myself, but never noticed that they followed any particular pattern.

"In Japan it is so," Mrs. Matsuzaki assured me. "It is not simply an old wives' tale. Even in our big cities the northeast areas were always the last to be developed. Do you know Osaka?" I nodded.

"Then you know that the great international fair called Expo 70 was built on the northeast side of the city. But perhaps you do not know why. One reason was that it is kimon, the devil's gate, with fewer houses and factories in the way."

Homestretch hop carries a young teacher and her partner toward the finish line in a three-legged race during Futagami Jima's annual school athletic meet. The man carries his entry card in his mouth after bobbing for it in a dish of whipped cream.

Reflecting on the past, an elderly couple watch the waterfront scene. Few old people can afford the luxury of retirement; most continue to work or to care for their grandchildren while the parents earn a living.

IN OTHER RESPECTS Futagami has little in common with Osaka, a city plagued by pollution and growing crime. Lacking a policeman of their own, the villagers must summon help in emergencies from Matsuyama, 12 miles across the water. The last time Futagami Jima made use of the service was four years ago, when visiting sport fishermen got out of hand and had to be escorted from the island. Among themselves the villagers have quieter ways of settling differences.

"Whether we like it or not, we are a single family," says Keichiro Nakamura, the highly respected *sōdai*, or village chief. I called on him one evening to learn how Futagami deals with minor disputes.

"We are 631 people, with very little living space," Mr. Nakamura began. "More than most Japanese, we have learned the wisdom of the old proverb, 'If you curse a man, better have two graves ready'—meaning the second one for yourself. If we spent our time quarreling, Futagami Jima would be nothing but graves." He smiled. "And our land is too precious for that."

Like most communities, the island has had its occasional troublemakers, who either left of their own accord or were persuaded to depart by the village elders. It has been many years since Futagami Jima resorted to the grim practice known as *mura hachibu*—literally, "village eight-parts."

"It was a form of ostracism," Mr. Nakamura explained. "In the old days village life

was exceedingly close, and a troublesome man was a burden on everyone. In extreme cases the village declared mura hachibu, denying the offender community aid for any eight of the ten recognized village functions that normally require neighbors' help.

"Such a man was forced to harvest his crops or haul his boat alone and to forfeit almost every group activity, including social gatherings. If his house caught on fire, he might have to fight the flames single-handed, unless his neighbors' homes were threatened.

"Of course," Mr. Nakamura added, "the man's family suffered, too, even if they were innocent. It was the worst punishment a small village could inflict, and the mere thought of it made people more tolerant of one another."

THE WORST PUNISHMENT for any villager today, whether intentional or not, involves damage to *kao*, or face. Contrary to Western belief, the Japanese rarely speak of "losing" face—the expression is much too mild. Islanders use the term *kao o tsubusu*, meaning to crush or destroy face, in the sense of physical injury. Just how deep and painful the injury can be, Jim Stanfield and I learned one day on Futagami Jima.

Early in our visit we made friends with a young fisherman and his wife who are among the poorer members of the community. The couple earn a bare living by the technique known as *tateami*, using large gill nets strung across the ocean floor to entangle fish drifting along with the current. In order to complete our view of island fishing, we asked permission to accompany the couple for a day at sea. With some reluctance, they agreed.

The day turned out poorly. After hours of laborious hauling and resetting of nets by means of a crude power windlass, our catch totaled less than a score of small fish, almost none of them salable.

With each meager haul the fisherman and his wife covered their embarrassment with repeated laughter and observations on how much easier it was to raise an empty net than a full one. Although Jim and I shared their disappointment, etiquette forbade us to explain that, fish or not, the technique was fascinating. Worse still, we were forced to laugh along with them. Mercifully, the day finally ended.

From that time onward our friends avoided us—a difficult feat in a village the size of Futagami. Whenever they spied us on the quay, they either drifted quietly away from the waterfront or took refuge in the cabin of their boat. Even the couple's children, who had once delighted in challenging us to a daily round of jan ken pon, kept a careful distance. At length I asked Obasan, who was our adviser in such matters, what to do.

"Nothing," she answered. "If you thank them again or take them a small gift, you will merely remind them of their shame. Underneath, they are still your friends; be patient, give them time. Very likely a way will come."

Time stretched to more than a month and the way finally materialized, on our last night in the village. As a gesture of appreciation Jim and I gave a small party in the upstairs meeting hall of the fishermen's cooperative association.

Unable to invite the entire village, we concentrated on those we had been closest to—Tadayoshi Maeda, the boatbuilder; Mrs. Matsuzaki, the midwife; Mr. Nakamura, the village chief; and, of course, Obasan, who kindly volunteered as caterer. In addition there was the farmer, Tatsunosuke Nishino, half a dozen fishermen, including Tatsuo Hisano, the octopus trapper, and roughly a score of other villagers.

Hoping that a group invitation would seem impersonal enough, we included our young tateami fisherman and his wife on the list and, as Obasan prophesied, they accepted.

Neither Jim nor I was prepared for the initial view of our friends, and in fact we scarcely recognized some of them. Abandoning custom for once, the men brought their wives, as we had requested, but in a thoroughly unfamiliar style. Gone were the baggy work trousers and sunbonnets, to be replaced by some of the most gorgeous kimonos I have ever seen, several of them family heirlooms. It suddenly occurred to me that because of the sunbonnets I had never clearly seen the faces of half the women, and that many of them were beautiful. In a quiet way several of the men were equally impressive in somber-hued kimonos complete with *haori*, the elegant outer jacket of dark silk.

There was nothing somber, however, about the party that followed. For once it was Jim's and my turn to announce "*Irasshaimase*" (welcome) and to seat each couple as they arrived, but more than that our guests would not permit. With typical ease and informality, Futagami Jima took over the occasion, entertaining us in memorable farewell.

It was a long farewell, including toasts

with saké—mild rice wine—songs, and endless *odori*, traditional dances. With little success, Mrs. Nishino tried to teach Jim and me an odori symbolizing the harvest, until her husband cheerfully observed, "*Totemo mikomi ga nai desu!*—It's absolutely hopeless! We'll never get the crop in!"

It was a time of small personal jokes. I discovered that Mr. Nishino was known affectionately among his neighbors as Imo Sensei (sweet-potato professor) for his knowledge and love of farming. When Obasan revealed my wariness of the bath, I was promptly christened Goemon, the robber who came to a steaming end. Since Jim Stanfield's first name matches that of Japan's legendary first sovereign—Jimmu Tenno—he became Tennosan (honorable emperor). I was pleased to see our tateami fisherman and his wife join in the merriment; a painful chapter in our visit had obviously been closed.

Long after Futagami is generally asleep, the party ended, and we walked back along the darkened waterfront. Skirting the quay with its shadowy ranks of boats, I recalled the lines of a poem written about Futagami Jima by its school principal, Tokui Yoshiharu, and sung earlier that evening:

Lower the rush curtains of the houses
Overlooking the calm sea.
Moor the fishing boats
So they can dream the night's dreams.

EARLY NEXT MORNING we left Futagami by the daily supply boat from Matsuyama. Despite a late evening the night before, many of our friends were already at sea, dark specks far out on the horizon. To our surprise more than 50 villagers came to see us off, including the entire kindergarten class. Someone had produced a giant package of streamers to be stretched between ship and shore, and there were enough mikan gifts to sink a fishing boat.

Amid a confusion of good-byes, we stepped aboard and watched the streamers part one by one as we pulled away from the pier. I caught a glimpse of Mr. Nishino, who had forsaken his beloved fields for the occasion, and of our young friend Shinji Nakata, pantomiming a last game of jan ken pon.

And finally there was Obasan, standing on a corner of the pier, waving an apron with all the energy of a signalman. Cupping my hands, I called to her, "We'll be back, Obasan—keep the bath water hot."

I'm confident she will. □

Enthralled with make-believe, wide-eyed students in Futagami's small kindergarten sit quietly at story hour. As more and more of its young people depart, Futagami becomes, in the words of one villager, "an aging star—still shining, but growing smaller."

The Spider That Lives Under Water

ARTICLE AND
PHOTOGRAPHS BY
ROBERT F. SISSON
NATIONAL GEOGRAPHIC STAFF

INTO THE WATERY DEPTHS plunges the tiny diver. Instead of carrying an Aqua-Lung, he wraps a glistening bubble of air around his abdomen and its breathing pores. As he reaches the bottom, his eight myopic eyes sight a shadowy movement. Lunging, he seizes the quarry—an inch-long rainbow guppy. Injecting venom with his fangs, he kills the fish, and then seems to waltz in triumph with it across the aquarium floor (**right**). Later, he will devour it at leisure in his submerged home.

The little swimmer, which scientists call *Argyroneta aquatica*, is one of the most unusual among the world's 30,000 known species of spiders. It lives almost its entire life beneath the surface, building air-filled domiciles in which to dine, sleep, and even hatch its young.

In nature this eight-legged aquanaut is found only in Europe and Asia. To make these photographs, I had several batches shipped from England to my home in Washington, D. C. Soon they were established in my aquariums, and I had my first exhibition of their engineering genius.

I watched as a spider raced from one plant stem to another and back again, spinnerets quivering excitedly as they extruded fine, almost invisible, silken strands. He continued, and I began to see the grand design: a fine-meshed net of silk, anchored to plants by slender threads.

As he climbed from beneath his creation, he shucked off most of his bubble of air. This bobbed into the web, buoying its middle. He swam to the surface, gave a flip, and trapped another bubble. The silvery globule clung to his hairy rear legs and abdomen by a process called capillary adhesion. Pulling himself down preset silken guy lines, he deposited this second bubble beneath the web, where it merged with the first. The web ballooned upward into a kind of bell or dome (page 696). After several more trips, he moved into his air-filled retreat.

In the lakes and slow-moving streams of their natural environment, these spiders build summer and winter bells, moulting bells, and breeding bells with a sealed-off upper story where the eggs hatch. Life in an aquarium, though, seems to cramp their style—for mine built only breeding bells and what were probably summer residential bells.

As if to make up for such shortcomings, aquarium existence offered a novel opportunity. One night I noticed a spider sitting on the aerator in his tank, apparently trying to capture its bubbles to renew the air in his bell. Suddenly he grabbed a bubble and rode it to the surface. Then he returned, climbed back onto the aerator, waited for the right bubble—like a surfer waiting for the biggest wave—and sped upward again.

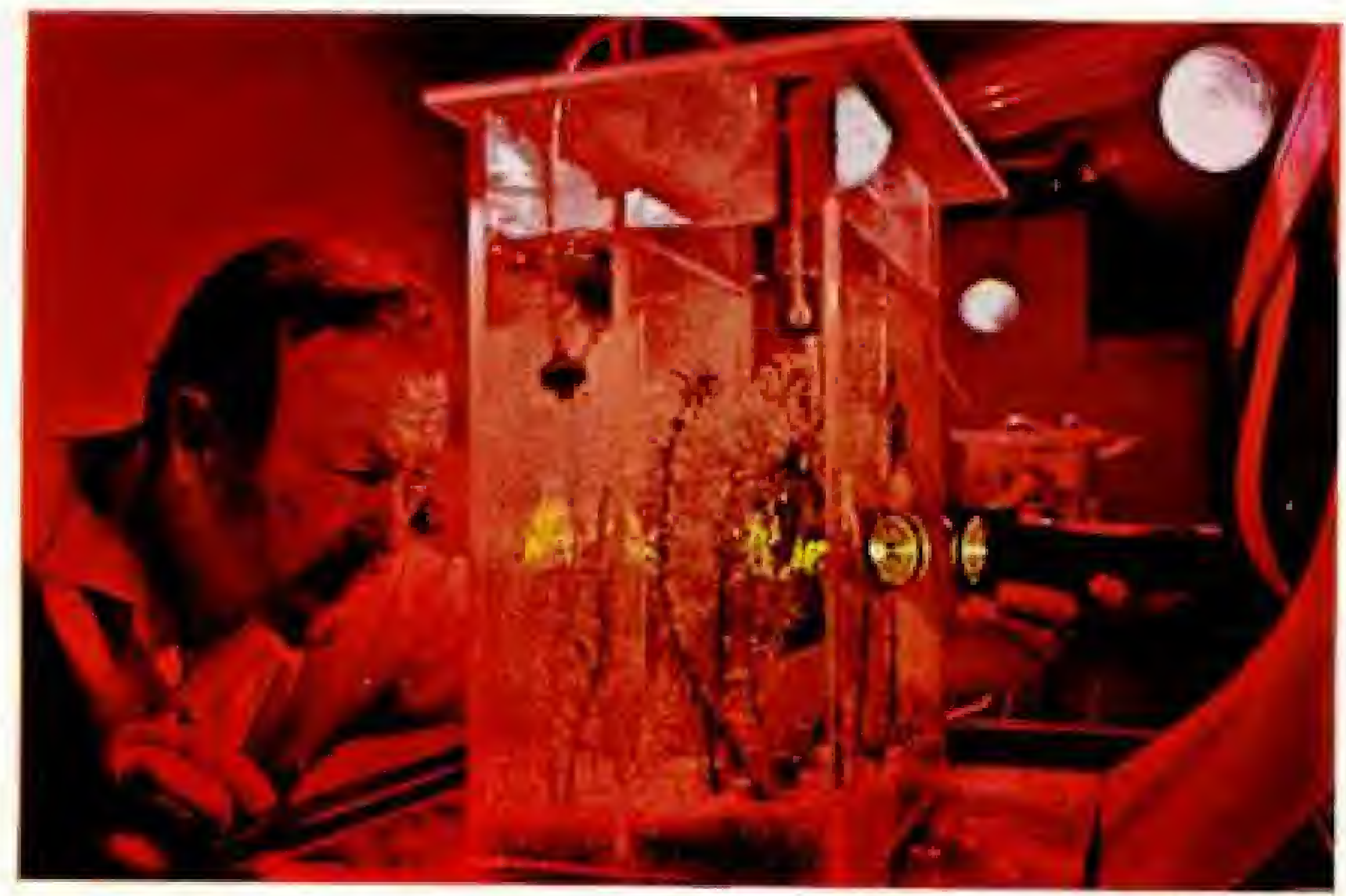
I don't pretend to understand the psychology of spiders. But, after watching this scene again and again, I could almost see the little fellow grinning excitedly as a bubble zoomed him to the surface.

Carrying his own air supply, the underwater predator *Argyroneta aquatica*, only 3/4 of an inch long, totes his guppy dinner to a larger submerged bubble where he makes his home.

After "filling up" at the surface (**above**), a water spider heads for his bell-in-the-making with a newly snared bubble of air. He scissors his rear legs to help lock the globular mass to his body.

Another spider (**left**), his protruding spinnerets idle, laboriously pulls himself down anchored web lines with his buoyant cargo. Behind him sits a neighbor cozily ensconced in a completed bell.

His underwater habitat finished (**below**), the spider dwells head downward within it; his forelegs poke through the open underside and rest on guy lines. The irregular far-flung web does not actually capture prey, but it does transmit vibrations to the waiting spider whenever an enemy or a potential victim brushes a strand.



JAMES L. STANFIELD

Obscured by dim red light, Mr. Sisson observes his nearsighted, largely nocturnal subjects without being seen by them. Flashlight assists in focusing his cameras and in backlighting the air bells for flash photographs.

Maintenance busies a female, checking the threads that anchor her bell to water plants (**right**). Other aquarium residents—guppies and snails—as well as the spiders themselves, often tear the lines inadvertently, damaging or destroying the fragile bells.

Snippet of silk trails from idle spinnerets on a spider's bubble-enveloped abdomen. The strands, barely discernible in the water when first extruded, become easily visible within a few seconds.

Impatient Romeo, a male spider (**above**) climbs out of the bell he has constructed next to that of an apparently indifferent female. Silken tunnels occasionally link the "honeymoon" bells. Here, however, the eager suitor simply went beneath the female's bell and yanked her out from below.

Battle ends with an embrace: After brief, violent thrashing, the male clutches the female (**left**) and fertilizes her by inserting sperm-filled, leglike feelers into openings in her abdomen. Half again as large as she is—unusual among spiders—the male easily dominates his spouse. After mating, the female adds a second story to her bell, where the eggs will be laid and hatched.

Setting out on its own, a recently hatched *Argyroneta aquatica* (**right**)—shown 25 times life-size—perches atop a water plant after gnawing its way out of the sealed upper story of the maternal egg bell. Twenty-seven days have elapsed since fertilization. Carrying a diminutive bubble of air—a life-giving legacy from its mother's bell—the spiderling will soon swim to the surface for a new supply. □

THERA

KEY TO THE RIDDLE OF MINOS

By SPYRIDON MARINATOS

INSPECTOR GENERAL OF ANTIQUITIES
GOVERNMENT OF GREECE

Photographs by OTIS IMBODEN

NATIONAL GEOGRAPHIC PHOTOGRAPHER

IN ITS LONG and violent history, the island has been called many things. Mariners know it now as Santorin, a contraction of Santa Irene, the name of its patron saint. Before that, Greeks of the classical age called it Thera, as it is again officially known. Tradition tells of two more early names: Strongyle, or Round Island, and Kalliste, the Most Fair.

Santorin is one of the Cyclades, those lovely isles strewn across the Aegean between the Greek mainland and Crete (map, page 708). Actually, the Cyclades represent mountain peaks of a now-sunken landmass that once connected Greece and Asia Minor.

Ships approach Santorin from the west, and the island—a sprawling crescent of some thirty square miles—rises sheer and high out of the blue sea. The tortured faces of the cliffs reveal strata of pink and rust red, black and white—all of them attesting to a turbulent geological past that once, 3,500 years ago, altered the course of Western civilization.

The gleaming white dwellings and soaring steepled churches of Santorin's villages cling to the heights (pages 712-13). From the quay, a cobbled path with 587 steps snakes up a precipitous slope to Thera, the chief town. Pious islanders believe that the patient and sure-footed donkeys that carry visitors to the top are inhabited by souls in purgatory, who earn remission of their sins by toiling up that terrible path. Throughout Greece, donkey owners warn recalcitrant beasts to behave, "or I'll send you to Santorin."

So the donkeys labor upward in their timeless zigzag, church bells peal at midday, and birds swoop and call along the shore. In the piercing Aegean sunlight, Santorin—or Thera—seems a dream of stillness and peace.

It is not. The island and its satellites, Thirasia and Aspronisi, are the shattered shell of a mighty—and still active—volcano. In past epochs Thera has erupted, subsided, and erupted again, visiting death and devastation upon a wide area. The sea flooded long ago through the blasted crater walls that now form Thera's bay. So deep is this old crater, or caldera—1,300 feet in places—that no ship can anchor in it.

Roughly in the center of the bay two hulking clinkers began to rise convulsively from

Foretaste of doom: Villagers on the Aegean isle of Thera search the rubble of homes shattered by an earthquake. But the tremor is only a prelude. A volcanic cataclysm later gutted the island, snuffing out the brilliant Minoan civilization there and on nearby Crete. The catastrophe, which took place about 1520 B.C., had a profound effect on Western history by shifting power to the Achaeans, mainland forebears of the classical Greeks. In 1934 the author first postulated Thera's destructive role. Recent excavations have borne out his theory, thus offering a solution to one of the enigmas of the ancient Mediterranean: Why did Minoan culture die?

PAINTING BY STAFF ARTIST LLOYD K. TOWNSEND

OPPOSITE PAGE FOLDS OUT

the sea more than a thousand years after Thera's last great eruption. People call them Old Burnt and New Burnt. In the fullness of time they may form yet another huge volcano, explode, and rain lava and ash on sea and islands. As recently as 1956 Thera heaved impatiently; the resulting spasm smashed 2,000 houses in less than a minute.

Thera's long volcanic past has cloaked the island with layers of ash and pumice, as thick as 200 feet in places. Beneath them lies evidence of a mammoth upheaval that, some 15 centuries before Christ, destroyed a brilliant civilization—that of Minoan Crete.

Since 1967 I have been directing excavations of this strange, sinister island. Our archeological team from Greece's Department of Antiquities has turned up the remains of a 3,500-year-old city rich in pottery and art. Although the dig is still in its infancy, we have brought to light superb frescoes, among them a Theran landscape—a lovely work of art invaluable for its biological and geological detail (pages 724-5). Another portrays two boys in the act of sparring; surprisingly, they wear boxing gloves (page 719).

The excavation at Thera offers an unrivaled opportunity to reconstruct the catastrophe that destroyed the Minoan world. The dig also provides vivid glimpses into everyday life during the Bronze Age's glittering zenith. For ours is the privilege not of excavating the usual decayed ruin, but of exploring a town abandoned and obliterated in the space of a few weeks.

The Grain of Truth in an Ancient Tale?

Recently, writers have speculated that the explosion of the island of Thera inspired the legend of Atlantis. The idea that a highly civilized continent was swallowed by the waves in a cataclysm haunted the classical world. Plato mentioned the event and even described the landscape of the "lost continent."

But parallel legends of a sunken landmass existed throughout the ancient world, and many antedate the explosion of Thera. Such a tradition was known in the Middle Kingdom of Egypt about 2000 B.C.

This legend may well be the common property of many ancient peoples—as is the tradition of a mighty flood. Nonetheless, the eruption of Thera could have fathered the legend in its Aegean version: a great civilization wiped out in a flash.

My interest in Thera was kindled in 1932 when I was a young *ephor*, or keeper, of antiquities in Crete. This island, of course, can fire the imagination of any archeologist. For 1,500 years, beginning about 3000 B.C., Crete and the Cyclades dominated the Mediterranean. Here, indeed, was the birthplace of European civilization.

Keeled Ships Played Island Leapfrog

Crete's wealth and power, as well as the prosperity of the islands that spangled the waters to the north, stemmed from command of the seas. In an epoch when competing powers in Egypt and Mesopotamia could fashion only troughlike vessels suitable for river navigation, shipbuilders of Crete and the Cyclades were using the keel, probably an Aegean invention. Stable and sturdy, Cretan ships coursed the Mediterranean, the "wine-dark sea" of antiquity, from end to end.

In time, the Cyclades became a kind of international wheat center for the ancient world. In addition to grain, Cycladic captains transported raw materials—obsidian, copper, and tin—along with art objects—pottery and marble idols. They even settled colonies at commercially strategic sites.

Using small oared vessels capable of a speed of perhaps six miles an hour, the Bronze Age merchantmen could travel as far as 216 miles in 36 hours. A glance at the map will show you that landmasses, particularly islands, are situated throughout the Mediterranean at maximum intervals of 180 to 200 miles. So, with good weather, a vessel could reach any point in that sea within a few days by a series of *diarma*, or passages.

Thus, it is not surprising to find Cycladic pottery from the 18th century B.C. at Marseille in France or at Minorca, one of the Balearic Islands of Spain, and amber objects fashioned by craftsmen of the British Isles in

Blowing its top. Thera's cone rains ash and red-hot pumice on a seaborne exodus. Warned of the eruption, most inhabitants escaped with their valuables before volcanic debris blackened the skies and buried their world. Thus a once-supreme maritime civilization died at its zenith. PAINTING BY STAFF ARTIST LLOYD K. TOWNSEND

GREECE

ASIA MINOR

TURKEY

Aegean Sea

Mediterranean Sea

Cyclades

THERA

CRETE

AREA OF HEAVY VOLCANIC FALLOUT

▲ Sites of Minoan settlements or influence
Elevations in feet

With mind-staggering force, Thera's volcano belched ash high into the air; winds carried it as far as 600 miles. The shaded area in the map above shows the heaviest concentration of volcanic fallout, based on core samples taken from the sea floor by American scientists. The Theran ash killed island vegetation and clogged the harbors of eastern Crete, whose ships had traded throughout the Mediterranean.

Drained of its molten interior, Thera's cone slumped into the sea, turning the round island into a broken crescent (**left**). The collapse set up immense tidal waves that surged outward at perhaps 200 miles an hour, dealing the port settlements of Crete, 70 miles away, a pulverizing blow.

16th- and 15th-century B.C. tombs on the Greek mainland.

The second half of the 16th century B.C. marked the golden age of Minoan culture on Crete. The name of the civilization derives from Minos, a legendary Cretan king. Minoan warships had swept the sea of pirates, and so powerful and secure were the Cretans in their island fastness that neither walls nor fortifications surrounded their great cities.

Huge multistoried palaces overlooked rolling, fertile fields. Slaves and servitors by the thousands labored in the vast royal complex of Minos at Knossos. With a population approaching 100,000, Knossos ranked at the time as the greatest city on European soil and, quite possibly, as the largest in the world. There is evidence that other Cretan city-states—with palaces at Phaistos, Mallia, and the recently discovered Zakros—recognized Knossos as "the first among equals."

Splendor Suddenly Changed to Rubble

In this epoch Cretan influence permeated every part of the Mediterranean. Colonies existed throughout the Aegean—in Melos, Thera, Keos, Amorgos, Kythera—and as far afield as Rhodes and Miletus in Asia Minor. Only Mycenae on the Peloponnesus—home of the Achaeans—stood as a serious rival to the power of Minoan Crete. Every indication supports the thesis that, as the 16th century B.C. waned, the whole eastern Mediterranean was evolving into a Minoan preserve.

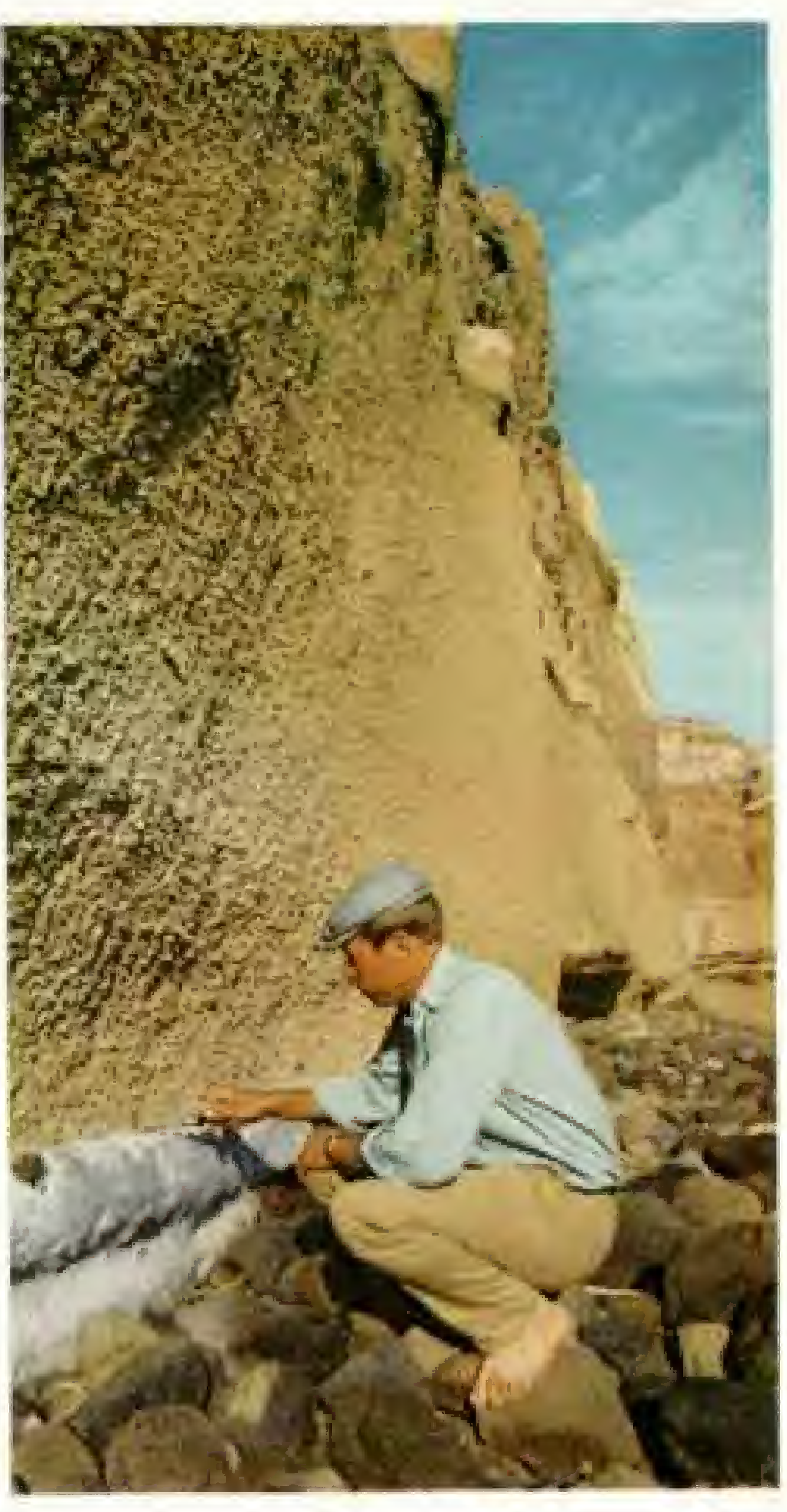
Then came disaster, swift and complete. Ruin struck every palace, every settlement. Crete and its dazzling culture were erased from the ancient world. And the splendor never returned.

During the first half of our century, scholars believed that the end came when the rough, warlike Achaeans invaded Crete, burned its palaces and plundered their treasures. Sir Arthur Evans, the excavator of Knossos, postulated instead that an earthquake was the cause of the destruction. But earthquakes strike only limited areas; no shock could be powerful enough or sufficiently widespread to annihilate every settlement on a large island. Some catastrophe on a much greater scale had turned the course of civilization.

My own interest in the problem of the demise of Minoan culture began, as I mentioned earlier, in that long-ago year of 1932 while I worked as an ephor on the island of Crete. My search commenced in rather unlikely fashion. Strabo, the Greek geographer, reported that Minos had used Amnisos—merely a sandy shore in 1932—as the harbor town of Knossos. With a budget of approximately $135, a princely sum for Greek archeologists in those days, I commenced my first major dig on the reputed site of Amnisos.

By the last scheduled day of the excavation I had exhausted my funds and found nothing

(Continued on page 715)



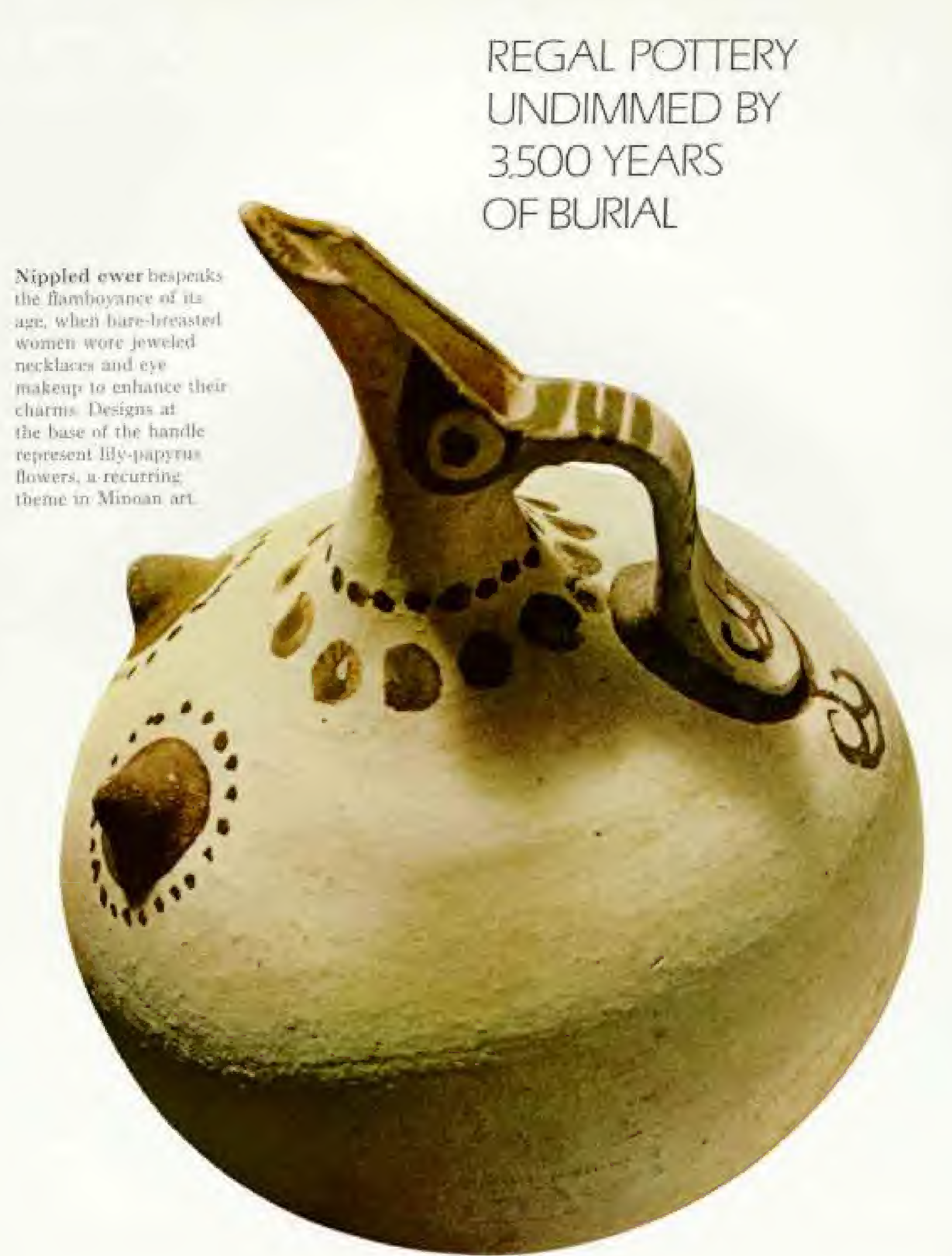
Outlasting centuries of wind and wave, a 30-foot beachside cliff of tephra—the fine glass-bead ash from past eruptions—lies atop a stratum of eroded gray rock. The tephra, which sometimes lies as thick as 200 feet, seriously hinders excavation, but is an important island export used in making cement.

Eared clay vases like these once held miniature hanging gardens. The ears, pierced vertically, probably held thongs by which the cylinders were suspended.

Terra-cotta bull bound in a painted net symbolizes Minoan culture. The animals played a major role in Minoan mythology and religion, ranging from the fabled Minotaur—half man, half bull—to the beasts used in ritual games on Crete.

Tapered pot, an intact *rhyton* ends in a small hole at the base. Possibly a ritual libation vessel or funnel for narrow-necked jars, it exhibits the rippled pattern common to much Theran pottery.

REGAL POTTERY UNDIMMED BY 3,500 YEARS OF BURIAL



Nippled ewer bespeaks the flamboyance of its age, when bare-breasted women wore jeweled necklaces and eye makeup to enhance their charms. Designs at the base of the handle represent lily-papyrus flowers, a recurring theme in Minoan art.

Still clinging to disaster's doorstep, the whitewashed town of Thera overlooks a bay that was once a mountain. Low walls divide sloping terraces to control

erosion of the rich volcanic soil. Island bounty includes barley, beans, tomatoes, and grapes that yield wines renowned throughout the eastern Mediterranean.

Out of rubble, enduring art: A mass of crumbling fragments only two years ago, an antelope fresco takes shape as restorers in Athens piece it together and fill in voids with matching paint. Strikingly true to life, these graceful animals represent a species that now exists only in East Africa. That they were known to Minoan artists raises some fascinating questions. Did *Oryx beisa* once roam as

far north as the Mediterranean? Or did Crete's sailors venture beyond "their" sea to East Africa? Other frescoes from Thera depict blue monkeys and a Negroid head, thus supporting the latter view.

With a lucky instinct I chose a spot for the final try. In an hour my helpers and I encountered fragments of a precious fresco showing white Madonna lilies on a deep-red ground. In the end, we unearthed a good part of the ancient harbor town, including a royal villa with splendid floral motifs.

But what especially piqued my interest at Amnisos were the curious positions of several huge stone blocks that had been torn from their foundations and strewn toward the sea. "Some terrific power," as I reported in a scientific account of the year's excavation, had swept them from their original places. Of even greater interest, I found a building near the shore with its basement full of pumice. This fact I tentatively ascribed to a huge eruption of Thera, which geologists then thought had occurred around 2000 B.C.

1883 Eruption Sheds Light on Thera

Later I learned that receding tsunamis—"tidal waves"—constitute one of nature's most fearful forces, and would easily account for the dislodged stones. I began to realize that it was the eruption of Thera—which I date at 1520 to 1500 B.C.—that had ended Minoan culture. I presented this theory to scientific audiences in 1934 and in 1937. On neither occasion did it gain much credence.

Then, also in 1937, I became a visiting professor at the State University of Utrecht and gained access to voluminous Dutch material on the explosion of the island of Krakatoa in the Netherlands East Indies in August of 1883. Krakatoa burst with a roar heard more than 2,000 miles away; the resultant aerial vibrations circled the globe several times. As the eruption continued, vast quantities of pumice hurtled through the air, defoliating trees and clogging harbors for months to come. Volcanic dust blocked out the sun for a radius of 100 miles. Some of it eventually sifted to earth 1,000 miles from Krakatoa; the rest, ejected with a force that drove it into the stratosphere, dispersed over the entire planet, causing spectacular sunsets through the closing months of 1883.

Finally came the culminating horror—the tidal waves. More than 100 feet high and with a velocity in excess of 50 miles an hour, they ravaged the nearby coasts of Java and Sumatra. In places they raged inland for 1,000 yards and were still 30 feet high. They swept away entire towns and villages, almost 300 of them. This disaster crushed the life from more than 36,000 people.

A puzzle comes together in the hands of Thera's chief restorer, Tassos Margaritoff, photographed with a camera placed inside the jar he rebuilds (**above**). Numbers and symbols chalked on matching fragments guide him.

Royal pantry? Man-size *pithoi* (**left**) once held staples—wine, oil, and grain. More than twenty of the vessels were found in what was possibly a palace storeroom.

Mining for antiquities, workers retrieve pottery from a tunnel that retraces an ancient street (**right**). Such corridors were excavated to provide public displays without disturbing farmland above. But threat of collapsing ceilings has forced abandonment of this method.

Yet, colossal as it was, the explosion of Krakatoa released a mere fraction of the destructive force unleashed 3,400 years before by the eruption of Thera. In the agony of Krakatoa, a bit more than eight square miles of the island sank into the sea; Thera lost 32 square miles. To gain an adequate picture of the convulsion that shook the Aegean, I suggest that one must multiply the Krakatoa events by a factor of four.

I calculate that the tidal waves created by the eruption sped from Thera to Crete—a distance of 70 miles—in less than half an hour. Some scholars estimate their speed at more than 200 miles an hour and assign to them the enormous height of 300 feet as they piled up on the northern coast of Crete.

In 1939 I again advanced my theory of the destruction of the Minoan world, this time with considerable supporting data, in the British archeological journal *Antiquity*. Again, scholars were skeptical. Indeed the editors added a note pointing out "that in their opinion the main thesis of this article requires additional support from excavation on selected sites."

Need for Tephra Will Help Archeology

At this point, the sad years of World War II intervened. Years of political troubles followed. Not until the 1960's was I able to accept the challenge of proving my thesis by means of excavations on Thera itself.

Once more I had to rely on the instincts archeologists develop in the field. Toward the end of the past century, both German and French teams had dug on Thera with a measure of success; their work proved beyond doubt that Thera had been populated before the gigantic explosion. Indeed, the satellite island of Thirasia gave up spectacular traces of the catastrophe. But I felt that I had to start completely afresh.

Thera poses several problems to the archeologist. Those parts of it that neither exploded nor sank lie beneath a thick blanket of pumice and volcanic ash. Therefore, in most areas normal excavation is impossible. The future holds promise, however, because commercial interests are removing this layer—known as tephra—since it makes a highly cohesive and waterproof mortar, serves as an insulating material, and constitutes an important component of cement.

Buried Shards Date Thera's End

As I pondered the most promising place to begin excavating, I became increasingly attracted to the village of Akrotiri on the southern hook of Thera (pages 720-21). First, in this sector erosion had removed as much as 65 feet of volcanic ash, thus greatly facilitating the act of digging. Second, Akrotiri borders the island's most fertile valley and is sheltered from the strong winds that buffet the northern section.

Beyond these reasons lay the instinct I spoke of. South is the secret of orientation of all ancient peoples of the Northern Hemisphere, for they reveled in light and warmth. And from Akrotiri, in the clear mornings of autumn and winter, one can even see Crete looming on the distant horizon. What could be more natural than for these Minoan colonists to build a city within sight of the island mother of their civilization?

So, in a ravine near Akrotiri, where the French had found pre-eruption artifacts so many decades before, we hopefully plunged our spades on a hot summer day in 1967. A few hours of digging showed that the detective work had not been in vain. We first came upon loose stones with fragments of pottery. Two precious shards we recognized as imported Cretan ware. They provided us with a vital date, for this kind of pottery was made between 1520 and 1500 B.C.

Soon the seemingly loose stones became recognizable walls. We found a clay cup standing upside down and near it a stone lamp with traces of lampblack still visible; clearly it had been burning just before the catastrophe. I felt at once that we had come upon the remains of an upper story. Fearing to damage any fragile articles on the floor beneath, we covered the trench and commenced

Tribute to the patience and skill of restorers, boxing boys shattered by Thera's explosion today resume their bout in Athens' National Archaeological Museum. After reassembly of innumerable fragments—some only pinhead size—artists rendered the missing portions, which appear smooth. This princely fresco, still vivid after 35 centuries, contains the first known depiction of gloves.

to dig slightly to the north, hoping thus to expose the exterior of the building.

Find it we did. Its facade of carefully hewn stones indicated an important edifice, possibly a palace. At the same time I noted that the upper walls had collapsed into a jumbled mass. Over the whole of the ruin, like a pale shroud, lay a thick layer of white volcanic ash. But beneath the fallen stones we could find not the least trace of it. My instant conclusion: A strong earthquake destroyed the building; thereafter a shower of tephra from the exploding volcano buried it.

We had, in fact, made a most interesting discovery. Geologists had long maintained that eruptions of Thera-Krakatoa type volcanoes are never accompanied by earthquakes. Convincing evidence to the contrary lay before our eyes.

That first year produced other discoveries—fine pottery, plastered walls, storerooms with large storage jars still in place (page 716). But above all we had finally found a Minoan city on Thera that had been destroyed by the eruption.

During the next two years we enlarged the scope of our excavations; our labors were frequently rewarded with important finds. For the sake of our work, as well as for our personal comfort, we also made improvements in our surroundings. We brought in electricity, built habitations, storerooms, and laboratories. We diverted a stream bed that coursed with water during the rainy season; unhappily, it had previously flowed through the center of our ravine and had eroded some of the ruins underneath.

Akrotiri was the poorest and most remote village of Thera, and the inhabitants—hoping for an influx of visitors—enthusiastically supported our endeavors. But when I offered to link the village by road with the rest of the

Bowing to eternal winds, barley heads wave across a beautifully preserved ewer. This vessel perhaps held libations meant to appease the gods and ensure a bountiful harvest.

Ageless ways live on in Akrotiri, a hilltop village near the author's excavations. Here a farmer winnows barley threshed under the hoofs of his mule, while the resting animal munches leftover stalks.

Hand-powered wheel devours fava beans through its center hole, grinds away the husks, and spits them out at the base. Minoans apparently used favas—about the size and shape of small lima beans—in fertility rituals. Today's Therans eat them in a hearty soup.

island, if the villagers would donate the necessary land, my proposal met with the utmost skepticism. Later, after the residents had duly given up the land and we had constructed the road, I learned why.

"For about fifty years," one of them told me dryly, "before every election a politician would turn up and promise us a road. Men would soon arrive with theodolites and they would measure and survey and plant stakes. Then, shortly after election day, they would remove the stakes, pack up their instruments, and disappear."

Sea Urchins Prized Since Ancient Times

With our logistical situation thus improved, and with the aid of the Greek Government, we have been able to increase the pace of our labors. We have uncovered at least one workshop, possibly that of a coppersmith. However, we have found few metal artifacts, indicating that the ancient inhabitants had sufficient warning of impending doom to gather up their valuables and flee.

We have also discovered a building that we call the Mill House. A small, charming vestibule supplied with a stone bench leads into a larger room where we found millstones still in position. A commodious and deep pottery bathtub stood against one wall. In a corner we came upon a rarity. It appeared as layers of dark dust within the white volcanic ash. Inch by inch we freed it, constantly applying epoxy resin to harden it.

It proved to be a sizable basket, apparently of twigs and bark strips. In it we found some spines of sea urchins, indicating that these tasty echinoderms were as much esteemed in Minoan times as they are today.

I believe that the Mill House was a center of religious ritual. In certain aspects it resembles other Minoan sanctuaries. Here a high priest, or, in the case of a palace, surely the king, would grind the flour necessary for every sacrifice to the deities.

Early in the excavation, I had cautioned our two foremen, both experts in their field, to be alert for inscriptions. Both husky John Karamitros, known to the men as Big Boss (opposite), and light, agile George Vassiliadis —Mini Boss—had promised to do so. The first to discover an inscription, I announced, would be handsomely rewarded.

Thus, to my shock, I discovered one day as I strolled through the excavation that the uppermost vase on a miscellaneous heap bore upon its shoulder a finely preserved Linear A inscription. I could not believe that the lynx eyes of Karamitros, in charge of this area, had failed to note it. Approaching the vase, which lay just as its owner had left it 3,500 years ago, I ran my fingers across the incised area with a sense of awe. At last, in the mysterious Linear A script, the first fully preserved inscription from Thera!

When I reached Karamitros and his workmen, I said, not without irony, "So, Big Boss, you've discovered the first inscription! And you have kept it secret!"

Electrified, Big Boss and his men ran to the heap of vases. Feverishly they examined them. Then Karamitros turned indignantly. "Professor, you are mocking us. There is nothing here."

Solemnly, perhaps a bit smugly, I pointed to the uppermost vase. Then I blinked in bewilderment. The inscription had disappeared!

Not for several days did any of us realize what had happened. Then, intensive, around-the-clock observation of the vase showed that the inscription became visible only when the sun struck it from a precise and transient angle—in all, for only a few minutes a day. Thus did Big Boss regain his prestige.

Fortuitously, all of the Linear A symbols on the vase belonged as well to the now-deciphered Linear B, so after laboratory examination we were able to read: *a-re-sa-na*. Possibly it represents the name of a fertility goddess analogous to Ariadne; or perhaps it proclaims the ancient name of one of the island's ports, which probably conducted a lively trade in olive oil, shipping it in such jars.

Finds Shed Light on Minoan Menu

Discoveries on Thera have offered fascinating glimpses into the life as well as the death of the Minoan Age. We learned that the Therans ate an abundance of seafood, savored roasted snails (page 726), and consumed several varieties of beans. Barley and millet figured in their diet, and sesame seeds constituted a condiment. In some vases lay the remains of flour, onions, and buns.

In one room we obtained a plaster cast of a complete wooden bed (pages 724-5)—the first such item of furniture found on a Minoan site. Even the thongs that lashed the hide mattress support to the frame are clear to the eye. The bed provides additional evidence

Farsighted professor and Inspector General of Antiquities for Greece, author Marinatos (**right**) began excavating near Thera's southern tip five years ago on the theory that a prehistoric city lay entombed there. He believes it would take a hundred years to free the island's vast trove of artifacts from its shroud of pumice.

Treasure from the tephra: Excavation foreman John Karamitros exults over a bronze roasting pan, one of Thera's few metal finds (**below**). A workman trowels off vestiges of pumice. Metal weapons, tools, and utensils, known to have been used on Crete, probably abounded on Thera as well. But they are found only rarely, as are human skeletons—evidence that Thera's Bronze Age inhabitants had time to save not only themselves but their most valuable possessions.

Cryptic note from ages past, a T-shaped symbol on a clay shard belongs to Linear A, the Minoan script scholars believe was later adapted by early Greeks. Too few samples have been found to permit decipherment, but continued search may yield new fragments—perhaps even an Aegean Rosetta stone.

that the Minoans, like most Mediterranean people of the time, were tiny—no more than five feet four inches in height.

Their religion, as elsewhere in the ancient world, centered upon fertility idols of marble or clay. We have found several, all with their arms extended.

So far, one principal sacrificial area has come to light. The remains of a fire have yielded the charred bones of birds, lambs, kids, and other minor animals. Vases full of fava beans had been cast into the flames, as well as small clay oxen, thrifty substitutes for the real thing. All, certainly, had been offered to the goddess of fertility.

Artist's Work Shows Love of Nature

Such discoveries, significant as they are, pale beside the glory of the frescoes preserved in Thera's volcanic ash. A continuous wall painting covered three sides of the room in which we found the bed. In all, the fresco

Spring blooms across a majestic fresco of lilies and swallows. Gauze strips at right bolster the painting on the earthquake-buckled wall. Workers will cover the masterpiece with adhesive and more gauze, then pull it free for reassembly in Athens' National Archaeological Museum.

Amphorae and other vessels lie in the foreground as they were found, nestled under the plaster cast of a bed. The wooden frame had long ago turned to dust, but an impression remained in the tephra. Master restorer Stamatis Perrakis, using a technique made famous at Pompeii, forced plaster into the cavity, then pared off the ash (**below**), leaving a cast so detailed that thongs once binding the frame show clearly.

covers more than 16 square yards, making it the largest well-preserved painting in Aegean archeology.

This fresco is the work of an unknown genius. In place of the fussy vertical and horizontal subdivisions, or zones, that break up virtually all archaic paintings, the artist has shaped a huge, unified whole.

A springtime scene lies before us, the landscape of Thera before the great eruption. Hills and boulders appear; they are similar to those found on other volcanic islands. Clusters of red lilies nod as if bent by a gentle breeze, while swallows dart above them. The whole picture gives an impression of infinite charm and love of nature. It may be a religious allegory, I believe, with origins reaching across the Mediterranean to Egypt.

Another fresco portrays a group of sensitively conceived antelopes, almost certainly done from life (pages 714-15). The species, *Oryx beisa*, now is confined to East Africa.

Yet another wall painting depicts a troop of blue monkeys—also now native only to Africa. The monkeys, having apparently ravaged an orchard, are scrambling up Thera's red lava precipices pursued by dogs. The patriarch of the troop acts as a rear guard, turning a menacing face to the hounds.

This monkey fresco, together with that of the antelopes, raises the intriguing possibility that animals now indigenous only to Africa once roamed on the Cyclades as well. The fragment of another fresco, all that we possess of the original, shows a Negroid head.

Fresco Foreshadows Homer's Words

Our experts pieced together still another wall painting we had found virtually pulverized. Under their ministrations, a most unlikely scene took shape—the "Fresco of the Princes," our now-famed boxing boys (page 719). Their long black hair streams through blue headdresses, a puzzle until one remembers the blue hair of some of the characters in Homer. In fact, these Minoans were some of the very people Homer later immortalized in the *Iliad* and the *Odyssey*.

Actually Homer—perhaps unknowingly—was perpetuating a Mesopotamian tradition. Cuneiform tablets left by the Sumerians and the Akkadians prescribe that the hair of royalty must always be rendered in lapis lazuli. So the young boxers of Thera may well reflect the influence of Oriental portrayals.

This, at least, would seem a likely explanation, though no representation of blue headwear has ever been discovered in Crete. Quite incidentally, the fresco's depiction of gloves appears to be the earliest one known to archeologists.

During the excavation of Minoan Thera, Greece's Department of Antiquities reached a radical decision. The emerging city offers a unique picture of a Bronze Age civilization at its apex. Save for the most precious objects, we determined to leave everything in situ. For the simple truth is that we are excavating not a ruin, but a museum.

We have, therefore, erected a roof over the excavation, and will extend it as the dig itself extends. We welcome visitors. Eventually they will be able to stroll through the streets and glance through the doors and windows of a once-flourishing Minoan city, a city that died by violence, a city that in the pathos of its ruin—its pulse of life stopped virtually in mid-beat—stands as an epitaph for the brilliant, seagirt world of Minos. □

Remnants of a Bronze Age feast, snail shells discovered in an ancient vase acquaint archeologists with the Minoan diet. The shells belong to a land species now found on Crete but not on Thera, possibly indicating that the creatures were wiped out by the eruption, or that they and other foods were imported. Excavations on Thera have also yielded the remains of sea urchins, crudely ground barley, and a tarlike substance that was probably olive oil—items still basic to the Aegean diet today.

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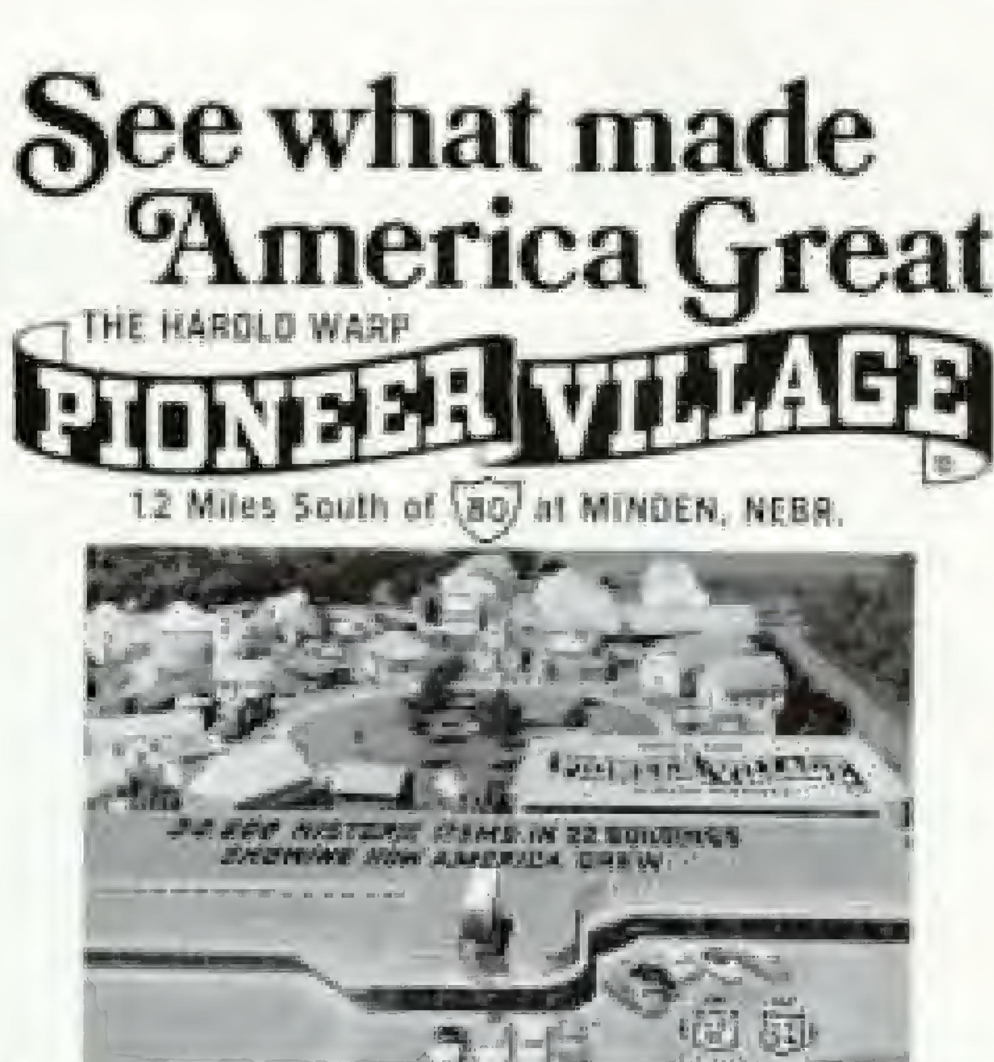

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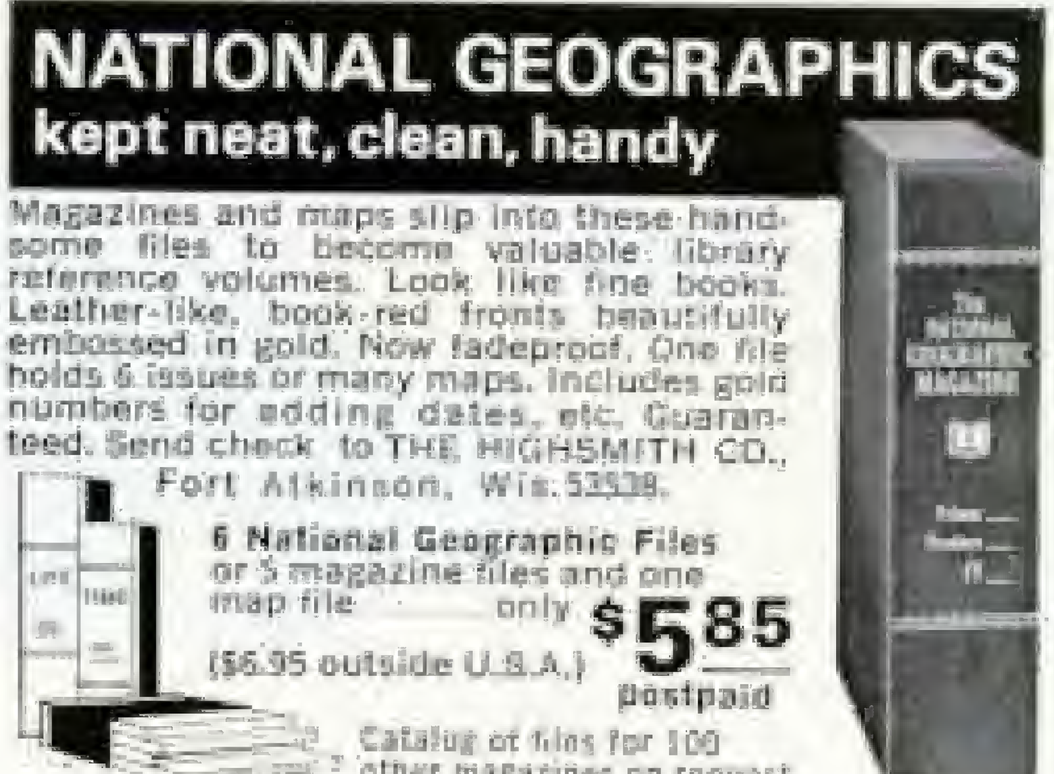

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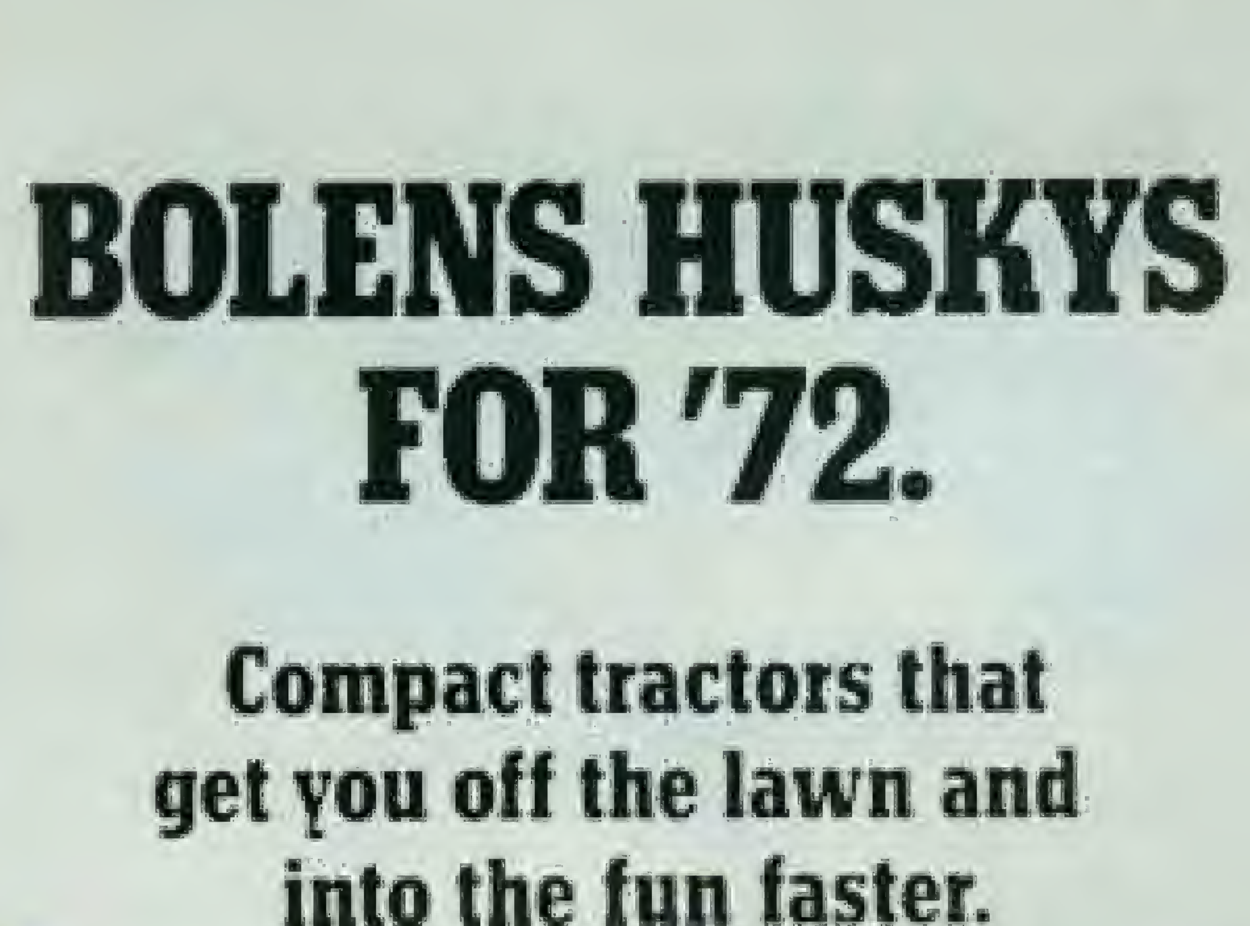

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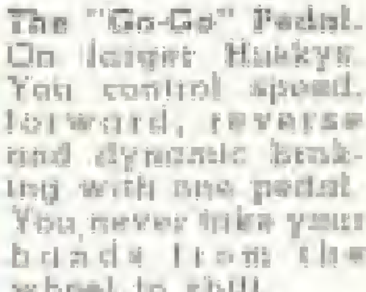

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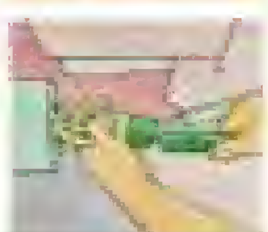

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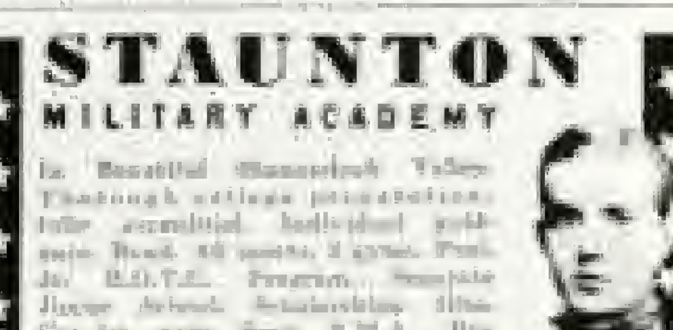

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