VOLUME CIII NUMBER FIVE

THE NATIONAL GEOGRAPHIC MAGAZINE

MAY, 1953

PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
WASHINGTON, D. C.

$6.00 A YEAR 60c THE COPY

VOL. CIII, No. 5 WASHINGTON MAY, 1953

THE NATIONAL GEOGRAPHIC MAGAZINE

School for Survival

High in the Sierra Nevada, Airmen Who May Be Forced Down Learn How to Stay Alive Until Rescued

By CURTIS E. LEMAY

Commanding General, Strategic Air Command, United States Air Force

THESE are the last two entries in an airman's diary, the diary of a B-26 pilot who crash-landed in Labrador in December, 1942.

Three of his crew had set out in a dinghy to get help; they were never heard from again. The other four huddled in the fuselage and, for two months, slowly starved to death as their jumbled assortment of food dwindled away: Spam, Hershey bars, caramels, Coca-Cola, peanuts, canned chicken, dates.

On January 26 the pilot wrote:

"Overcast but fairly calm. Each day, we don't see how we can last another day, but each time we manage to go on. We all smoked a pipe of tobacco this morning, and G. really got sick and I felt pretty bad, but we came out of it pretty well."

Endurance Is Not Enough

On February 3, he scribbled this final note:

"Spent a solid week in bed. Today W. died after being mentally unbalanced for several days. We are all pretty weak, but should be able to last several more days at least."

Perhaps they did. But it wasn't enough. They were found by Eskimos a month later, all dead. The ironic footnote to their tragedy is this: the Eskimos came from a village only an hour and a half's journey away by foot.

I do not cite this crew's experience in derogation. Far from it. They were gallant men who endured much—and, by the diary's evidence, endured it to the end—with courage and stubborn cheerfulness. But for me and for the command I head the moral is inescapable—endurance is not enough.

The downed airman (and we have had many go down over Red-held Korea) cannot defeat cold and hunger and isolation by sitting on his hands. He must know what to do. He must equip himself mentally and physically to do it. And he must act.

There are still, perhaps, a few "realists" around who will shrug off the loss of such crews as merely a part of the normal attrition which afflicts any operating air force. They could not be more mistaken. To the Strategic Air Command, no pilot, no bombardier, no gunner, no crew is expendable.

The reason lies embedded in hard fact: SAC's mission is to preserve the peace by presenting to the enemy the constant, poised alternative of total retaliation. So far, we have fulfilled this primary obligation. But our deterrent value in peace, and our destructive potential in war, depend alike upon our readiness to deliver a knockout atomic punch —not in a year or a month or a week, but *now*. Not with crews we might eventually train, but with the precision teams at our disposal today.

Why are these crews so valuable? Because they are made up of human lives and are

The Author

For nearly five years General LeMay has headed the Nation's striking force of huge strategic bombers. An aggressive and resourceful commander, he developed standard techniques of bombing and formation flying as he led American bombers against both Germans and Japanese. During World War II he rose from major to major general, and in 1951, when only 45, he became a four-star general. A graduate of Ohio State University, he holds a degree in engineering. Since 1951 he has been a Life Trustee of the National Geographic Society.—Editor.

U. S. Air Force, Official

A Survival Trainee in Wilderness Alaska Tunnels an Entrance into His New Home

Crews of the Strategic Air Command, if forced down in desolate terrain, must understand Nature to exist. Survival schools teach the men how to live off the land pending rescue (map, page 369). Students at the 10th Rescue Squadron School, Kotzebue Sound, are taught to build life-saving snow shelters. Two men constructed this snug dome. One remains inside, having placed top blocks in position. His partner now liberates him.

irreplaceable. Because each crew, manning its massive bomber, commands more lethal power than a whole fleet of World War II planes loaded with ordinary high explosives. Because years of intensive training are required to raise each crew to performance pitch.

The ships themselves are important, yes. But the crews are even more so. During the last war it was possible, and necessary, to send airmen into combat after only eight months of training. Many a crew flew its first mission with barely a score of hours aloft together.

Today SAC would rate such a crew as apprentices. They would have to put in another three months of work and a good 150 hours of flying time to graduate to combat-ready status. To make the first team and to become a lead crew might take them from six months to a year and a half.

Nor can even the lead crews rest on their honors. Kept in constant practice, they are never allowed to forget that their individual and group proficiency records come under ceaseless scrutiny. At regular intervals they are checked out on all minute aspects of their job, from gunnery and navigation to ditching and bail-out techniques. They know, too, that a black mark in any one airman's specialty downgrades the whole crew.

Accountants have put price tags on these thousands of hours of group flying and group training; they say, for instance, that each B-36 lead crew represents a $3,000,000 investment. They may be right. But the dollar figures tell only half the story. We can replace the money; it is extremely dubious whether we shall, in a crisis, ever be given enough time to replace the crew.

A School for Survival Is Born

It was with such thoughts in mind that I found myself, during the summer of 1948, sitting at a table at the Rod and Gun Club in Wiesbaden, Germany, talking with two fellow officers: Col. Demetrius G. Stampados and Maj. Burton T. Miller. I like hunting, and so do they. But I had just taken over as Commanding General of SAC, and we had other matters to discuss.

"Look," I said, "as you gentlemen are well aware, SAC's mission is global. Our men

U. S. Air Force, official

General LeMay and His Crew Man Life Rafts in the Pool at Offutt Air Force Base

Once a year SAC crews practice ditching procedure. General LeMay (center, hair streaming down forehead) led his men into this pool from a diving board. All the men wear waterproof survival suits and Mae West life preservers. Each SAC bomber carries three life rafts. Two are packed into special fuselage compartments; they can be ejected automatically. Once released, they inflate themselves with carbon dioxide.

are going to be flying over some of the worst terrain in the world, and some of the most remote. Every now and again some of them are going to be dumped on it. Maybe they'll ditch, maybe they'll jump, maybe they'll crash. But their problem is going to be the same: how to survive off the land, whatever that land may be—tundra, jungle, desert, or just mountains.

"I want them trained to survive. And I want to set up schools in which they can get that training."

We batted the subject back and forth. Miller had been an outdoorsman and an ordnance expert all his life. Stampados, a peacetime big-game hunter, had become in the war a member of the British Commandos and of the Eighth Army's Long Range Desert Group, had served as an intelligence officer for the Office of Strategic Services, and had operated behind enemy lines in the Balkans and the Far East. He had learned survival techniques the hard way.

The upshot of our Wiesbaden conversations was the activation, on December 16, 1949, of SAC's 3904th Training Squadron at Camp Carson, Colorado. The school commandant: Colonel Stampados. Its research and development officer: Major Miller.

To aid Stampados in his ground-breaking work, we combed the Air Force and the ranks of Army reservists for skiers, explorers, mountaineers, trappers, woodsmen.

We were lucky. We netted men like Lt. Col. Charles A. K. Innes-Taylor, transportation officer for Admiral Byrd's 1934 Antarctic expedition and a former Canadian Mountie*; Capt. Willie Knutsen, Norwegian habitué of the Arctic (page 573)†; Per Stoen of the Arctic Indoctrination School at Nome, Alaska; survival expert Maj. L. E. Dawson; Hans Siewers, who had trapped in Greenland; M/Sgt. K. E. ("Slim") Moore, Canadian-trained dog-team handler; M/Sgt. William Ferreira, who escaped three times from German prison camps; and a swarm of volunteers

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

† See "Milestones in My Arctic Journeys," by Willie Knutsen, NATIONAL GEOGRAPHIC MAGAZINE, October, 1949.

Edward B. Reid, Civil Aeronautics Board

Airmen in a Distress Drill Evacuate a Globemaster by Hurtling Down a Canvas Slide

Recently the Air Force and civil agencies devised a special method for emergency evacuation of the workhorse Globemaster transport. Tests proved 214 men could quit the big plane in 100 seconds. This crew practices at Brookley Air Force Base, Mobile, Alabama. The first men out descend knotted ropes (on hatch), then hold the tarpaulin for others to slide down. Numbers identify some of the test participants.

who had seen service with the ski troops and with the 10th Mountain Division in Italy.

With such a cadre of instructors, the 3904th set up shop in the Colorado Rockies as an advanced survival school. To it were channeled successive classes of SAC airmen who had taken standard survival training at the Air Force base units, using such terrain as the jungle at Ramey, Puerto Rico; the Okefinokee Swamp at Turner, Georgia; and the woodland at Lockbourne, Ohio.

They came to Carson, summer and winter, to get really intensive instruction in dealing with the kind of terrain they are most likely to encounter in a major war—the terrain of the north (map, opposite). At Carson, National Geographic photographer Volkmar Wentzel took many of the fine photographs which illustrate this account.

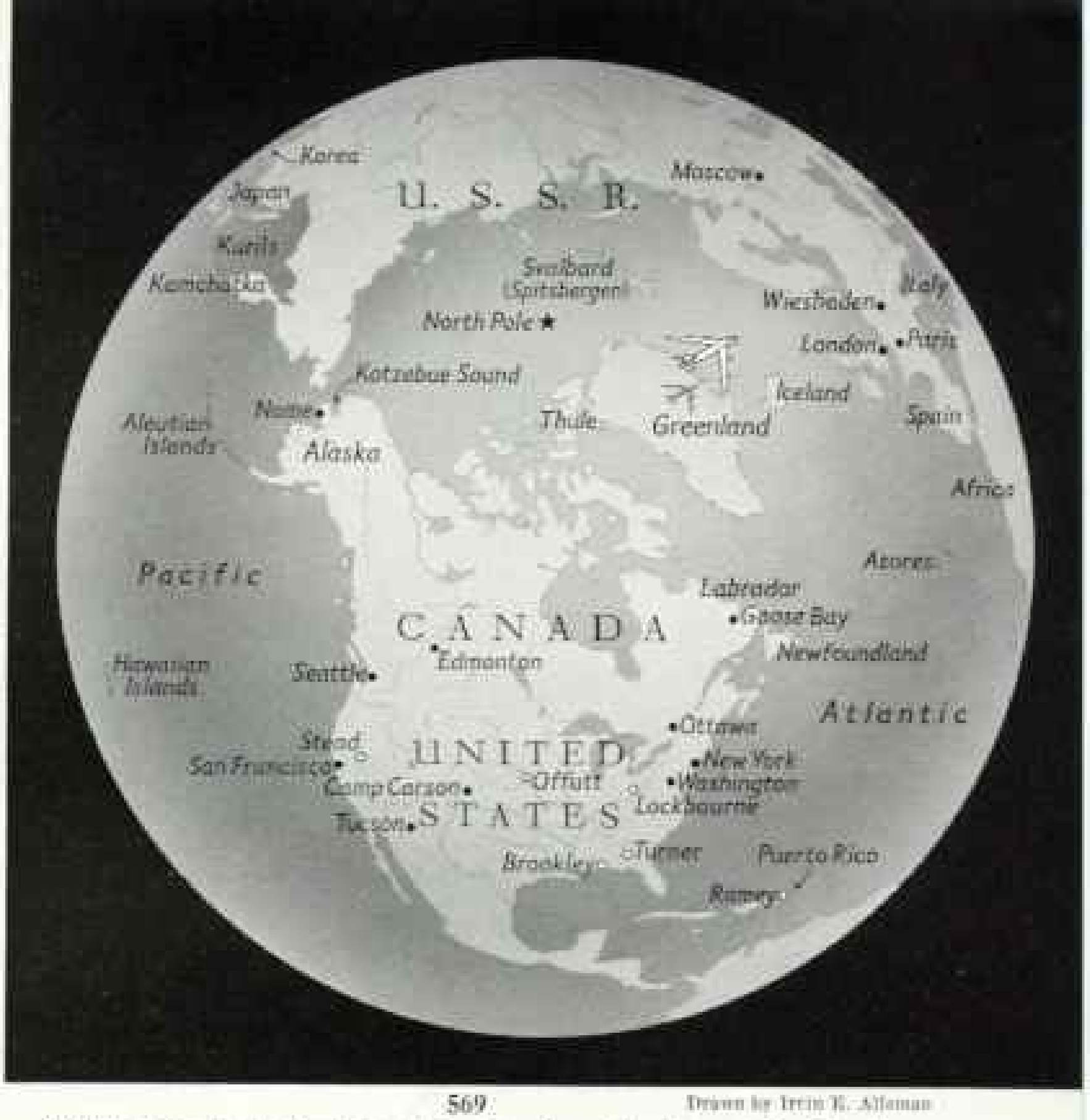
Success in Colorado made it clear we would need an even bigger training area to handle both our own SAC crews and those of other commands who now sought our instruction—airmen from the Far East Air Forces, from the Tactical Air Force, from Military Air Transport Service, and from the Royal Canadian Air Force. Accordingly, in 1952 we shifted the bulk of our advance work to Stead Air Force Base, 10 miles northwest of Reno, a few miles from the high Sierra Nevada, which

runs along the California-Nevada border.

Stead, a rather bleak, treeless encampment on the sagebrush flats beneath the mountains, houses the students for only five days. The rest of the 15-day course they spend in a wilderness training area, testing, under conditions of real stress, their capacity—or incapacity—to survive.

The moment these crews land at Stead they begin to realize they have left luxury behind. Debarking from trucks, they draw sleeping bags and march off across dusty roads to the square hot tents they are to occupy—and keep clean—while on the base. Next morning they stumble from their cots at 0530 to start their first day of indoctrination and appraisal.

From then on, through three grueling days, the crews eat, drink, and dream survival. Lecturers pound the facts of outdoor life into them in concentrated bursts. Civilian analysts run them through group performance tests. Jumpers refresh their knowledge of parachute technique (page 573). Radiomen check up on their skill with emergency transmitters, and instructors give them tips on terrestrial navigation.



569 Drawn by Irvin E. Alleman

SAC's Survival Training Emphasizes the Strategic North

In a major war bomber crews would fly polar routes, hazarding snow and cold if downed. SAC's advanced school at Stead Air Force Base, Nevada, specializes in northern survival. Air Force bases are designated by open circles; towns and cities by solid circles.

An Airman's Best Friend—His Chute

One order which is rammed into them at every opportunity is this: hang on to your chute; it's an airman's best friend. They begin to understand why when they consider the catalogue of things that can be made from its canopy, shrouds, webbing, and metal fastenings. To name a few:

Blankets, bedrolls, tepees, lean-tos, snares, slingshots, fishhooks and fish lines, nets, seines, mukluks, eye shields, hats, scarves, puttees, insect hoods, splints, bandages, slings, packs, sails, snowshoes, spearheads, and signal panels (pages 573, 596, and 598).

When the crews aren't tied up in lectures and tests, they often drop into Stead's display building and study its static exhibits—deadfalls and Apache foot snares, gun traps and gill nets, rafts, lean-tos, paratepees, fish spears, racks for smoking meat, and (in some ways the most interesting of all of them) the E-1 Survival Kit (pages 574 and 580).

This 42-pound outfit, which a flyer can attach to his chute harness, contains 42 items that give him the best possible chance of surviving in any climate, any terrain. They range from a 3½-pound folding-stock rifle to a vacuum-packed sleeping bag; from five days' concentrated rations to a mosquito net; from fishing tackle to extra socks. Each item has been slimmed down to its minimum size and weight; each has been field tested.

Before students leave for the hills with this kit, they must get squared away on a primary problem of survival: how to reach land safely in the first place. Instructors at Stead remind them of some gruesome statistics: one airman out of every three who bail out leaves his plane uninjured but is hurt or killed on landing.

Some of these casualties come from smashing into trees, some from drowning under the chute, some from poor posture on impact. But others in these days of stratospheric flying stem from ignorance or forgetfulness of the hazards of jumping from high altitudes.

A man bailing out from a B-36 at 35,000 feet runs the risk of pulling his ripcord prematurely and suffering a crippling jolt. Or he may fail to use his auxiliary oxygen tank, or use it improperly, and black out.

U. S. Air Force, Official

Hungry Flyers Deep in the Everglades Stretch and Scrape a Tasty Rattlesnake

Airmen are told that the tropics, with their teeming life, offer an excellent chance for survival. These trainees, having removed the diamondback's skin (on line), prepare the meat for supper.

That doesn't mean that men shouldn't jump from a crippled ship, high up. It does mean that they must be trained, and trained again, in the essential techniques; and that, if it's at all possible, they should stick by the plane until it has lost sufficient altitude.

If a crash landing is feasible, it should be preferred to indiscriminate bail outs. It's not only safer but it gives the survivors the benefit of whatever equipment the plane is carrying, plus the use of the fuselage itself as temporary shelter and as a rescue marker.

Training Scotches False Notions

Crews that come to Stead are taught, too, that though their training here will emphasize survival procedures adapted to northern woodlands, they will do well to pick up pointers on living in the jungle, the desert, and on Arctic tundra and ice.

From training films, from the new SAC *Land Survival Guidebook*, and from talks by Stead's civilian survival experts, they garner a good deal more information than they can perhaps retain. Some of it, however, stays with them, and more will come back to them as they need it.

The basic and most useful impression that they derive, I think, is that neither jungle nor desert nor Arctic is as nightmarish as portrayed in pulp fiction. When an instructor asks a new student what would be the first thing he'd do if he came down in such country, he'll often answer, "I'd shoot myself!"

But he soon learns that in the jungle, for example, he need go neither hungry nor thirsty. He'll be able to find water in young cane stalks, juice in vines and the fruit of most trees, blood in any turtle or animal. He can eat any beast with fur on it, any palm bud, any flower without a milky or colored sap.

He's taught, too, that even if he loses the mosquito net from his E-1 pack, he can make a pretty good head protector from his T shirt. As for other insects, he's told that he can eat them—grasshoppers and certain butter-

flies (minus their wings and legs), ants and ant eggs, wood grubs from rotten logs. Not appetizing, perhaps; but nutritious. And certainly abundant. If the Australian aborigine can dine happily off snakes, lily roots, worms, and lizards, the trainee is told, why, so can he. And if an Arab considers fried locusts a treat, then a hungry American flyer shouldn't pass them up.

How to Paralyze a Fish

One tip that generally tickles the airman's imagination is the notion of using the sap from a sandbox tree to catch fish. He learns that if he mixes this stuff with sand or dirt and spreads it on a pond or stream, it will paralyze the fish so that he can scoop them up by hand. Moreover, they'll be just as edible as if hooked on a line.

Most students, of course, don't exactly look forward to a meal of roast sloth, broiled termites, and fern-shoot stew, topped off with wild figs and trumpet fruit. But they do find it distinctly reassuring to realize that the jungle holds substitutes for the corner grocery store and the post exchange.

Even the Far North, they are surprised to discover, can offer a large and remarkably varied larder to a man not too finicky and not too lazy: bats, lizards, newts, frogs, snakes, wood grubs, rock tripe, and the woolly lousewort (page 592). The over-rich liver of the polar bear, they soon gather, is better left alone; but lemmings can be tackled with some profit.

Stead's instructors naturally encounter some resistance among airmen to the idea of lunching off lichens, seaweed, and carrageen moss. But they maintain stoutly that these humble items aren't bad. They also speak well of dandelions, sea cucumbers, and mussels, though not of blue, or black, mussels, which can be poisonous during the summer in some areas.

On the subject of fish the instructors find it easier to convince the airman that he can survive with some pleasure in the Far North. They remind him that he can eat salt-water fish raw; the fresh-water ones (which may contain parasites) he had better cook (page 594). And if he manages to catch some Arctic inconnu he can consider himself blessed with a gourmet's delicacy.

Admittedly, it's not easy for a student airman at Stead to switch his mind from survival on ice and tundra to survival in the desert. Yet he's ready to concede that intercontinental bombers in a global war may traverse both types of terrain in a single day and that he may have to come down on either. He also recognizes that deserts cover nearly one-fifth of the earth's land surface.

It's enough to make any pilot's mouth dry just to listen to the facts about water and desert survival. At temperatures above 90° F., his instructors inform him, dehydration of 15 percent can prove fatal; the body needs from two to three times as much water in the desert as in the jungle—at least three to four quarts a day. If a man can't get it, he'll probably die.

But if he does have water, he can make it last longer and carry him farther by "rationing his sweat"—deflecting the sun with light clothing, traveling by night if at all, living in slow motion.

If he stays close to his plane, sets up signal devices (brush and oil beacons, mirrors, flares), and spreads out parachute panels, he can maximize his chances of being picked up (page 591). As long as he has stowed enough food and water on board, he'll be safe.

In short, the instructors point out, the time to lick the desert is before you take off.

On the afternoon of their third day at Stead student crews turn from the theory of survival in varied climes and tackle thorny reality in the near-by hills.

First they draw the supplies they need in addition to their E-1 kits: first-aid boxes, parachute panels, 10 bars of pemmican (dried meat), 3 pounds of fresh beef, and 3 pounds of root vegetables. The food won't be enough to get them through the trek in comfort, but it will tide them over until they learn to live off the land.

They Take to the Hills

At 9 p. m. they take off in a convoy of six-by-sixes. For 50 miles the trucks follow the highway from Reno. Then, at Honey Lake, California, they turn to the left and begin to climb switchback roads that lead steeply through ponderosa pine to an area of razor-backed ridges and narrow upland meadows.

Here the airmen will carry out a tactical exercise which for some will prove a lark, for others an ordeal, and for all a test. Simulating a jump over remote and rugged terrain, they will "bail out" of their trucks by crews, head into the tall timber, and for the next 10 days work their way cautiously across the training area to pickup points on the eastern side. They carry maps and radios. For more precise coordinates and new directions they must contact the base by radio each night.

South of Crocker Mountain the convoy cuts west to the Grizzly Valley road. Stakes indicating bail-out stations appear every four-tenths of a mile. As each crew nears its marker, its truck slows down for a moment, and in pitch darkness the men tumble out and make themselves scarce.

At this point many a crew makes its first and worst errors. Traveling through broken country at night is difficult enough even for trained men. For flyers quite out of their element it can be anything from a farce to a nightmare.

In charge of each crew is its aircraft commander (A/C). A regular Stead instructor accompanies him; but the instructor's mission is primarily to observe, to listen, to teach by correcting mistakes, and to appraise the A/C's talent for leadership and the individual crew member's capacity to survive.

If an airman suffers a serious injury, or the A/C gives an order dangerous to the whole group, the instructor can interfere; otherwise he allows his crew to determine its own course of action, right or wrong. This kind of teaching sticks with the students.

Packing Through the High Sierras

It often happens, then, that the A/C will bail out with his bunch, look at his compass, mutter "Follow me, men!" and vanish into the scrub. He gives no instructions on trail discipline and night signals, doesn't check his contour map, doesn't arrange a rendezvous point for the first camp.

Result: his crew strings out behind him like a kindergarten class at a museum, contact is lost, and before he has gone half a mile he's short two or three men. Sometimes the instructor will round up the strays for him; sometimes he will just trail them, satisfy himself that they're getting along all right, and leave it up to the A/C to reunite his crew, if he can, and continue the trek.

For the purposes of this exercise, the A/C and his men must assume that the territory they're traversing is enemy-held. This means concealment, camouflage, caution. It means keeping to the woods and keeping off the logging roads that crisscross the area. It means few fires and small ones. It means sentries at camp and scouts on the trail.

Crews hopping off from Grizzly Valley road usually make no more than a mile before they bed down. They're up at dawn, however, to push deeper into the mountains and pitch a real camp.

Some A/C's take it slow and easy on that first day's trek. Others feel they must set some kind of cross-country record; as a consequence, by nightfall half their men may be nursing blistered feet or twanging tendons.

Next day, if the A/C feels he's hit upon a sufficiently remote and well-hidden camp site, he may set his men to smoking the beef they've brought. Using parachute panels, they build and cover a tepee of saplings (page 576), erect a rack inside, three or four feet off the ground, place the meat on it in strips, and light a slow smudge fire of green wood underneath.

A few hours' smoking preserves the meat for a week or more, even in summer. If the smoke makes too obvious a beacon, the instructor will probably suggest that they do their curing by night.

For some crews the strongest incentive to living off the land is the pemmican they carry. Actually, this dried beef-and-pork preparation, which comes in aluminum-wrapped chunks, can be made very palatable if boiled long enough and supplemented with a vegetable or two, some greens, or, if a man is lucky enough to have it, a pinch of chili powder.

But many airmen, unimpressed by the pemmican's high protein content and persuaded that "a guy just can't stomach that greasy stuff," would rather forage for something else.

Before their trek is over, they are likely to have become pretty fair scroungers. They learn to make gill nets from their chute cords and set them at strategic bottlenecks in the creeks that fan out over the training area (page 594). Some discover the chilly art of stirring up the mud of beaver ponds with their feet and, with bare hands, catching trout as they are blinded by the muddy water.

Stead's training area contains few rabbits, but ground squirrels, ground hogs, chipmunks, and porcupines abound. The airmen make snares from ripcord wires, whittle figure-4 deadfalls, set baited traps, and then, with vast pride, skin and cook their prizes (pages 570 and 578).

Porcupine in a Parachute—a Poor Dish

Appetite, of course, is the best sauce. Sometimes, however, even appetite balks at its task. One crew treed and killed a porcupine which weighed, after skinning and dressing, a good 15 pounds. Following instructions, they wrapped it in parachute cloth, soaked it overnight, and roasted it.

Unfortunately, it turned out that their chute had been warehoused in naphtha flakes. The flavor it imparted to the porcupine had to be tasted to be believed.

Even airmen with considerable camping experience can pick up many pointers from their instructor as the days go on, and remind themselves of much that they have forgotten.

They learn to avoid trichinosis by cutting doubtful meat into bite-sized pieces and cooking it thoroughly; to treat frostbite by thawing or warming the affected areas rather than by applying snow or ice; to lay out shadow signals for rescue planes in snow-covered terrain by digging trenches, lining them with spruce boughs, and piling snow highest on the south side of the letters (pages 591 and 602). They

Kodachrome by National Geographic Photographer Volkmar Wentzel

Capt. Willie Knutsen, an Experienced Arctic Explorer, Instructs a Survival Class

Few if any downed flyers would have ready-made snowshoes and tents in their survival kits. From teachers like Knutsen they learn how to improvise. One diagram explains shelters and traps; another takes aim on a rabbit.

General LeMay Inspects SAC's Survival Kit

Around the clock, all over the world, some plane of the Strategic Air Command is usually droning above a part of the globe's most inhospitable terrain.

To give crew members a fighting chance if they are forced down in remote areas, SAC trains each man in the use of emergency bail-out equipment, such as the E-1 Survival Kit.

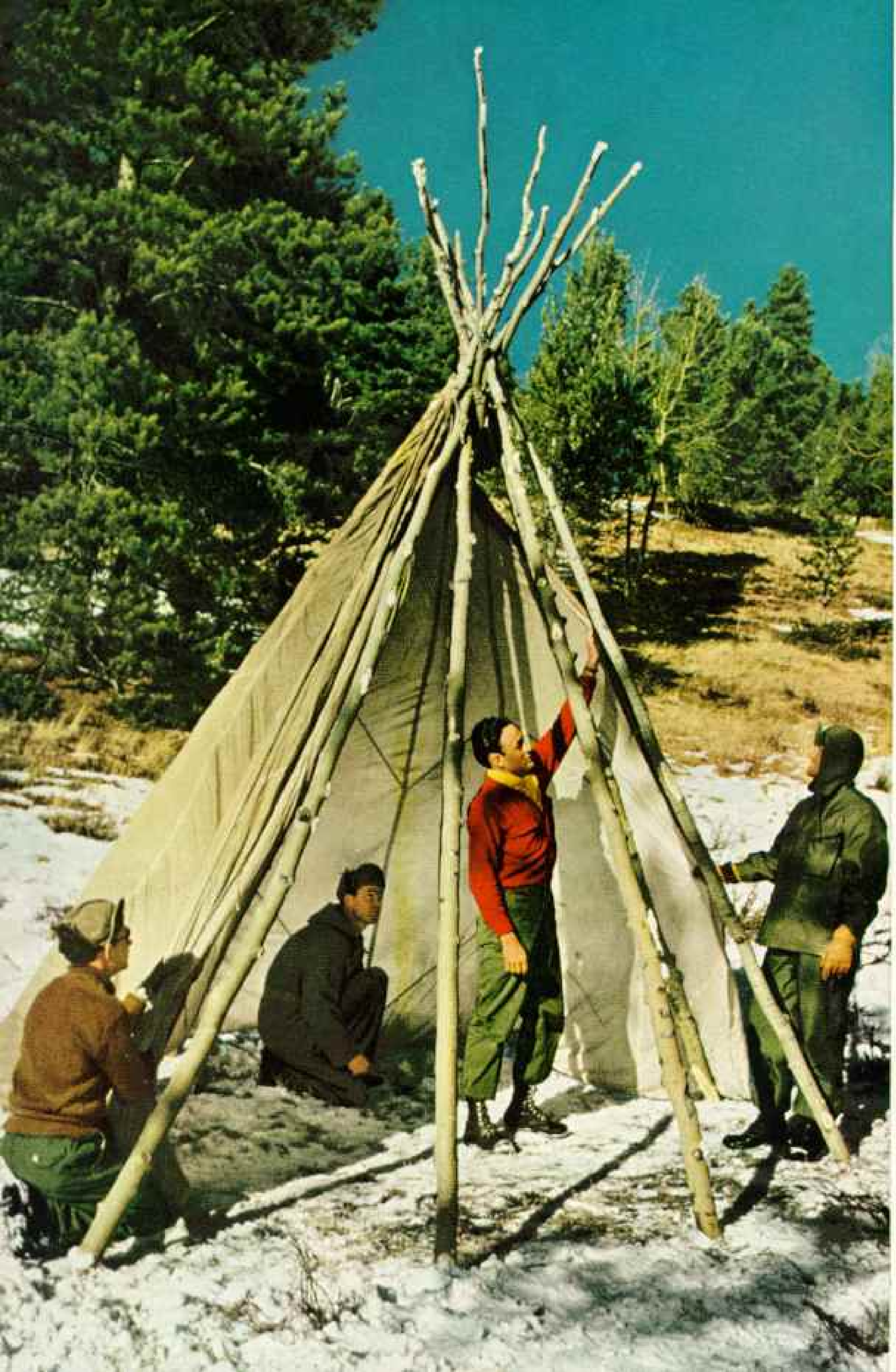
E-1's rucksack, which can be snapped onto a flyer's parachute harness, contains almost everything he needs in any area or climate. Its field-tested items, many of them vacuum-packed, include sleeping bag, radio, snares, fishing tackle, hatchet, hunting knife, compass, extra socks, mosquito net, five days' concentrated rations, and a 3½-pound folding-stock .22-caliber rifle (page 580). The entire outfit weighs only 42 pounds.

Here at Offutt Air Force Base, 10 miles south of Omaha, Nebraska, the author examines the parka and fleece-lined flying boots of a new-type waterproof survival suit (page 595) and a fur-collar cold-weather jacket. General LeMay originated the kit.

Parachute Students at Camp Carson, Colorado, Learn to Keep the Wind from Rolling Them Like Tumbleweeds

Strong ground breezes can bruise flesh and break limbs. To spill air from chutes, men run to leeward, or lie prone and pull in the bottom risers.

Kodachrome by National Geographic Photographer Volkmar Wentzel



This Springy Bed Requires Only Trees and Hatchet

Balsam boughs do not a box-spring mattress make, but they're a lot softer and drier than bare ground. These students, training near Colorado Springs, Colorado, use sprigs 8 to 10 inches long and lay them like shingles.

A Wooden Tureen Boils Without Fire

Hollowed from a log, the airman's watched pot is heated with hot stones dropped into the water. Some savages, lacking metal pots, use the same trick.

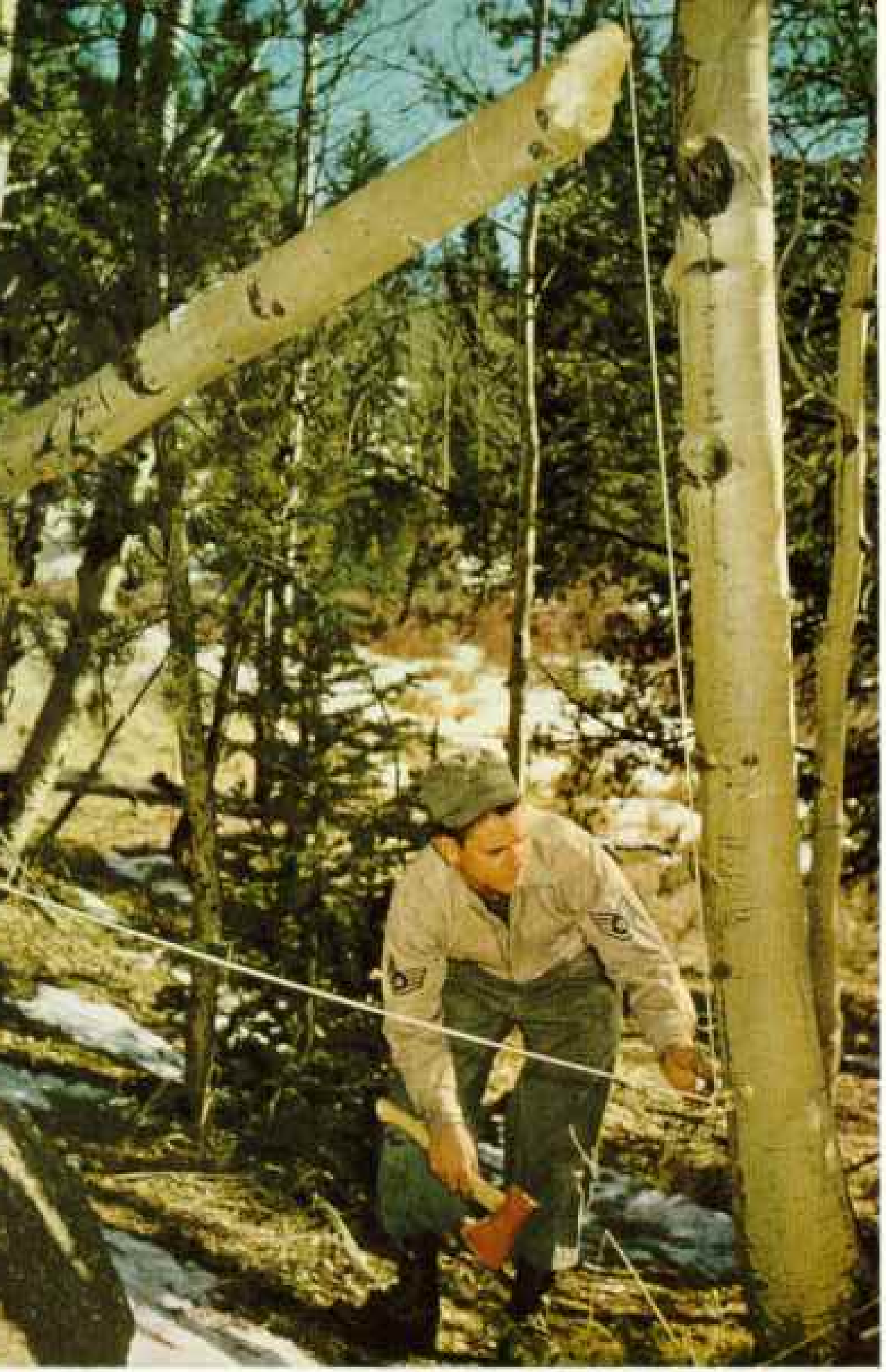
14 Panels of Parachute Will Cover a Paratepee

Three men can sleep comfortably in this tent. Wing poles, not yet added, will hold open a chimney flap, allowing tentmates to build a fire without smoking themselves out.

Poles cut from the wilderness are tied with parachute shroud lines. The tepee's steep pitch easily sheds water, and the entrance is set in the lee of the prevailing winds.

The Air Force considers its paratepee, adapted from those built by the Plains Indians, the most efficient shelter yet devised for northern use.

Kodachromes by National Geographic Photographer Volkmar Wentzel



Snares and Deadfalls Offer Food to Those Able to Make Them

Because a flyer may have to jump without a gun, or may come down in enemy territory, he is trained to obtain game the silent way—by snares and deadfalls.

Most traps operate on two simple principles: pull up or knock down.

← One knock-down type taught at SAC's advanced school is the three-pin trigger deadfall. When an animal runs into the trip line set across a game trail, the delicate trigger slips free and the heavy log falls with crushing force. Here the sergeant adjusts the trigger.

This device may be rigged with a snare instead of a deadfall. Then the log is used as a counterweight to hoist the animal high.

→ Ojibway Indians inspired the bird snare (top), but a parachute spring provides the tension. The balanced twig, baited with food, serves as a trigger. Any hungry bird alighting on the stick releases the dangling noose strings, which instantly snap tight and imprison its feet.

A figure-4 deadfall (below) offers bait and sudden death to rabbits and ground squirrels. The slightest jar triggers the supporting sticks and drops the heavy flat rock.

One Deer Like This Could Keep a Crew Alive for Weeks

Some city-bred flyers reporting to SAC's survival school at Stead Air Force Base near Reno, Nevada, never saw a live cow face to face, much less a deer.

Hunting is forbidden in the training area. Notwithstanding, airmen must learn to stalk, snare, butcher, and preserve game.

Veteran woodsmen who serve as instructors remind students of certain labor-saving principles practiced by Indians. "Move your camp to your kill," they advise, "and not vice versa. If you must transport the carcass, first reduce its weight by eating heart, liver, kidneys, skull meat, intestines, and leg-bone marrow. Roll, don't carry, game downhill. On snow or ice, use the pelt of one animal as a sled to drag another."

Once scraped free of fat and stretched between trees, a hide can be green-dried in a day. Spread under a sleeping bag, it makes an ideal insulator.

Amateur skinners laid bare this deer's hindquarters. Now they strip hide from the forelegs. The instructor uses a microphone in describing the operation to his class.

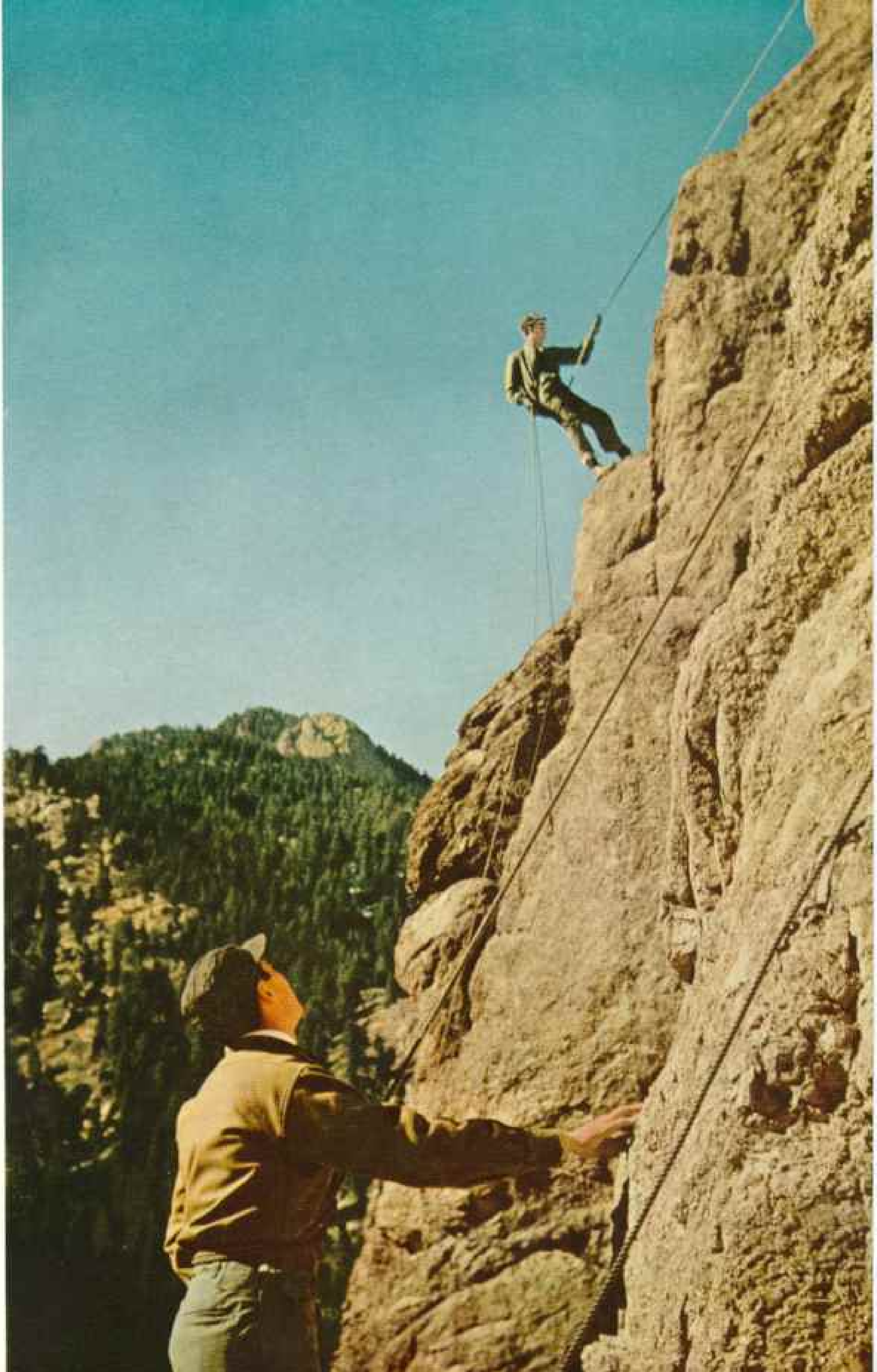
Kodachromes by
National Geographic Photographer
Volkmar Wentzel

↑ This Stretcher Ride in Miniature Looks Like a Thrill to Be Avoided

Parachute lines can be woven into 75-foot, four-strand ropes with a tensile strength of 7,000 pounds. Using such ropes, survival students learn to lower wounded companions from mountains—first on models, then on cliffs.

↓ Of All This Emergency Gear, Extra Socks May Prove Most Vital

A touch of frostbite quickly teaches the trainee the value of keeping feet dry. Airman holds Hornet rifle. → Rappeling down a cliff, the student uses his line as a friction brake, passing it between legs, around hip, across chest, and up over shoulder.



"Hey! Here We Are!" Survival Trainees Signal to a Plane

Many a marooned aircrew has danced in jubilation as a rescue ship cruised overhead, only to sink into despair as it passed by.

To avoid such disappointments, SAC airmen learn to rig emergency signals as soon as they land. Tramping out messages in the snow, they lay out letter trenches north and south so that shadows stand out in the sun moving east to west.

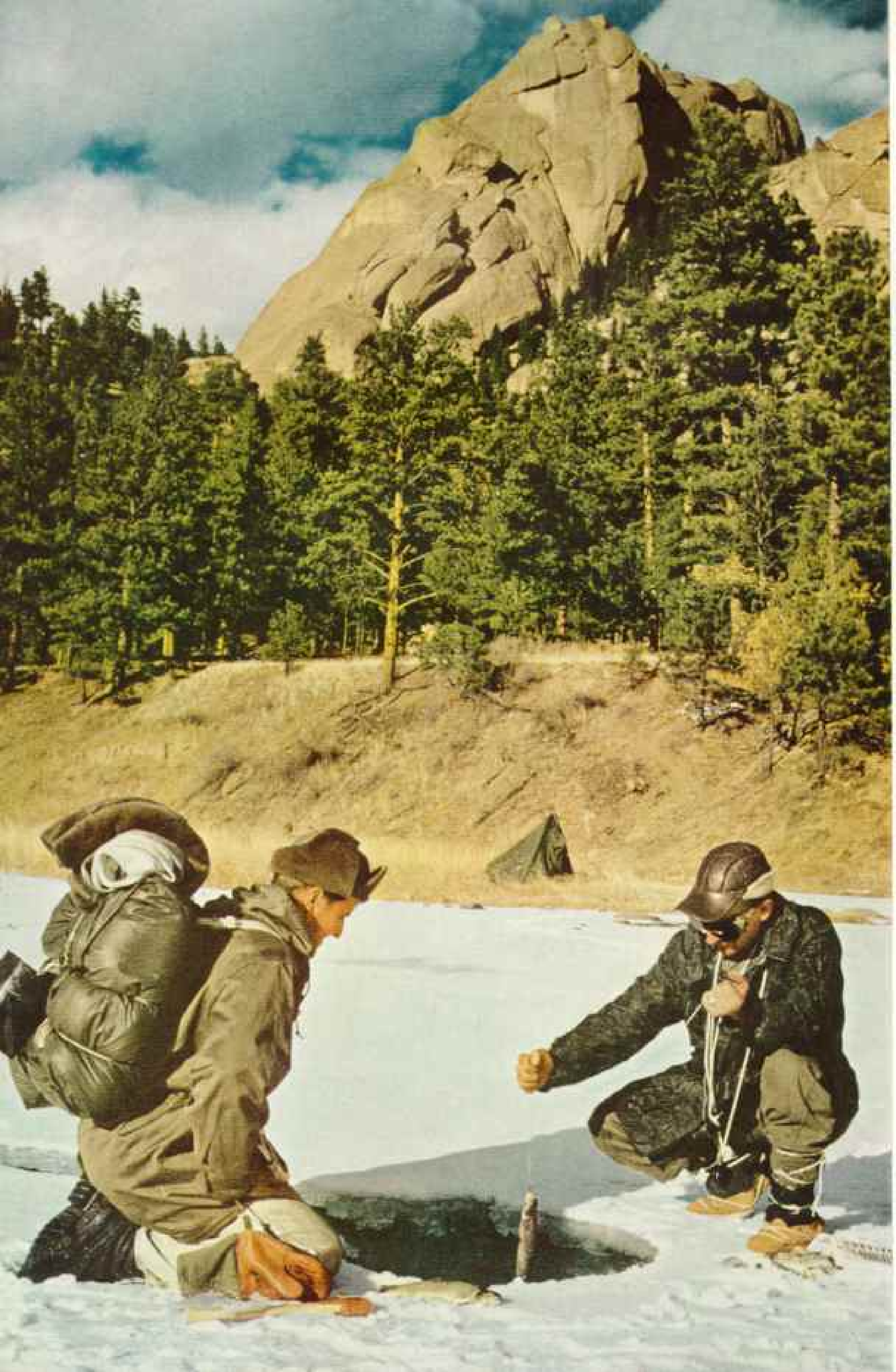
Summertime messages may be spelled out with sod blocks, logs, or rocks (page 591).

Trainees here set off a smoke pot, spread a parachute's brilliant panels, flash a mirror, and wave their arms.

✝ Map or No Map, Someone Is Going to Get Lost

This instructor points out the spot where aircraft commanders will "bail out" from trucks at night for a 10-day trek across a rugged training area in Colorado. Most officers will rely on their aerial navigators to lead them to the rendezvous point on time. And some navigators, out of their natural element, are sure to go astray.


D
C
B
A



are told how to build a shelter from soft, deep snow—tamp the snow evenly with snowshoes and allow it to freeze overnight before cutting into blocks (pages 566 and 587); how to find "Indian kerosene" in dead pitch-filled evergreen branches.

A damp sleeping bag can be dried in winter without a fire, they learn—let it freeze stiff outside the tent, then knock off the frost and ice crystals with a stick.

To rig a loop set, the men are instructed to place the snare on a game trail along a slope or stream so that the weight will fall far enough to hoist the animal out of reach of hijacking predators.

Safety pins, they discover, can be made into guides for a willow fish pole, and a key-type can opener can be set in wood and sharpened into an awl, unwound and given a needle point, flattened into a screw driver, or bent into a fishhook.

Most campers, no matter how experienced, know little about woodland plants as food. They haven't had to find out. Yet, as Stead's instructors point out, the rules, at least for the North Temperate Zone, aren't hard to remember:

> Flowers of all plants are edible either raw or cooked.
>
> Almost all fruits, nuts, and berries are edible (the most common exception is the baneberry).
>
> Leaves and stems of nonpoisonous plants can be eaten raw, or, if too bitter, boiled in several changes of water.
>
> Roots, tubers, shoots, and rootstalks should be roasted, baked, or boiled.

Why Not a Venison Dinner? Too Easy!

With plenty of deer in the training area, some crew member is always sure to ask why he should bother with "rabbit food." Why not venison? The answer, of course, is that it would make survival all too easy, at least until the deer were badly thinned out.

One hindquarter of deer would feed a whole crew for the duration of its trek. They would not only waste the rest of the animal but would never learn to experiment with other food sources.

Though the airmen are not allowed actually to shoot or trap or butcher a deer, they are taught how to go about it (page 579). They practice setting the simple, reliable Apache foot snare; they construct the lethal deadfall with three-pin trigger. They also pick up the essential principles of stalking game: keep off the skyline; keep the wind in your favor; and search the terrain in all directions, preferably with the sort of monocular that comes in the E-1 kit.

Trial hunts reveal that the airmen's chances of stumbling upon game are pretty remote and that they will have to go out and spot it—before they're spotted first. The Hornet rifle they'll ordinarily carry is only .22-caliber; clearly, in order to bring down any sizable animal, they will have to get to fairly close quarters.

Instructors Are Trained Men

These things they learn partly by doing, partly by talking with the instructor. In their 10-day crossing of the area they average about five miles a day; usually it means the pitching of half a dozen different camps. There's plenty of time, between chores or along the trail or around the fire at night, to chew over the day's successes and fiascos and to cross-examine the instructor on survival technique.

That instructor is likely to be a pretty unusual man. Chances are he'll be a noncom, a staff or tech sergeant. Yet he will have had at least two years of college, many years of outdoor experience, and highly specialized training in survival work.

More important, the instructor will possess the poise and judgment necessary to lead, through a grueling trek, a $3,000,000 crew, whose commander may be a lieutenant colonel, subtly indoctrinate them with specific wilderness lore and with a healthy attitude toward stress itself, and, at the same time, coolly appraise the survival efficiency of each crew member from the A/C down. That takes quite a man. SAC is lucky to have found and developed as many as it has.

After handling a score of crews, an instructor at Stead is not easy to surprise. He no longer chokes when he encounters some crew member who has never seen a live cow. He begins to expect that one airman out of every two or three crews will bed down in the middle of a game trail and wake up yelling as the first couple of deer pound down the path and hurdle his sleeping bag.

The instructor even becomes inured to the fact that the crew's navigator will almost certainly manage to get lost. Every crew automatically turns over its navigational problems to its "pro"; and the pro, bereft of the tidy tables and charts that made his flying job so comparatively simple, customarily takes his crew on a scenic tour around Robin Hood's barn. Then some rank amateur of a gunner

Kodachrome by National Geographic Photographer Volkmar Wentzel

A Hole Chopped in the Ice Yields Dinner for Two

Emergency fishing gear packed in a survival kit may be used in tropical or arctic waters, fresh or salt. These SAC trainees from Camp Carson use their kit's lines to jig for fish in the South Platte River.

or a flight engineer takes over, fishes out his Weems plotter and his map, and gets the group back on the right track.

An instructor can be amused by his crew's naivete, but occasional specimens try him sorely. These include the officer who balks at trail discipline and tries to pull his rank on the instructor; the A/C who finds himself befuddled by the unfamiliar problems of mountain survival and trades his leadership for self-pitying apathy; and the airman who discovers when the going gets rough that he is sick and should be evacuated at once.

A frequent complaint of crew members who "want out" is altitude sickness, caused by low oxygen pressure. Like all SAC flyers, they've been thoroughly briefed on the physiology of high flight and the dangers of oxygen deficiency. It's natural enough that when they begin to pant up and down the Sierra Nevada at 6,000 or 7,000 feet, usually a bit hungry, tired, and pack-sore, they should note in themselves persuasive symptoms of mountain sickness.

From then on, unless the instructor or a medical corpsman can snap them out of it, they're likely to become increasingly convinced that the strain is building up, that pressure on the heart is growing, and that they're about to black out.

Shrewd Medics on Duty

Fortunately, the school maintains some roving medics up in the area who are both sympathetic and shrewd. They can spot a malingerer at 50 yards, and they can tend to a real cardiac case with certainty and dispatch.

These medics have one advantage over doctors down at the base: they know from intimate experience what the men are up against, because they live up in the Sierra Nevada most of the time. They know that while a trek in midsummer can be merely a pleasant outing for a good camper, in winter and rough weather it can be quite an ordeal for a tyro.

Hiking under a heavy pack with a pulled tendon can become excruciatingly painful. Fighting through snowdrifts when you're wet, lost, and underfed is not necessarily fun; and drifts in the area can reach 20 to 25 feet.

Rugged days, sleepless nights, below-zero cold, the responsibility for a dozen other men under unfamiliar conditions—these can erode the morale of many an A/C who never had any trouble running his crew before.

SAC's medics and instructors, indeed, tend to be less surprised at the number of men who crack up during the trek than at how many do not. They remember the officer last summer whose soles were simply strips of raw, blistered flesh but who nevertheless led his crew out of the area under full pack.

They remember the airman with severe abdominal pains who was brought almost forcibly up to a medics' post, was diagnosed as having appendicitis, yet insisted on returning to his crew. Only when they drew up a paper for him to sign, absolving them of all responsibility for his death, did he agree to go down out of the hills. He was on the operating table in an hour—and, literally, not a minute too soon.

Some Radios Are Disabled

The tenth and last day of the trek finds most crews camped near the final ridge on the eastern flank of the training area. The majority have been able to maintain nightly radio communication with the base and receive the exact coordinates for their pickup.

A few, however, have damaged their transmitters, dropped their generators in some stream, or discovered that, when their crew split up, the generator carrier went one way and the transmitter man another. Such crews will be picked up anyway, their instructors having been given the rendezvous directions before they started. But the men responsible will be downgraded for an error that, under actual survival conditions, might have cost them their rescue.

To some crews the end of the trek comes as a huge relief, to others as a blow. But all of them, tanned, bristle-bearded, their boots dusty and their fatigues greasy, seem to stride along now with the slouchy assurance of veterans.

Those who hit the last cutover ridge in summer must contend with rattlesnakes basking on the exposed ledges (one crew killed 25 and captured two). Those who meet it in winter must clamber down a 2,500-foot palisade booby-trapped with snowslides. Yet, because they know they are coming down the homestretch, they somehow have a jaunty air.

Know Thyself—and Thy Crew

They have learned how to pace themselves in rugged terrain, how to care for their only means of locomotion, their feet, and how to use the equipment they carry. Most of all, they have learned how to improvise and how to help Nature to help them.

They have learned, too, a lot about each other. They have found that Joe, the bombardier who never had much to say, is the one they can depend on to bring home the bacon or the snared ground hog. They have discovered that Bob, a fine radarman aloft, can get lost on the ground more quickly than any of them. They have come to realize that the Old Man is the kind of guy who can walk

National Geographic Photographer Volkmar Wentzel

Snow Masons Lay a Block in the Wall of an Igloo at Stead Air Force Base

An Eskimo house is surprisingly sturdy. Blocks join together at corners; loose snow fills chinks.

all day on a twisted, swollen ankle and never mention it except as a joke.

Before they went up to the training area, they were asked to tick off the names of fellow crew members with whom they would "feel surest of surviving." On their return they are given the same form to fill out. Scarcely a crew fails to make some changes.

Back at the base they scrub up their kits, turn them in, and put in a little sacktime. They haven't much to worry about now, except their final ratings. The instructors, they know, are busy in their barracks compiling them.

It isn't an easy job. Sometimes, when a real snafu has occurred at the bail-out point, the instructor hasn't even seen some of his charges till they're picked up. More frequently, he'll keep his whole crew together throughout; yet, when he comes to evaluating each member, he'll realize that he had his eye much more on some than others. Again, he'll be tempted to forget that, though one of the crew officers pulled rank on him and made him sore, the man actually did a fair job of survival.

The instructor must rate each individual and each crew on these qualities: leadership, morale under stress, trail discipline, ground navigation, route finding, living off the land,

care and use of clothing and equipment, outdoor craft, health, attitude, physical condition, and parachute evaluation.

Each of these categories, moreover, is broken down into many subheads. Take outdoor craft. The instructor must size up the crew member on selection of camp site, erection of shelters, emergency fire methods, improvising in the field, skill with ax and knife, proper firewood, ropes and knots, and sharpening hand tools.

Or take leadership, the criterion SAC considers most important of all in appraising an A/C. We want to know how well he utilizes his man power. Does he brief his crew? Show resourcefulness? Instill confidence and respect? Exhibit calmness under stress? Take an interest in his crew's welfare and morale? Survey new situations accurately? Plan and organize? Maintain control?

The Commandant Sounds Off

We don't, of course, expect a perfect score from every aircraft commander. But those who fail can look forward to reassignment. Conversely, those crewmen, no matter what their rank, who indicate a marked aptitude for leadership can be sure their initiative will not go unnoticed. The school's evaluations become a permanent part of every airman's record.

The crews get the good—or the not-so-good—news about their ratings in a special critique. There, in the space of an hour and a half to two hours, the head of the training squadron relentlessly reviews their sins as well as their successes.

On rough-hewn log benches the men sit in groups, each crew somehow a little tougher than before, a little more conscious of its own identity. Some of the men are in blue jeans, some wear baseball caps or sombreros. A few proudly finger their week-old whiskers.

The commandant begins in jocular vein.

"Gentlemen," he's likely to say, "I congratulate you. You made it. I know many of you didn't think you would, and some of you didn't care. You didn't ask to be sent here, and it didn't make you any happier when they took away your nice ration and your soft bed and dropped you out in the sticks in the middle of the night and told you to start running.

"Your morale went bump, and you wanted to tell the whole Air Force, 'Okay, gentlemen, you can have your wings and your soldier suit back. I want out.'

"But you kept in there plugging, most of you, and you came through, and you learned something, partly about yourselves and partly about the woods. Perhaps what you learned about yourselves will prove, in the end, to be the more important to your eventual survival.

"This tactical exercise you've completed was tough. At times, I have no doubt, you experienced a flicker or two of fear. But let me remind you that the real thing will be ten times tougher. You may be seriously injured when you ditch or jump. You may be wounded before you ever leave the plane. You may come down in hostile territory with patrols hounding you day and night. Above all, you will have no certainty that you will be rescued in 10 days—or 10 months.

"In short, you will become acquainted with your greatest enemy, not hunger, not climate, not terrain, but fear. Fear can paralyze you into passive acceptance of your fate or it can shock you into panic.

"It will do neither, however, if you remember these principles of survival: face the facts; make a plan; keep busy; and keep trying. In short, your one dependable antidote to anxiety will be purposeful activity."

The commandant pauses. The upturned faces below him are thoughtful enough; some of the crews will be over Korea in a few weeks, practicing, perhaps, what they now hear preached. The speaker turns to his notes.

Outdoor "Surgeons" Operate on Selves

"Before I give you your ratings, let me run over a few points on your woodmanship. You appear to have been an average class. The chief medical officer warned you that the hunting knives you would carry were sharp, and that testing the blade against the left forefinger was not recommended. I observe from your instructors' reports 37 cases of laceration of the left forefinger."

They laugh. Uneasily, one or two put their hands in their pockets.

"As to navigation, you seem to have picked up some of the notions beloved by other classes, such as the belief that the best way to travel due east is to walk along keeping the sun always on your right. Around noontime, I imagine, you found it more than a little difficult.

"Others of you, I hear, felt sure that the shortest distance between two points is always a straight line, regardless of those little contour marks on the map. You fellows who encountered a mountain between your two points may have begun to wonder if Archimedes had ever done much cross-country hiking.

"On camouflage, I note in some cases an excess of artistry over common sense. I am thinking of one particularly touching spectacle I witnessed this week up in the training area. There, walking down the road in broad

Paddlers Abandon a Ditched C-82

To make a training film on living off a northern land, the Air Force sent a 24-man team into one of Alaska's most uncomfortable and weather-vexed sites. Rain falling for 50 days during June and July handicapped the cameramen. Once they shot a crucial scene, only to have the editors order a retake weeks later. By that time frost had browned the lichens, and tracked vehicles had gouged the terrain; so the men resodded the entire area and sprayed it with green paint.

Despite these difficulties, the unit produced *Survival on the Arctic Tundra* as directed. Frames cut from that movie yielded the color illustrations which follow in this series.

A crew towed the C-82's tail section upriver and sank it, realistically canted, atop a sunken raft (page 591).

This simulated crash forced crewmen to put their training into practice on an ice-cold lake. Two rubber life rafts were immediately inflated and launched.

➤ The radio operator, climbing the C-82's tail section, rigs up a radar reflector as a locating device.

Parachute Canopies and Sod Walls Make a Hut, and Willow Branches a Mattress

Their plane off course and out of fuel, these men drifted apart as they parachuted to earth. Now they have reassembled, and their first thought is to prepare shelter for the night. Their survival kit lost, they improvise with a parachute tent strung over low, wind-breaking sod walls.

Separated from his companions, this survivor made a mattress of twigs and rolled up in his parachute. His head net veils him against the north's swarms of hungry mosquitoes (page 596).

Kodachromes from USAF Film

↑ "Went This Way," Says the Arrow. ↓ "Unable to Proceed," the "X" Tells Air Rescuers

Survivors of crashes use every means possible to attract the attention of rescuers. These airmen, downed far from their base at Nome, know they must attract help.

One man rigs a parachute arrow to mark his intended direction of travel; its colors stand out vividly on the monotonous tundra. The other two, deciding to stay where they landed, dig dark trenches and stack blocks of earth to break the prevailing green. A C-82's tail section shines in the lake (page 589).

Airmen Marooned on an Aleutian Island Sample Seabeach Sandwort and Find It Edible

In summer the Far North provides valuable plant foods for men trained to recognize them. Sweet and edible salmonberries (top left) grow abundantly on the tundra. Succulent seabeach sandwort (right) makes an antiscurvy salad.

Bottom panel: Leaves of the arctic dock (left) may be eaten raw or boiled; Eskimos like the root, too. Petrusky (right) is favored by Aleuts, who use its pithy stem, dry and pulverized, to season winter food.

593

Kodachromes from USAF Film

"Gone to Earth!" But Not for Long. Airmen Dispossess a Red Fox

If they had carried guns, these lost airmen might have bagged ducks, loons, gulls, or ptarmigan, but they had to settle for a fox, whose burrow they discovered in the Alaskan tundra. They sealed all but one exit to the den, set a snare above it, and funneled smoke into the hole.

Fleeing, the animal ran into noose and forked stick (below left) and the carving knife (right). Tough and gamy, its flesh nevertheless satisfied gnawing appetites to a certain degree.

↑ **Some Places Forbid Gill Netting, but the Arctic Knows No Law Save Survival**

Waters in the Far North are well-stocked. Some fish (like the inconnu) taste best raw and frozen. Others, such as arctic char, salmon, pike, and trout, prove better cooked. Survivors pressed with other tasks can set nets across narrow stretches and let struggling fish entangle themselves by the gills. Nets of a much finer weave protect the fishermen's heads from mosquitoes.

↓ Cooks coat the fish with clay and grass and lay them on coals. Diners, breaking off the hard shell half an hour later, find the flesh has lost none of its natural juices.

Flyers Learn How to Stay Dry in Water

Men who bail out over the tundra must often travel miles to rendezvous with one another. At times they have to wade or swim across lakes that rarely grow warmer than 40° F., even in midsummer.

To guard its men against long exposure to frigid water, the Air Force developed a rubber suit for wear over clothing and pack (page 574).

This airman, having swum across a pond, emerged warm and dry. Now he folds his yellow suit and attaches it to a towline, the other end of which he left in the hands of a friend stranded on the far shore.

Wearing the survival suit, the remaining flyer clambers out of the shallows. His companions assist him with a tug on the cord.

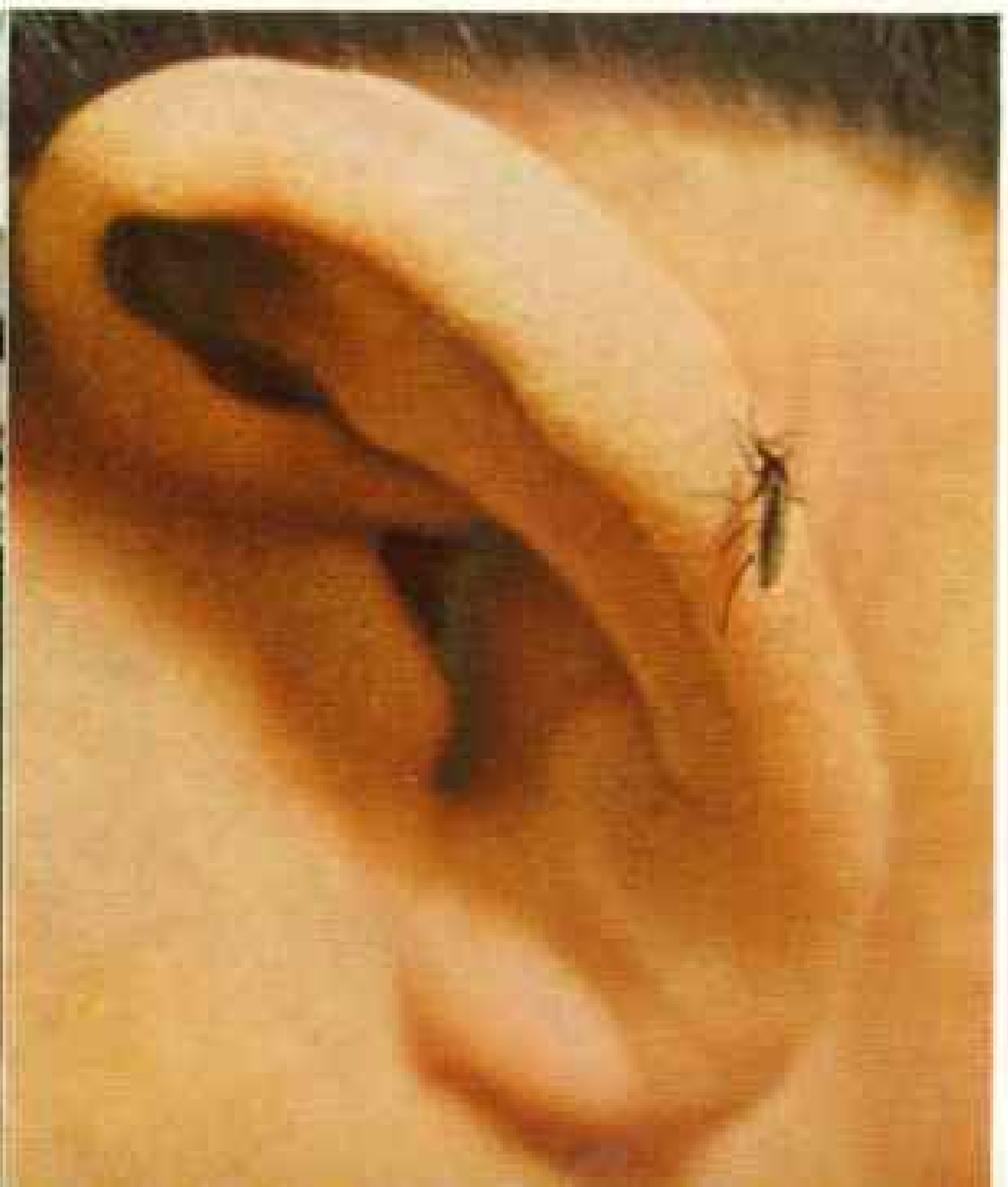
Kodachromes from USAF Film

^ They Also Serve Who Only Sit in Camp

Injuries are likely on any bail out. But the wounded can make themselves useful by improvising such implements as slingshots from willow forks and elastic pins of a chute pack; awls, needles, and fishhooks from key-type can openers, and fish-spear prongs from parachute locking pins.

⸸ Tundra Mosquitoes Carry Spears

One man lost in the Alaskan wilds declared, "The only way Nature could increase the mosquitoes in a cubic yard of tundra air would be to make them smaller." Beards helped, and head nets (left) were indispensable, but no one was completely free of bites. Bare ears made inviting landing fields.



Ptommy Ptarmigan Escaped Execution

This crew, stranded in the Aleutians, planned to make a meal of the captive bird. But Ptommy became such a camp pet that no one dared harm him.

Ptarmigan, whose flesh resembles that of pheasants, are easily panicked by too stealthy or too bold an approach. A slinger's best method is to remain erect and walk around a covey in narrowing circles until he comes within effective range.

➔ One of Ptommy's cousins sizzles on the spit next to a mess of tender coltsfoot leaves freshly boiled in a fishing-kit can.

Kodachromes from USAF Files

One Ptarmigan in the Net Is Worth Ten in the Willow Bush

Two kinds of ptarmigan—rock and willow—are found in the northern wilderness. "Rockers" live on glaciers and above timber line and usually feed in small groups. Willow ptarmigan in fall and winter sometimes congregate in coveys of a thousand or more along sand bars. They can be snared with loops of fine wire or thread strung along bird trails.

Here an "injured" pilot (above) weaves a net of nylon thread obtained from parachute shroud lines. Other airmen (below) trap a ptarmigan with a gill net staked across a run.

Catching Crabs by Radar in the Aleutians

▲ Baited with a small fish, a radar reflector becomes a trap for a Pacific edible crab (below).

An airman lowers the trap by parachute line into a pool at the foot of a cliff. A lucky catch might weigh several pounds.

The reflector's primary purpose is to turn back the radar beams of a search plane, enabling rescuers to locate lost parties hidden from sight on tundra, desert, mountains, or sea.

Kodachromes from USAF Film

Kodachromes from USAF Film

In Rescue, All's Well That Ends Well. A Helicopter Begins Evacuation from the Tundra

Competent airmen often prove bewildered tenderfeet when dropped into the wilds. Prime objective of SAC's school is to replace vague fears with hard facts and to buttress the flyer's will to live.

Wilderness-tested survivors know their most exultant moment when the smoke signals go up and the rescue plane dips its wings in answer.

daylight, was a beautiful little Christmas tree —in GI boots."

Turning to a blackboard behind him, the commandant pins up a large chart; on it is a graph outlining the combined scores of all crews in the present class. Then his assistants hand out the individual and group ratings to the crews themselves.

They are, as the commandant has intimated, a pretty average bunch. Very few of them have failed the course; very few of them, too, have made a top score. Perhaps more significant than their marks, however, are the statistics indicating their growth in confidence. When they arrived, nearly a fifth rated themselves as "inadequate for individual and group survival." Now, at the end of the course, that ratio has shrunk to a handful.

Course Pays Off in Combat

The newly gained assurance which these crews manifest isn't misplaced, either, according to intelligence reports from Korea. About a third of SAC's crews have now gone through the course at Camp Carson or at Stead, plus trainees from other commands; and many of these crews have flown out to the Far East for a tour of battle duty.

Though bomber losses in Korea have been relatively light, and no definite conclusions are available, a significant number of fighter and fighter-bomber pilots have come down in enemy territory and have brought their SAC schooling into play.

Their comments on reaching our lines have furnished eloquent testimonials to their training.

"The stuff they taught me at SAC sure pulled me through," declared one. Said another: "It was rugged, but I never felt helpless. I knew what to do, and I did it, and I just never left myself time to get scared." A third asserted: "I remembered what I'd learned at Stead, and I kept cool, kept going—and kept my socks dry."

One of the most telling examples of what even a smattering of survival knowledge can do for a downed crew is the experience of the "Goose Bay Gang."

This contingent consisted of a B-50 bomber crew and passengers flying back to Tucson in September, 1950, from a field at Goose Bay, Labrador (map, page 569). They were about 110 miles due west of Goose Bay when three of their engines failed. They jumped.

It was an exceptionally good jump. All 16 men left the plane from about 1,700 feet at around 10 p. m., the pilot last. They came down in the spruce scrub and marshes within an area no more than four miles in diameter.

As they stowed their chutes and rendezvoused, they found that with the exception of one man who had broken his leg everyone was in condition to walk.

The aircraft commander was a young first lieutenant, Jack Thompson. He was well outranked by several of his passengers, but he accepted his responsibility for leadership unhesitatingly and made it stick. He and his crew had completed elementary survival training at their home base, and he had asked for and received a two-hour briefing at Goose Bay on living off the land in the Far North.

Taking a rapid inventory, Thompson discovered that no one had been able to bring down any emergency equipment. Two men had .45's; each man had his parachute. That was all. The radio in the plane had failed at the same time as the engines, so that the operator had had no chance to send an SOS. They were lost, and there was no telling when, if ever, they would be picked up.

Thompson didn't give them time to sit around and brood. He put several of the men to work pitching paratepees; others he detailed to gathering spruce boughs for flooring; still others he sent to forage for food and firewood. The injured man he placed in the first tent that went up, with a rough splint on his leg and a 24-hour guard to look after him.

The food detail reported no big game but plenty of cranberries and blueberries still edible beneath the light frosting of snow. One man shot a small bird. Scouts reported a river only a few hundred yards away.

Next morning, with the group's most immediate needs having been met, Thompson had a detachment begin construction of a raft. The men had no axes or hatchets, but they pushed over dead spruce trunks and rolled them down to the river. There they lashed them together with ropes made from their chute shrouds. Another unit hacked out a signal in a clear, snowy space: "16—OK," while others laid smoke beacons of crisscrossed branches (page 602).

Needle in a Northern Haystack

For three days Thompson's crew waited and worked. It was no picnic. One man found he had fractured his ankle on the jump; another that he had chipped a bone in his foot. Neither of them wanted to fold up, but both were pretty well hobbled. As for the others, they tried to do what Thompson asked—forget their long-range prospects of surviving a Labrador winter and concentrate on doing a job.

Meanwhile, a joint U. S. and Royal Canadian Air Force hunt had been in progress for 72 hours, searching the missing B-50's route, map square by map square. The hunters had

U. S. Air Force, Official, Capt. George O. Hambrick

Airmen Stranded in the Labrador Wilderness Signal "16 OK" to a Rescue Helicopter

On September 21, 1950, 16 flyers parachuted from a disabled bomber 110 miles west of Goose Bay, Labrador (page 601). Employing survival training, they built shelters, lit signal fires, and scratched a message in snow. Canadian airmen found them on the 24th; the next day helicopter pilot Hambrick, who made the photograph, removed them. A smudge fire, indicating wind direction to the pilot, smolders near paratepees.

not been too hopeful. They had no idea when the plane had gone down or whether it had been on its flight plan at all. And bad weather, closing off all reconnaissance, could be expected any day.

Suddenly, on Sunday afternoon, a radio message came in from a Canadian search plane: smoke signals had been sighted. At once a pararescue team was dispatched. Over the target three survival experts plummeted into space and chuted down to Thompson's men. Medical supplies, food, and other equipment followed.

Helicopter Aids in Rescue

Next day a helicopter began shuttling the men to a lake 12 miles away, where a pair of amphibians picked them up and flew them back to base.

What did all this prove? Not that Thompson or his men had become accomplished outdoorsmen. Matter of fact, they had made many mistakes or omissions, not the least of which was their inexplicable failure to fish and to set gill nets. The river they were about to embark on with their raft ran in the wrong direction; it would have taken them even farther from civilization.

But Thompson, whose indoctrination in survival had been limited to base-level training and a two-hour checkout at Goose Bay, showed that the essential principles can be quickly grasped and that their adoption can mean the difference between productive discipline and group collapse. He kept the energy and imagination of his crew focused upon purposeful, practical activity. He left no doubt where the leadership was vested, yet he made it plain, too, that the full cooperation of each was vital to the success of all.

With more training Thompson and his men could have done better. But they gave solid evidence of how far even a little knowledge can take a bunch of novices and of how much we can expect from the really well-schooled flyers we are now graduating each fortnight from Stead.

Other accounts in the NATIONAL GEOGRAPHIC MAGAZINE of survival training and experience include "We Survive on a Pacific Atoll," by John and Frank Craighead, January, 1948; and "They Survived at Sea," by Lt. Comdr. Samuel F. Harby, May, 1945.

American Wild Flower Odyssey

A Lifetime's Search Covers Deserts, Mountains, and Lowlands; Prizes Range from Maine Orchids to Texas Cacti

By P. L. Ricker

President, The Wild Flower Preservation Society

With 28 Color Illustrations by the Author

DURING the past 60 years I have traveled some 150,000 miles to study and photograph wild flowers in almost all parts of the United States.

This lifelong interest in a form of Nature almost infinite in its beauty has taken me by boat, canoe, buckboard, automobile, train, and on foot to cold and storm-swept mountain summits, barren deserts, sinister swamps, lush meadows, and woodlands.

In all these places, and many more, wild flowers display in season their amazing variety of color and form. All year round, through cycles of growth and rest, they demonstrate Nature's almost unbelievable adaptability to environment.

A fossil fern, displayed in a piece of rock on my Maine grandmother's parlor whatnot, first aroused my interest in Nature. As a small boy of 7, I was forbidden to touch it. No one could tell me about it, so I borrowed a book on fossil plants from the public library. It proved so fascinating that botany in general and wild flowers in particular have served me as a lifelong profession and hobby.

Flower Hunting Often Exciting

Tracking down a "lost" or elusive wild flower is as exciting to the botanist as a search for wary game is to a hunter.

A case in point is the box huckleberry. It was originally found in Virginia between 1800 and 1805 by three botanists, but after they died the locality was lost. In 1845 it was found in New Jersey. In 1921, more than 100 years after its Virginia locale was lost, the Reverend Fred W. Gray, an amateur botanist, observed the plant near Dorr, West Virginia, not far from the Virginia border. He learned that locally it was known as juniper berry, and in a few weeks, through newspaper advertising and correspondence, discovered more than 75 localities of the plant.

Later I searched for box huckleberry with friends along a stream between Annapolis and Baltimore, Maryland. Finally, after two days of hunting through thick stands of mountain laurel, we found it. The exact location must remain a secret, for the plant is much sought as a decorative shrub, and this small stand might be destroyed.

Another kind of adventure sometimes accompanies the search for wild flowers. Nearly 50 years ago a friend and I were studying plants and wild flowers in the Okefinokee Swamp in southeast Georgia. Poisonous water moccasins were so thick that our guide, wearing heavy knee-high boots, walked ahead, killing snakes with a machete.

Once, as we pulled our boat ashore, the guide reached toward a hole in a cypress stump. At the same moment I saw something move within the cavity. Quickly I emptied my revolver into the hole, and a fatally wounded moccasin slowly emerged.

Another time, while I was botanizing with friends in the woods of western Pennsylvania, a member of the party bent down to pluck a May apple. Suddenly he straightened up, yelled, and fled down the trail. A big rattlesnake was coiled completely around the stem of the flower!

When an angry bull objected to my photographing a large field of several kinds of wild flowers near Bozeman, Montana, I had to toss my camera hastily into a thicket and make for a handy tree.

In general, however, the pursuit of wild flowers is infinitely less dangerous to man than are man's activities to wild flowers.

As Nation Grows, Flowers Vanish

The spread of civilization across North America rapidly destroyed the flowers that once were abundant. Some species even may have become extinct. A century ago railroad surveyors and early settlers on the Great Plains reported vast stands of colorful wild flowers covering the land for miles. Today most of these species are rare.

Saving America's wild flowers from destruction and promoting enjoyment of their beauty are the principal objectives of the Wild Flower Preservation Society.*

To help inform travelers of the most interesting and colorful flowers to be found in

* Leaflets listing wild flowers that need protection and suggesting how to establish wild-flower preserves and transplant flowers to preserves from areas that are to be cleared may be obtained by sending 20 cents in coin (not stamps) to the Wild Flower Preservation Society, 3740 Oliver Street, N. W., Washington 15, D. C.

604 Lois Marden, National Geographic Staff

different sections, I and various companions have toured most of the country during several recent summers, both to see the flowers at first hand and to record their beauty in color photographs.

200 Species Described

Space permits the mention or brief description of only about 200 of the some 25,000 species of wild flowers found in the United States. Merely to list the names of all the species would take more text space than is available in an entire issue of the NATIONAL GEOGRAPHIC.

In this article I have endeavored to include those flowers that are most representative, interesting, and colorful, together with a few of the more familiar flowering trees and shrubs. They are mentioned as a rule only by their most used common names. Scientific names may be found readily by those who so desire in any good regional reference work on wild flowers.

To photograph wild flowers, I use a single-lens reflex camera and an exposure of about one tenth of a second, at F-8 to F-24, to insure good depth of field and to show the natural habitat and associated plants. Supplementary lenses provide magnification when needed.

Our odyssey began at Acadia National Park in Maine. Climbing up through the wooded areas on the sides of Cadillac Mountain one fine June day, we were appropriately greeted first by the dwarf cornel, or bunchberry, with its showy, white leaflike bracts surrounding the tiny, less conspicuous, greenish-purple or violet true flowers (opposite page).

Near by spread carpets of white false lily of the valley, or Canada mayflower, found in

← Mount Desert Island, Maine: Start of the Wild-flower Odyssey

The author found false lily of the valley and bunchberry (illustrated at right) in woods cloaking Cadillac Mountain before Mount Desert Island's disastrous forest fire. These girls pick blueberries on Cadillac's denuded slope. Bar Harbor, a fashionable resort town, looks out on Bar Island (left) and three of the isles called the Porcupines.

➤ White blossoms of false lily of the valley (above) form dense carpets in moist woods and thickets from Labrador south to North Carolina and west to North Dakota. The plants rise two to six inches.

Bunchberry, or dwarf cornel (below), has showy white bracts, or specialized leaves, which have the appearance of blossoms but not their function. They surround the inconspicuous true flowers, which are greenish purple or violet. The bracts attract pollenizing insects. Bright-red berries will replace the flowers.

Bunchberry, a member of the dogwood family, ranges from Newfoundland south to West Virginia and west to California and Alaska.

Elliot P. Porter

moist woods and thickets from Labrador to North Carolina. Here and there, too, we saw the pink or white flowers of bird-on-the-wing, so named because the central crest of the blossom, flanked by two winglike petals, somewhat resembles a flying bird.

Around the foot of Cadillac we saw a few of the magenta flowers of rare rhodora, a shrub growing one to three feet high, which blooms in May and June and ranges from Newfoundland and Quebec south to Pennsylvania.

A Plant That Catches Insects

Pitcher plants in a near-by bog were occasionally catching unwary insects (page 625). The prostrate pitcher-shaped leaves are partly filled with rain water, and a digestive material is added by glands in the leaves.

Attracted by the red-mottled leaf tips and the nectar the plant secretes there, insects crawl down into the pitcher, but are prevented from escaping by stiff reflexed hairs lining the throat. They soon fall into the liquid and drown, and the leaf absorbs the extract of the softer parts of their bodies.

Insect food is believed to provide the plants with nitrogen, which otherwise would be lacking in their nourishment.

Along the gravelly shore of Mount Desert Island, careful search revealed the beach pea with its stalks of handsome purple flowers. Near by was a three-foot mat of fleshy, bluish leaves of sea lungwort with a few stems of light-blue, bell-shaped flowers.

Orchids are not associated in many people's minds with the State of Maine; yet these delicate flowers abound in the bogs and drier wooded areas around Caribou. I was guided on an orchid quest there by the

Ted Rall, N. Y. Herald Tribune

Flowering Dogwood Brightens the Spring Landscape from Maine to Texas

For sheer beauty, these white flowers are rivaled by the plant's red autumn foliage. Virginia and North Carolina make dogwood their State flower; Connecticut gave us this display.

late Olof O. Nylander, a Swedish naturalist. Mr. Nylander, then 80, and I had corresponded 50 years earlier, when I was a student botanist.

Most beautiful of all the orchids we found was the small round-leaved orchis, with its spikes of two to nine slightly rosy flowers about half an inch long and a white lip dotted with purple. Near by grew green and white adder's-mouth and four species of white, green, and greenish-yellow fringed orchids.

Arctic Plants on Mount Katahdin

In a bog and in damp woods near Fort Fairfield we found two species of twayblade, one with greenish-yellow and the other with brownish-purple flowers. Thickets on "Quoggy Jo Mountain" were the hiding place of the spotted coralroot, named for the resemblance of its root to the shape of coral. We also found its yellowish unspotted relative.

It is a far cry from lowland orchids to the dwarfed and hardy alpine plants that survive the freezing gales and deep snows of Maine's mile-high Mount Katahdin, which rears its granite cliffs dramatically above the nearly level surrounding country.

Here live plants that were arctic in their habits in the Ice Age and have survived to this day in the harsh environment they love. They could not stand the summer heat and uncertain moisture supply of the lowlands, but on the mountain they have plentiful water supplied by fog and rain.

The top of Katahdin was so cold that June day that even with two pairs of gloves my hands were almost too chilled to work the camera.

Near the summit is a tableland covered with a dense growth of very dwarf spruce edged with thick mats of *Diapensia lapponica*, a small, thick-leaved heathlike plant with numerous small white flowers, also found on other high mountains of New England, New York, and the alpine regions of Europe and Asia.

Below the edge of the tableland, in rocky nooks with a sunny exposure, we found alpine azalea, with pink-and-white bell-shaped flowers; and mountain heath, whose urnlike blooms are pink to purplish.

Here, too, we discovered the last remnants of the blooms of Lapland rosebay, which had reached its prime two weeks before. This dwarfed alpine shrub, growing near the ground to avoid the cold wind, bears light-purple flowers. It grows in Greenland and Labrador, but in the United States only the high mountain summits of New England and New York know it.

Along the trail farther down grew a subalpine plant, Labrador tea, a low straggling shrub with clusters of white flowers and evergreen leaves densely covered underneath with brownish woolly hairs. Explorers in Canada have used it as a tea substitute.

Here we found good stands of sheep laurel, a low shrub with crimson-pink flowers and elliptical leaves olive green above and pale green beneath. Poisonous to sheep, it is sometimes called lambkill, though victims often recover.

National Geographic Photographer Willard R. Culver

Virginia Bluebell Ornaments the Nation's Capital

The author awaits a lull in the breeze to photograph the flowers in Rock Creek Park. The plant ranges north to Ontario, south to Alabama.

Driving from Katahdin to Moosehead Lake, we frequently saw the white form of the pink lady's-slipper (page 609). Now and then a brood of young partridges scuttled into the underbrush while the mother sat in the middle of the road trying to block our car until the chicks were out of sight.

Hawkweeds Are Imported Pests

In open fields near Moosehead Lake were many acres of the beautiful but obnoxious orange and yellow hawkweeds, two of the worst plant pests in New England. The weeds are believed to have entered the United States mixed with grain seed from Europe, before the days of plant inspection.

Our next major stops were the southern New Jersey Pine Barrens and coastal bogs around Hammonton, long known as a botanists' paradise. We waded several hours in a bog where skunk cabbage, the earliest spring flower, grew in abundance (page 610). Its name derives from the odor released when the plant is bruised; it is also known as polecat weed and swamp cabbage. The scent attracts carrion-eating flies which carry pollen from plant to plant.

Skunk-cabbage flowers are purplish brown, yellow, or purple. Almost all the close relatives of this plant are found in distant Malaya.

Interspersed among the skunk cabbage grew swamp pink, with its dense clusters of small pink-purplish flowers forming a background for its blue pollen sacs.

Patches of little heathlike pyxie, or flowering moss, spread like snow on the sandy soil of a scrub-oak forest near Hammonton.

Potomac Valley Wears Lady's-slippers

In August, in the coastal bogs around Cape May, one may find two yellow-flowered orchids, and in a large shallow pond the small, slender-spiked white flowers of the snowy orchid.

Pink lady's-slipper, or moccasin flower, greeted us in profusion in the Potomac Valley of Maryland and Virginia. This, our largest and most beautiful northern orchid, is of

interest because of the way it forces honeybees to assist in its propagation.

Entering the flower, the bee enjoys a banquet of nectar spread for her, but when she is ready to leave she finds herself trapped. The only way of escape is through a narrow aperture where sharply pointed papillae comb out the pollen grains brought in by the bee on the hairs of her back or head. As the bee struggles on, anthers deposit fresh pollen upon her back, and this she eventually carries to the next flower, insuring reproduction of the species.

Pink lady's-slipper needs acid soil and will not live under ordinary garden conditions or if watered with chlorinated city water, which is too alkaline.

Trout lily (page 612) also blooms along the Potomac, in large yellow stands. Its name was bestowed by John Burroughs, the naturalist, who noted how the brown spots on its leaves resemble the fish's mottled coloring. The seeds develop a small bulb which produces only small leaves. Succeeding bulbs grow more deeply into the ground each year for seven years, producing flowers only at the end of that time. Then new seeds start the cycle again.

Many species of the wild flowers of this area may be seen in the 400-acre Conway Robinson Memorial Forest near Gainesville, Virginia.

Flower lovers of the Nation's Capital and near-by sections can enjoy a treat each year in the upper part of Rock Creek Park, where in April a large area is almost completely covered with trout lily, spring beauty, white rock saxifrage, and blue, white, and yellow violets (page 607). Many species of violets produce two forms of blossoms, one having the usual petals and the other the so-called "hidden" flowers near the roots.

Small colonies of trailing arbutus (page 610) also bloom in Rock Creek Park. Its fragrant white-pink flowers are harbingers of spring in many areas. The species is disappearing because it is hard to pick the blossoms without uprooting the plant. When it was found by the Pilgrims they called it Mayflower, from its time of blooming.

Skyline Drive Offers Bright Display

Southwest from Washington the Skyline Drive and Blue Ridge Parkway offer one of the finest displays of wild flowers in the eastern United States (page 618).

Early settlers in the Appalachian region burned large areas to provide pasture, and this practice and subsequent grazing by cattle largely destroyed the great stands of wild flowers which grew here originally. They survived only around the edges of pastures and in out-of-the-way places, but now that farmers have been moved from the park areas, wild flowers are making a strong comeback.

Here, without leaving the car, one may see pink azaleas; yellow lady's-slippers; viper's bugloss, introduced from Europe; wild pink; and bird's-foot violet. Many other species, such as bog orchids and white buck bean, can be found only by searching bogs and adjoining fields and woodlands on a short hike from the road or the near-by Appalachian Trail.*

Redbud and flowering dogwood are at their best between mid-April and mid-May along this route. The "flowers" of dogwood are not the true blossoms, but supposedly are intended only to attract insects to the small yellowish-green real flowers at the center of the showy bracts (page 606).

Trilliums (page 611), whose white flowers turn pink with age, also bloom at about this time in the same area. The flowers are very sensitive to light and turn on their stalks to follow the sun across the sky. The young plants of trillium sometimes are eaten as greens under the name of "much-hunger," but the roots are highly emetic.

Cowslip Greens Are Edible

Big Meadows bog, between Panorama and Swift Run Gap, and other wet places along the road display quantities of yellow marsh marigold, or cowslip (page 613), also often eaten as greens. They should be boiled first, however, as the fresh leaves contain a poison.

Flame azaleas, ranging in color from pale yellow to deep orange red, and the rosebay, or rhododendron, bloom pink to purplish pink from the last of May to the middle of June or later, higher up in the Virginia and North Carolina mountains.

Red columbine displays its inverted, cornucopia-shaped flowers in the fields throughout the season, and around the end of July it will have for company the Turk's-cap lily (page 613), with its yellow-and-red flowers, and five-foot stalks of black cohosh, which has white spires rising one to two feet from a base two or three inches thick.

In the spring, dry slopes having acid soil display spring iris (page 612) with its big purple flowers resembling giant violets from a distance; and bird's-foot violet in two colors, the three lower petals lilac purple, the two upper petals dark violet.

No eastern State can surpass the wild-flower displays of North Carolina's coastal plain from spring to early fall. Driving from New Bern to Wilmington, four or five miles from

*See "Skyline Trail from Maine to Georgia," by Andrew H. Brown, National Geographic Magazine, August, 1949.

Kodachrome by P. L. Richer

Pink Lady's-slipper, Loveliest Northern Orchid, Forces Bees to Assist Its Reproduction

Once inside the blossom of *Cypripedium acaule*, a bee can escape only by brushing against plant hairs, which pick up the pollen carried from other flowers. This **Pink Lady's-slipper** grew at Langley, Virginia.

© National Geographic Society

610

↑ Fragrant, Delicate Trailing Arbutus Shyly Proclaims Spring Is Here

Pilgrims named the plant Mayflower not for their ship but for the month it usually blooms. *Epigaea repens* is disappearing in many areas because pickers uproot it. Massachusetts claims **Trailing Arbutus** as her State flower. Maryland grew this specimen.

↓ Skunk Cabbage Rushes the Season, Sometimes Growing Out of Snow

Skunk Cabbage takes its name from the odor released when the plant is bruised. In some parts of eastern United States *Symplocarpus foetidus* is the earliest flower, blooming in January. Rock Creek Park, Washington, D. C., witnessed this emergence.

Kodachromes by P. L. Ricker

Passionflower Reminded Explorers of Christ's Crown of Thorns

Pistils of *Passiflora incarnata* were likened to the nails driven through Jesus' hands and feet at the Crucifixion. **Passionflowers** up to three inches wide grow on vines 20 to 30 feet long. This plant bloomed at North Beach, Maryland.

Light-sensitive Trillium Turns Blossoms Toward the Sun

Trillium grandiflorum is often called wake-robin because it blooms about the time robins return. White at first, its blossoms turn pink with age. **Trillium** grows in woods from Ontario and Quebec to Arkansas and North Carolina. Virginia contributed this bloom.

← Spring Iris's Purple Blooms Spread a Violet Scent

Sepals of *Iris verna* have yellow spots at the base; they bear the same color as the petals above. From a distance the flowers resemble giant blue violets. **Spring Iris,** also known as dwarf iris, is one of the most beautiful of many species. It prefers acid soil in the open woods and dry pinelands from west Florida and Mississippi north to Kentucky and Pennsylvania. These blossomed at Skyland, Virginia.

↓ Trout Lily Takes Its Name from Mottled Leaves

John Burroughs, the naturalist, so dubbed the **Trout Lily** when he saw how its leaf markings resembled those of the fish. *Erythronium americanum* also is known as fawn lily, dogtooth violet, adder's-tongue, rattlesnake violet, and scrofula root. Yellow flowers, sometimes tinged with purple, are two inches long.

Growing out of a deeply buried, bulblike corm, half the stem lies below the ground. For this reason the leaves, though actually halfway up the stem, appear to grow out of the base.

Trout lilies may be found in woods and thickets from Nova Scotia south to Florida and west to Nebraska. This example was sighted on Plummer Island, Maryland.

Kodachromes by P. L. Richter

Marsh Marigold Spreads Golden Carpets in Swamps and Meadows

Buttercuplike *Caltha palustris*, shown in Shenandoah National Park, is also known as cowslip. Its shoots are sometimes eaten as spring greens; the leaves contain a poison which must be boiled away. **Marsh Marigold** grows from Newfoundland to South Carolina.

Red Columbine's Inverted Blossoms Resemble Cornucopias

Aquilegia canadensis (right) grows in rocky woods from Canada to Texas. **Turk's-cap Lily** (left) rises as much as 10 feet and bears as many as 40 flowers on a stalk. Wild tiger lily and *Lilium superbum* are its other names. Virginia provided both flowers.

614

Seaside Indian Paintbrush, or Painted Cup, Lives Only on Rocky Cliffs Along California's Northern Coast

Brilliant flowers of *Castilleja latifolia* have given it the aliases prairie fire, blood warrior, and nosebleed. **Seaside Indian Paintbrush** is parasitic on the roots of grasses and possibly other plants. Most species have red flowers rather than the orange of this one.

Blue Blossoms of Common Lupine Lend Color to Drab Hillsides and Banks

Photographed in Maryland, *Lupinus perennis* is related to the bluebonnet, the Texas State flower. It grows one to two feet high. Sometimes the flowers are pink or white instead of blue. Other names are Quaker bonnet, old-maid's bonnet, and sundial, the last because the leaves in following the sun rotate as much as 90° on their axes. At night and on cold, dark days the leaves "sleep" by folding down around the stalk or by standing upright. **Common Lupine** ranges from Maine and Ontario south to the Gulf.

Three wild-flower species share a natural garden watered by melting snow at the foot of Mount Hood, Oregon. **Sierra Shooting Star** (*Dodecatheon jeffreyi*, upper center) thrives at elevations up to 10,000 feet. *Caltha biflora* (lower center), the Northwest's **Marsh Marigold,** is much smaller than *palustris*, its eastern relative (page 613). **Coast Trillium** (*Trillium ovatum*, with white flower, right) resembles the eastern species, *grandiflorum* (page 611).

Kodachromes by P. L. Richer

Globe Mallow Brings Vivid Coloring to the West's Dry, Sandy Plains

Pink blossoms of *Sphaeralcea coccinea* may shade from pale orange to brilliant scarlet. **Globe Mallow's** five-notched petals are an inch wide, and the slender stems four to twelve inches high. Dubois, Wyoming, gave us this bright spectacle.

Lewisia, Montana's State Flower, Honors a Western Explorer

Lewisia rediviva, better known as **Bitterroot,** takes its name from Meriwether Lewis of the Lewis and Clark Expedition (1804-06). The plant ranges from Montana to Arizona. **White Clover,** which botanists call *Trifolium repens*, here grows in close association.

the ocean, we saw white Spanish bayonet occasionally growing in roadside fields.

Most interesting of the plants of this area is the Venus's-flytrap (page 629), a carnivorous plant found only in this region. It blooms about Memorial Day. The plant is difficult to keep alive in cultivation because it gets fewer insects than in the wild and because soil conditions usually are unfavorable.

Leaves at ground level around the base form the trap. When an insect alights or crawls upon a leaf, it touches one or more of three sensitive trigger hairs on each side of the leaf's midrib. This touch sends a stimulus to the midrib, causing the two halves of the leaf to close.

Stiff, hairlike bristles on the edges of the leaf interlock so that the victim cannot escape. Meanwhile the insect is covered with digestive juice excreted by the leaf when the trigger hairs are touched.

Sundew Fluid Fatal to Insects

Three species of another carnivorous type, the pitcher plants, also are common in this area. Two of them, one with red and the other with yellow flowers, bloom about Memorial Day, and a third, also having red flowers, about a week later.

Roadside ditches and low, damp areas near by teemed with sundew (page 629), still another carnivorous plant. Its leaves are covered with sensitive reddish hairs which exude drops of sweet, sticky fluid. Insects attracted by the sweetness are trapped in it. As they struggle to escape, the hairs are stimulated to give off more fluid and bend over to trap the victims.

Other flowers that brighten the coastal North Carolina landscape include hatpins, so named because of the shape of their flower stalks; white-topped sedge; violet, white, and yellow butterworts; and orange milkwort.

Along woodland borders we saw occasional loblolly-bay trees with large white flowers, resembling the famous "lost" Franklinia tree, named for Benjamin Franklin, which has not been found growing wild since 1790 and is believed to have been destroyed by fires and men seeking specimens for sale. Cultivated specimens still survive, however.

Shrubby honeycups, with long racemes of large, white huckleberrylike flowers, are so common that they comprise 40 percent of the flora in the 48,000-acre Holly refuge near Burgaw, North Carolina. Often we saw fields and roadsides covered with the spicy, fragrant white to purplish dwarf azalea. Yellow jessamine, State flower of South Carolina, formed solid masses of color on trees and fences.

Solitary, erect scarlet flowers of the Catesby lily, spotted with yellow, were conspicuous though not common. Near the road we often spotted the two- to three-inch purple-and-flesh-colored passionflower (page 611). Its basal corona and fringelike filaments are supposed to represent Christ's crown of thorns, and the nail-like pistils the nails driven into His hands and feet on the Cross. The five sepals and five petals supposedly are symbolic of the 10 faithful disciples, excluding Judas, who betrayed Him, and Peter, who denied Him.

In sandy fields we saw many beds of the blue common lupine (page 615), also known as sundial because its leaves rotate up to 90° to follow the sun. Often mixed with it was the beautiful rose-red *Phlox drummondii*, introduced here from Texas.

One of the best flame-azalea displays may be found the last half of June on Mount Mitchell, in western North Carolina, the highest peak east of the Rockies.

Here also are large stands of galax, the leaves of which are much used by florists for wreaths and other decorations. It was here, in a storm during a surveying trip in 1857, that Elisha Mitchell, the geologist and botanist for whom the mountain was named, fell into a stream and was drowned.

Rosebay Covers Roan Mountain's Top

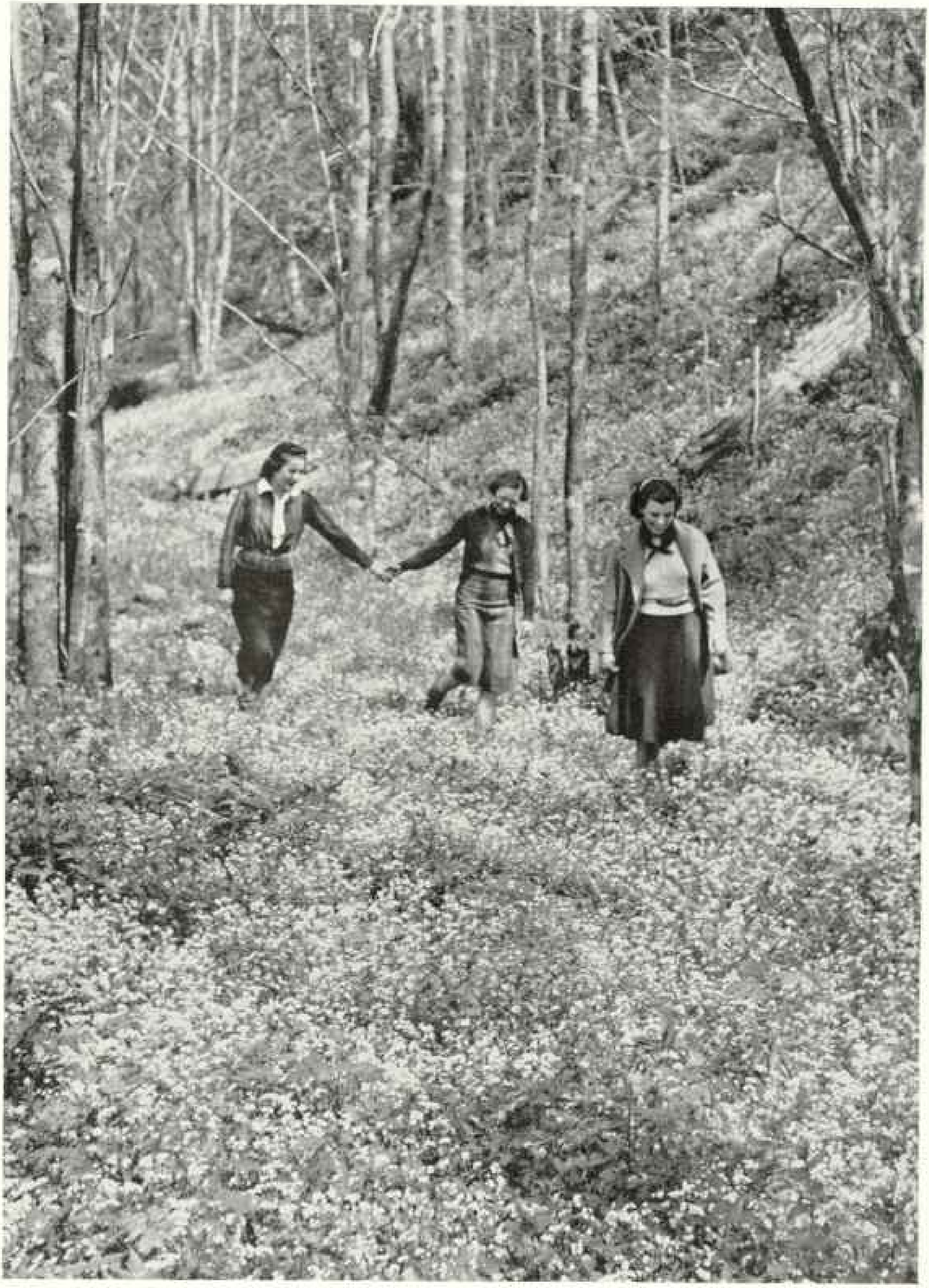
The thrill of a lifetime awaited us at the end of June on the lonely summit of Roan Mountain, on the North Carolina-Tennessee border, reached by a dirt road from Bakersville, N. C. The higher of the mountain's two peaks has two large masses of rose-pink mountain rosebay, covering 400 to 600 acres, the most gorgeous display of wild flowers we saw in the entire Southeast. A fire tower on the lower peak provides a fine view of the blooms. Elsewhere this flower is rose purple.

Clingmans Dome, in the Great Smoky Mountains, with an automobile road nearly to the summit, offers one of the best views of the area. Pink rhododendron and white to pinkish mountain laurel, which bloom in this region in June and early July, can be seen on the peaks known as the Chimneys from the lower road, but near views of the best areas can be obtained only by a strenuous trail trip of several miles.*

During World War II, when supplies of Mediterranean briar were cut off, burls of both rhododendron and laurel were used for making pipe bowls, and still are.

Mountain laurel is one of the most abundant plants all the way from the Berkshires of western Massachusetts to Florida. Some farmers consider it a weed and try to burn it out, but even forest fires do not kill it.

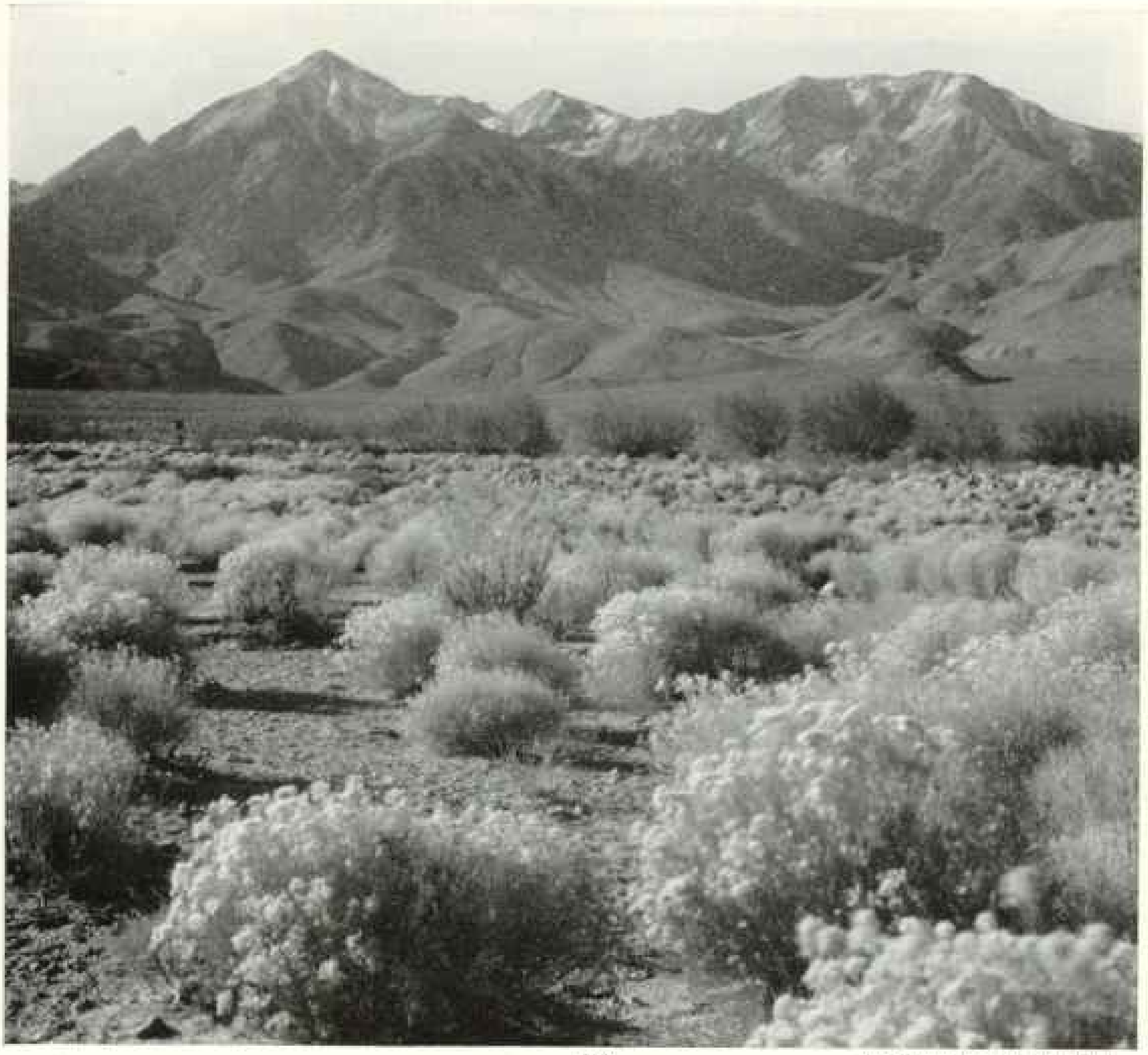
* See "Pack Trip Through the Smokies," by Val Hart, National Geographic Magazine, October, 1952.



618 National Geographic Photographer J. Baylor Roberts

Spring and Its Wild-flower Beauty Lure All the World to the Out-of-doors

Lush blossoms, symbolizing Nature's reawakening, appeal alike to school child, city dweller, and professional botanist. White mountain phacelia here carpets a Blue Ridge dell in Sevier County, Tennessee.



619 All-Year Club of Southern California

Bright-yellow Flowers of Rabbit Brush Shimmer in the Mojave Desert

Rabbit brush loves plains and stream banks in semiarid western areas. Some species contain raw rubber, which Indians once used as a crude chewing gum. Two specimens of this type appear in lower right.

Hundreds of tons of its leaves are used annually as decorations, but even this practice does not threaten its existence.

Laurel stamens bend backward until the pollen ripens. Then, as part of the reproduction cycle, the stamens whip forward like released springs, hurling pollen two or three feet onto neighboring flowers.

Florida wild flowers are of outstanding interest. Driving south from Jacksonville early in March, one may see as many as 50 species in each 100 miles of driving, most of them just getting started. Among them are dwarf flag pawpaw, with one-and-a-half- to two-inch white or yellowish flowers, and occasional stands of yellow prickly pear and blue wild petunia.

Along the Tamiami Trail through the Everglades we found it worth while to drive slowly and stop often, though some flowers cannot be seen without wading in the shallow water near the road. Most beautiful of southern plant pests, the bluish-purple water hyacinth fills the canal in many places on the north side of the highway (page 621). A constant eradication program must be maintained to prevent it from completely choking canals and rivers.

Pond cypress is also abundant, and on its bark grows the conspicuous red-bracted air plant *Tillandsia fasciculata*, which draws its nourishment from the atmosphere.

Also on the cypress bark is found the small-flowered green-fly orchid. I succeeded in flowering one of the plants on a six-inch strip of bark at home by placing the bark in a glass of water.

Along roadsides near Tampa we saw a prostrate-growing milkweed with odd white-veined leaves, a small purple sesban tree, and a low

A. Aubrey Bodine, Baltimore Sun

Black-eyed Susan Carpets a Field with Gold

Though native to midwestern prairies, black-eyed Susan is Maryland's State flower. This stand sprang up in Green Spring Valley near Baltimore.

spurge nettle with three-quarter-inch fragrant white flowers, also called tread-softly because its stinging hairs are extremely painful to barefoot youngsters.

A few miles west of Denham, north of Tampa, are occasional beds of yellow hooded pitcher plant (page 628).

Often in the South we saw the two- to three-inch flowers of zephyr lily, white with a purplish tint outside.

Louisiana Leads in Iris Species

Louisiana greeted us in April with its many species of iris, far more than can be found in any other State. A few may be seen at the Avery Island Bird Sanctuary south of New Iberia.

Unfortunately, many of the iris species have been lost forever through filling for levees and the draining of swamps. Countless thousands have been dug up for gardens, where in many cases they failed to survive.

Texans can boast that probably close to 40 percent of their wild flowers, except for introduced weeds, are found in no other State. The first such native, or endemic, species we saw was the famous State flower, the Texas bluebonnet, *Lupinus subcarnosus*, which so closely resembles the more common *Lupinus texensis*, also called bluebonnet, that few people know the difference.

An old legend says that the red spots on Texas bluebonnet petals represent blood spilled from an Aztec human sacrifice.

Approaching the San Antonio area, we found most of the bluebonnets growing with Indian paintbrush, but about 60 miles to the northwest, near Kerrville, was a solid field of bluebonnets covering several acres (page 634).

Along the road from Boerne to Mountain Home were many pink mimosa, yellow wild flax, a low white-flowered yuccalike plant called bunch grass, or sacahuiste, and white rain lily, which lies dormant until a rain and then comes up thickly.

In east Texas we also saw several flowers common throughout southeastern and northern plains areas, including false dandelion, false dragonhead, and wine cups with one- to two-inch red-purple blossoms.

On the high, arid plains of west Texas vegetation is markedly different, but even in dry years mesquite, creosote bush (named for its odor), sotol, and several species of cactus bring forth their flowers. Other plants lie dormant until, every three to seven years, there is sufficient rainfall; then the plains flame with color.

Two common flowers we saw were Indian blanket, or fire wheel, with a wide red inner ring and a narrow outer ring of yellow, and the tall pink gold-eye phlox (page 632).

The Texas Highway Department at Austin

furnishes advance information about the prospects of a good flowering season and carries on an extensive roadside planting program. On the approaches to bridges and culverts several large species of Spanish bayonet have been set out. One of these, *Yucca treculeana*, is often ten to twelve feet tall and displays clusters of large white flowers from three to five feet long and two or more feet in diameter.

We had the good luck to find in the Davis Mountains the only native American species of yellow-flowered wild onion, *Allium caryi*, which is found in only a few localities there.

National Geographic Photographer David S. Boyer

Water Hyacinth, a Lovely Pest, Hinders Boating in Florida

Thick-growing plants, clogging streams, deplete fish by cutting off light and destroying their natural food. Flowers float on inflated leaf stalks.

Mexicans Make Cactus Salad

Beyond, on the plains, were yellow bitterweed, unpalatable to livestock and so abundant that it largely destroys the value of other plants for grazing.

Cacti in this region are too numerous to mention them all, but one of the most common is prickly pear (page 630), from which the Mexicans make a salad and candy after removing the spines. One of the varieties, known in Mexico as tuna, has an edible fruit resembling strawberries in taste and color when ripe.

Most prickly pears have large yellow to orange flowers that often take on deeper hues with age. The joints have many long spines and small rosettes of short, barbed spines.

Cane cacti, also found here, have cylindrical jointed branches several feet high; the flowers are usually pink, rosy, or red (page 630). In some species, known as chollas, the joints are so loosely attached that they drop off at a mere touch, as I learned when some of the barbed spines stuck in my back while I was taking a picture (page 623).

Hedgehog cacti are low, cylindrical, single-jointed plants, sometimes forming spiny hemispherical mounds. The flowers are mostly bright red, crimson, or purple, and as much as four inches across.

Barrel, or fishhook, cactus, similar to the hedgehog but larger, has stiff straight or hooked spines. The plant's body often is somewhat coarsely fluted or tubercled and has rosettes of spines along the ridges. Flowers may vary from yellow to red. Thirsty desert travelers sometimes cut off the top of the "barrel" and drink the juice secreted in the whitish pulp.

Nipple cactus (page 631) is a dwarf species, named for its small nipplelike shape. Cacti in general have no leaves, and this provision of Nature prevents excessive loss of moisture by transpiration in the desert.

As we approached the Chisos Mountains, which rise with unexpected rugged grandeur in the southern part of Big Bend National Park, the first change from the desert flora that we noticed was Texas madroño, a small tree member of the heath family with thick,

622

Fred Masters

Snow-white Matilija Poppies Beautify Southern California's Coast

Seen near San Diego, these flowers bear frilled edges and a delicate fragrance. Stems rise as high as eight feet; blossoms spread three to five inches; leaves are bluish green.

Ray Manley, Western Ways

Giant Cactus Rears Corrugated Arms Aloft. Jumping Cactus Seems to Throw Its Spines

Slow-growing saguaros may reach an age of 200 years and a height of 50 feet (page 624). So easily do the joints of cholla (left and center) drop off the limbs that sometimes they appear to leap at passers-by (page 621). These riders dismounted to pick poppies on a guest ranch near Tucson, Arizona.

glossy, roundish leaves and dense clusters of white huckleberrylike flowers.

At a pass leading into the Chisos Mountain basin stood a huge rock some 500 feet high, and around its base were dense circular clusters of broad-leaved century plant.

Century's Spikes Used as Weapons

Century plants are so named because they are slow to mature and blossom, although most species bloom in about 20 or 30 years instead of 100. Margins of the leaves are often spiny, and the long, sharp spikes on the ends were used as weapons by the Indians. The flowering stalk, with clusters of yellowish flowers at the top, sometimes reaches a height of 30 feet.

Mexicans make pulque, which resembles beer, from the fermented juice of century plants and distill the mashed stems to produce potent tequila.

Long stretches of the roadside toward El Paso were covered with thousands of the branching type of yucca, not in flower. Another section of highway was lined with a solid two- to three-foot-wide hedge of spectacle pod, bearing pairs of thin quarter-inch fruits resembling miniature spectacles. The plants grow in this hedgelike manner because only here, where the limited rains run off the pavement for a few feet on either side, is there enough moisture for the seeds to germinate.

After several hundred miles of desert driving we had a longing for green vegetation and satisfied it with a trip up 10,713-foot Mount Graham, in Arizona, where snow still remained near the top. Water from the melting snow had brought to life small white Rocky Mountain marsh marigold.

A small species of mistletoe, lacking white berries and not used for Christmas decorations, grew profusely on the limbs of Engel-

mann's spruce. Like its eastern relative, this mistletoe has rootlets which penetrate the bark and absorb sap but apparently do little harm to the tree.

A violet haze covering the ground near Globe, Arizona, proved to be a large growth of very small gilia, suitable for cultivation in rock gardens. Farther along the roadside the leguminous paloverde tree, which bears its seeds in pods, was a solid mass of golden flowers. During the dry season these trees are leafless, but they remain conspicuous because of their yellowish-green bark.

Wild-flower lovers visiting this area should not miss the Boyce Thompson Southwest Arboretum near Superior, Arizona, where several hundred plants native to this region are brought together. Here grows yellow-flowered incienso, which yields a gum formerly chewed by the Indians and used as an incense in churches.

Tall, whiplike, thorny stems of the ocotillo, ends closely covered with bright-red flowers, were often seen on rugged slopes and roadsides beyond the arboretum. Its leaves fall off in dry weather but grow out again after a rain.

Tall Saguaro Useful to Birds

Farther down the slopes were many giant saguaros, which produce the State flower of Arizona and often reach a height of 50 feet. The upper half of this cactus has several erect arms, crowned by conspicuous white rings of flowers. Woodpeckers drill holes in the saguaro for nests, which later are taken over by elf owls. Birds feed on the pulp.*

Two-inch-wide white flowers of Easter daisy, which blooms about Eastertime, greeted us at Grand Canyon National Park. On the Dripping Spring Trail in the canyon itself we saw a low pink phlox, often grown in rock gardens; red-bracted Indian paintbrush; and a red-flowered beardtongue.

As we crossed from Arizona into Utah, the roadside displayed low white-flowered desert lily, a taller white prickly poppy, and yellow Oregon grape. This is the Oregon State flower, and its blue fruits form grapelike clusters.

Sparse desert vegetation through Utah and Nevada was punctuated by gray sagebrush and 15- to 30-foot Joshua trees, the only yucca which has many short branches.

California greeted us with desert willow, not really a willow at all, for it thrives on little moisture and for this reason is much used for windbreaks in the Dust Bowl area farther east. Sand verbena, another desert flower, displayed rose-purple blooms.

Along the edge of the Mojave Desert, at Victorville, California, we found in an oasis, formed by runoff from irrigation water, a large stand of one- to two-foot yerba mansa with small white flowers on a conical spike, surrounded by five to eight white leafy bracts.

Cajon Pass, 3,823 feet high, brought us the finest display of wild flowers we had seen west of Texas. Most striking were the many quixote plants, more aptly called candles-of-our-Lord, for the stalks stand up exactly like candles in a candelabrum.

Santa Barbara Garden Covers State

Santa Barbara's fine Botanic Garden provided in two days a better view of California wild flowers than could be obtained in weeks of travel. The plants are set out in typical habitats, such as arroyo, canyon, chaparral, desert, foothill, forest, island, meadow, and woodland. Here we saw yellow bladderpod; yellow giant coreopsis; white Apache plume, so named because its seeds bear tiny plumes that enable them to sail on the wind; white matilija poppy (page 622); yellow bush poppy; and yellow Fremontia, or flannelbush, named for the famous explorer of the West, John C. Frémont, who discovered it in 1846.

We also saw gum plant, whose fluid extract is good for poison ivy, but, strangely enough, often works only once for any individual.

The State flower, California poppy, once was plentiful in coastal valleys and foothills. Accounts of sailors and others who visited the San Francisco Bay area in the days before California was settled tell that the hills around the bay were solid with California poppy. Spaniards called it *copa de oro*, or "cup of gold." Now it is seldom found abundantly except in inaccessible spots.

Some of the country around Bakersfield only a few years ago also had beautiful displays of wild flowers. Since then, however, 5,000 acres have been plowed for planting grain.

Crossing 2,224-foot San Marcos Pass beyond Santa Barbara, we were rewarded by finding crimson sage; chaparral, a name applied to thickets of rigid or thorny shrubs on dry mountain slopes; chamise, with close panicles of small white flowers; and red heart, so called because the upper sides of the branches become reddish brown in drying.

Sheets of gorgeous color greeted us along the coastal highway that parallels the Pacific. Lower slopes of the Coast Ranges were covered with solid masses of blue and white lupine. Toward Lucia the blue lupine is replaced by yellow in a similar display (page 626).

Beyond Carmel were brilliant orange-red displays of seaside Indian paintbrush, or painted cup (page 614), and one of the

*See "Saguaro, Cactus Camel of Arizona," by Forrest Shreve, NATIONAL GEOGRAPHIC MAGAZINE, December, 1945.

Insect-consuming Pitcher Plant Drowns Its Prey in Rain Water

Attracted by a sweetish secretion on the lips of the pitcherlike leaves, victims of *Sarracenia purpurea* fall into the liquid below and perish. **Pitcher Plant** then absorbs the insects' soft parts. Seen at Beltsville, Maryland.

626

Lupines Carpet the Pacific Shore with Gold: Little River Beach State Park Near Eureka, California

Abundant on mountain slopes as well as coastal sands, *Lupinus arboreus* has a treelike trunk attaining as much as four inches in diameter and 12 feet in height. Other **Lupine** species bear blue or white flowers (page 615). Bacteria in nodules on the roots fertilize the soil by collecting nitrogenous material.

Western Centaur's Flowers Hug the Ground

Scientists call the **Western Centaur** *Hesperochiron californicus*. True to its name, this patch grew in California.

Checkerbloom Colors California Hillsides

Point Lobos State Park contributed this lavender display of *Sidalcea malvaeflora*, the **Checkerbloom.**

Kodachromes by P. L. Ricker

628

Carnivorous Hooded Pitcher Plants, Poised Like Cobras, Await Their Prey Near Lake Fern, Florida

Small insects, trapped and drowned in a fluid within the hollow leaves, are absorbed by the **Hooded Pitcher Plant** for their nitrogen. Certain mosquitoes breed only in the plant's liquid; wings carry them safely out of the trap. *Sarracenia minor* ranges from North Carolina to Lake Okeechobee.

Venus's-flytrap (Right) and Sundew Set Efficient Snares to Catch Insect Food

Fringed with stiff bristles, the traplike leaves of *Dionaea muscipula* stand invitingly open awaiting prey. If an insect touches one or more sensitive trigger hairs inside the leaf twice in 10 seconds, the halves close like pincers and the outer bristles interlock to prevent escape. Sometimes **Venus's-flytrap** crushes soft-bodied victims. This plant grew near Edgecombe, North Carolina.

Sweet sticky droplets, shining like dew, attract insects to the leaves of *Drosera intermedia*, the **Sundew**. Struggles of entangled feet stimulate the plant's hairs to secrete more fluid, suffocating its victims. An acid juice then digests the softer parts. Beltsville, Maryland, raised this natural flypaper.

Kodachromes by P. L. Richer

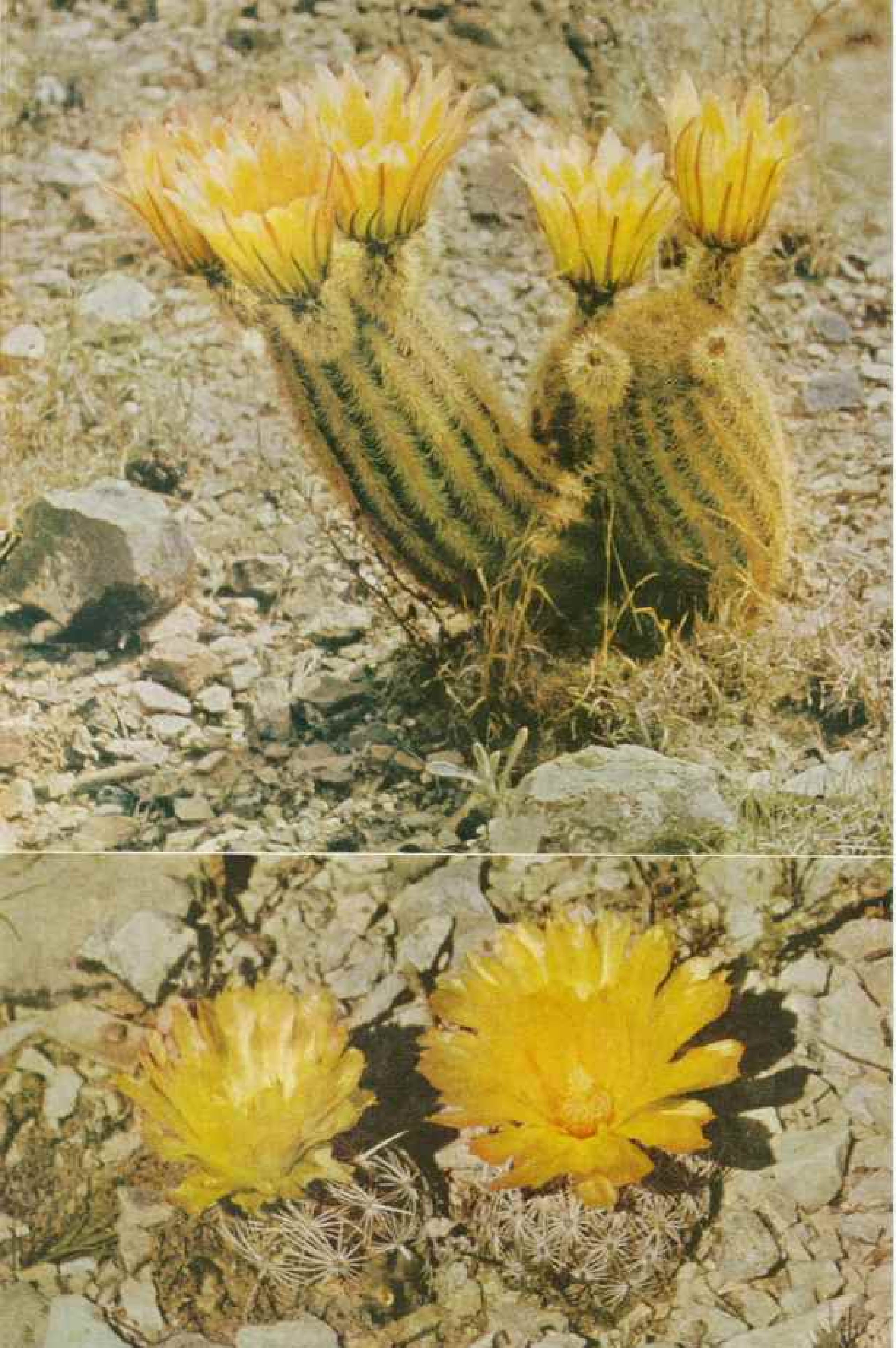
← Cane Cactus Guards Flowers with Sharp Barbs

Long slender stems of *Opuntia imbricata* provide a workable wood sometimes fashioned into picture frames and trinkets. Other names of the **Cane Cactus** are tree cactus and candle cactus. This plant grew in Texas; others may be found in the deserts of Mexico, Colorado, Arizona, and New Mexico.

→ Yellowish Nipple Cactus Is a Prickly Dwarf

Mamillaria similis (above and below) lives on the rocky plains of Texas and Mexico. **Nipple Cactus** resembles the bigger and better-known barrel cactus, whose moist pulp, obtained by cutting off the top, has quenched thirsts in the desert.

↓ **Prickly Pear** grows as far north as the plains of western Canada; this one was pictured near Scotts Hill, North Carolina. *Opuntia humifusa* has few spines but many small bristles; the latter can be painful if they penetrate the skin. Mexicans make salad and candy from some species after removing the spines. They honor the plant by giving it a position on the Republic's coat of arms.



Tidytips Are Neatly Ringed with Immaculate White Edges

Tidytips grow abundantly in California's coastal area; these were seen at Pismo Beach. Tiny hairs on the narrow leaves exude a sticky gum, and the bright-yellow flowers give out a pleasant aroma. *Layia platyglossa* is the Latin name.

Gold-eye Phlox Is Found Only on Texas' High Prairies

Phlox roemeriana is one of about 1,000 species of wild flowers exclusive to the Lone Star State. These **Gold-eye Phloxes** brighten the countryside near Sonora in the western part of the State. Five petals are characteristic of the phlox family.

beardtongues. There are more than 250 species of this attractive plant, the beardtongue, all native to North America except for a single Japanese species.

A strange example of Nature's adaptability can be seen at Point Lobos State Park. Here is the country's last sizable stand of Monterey cypress. Growing on its branches are long strands of a green alga supposed to have been blown there from the sea several hundred thousand years ago and to have adapted itself to growing out of water. It is festooned like Spanish moss and now draws nourishment from air instead of water.

Rich Display at Point Lobos

The flower display at Point Lobos exceeded in color anything else we saw on our odyssey. Included in it were a lavender mallow called checkerbloom (page 627), a rose-pink gentian called canchalagua, purple owl's-clover, a yellow composite known as lizard's-tail, and sulphur-yellow tidytips (opposite), all thickly mingled with seaside Indian paintbrush. California has more than 1,000 species of wild flowers not found in any other State.*

Yosemite National Park displayed large bushes of white western azalea and yellow pond lily. In the garden near the park museum were Stiver's lupine, with yellow banner and pink wings; wild geranium; and white to pinkish pussy's-paws, whose flowers suggest the feet of a cat.

Western flowering dogwood grew along the drive to Glacier Point, with five white bracts instead of the four of the eastern species. Higher up, a mountain meadow was covered with small white coast marsh marigold, while in the background was a stand of white fir, its trunks covered solidly with a small branching yellow lichen which was once used by the Indians for dyeing clothing and blankets.

Along the road in pine woods we saw the bright-red snow plant, a relative of the Indian pipe, which sometimes grows near the edge of melting snow and is saprophytic—that is, it feeds on decaying vegetation. It first appears above ground as a large inverted cup-shaped bud and gradually develops a thick, scaly red stem up to 15 inches high, the upper half bearing fleshy red flowers.

A wild-flower nursery above Columbia displayed thousands of trout lilies raised from bulbs which mature in two years instead of the seven required by the eastern species.

Near Myers the ground was covered with an attractive small white flower called western centaur (page 627). Its small blossoms and habit of growing close to the ground make it appear much like the eastern trailing arbutus. Farther on, near Lake Tahoe, were many camas lilies with racemes of small dark-blue flowers. Just north of Ukiah we saw many summer's darlings with one- to two-inch rose-pink flowers and a central blotch of a deeper shade on each petal.

Firecracker plant, well named for its cluster of tubular bright-red flowers about an inch long, was seen at Richardson Grove on the scenic Redwood Highway.

Covering the landscape at Little River State Park was yellow lupine. On the sandy approaches to the beach were large areas of a trailing yellow sand verbena.

Large stands of pink coastal rosebay, or rhododendron, State flower of Washington, were blooming at Del Norte Coast Redwoods State Park, and near by grew a rose-red corn, or bead, lily. Near the coast, at Smith River, we found yellow dune tansy, yellow sand-dune phacelia, and baby blue-eyes.

Azaleas Blaze in Oregon Park

Azalea State Park, just across the California line in Oregon, has a fine display of white to creamy western azalea and occasional bushes of honeysuckle bearing pairs of small black fruits surrounded by conspicuous red bracts.

A few miles west of Cave Junction, Oregon, we were guided to a mountain bog filled with western pitcher plants, with one- to two-foot slender hooded pitchers and one-and-a-half- to two-inch pendulous dark-purple narrow petals.

Topping a 2,600-foot ridge to catch our first view of snow-capped Mount Hood, we saw three- to four-foot stalks of bear, or squaw, grass, bearing conical racemes of small white flowers six to twelve inches long. In a boggy area at the base of Mount Hood were growing many plants of western skunk cabbage, which has two- to three-inch bright-yellow spathes enclosing the inner fleshy body that bears small flowers.

Several feet of snow were still banked behind Timberline Lodge, 6,000 feet up on the slopes of Mount Hood. Below it the banks of a small stream fed by the melting snow were covered with coast marsh marigold, white coast trillium, and a purple shooting star (page 615).

Near Olympia, Washington, at Hawks Prairie, we found lupine, bellflower, Oregon sunshine—a composite with yellow flowers—and two-foot stalks of death camas, so named because its roots contain a deadly poison.

Near Vantage, Washington, where we crossed the Columbia River, we saw blazing star, with its two- to three-inch yellow flowers, and sulphur flower.

* See, in the National Geographic Magazine: "California Says It with Wild Flowers," by Francis Woodworth, April, 1942; and "Wild Flowers of the West," by Edith S. Clements, May, 1927.

Schoolgirls Float in a Sea of Bluebonnets, the Texas State Flower

In March, Texas roadsides and pastures turn a gorgeous purple with stands of this native lupine. Throngs of Sunday motorists drive out to see them. Artists have devoted their careers to painting bluebonnets.

Flowers of Yellowstone National Park are so numerous and so well described and pictured in a park booklet that I will mention only three—fringed gentian, yellow pond lily, and elephant's-trunk, the last obviously named for the curved upper lip of the red to purple flowers it bears.

The drive eastward from Yellowstone Park to Beartooth Lake and over the 10,947-foot Beartooth Pass to Red Lodge, Montana, not only crosses one of the grandest scenic areas of the Northwest but offers a fine variety of wild flowers. They include larkspur; arnica, whose European relative provides the extract used in the medicine of the same name; and, at the top of the pass, Mariposa lily and marsh marigold, the last often entirely surrounded by snow.

Bitterroot, or *Lewisia rediviva*, the State flower of Montana, grows in this region (page 616). Its genus name honors Meriwether Lewis, of the Lewis and Clark Expedition. Bitterroot is found from Montana's Bitterroot Range, named for it, westward and south to Arizona. The Indians once roasted the starchy taproot for food.

Southward from Yellowstone Park few wild flowers appear on the arid plains, but occasionally we spotted good stands of skyrocket, with slender red trumpetlike flowers one to one and a half inches long, and a low-growing globe mallow, which prefers sandy areas (page 616).

Finest of Wyoming's wild-flower displays were in the high meadows of the Medicine Bow Mountains west of Laramie. Here amid rocky rivulets was a wonderful subalpine garden with hundreds of Rocky Mountain marsh marigolds and crimson-purple primrose. Near by were white sandwort, purplish catchfly, rose-purple heads of alpine clover, red-bracted Indian paintbrush, trout lily, daisy fleabane, bluebell, and bog laurel.

Crossing 11,797-foot Fall River Pass, northwest of Denver, we photographed large areas of yellow alpine sunflower and *Jamesia americana*, a small bush with terminal clusters of inch-long waxy white flowers.

Wild flowers furnish beauty everywhere. Some of the loveliest grow in harsh deserts or on the chill summits of barren mountains. Wherever seen, they reaffirm the glory and wonder of Nature unspoiled.

For other articles on wild flowers of the United States, see the two-volume NATIONAL GEOGRAPHIC MAGAZINE Cumulative Index, 1899-1952.

The GI and the Kids of Korea

America's Fighting Men Share Their Food, Clothing, and Shelter with Children of a War-torn Land

By Robert H. Mosier

Technical Sergeant, United States Marine Corps

I SLEEP pretty solidly when I'm sacked in at a battalion command post; they're usually a good 1,000 yards back of the front line. But when the machine-gun slugs began whining over our tent, I woke up.

From the tinny cough of the gun I figured it was a light Russian type, like a Browning. From the angle of the shots I decided the North Koreans who had lugged it through our lines must have set it up near our mortars and were shooting across our gulch, the bullets ricocheting off the boulders at our back. With no moon to see by, they were just spraying the neighborhood in general.

Our riflemen up on the hill opened up about then, and a fairly brisk fire fight got under way. I rolled over, shoved my head under my sleeping bag, and tried to go back to sleep. There were a lot of green replacements in the area that week, and anybody who got up and wandered about after dark was as likely to get clipped by our side as by the enemy.

But after a while, in spite of all the racket outside, I could hear somebody shuffling around in our tent. I thought it might be Sgt. Roy Duncan, the new photographer just assigned to the 3d Battalion, 1st Marine Division, so I said:

"Listen, don't get all shook up. This sort of thing goes on all the time."

He didn't answer, though. In a moment a match scratched, and I saw by the candle he was holding that it was Kim, my houseboy. His pack was at his feet, and he'd been loading it with all his most precious possessions —his album of pin-ups, a tattered old Christmas card from my wife, a carton of cigarettes, and stuff like that.

Too Much for a 15-year-old

"Where do you think you're taking off for?" I asked him.

He looked at me, and his lip was trembling a little. "Movie," he said. "They show movie back at photo lab."

I glanced at my watch. "Looks like you've missed the beginning of it already," I said. "It's 2 a.m."

I'll say this for Kim: It was the one and only time I ever saw him scared. He was 15 years old: this was the second winter of the war, and he'd taken plenty. I used to get a kick watching him walk around under counter-battery fire, as cool as a field ration, while recruits from stateside were diving for the ditches.

I first met Kim at a refugee camp near Changdo-ri. It was snowing, and I was standing by a sentry fire talking with some of the men. Kim came out of a tent near by. He stood there quietly until there was a lull in the conversation, and then he put a question through one of the Korean guards: "Could I be your houseboy?"

It was pitch dark, but in the light of the flames I was surprised to see the kid was neat as a pin. Even his shoes were shined. It had been so long since I'd seen any youngster who wasn't dirty, ragged, and generally beat-up that it gave me a jolt.

Kim Finds a Father

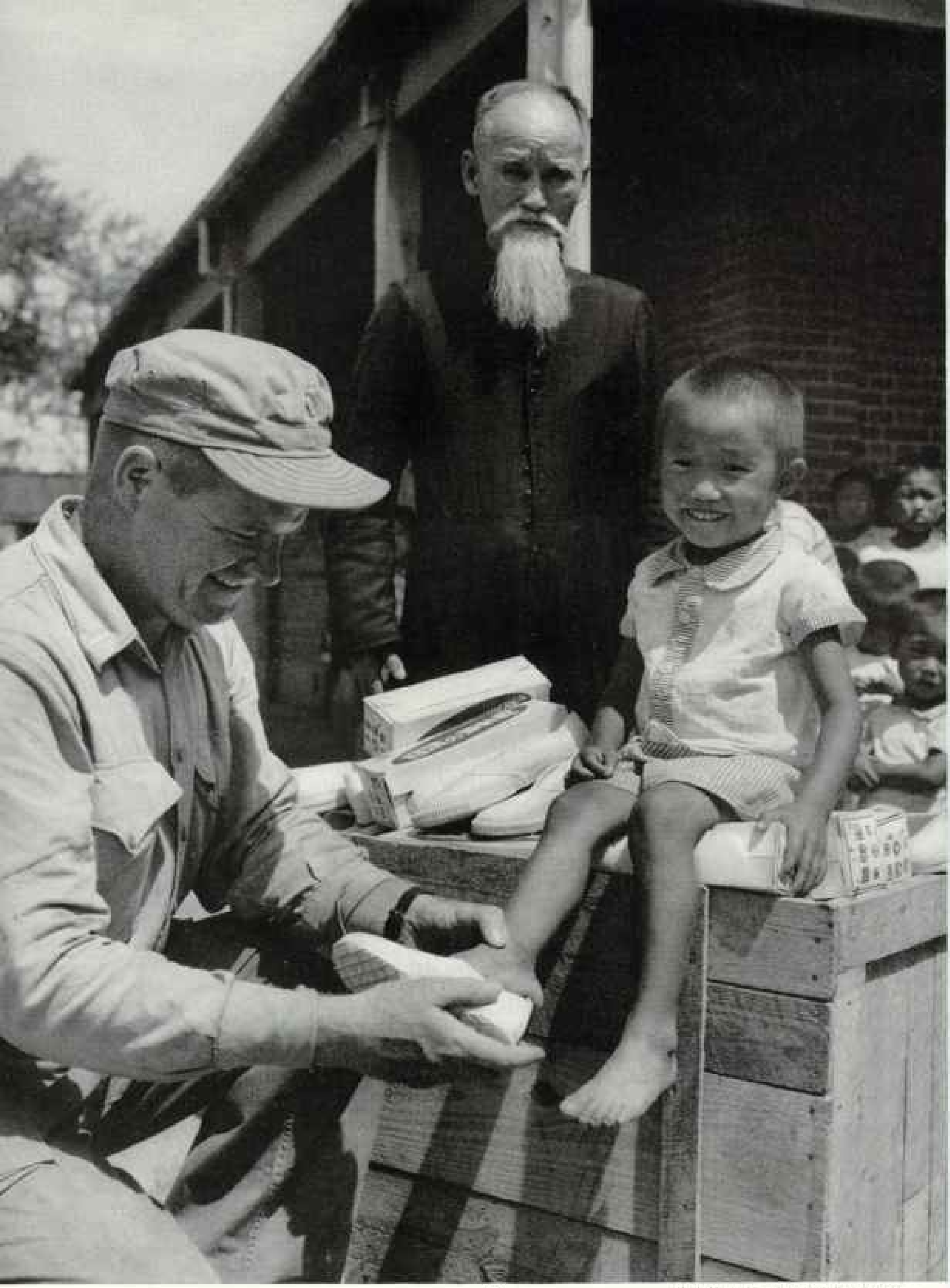
I checked into Kim's record. He came from a Korean Christian family that lived in Hongchon. His father had been killed and his home bombed out, and he had wandered up toward the front in search of work or food or both. He'd been pushed around a good deal, but he wore a grin that looked as if it were stuck on to stay (page 639).

I adopted Kim. Or perhaps it was the other way around. At any rate, we took care of each other. I gave him tent space and part of my rations and whatever odd bits of clothing and gear I could scrounge. In return, he policed our quarters, washed my clothes, and guarded my belongings when I was out on jobs as a photographer assigned to division headquarters. Occasionally he cooked me Korean dishes.

Kim spoke no English at first, and I no Korean; but we learned fast. He carried a pad with him everywhere, pulled me up short on any word he didn't recognize, and made me write it down. He didn't have to be told anything twice.

American food didn't sit too well with Kim for a while. In a few weeks, however, he developed a passion for what he called "No.-1 chow"—spaghetti, ice cream by the quart, steak, and candy from my rations.

His liking for American things went further. He plastered his part of the tent with color pictures cut from American magazines. He talked my arm off about American trade schools, never quite getting over his surprise at the idea of youngsters being trained free.



636

U. S. Marine Corps, Official, Sgt. Curt Glass

Grin and Gift Span the Language Barrier Between U. S. Marine and Korean Orphan

Men of the 1st Marine Aircraft Wing took over the support of this orphanage at Pyongtaek, 40 miles south of Seoul, and spent precious off-duty hours baby-sitting with the children (page 640).

637 U. S. Marine Corps, Official, T. Sgt. D. F. Ball

Airlifted from the Fighting Zone, These Anxious Orphans Expected Marines to Eat Them

When Marine Aircraft Group 12 learned that a band of homeless and half-frozen children was stranded close to the front in January, 1952, the men flew in and picked up 50 ragged, shivering kids made fearful of Americans by Red horror stories. When they arrived at Kangnung, the small passengers stared dully at toys and refused to eat. Persistent kindliness convinced them their rescuers were not cannibals (page 649).

He had to be pulled bodily out of a hot shower. He saw every movie that came to our area and became convinced that all Americans either rode horses or drove Cadillacs, held up banks as a matter of course, and peppered each other with six-guns on the street.

It was inevitable, I guess, considering my job, that Kim should develop into a "shutterbug." I got him a simple camera, salvaged some slightly fogged movie film, and taught him to load the cartridges inside his sleeping bag. He was so excited he would rush to the tent door, shoot 16 exposures in 16 seconds, and return for more.

To Hongchon for Christmas

When he calmed down and learned something about composition and lighting, he did pretty well. In fact, he often outshot our official photographers, because he could work his fellow Koreans into more natural-looking poses than any tongue-tied Yank could engineer.

Kim wasn't particularly homesick, but as the Christmas season rolled around he began to get itchy feet. So I decided to surprise his family and take him back to Hongchon for the holidays.

This meant presents, of course. Not electric trains or neckties or perfumes or lingerie; they don't have department stores along the front. It meant bird-dogging around the quartermaster section, where Marines going home on rotation discarded their worn-out fatigues. It meant arguing some friends out of a set of long-johns and a greasy parka. It meant saving up my PX ration of chewing gum and chocolate.

Finally, though, we had our sleeping bags loaded with loot, I got a pass, and we started hitchhiking south (map, page 653). A Marine pal of mine gave us a lift as far as Inje. Then we thumbed an Army supply truck heading for an engineers' dump.

Snow was drifting down, as usual, and tanks had churned the roads into gumbo. But

638

U. S. Air Force, Official

The Kid Who Walks Alone: War's Little Old Man Ascends the Ramp to a Rescue Plane

When China's armies were threatening Seoul in December, 1950, the United States Air Force diverted 15 cargo planes to "Operation Orphan Annie" and ferried this abandoned youngster and a thousand others like him to safety on Cheju Do (Island). Next year the airmen flew back with lollypops, rice bowls, and Christmas trees (page 652).

the rumpled mountains looked as serene as ever. I heard Kim muttering something, and, when I asked him to translate, he quoted me some lines that went about like this:

From the door of my house I count
three mountain peaks.
The long road thither is the road of
my desire.
Often at dusk their voices call my
name
And love flows down to me from
those far heights.

For most of the five-hour trip through the hills and battered villages, Kim concentrated on the harmonica my wife had sent him for Christmas. He was trying to play the Marine Corps song. He made a hash of it, but he kept trying.

It was dark when we pulled into the courtyard of Kim's home. After the family's house in Hongchon proper had been demolished, they had moved into a farm building 14 miles northeast of the city. I could spot the dull gleam of a candle; otherwise the place looked dead.

It came to life with a bang when Kim flung open the door and yelled that we were here. More people boiled out of the house than I had thought were in the whole village. While his sister and the servants danced around him, and everyone had a good cry, Kim's mother took his face in her hands and stared at him as if she wanted to memorize every line in it. She hadn't seen him for six months, and I guess she had wondered whether she ever would again.

639 T/Sgt. Robert E. Mosier, USMC

Kim, the Author's Friend, Wears an Indelible Grin

Infatuated with all things American, Kim especially enjoyed steaks, cowboy movies, pin-ups, hot showers, and photography. Able to cajole fellow Koreans into natural poses, he sometimes obtained pictures superior to Marines' official efforts. Here he practices with Sergeant Mosier's old camera (page 635).

I was introduced by Kim as, apparently, some kind of cross between Santa Claus and Abraham Lincoln. At any rate, they all started bowing and kowtowing to me, and I stood there feeling like a freak and wondering if I should bow back at them. But Kim's grandfather seemed to have a little more savvy; he came up to me and shook hands.

A Party To Be Remembered

That broke the ice a bit. Kim's good-looking sister plopped down and unlaced my boots. His grandmother cleared a place for me on the rice mat, and a servant rushed off for a hot drink and some food (page 657).

It was quite an evening. If they thought we were little tin gods when we first appeared, empty-handed, they were ready to elect us mayor and president respectively when we lugged in our sleeping bags and unloaded our presents.

I've never been backstage at a musical comedy on Christmas Eve, but this was a bit the way I imagined it would be—everyone shrieking, laughing, peeling off one costume and trying on another, passing food and little cups around, singing snatches of carols, and generally lifting the lid.

The fit of the clothes they picked would have made any tailor strangle himself with his own thread. Kim's sister fell for a Marine dungaree jacket with USMC on the left pocket; it came down to her knees. His grandfather, whitebearded and dignified in his native dress, looked a bit weird in the fatigue cap he selected. But nobody cared.

As the party picked up speed, more and more villagers kept trickling in. The kids romped through the sort of rummage sale we had set in motion. The old gentlemen squatted gravely against the wall, puffing on their little bamboo-stemmed pipes. Since few of the Marines I knew smoked pipes, I had been able to get hold of a good many tins of tobacco from the PX, and now I doled them out.

When all the clothes had been pawed

through, we produced American magazines. In two minutes the grownups were playing cut-it-out-and-paste-it-up. The men went for the pictures of chromium-covered cars, complicated farm machinery, and bathing beauties. The women gawked at the automatic electronic gadgets in the spotless, fancy kitchens.

Both men and women were bowled over by photographs in color of Iowa cornfields and plains of Montana wheat. Korea is so hilly that if you set a marble down anywhere in it, I don't think it would stop rolling till it plunked into the sea. The sight of those vast flat spaces in America was, in a way, more impressive to Kim's folks than any shots I could have shown them of factories or cities or stacks of dollar bills.

A picture that especially appealed to the women showed an American man wheeling a baby carriage with one hand and carrying with the other a big bag of groceries, while his wife pranced along beside him holding nothing heavier than her purse. The female chatter over this revolutionary scene came to a dead stop when Kim's grandfather (the big boss, as in any Korean household) strode over and asked what all the fuss was about. The women turned the page, quickly.

The party broke up about midnight. Neighbors and family members drifted away until only Kim and I were left to occupy the living room. We stretched out our sleeping bags and turned in, our heads pillowed on rice bags.

Sleeping on Stove-heated Beds

The stone floor slabs, heated from beneath by the exhaust from the sunken cookstove, had been so hot earlier in the evening that I had had to requisition a cushion to insulate the seat of my pants. Now they had cooled to a pleasant warmth.

As I dropped off to sleep I could hear some of the village kids still singing. The words were Korean, but I recognized the tune. It was "Silent Night."

When I woke around 8:30, I found my dungarees had been not only washed but starched and pressed to a knife-edge. What's more, Kim's mother, noticing that my trouser cuffs drooped over my boots and picked up the mud, had inserted elastic bands to make them fit snugly and dry.

Kim's sister brought us a pan of hot water, and, after we had washed, a bowl of rice. My first efforts with chopsticks landed a big wad of rice in the lap of the grandmother. She thought it was the funniest thing that had happened since she saw me try to squat and tuck my bony knees and feet under the little low table they dined from.

I had trouble with another Korean custom, too. It was easy enough for Kim's folks to slip off their soft shoes when they entered the house. It was another thing for me to unlace my big boots every time I came in and to lace them up when I left, particularly when the grownups kept calling me inside to talk and the kids yelled to me to come out and play.

They gave me a good time, though. I felt almost as choked up as Kim when we had to say good-by and hitch our way back to the front lines. Kim's grandfather made a little speech about how grateful they were, and all that. I'm not going to repeat it, but I haven't forgotten it; it was the kind of thing you wouldn't mind having for an epitaph, if you have to have an epitaph.

I thought about that matter of gratitude as we rode north. The Koreans I'd met had been really surprised at the kindness our troops showed toward their kids. Not that they don't like their own children, but their sympathy tends to dwindle at the limit of the family circle.

Reds Stoned Hungry Children

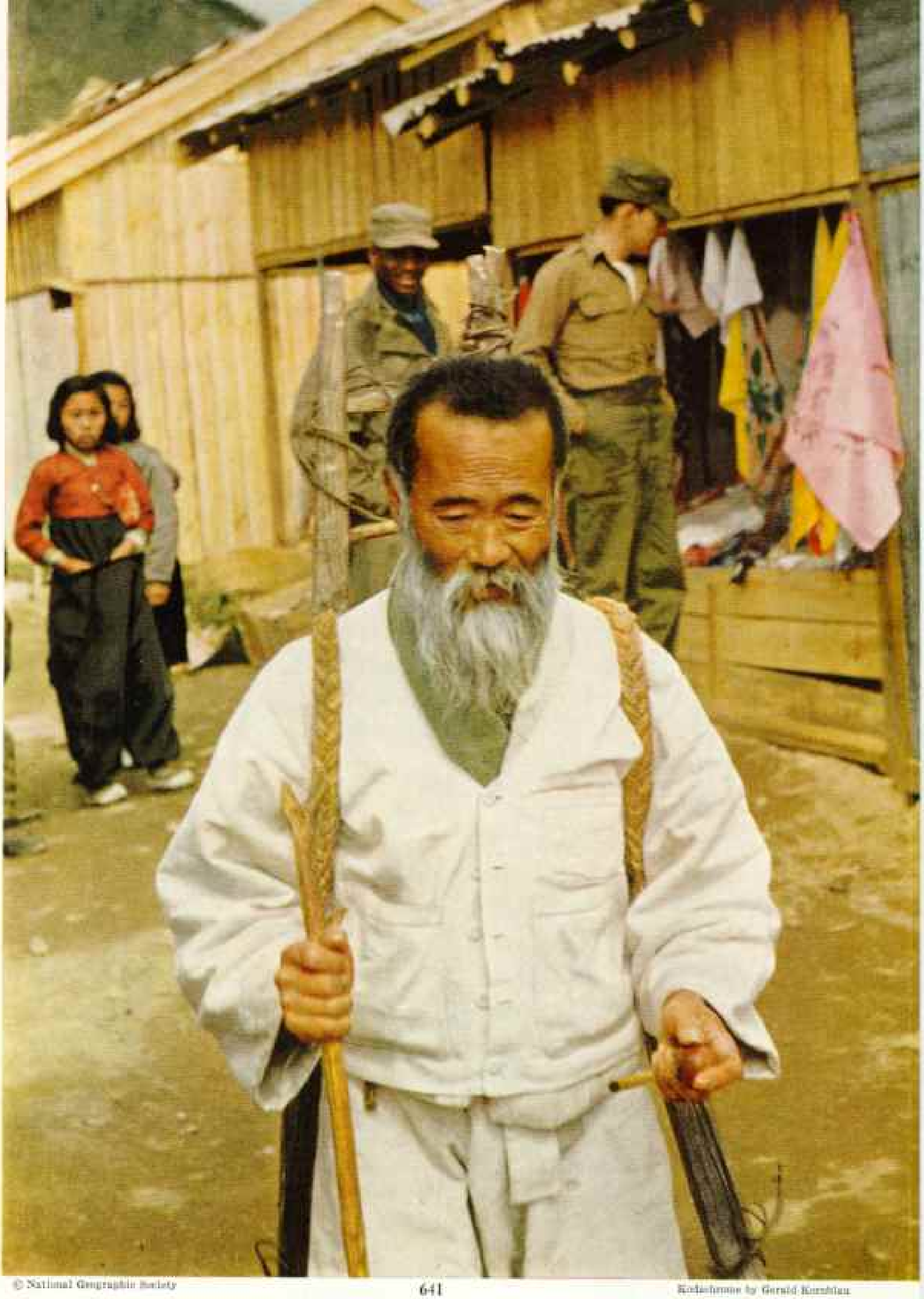
Moreover, they said they'd seen the Chinese Red soldiers either ignore or shy rocks at youngsters who tried to beg food from their company messes, and they expected our men would act the same way.

My work as a photographer had taken me around a good section of the forward areas, with Marine infantry regiments, tank and weapons companies, and rocket teams, Korean Marine units, and Navy medical sections. I'd seen what the Marines had done for Korea's kids, and I'd heard or read about the work of the other services. I guess they weren't doing anything that GIs haven't done in any country they've fought in; but, all the same, it made me feel pretty good to be an American.

A lieutenant with the 11th Marines—Harry L. Gary—took one look at the goose-pimpled, ragged kids around his base and wrote home to Springfield, Missouri. Inside of 12 days his aunt and uncle and the local newspaper had put on a clothing drive and begun shipment of about three-quarters of a ton of sweaters, shoes, gloves, and things like that.

A fellow with the 1st Marine Aircraft Wing, M/Sgt. John Cain, began to chip in part of his pay to send some Korean kids to school. When Cain was shot down over North Korea, the rest of his squadron took over the job. Now they have 20 kids in school and are trying to build a new one to house 100 more.

The wing as a whole didn't do so badly, either. By the time I left Korea, it had collected more than 100,000 pounds of clothing from home and had passed it along to some 2,000 orphans and hundreds of refugees (page



Kodachrome by Gerald Kunhlau

An Elderly Carrier Faces Korea's Future with Faith and a Strong Back

Scarcity of vehicles and animals forces much of the country's freight to move by man power. This porter needs but a few cupfuls of rice a day to carry a weight equal to that of the two GIs inspecting scarves in Chunchon's market.

War's Steam Roller, Which Flattened So Many Korean Towns, Left Sokcho-ri Untouched Beneath the Taebaek Range

This east coast village near the 38th Parallel depends on its fleet for the fish and dried seaweed which comprise most of its meager diet. These children, enjoying a rare recess from household tasks, have laid out a playing field for their version of hopscotch.

These Grave Eyes Have Looked Upon Three Years of War

Korea can claim just title to a sad superlative: it is the most devastated country of modern times. War's surge and ebb have left ruined rice paddies, gutted factories, charred villages, 3,500,000 refugees, and 100,000 homeless orphans.

To American servicemen, the most pathetic victims are children—the almond-eyed, pickaback babies; the toddlers with hunger-defined, radiatorlike ribs; and the swarms of grinning, half-starved "shoeshine boys" always on the prowl for a job, a C-ration, or a stick of gum.

← The boy, who carried a 40-pound load of brush on his A-frame, illustrates the U. S. Marines' habit of outfitting any child in sight. His hat is dungaree; his jacket (of Korean style) is cut down from a Marine poncho.

→ The girl, in Sunday best, wears her hair in bangs. In adolescence she will let it grow into pigtails. As a wife she will put it up in a bun. Her home is the Kimpo peninsula, near Seoul.

Kodachromes by
T/Sgt. Robert H. Masler

Chunchon Residents Salvage the Foundations of Tomorrow's City from War's Dusty Rubble

This place saw heavy shellfire before United Nations forces recaptured it in May, 1951. The woman's headpad will cushion her tub of bricks.

Outdoor Oven Floods an Entire House with Central Heating

Americans serving in Korea discovered to their surprise that radiant heating was not as modern as they supposed.

Koreans have long built even their humblest houses so that the heat and smoke from the sunken outdoor cookstove pass under floors to double chimneys on the far side of the dwelling. A breakfast fire keeps the floor comfortably warm until noon.

Cooking is only a fraction of the Korean woman's daily duties. From dawn until late at night she sews, washes, irons, cleans, carries fuel, and works around the farm or in the shop. Yet she rarely owns even a name; men refer to her merely as the wife, daughter, or mother of some male. She eats after her men and in a different place.

This woman, who stirs fire under her bricked-up rice pot, could maintain her squatting position for hours if she didn't have so much else to do. She lives near Kanghwa.

Kodachromes by Gerald Kerstlau and T/Sgt. Robert H. Mosier

^ The 38th Parallel: Where North Korea Meets the South

An artificial boundary set by the big powers in a postwar settlement divides Korea at the world's best-known and bloodiest parallel: the 38th.

Here the line passes just north of Chunchon, toward which the Pukhan River coils. Flat lands in distance are broken by a small, steep hill. American flyers, annoyed by the way this bump lay athwart their approaches to Chunchon's airfield, called it "Unnecessary Mountain."

<- Pukhan River Gets Clothes Whiter

Most GIs in Korea send their wash to "mama-san," the nearest laundress. She boils the clothes in a tin tub by the riverbank, beats them on a rock with a stick; rinses, beats again, and rinses once more.

Since Korean soap is usually made with a generous portion of fish oil, the soldier's shirt may be returned with an interesting aroma. Its buttons are likely to have taken quite a beating. But GIs agree that any laundry is better than one's own.

Here mama-san's boys get a bath in the Pukhan.

Kodachromes by Gerald Kunchlau

Kodachrome by Gerald Kordalau

Four Hundred Pounds of Flour Move by Korea's Chief Burden Bearer: Man

One reason United Nations airmen have been unable to cut the enemy's line of supply is that thousands of tons of food and ammunition jog down to the front each night on porters' backs. Carriers use triangular wooden frames to support loads far larger than they could otherwise balance. Resting, this man will ease the A-frame to the ground, prop it up with his stick, and wriggle out for a breather.

649

U. S. Air Force, Official

Young Cowboys, Just off the Korean Range, Relax with Roy Rogers

UN officials, scouring the war zones for homeless urchins, have deposited many in the south and on islands where children can get a fresh start in life. These sweaters and boots arrived in American gift packages.

636). On top of that, the men dug about $18,000 from their own pockets to buy food and put up orphanages.

Maybe you read about "Operation Kidlift." There were quite a few such lifts, actually, but the one Marine Aircraft Group 12 staged was typical. The group was near Kangnung, below the 38th Parallel, when the men heard about a bunch of Korean children stranded up in no man's land.

The UN civil assistance people were trying to evacuate them by truck, but, in the snow and over those mountains, the trip was taking about 12 hours, and some of the children were dying on the way.

The upshot was that the Marines got a green light to fly a transport up there. They picked up 50 dirty, half-starved kids so thin they had to stuff pillows around them to make the safety belts fit (page 637).

When the plane landed at Kangnung, the kids didn't want to get out, and when the Marines sat them down in front of some hot rice, they wouldn't eat. They'd been told by the Communists that the Americans liked to round up children, fatten them, and dine off them.

Marine's Mustache Helps Cause

MAG 12 finally convinced the youngsters that the Marines were more interested in becoming foster parents than cannibals. Then they began to gobble up their food and sing and play with the dolls and slingshots and wooden horses the Marines had improvised for them.

But the group didn't let it go at a one-day gesture of good will. The Marine airmen took on the support of the orphanage to which the children were sent, foraged for clothes, raised

International, Dave Cicero

Korean Hopes for Peace Rest on Eisenhower

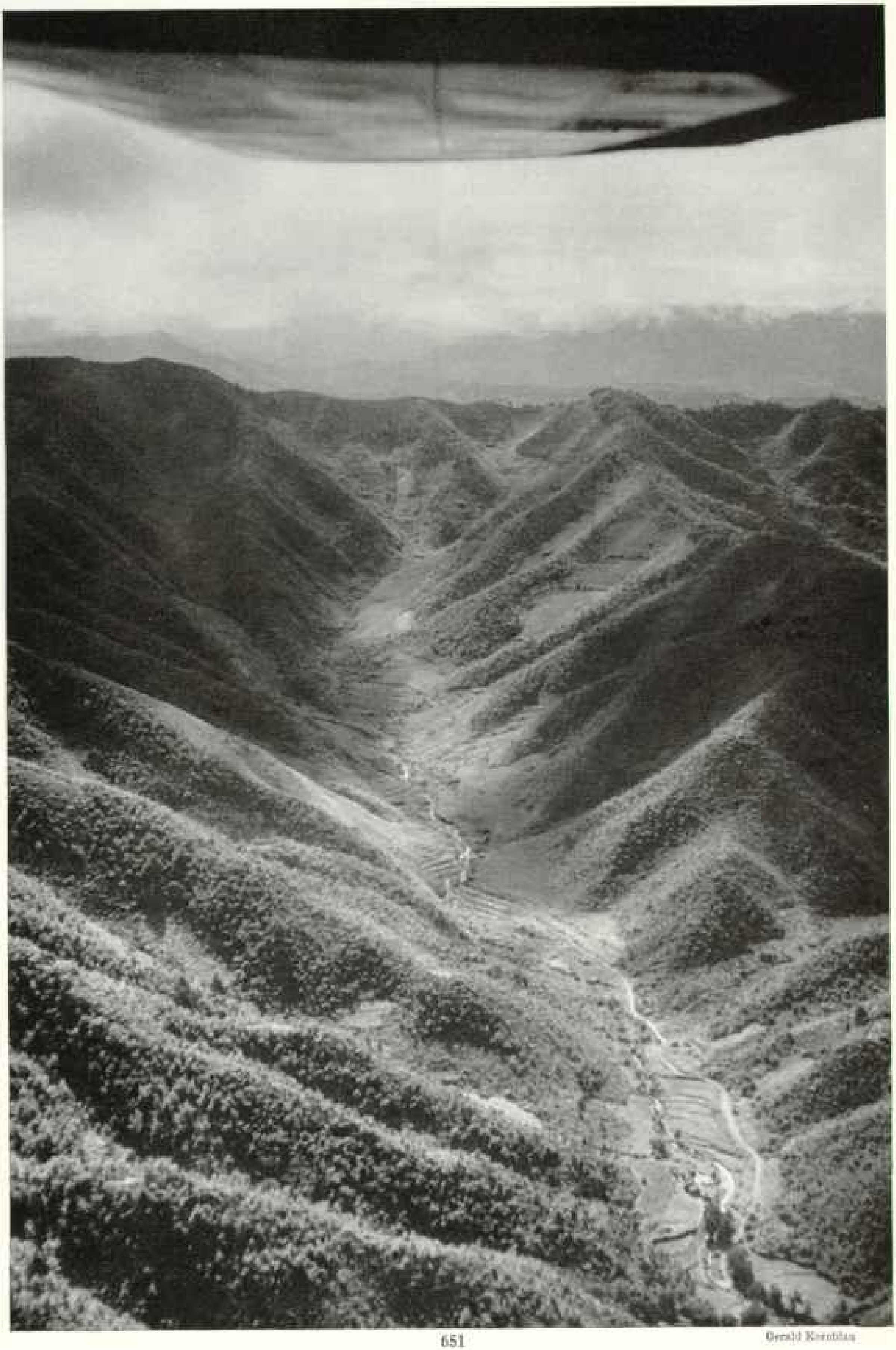
In December, 1952, Dwight D. Eisenhower visited embattled Korea to study the situation at firsthand. He conferred with UN commanders, met Korea's President, and visited troops in the field.

Republic of Korea officers, briefing General Eisenhower on a tactical situation, here use a sand map to illustrate the terrain.

← This Seoul schoolgirl hoped to greet the distinguished visitor, but was disappointed because security safeguards did not allow him to make an appearance.

➤ Some Korean valleys are flak-trapped. Communists stretch steel cables from mountain to mountain to entangle night flyers. Again, they rig dummy searchlights to simulate truck convoys, then machine-gun any fighter plane that dives in. This valley lies north of Kapyong.

Wide World



651

Gerald Kerrotilas

money (one Marine auctioned off in the States a picture of his 13-inch mustache), and even spent their few hours of leave time playing nursemaid, teacher, and back-scrubber. Two weeks later they went back to the front for another planeload.

This idea of seeing the job through is pretty well illustrated, I think, by Lt. Comdr. Dick Cleaves, who was chaplain of Marine Aircraft Group 33. When Cleaves helped to set up the Marine Memorial Orphanage at Pohang-dong, he took part of the money the Marines contributed and bought land which the kids themselves could cultivate. Kids were added only as fast as rice paddies could be bought. The orphanage consists now of six buildings and more than 5,700 pyong of ricelands (a pyong is 36 square feet).

These few instances, of course, don't begin to cover all that the Marines have done, formally or informally, for the children they've met. And the other services have been just as active. You might not think the Navy got ashore enough to know what the kids' needs were, but I can tell you what the men of one ship did, anyway.

They were serving on the carrier USS *Kearsarge*, and they decided that the children they wanted to help would be those who had had it roughest. So they picked out an orphanage set up in an old Buddhist retreat near Seoul, a place where soldiers brought kids abandoned along the battle line. For this little mission, run by American medical missionaries, they collected more than 1,200 pounds of warm winter gear.

Navy units tend to pass the word along from ship to ship. Another one that did a real job was the heavy cruiser USS *Los Angeles*. Its crew rounded up big donations of cash and clothing for 10 different orphanages and hospitals in Korea.

I wasn't in Korea at the time of the Air Force's "Operation Orphan Annie," but I've heard about it. It was organized in December, 1950, when the Chinese were pushing us back, and it looked as if Seoul would have to be evacuated.

In the retreat we had picked up hundreds of babies—some of them sitting beside their dead parents, others just lost and huddled in the doorways of bombed buildings or sleeping on piles of rubble (page 661). Plans were made to ship about a thousand off to a safe island by a South Korean naval vessel.

But the ship never showed up at Inchon. So the Air Force Combat Cargo Command stepped in. Though they had work enough to do in the scramble that was going on to regroup all UN forces, they somehow rustled up 15 twin-engined transports, crowded 70 kids into each flight, and flew them southward out of Kimpo Airfield (page 638).

It was lucky they did; at least 100 of the

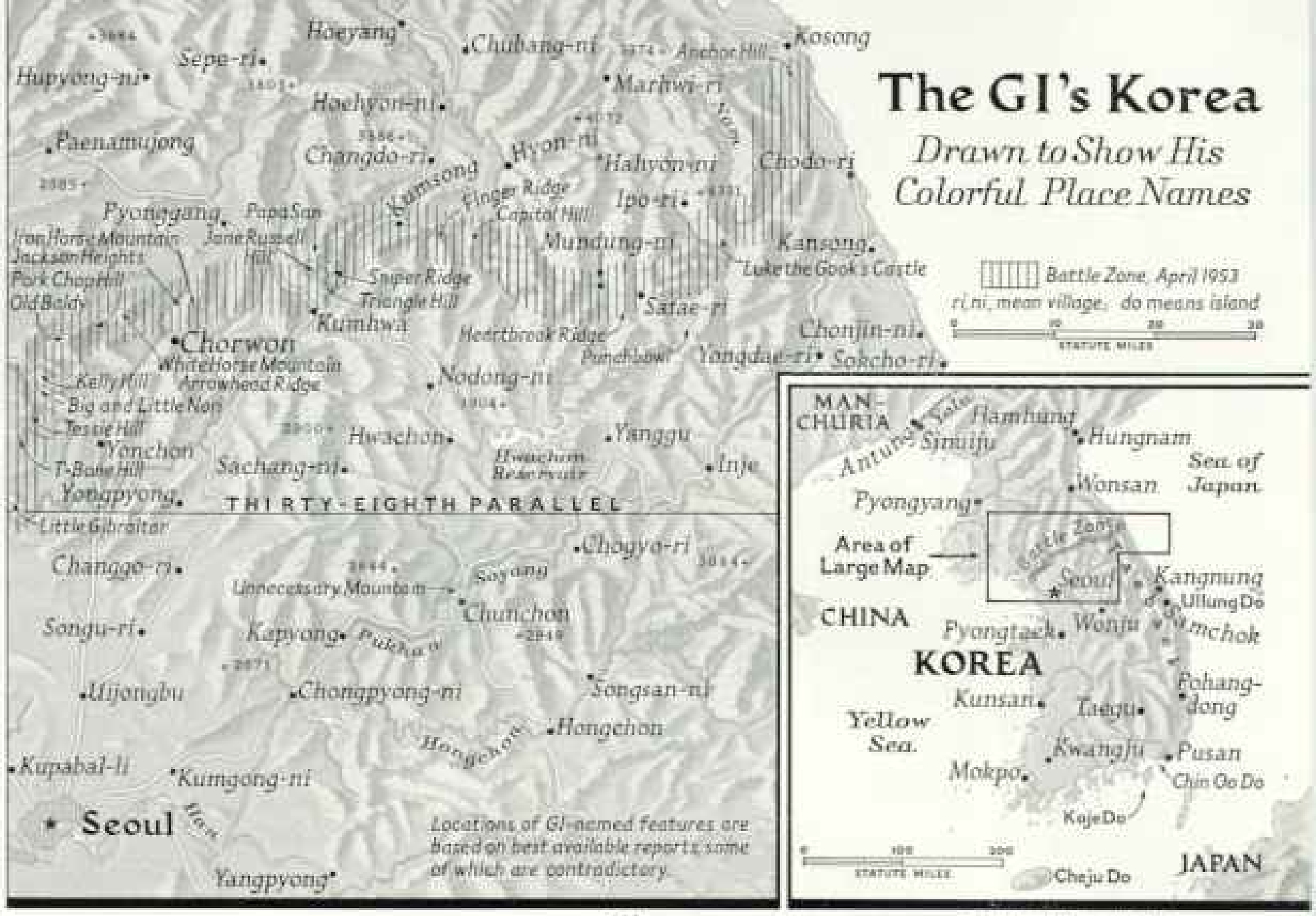
children were already too sick or weak to walk. The weather was freezing, and some of them had no more on than the straw sacks or thin rags they had been found in.

Airmen Return with Christmas Gifts

They arrived safely, though, and began life all over again on Cheju Do (Island). One thing that interested me was to read in the paper later that the airmen who had flown them in came back the following Christmas with a load (which they had paid for) of 2,000 lollypops, several Christmas trees, 1,000 rice bowls, 2,500 notebooks, 100 toothbrushes, and some sewing machines for the girls. Korea's "Orphan Annies" hadn't been forgotten.

What about the Army? All I can say is that whenever I picked up one of their newssheets in the field (anything from a blurry mimeographed regimental bulletin to a printed division weekly), I ran across accounts of clothing drives, fund-raising campaigns, building projects, and Christmas parties for Korean kids. Half the time items like that would crowd world news or battle stories right off the front page.

I remember particularly the job the 40th Infantry Division did at Kapyong, 36 miles northeast of Seoul. This little town wasn't exactly a cultural metropolis, I guess, even before the war. But when the fighting had whipsawed through it five times, it really be-



653

Orphan-making War Has Ebbed and Flowed Across Korea's Fateful 38th Parallel

gan to show signs of wear and tear. Most of the houses, in fact, and all of the schools had been thoroughly chewed up.

That hadn't stopped the Korean teachers and their kids. They used tents for classrooms. With winter coming on, however, they were facing some pretty chilly school days.

At that point the 40th Division stepped into the picture. Its commander, Maj. Gen. Joseph P. Cleland, conferred with Kapyong's officials about their needs. Then he went back to his own men and put it up to them.

Within three weeks the GIs in the 40th scraped up $14,000—and an architect. He was First Lt. Robert F. Van Hoef, and he designed a long, low, modern school building which could take care of 600 kids. He even drew sketches of an auditorium and outdoor pool that could be added later.

That may sound fantastically ambitious. But $14,000 can go a long way in Korea, especially if the labor is free. The people of Kapyong, short on money but long on energy, volunteered to perform all the manual labor and to provide the sand, stone, and gravel. They even set up a little sawmill.

The work wasn't all left to the men, either. They have Widows' Clubs in Korea, made up of women whose husbands were killed in the war. The local Kapyong chapter turned out, 150 strong, and unloaded the stone for the rock-and-cement foundation.

When the building went up, the townspeople had one last request. They wanted to christen it. And the name they picked for it was Kaiser—for Sgt. First Class Kenneth Kaiser, Jr., of Los Angeles. Why? Because he was the first man from the 40th to be killed in combat in Korea.

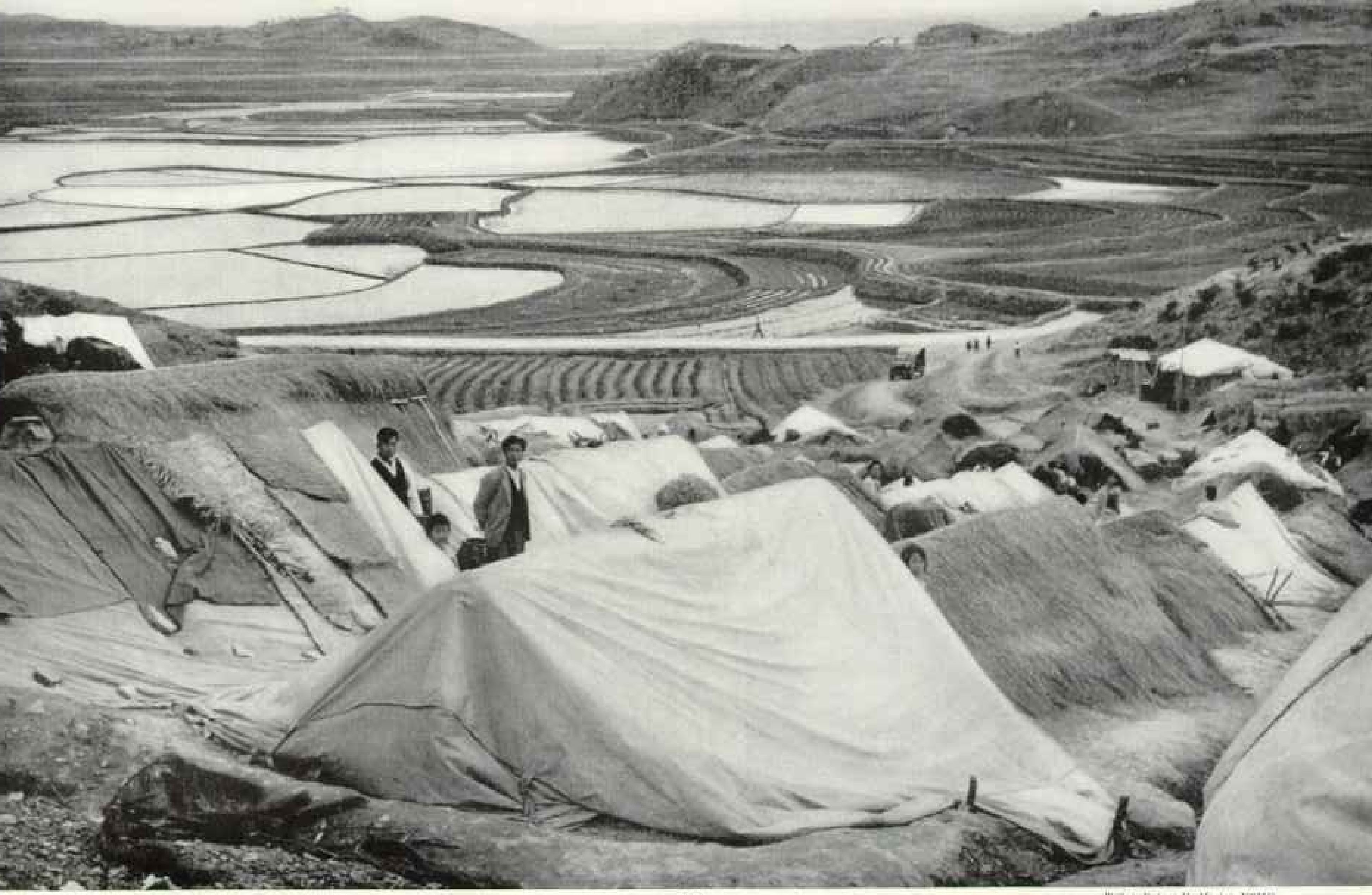
"Boys' Town" Comes to Korea

There's another project you ought to know about. That's the Children's Democratic Town on Chin Oo Do, off South Korea. It was set up by Lt. Col. John C. Keele, Jr., of the United Nations Civil Assistance Command, Korea, in the spring of 1951, when UNCACK was getting worried about the gangs of kids roaming the streets of Pusan, begging and stealing for their living.

Keele was interested in doing more for the kids than filling their stomachs—though that was a job in itself. He wanted to show them what democracy was all about, by having them live it.

The island he took them to was just a barren rib in the sea, so unimportant that nobody had ever bothered to name it. But the children did. They called it Chin Oo Do, which means "Island of True Friends."

Under Keele's guidance, the town's 190 boys and 30 girls organized themselves into a community run on the honor system. Each month they elect their own mayor, vice-mayor,



654

T/Sgt. Robert H. Mosher, USMC

^ 125 Refugee Families Work the Rice Fields in a UN Camp Near Munsan. Tarpaulins and Thatch Roof Their Cheerless Huts

v Uprooted from homes, this column of human misery loaded possessions on heads and shoulders and, together with a lone cow, sought haven in the Korean blizzard. Of Korea's 20,000,000 people, an estimated 3,500,000 have been dispossessed by war (page 656).

Department of Defense, from Field Reporter

and departmental officials. Each tent has a judge, and the island as a whole has a high judge. Twenty boys make up the police force.

They had a rough go of it at first. Their tents were unheated; their blankets were spread on beds of seaweed. Clothes were scarce and rations uncertain. Now these kids are trying to become more self-sufficient by growing truck gardens, raising poultry, and fishing.

They wouldn't have pulled through, however, without relief packages, and they've shown their recognition of it by naming their tents after the cities from which the gifts have come. Streets in Chin Oo Do form a kind of roster of UN charity—Washington, New York, Sydney, Bangkok, Jerusalem, London, Manila, Paris. . . .

Furthermore, the kids don't lose sight of the principles on which their town is supposed to be run. The lane up from the dock is studded with placards that read: "Absolute Honesty. Absolute Purity. Absolute Unselfishness. Absolute Love. No Hatred. No Fear. No Covetousness. New Man. New Country. New World."

A Big Drop in a Big Bucket

Quite an order. But the kids seem to think they can pull it off. At any rate, they've strung up a bell made of six shell casings. They call it the "Holy Bell of Change," and the inscription reads: "This bell changes everything. Things evil good; things good better. . . ."

These were hopeful things to mull over, jolting through the mountains on the long road back to the front. I knew we Americans were doing a lot, one way or another, to relieve the misery around us. Yet it still seemed a drop in the bucket. A big drop; but a big bucket, too.

The figures we usually heard put the number of Korean refugees at 3,500,000, the number of orphans at 100,000—this in a nation of only 20,000,000. If we applied the same ratio of disaster to our own population of 158,000,000, it would mean more than 27,000,000 Americans blasted out of their homes and turned onto the roads with not much more than a rucksack to their backs. Moreover, it would mean that those hordes of refugees would be pressing back upon cities and farms never really rich and now thoroughly ripped up by war.

Stacked up against calamity on a scale like that, our best efforts can't look like much. And I couldn't help wondering what will happen to Korea's children when the Marines and the GIs and the other troops pull out—a day that will have to come sometime.

It came for me in July of last summer. Our division was ordered to Munsan, and the commanding general passed the word down that all Korean civilians not essential to military operations would have to retire to the rear areas. That meant Kim, among others.

Kim could have returned to the refugee camp where I had found him. But it had no school, and we both agreed that school was what he needed most. So I fixed him up with some money, clothes, odd bits of gear, and candy, and put him in charge of a friend in the motor-transport pool who would drop him off at Hongchon. We said good-by.

As it turned out, I could have saved my breath, because Kim was back in a week. He said he was sticking with me for good.

"What about the general's order?" I inquired.

"You take me to general. I explain him."

I wasn't exactly on those terms with the general at the time, so I told Kim he would really have to go home. He cried. I came fairly close to it myself.

In the end, though, he went, clutching a three-cell flashlight and a watch which I couldn't help giving him. But he wasn't looking at the presents as he left. He was looking at me. Sitting up in the cab of the six-by-six, he suddenly seemed very small and very young.

I never heard from Kim again. I didn't give him any forwarding address, and I didn't write him. He had his own life to take up again, among his own people, and I figured it would only sidetrack him to keep alive his hopes—the hopes almost any Korean kid has—of coming to America and living in the miraculous steel-and-chromium world of the illustrated magazines.

This Much Will Remain

Will Kim remember me? Will the Korean people in general remember the GIs whose job it was to break and smash and burn things, but who tried to mend what they could and to blot the tears off at least a few grimy cheeks?

When all is said and done, I think the Korean children won't forget us in a hurry. I came across a letter, once, written by the children of an orphanage near Inchon to the crew of the USS *Los Angeles*. It says, in its own odd way, what I believe a lot of Koreans would like to say:

"This civil war have made plenty of poor orphans who are lost their parents and warm cradel, they were wandered on the cold street during cold winter night, but now this orphanage fortunately have men like you who are very kind helper in the world especially UN force. We have feeling very thankful day and night."

Patient Women Grind Corn by Hand Near Hongchon

Like many an American Marine, the author hired a Korean houseboy and soon came to regard him more as son than servant. Christmas Eve found them journeying from the front for a surprise party at Kim's home, 14 miles northeast of Hongchon.

For gifts Kim and his sergeant brought presents beyond price: cast-off Marine clothing, chewing gum, candy, illustrated magazines, and pipe tobacco. Everyone tried on everything, regardless of size, and dissected the magazines for pin-ups.

Men's first choice among the color photographs fell to sleek cars and farm machinery. Women chose, with squeaks of incredulity, illustrations of labor-saving kitchens and suites of furniture.

↑ Kim's grandmother feeds corn into the grinding stone. His sister pours in water and helps to spin the heavy disk. The big iron pot will steam the grist. American newspapers serve as wallpaper.

↓ Vendors squatting in the market place at Chunchon read, gossip, and scan the horizon for a customer. Ice cream is advertised; a watery sherbet is sold.

Kodachromes by T/Sgt. Robert H. Mosier and Gerald Kornblau

† **A Marine Tank Digs In on a Frozen North Korean Ridge for Direct Fire into the Enemy's Positions**

Men of Charlie Company, 1st Marine Division, dug this outpost near Changdo-ri and gouged the snowy terrain to keep tank treads from slipping. Then they fired 90-mm. shells at Communists concealed in the distant hills, and tossed out the empty cases (foreground). Soon they will lay sandbags to lessen the impact of incoming "mail" from the foe's batteries. Their mobile forts are capable of quick getaway in an emergency.

Koreans prize their few cattle highly. Most farmers prefer to load their own backs rather than tire oxen needed for plowing (page 648).

Kodachromes by T/Sgt. Robert H. Stotler and Gerald Kornblau

Line Forms at Right for the Morning Scrub at Hwachon

Koreans, who love their children deeply, were astonished to see U.S. servicemen take a benevolent interest in them. They noted that enemy Chinese protected their rations by flinging rocks at small, hungry foragers, while American GIs gave them —literally—the food in their mess kits and the shirts off their backs.

Army, Navy, Air Force, and Marine units have set up or supported orphanages, organized airlifts to rescue battle-trapped children, and pressed their stateside families into sending food and clothing for refugees.

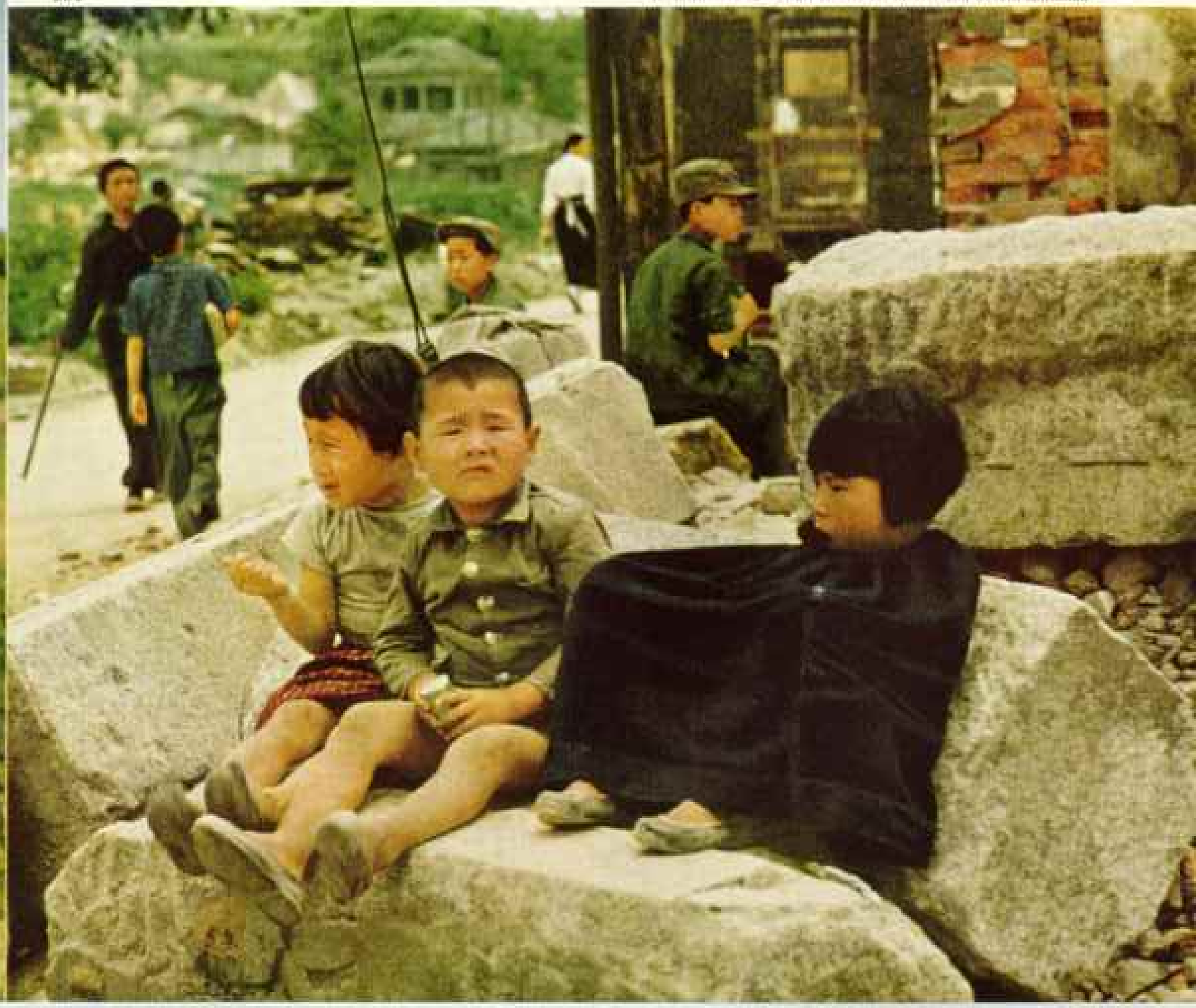
Korean girls early in life are saddled with the responsibility of carrying younger brothers and sisters. Upper-class Koreans in prewar times kept girls in strict seclusion within the family compound. Such isolation led them to invent their bouncing-board game—a seesaw on which they jumped high enough to peep over the courtyard wall into the world outside.

Chunchon Children Seek Security in a Bank's Tumbled Blocks of Granite

United States forces have repeatedly rounded up Korea's wandering moppets and found havens for them. But each new day adds fresh recruits to the army of the homeless.

← A cloth band around the waist links mother and child in Tongjin. Hands gripping a shopping bag support the youngster's southern exposure. A Marine's discarded winter underwear peeps from the woman's sleeve.

Kodachromes by T/Sgt. Robert H. Moster and Gerald Kornblau



Marines Resting from Combat Hear the Songs of Home

Red drapes stretched between trucks form a backdrop for a USO show near Pyonggang. Marines, living in a world of drab khaki and green, get a thrill out of the entertainers' bright costumes.

Though these men of the 7th Regiment have gone into reserve, many still clutch rifles, for enemy infiltration is uncomfortably possible.

Napalm Swathes an Enemy Bunker in Liquid Fire

This 1st Marine Division flame thrower penetrated the front line near Chang-do-ri. It was accompanied by infantry to clear out any rocket or grenade teams hidden by the rough terrain. The bunker, which proved to be unoccupied, was saturated with enough flame to asphyxiate defenders by devouring all oxygen within the chamber.

When the last tank and infantry team assaults the last enemy emplacement, Korea will face a task almost as onerous as war: reconstruction. Property damage in North Korea is incalculable; in South Korea it has reached an estimated $1,500,000,000.

For relief and immediate economic aid, 34 of the United Nations have sent Korea more than $580,000,000 in food, clothing, medicines, fishing nets, coal-briquetting machines, raw materials, and school supplies. The United States contributed the bulk of these donations. Eleven other nations have pledged assistance.

Meanwhile the fighting goes on. Even on days when the communiques are skimpy, tank-infantry patrols push into the hills on dangerous and lonely work.

Kodachromes by
T/Sgt. Robert H. Mosier

Kodachromes by T/Sgt. Robert H. Mosier

War or No War, Man and Beast Must Go On Tilling Korea's Rice Fields

Plagued by periodic droughts, Korea does not offer ideal conditions for rice culture. However, Japan's former occupation forces converted much of the land into irrigated paddies; so today rice remains the dominant crop.

Above: A bull, guided by nose rein, drags a harrow, leveling the paddy and mixing fertilizer.

Below: Farmers, growing rice seedlings in special plots, yank out clumps, tie them with straw, and flip them aside for transplanting. Marine dungarees outnumber native garments here.

India's Sculptured Temple Caves

By Volkmar Wentzel

National Geographic Society Staff Photographer

With Illustrations from Photographs by the Author

AJANTA, I read, "is the most ancient and priceless art heritage handed down to India." And Kailasa Temple at Ellora, the "noblest Hindu monument of ancient India," is man's idea of a god's heaven.

Such descriptions, read as I traveled to India, helped to prepare me for an assignment by the National Geographic Society to photograph those extraordinary shrines in the State of Hyderabad. Months later, gazing upon carvings and frescoes, I understood why Ajanta and Ellora had evoked such praise.

Both religious centers were carved with infinite patience from the living rock. Monks, priests, and laymen worked by sun and torchlight for more than a thousand years on 60-odd temples and halls.

Frescoes Picture Ancient Life

Ajanta monastery was settled two centuries before the Christian Era, when followers of Gautama Buddha retired to that lonely precipice. There with mallet and chisel they dug into the rock and hollowed out nearly 30 temples and dwelling halls. On the walls and ceilings they painted exquisite frescoes portraying the life of ancient India.

In the 7th century the Buddhists mysteriously abandoned Ajanta to the jungle and moved to a hillside near Ellora, 50 miles away. Hindus and Jains joined them. During the next 200 to 300 years, the three sects carved another 30-odd temples.

I drove up to the Ajanta guesthouse at twilight. Leaving my Sikh assistant, Jai Singh, I walked off alone to see the temples before darkness closed in.

Soon I stood in the sweeping crescent of the wild Waghara River, gazing at a cliff that rose a sheer 250 feet from the stream bed (page 668). My eye was caught by four rock-hewn temples with cyclopean-eyed windows (page 666). Connecting them, massive columns marched 2,000 feet around the river bend. Behind those pillars lay the dwelling halls of monks who attended the temples.

As I strolled the path beneath the porticoes, I could imagine the bygone Buddhist monks walking as I walked, meditating, chanting prayers, and teaching students.

Visiting a monks' hall, I trod paths worn in the stone floor by the feet of countless pilgrims. I paused before shrines which showed Buddha in life (page 667) and in Nirvana (page 670). I explored cubicles where austere monks had slept on stone beds and pillows.

But it was not until the next day, when Jai set up lights for my cameras, that I noted Ajanta's artistic triumph—the frescoes. Color still glowed from painted walls; flowers a thousand years old sparkled like jewels. Vivid figures seemed to move with life. Gift-bearing ladies served godlike kings. Dancing dwarfs sang carols and played musical instruments.

But time had exacted a heavy price. The frescoes bore the marks of moisture, insects, and bats. Shellac, applied by restorers after Ajanta's rediscovery by British soldiers in 1819, had harmed rather than helped.

Later I spoke to an Indian friend about the tragedy of the paintings.

"Yes," he agreed, "much has been lost, but much has been won, too. The Ajanta frescoes, tattered as they are, have inspired a new school of art in Calcutta."

Visiting Ellora, we were guided by Livingstone M. Bhaktul, resident archeologist.

"During World War II," Mr. Bhaktul told us, "your American GIs came to Ellora in such droves that we had to put them up in tents. Our cook worked overtime preparing hundreds of box lunches. But the Yanks were nothing new, for Ellora has had sight-seers 13 centuries. Unlike Ajanta, it was never lost."

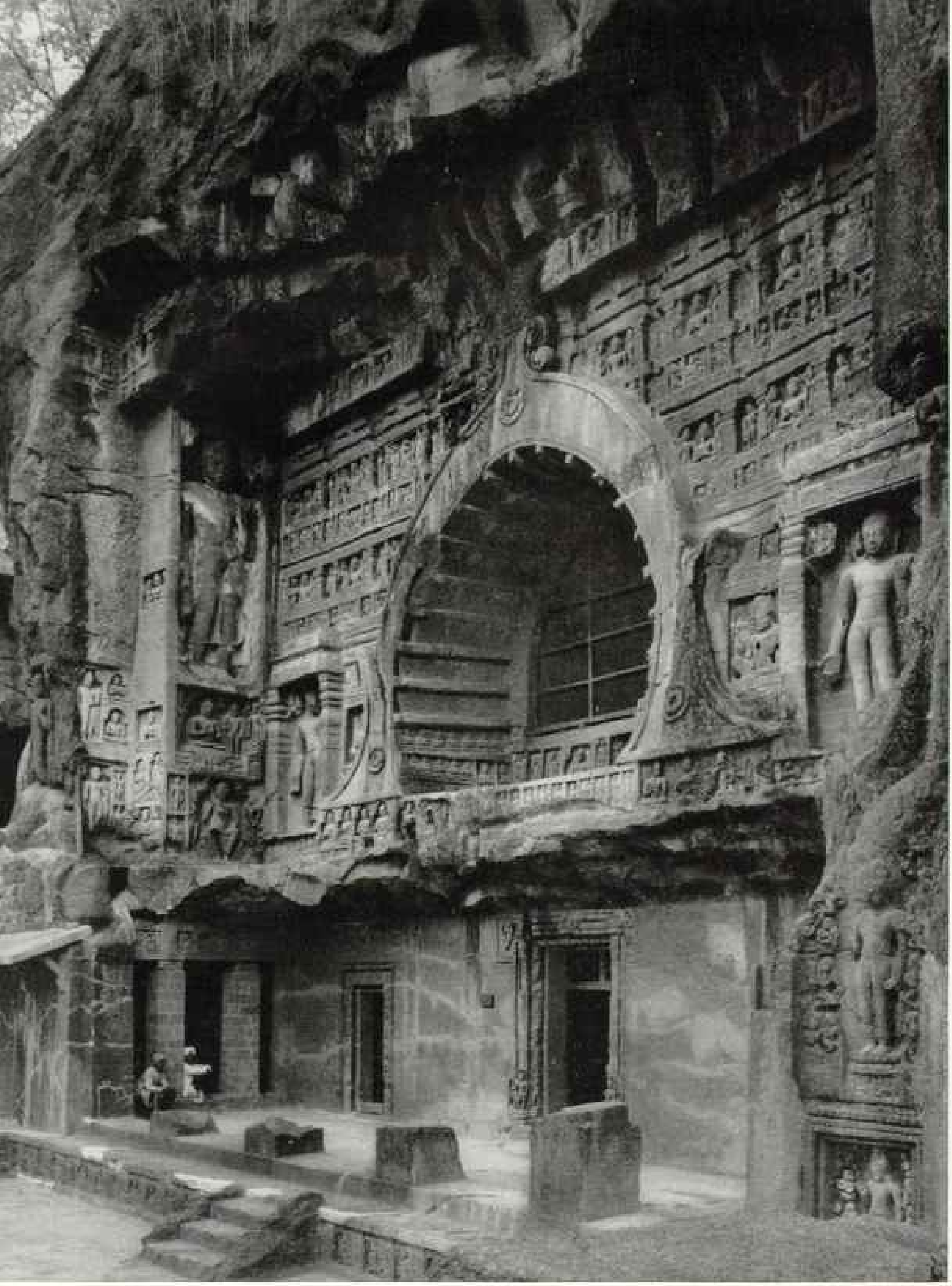
Ellora's temples stand out above a broad expanse of rolling hills. First the Buddhists dug out enormous halls; then Hindu and Jain sculptors fashioned temples next door. Under the talented Hindu artists, Indian sculpture reached a golden age. Their graceful and imaginative female figures have rarely been equaled (illustrations on following pages).

Dream of Heaven Endures

We saved the god Siva's Kailasa Temple to visit last (page 672). I had expected much; I discovered more. Accustomed to stone blocks and mortar joints, I found it hard to believe that not only the great temple itself, but obelisks, life-size elephants, and dancing gods were all carved in one piece. Quarrymen, starting work from the top of the cliff, laid bare a huge monolith for the sculptors.

"We estimate that the job took more than 40,000 stonecutters excavating 200,000 tons of rubble," said the archeologist. "Then the artists went to work. Finally, plasterers covered the temple walls and sculptures with a fine lime that shone as white as snow and glistened for miles away—a dazzling abode for Siva."

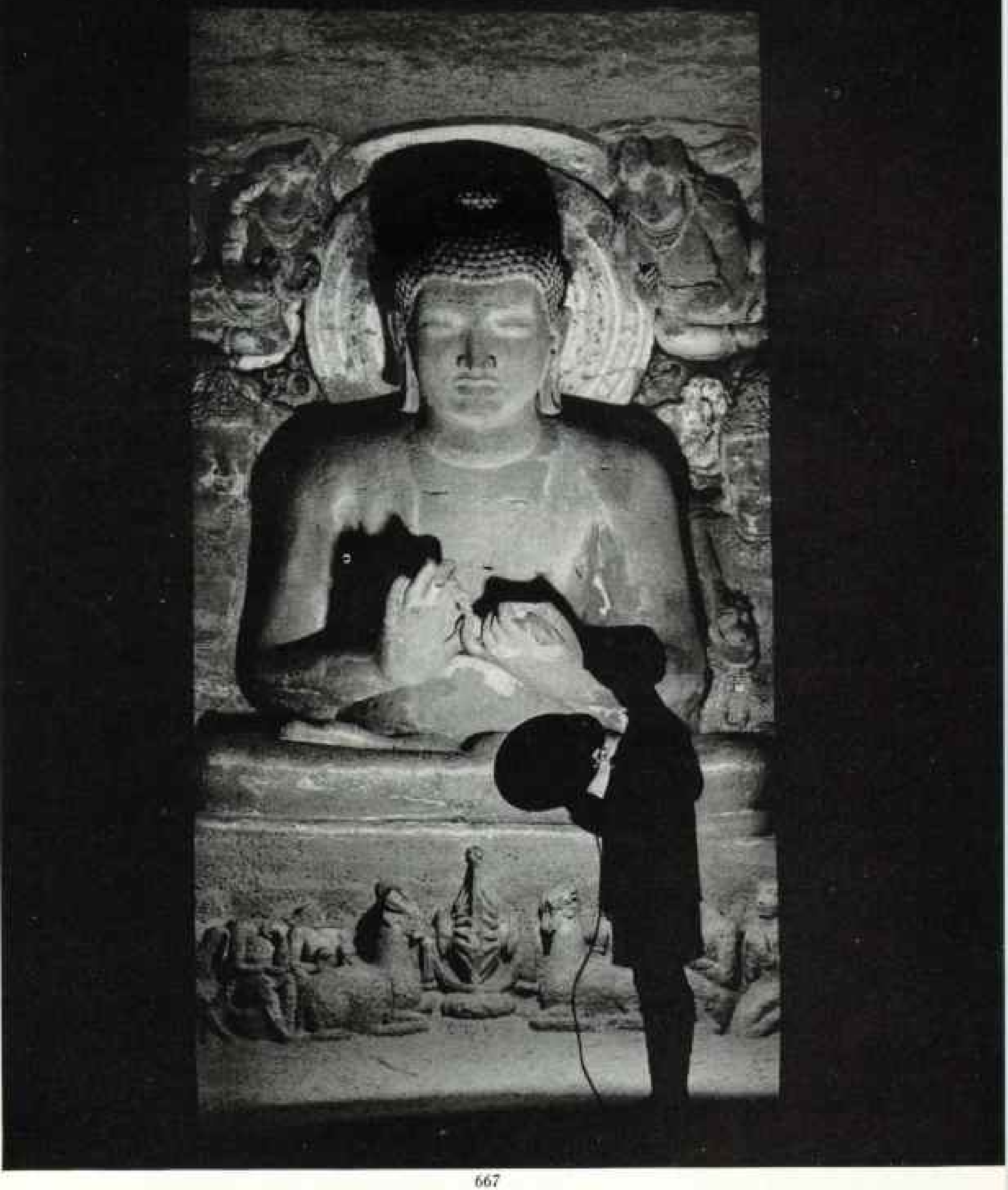
Plaster was peeling and statues had been chipped by image breakers, but the builders' bold dream of a god's heaven endured.



666

Buddhist Monks Carved a Jewel-box Façade out of the Living Basalt 1,400 Years Ago

Indian recluses two centuries before the Christian Era retired to a lonely canyon near Ajanta in Hyderabad. For the next 800 years they and their successors carved some 30 halls and chapels from the face of this cliff (page 668). When Buddhism declined in India during medieval times, the priests abandoned all their work to the jungle.



667

Buddha with Graven Gestures Symbolically Turns the Wheel of the Law in Ajanta

Forsaking a kingdom about 530 B.C., Prince Siddhartha set out as a wanderer in quest of wisdom. When enlightenment came, he went to Banaras' Deer Park to preach. Here, beneath the image, his first converts kneel beside two gazelles. They flank the Wheel of the Law, emblem of Buddha's doctrine. India retains the device on its flag.

668

Beetling Cliffs and Creeping Jungle Hid Ajanta's Temples and Halls Until British Soldiers Rediscovered Them in 1819

Swung in a half-moon along the wild Waghara River, this underground city housed a university. Monks and pilgrims strolled beneath the columned porticoes. Ajanta's carvings reveal the evolution of Buddhist architecture from the severe to the elaborate (page 666).

Colossal Buddha Broods in an Ellora Cave

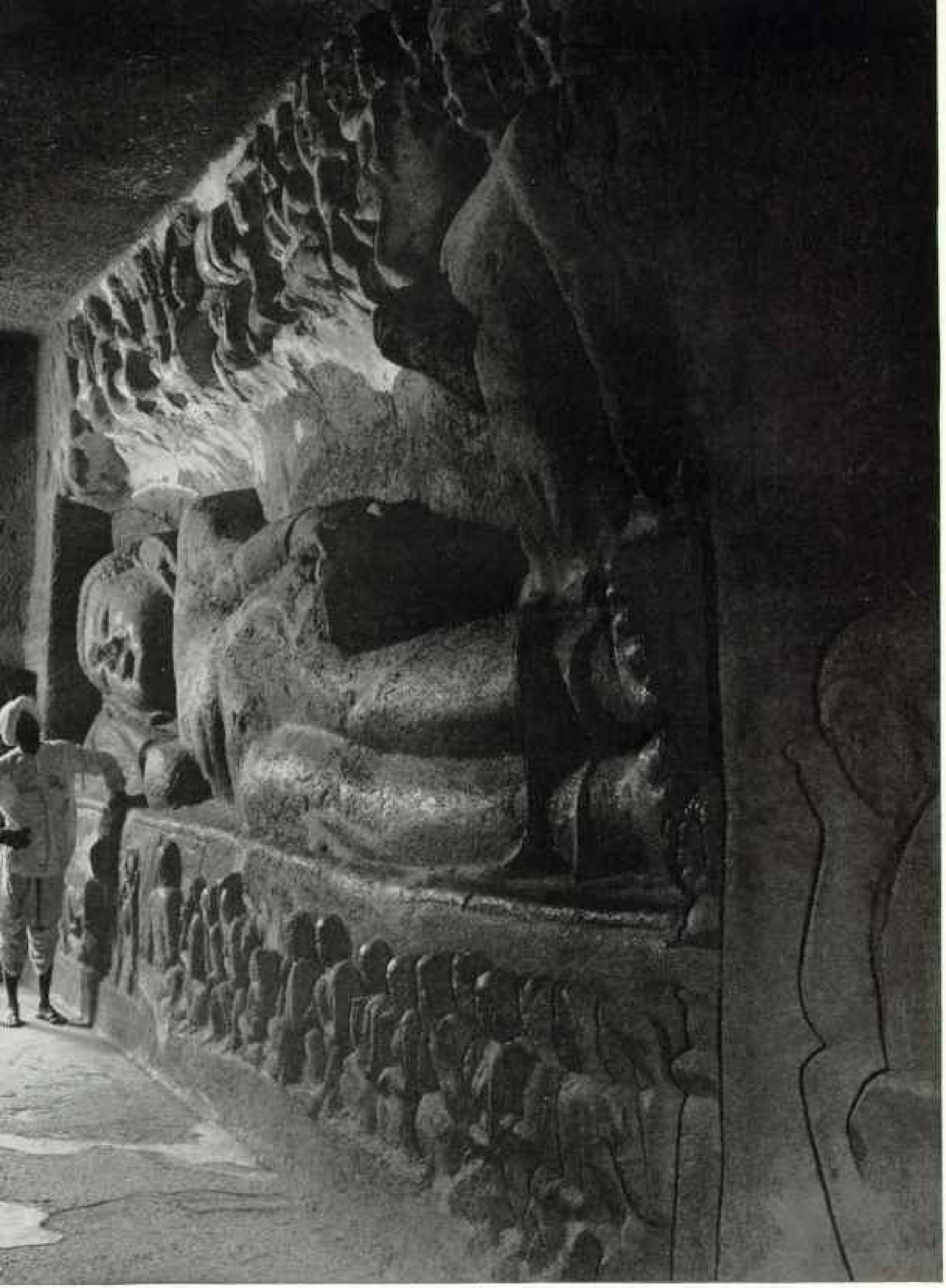
About 1,300 years ago a group of Ajanta artist-monks moved to Ellora, 50 miles southwest of Ajanta, and began carving fresh caves in a majestic cliff.

Ellora became a crossroads for India's religions. Hindus and Jains, an ascetic Indian sect, joined the Buddhists. All three groups left their stone gods carved in more than 30 temples and monasteries hewn out of rock. Ellora, unlike Ajanta, never became a lost shrine.

Although Ellora was begun by Buddhists, it soon became a major monument to the Hindu god Siva. In the end, Buddha was made an incarnation of Vishnu, another Hindu god, and the Master's religion was absorbed into Hinduism. Meanwhile Buddhism continued to flourish in Asian nations as far away as Japan.

This Buddha towers 11 feet in a monks' enormous hall. Haloed Bodhisattvas, beings who have entered the path of wisdom, protect him with sword and yak-tail fly whisk. These divinities will become Buddhas in a future incarnation.

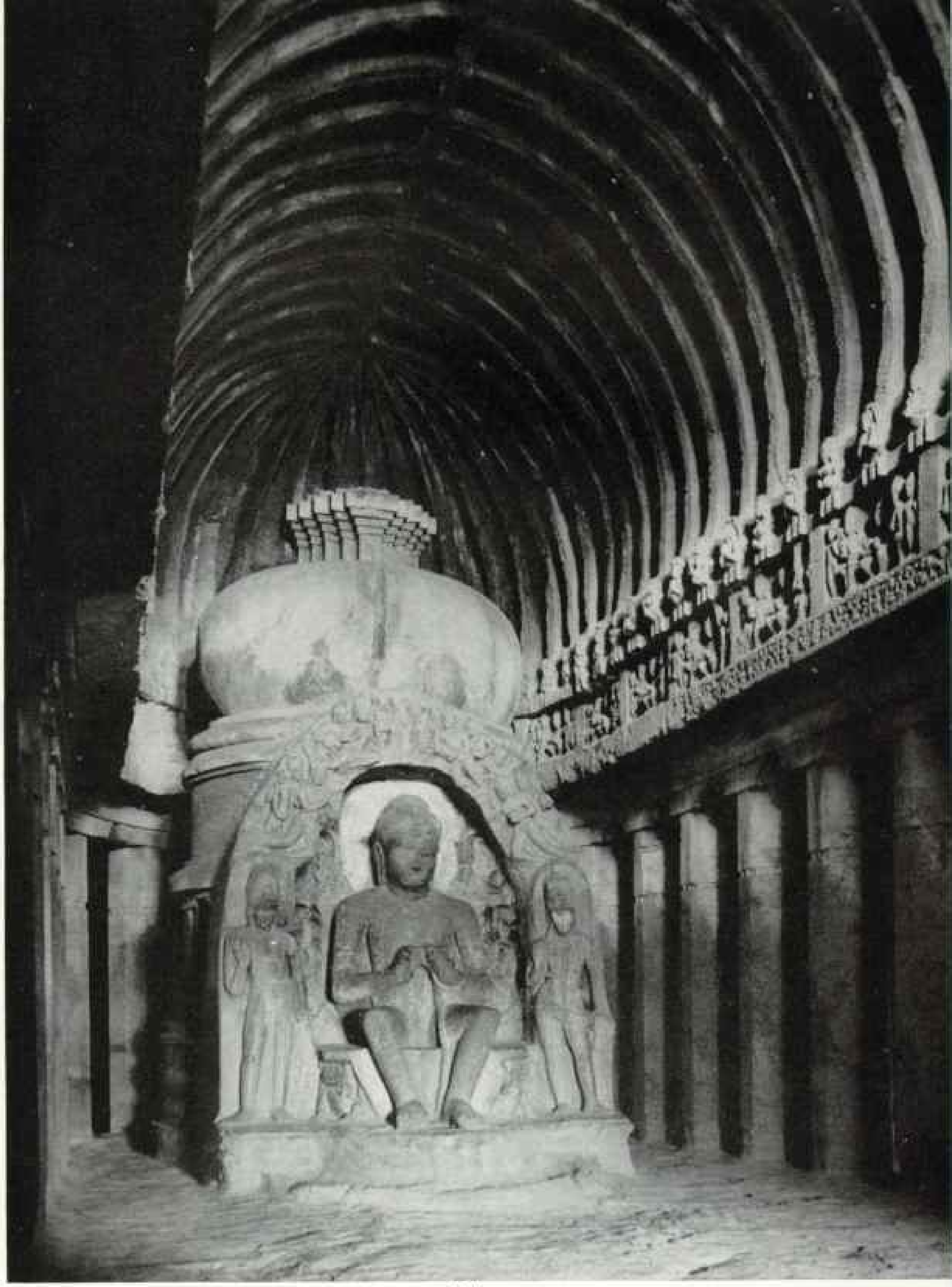
Smaller Buddhas meditate on thrones of lotus, sacred flower of the faith.



670

Ajanta: A Chorus of Angels Fills the Sky as Buddha Enters Nirvana, His Blissful Oblivion

Neither heaven, hell, nor purgatory, Nirvana offers happiness to many Buddhists because it brings the end of struggle. Only the holiest men attain the goal, after quenching the fires of love, hatred, and delusion.



671

Maitreya, the Buddhists' Messiah, Sits Enthroned Before a Stupa in Ellora

Graceful stone rafters in a monolith arch above the future Buddha, who is still in heaven. Faithfully following a wooden pattern, the beams show even mock nailheads. Dancing dwarfs cavort along the frieze.

672

Kailasa Temple, Ellora's Glory, Was Carved from the Top Down out of Living Granite

Life-size elephants, grotesque monsters, benevolent gods, and bewitching goddesses march in mute parade along the walls of an architectural marvel cut in the 8th century. The temple (directly above) rises 96 feet.

673

Excavators Removed a Hillside to Expose Solid Rock for the Hindu Sculptors

Kailasa Temple represents Siva's heaven on a Himalayan glacier, a place no mortal can reach. Builders used the obelisk as a flagpole; they dedicated the two-story porch (center) to Nandi, the sacred bull.

A Weathered Stone Lion Guards the Entrance to Sita's Bath, an Ellora Cave

Photographer Wentzel (left) made a two-year survey of India for the National Geographic Society. Buying this United States Army surplus ambulance, he converted it into a rolling dormitory and darkroom, and visited spots far from train and bus routes. Mr. Wentzel painted The Society's name in three languages: English, Urdu, and Hindustani. Jai Singh, his Sikh assistant, stands in the center.

← Siva Destroys with Many Arms

To Western eyes, the Hindu reveres a confusion of gods, but many are simply incarnations of Brahma the Creator, Vishnu the Preserver, or Siva the Destroyer, the three aspects of the supreme spirit called Brahma.

Here Bhairava the Terrible, an incarnation of Siva, wreaks vengeance on Ratnasura, a demon, in Ellora's Temple of the Ten Incarnations.

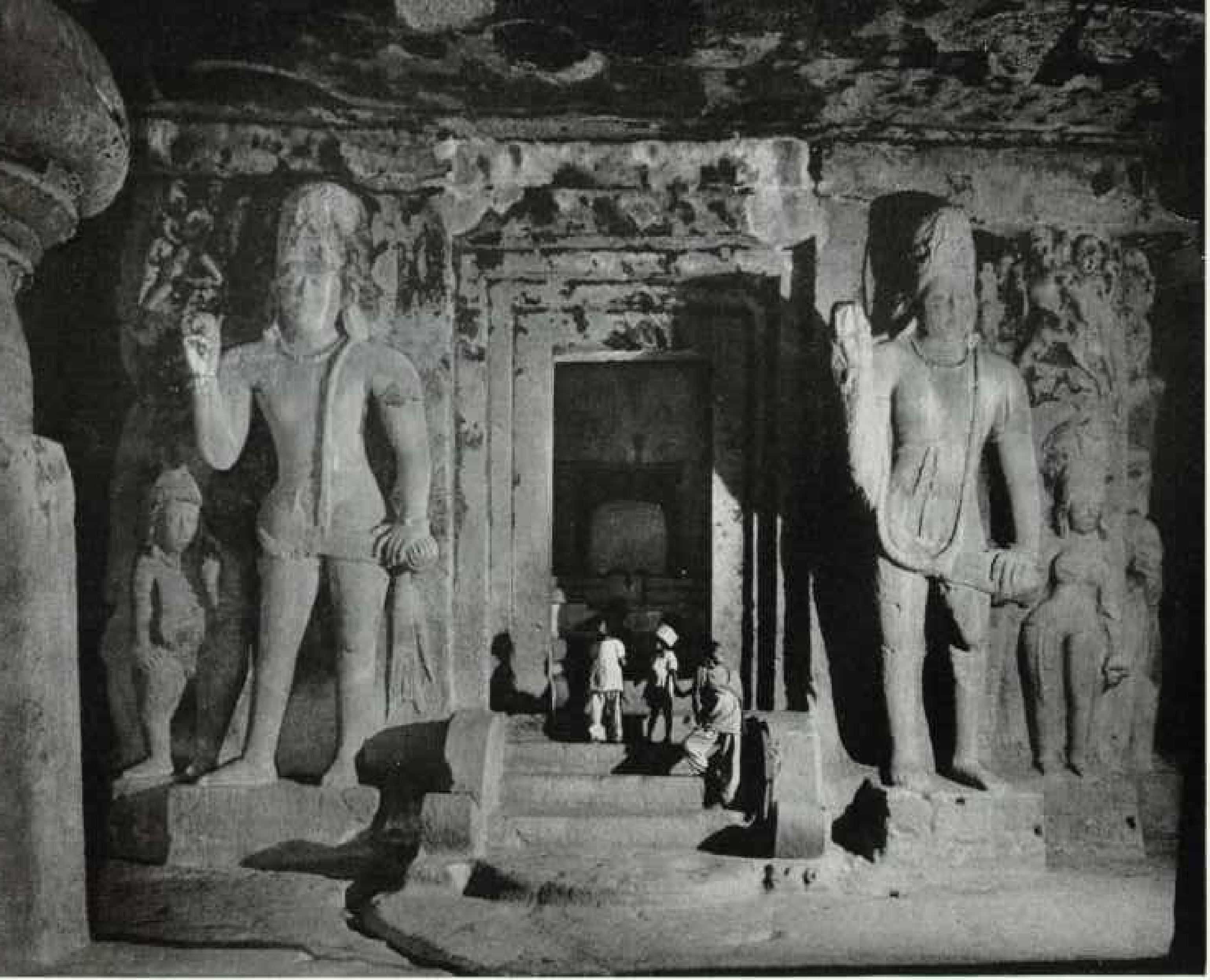
In Hindu sculpture, multiple arms symbolize divine power, and Bhairava demonstrates his strength. His topmost arms hold an elephant skin. The next two carry swords; one skewers a body. An arm in lower left holds a man by the leg. Still another (above female figure) carries a bowl-like skull.

Begemmed Parvati, Siva's Himalayan bride, sits at right and adores him.

675

A Stately Maiden and Her Attendant Decorate a Niche Beside Sita's Bath

Hindu priests used Sita's Bath, Ellora's largest cave, in performing ritual ablutions. It is named for Sita, wife of Rama, a legendary Indian hero and one of the incarnations of Vishnu.



Giant Doormen Watch over Siva's Shrine

Most Ellora temples belong to Siva, for he was the favorite among the Brahmans who built them.

Siva's colorful and complex personality delighted intellectuals of the Hindu priesthood. As the destroyer, he removed beings who became weak and useless. By refusing to destroy, he became the protector of the strong and useful (page 674).

Siva was the divine dancer who could interpret the mathematical law of the universe in 108 different movements, and he was the Lord of Knowledge, the center about whom the universe revolved.

This Ellora shrine lies at the end of an immense hall. Divine guardians, towering 16 feet, wear the sacred thread of cotton hung from left shoulder to right hip. Children play on the steps.

Vengeful Durga Brings Death to a Demon

Siva's wife, Parvati, is worshiped in many winsome forms: Uma the Gracious, Ambika the Mother, and Sati the Good Wife. But her most familiar incarnations are the terrifying Durga the Unapproachable and Kali the Black.

The Kali cult gave to us the word "thug," meaning a footpad. A century ago British soldiers in India battled bands of murderous Thugs who worshiped Kali. Posing as innocent travelers, this fraternity lured wayfarers into trustful acceptance, crept upon them in sleep, strangled them with cloth nooses, and plundered their possessions.

One captured killer justified his profession by saying that all its mysteries were revealed on Ellora's temple walls. Even the assassin's methods, from the use of the noose to the victim's secret burial, were portrayed by the gods, he asserted.

Kali is one aspect of the goddess of destruction. Another is Durga, here shown killing the demon-buffalo, Mahishasura. She wields sword and trident in her right hands.

678

Medieval Sculptors Gave This Mother the Hourglass Waist of Victorian Times

A diaphanous sari completes the costume of a figure carved on a column in a temple to Siva. She lost her nose when image-hating Moslems, invading India, smashed many Ellora sculptures.

Macau, a Hole in the Bamboo Curtain

By George W. Long

With Illustrations by National Geographic Photographer J. Baylor Roberts

ON THE border between Red China and the tiny Portuguese colony of Macau I watched traffic ebb and flow between two worlds.

Through the Barrier Gate barefooted farmers, trotting under creaking shoulder poles, brought fruit and vegetables from China. Slender Chinese girls carried stacks of small blue boxes made at home for a match factory in Macau.

Squawking chickens and sway-back pigs arrived in big rattan containers. Flocks of live ducks crossed the line, slung head down over the rear wheels of bicycles.

The only China-bound traffic I saw was an almost empty model-T bus and a gang of men carrying crude wooden coffins of Macau Chinese who wished to be buried in China soil. Red guards open even these to make sure they hold no contraband.

Portuguese officers kept careful watch but stopped no one. Near by, a jet-skinned guard from Mozambique faced a Red Chinese sentry.

"There's trouble now and then," said the captain in charge, "but it always blows over. Sometimes a Chinese guard tries to pull one of our African boys over the line. Then anything can happen."

Drumbeats sounded across the frontier. The captain smiled. "Morning indoctrination class to cleanse the thoughts of these farmers who must set foot on our soil," he explained.

Peephole and Listening Post

So small is this peephole in the Bamboo Curtain around Red China that most maps of the Far East show the colony as a mere dot. It covers a hilly peninsula only three miles long and a mile wide on the South China coast across the broad Pearl River (Chu Kiang) estuary from Hong Kong.*

Including two small islands—Taipa and Coloane—the whole colony totals only six square miles, but it supports some 300,000 people. About 99 percent are Chinese, many of them refugees.

Because of its location and its neutrality, Macau remains an important listening post. An agent of a foreign power may be sitting at the next table.

Macau was founded four centuries ago, about the time the first Elizabeth ascended England's throne. It was Europe's earliest foothold and Christianity's first beachhead in China. No flag but Portugal's has ever waved above it. In its old Protestant Cemetery I found weathered tombstones carved with names of New England traders and sailors.

Today Macau is a strange blend of southern Europe and the Orient, the old and the blatantly new, the good and the seamy.

Over all lies the spell of sunny Portugal. Except among the Chinese, life is unhurried; there is a forever-siesta atmosphere. Church bells, rather than clocks, chime the hours.

Most of Macau's few thousand Portuguese belong to families that have lived in the colony for generations. Tenaciously they cling to the customs and manners of the homeland, but Macau is their first love.

"It is small, but it is so beautiful," they say.

No Place to Go But Hong Kong

Even so, Macau Portuguese suffer from claustrophobia caused by the Bamboo Curtain. Wistfully they describe the good old days—picnics on the mainland, boat trips on West River (Si Kiang), and excursions to Chinese cities like Canton.

* See "Macao (Macau), 'Land of Sweet Sadness,'" by Edgar Allen Forbes, National Geographic Magazine, September, 1932.

"Except for occasional trips to Hong Kong," I was told, "we are shut-ins."

Approaching the colony by sea, I saw first its quiet Mediterranean-like face—a timeless Riviera town climbing the peninsula's low green hills.

As the boat from Hong Kong rounded this headland and steamed into the riverlike inner harbor, a modern metropolis slid into view. Tall buildings loomed above the water front, lights regulated traffic on busy streets, and big neon signs splashed the scene with color.

American and British goods filled stores along Avenida Almeida Ribeiro, the main business street (next page). Chinese shoppers stared at window placards in English advertising Kleenex, Parker 51's, Kodak film, tooth paste, and a variety of beauty aids. Coca-Cola signs were numerous, and street vendors sold a dozen brands of American cigarettes.

Downtown, in a maze of narrow streets festooned with laundry, I shouldered through crowds of Chinese in black pajamalike garb. It was bedlam, like a bargain basement sale.

Hawkers shouted, pedicab bells jingled, wooden sandals clattered, and itinerant secondhand dealers sounded iron clappers. From upstairs rooms came the loud, furious rattle of mah-jongg pieces being shuffled.

Live Fish, Dried Snakeskins Sold

I window-shopped and watched artisans making brooms, rope, incense sticks, clogs, and fancy paper funeral pieces. In fish stores strange specimens in tanks stared back at me. Browsing in a Chinese drugstore, I discovered cures for every ill known to man, cures that included dried snakeskins, sea horses, lizards, and powdered boar tusks.

After dark the colony sparkles like a jewel against the black, forbidding hills of China. Lights of the business center set the sky aglow, and the latest in sodium street lights turn night into day along the broad avenues.

How the tiny colony supports its teeming thousands is something of a mystery. "We take in each other's washing," was the way one Chinese I met explained the economic puzzle.

Chinese are the businessmen, artisans, shopkeepers, laborers, and fishermen. Small, largely nonmechanized factories turn out firecrackers (page 685), matches, sauces and preserved fruits, Chinese slippers, and textiles.

On the Barrier Gate is carved "Honor the fatherland and it will take care of you." Macau fulfills that promise and extends its care to thousands of refugees from China.

The colony has built living quarters for Government workers and large low-rent housing projects. Many institutions, some run by the Church, care for orphans, the sick, and the aged.

For years Macau has had a lurid reputation as a haven of opium smokers, smugglers, big-time gamblers, and sinister undercover agents. Long ago its name became synonymous with vice and cloak-and-dagger intrigue.

Macau people are concerned about this. "It is greatly exaggerated," they say. "It was true years ago, and even after the last war, but not now."

Opium Regulated, Gambling Curbed

The colony strictly regulated the use and sale of opium in 1946 and has now closed all but one gambling place, Government-licensed and operating on several floors of the modern 14-story Central Hotel.

Like most visitors, I went to the Central. On one floor, Chinese, Europeans, and turbaned Indians quietly played *kuzee*, a dice game. On another I watched fan-tan.

At the head of a table ringed with players sat a fat, bald Chinese who looked like a Buddha. He held a slim ivory stick, and before him glistened a silver chalice upside down.

"Under the chalice is a pile of ivory buttons," a friend explained. "Buddha counts them four at a time with his baton. Players bet on whether 1, 2, 3, or 4 will be left over."

A bell rang; bets closed. Slowly, deliberately Buddha counted. Almost before he began, old habitués held up fingers to show the winning number. I never saw them miss.

Macau people gamble on more than dice and buttons. They are gambling on the future of their little garden spot on Red China's border, and they show little or no apprehension.

"We're in a tight spot, of course," Macau's Governor told me. "Every bit of our food comes from the mainland. We must trade with China or die. We keep strictly neutral always."

Over the centuries that policy has paid off. Macau has got along with Ming, Manchu, Nationalist, and—so far—with Communist leaders in China. Even the Japanese did not take Macau during World War II. Tiny as it is, and often threatened, it has remained under one flag longer than any other European settlement in the Far East.

Kodachrome by National Geographic Photographer J. Baylor Roberts

"Welcome!" Exclaims Macau, a Bit of Portugal in the Orient →

Though Portugal has ruled this small colony four centuries, Chinese comprise the overwhelming bulk of its 300,000 people. These gaudy street signs show how Chinese merchants dominate retail trade on Avenida Almeida Ribeiro, Macau's business center. Usually the avenue swarms with pedestrians, bicycles, and pedicabs. Here it is spanned with a bamboo arch erected as a greeting to Portugal's Minister of Overseas Territories, who paid an official visit in June, 1952.

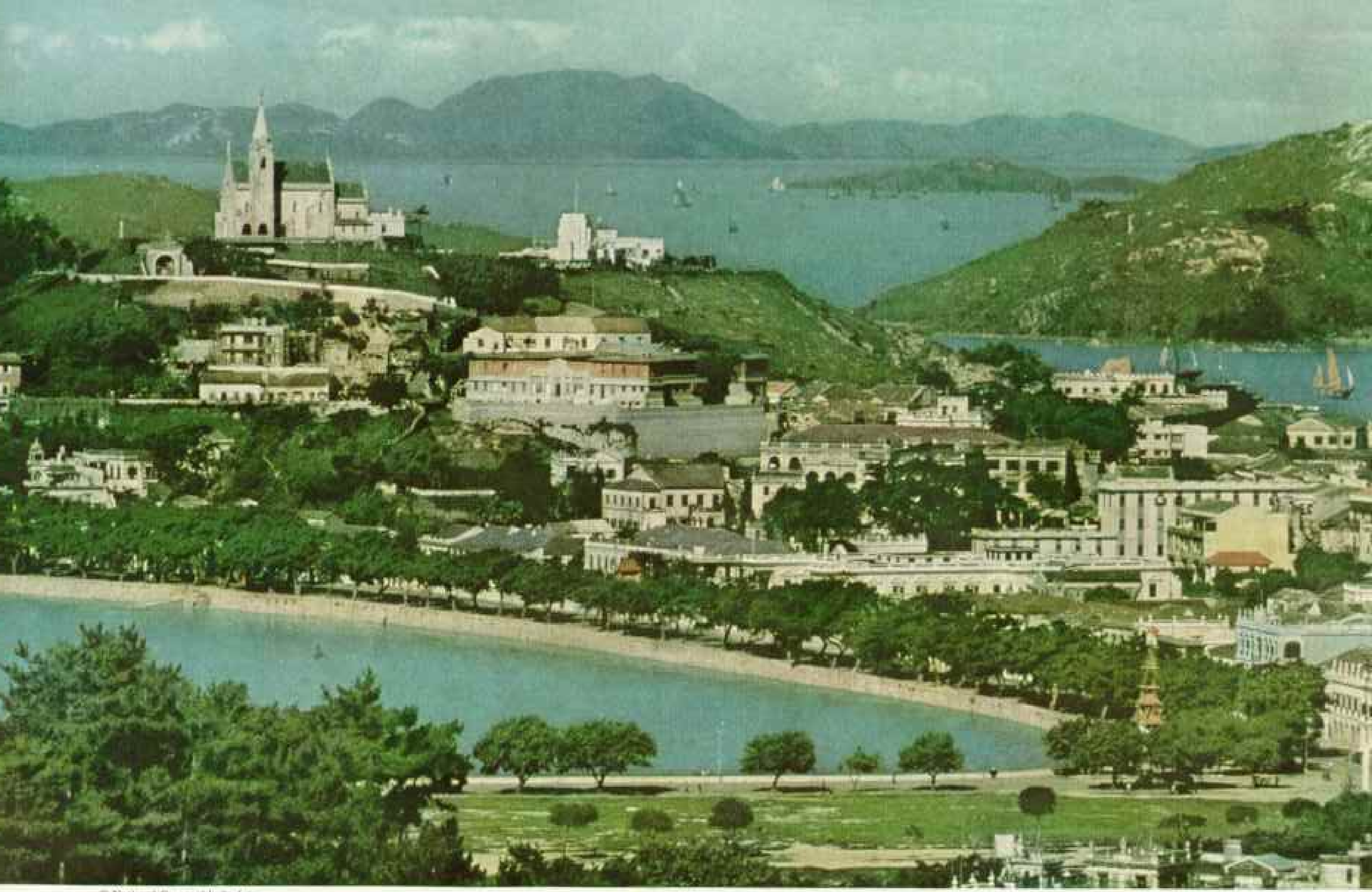

RESTAURANTE
KUOC CHAI
國
際
BEMVINDO
歡迎羅慧文部長蒞澳

682

Fishing Junks Play a Daily Drama Below Banyan-shaded Barra Point. Red China's Grim Hills Loom Across Inner Harbor

Fishermen's dip nets stretch above water like aerialists' safety nets. They rise or sink as ropes to the shacks apply tension or release it.

Spreading fiber-mat sails, clumsy fishing junks appear to race a passenger ship steaming from Hong Kong to Macau.



Macau, Like Rome, Rises on Seven Hills: the View Toward Penha Hill

The colony makes ready for America's Fourth of July; the United States takes most of Macau's fireworks. For safety's sake, this powder factory stands on an island two miles from the city. One of the girls packages Yan Kee Boy firecrackers. Another (left) tamps in fuse covers; each circular bundle holds a thousand firecrackers.

Kodachromes by National Geographic Photographer J. Baylor Roberts

Portuguese Sailors March Past Pastel Homes of the Praia Grande. Helmeted African Soldiers from Mozambique Present Arms

Macau children turn out to see Manuel Maria Sarmento Rodrigues, visiting Minister of Overseas Territories (in whites, hand raised). He accompanies Macau's governor to a grotto named for Luiz Vaz de Camoëns, Portugal's soldier-poet of the Age of Discovery. Uniformed members of the Portuguese Youth Movement stand at attention. Page 688: Motorcycle police, machine guns on back, escort the minister into the city.

BENVINDO

歡迎羅慈文部長蒞臨

M.15-P.

M.18-P.

Silkworms in England Spin for the Queen

In a 15th-century Castle, Thousands of Pampered Larvae Make Silk for Elizabeth's Coronation Robe

By John E. H. Nolan

ONE April morning in 1952, a letter bearing the royal coat of arms arrived at Lullingstone Castle, stately and historic home of Zoë, Lady Hart Dyke, pioneer of sericulture in 20th-century Britain.

"Her Majesty," the letter said, "would be pleased if the silk for the Coronation Robe could be supplied by the Silk Farm at Lullingstone."

Lady Hart Dyke at once announced the good news to her staff of young silk workers. There were cheers, and some quoted the silk farm's motto: "Patience and perseverance turn mulberry leaves into the silken robes of a Queen."

Young Elizabeth is not the first English Queen to be associated with the estate of Lullingstone, which has witnessed more than 800 years of history. Queen Anne was a frequent visitor, first as a child and later as ruler from 1702 to 1714.

The castle, built almost 500 years ago, nestles in Kent County's scenic Darent Valley, 17 miles southeast of London (page 692). It takes its name from the original estate of Lullingstone, which was listed in the Domesday Book in 1086 as the property of Odo, French Bishop of Bayeux, half brother of William the Conqueror.

Traditionally, the name Lullingstone came from the peaceful sound of the waters of the Darent River falling over stones on their way to the Thames.

How Silkworms Came to Lullingstone

Even more fascinating to me is the story of Lullingstone today. Here, in the short space of 20 years, Lady Hart Dyke has established a silk farm which not only attracts worldwide attention, but has received royal patronage.

Beginning with a handful of silkworms and a few mulberry leaves, Lady Hart Dyke struggled against pessimism and apathy to prove that Britain could produce raw silk as fine as the best from China and Japan.

Silkworms were brought to Europe in the 6th century, when two monks risked torture and death by smuggling a few of the prohibited eggs from Persia. The Oriental monopoly of the golden thread was thus broken, and from this one daring act all silk raising in the Western Hemisphere originated.*

At Lullingstone I saw the same methods of rearing the worms to the cocoon stage as had been perfected by the Chinese around 2000 B. C. Only the incubating and reeling operations have been improved.

The director's late husband, Sir Oliver Hart Dyke, designed and built the machinery for unwinding the cocoons. Her ladyship imported thousands of eggs and mulberry cuttings, and numerous books for studying the subject. To learn more about it she went to Italy and visited silk mills at Milan before starting the farm in 1932.

From the Palestine Government's nursery at Nablus, Lady Hart Dyke obtained 4,000 mulberry trees. From France she imported a few pounds of white mulberry seed, which she planted under glass.

Near the famous herb garden, her veteran gardener, Tom Booker, who has served the family for more than 40 years, tended row upon row of seedling mulberries. Now there are 22 acres of mulberry trees.

In the castle itself, aided by three local girls, Lady Hart Dyke set up the incubation rooms, reeling and testing machines, and other equipment.

School Children Help Robe a Queen

By 1936 the silk farm was a great success. Inquiries poured in from many countries. People of all ages wrote or came to purchase eggs and mulberry seeds for starting their own silk farms. Her ladyship now buys back suitable cocoons raised all over Britain, mostly by school children (page 690).

Continuing the royal contact with Lullingstone that has existed since its first stone was laid, Her Majesty Queen Mary displayed great interest when visiting the farm. She asked Lady Hart Dyke the most searching and difficult questions about sericulture, and, upon leaving, graciously accepted a length of green silk damask.

Then came the most important event in the silk farm's history up to that time. It was 1937, and Lullingstone was chosen to provide 20 pounds of raw silk for the coronation robe of King George VI's Queen, and for the robes of the little Princesses, Elizabeth and Margaret Rose.

The farm's maximum output was then only five pounds of raw silk a week, but, to fill the royal order, 20 pounds had to be produced in two weeks. This meant running the machines

*See "Spain's Silkworm Gut," by Luis Marden, National Geographic Magazine, July, 1951.

690 John R. H. Nolan

Children Count Cocoons, Their Silken Contribution to the Queen's Coronation

British youngsters earn pin money selling home-raised cocoons to England's only raw silk producer, the Lullingstone silk farm, 17 miles southeast of London. But last summer they gave their finest to be reeled into thread for Queen Elizabeth's coronation robe. These donors live at Eynsford, Kent, a mile from Lullingstone. There, in a 50-room castle (page 692), Lady Hart Dyke revived British sericulture in 1932.

24 hours a day, with the tiny staff of three working in shifts around the clock. But the order was completed on time.

Pamela Spencer, a local girl, told me how she and her two colleagues slept in Lady Hart Dyke's oak-lined office during that hectic period—the same room from which Anne Hart, a 17th-century daughter of the house, escaped through an open window into the arms of her lover, handsome John Bluett.

In the Path of Flying Bombs

With the coming of World War II, the peace of the Darent Valley was rudely shaken. During the first months nothing serious happened, but as time passed many bombs shattered the quiet of Lullingstone.

In the summer of 1944 death rained from the skies when Hitler's flying bombs either cut out overhead or scuttled past with a noise like a thousand rattling tin cans.

Soon the valley became known to Londoners as "Doodlebug Alley," for between the hills above the Darent River, a tributary of the Thames, the winged bombs sped toward England's capital.

During that summer of tragic memory, more than 2,000 bombs of all types cratered the banks of the Darent. Ancient manors and cottages were smashed or badly damaged. Life became a nightmare, and none hated the noise and fuss more than the silkworms.

Glass was replaced in the rearing-room windows—only to be blown out again. Worms perished by tens of thousands, killed by blast or cut to pieces by flying glass.

Falling ceilings crushed fragile incubators, and reeling machines were put out of action. Cracks appeared in the stout walls of the Tudor gatehouse, but from its tower a tattered Union Jack fluttered defiantly over the smoke-filled valley.

For several nights Lady Hart Dyke slept beside her surviving silkworms, always ready to draw protecting covers over their trays. Often she had to throw herself flat on the floor when a "bug's" hideous-sounding death rattle warned of its rapid approach.

Trees Burned by Incendiaries

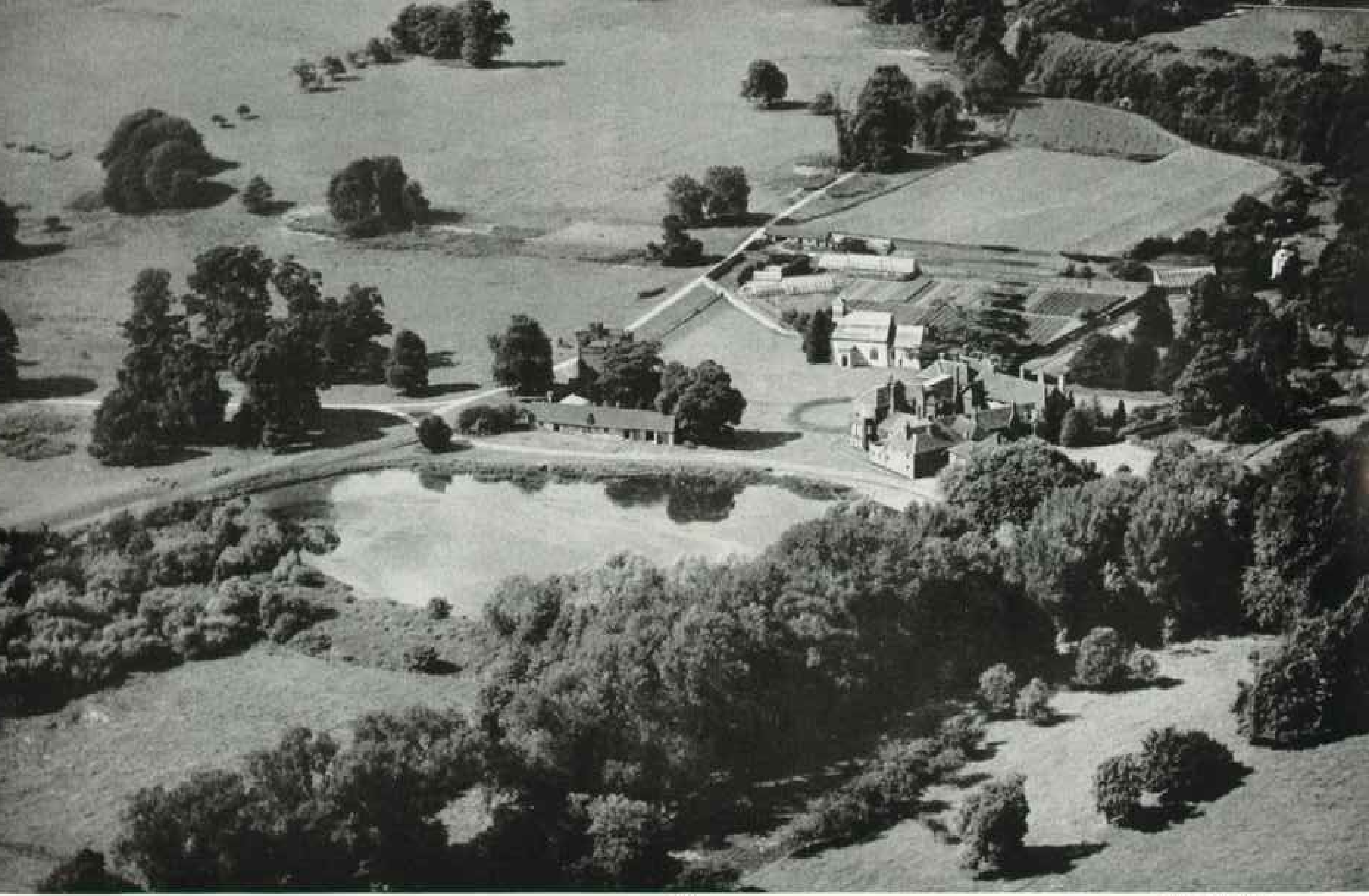
One morning Lady Hart Dyke was confronted with the fact that during the night most of the mulberry trees had been burned by incendiary bombs—and the mulberry leaf is the staple food of *Bombyx mori*, the only breed of silkworm raised at Lullingstone. Lettuce leaves might keep the worms alive, but such food would not produce large cocoons, and the silk would be too thin for use.

Lady Hart Dyke was at a loss, for there were not enough leaves to last another week. Suddenly she thought of the children who were raising silkworms in many parts of England. Forthwith she penned the following

691

Silk Workers Follow Lullingstone's Banner in a Harvest Festival at Canterbury

Maj. R. Field Bibb, manager, raises the silk farm's flag; it shows three dark mulberry leaves, each with a yellow cocoon in the center. Lady Hart Dyke (second in line) bears a tray of cocoons. Six of her workers in matching turbans march with her to Canterbury Cathedral for a thanksgiving service. The occasion was Britain's Harvest Festival of the World (1948), in which agricultural delegates from Commonwealth nations carried gifts.



Lullingstone Has Been in the News for 867 Years

In the 11th century, a few years after the Norman Conquest, the estate of Lullingstone belonged to Odo, half brother of William the Conqueror. The present castle is believed to have been started during the Wars of the Roses. In Queen Anne's reign the front was rebuilt in Tudor style. In 1944 Hitler's buzz bombs damaged the castle and outbuildings, hitting a tower of the Tudor gatehouse (center). Old St. Botolph's Church stands beyond the castle. In distant greenhouses and gardens mulberry seedlings grow. The lake is a last reminder of a moat filled in about 1750. Royal silk is made in the castle itself.

← Edna Clark gathers mulberry leaves and feeds them to the silkworms. ↓

advertisement, which appeared in 50 newspapers:

"HELP! ! HELP! ! ! Lady Hart Dyke would be extremely grateful for sacks of mulberry leaves for her silkworms. Will those kind enough to help please send their sacks by post or rail to Lullingstone Castle, Eynsford, Kent. Do please despatch as soon as possible after picking, as mulberry leaves ferment very quickly."

The response was amazing. In two days nearly half a ton of leaves arrived. Boxes, brown-paper parcels, even envelopes, were delivered by every post. More than 50 percent came from children. The royal silkworms were saved.

In the midst of all this confusion 200 American colored troops arrived and were billeted in the castle's outbuildings. Most of them hailed from the Deep South. When off duty they volunteered their help to this brave but harassed woman. They displayed a natural aptitude for handling the worms.

Returning home late one night during a severe buzz-bomb attack, Lady Hart Dyke noticed a dim light flickering from St. Botolph's Church in the castle grounds, a violation of blackout regulations.

Investigating, she saw two lighted candles on the altar, and the pews seemed to be filled with dark forms. Sharply she called out, "Who's there?"

"Oh, ma'am," came the answer, "it's only us boys prayin' de good God to save us from de ole doodlebugs."

"Our Worms Hate Crowds"

Even before I reached Lullingstone, I began learning about its unusual industry. Walking to the castle from Eynsford, where the train had dropped me, I overtook two children, both carrying small baskets of silk cocoons.

The older child, a boy, told me the cocoons were a present for the Queen.

"Yes," said his girl companion, proudly, "the silk will be worn by Her Majesty on Coronation Day."

Near a Tudor cottage unscathed by the war, we met three people on horseback. The boy pointed them out as visitors to the castle.

"Hundreds of folk come to see the silkworms at Lullingstone," he said as he ran along beside me.

"But when there are too many people," his companion chimed in, "they have to wait their turn. You see, our worms hate crowds—they like lots of fresh air."

At the castle entrance we were met by Maj. R. Field Bibb, manager and secretary of the silk farm (page 691). After the children had run inside to deliver their cocoons, the major strolled with me across the lawn and smiled when I remarked on the fine quality of the turf.

"It should be good," he said, "for it was here that one of the earliest games of lawn tennis was played, in the late 1800's."

Three enormous cedars of Lebanon, almost 300 years old, flank one side of the castle; two have lost limbs to doodlebugs. Standing in the shadow of these stately trees is tiny St. Botolph's Church. Within, under sculptured effigies, rest members of past generations of the Hart and Dyke families.

At the annual Palm Sunday service, said the major, a special ceremony, Blessing the Silkworms, takes place in the side chapel of St. Botolph's. Worms, skeins of silk, even small machines are brought in procession to receive the blessing.

"Last year," he added, "we attended two such ceremonies, one here and another held at a monastery belonging to monks of the Benedictine Order."

Doll Left by Queen Anne as a Girl

The castle's mellow red-brick front, erected by a former member of the family to please Queen Anne, conceals its original character. Behind lies a Tudor courtyard overlooked by mullioned windows.

Inside, the great hall gripped my attention. Old paintings decorated its oak-paneled walls. One portrayed a 16th-century head of the house with his two sons. It belonged to the school of Holbein and was dated 1575.

My eye fell next upon a doll seated in an old carved chair. Said the major, "We call her Anne. It was left behind by that Queen on one of her visits when a child."

The doll wore a pink satin dress of beautiful quality, as brilliant as the day it was dyed some 250 years ago.

In an alcove hung a framed square of white silk. It was taken from the length of material made at Lullingstone for the wedding dress of Britain's young Queen, Elizabeth II. Designed from a painting by Botticelli, the dress had been embroidered with White Roses of York, starflowers, orange blossoms in pearl and crystal, and ears of corn.

The main staircase, the major informed me, had been built specially for Queen Anne, who was slightly lame and inclined to be plump. Broad, shallow treads enabled Her Majesty to use the stairs with dignity and without undue exertion.

At the top of this royal staircase I met a lady with very blue eyes and a determined-looking chin—Lady Hart Dyke (page 691). She greeted me with outstretched hand and a smile.

Just then the front doorbell rang, and the major left us to welcome a party of visitors.

European

A Silk Moth Emerges and Lays Her Eggs

↑ Metamorphosed from a lowly caterpillar, *Bombyx mori* leaves her dark cell. The crawler's false feet have disappeared; now the insect's six true legs appear. Wings unfold dramatically. At first the moth was a ravenous larva, later a pupa changing form within the silken shell. Here she is reborn as the imago, an adult insect. Lacking jaws to bite her way out of the cocoon, she has dissolved its gumlike binder and pushed aside the threads.

Right, above: The female lays 300 to 450 eggs. These are stored until spring renews the leaves on Lullingstone's 30,000 mulberry trees.

→ Having laid her eggs, the fulfillment of life's mission, the female clings to her cocoon and prepares to die. She can fly little or not at all. Males test wings just enough to flutter up close to females. Neither pupa nor adult moth takes food. Domesticated for centuries, *Bombyx* is no longer found in the wild state.

The Larvae Gorge for Five Weeks Before Spinning Their Silken Shrouds

These three-inch caterpillars have eaten continuously since hatching. Each has devoured about three-fourths of an ounce of leaves. Eating, they make a sound like rain. Apertures in their sides serve as breathing tubes.

A cocoon maker emits liquid silk from two head sacs. Contact with air solidifies the secretion. First strands form a hammock to support the cocoon. Silken figure eights spun in the next three days will enclose the body.

Raw Silk Comes from Fluffy Shells

In silk making, Nature's process ends and man's begins with the cocoon. To fill this bin, moths first laid eggs. Tiny caterpillars hatched, devoured leaves, grew, cast their skins four times, and after five weeks of life wound themselves within continuous filaments of natural silk (page 704).

Each season the farm allows a few thousand moths to emerge from cocoons, select mates, lay eggs, and start the new cycle that will maintain Lullingstone's working force at some 4,000,000 silkworms.

Most cocoons, however, are baked an hour in a temperature adjusted to kill the chrysalides, or pupae, without injuring the silk. They are then stored in a cool room until workers begin unwinding the mile and a half of silk in each one (page 699).

Cumbine

European

40 Cocoons Make a Double Handful

Sorted and graded, these cocoons are ready for the stifling oven. They go to that death chamber because the moths, if allowed to emerge naturally, would indelibly stain their silken prisons with a dissolving fluid used in breaking out.

Thumb-wide and more than twice as long, the cocoons suggest peanut shells.

Though Lullingstone buys cocoons from thousands of children, it raises far more of its own. Its raw silk, however, totals less than one-tenth of one percent of that processed by Britain's 400 silk firms. All the rest has to be imported.

Girls Unwind the Cocoons and Reel the Silk

Women, working in pairs, soften the cocoons and reel the thread in the castle's former laundry. One of them here ladles cocoons into the reeler's basin. Silk ends clutched in her hand are passed to the reeler across the table. The latter feeds the ends into revolving disks which twist four strands together. Threads then run across pulleys and onto spindles in the cabinet.

An operator drops cocoons into boiling water to soften the natural gum binding the threads. Soon the circular brush (above her hand) will move into position, start revolving, and pick up the silk ends.

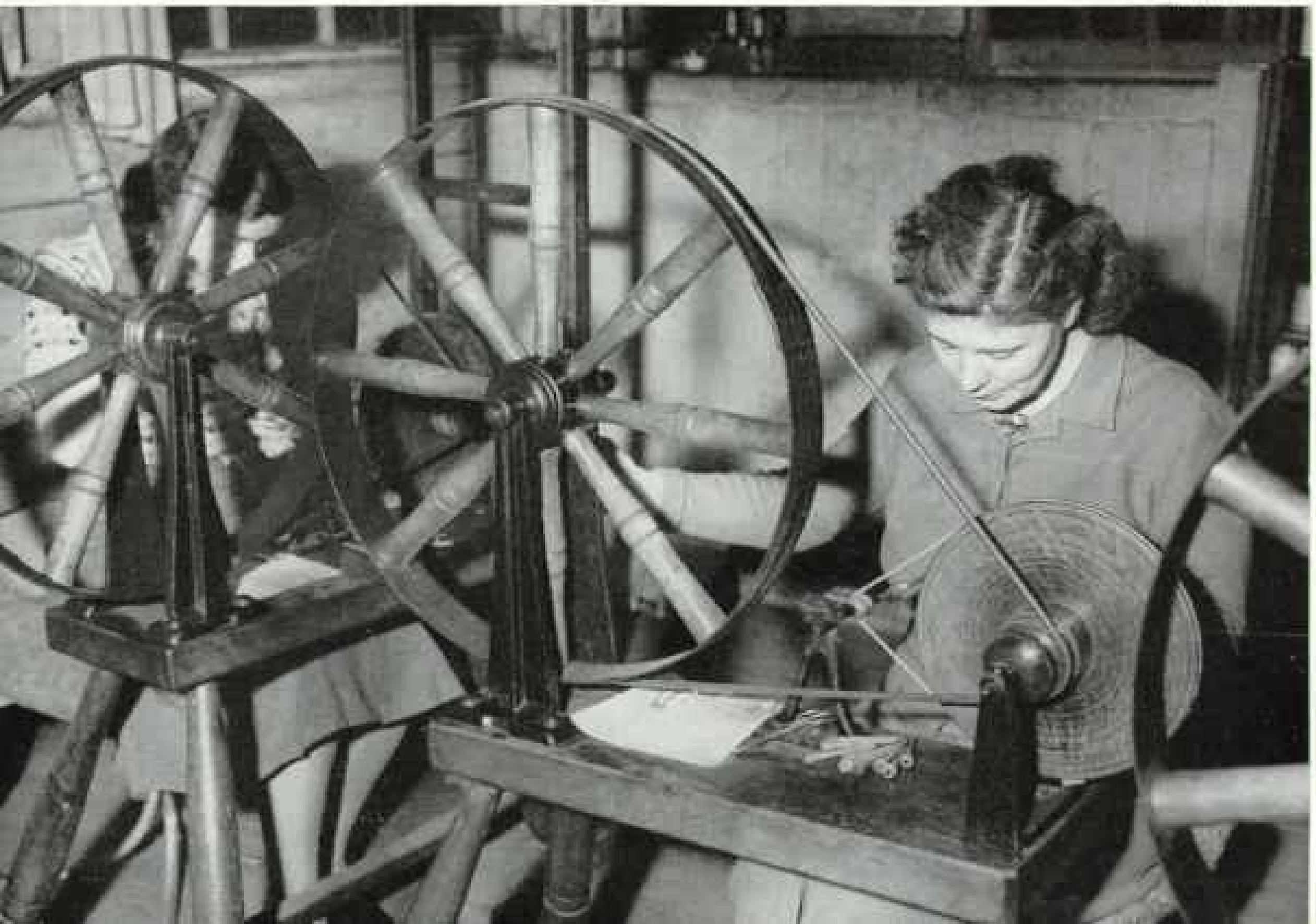
This girl prepares to pass a dozen thread ends to the reeler.

Six girls can turn out 48 skeins, or six pounds, in an eight-hour day. They waste nothing. Crushed cocoons (in left foreground of each picture) will be fed to chickens. Chrysalides and fiber scraps from reeled cocoons are pressed, dried, sacked, and sold as poultry feed and fish bait.

700

Four Skeins Reach Lullingstone's Testing Room, Where Raw Silk Is Inspected

Weft thread, seen at right, is wound by hand onto a quill, or bobbin, at New Mills, Braintree. Since leaving Lullingstone, this royal silk has been "thrown" (two threads twisted together), degummed, and dyed purple. Soon it will go to the looms (opposite).



© Daily Graphic

Royal Velvet Is Hand-loomed

Here the shuttle is thrown across the loom of a centuries-old type at the Braintree mills. The purple cloth was loomed in two 20-yard lengths each 21 inches wide, the second to serve in case of damage in cutting or embroidering the first. Every square inch has 16,000 pile ends.

➤ At the Royal School of Needlework, Princes Gate, Kensington, the Royal Cypher "ER" (Elizabeth Regina) has been embroidered in gold on the Robe of State in which the Queen will leave Westminster Abbey. Needlewomen work on the design of "olives and wheatsheafs" chosen by the Queen. It symbolizes peace and prosperity for her reign.

Combine

"Always visitors," her ladyship commented with a laugh. "Last year nearly 40,000 came to see the silk farm. They come by bus from all parts of Britain, and more than half are children.

"Come along," she added, "I'll show you the Tudor kitchen first."

Silkworm Eggs in Castle Kitchen

I expected to see a lot of old spits and copper pots and pans. Instead, I saw a number of wooden racks, with hundreds of small white cotton bags suspended from them.

Lady Hart Dyke explained that the entire silk farm was housed within the castle walls, except for greenhouses and nurseries containing some 30,000 small mulberry trees, and the kitchen was now the egg-laying room. Each little bag, she said, contained a female moth of the silkworm, placed there after mating.

After about four weeks, the bags are opened. This allows time for each moth to lay 300 to 450 eggs, after which she dies (page 695).

Dead moths are removed, and the eggs are stored in boxes in a cold, dry room till a time in spring when the mulberry leaves are the size of an English halfpenny. Then they are placed on muslin-covered trays and put into an incubator.

At Lullingstone the incubators are simple square wooden boxes on legs, lined with metal jackets for holding water. The water is heated by a small oil lamp set on a movable bracket underneath so that it can be raised or lowered according to the temperature required. Usually the eggs hatch in about seven days at 72° F.

The silkworms normally hatch in early morning. They break the egg by biting through the side of the shell.

On emerging, they are about one-twelfth of an inch long, dark, and covered with long hairs which disappear after the fourth day. Nature provides the hairs to protect worms against overcrowding or crushing by their fellows. Because of their size, color, activity, and sharp jaws they are called "ants" at this period of their lives.

To remove the worms from the incubator, pieces of finely perforated paper are placed over the trays, and strips of mulberry leaf are laid on top. Attracted by the smell of the leaf, the worms wriggle through the holes, which prevent empty shells or unhatched eggs from being dragged along by the thin filament of thread exuded by the newly hatched worm.

When all the mulberry strips are covered with worms, they are placed upon large trays and taken to the rearing rooms (page 693).

On our way there along an oak-paneled corridor hung with antique pistols and blunderbusses, we met the major again, surrounded by a party of excited children. Many carried cardboard boxes.

"They are full of cocoons," her ladyship explained. "Thousands of children are sending their home-produced cocoons to be turned into silk for the Queen's coronation robe."

In a rearing room a vast sea of silkworms crawled over long trays set up in tiers. The scent of fresh mulberry leaves filled the room.

Busy Chewing Sounds Like Rain

At first I was puzzled by a curious sound, somewhat like that of falling rain. It was the sound of the silkworms' busy jaws cutting into dry leaves. The leaves must be dry, since dampness causes various ills of the domesticated silkworm.

The worms are fed five times a day. For the first ten days the mulberry leaves are cut into small pieces; then larger ones are provided, until finally the worms receive whole leaves (page 696).

"How long do they live, and how much do they eat?" I asked.

"Not very long—only 35 to 40 days," said my guide, "but in that time each worm consumes about three-fourths of an ounce of mulberry leaf."

Along with this heavy intake of food goes rapid growth. On the sixth day after hatching, the loosely fitting skin fills out, but since the skin does not grow with the rest of the body Nature steps in and causes the creature to molt, or cast its skin.

This process occurs four times before the worm is ready to make its cocoon.*

Lady Hart Dyke pointed to a worm that was molting. With almost acrobatic contortions, it drew itself farther out of its old envelope.

The silkworm, I learned, has an odd way of breathing. Unlike most creatures, it does not breathe through its nose or mouth but through nine oval holes along its sides.

Each Worm Spins 1½ Miles of Silk

In a room next door these strange insects were in a more advanced stage. From three to four inches in length, their almost transparent bodies were greenish-gold. Beside their trays were neat, tent-shaped bundles of straw.

Having molted the fourth time, the worms had finished their growth. Their tiny reservoirs were full of liquid silk, and the time to make their cocoons had come.

I watched a worm which had started to spin

* See "Strange Habits of Familiar Moths and Butterflies," by William Joseph Showalter, National Geographic Magazine, July, 1927.

703

Peers and Peeresses Carry Coronets and Wear Crimson Velvet Trimmed with White Fur

Tailors and dressmakers worked for a year preparing robes for the peerage at prices ranging from $3,500 for ermine to $100 for miniver, or rabbit. Those unable to buy such finery may hire it. Peeresses wear diamond tiaras. Together with peers, they don coronets immediately after the Archbishop of Canterbury crowns the sovereign.

its cocoon. Its body emitted a thick viscous solution which solidified into a thread of silk as it came into contact with the air. Equipped with two sacs, the worm soon emitted a second thread. Covered with a natural gum, the two threads adhered, resulting in a single thread of greater strength.

My worm had suspended its "hammock," or safety net, between two straws and was now wrapping silk around itself in the form of figure eights (page 696). While I was engrossed in this remarkable exhibition I was reminded by the major that I should have to wait three days for the cocoon to be completed.

"In that time," he said, "the worm will have moved its head back and forth some 300,000 times and spun about a mile and a half of silk."

Cocoons are plucked from the straw tents in the manner of cotton being picked. Then all except those set aside for reproducing the next season's moths are placed in sacks and taken to the stifling ovens.

Emerging Moth Would Ruin Silk

Were it not for the stifling process, the occupant would emerge from the cocoon as a moth and spoil the silk.

Unlike the worm, which bites through the egg to free itself, the moth has no jaws with which to bite its way out of the cocoon. Instead, from two glands in the head, it pours a drop of alkaline fluid upon one end of its silken prison (page 695).

This fluid has a solvent effect, not upon the silk itself but upon the natural gum with which the silk is covered: its action causes the threads to loosen so that they can be pushed aside by the moth. But if the moth were left alive to escape its silken cell, the fluid would leave an indelible stain on the silk.

Cocoons can be stifled by gas or steam, or by dry heat, the method used at Lullingstone.

"Our methods may be primitive, but they are adequate," Lady Hart Dyke remarked. "We leave the cocoons for about an hour, at a temperature of between 168° and 174° F. That is sufficient to kill the pupae before they form into moths and yet not damage the silk."

Her ladyship demonstrated how the rough silk, or floss, is stripped from the outside of the cocoons. Taking a handful of cocoons, she placed them in a hopper above a long, sloping tray fitted with three rough-sided, revolving metal rods. As the cocoons slid down the incline they were caught by the rods and freed of floss by the time they reached the bottom.

After being sorted for size and quality, the cocoons are taken to a vermin-proof storeroom until the reelers are ready to unwind their silk.

The reeling shop, a large steam-filled room, was once the castle's laundry. At work here were six girls, two to each reeling machine. These machines are in two parts, the cocoon basin and the actual reeling apparatus (pages 698 and 699).

Suspended in each basin, full of boiling water, was a metal colander held fast by clips. Some 50 cocoons were placed in this receptacle under a revolving brush. Set in motion, the brush swept the now softened cocoons round and round. After about 35 revolutions it was lifted, and there, clinging to its stiff bristles, I saw a number of silk threads.

Thickness Is Important

The girl jiggled these silken strands gently up and down in the water until the cocoons began to unwind; then she handed them to the girl opposite. This operator fed the ends of the threads into revolving disks which carried them up to a series of pulleys and so onto large revolving spindles.

The silk then being reeled was for the lining of the Queen's coronation robe, so extreme care was being taken to insure that the thickness of the thread remained standard.

This standard is known as the denier, or measurement of a thread's thickness. It is based on the weight for a given length, which is obviously greater for a thicker thread. The name originated from an old French coin once used as a weight for weighing silk. A single cocoon thread is normally about three deniers.

From the reeling shop, with its rather sickly odor, we went to the testing room. Here the skeins from the reeling cabinets were being stretched, opened out, and searched for loose ends, thick threads, and bits of fluff.

At intervals tests were made of the skeins by measuring off 450 meters of thread and weighing it on a very delicate scale.

When this examination was completed, the skeins were laced, twice in white to keep them neat, and once in red to indicate the beginning and end of the thread. They were then twisted, like skeins of wool, and parceled into "books" ready for dispatch to the weavers.

Industry Grew from Childhood Hobby

Although I had seen almost everything in this home of royal silk and had listened with great attention to the absorbing story of the silkworm's life and work, I still had one question for her ladyship: "What made you keep silkworms?"

"That is a difficult question," she replied with a smile. "I first became interested in these strange little creatures when I was four. I started silkworm rearing as a hobby—and this grew into the small industry you see today."

Burr Prizes Awarded to Dr. Edgerton and Dr. Van Biesbroeck

FOR extraordinary contributions to science in cooperation with the National Geographic Society, Dr. Harold Eugene Edgerton and Dr. George Achille Van Biesbroeck have received The Society's Franklin L. Burr Prize, consisting of cash awards.

Dr. Edgerton, professor of electrical engineering at the Massachusetts Institute of Technology, Cambridge, invented the electronic flashlight for ultra-high-speed photography. Dr. Van Biesbroeck, of Yerkes Observatory, who is professor emeritus of astronomy at the University of Chicago, demonstrated that starlight is bent by the sun's gravity, as predicted by Dr. Albert Einstein in accordance with his theory of relativity.

The Franklin L. Burr Prize was established under the bequest of the late Mary C. Burr, Hartford, Connecticut, who bequeathed a fund to the National Geographic Society in memory of her father. Miss Burr's will directed that the income be used in the awarding of cash prizes to those members of National Geographic Society expeditions considered by the Board of Trustees to have done especially meritorious work in the field of geographic science.

Dr. Edgerton developed lights that flash as briefly as a millionth of a second. They have made it possible for photographers to picture clearly a bullet traveling 1,800 miles an hour, the bursting of an electric-light bulb struck by a hammer, or the impact of bat against baseball.

These lights now find a variety of industrial and scientific uses. With them, camera shutter speeds become relatively unimportant, for the object to be photographed is illuminated sufficiently to impress its image upon the film only during the almost instantaneous flash.

Action-stopping photographs in the NATIONAL GEOGRAPHIC MAGAZINE of bats in flight and of a hummingbird's wing beating 55 times a second owe their existence to Dr. Edgerton's genius. The inventor made some of the pictures himself, although he is primarily an electrical engineer, not a photographer.

On January 12, at a luncheon held in his honor at The Society's headquarters, Washington, D. C., Dr. Edgerton was presented with a check for $2,000. Making the presentation, Dr. Gilbert Grosvenor, President of the National Geographic Society and Editor of its magazine, remarked that The Society had been notably aided in its mission of increasing and diffusing geographic knowledge through the use of equipment designed by Dr. Edgerton for the specific needs of its staff photographers.

"The Society has been very fortunate in receiving so much generous help from Dr. Edgerton," said Dr. Grosvenor. "It has helped us achieve results of great value.

Edgerton Flash Stops a Bird in Flight

Before invention of the electronic speed light, such pictures clearly defining beating wings were impossible. The inventor himself took this portrait of a male Anna's Hummingbird in California. Its wings whir 55 times a second; at top speed they go four times as fast.

See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Freezing the Flight of Hummingbirds," by Harold E. Edgerton, R. J. Niedrach, and Walker Van Riper, August, 1951; "Circus Action in Color," by Harold E. Edgerton, March, 1948; and "Mystery Mammals of the Twilight," by Donald R. Griffin, July, 1946.

W. Robert Moore, National Geographic Staff

Dr. Van Biesbroeck on Sudan's Sands Prepares to Shoot an Eclipse

Here the astronomer sights on a guide star while making adjustments in the clockwork that drives the 20-foot telescope. Canvas screen in background protects the instrument from desert winds.

"Dr. Edgerton never has permitted the National Geographic Society to pay him personally for his work. Now, through this richly deserved award made possible by the distinguished Burr family, The Society can repay part of its own indebtedness to him while expressing the gratitude of the entire world of geographic science."

"Whenever one starts anything new," Dr. Edgerton said in reply, "it is usually a long time before anyone appreciates or uses it. But almost immediately, in my case, there came inquiries from the National Geographic Society, followed by encouragement and practical tests of the equipment.

"The interest of The Society and its photographic experts has been of inestimable value."

Trustees of The Society present at the luncheon, besides Dr. Grosvenor, were Dr. Lyman J. Briggs, Franklin L. Fisher, Dr. Robert V. Fleming, Dr. Alexander Wetmore, Dr. Hugh L. Dryden, Dr. William E. Wrather, Melville Bell Grosvenor, Rear Adm. L. O. Colbert, U. S. Coast and Geodetic Survey, Ret., Vice Adm. Emory S. Land, U. S. Navy, Ret., and Dr. Thomas W. McKnew.

Also present were members of The Society's photographic staff who have worked closely with Dr. Edgerton. Edwin L. Wisherd, chief of the photographic laboratory, in particular realized the worth of Dr. Edgerton's flash equipment. Using it, he made pictures of flying squirrels that showed clearly for the first time how the nocturnal animals achieve their soaring flight.*

Dr. Edgerton is a native of Fremont, Nebraska. Two years after his graduation from the University of Nebraska in 1925 as a Bachelor of Science, he earned a Master of Science degree from the Massachusetts Institute of Technology, later a Doctorate of Science.

Dr. Van Biesbroeck Confirms Einstein

Dr. Van Biesbroeck received his award, $1,000, at his home in Williams Bay, Wisconsin. The distinguished astronomer, in cooperation with the United States Navy and Air Force, in 1952 led a National Geographic Society expedition to Khartoum in the Sudan, where he photographed the star field around the sun during its total eclipse of February 25.†

He returned to Khartoum in August, and, with the telescope standing in exactly the same place as before, photographed the same stars in the same relative position at night. By comparing the two sets of pictures, he measured accurately the displacement of the star images caused by bending of their light as it passed the sun.

Almost 40 years before, Dr. Einstein had calculated that the shift would be 1.75 seconds of arc, a tiny fraction of one degree of a circle. The amount of displacement observed by Dr. Van Biesbroeck was between 1.40 and 2.00, with an average of 1.70 seconds of arc.

Born in Gent, Belgium, Dr. Van Biesbroeck studied astronomy both in his native country and in Germany. He came to the United States in 1915 as a visiting professor and became an American citizen in 1922. His association with the University of Chicago, where he was active professor of astronomy from 1924 until 1945, started in 1917.

* See "'Flying' Squirrels, Nature's Gliders," by Ernest P. Walker, NATIONAL GEOGRAPHIC MAGAZINE, May, 1947.

† See "South in the Sudan," by Harry Hoogstraal, NATIONAL GEOGRAPHIC MAGAZINE, February, 1953.

NATIONAL GEOGRAPHIC SOCIETY

SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON 6, D. C.

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

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

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

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

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

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola a ton of scientific instruments and obtained results of extraordinary value.

A notable undertaking in the history of astronomy was launched in 1949 by The Society in cooperation with the Palomar Observatory of the California Institute of Technology. This project will require four years to photomap the vast reaches of space, and will provide the first sky atlas for observatories all over the world.

In 1948 The Society sent seven expeditions to study the Sun's eclipse on a 5,220-mile arc from Burma to the Aleutians.

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

The Society granted $25,000, and in addition $75,000 was contributed by individual members, to help preserve for the American people the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

EXECUTIVE STAFF OF NATIONAL GEOGRAPHIC MAGAZINE

GILBERT GROSVENOR, EDITOR
JOHN OLIVER LA GORCE, ASSOCIATE EDITOR

Senior Assistant Editor
MELVILLE BELL GROSVENOR

Assistant Editors
FREDERICK G. VOSBURGH
LEO A. BORAH
F. BARROWS COLTON
MASON SUTHERLAND

Editorial Staff
GEORGE W. LONG
ANDREW H. BROWN
ROBERT LESLIE CONLY
BEVERLEY M. BOWIE
LONNELLE AIKMAN
STUART E. JONES
ALLAN C. FISHER, JR.
LEONARD J. GRANT
ROSE T. MACINTOSH, Administration

Foreign Editorial Staff
MAYNARD OWEN WILLIAMS, Chief
W. ROBERT MOORE
LUIS MARDEN
HOWELL WALKER

Editorial Research
INEZ B. RYAN
MARGARET G. BLEDSOE

Chief Cartographer
JAMES M. DARLEY

Cartographic Staff
NEWMAN BUMSTEAD, Asst. Chief
CHARLES E. RIDDIFORD
WELLMAN CHAMBERLIN
ATHOS D. GRAZZINI
JOHN J. BREHM
RALPH E. McALEER
APPHIA HOLLSTOCK
RICHARD DARLEY

School Service
RALPH GRAY, Chief
WILLIAM A. KINNEY

News Service
WINDSOR P. BOOTH, Chief
JOHN R. HODGES

Geographic Research
GEORGE CROSSETTE

Advertising
GILBERT G. LA GORCE, Director

Staff Artist and Naturalist
WALTER A. WEBER

Librarian
ESTHER ANN MANION

Illustrations Editor
FRANKLIN L. FISHER

Assistant Illustrations Editor
WALTER M. EDWARDS

Illustrations Staff
KIP ROSS
ANDREW POGGENPOHL
EDWARD C. FERRIDAY, JR.
DEE JAMES ANDELLA
HERBERT S. WILBURN, JR.
ROBERT J. REYNOLDS
CARO STILLWELL, Librarian

Photographic Laboratory
EDWIN L. WISHERD, Chief
RICHARD H. STEWART, Asst. Chief
FRANK H. WILDING

Staff Photographers
B. ANTHONY STEWART
WILLARD R. CULVER
J. BAYLOR ROBERTS
VOLKMAR WENTZEL
ROBERT F. SISSON
JOHN E. FLETCHER
DONALD McHAIN

Film Editor
JOSEPH M. RIDDOUT

Printed in U. S. A. Entered at the Post Office at Washington, D. C., as Second Class Mail Matter. Acceptance for mailing at special rate of postage provided for in Sec. 1103, Act of October 3, 1917, authorized July 1, 1918. Cover design and name registered in United States Patent Office. Marca Registrada.

Glad to Have You Aboard

There are no strangers on the LURLINE. Captain Johnson makes you feel right at home with his cordial "*Aloha*" . . . his "Welcome Aboard!" And all around you is the spirit of Hawaii. It invites you to all kinds of fun and relaxation . . . seagoing sports, parties, movies, dancing. It adds zest to your enjoyment of matchless food and of well-serviced, luxurious living. Only Matson know-how, product of nearly three-quarters of a century on the Pacific, could weave the gaiety and color of Hawaii so intimately into your voyage on the LURLINE. What a vacation . . . all included in your round-trip fare!

See your Travel Agent or any Matson Lines office: New York, Chicago, San Francisco, Seattle, Portland, Los Angeles, San Diego, Honolulu. And book round trip on the **LURLINE!**

THE LURLINE SAILS FROM SAN FRANCISCO AND LOS ANGELES ALTERNATELY

Matson Lines

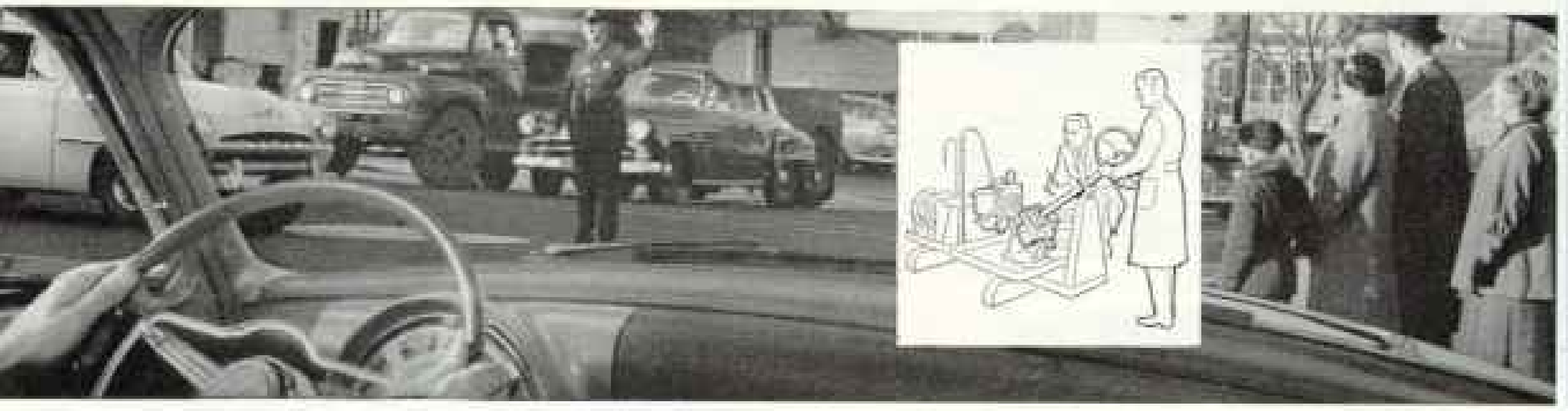
For the finest travel, the **LURLINE**
for the finest freight service, the
Matson cargo fleet . . . to and from Hawaii.

EASIEST TO DRIVE AND THIS IS WHY

There are engineering reasons for every benefit your new Chrysler Corporation car offers you

SITTING IS A NEW EXPERIENCE in the 1953 Plymouth, Dodge, DeSoto and Chrysler. Here you ride comfortably relaxed, not all hunched up. On Comfort-Level seats, you can wear your proudest hat without ducking!

THERE ARE REASONS. Testing and studying for years, Chrysler Corporation engineers and coachwork designers developed a new way to "spring" your car that makes your ride steadier, more truly balanced than was possible before. There's plenty of head and shoulder room. Your seeing area has been increased as much as 15%, too.



EASY DOES IT. At a tangled downtown intersection, or out on the bounciest country road, you steer without strain. Available on Chrysler and DeSoto, full-time Power Steering makes steering your car easy as dialing a phone.

THERE ARE REASONS. Careful oil pressure tests are part of the behind-the-scenes development of full-time Power Steering. This popular Chrysler Corporation exclusive relieves you of 80% of your normal steering effort. And another Chrysler advance, Power Braking, uses engine power to make braking easier and quicker for you, too.

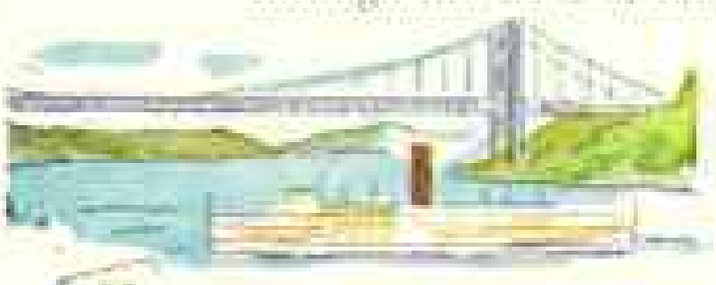
Back of every development that makes your Chrysler Corporation car so easy to drive are the talent and experience of engineers, scientists and technicians with the one aim— to produce fine cars of superior worth. **CHRYSLER CORPORATION**

engineers and builds **Plymouth, Dodge, De Soto, Chrysler Cars & Dodge Trucks**

Chrysler Marine & Industrial Engines • **Gilfillan** Metal Powder Products
Mopar Parts & Accessories • **Airtemp** Heating, Air Conditioning, Refrigeration • **Cycleweld** Cement Products

NEW YORK STATE SIGNPOSTS

Mighty Niagara thrills over three million visitors yearly. The spectacle of the great cataract, a boat ride on the "Maid of the Mist," and a tour through the Cave of the Winds are experiences you'll never forget.

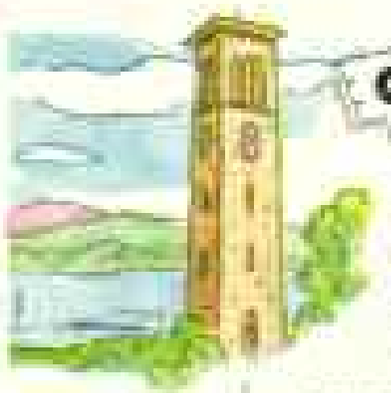


Hudson-Taconic Region—Here you'll enjoy superb scenery, West Point, Hyde Park, and Bear Mountain State Park.

Finger Lakes Region—Sailboating and scenic beauty have made this region a favorite vacationland.

Saratoga-Lake George—See America's most famous spa, its oldest race track, and 30-mile-long Lake George.

Adirondacks—Majestic Whiteface Mountain and historic Lake Champlain are outstanding features of this famous summer playground.



Chautauqua-Allegany Region—Chautauqua offers summer programs of music and education. Allegany, the state's largest park, is located in this region.

Central New York—Visit the Baseball Hall of Fame, the Farmers Museum at Cooperstown, or relax on drives through quiet countryside.

FREE BOOKLET. "New York State Vacationlands" contains 196 pages, 81 full-color photographs. It's the most complete state guidebook ever offered! Send for your copy today.

More people find more to see and do in

New York State

The Vacation Empire

New York State Department of Commerce
Room 702, 112 State Street, Albany 7, New York

Send "New York State Vacationlands." I am interested in: A ( ) resort hotel, B ( ) city hotel, C ( ) bungalow colony, D ( ) tourist home, E ( ) summer cottage, F ( ) campsite, G ( ) children's camp, H ( ) dude ranch. I'd like information on areas checked:

1. ☐ Adirondacks
2. ☐ New York City
3. ☐ Catskills
4. ☐ 1000 Islands-St. Lawrence
5. ☐ Niagara Frontier
6. ☐ Finger Lakes
7. ☐ Saratoga-Lake George
8. ☐ Long Island
9. ☐ Mohawk Valley
10. ☐ Central New York
11. ☐ Hudson-Taconic
12. ☐ Genesee Region
13. ☐ Chautauqua-Allegany
14. ☐ Capital District
15. ☐ Southern Tier

Name_____
(PLEASE PRINT)

Address_____

City_____ Zone_____ State_____

The New IBM Electronic Data Processing Machines

For Science *Industry... Defense*

Combining the great storage capacities and speeds of cathode ray tubes, magnetic drums, and magnetic tapes with the tremendous computing speeds of electronic tubes, IBM engineers and scientists have produced in these machines the most flexible and most productive calculating unit ever marketed.

Here is a computer that can add and subtract 16,666 times a second . . . that can multiply and divide 2,192 times a second . . . and can recall factors from storage, or "memory," in as little as 12 millionths of a second.

This momentous advance in electronic computing gives defense industries, for which this computer was especially designed, a tool of vast power and versatility. For peacetime uses, it will be applied to a wide variety of engineering, research, and scientific problems.

The new IBM Electronic Data Processing Machines are the forerunners of data processing machines for business, now under intensive development in IBM laboratories.

1. 2. 3.

3 KINDS OF "MEMORY"

(1) Magnetic drums—any of 81,920 digits* can be stored or recalled in an average of 40/1,000 of a second. (2) Cathode ray tubes—any of 10,240 digits* can be stored or recalled in 12/1,000,000 of a second. (3) Magnetic tapes—any of 2,000,000 digits* can be stored on one tape or recalled from it at the rate of 12,500 a second.

*Expressed in terms of equivalent decimal digits.

IBM

INTERNATIONAL BUSINESS MACHINES
590 Madison Avenue, New York 22, N. Y.

it's fun

to go to California on the

San Francisco OVERLAND

FASTEST non-extra fare streamliner over any route between Chicago and San Francisco. Direct Overland Route (C&NW-UP-SP). See the High Sierra by day.

FINE FOOD is an *"Overland"* specialty. And eating on the train while scenery glides by your window is half the fun of traveling. Meals are reasonably priced.

Stopover at Reno for fun or to try your luck.

YOU'LL FIND congenial traveling companions in the *"Overland's"* Pullman lounge. Luxurious Pullman accommodations. Low-cost, reserved-seat Chair Cars. Special Lounge for Chair Car passengers, too. Spacious restrooms. Pillow service.

HIGH SPOT of your *"Overland"* trip is arrival at San Francisco. Cross San Francisco Bay by ferry, see both famous bridges. Returning, try another S. P. route and streamliner, see twice as much. Send for folder that tells how.

C. T. Collett, Southern Pacific, Dept. 233
310 So. Michigan Ave., Chicago 4, Illinois.

Please send me, free, your full-color book, "Wonderful Ways West."

NAME_____

ADDRESS_____

CITY & ZONE_____ STATE_____

(IF STUDENT, PLEASE STATE GRADE_____)

SOUTHERN PACIFIC LINES **S·P** AMERICA'S MOST MODERN TRAINS

Here's why it takes

80% less effort to *steer* this new DESOTO and

50% less effort to *stop* it!

Both the Fire Dome V-8 and the Powermaster Six are now on display.

PROBABLY the first thing that you notice when you drive the new De Soto is that you can turn the wheel with one finger, *even with the car at a standstill.* "Hydraulic muscles" go into action the *instant* you turn — do *80%* of the work. The gentlest pressure on the wheel masters bad ruts, soft shoulders. This *Full* Power Steering makes parking easy as dialing a telephone.

The accelerator gives another surprise. Press it, and you feel the surge of the mighty 160 h.p. Fire Dome V-8. It's the world's most powerful, most *efficient* engine design.

And when you apply the brakes, you sense new safety. "Jamming on" is past history. These Power Brakes take *half* the foot pressure.

Notice, too, the new "low-contour" styling—so beautiful, so very *practical.* You get a better view all around. Notice the comfort of chair-high seats—the extra *roominess* everywhere.

Drive this new De Soto soon! Discover a new *kind* of motoring. De Soto Division, Chrysler Corporation, Detroit, Michigan

Whether you choose the mighty De Soto 160 h.p. Fire Dome V-8 (world's most powerful engine design), or the popular Powermaster Six, you'll enjoy the satisfaction of having vast reserves of power. With both you have the economy of *regular* gas.

There's **One Sure Way**

to enjoy Spring travel at its best...

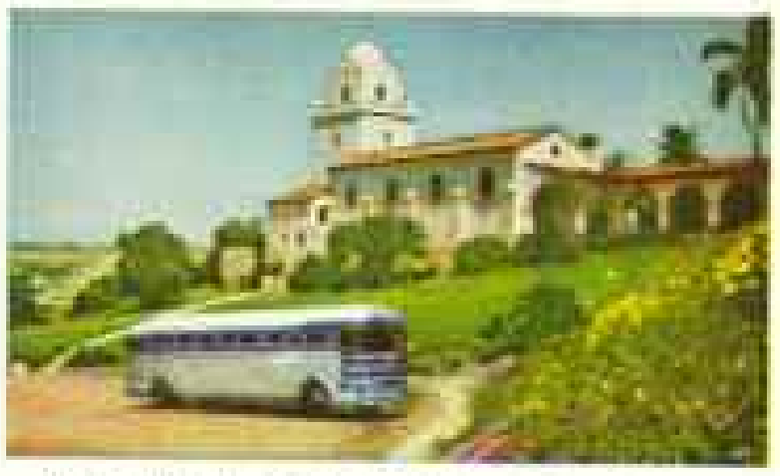
Go Greyhound!

You can plan with confidence when you choose Greyhound for Spring trips, on business or pleasure, to any part of America.

You know you're getting the highest standards ever established in highway travel—plus fares that are far lower than other types of transportation (a fraction of the cost of driving your car). And you're *sure* of the dependability and service that have made Greyhound *Today's Best Buy in Travel!*

One Sure Way to take it easy—Relax as you ride behind one of America's finest drivers.

One Sure Way to plan smooth trips—Let Greyhound's travel experts arrange details.



One Sure Way to meet America—Take a Greyhound Expense-Paid Vacation Tour!

FREE! Full-color pleasure map

Mail coupon to **Greyhound Information Center, 71 W. Lake St., Chicago 1, Ill.** for free Pleasure Map of America. Includes details on 50 Amazing America Tours.

NAME _____

ADDRESS _____

CITY _____ STATE _____ 53-3-ES

A quick tour ... to a land of new profits

One of the Profitlands of your business future is the Land of Glass.

During the next few months, you will be planning for 1954. Perhaps you'll be thinking about premiums, or about accessories, or about *new* products.

We would like to plan *with* you, as we have done with hundreds of other forward-looking manufacturers.

For example, we might discuss how *premiums* of heat-resistant Pyrex brand glasses can help you sell more goods; or how—if you make kitchen appliances—attractive Pyrex bowls, dishes or refrigerator sets might raise your competitive position; or how you might use low-cost Pyrex brand glasses instead of other high-cost materials and save money while boosting sales. Pyrex ware is so popular with American women that 90% use it *now* and always want more!

A quick tour of the pictures at the right and of our descriptive brochure about glass in industry—free of cost or obligation—may offer more excitement than a trip to Bali! May we hear from you before your plans have jelled?

Beverage Server

Household Vacuum Carafe

Pyrex Colored Casserole with Cover

Pyrex Refrigerator Set

Chemex Coffee Maker

Corning Glass Works

CORNING, NEW YORK

PYREX

Corning means research in Glass

CORNING GLASS WORKS, 155 Crystal St., Corning, N. Y.

Please send me a copy of your new brochure, "Glass and You."

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State ____

"PYREX" is a registered trade-mark of Corning Glass Works in the United States.

AMERICAN STATIONERY with your *SUMMER ADDRESS*

Going away for the summer? Be sure that you have an ample supply of "summer-address" American Stationery. This fine writing paper saves *so* much of your time and effort in personal and household business correspondence. And it is so unbelievably inexpensive—200 note sheets and 100 envelopes, rag content bond paper, all printed with your name and address for only $1.00! Order yours now.

Order in quantities as listed. No "split-package" orders accepted. Printing is in rich blue ink; maximum — 4 lines, 30 characters per line including punctuation and spacing. Remit with order. West of Denver, Colo., and in U. S. possessions, add 10% to prices. (No foreign orders.) We pay postage. *Satisfaction guaranteed.*

THE AMERICAN STATIONERY COMPANY
300 PARK AVENUE, PERU, INDIANA

STANDARD PACKAGE 200 NOTE SHEETS (6 x 7) and 100 NEW, IMPROVED ENVELOPES. All neatly printed with name and address $1.00

ENVELOPE PACKAGE 200 ENVELOPES (3⅝ x 6½ — envelopes as in Standard Package). They seal *right*. Perfect for mailing checks. Printed $1.00

DELUXE PACKAGE 125 LETTER SHEETS (6¾ x 10½) and 125 MATCHING ENVELOPES, all in *Amalfi* paper. Distinctive. Printed $2.00

CORRESPONDENCE CARDS 100 CORRESPONDENCE CARDS (3½ x 6) and 100 ENVELOPES. Cards are high-quality pure white vellum. Printed . . $1.50

American Stationery

THE FINE STATIONERY IN THE PLAIN BOX

K *is for Kitten*

Room Air Conditioner
Fits in window—cools, filters, circulates fresh air.

Guaranteed by Good Housekeeping

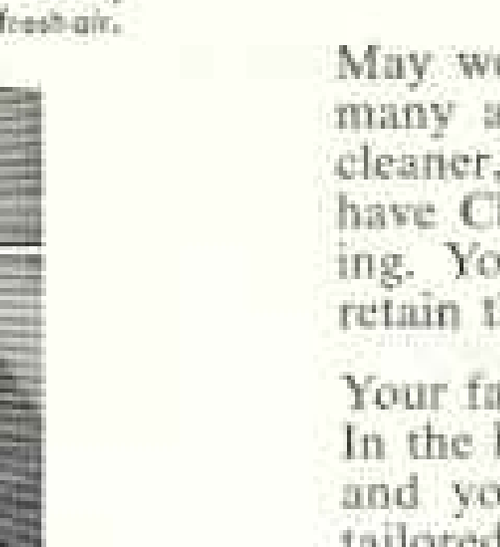
Year 'Round Air Conditioner
Heats, cools, filters, circulates air.

so playful and gay,
with Chrysler Airtemp . . .
the weather's like May!

May weather inside *your* home all year 'round has many advantages. Every room in your home stays cleaner, longer . . . needs less housework . . . when you have Chrysler Airtemp Year 'Round Air Conditioning. Your drapes and furniture stay new looking—retain their beauty for years.

Your family will be healthier, more comfortable, too. In the hottest part of summer or in winter cold, you and your family can live in a *Springtime* climate tailored to YOUR wishes.

Comfort Zone



Chrysler Airtemp

HEATING • AIR CONDITIONING
for HOMES, BUSINESS, INDUSTRY
Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

Get a free copy of the delightful Alphabet Book for children. It shows many benefits of Chrysler Airtemp Air Conditioning for you and your family.

Airtemp Division, Chrysler Corporation
P. O. Box 1037, Dayton 1, Ohio

NG-5-53

☐ I want to know more about the Chrysler Airtemp Comfort Zone.
☐ Send me my free copy of the Chrysler Airtemp Alphabet Book.

Name _____

Address _____ Phone _____

City _____ Zone _____ State _____

Star of the silky way

This one had to be good. It's our Golden Anniversary ROADMASTER.

So upon it we lavished our skills, talents and time—and when you drive it, you will come to know how good a fifty-year best really is.

You'll know it in the swift and soaring power response of its V8 Engine — the world's newest and most advanced V8.

You'll know it in the silken velocity of its getaway—with Twin-Turbine Dynaflow adding far swifter, quieter acceleration to infinite smoothness.

You'll know it, too, in the velvety luxury of its bettered ride, in the new ease of its handling, in the more reassuring comfort you feel, in the more precise control it gives you—*now with Power Steering as standard equipment* and Power Brakes* to lighten the task of quick, sure stopping.

But why say more?

It is for you, the beneficiary of all this engineering excellence, to discover the great and gorgeous going of the swiftest, the smoothest, the silkiest, the most silent automobile yet built in half a century of Buick building.

Your Buick dealer will be very happy to introduce you two. Why not drop in on him soon?

BUICK *Division of* GENERAL MOTORS

**Optional at extra cost.*

Television treat—the BUICK CIRCUS HOUR—every fourth Tuesday

WHEN BETTER AUTOMOBILES ARE BUILT BUICK WILL BUILD THEM

Custom Built **ROADMASTER** *by Buick*

"I've waited a whole year for this!"

And so have all my folks! We've spent so many wonderful holidays in Ontario, we know just how much fun we're going to have. I learned to swim and to dive in Ontario. And this is where Dad taught the boys to fish and sail. There are more than half a million lakes in Ontario, you know! And now we're older, we enjoy so much the wonderful trips we take on those toll-free Ontario super highways.

Travel Tips.

- Well-staffed reception centres at all border crossings to help you plan your trip.
- Warm days—cool nights.
- Excellent shopping, with liberal customs exemptions.

ONTARIO

CANADA-VACATIONS UNLIMITED

Ontario Travel
41-C Parliament Bldgs., Toronto 2, Ontario

Please send me free guide map and 64-page illustrated booklet about Ontario.

Name.....

Street.....

City.....State.....
PLEASE PRINT

35 MM Shooting is fun...

..but the real thrill is the show!

YOU GET

Extra Pleasure showing color slides with

La Belle

Automatic 35 mm. Slide Projectors

LA BELLE "500"
Powerful 300 watt illumination. Complete with F:3.5 coated lens, 300 watt lamp, and two "Safety-File" slide magazines..... **$95.00***

America's ONLY AUTOMATIC projector . . .

Handling of slides is over forever! No more smudges, fingerprints . . . no more fumbling in the dark, no up-side-down, or out-of-sequence pictures. Slide shows are no longer a chore. ALL THESE BENEFITS ARE YOURS EXCLUSIVELY . . . in the new La Belle AUTOMATIC Slide Projector. And La Belle will show either glass or ready mounts.

NEW BRILLIANCE, CLARITY WITH PRECISION OPTICS

EXCLUSIVE TURBINE-COOLING PROTECTS VALUABLE SLIDES

LA BELLE "302"
Remote control permits slide changing from anywhere in room. Complete with F:3.5 coated lens, 300 watt lamp, two "Safety-File" slide magazines, and carrying case.
$154.95*

Ask your photographic dealer for FREE DEMONSTRATION of La Belle AUTOMATIC SLIDE PROJECTORS

La Belle industries, inc. OCONOMOWOC, WISCONSIN

IN CANADA—PRECISION CAMERAS, MONTREAL, QUEBEC

* All prices include Federal Excise Tax

Choose your WESTERN VACATION SPOT here...

then go in style aboard NP's *faster* NORTH COAST LIMITED

ALASKA CRUISE

Cruise the Inside Passage to Alaska past majestic icebergs, towering fjords. Visit Eskimo villages, "gold rush" towns. From May to October, sea trips are available to Ketchikan, Juneau, Skagway, Sitka, Gulf of Alaska, Kodiak, Seward, Prince William Sound, Columbia Glacier, Valdez or Cordova. NP will arrange one-to-three-week cruises for you, take you west on either of our fine transcontinental trains, the North Coast Limited or the Mainstreeter. Round trip steamship fares begin at . . . **$160**

DUDE RANCHES

Pick your own brand of western fun. Youngsters will like a real workin' ranch; you might prefer a rough-and-ready camp or a luxurious mountain lodge. NP has information on ranches in Montana, Wyoming, Washington and Oregon. We'll make your reservations, then speed you to meet your ranch car at our station. En route you'll get your first taste of western hospitality—our famous diner meals with the "Great Big Baked Potato". Weekly ranch rates, including meals, use of horses, from . . . **$60**

YELLOWSTONE PARK

Bring your camera for snapshots of animals, geysers, spectacular scenery in America's favorite playground. Go NP and choose from three Park entrances—thrilling Red Lodge High Road, Paradise Valley and the Gardiner Gateway, and rugged Cody Road. Old Faithful Inn, Grand Canyon and Mammoth Hotels open June 22—Sept. 10 for tours of 2½ days or longer. NP offers shorter trips Spring and Fall. All-expense tours from Chicago to Yellowstone and return via the Mainstreeter, from . . . **$143**

PACIFIC NORTHWEST

Take your choice of mountains or seashore. Relax, climb or hike at Rainier or Olympic National Parks, at Mt. St. Helens or Mt. Hood. Fish the famed Columbia for fighting salmon. Sail Puget Sound to San Juan Islands, Victoria or Vancouver, British Columbia. Stopovers and diverse routing privileges make it easy—and inexpensive—to include Spokane, Lake Pend Oreille, the Canadian Northwest or California on your tour. Round trip fares, Chicago to Seattle, Portland or Tacoma, as low as . . . **$82**

How to make the most of your vacation...

Easiest way to arrange a vacation is by mail. Why not try it this summer? Just write us a letter, name the places you'd like to go. We'll plan a program for you, mail it promptly—with complete costs and schedules. If it suits you, order your reservations and tickets from us by mail. It's as simple as that.

You can stretch vacation time and money, too, when you travel NP. Low train fares actually cost you less than driving your own car. And Northern Pacific's new streamlined schedules save you extra hours for fun when you get where you're going.

Deluxe "Day-Nite" Coaches and private All-room Pullmans let you choose accommodations to fit your family and finances. Two smart lounge cars afford extra pleasure for both Pullman and Coach passengers on the faster North Coast Limited.

For rates, schedules and more information about western vacations, see your local travel or ticket agent, or write . . . G. W. Rodine, Passenger Traffic Mgr., Northern Pacific Railway, Dept. 702, St. Paul 1, Minn.

NORTHERN PACIFIC RAILWAY *Main Street of the Northwest*

COMING TO

Canada

THIS YEAR?

TRAVEL ON ROAD TESTED TRAVEL ROUTES

If you're planning a motor trip to Canada, let British American Oil help you with its free Travel Bureau advice on tested travel routes. The 7000 friendly dealers of this large, nation-wide oil company will welcome you with courteous station service. They'll speed you on your way with quality petroleum products and helpful tourist information. Clip the coupon for advance personalized guidance on *your* trip.

BRITISH AMERICAN OIL
Company, Limited

B-A Travel Service Bureau
British American Oil Bldg.
College at Bay St., Toronto, Canada.

Please send me complete free information on my trip:

Starting Point.....

Destination.....

Name.....

Address.....

City.....State.....

Top-flight Shots

are taken by owners of Zeiss Ikon cameras. Noted for superior optical and mechanical quality. In a wide variety of models.

At leading dealers.

Write us for literature.

Zeiss Ikon

CAMERAS

CARL ZEISS, Inc.
485 Fifth Ave., New York 17

SAFE

as the Queen's Crown Jewels

Carry your travel funds this safe, spendable way on your Coronation visit!

Your travel funds, in the form of National City Bank Travelers Checks, couldn't be safer, if they were guarded in the Tower of London, with the Crown jewels. NCB Travelers Checks are spendable anywhere, for anything. If lost or stolen you get a full refund. Cost only 75c per $100. Good until used. Buy them at your bank.

The best thing you know wherever you go

NATIONAL CITY BANK TRAVELERS CHECKS

Backed by The National City Bank of New York
Member Federal Deposit Insurance Corporation

...relax in Canada

There's "bigness" and beauty wherever you go in this land of
VACATIONS UNLIMITED

MAP OUT your "pleasure programme" from over a million square miles of holiday variety. Mix the quiet charm of old forts and riverside hamlets with the allure of mountain luxury-resorts and "foreign" cities.

MEANDER along scenic coasts. Drive right up to sand-and-surf all to yourselves. Roam in National Parks where there's interesting wildlife to put on film . . . frisky "fighters" to tussle with in famed angling waters. Settle down beside a lake for sailing, canoeing. See your travel or transportation agent soon; send coupon now.

01-1-13-53-04

CANADIAN GOVERNMENT TRAVEL BUREAU

Department of Resources and Development — Ottawa, Canada

Please send your 48-page, full-colour book on vacation attractions in all parts of Canada ☐. Tell me where Canadian travel films are available in the U.S.A. ☐
Check if so required.

Name _____
(PLEASE PRINT)

Address _____

Town _____ *State* _____

Every day's a great day for
all the family...when you vacation

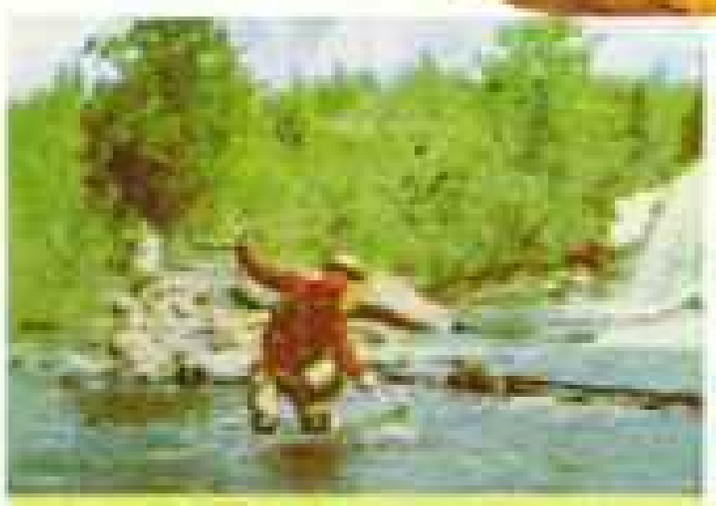
in **Michigan**

WATER WONDERLAND

From your first moment in Michigan, you'll know the distinctive charm that has made this nature-blessed state the Nation's favorite family playground.

Each new hour offers opportunity for active sport or relaxation. Michigan's vacationtime hosts have complemented nature's beauty with golf courses, tennis courts, bridle paths, and every other facility for round-the-clock pleasure. They've built and beautified rustic cabins and friendly hotels to serve as your comfort-conditioned headquarters.

Vacations are a Michigan specialty! You can have a king-size vacation on a modest budget. This year, make Michigan *Your Summer Home!*



Every Day is Father's Day

Dad, choose any sport you like. You can fish, for example, along 36,350 miles of singing streams, or in any of 11,037 sparkling lakes.

Every Day is Mother's Day

Mother, you'll find pleasures by the dozen. If golf is your brand of vacation fun, there is always an inviting green-clad course nearby.

Every Day is Teen-Agers Day

Michigan was made for you. Enjoy sailing, swimming, canoeing, horseback riding to your heart's content—yours for the asking.

Every Day is Youngster's Day

More than 3,000 miles of "fresh water seashore"—one more reason why Michigan is happiness headquarters for children.

MICHIGAN TOURIST COUNCIL

MICHIGAN TOURIST COUNCIL
Room 11, Capitol Bldg.,
Lansing 13, Michigan

Get complete Michigan story in our FREE color folder. Mail coupon today!

NAME_____

ADDRESS_____

CITY_____ ZONE_____

STATE_____

Include guidebook of the regional tourist association checked.

- ☐ East Michigan Tourist Association
- ☐ Upper Peninsula Development Bureau
- ☐ Southeast Michigan Tourist Association
- ☐ West Michigan Tourist Association

Bolex Stereo System $397.50 inc. F.E.T. Complete with Bolex H-16 Deluxe camera $715.50 inc. F.E.T.

Today's movies ...not yesterday's!

Today's flashing action . . . at today's tempo . . . with today's newest development . . . Bolex Stereo Movies! Industry's leaders are already flocking to see the cinema's newest arrival. Here is your opportunity to be in at the beginning!

It's the famous Bolex H-16 DeLuxe movie camera with the exciting new Bolex Stereo System . . . the first completely integrated stereo movie camera . . . a masterpiece of optical engineering by Kern-Paillard.

See how utterly simple is the switch from regular movies to Bolex Stereo movies . . . in full color . . . using your present 16mm projector . . . and with no increase in operating costs!

Bolex Owners receive regular free mailings of the 25¢ magazine "Bolex Reporter" by registering serial numbers with us. Overseas subscriptions $2.00 four issues.

Paillard Products, Inc., 100 Sixth Ave., N.Y. 13, N.Y. Outside U.S.A. write to Paillard, S.A., Ste. Croix, Switzerland

Be first...to enjoy 16mm home movie

Bolex® Stereo!

Jacobsen

so much mower for your money

24-inch cutting width

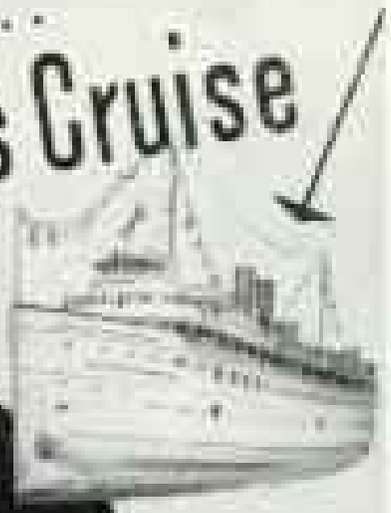
A mower for every lawn, every pocketbook, in both reel-type and rotary models.

See your dealer or write for folder.

JACOBSEN MANUFACTURING CO., Racine, Wis.

Here's top measure in cruise pleasure . . .

a Great Lakes Cruise



7 DAYS from $129.50
from Buffalo, Cleveland, Detroit, Chicago or Duluth.

Over 2200 miles of exciting cruising! Shorter cruises available from $35.50. Rates include transportation, meals, berth in OUTSIDE cabin, entertainment. Tax extra.

See Your Travel Agent or for Free Booklet mail this coupon

GEORGIAN BAY LINE
Dept. N, Foot of Woodward Ave., Detroit 26, Mich.

Please send me a free copy of your 1953 Great Lakes Cruise Booklet.

Name _____

Address _____

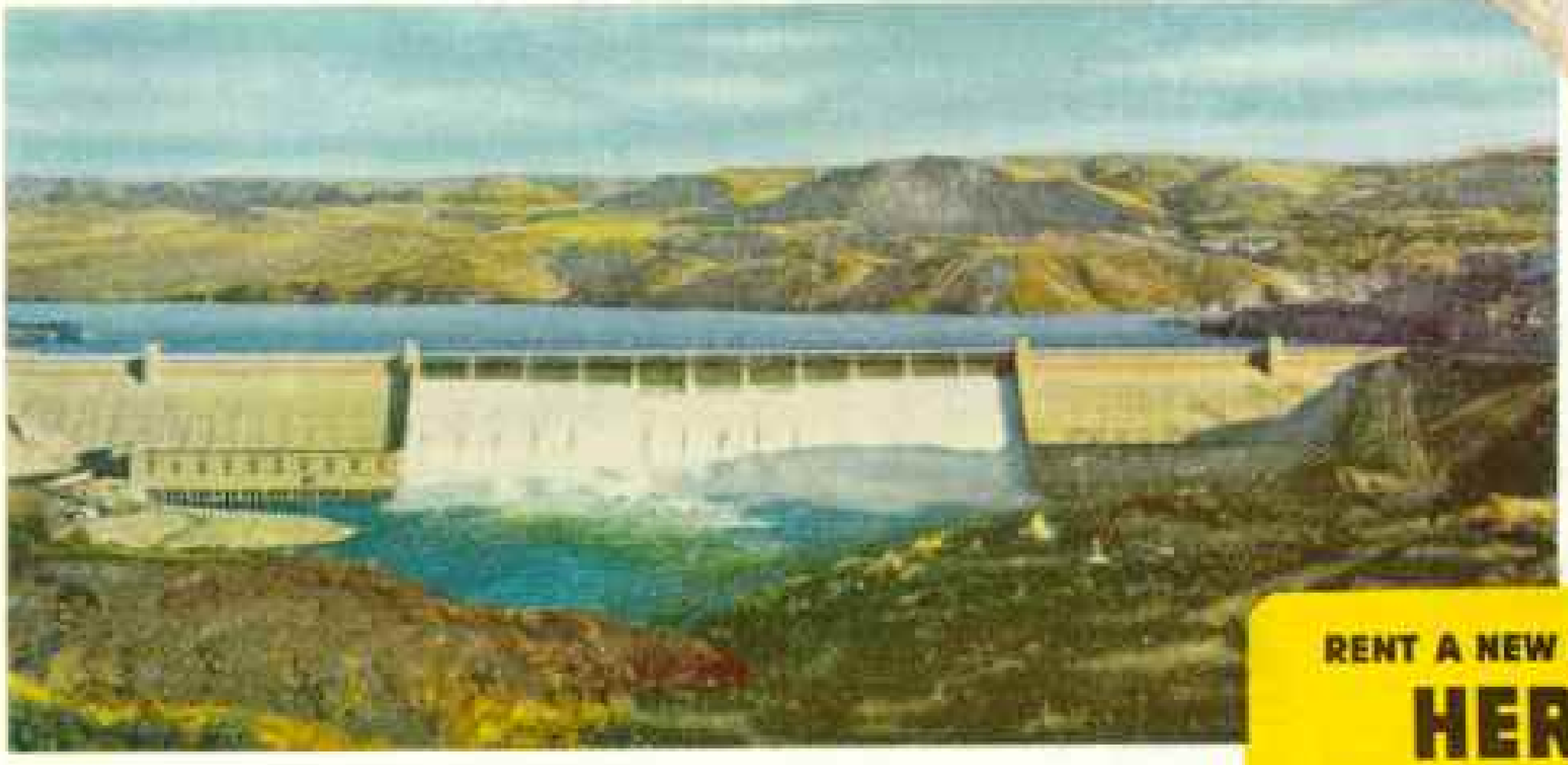
City _____ Zone ____ State _____

GEORGIAN BAY LINE

Smart travelers use HERTZ

to see more...do more...have much more FUN

Make your own schedule . . . hit the byways as well as the highways . . . discover things that are not in the book; in other words—see more, do more, have much more fun—in a fine new private car furnished by Hertz. This is the practical, carefree way to travel because of the surprisingly low rate of rental. In most Hertz cities you can enjoy 200 miles of sightseeing over a period of one week for as little as $49.00—or $9.80 per person if five ride—including all gasoline, oil and insurance. So plan your vacation the modern way—the smart way—the Hertz Service way!



Grand Coulee Dam, only 227 miles from Walla Walla, Wash., is one of the mightiest constructions built by man . . . 550 feet high, 4,173 feet long, 500 feet thick at base; 3 times bigger than the largest Egyptian pyramid. This majestic Dam harnesses the waters of the scenic Columbia River.

RENT A NEW CAR FROM

HERTZ

...drive it as your own

HERTZ SERVICE: what it is, what it costs, how to get it . . .

What It Is . . . Hertz is a rent-a-car service, International in scope, available in more than 500 cities and resort areas throughout the United States, Canada, Alaska, Hawaii, Cuba, Great Britain, Mexico and Switzerland.

What It Costs . . . Here is a specific rate example: at the Hertz station in Walla Walla, Wash., the 24 hour daily rate is $6.75, plus 8 cents per mile, including gasoline, oil and insurance. Thus, the total cost for a trip of 30 miles in any one day is only $9.15, whether one person or five ride in the car. Rates are lower by the week. Rates vary slightly in different sections of the country.

Gasoline, Oil, Insurance Furnished . . . Even on long trips, whatever amount you pay for additional gasoline and oil is refunded to you. Public Liability, Property Damage, Fire and Theft Insurance and $100.00 deductible collision protection are included in the low rate—at no extra cost.

How To Get It . . . It's as easy as A-B-C to rent from Hertz: (A) look in your telephone directory under "H" for your nearest Hertz station; (B) show your driver's license at the station and identify yourself; (C) step into a fine new car and go!

Advance Reservations . . . To be sure of a car when you need it, locally or in some other city, it is well to make a reservation in advance. Any Hertz station will make a reservation for you, anywhere, for any time. Or, if you have the correct Hertz station name and address at your destination city, you can make your own reservations by letter, telegram or telephone. Also, any railroad or airline reservation office will make a Hertz reservation for you through the Hertz Rail-Auto Plan or the Hertz Plane-Auto Plan at the time you purchase your railroad or airline ticket. Always insist on Hertz when you make your reservation and be sure you get Hertz service when you arrive at your destination.

New Model Cars . . . Cars rented from Hertz are always current-model cars of popular makes. The car you rent bears no Hertz identification—it is your *private car*, for an hour, a day, or as long as you wish.

Charge Cards Available . . . Hertz Charge Cards (international in application) are issued to well rated business firms and individuals. The card serves as identification, eliminates deposit requirements, and provides credit privileges if desired. Air Travel Card holders and Rail Credit Card holders are accorded the same privileges extended to holders of Hertz Charge Cards.

Additional Information . . . For information on Hertz stations —anywhere—or for information on any detail of Hertz Service operations, contact your nearest Hertz station or—write or phone Hertz Rent-A-Car System, Inc., Department 853, 218 South Wabash Avenue, Chicago 4, Ill.; phone: WEbster 9-5165.

Look in your telephone directory under "H" for your nearest Hertz station

HERTZ *Rent-A-Car* **SYSTEM**

WHEREVER YOU GO . . . WHATEVER YOU DO . . . YOU CAN RENT A NEW CAR FROM HERTZ AS EASY AS A B C

WHAT'S IN A Sun Valley IDAHO SUMMER?

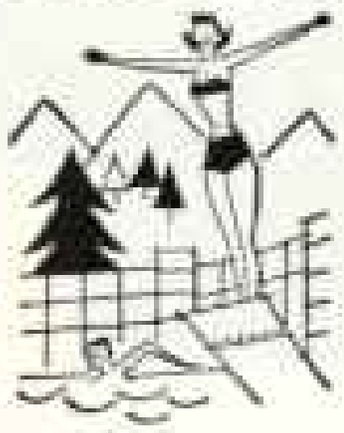
ICE-SKATING

on a big, smooth Out-of-doors rink

An exclusive Sun Valley fun feature! Skates can be rented and there's expert instruction available.

SWIMMING

in two out-in-the open pools



The cool, crystal-clear water is always appealing to swimmers and sun bathers.

GOLF

The velvety course is plenty challenging to par shooters and not too tricky for beginners.

HORSEBACK RIDING

There's a never-ending succession of scenic mountain trails to delight the rider. Many "Valley" visitors try it for the first time.

FISHING

Talk about fishing, this is *it!* Rainbow, Eastern Brook, Cutthroat Trout, Salmon, Chinooks and Steelheads are ready and waiting.

FOR RESERVATIONS and complete information, address Mr. Winston McCrea, Manager, Sun Valley, Idaho, or Union Pacific Railroad, Room 1796, Omaha 2, Nebr., or see your local travel agent.

UNION PACIFIC RAILROAD

OWNED AND OPERATED BY UNION PACIFIC RAILROAD

DON'T LEAVE ANYTHING TO CHANCE.

plan in **ADVANCE**

A comprehensive map of France in color, showing the network of the French National Railroads, makes it easy to arrange practical itineraries in advance. There is also a large colored map of Continental Europe with its important Rail connections.

Free Please send me illustrated "Railroad Map of France and Europe". Write to Dept. NG 5

French NATIONAL RAILROADS

FRENCH NATIONAL RAILROADS, 610 FIFTH AVE., N. Y.

TAKE YOUR CAR ACROSS LAKE MICHIGAN

SAVE 240 MILES OF CROWDED HIGHWAYS
BRIDGE U. S. HIGHWAY 16 BETWEEN
MILWAUKEE, WIS. and MUSKEGON, MICH.

S.S. MILWAUKEE CLIPPER

Enjoy this Wonderful Six-Hour Voyage

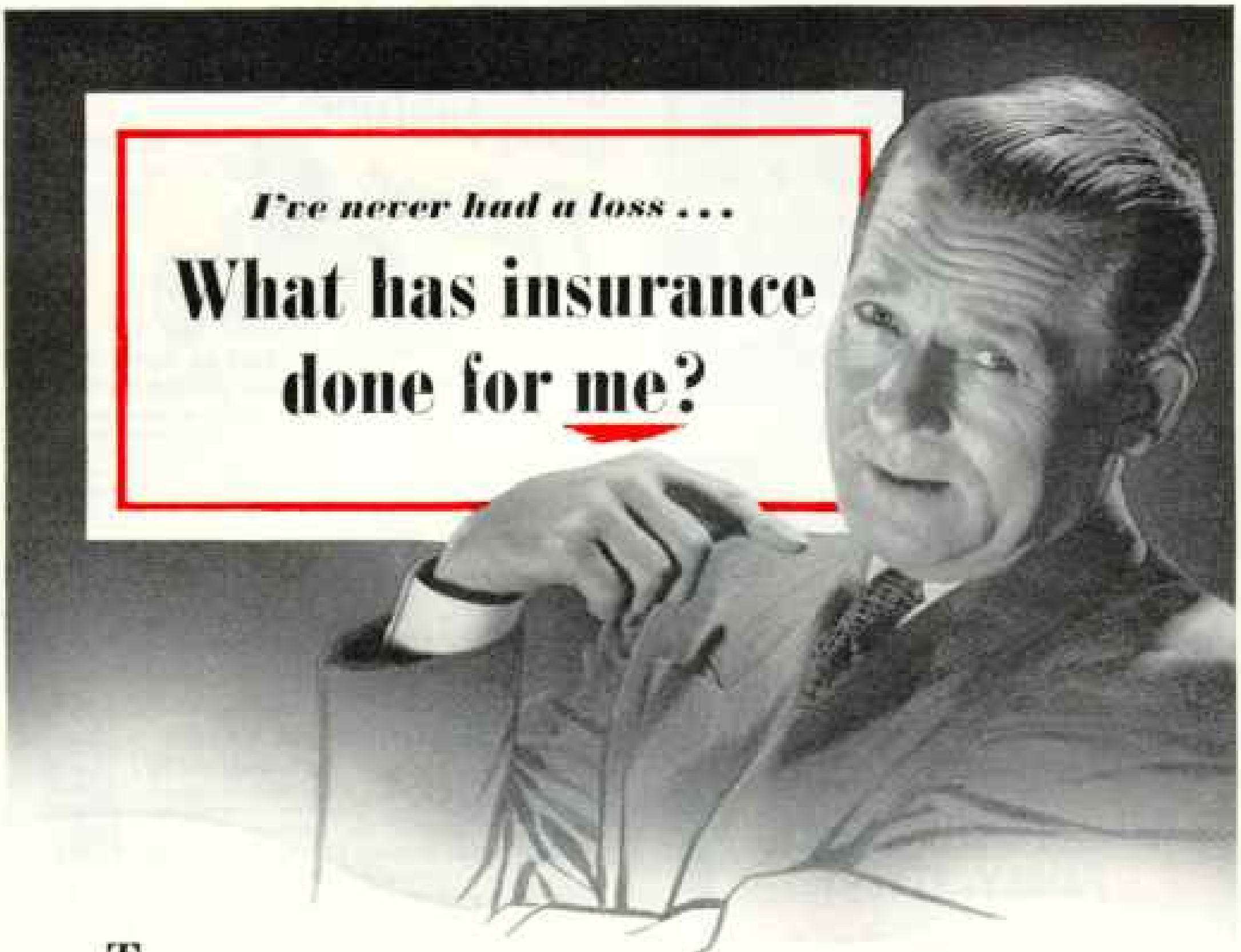
For illustrated folder write Wisconsin & Michigan Steamship Co., 619 E. Erie Street, Milwaukee, Wisconsin.

Comfortable lounges and decks . . . air conditioned bedrooms . . . fine food and refreshments, dance orchestra, nurses, children's playroom, *Ship to Shore Phone . . . Radar*

TICKET OFFICES AND DOCKS

MILWAUKEE, WIS. 639 E. Erie St.

MUSKEGON, MICH. "The Mart"

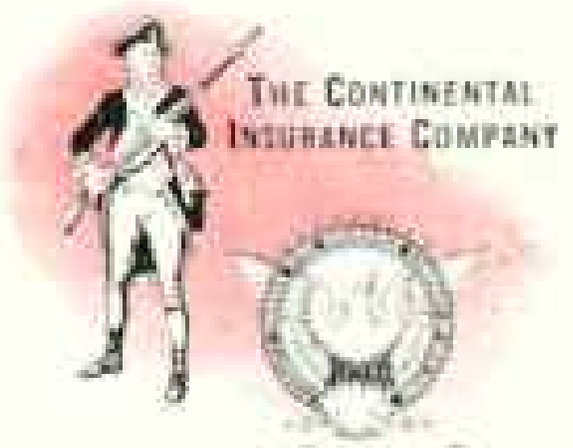


Though you have never suffered a loss, your insurance premium buys many things you would not wish to be without.

One is protection against misfortune—the building that *did not* burn; the elevator that *did not* drop; the boiler that *did not* explode; the dangerous manufacturing process made safe for workers; the accidents at a bad intersection that were prevented; the wiring or appliances that did not fail and destroy your home.

These and myriad other mishaps in which you or yours might have been involved, did not happen because the untiring vigilance of insurance inspectors and engineers prevented them.

Added to this, the greatest payment insurance makes to you is freedom from worry—a feeling of security—peace of mind!



100 YEARS

1953 marks 100 years of proven insurance protection by two America Fore Companies, The Continental and the Fidelity-Phenix.

For the name of a nearby America Fore Insurance Man, call Western Union by number, ask for Operator 25.

America Fore
INSURANCE GROUP

★ The Continental Insurance Company
★ Fidelity-Phenix Fire Insurance Company
★ Niagara Fire Insurance Company
★ American Eagle Fire Insurance Company
★ The Fidelity and Casualty Company of New York

Vacation Dreams Come True in MISSOURI

"HEART OF AMERICA"

Where FUN'S SERVED FAMILY-STYLE!

Junior hunts for arrowheads along forgotten Indian trails. Dad feels the surge of a scrappy smallmouth at the end of his fishing line. Sis thrills as "glamour girl" of the beach. Mom relaxes in the woodland coolness.

Everyone's happy in Missouri . . . and the cost is just about up to you. Choose from Missouri's wide range of hotels, lodges, cabins and cottages . . . every one will help your vacation budget go farther.

FREE color movies of Missouri vacation lands are available to organized groups. Write for information.

Get Your *Beautiful* FREE VACATION BOOK!

It's packed with color pictures and information to help you plan your vacation.

Please send me **FREE** *copy of* BEAUTIFUL VACATION BOOK.

Name .....

Street .....

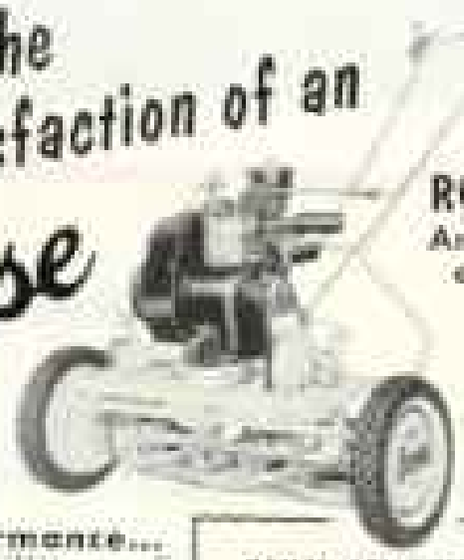
City .....

State .....

MISSOURI DIVISION OF RESOURCES AND DEVELOPMENT

Dept. E342 Jefferson City, Missouri

ENJOY the Lasting Satisfaction of an *Eclipse*



ROCKET 20"
An entirely new concept of effortless, precision power mowing.

Unmatched Performance... Year after year, millions of Eclipse owners get dependable trouble-free mowing perfection . . . easy, economical maintenance of better looking lawns.

Service and Parts . . . Spare parts and reliable service assured by Eclipse' 55 years' experience devoted solely to making quality lawn mowers. Authorized Parts and Service Distributors conveniently located.

Choice of Models... Reel or Rotary, Power or Hand. You can get the *right* Eclipse model, big or small, to best meet your grass cutting requirements.

ONLY AN ECLIPSE OFFERS ALL OF THESE FEATURES:

- Power-driven wheels, reel and sharpener.
- Finger-tip controls.
- Briggs & Stratton engine.
- Five sharp durable blades
- Specially tempered lower knife.
- Timken bearings in reel.
- Patented *Natural-Grip*, all-steel handle.
- Positive action clutch.
- Diamond chain drive.
- Goodyear puncture proof tires.
- "All-weather" finish.

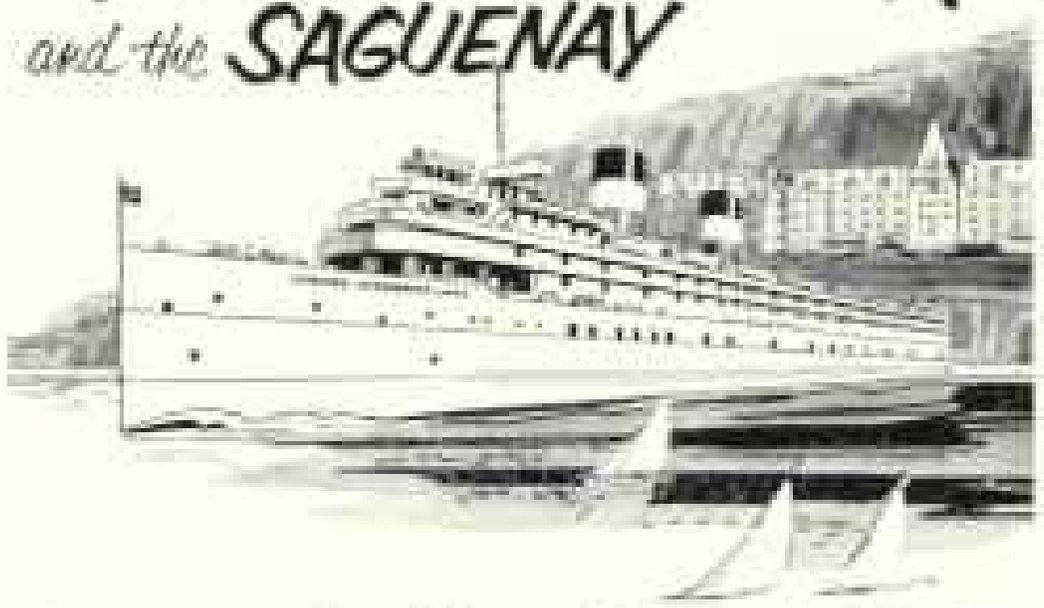
Finish Faster . . . Feel Fresher . . . with an *Eclipse*

All the Facts Are Yours FREE! Write for illustrated booklet with details on the complete line.

THE ECLIPSE LAWN MOWER CO.
Division of Buffalo-Eclipse Corporation
5005 Railroad Street **Prophetstown, Illinois**

Model names are registered trademarks of The Eclipse Lawn Mower Co.
Manufactured in Canada by MAXWELL, LTD., St. Marys, Ont.

Choose a CRUISE *through* FRENCH CANADA *and the* SAGUENAY



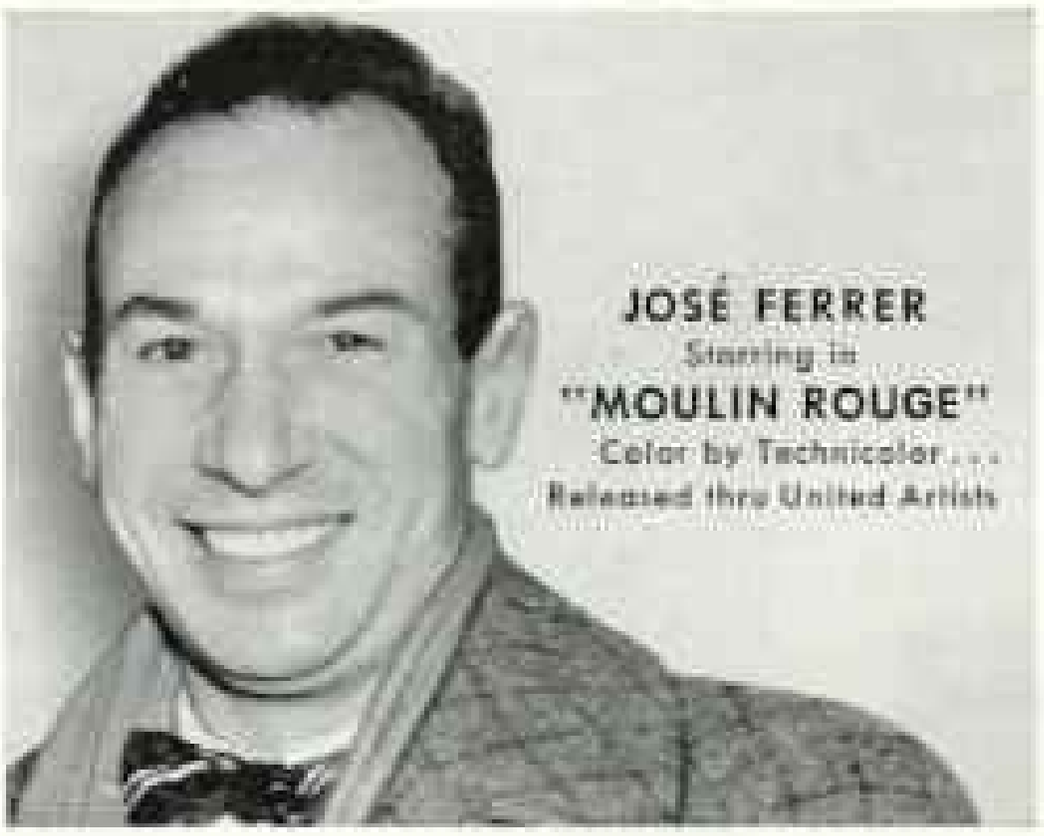
See cosmopolitan Montreal . . . quaint Quebec . . . old costumes and customs in the habitant country . . . Ste. Anne de Beaupré . . . and for contrast, the Manoir Richelieu at smart Murray Bay . . . and friendly Tadoussac.
Low-cost, independent or all-expense Cruise Tours from 3 to 8 days. Enjoy gay cruise life, too, with superb food and service and congenial companions.

See your Travel Agent, Railroad Ticket Agent, or

CANADA STEAMSHIP LINES

Boston • Chicago • Detroit • New York • Philadelphia
Toronto, Ont. • Quebec, P. Q. • Montreal

José Ferrer
SLEEPS COOL
with a low-cost Fedders Room Air Conditioner in his bedroom!



YOU can have the amazing new Fedders unit in *your* bedroom, livingroom or office for as little as $3 a week! It circulates sparkling cool air, wrings out excess humidity. Extra large filters catch dust, soot and pollen. Helps relieve hay fever, keeps rooms cleaner. Exclusive Built-In Weather Bureau gives you the weather you want at the flick of a button! The Fedders unit fits on windowsill without alterations, pipes or ducts. Mail coupon for fascinating booklets on health protection, new home comfort!

FEDDERS
A Great Name in Comfort

½ ton window model, ideal for bedrooms. Breeze Green or Ivory. From $229.95 on Easy Terms.

MAIL THIS COUPON TODAY!

FEDDERS-QUIGAN CORPORATION
Dept. 71, Buffalo 7, New York

Please send me books checked on how I can sleep, work, live better with a Fedders.

☐ "Healthier, Happier Living with a Fedders Room Air Conditioner."

☐ "How to sleep Cool when it's Hot!"

Name _____

Address _____

City _____ State _____

ride a

RALEIGH
CHAMPION OF BICYCLES • BICYCLE OF CHAMPIONS

Raleigh Sports Tourist with Sturmey Archer 3 speed gears and Dunlop 27" x 1¼ Balloon

For the precision engineering that makes it so easy to handle • for extra safety features that make it the safest on the road • for featherlight construction that makes cycling effortless • you'll choose a Raleigh every time.

For free catalogue and dealers' names, write to:

Raleigh Industries of America, Inc., Dept. G
669 Boylston Street, Boston, Massachusetts

Mere words cannot voice the incomparable beauty of Massachusetts — no picture can portray its atmosphere of colonial charm and historic pageantry. Why not pack your bags and see for yourself?

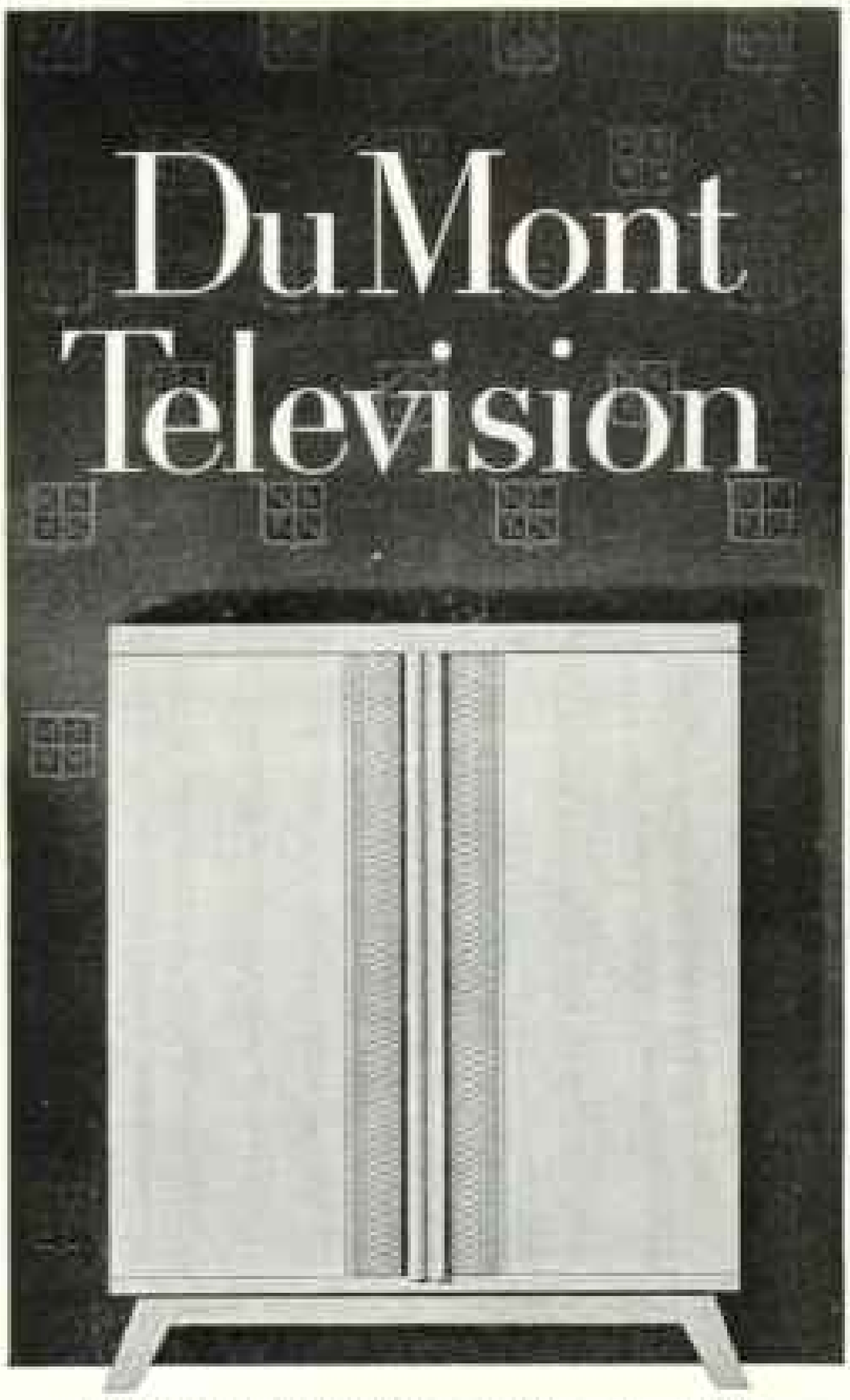
VISIT
Massachusetts
THE COMPLETE VACATIONLAND

Mass. Development & Industrial Commission
State House, Boston, Mass. Dept. NG 9
Please send Vacation Literature

Name _____

Address _____

Du Mont Television



Du Mont Custom NEWBURY II — 21-inch cylindrical-face Du Mont tube with 315 square-inch picture. Drawer for record player. Cabinet styled by Herbert Rosengren of ¾-inch woods and fine mahogany or limed oak veneers.

Proof you can See...

of extra quality for greater pleasure

Compare custom-crafted Du Mont cabinets at your Selected Du Mont Dealer's. See television's finest pictures appear, from every station, in sharp focus . . . *automatically!* Listen to the rich Du Mont tone...produced by a high-fidelity tone system. Here are proofs of television at its best. Choose Du Mont and expect to be complimented. (Provision for economical UHF adaptation)

Now you, too, can afford **DU MONT** from $199.95

First with the Finest in Television

Allen B. Du Mont Laboratories, Inc.,
Customer Priority Dept., Box N-5, East Paterson, N. J.

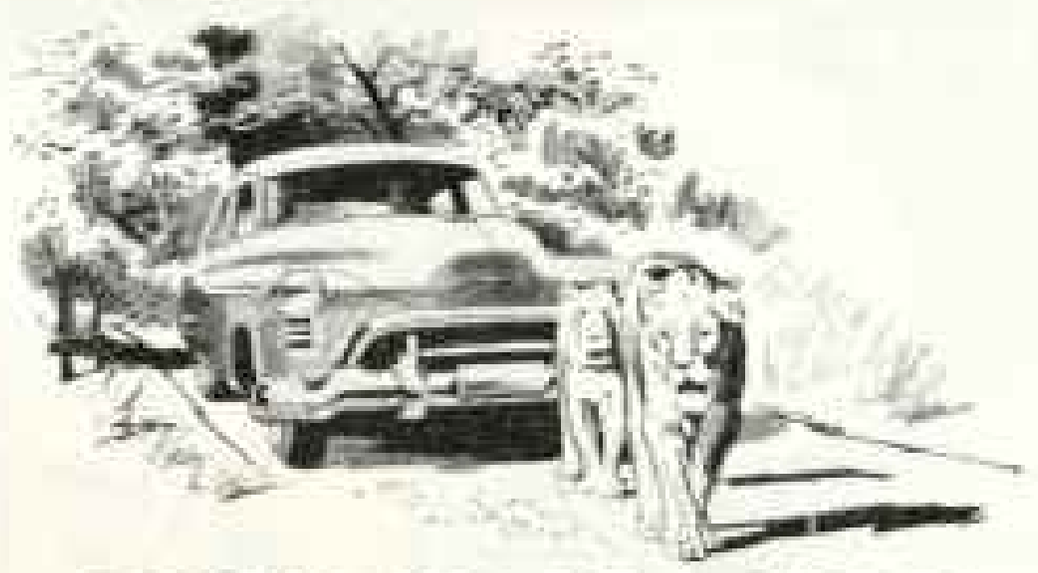
Please send your FREE BUYING GUIDE, showing Du Mont Telesets® in authentic styles for my home.

NAME_____

ADDRESS_____

CITY_____ STATE_____

*Trade Mark



SOUTH AFRICA

...Land of Contrast!

Dark Continent? Wait till you see South Africa's colorful cities...snow-capped mountains...exotic native tribes...wild game! Easily and comfortably you'll travel on to thrilling *adventures in contrast*. See your Travel Agent for literature and information, or write:

South African Tourist CORPORATION
475 Fifth Avenue, New York 17, N.Y.

ROTO-HOE

2 h. p. (as shown) only **$134.**

Useful All Year Around — Complete Interchangeability

America's Most Usable Garden Tool

MORE WORK—WITH LESS EFFORT! ROTO-HOE offers you the complete garden tool—it Tills, Cultivates, Composts, gives you portable power 'most anywhere. The powerful dependable Lauson 2 h.p. gasoline motor rotates 15 specially-hardened teeth at high speed, thoroughly mixing, aerating soil to 8" deep. Makes gardening a genuine pleasure.

COST? That's even more surprising—the same low $134 price established in 1947 for the complete ROTO-HOE basic unit shown above. YEAR 'ROUND Attachments do many extra jobs: Mow lawn, trim, edge, mulch, blow snow. All are low in cost too, to extend this real gardening value. See your dealer for a demonstration; write for free Illustrated circular to—

ROTO-HOE & Sprayer Co., Box 34, Newbury, Ohio

GARRARD

The World's Finest Record Changer

MODEL RC 80
$42.30 net
less cartridges

3 Speeds ...fully automatic with automatic stop

Can be used with your present set.

Garrard Sales Corp., Dept. NG 5-3
164 Duane St., N. Y. 13, N. Y.
Send GARRARD Fact Sheet.
Name_____
Address_____
City_____ Zone____ State_____

A Leica focuses, sights, shoots and winds like other 35 mm cameras. But a Leica thinks as you do — it follows your whims and inclinations, pokes into places of sunshine or shadow, wherever a new mood takes you.

A Leica is practical, whether you are an executive with a hobby, a doctor who records what he sees, a teacher eager to open young eyes to beauty or someone who "just likes to take good pictures." 10, 15, 25 years from now, your Leica will still be taking photographs exquisite in detail, repaying you many times over for your modest investment.

You ARE ready for a Leica. And a Leica, this photogenic spring, is ready for you — from only $151. Your dealer can supply you.

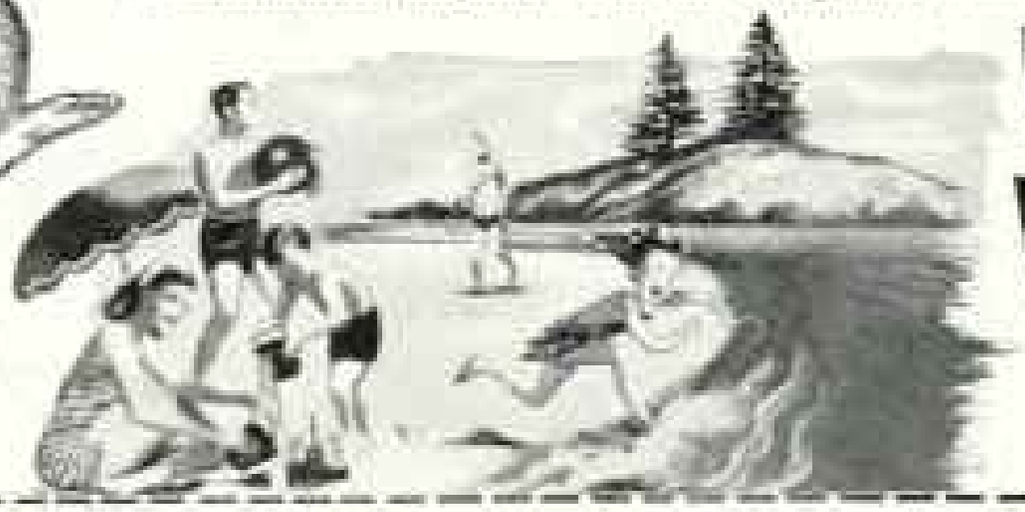
E. LEITZ, INC., NEW YORK

Leica

CAMERAS
LENSES
ACCESSORIES

Your family is in for a great vacation

Relax in WONDERFUL WISCONSIN where the temperature day and night during the summer months averages 69°. Enjoy every type of sports activity, including *fishing at its best!* 8,676 clear, blue lakes—8,349 miles of trout streams—94,500 miles of fine roads. Unsurpassed scenic beauty . . . interesting cities, exhibits and museums. Excellent accommodations and delicious dairyland food . . . moderately priced.



Wonderful WISCONSIN

WISCONSIN CONSERVATION DEPARTMENT
Recreation Section
Room 75, State Office Bldg., Madison 2, Wisconsin

Name.....

Address.....

City.....Zone.....State.....

Send today for FREE BOOK

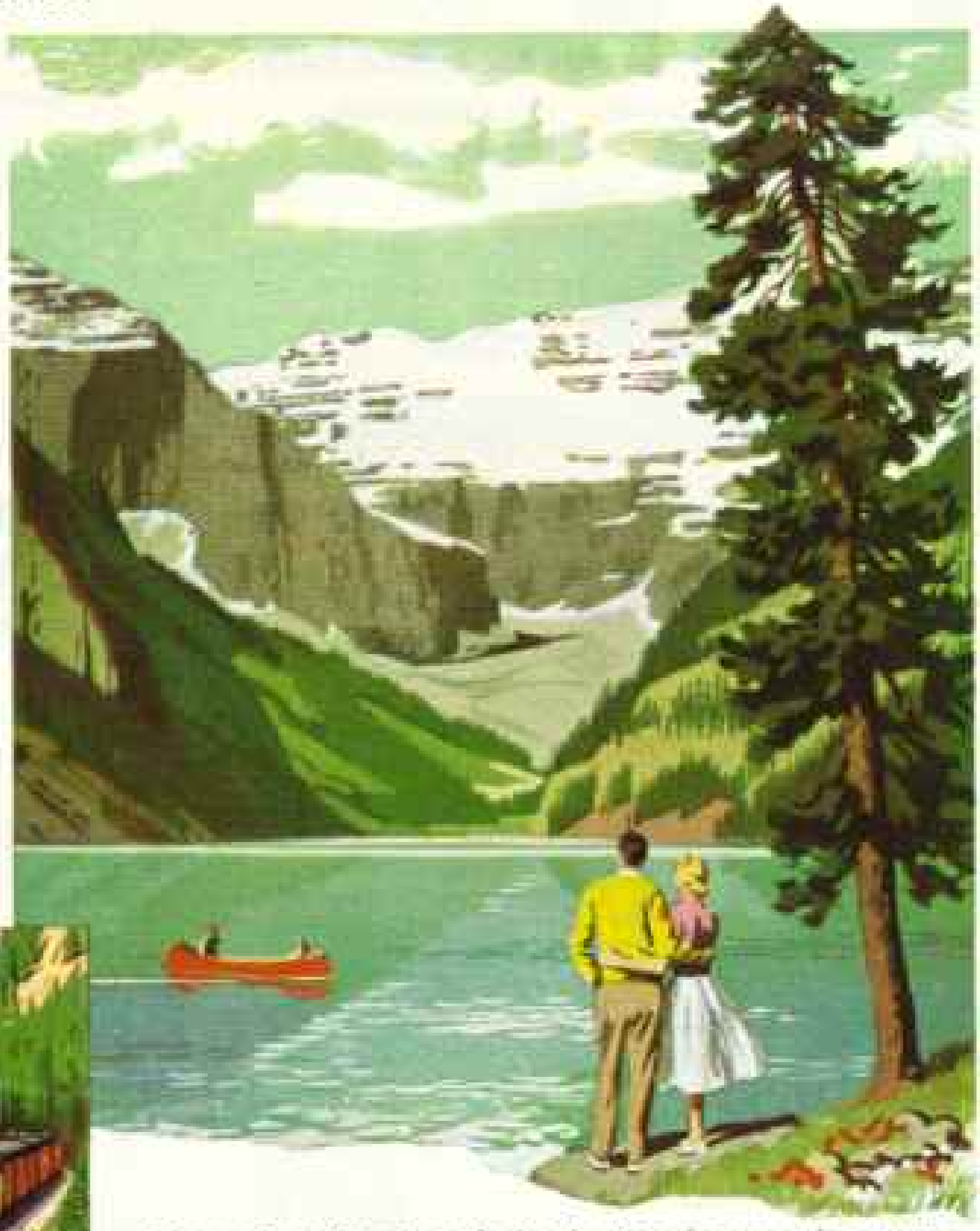

destination . . .
VACATION
transportation . . .
TRAILWAYS
THRU-LINERS
the Smartest distance
between two points
FOR CONVENIENCE — Thru-liners travel direct routes to your destination. No change of bus or baggage.
FOR COMFORT — Restful relaxation is yours to enjoy aboard modern, air-conditioned Thru-liners.
FOR SAFETY — Thru-liner travel is America's safest means of transportation.
FOR ECONOMY — Have more money for fun on your vacation. There are no lower fares.
Mail coupon for your choice of
TRAILWAYS All expense tours
TOMMY THRULINER:
"Your highway host from coast to coast."
TRAILWAYS, Dept. NG-53, 108 N. State St., Chicago, III.
I am interested in a ☐ Trip ☐ Expense Paid Tour ☐
(check one)
FROM
TO
LEAVING DATE
NAME
STREET ADDRESS
CITY
STATE

CANADA

passes your train window...

You can afford to see vast, varied Canada. To aid the budget, Canadian Pacific trains also carry tourist sleepers and coaches with inclining seats. Spotless! Cooled! Modern comfort with *fine* Canadian Pacific service!

Great picture-window views— all yours by Canadian Pacific train! East-to-West, there's quaint, walled Québec, metropolitan Montreal, North Shore of the Great Lakes, the grain lands. *Diesels* glide you mile-high into the shining Canadian Rockies!



Stop off at Banff or Lake Louise for vacation tours in the Canadian Rockies. Marvel at Columbia Icefield, Kicking Horse Pass, Emerald Lake, other grandeurs. *Play in mountain sunshine!* Gay resort life and golf at famous *Banff Springs*. You can hike, ride or fish from enchanting *Chateau Lake Louise*. Or "rough it" in comfort at any of several mountain lodges. Have the time of your life—in Canada, land of *vacations unlimited!*

Canada is news! See it by

Canadian Pacific

Ask your agent about Empress sailings to Europe ...Canadian Pacific resorts in down East Canada.

Agents in U. S. and Canada

Get the best out of your mind with this different dictating machine!

Your success depends not just on what's *in* your mind but what you get *out* of your mind—how well you *communicate!* And that's why the Dictaphone TIME-MASTER is the run-away favorite of busy people.

Just pick up the mike, talk, and you'll soon find out how easy it is to get the best out of your mind.

TIME-MASTER is so simple to use it puts wings on your work.

Your voice comes through with F-M clarity on the new *Dictabelt*, exclusive with TIME-MASTER. Your secretary transcribes from *Dictabelt* with reproduction so clear that she'll think she's listening to F-M radio!

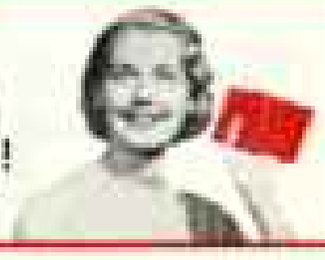
It's an age of plastics and electronics, and Dictaphone Corporation has taken advantage of both to bring you the remarkable TIME-MASTER and the even more remarkable new *Dictabelt*. The inexpensive, convenient *Dictabelt* can be used once and thrown away, filed or mailed.

Why wait longer? The coupon will deliver the promise promptly!

DICTAPHONE®
CORPORATION
Greatest name in dictation

IT'S SAID—

AND DONE!



Dictaphone Corp., Dept. H53
420 Lexington Ave., N. Y. 17, N. Y.
I would like: ☐ A free *Dictabelt* and folder.
☐ A free TIME-MASTER demonstration.

Name_____

Company_____

Street_____

City & Zone_____ State_____

How "young" will they be at 65?

YOUNG PEOPLE today have an excellent chance to live beyond their sixty-fifth birthday. Already there are over 12 million Americans who are past 65. By the end of the century, it is estimated that there will be nearly twice as many.

Most of these millions can look forward to being healthier, happier, "younger" after 65 than people of that age have ever been. This has been made possible chiefly by medical advances.

If you are one of those to whom the words "old age" conjure up an unpleasant picture, you are likely to be heartened by the views of authorities. They say that old age need not be *endured*; that it can actually be *enjoyed*. This depends largely, however, on what you do to safeguard your health.

Over the years, adjustments in diet may be desirable. While the *quantity* of food required in later life usually becomes less, the need for the essential proteins, vitamins, and minerals remains unchanged.

Moreover, proper diet is a safeguard against *overweight* which burdens the heart and often paves the way for diabetes, arthritis, and high blood pressure.

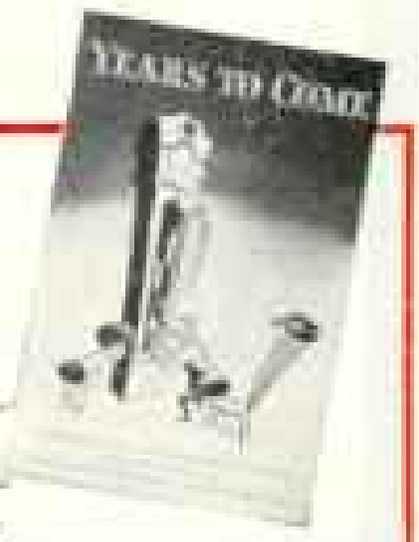
Of course the best way to conserve good health is to place yourself under your doctor's care and go to him for a periodic health examination as often as he recommends it. By following you through the years, your doctor will also come to know you as an *individual* . . . what your personal problems are, what strains your work places on you, what your reactions are in times of stress. Such information is of great value to the doctor in solving many health problems.

He can also advise you about your daily habits—such as getting plenty of rest and sleep and practicing *moderation* in all activities.

Enjoyment in later years also rests to a great extent upon one's mental attitude. This is why it is important to keep up your outside interests, including hobbies. Such activities will help keep you young in heart and young in outlook.

At no time of life should we take good health for granted. Rather, we should plan and work for it, just as we do for the other worthwhile things of life. By doing so, more and more of us can anticipate being "young" at 65 . . . and perhaps even in our seventies, eighties, and nineties.

Metropolitan Life Insurance Company



Please mail me a free copy of Metropolitan's new booklet, 553N, "Years To Come."

Name _____

Street _____

City _____ State _____

DANGER

out for lunch!

Diving at his prey, the duck hawk—*Falco peregrinus*—often reaches the amazing speed of 180 miles per hour.

So suddenly does he nab his lunch that even a duck in flight just doesn't have a chance.

How like a diving duck hawk is an accident! It strikes with the speed of an arrow, never sounds a warning to let you know it's on the way.

Since that is the nature of an accident—and since accidents happen at the terrifying rate of one every 3 seconds—*you need adequate Accident insurance.*

Travelers' Modern Accident insurance pays doctor and hospital bills. It buys groceries, pays rent—takes the place of a breadwinner's salary when he's laid up. You can get full information about Accident insurance from your Travelers agent or broker.

The Travelers

HARTFORD 15, CONNECTICUT

ACCIDENT • SICKNESS • HOSPITALIZATION

ENDS "DUNK FILLING"

Sheaffer's SNORKEL pen

THE ONLY PEN YOU FILL WITHOUT WIPING OFF THE POINT

You'll never again have a mess on your hands when you own Sheaffer's Snorkel Pen. See how its magic filling tube reaches out to drink the ink, while all others must be "dunked" well past the point. Fills instantly, at the finger-touch. Cleans and flushes itself at every filling, so only fresh ink remains, safely leak-sealed in the barrel. Try it yourself...and take special note of its superb writing smoothness.

Sheaffer's Snorkel Pens, $12.50 up. Others from only $3.75

Simple as...

1. Twist—filling tube extends beyond tip of point.
2. Touch down—pen fills instantly through tube at a single down stroke.
3. Twist—tube retracts. Pen is ready to write. No pen wiping needed.

SHEAFFER'S
WRITE OUT OF DISTINCTION

W. A. SHEAFFER PEN COMPANY, FORT MADISON, IOWA, U.S.A. IN CANADA: MALTON, ONT. IN AUSTRALIA: MELBOURNE

Great new team for color slides

Kodak's finest lens . . . the Ektar *f*/3.5, gives you extra color purity in each shot, extra brilliance, extra detail. *Smooth, needlesharp focusing* . . . coupled range finder, exclusive ball-bearing action. *Supreme accuracy* . . . new-type Vee-block bearings eliminate all play in range finder mechanism. *1/300 flash shutter* . . . has built-in synchronization. *Extremely compact* . . . weighs only 18 ounces; fits your pocket. *Automatic features* . . . film stop; film count; double-exposure prevention. Only $92.50.

Top brilliance in its price field . . . powerful 300-watt lamp with superb Lumenized optical system. *True color definition* . . . throughout slide area, with Kodak Projection Ektanon Lens, *f*/3.5. *Three-way slide cooling* . . . by blower fan, baffles, and heat-absorbing glass—fully protects slides. *New-type slide feeding* . . . in top, prevents jarring projector when changing slides. Ask your photo dealer for a demonstration. Only $56.50 including carry case.

Prices subject to change without notice and include Federal Tax

Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE-MARK

*Pronounced as though spelled, Cry-sler

That was the modest foot-note to the advertisement which appeared December 8th, 1923, announcing the entry of Walter P. Chrysler in the field of automobile manufacture.

The daring which led Chrysler to enter a business already dominated by giants, was reflected in the car he built which bears his name . . . now one of the great names in industry.

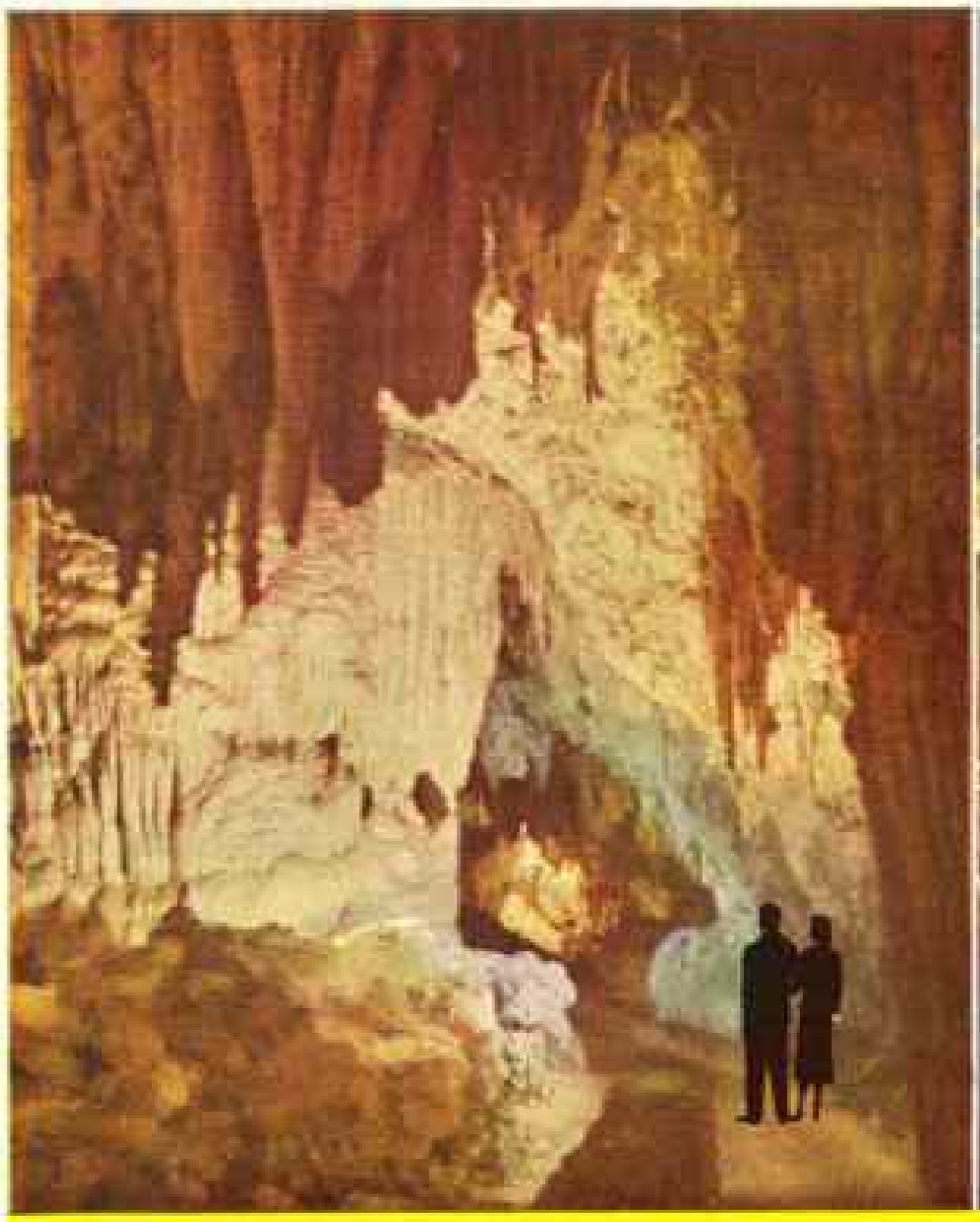
After Chrysler came Plymouth and De Soto, and the acquisition of Dodge. We have been suppliers to them for years. Dodge the longest. Budd has made millions of units for steel automobile bodies for all of Chrysler Corporation.

In business, one of the most important satisfactions is the thrill and stimulus of great associations. It is a satisfaction that has been our good fortune to enjoy in generous measure.

The Budd Company, Philadelphia, Detroit, Gary.

Budd

PIONEERS IN BETTER TRANSPORTATION

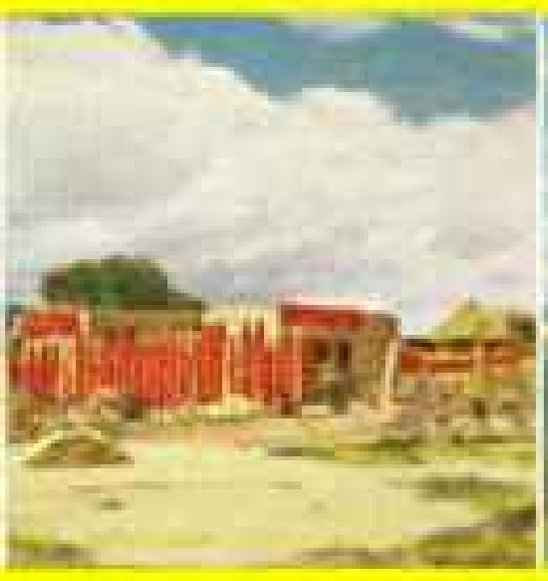


CARLSBAD CAVERNS NATIONAL PARK! SO MAGNIFICENT, SO HUGE, SO FANTASTIC YOU'LL NEVER FORGET IT!

TOP: ELEPHANT BUTTE LAKE, FINE BASS FISHING. LOWER: 16TH-CENTURY INDIAN CLIFF DWELLINGS.

Want a different vacation? Come to big, high, cool,

TAOS "HORSETAIL" DANCERS PERFORMING AT ANNUAL INTER-TRIBAL INDIAN CEREMONIAL AT GALLUP.



CHILI PEPPERS DRYING OUTSIDE ADOBE RANCH HOUSE.

PICNIC AND CAMP SITES AROUND IN NEW MEXICO'S FRAGRANT FORESTS.

unspoiled New Mexico—the fabulous Land of Enchantment!

NEW MEXICO'S modern highways lead to Carlsbad Caverns National Park, 8 National Monuments, 18 Indian Pueblos, 8½ million acres of cool green National Forests. They take you to fiestas, rodeos, ceremonials . . . to thriving hospitable cities . . . to fine hotels, motels, resorts and ranches. Come . . . see *all* of New Mexico this summer. New Mexico State Tourist Bureau, Box 1651, Santa Fe, New Mexico.

This year thrill to Adventure in

NEW MEXICO

THE LAND OF ENCHANTMENT

Camps

ADIRONDACK WOODCRAFT

Fun and adventure in the Woods. 20th year. Ages 7-17. Private lake. Program adapted to individual. Canoe and mountain trips. Horsemanship. Moderate inclusive fee. Resident nurses. Booklet. **Wm. H. Abbott, Dir., Box 2372, Fayetteville, N.Y.**

ADM. BILLARD NAVAL CAMP

Boys 6-18 enjoy naval program July 5 - Aug. 30. Sandy sea beach; sailing, swimming, all sports. School credits available. Jr. naval camp, ages 6-10. Separate 5-wk. cruise or sub-cluster. Uniforms. Catalog. **F. N. Leyser, New London, Conn.**

CULVER SUMMER SCHOOLS

on Lake Maxinkuckee. Eight weeks of Culver training in manliness, courtesy, promptness. Exceptional facilities. All sports. Swimming—Naval and Horsemanship (14-18); Woodcraft (9-13). Separate catalogs. **39 Lake Shore Place, Culver, Ind.**

FARRAGUT NAVAL CAMPS

Summer of adventure on Toms River for boys 9-16. Trips on 65-foot flagship. 42 activities. 2 gyms. 2 athletic fields. Remedial reading, tutoring. Approved summer school program. Catalog. **Farragut Naval Camps, Box LC, Toms River, N. J.**

FENSTER RANCH CAMP 11 Acres in the midst of the desert country. Therapeutic climate beneficial for sinus and asthma. Boys and Girls, 6-16. Daily riding, swimming, all other sports. Trips.... Tutoring. **Mr. George Fenster, Dept. G., Tucson, Arizona.**

LEN-A-PE Boys 6-16. In Pa. Poconos near N.Y.C. & Phila. 30 miles incl. Indians, cowboy, magician, nurse. Excellent care and food. Riding, aquaplaning, canoe trips, tennis, dances. Booklet. Indian Lodge—Assoc. lake front hotel. Phone: MElrose 2-1682 (Phila.). **David E. Keiser, 7733 Mill Rd., Phila. 17, Pa.**

CAMP LUPTON On the Shenandoah. A carefully supervised camp for desirable boys ages 8 to 16. Excellent equipment & location on Shenandoah River in foothills of Blue Ridge Mts. All appropriate sports, sloops & crafts. Own stable, riding master & instruction. Catalog. **The Director, Box N, Woodstock, Va.**

OGONTZ White Mountain Camp in New Hampshire. Girls 6-15 in 4 age groups. 750 acres on mountain lake. Rustic cabins. Swimming, sailing, canoeing, aquaplaning; farm and trail riding, tennis, hockey, golf; art, crafts, music, dramatics. Trips. Tutoring. *Booklet.* **Abby A. Sutherland, Box 600, Ogontz Center, Pa.**

WENTWORTH CAMP & SCHOOL Boys from 8½. Fun plus character training. Optional tutoring. Indian Tribe, Ozark Mt. Camp, riding, canoeing, sailing, swimming, fishing, riflery, military. H.S. & Jr. Col. **Wentworth Military Acad., 853-C Main St., Lexington, Mo.**

Colleges for Women

MARYWOOD COLLEGE

ACCREDITED Catholic college for women. Liberal arts, vocational home ec., teaching (elementary, secondary), music, secretarial, drama, radio, science, med. technol., psychology. B.A., B.S., B.M., M.A. Sports. Dorms. *Catalog:* **Box E, Scranton, Pa.**

Girls' Schools

CAZENOVIA JUNIOR COLLEGE In central N.Y.'s lake region. A.A. and A.A.S. degrees. Liberal arts, science, merchandising, med. illustration, legal and med. secretarial, nursery training, physical ed., music, arts. Sports. **Isabel D. Philsterer, Box N, Cazenovia, N. Y.**

EDGEWOOD PARK Two year advanced courses in cultural and practical arts. Fine arts, merchandising, sec. sc., medical asst., home ec., dramatics, interior dec., costume design, kindergarten. Accred. college preparatory. All sports. Ski hill. Moderate rates. Catalog. **Box N-10, Briarcliff Manor, N.Y.**

FAIRFAX HALL An old Virginia school in the famous Shenandoah Valley. Accredited 4 years high school, 2 years college. Liberal arts, secretarial, music, art, dramatics. Happy social life. Sports, pools. Private stable. Catalog. **Wm. B. Gates, Pres., Box N-535, Park Station, Waynesboro, Virginia.**

LINDEN HALL Junior College and School for Girls. Cultural and Vocational. Music, Home Economics, Secretarial Studies. Fine and Commercial Art. Dramatic Art. Preparatory and General Courses. Beautiful Campus. All Sports. Riding. Swimming Pool. Moderate Tuition. **R. K. Horne, D.D., Box 65, Lititz, Pa.**

OAK GROVE A FRIENDS SCHOOL For Girls Emphasizes Preparation for College and Gracious, Purposeful Living. Music, Art, Speech. Grades 7-12. Strong P.G. for H.S. Grads. Riding included. Joyous Outdoor Life. Beautiful fireproof Quadrangle. **Mr. and Mrs. Robert Owen, Box 140, Vassalboro, Me.**

SOUTHERN SEMINARY & JUNIOR COLLEGE Accredited Jr. College & H.S. Blue Ridge Mts. Music, Art, Drama, Home Ec., Phys. Ed., Secretarial, Merchandising, Kindergarten-Primary Tr., Equitation. 65th Yr. **Margaret Durham Hobey, Pres., Box 205, Buena Vista, Va.**

STRATFORD COLLEGE Executive Training in Art of Living. Accredited Jr. Coll. & H.S. Liberal Arts & Terminal Courses. Speech, drama, music, art, merchandising, sec'l., pre-nursing, med.-sec'l., med. tech., social & sports programs. Catalog. **Dr. John Simpson, Pres., Box N-5, Danville, Va.**

Sullins College Estab. 1870. Accredited Junior College, Liberal Arts & Terminal courses. Music, Speech, Art, Sec'l, Med. Sec'l., Merchandising, Home Ec., Phys. Ed., Ballet, Equitation (own stable), social programs, 55 acres. Private lake. Blue Ridge Mts. Endowed. After 2 yr. H.S. Dept. Business grads & interests. Catalog. **William E. Martin, President, Box N-5, Bristol, Virginia.**

Coed Schools

CHADWICK SCHOOL Rolling Hills, California

Coeducational Country Day & Boarding School. On Palos Verdes Peninsula. 22mi. So. of Los Angeles. Grades 1-12. Fully Accredited. Member California Assn. of Independent Schools. Summer School. **Commander and Mrs. Joseph H. Chadwick, Dirs.**

DEAN JUNIOR COLLEGE W. W. Garner, Pres. Franklin, Mass.

A.A. Degree in 2 years. Co-ed. Broad program of Liberal and Vocational Arts. Business Adm., Medical and Executive Secretarial, Merchandising, Home Ec., Pre-nursing, Phys. Ed., Art, Fashion, Unique guidance program. Traditional campus life. Athletics for all. Swimming pool. Near Boston's cultural, social advantages.

DEAN ACADEMY—Grades 11-12—new special technique to shape individual interests and abilities. Write for catalog (please state age).

ELGIN ACADEMY College preparatory. Coed; grades 7-12. Small classes. Individual PAR goals through personalized guidance. Sports, gym, pool, music, drama. Art gallery. Modern dorms. Endowed. Est. 1839. Write for catalog. **Edward P. Drosta, 117 Academy Place, Elgin, Illinois.**

SOLEBURY SCHOOL

Small, friendly school for Boys and Girls 12-18. Separate campus for girls. Conventional classes. Thorough preparation for college. Accredited. Sports. Art, Music, Dramatics. Near N.Y.C. & Phila. **W. P. Orrick, Headmaster, Box N, New Hope, Pa.**

WAYLAND ACADEMY PREPARES BOYS and girls for all colleges, universities. Small classes, supervised study. Religious, home atmosphere. Music, dramatics. Commercial dept. Athletics. New gym, pool. Dorms. Grades 9 to 12, with jr. **Weimer K. Hicks, President, Box 73, Beaver Dam, Wis.**

Languages

BERLITZ

French, Spanish, German, Italian, every other tongue. Small classes (or private) native teachers; rapid progress in conversational fluency. You speak from the first lesson. *Catalog.* **630 Fifth Ave., New York—and 28 other U. S. Cities.**

LINGUAPHONE LANGUAGE INSTITUTE

At home, quickly, easily learn French, Spanish, German, Japanese—29 languages by Linguaphone World's Standard Conversational Method. Million home-study students. FREE Book. **Linguaphone Institute, 2905 Merz., Rock. Plaza, N. Y. 20.**

Vocational

FRANKLIN TECHNICAL INST.

Two-yr. Engineering courses prepare for excellent positions in Mechanical & Machine Design, Structural Design & Architecture, Industrial Electricity & Electronics, Industrial Chemistry. *Catalog.* **33 Berkeley Street, Boston 16, Massachusetts.**

Bryant COLLEGE 90th year

• Campus to Career in 2 years with B. S. degree. Business Administration, Accountancy and Finance, Executive and Medical Secretarial, Merchandising, Advertising. 1-year secretarial diploma. Dorms on campus. 17 buildings. Coed. Effective placement service. Write for catalog.

Enrollment Secretary, Providence 6, R. I.

INDIANA TECHNICAL COLLEGE

B.S. Degree in 27 months in Aero., Chemical, Civil, Electrical, Mechanical, Radio engineering (incl. TV and Electronics). Drafting. 1-year. Earn board. Demand for grads. Enter June, Sept., Dec., March. Ask for free catalog. **153 E. Washington Blvd., Ft. Wayne 2, Indiana**

KATHARINE GIBBS Outstanding secretarial training for high school, private school graduates, college women. Resident facilities. *Catalog.* **Assistant Dean, 90 Marlborough St., Boston 16; 51 E. Superior St., Chicago 11; 230 Park Ave., New York 17; Montclair, N. J.; Providence 6.**

TRI-STATE COLLEGE B.S. Degree in 27 months in Mech., Civil, Elec., Chem., Aero., Radio and Television Engineering; Bus. Adm., Asst. Beautiful campus. Approved for Korea vets. Grads successful. Founded 1884. Enter June, Sept., Jan., March. Prep courses. *Catalog.* **1453 College Ave., Angola, Ind.**

Home Study

CALVERT "SCHOOL-AT-HOME"

Kindergarten through 9th grade

Calvert "School-at-Home" Courses give your child the same study plan used in the famous 50-year-old Calvert School in Baltimore. Easy to follow directions. Guidance by Calvert teachers. Lessons, books, supplies provided. Students transfer successfully. Start any time. Unique Crafts Course. *Catalog.* Give age and school grade of child.

CALVERT SCHOOL

35 TUSCANY RD., BALTIMORE 10, MD.

Colleges for Men

PENNSYLVANIA MILITARY COLLEGE Coordinated academic and military. ROTC—earn commission. Degrees in engineering, arts, sciences, business adm. Approved for vets. 122nd yr. *Catalog.* **Dean of Admissions, Dept. L, Chester, Pa.**

Boys' Schools

AUGUSTA MILITARY ACADEMY

"The Friendly School"

Distinguished ROTC school in Shenandoah Valley. Jr. and Sr. Divisions. Boys 8-20. Accredited; graduates in leading colleges. All sports—lacrosse, fencing, pool, gym. 1100 acres. Rate $1100. Family owned since 1742. *Catalog.* **Col. Chas. S. Roller, Box N, Ft. Defiance, Va.**

BAYLOR SCHOOL FOR BOYS

97th year. College prep. Accredited scholarship. Boys 12-18. Semi-military. Endowed awards. Ideal location, New gym. Championship athletics. Non-sectarian religious guidance. Summer camp, boys 8-14. *Catalog.* **103 Cherokee, Chattanooga, Tenn.**

BLAIR ACADEMY WELL-ESTABLISHED Reputation for Thorough College Preparation. Small Classes. Experienced Masters. Grades 7-12. Modern Equipment on Country Campus, 65 miles from N.Y.C. Swimming Pool. Golf Course. Est. 1848. **Dr. Ira A. Flitner, Box 17, Blairstown, New Jersey.**

BORDENTOWN MILITARY

FULLY accredited. College preparatory. Business, general. Aviation. Outstanding record of college entrance. ROTC. Boys taught how to study; remedial reading. Jr. School. 72nd yr. Summer session. *Catalog.* **Registrar, Box 655, Bordentown, N.J.**

BOLLES
OF FLORIDA

Fully accredited. Distinguished academic record. Grades 9-12. New conference-type classrooms. Remedial reading. Varsity and intramural sports for all. Year-round golf, tennis, sailing. Post-Military or post-training. Summer School. Catalog:

Registrar, Box 5037-N, Jacksonville, Florida.

Carteret

SUPERIOR College Preparation. Accredited. 1st Grade to College entrance. Small classes. Proper study habits. Remedial reading. Sheppe Homelike dormitory. Large gym. 40 acres atop Orange Mt. N.Y. trips 10 miles. Moderate rate. Booklet C-11.

Carteret School, W. Orange, N. J.

CASTLE HEIGHTS MILITARY ACADEMY

R.O.T.C. High School, prep. for Sr. roles Academies, Jr. School — special instructors, housemothers. 17 modern buildings. Enclosed, swimming pool, golf, aviation. For catalog and "25 Points", write:

Col. H. N. Armstrong, Pres., Lebanon, Tenn.

COLUMBIA MILITARY ACADEMY

12 miles from Capitol in U.S. Gov't. Fully Accred. R.O.T.C. Preparation for Gov't Academies. Jr. School. All sports. New gymnasium with tiled pool. 30-piece band. Summer School & Camp. Write for catalog. **Dept. N, Columbia, Tennessee.**

CULVER MILITARY ACADEMY

On Lake Maxinkuckee. 8th grade. Thorough preparation for leading colleges. Leadership training. Develops physical, intellectual, moral stamina. Senior Basic ROTC. Rated. All sports. Catalog. **59 Pershing Place, Culver, Indiana.**

DARLINGTON SCHOOL FOR BOYS

FULLY accredited. Individualistic instruction—high scholastic standards. Christian influence. Boys grouped by age and size for sports. Lake. Dairy. For catalog, address: **C. R. Wilcox, Ph.D., Pres., Box N, Rome, Georgia.**

DELBARTON SCHOOL

Benedictine school for boys, grades 7-12. College preparation only. Excellent record. Active sports program. Small classes. Friendly atmosphere. 48 acres. Near N.Y.C. Catalog. **Rev. Stephen A. Findley, OSB, Morristown, New Jersey.**

FARRAGUT

FULLY accredited. Preparation for all colleges, Gov't Academies. Two separate schools, Toms River, N.J., St. Petersburg, Fla. Naval training. Separate Jr. schools. Approved Summer School. Testing, guidance. Sports, bands. Specify catalog. **Admiral Farragut Academy, Box L, Toms River, N. J.**

FISHBURNE MILITARY SCHOOL

74TH YEAR. Grades 8-12. Non-profit. Accredited—all colleges. Develops character. Teaches "How to Study". ROTC. Highest Gov't. rating. Beautiful location in Shenandoah Blue Ridge. **Col. John C. Moore, Supt., Box N-5, Waynesboro, Virginia.**

FORK UNION MILITARY ACADEMY

★ Our ONE SUBJECT PLAN of Study

★ (Upper School) has increased number of Honor Roll students by 50%; develops capacity to concentrate. Fully accredited. ROTC has earned highest rating. 500-acre campus, 18 modern buildings; 2 beautiful, spacious gyms; pool. Splendid environment; excellent health record; separate infirmary, 2 nurses. Upper School grades 9-12. Junior School grades 1-7, separate buildings and housemothers. All athletics, bands, glee club. 50th year. For ONE-SUBJECT PLAN booklet and catalog, write:

★ **Dr. J. C. Wicker, Box 305, Fork Union, Va.**

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

GEORGIA MILITARY ACADEMY

Senior R.O.T.C.—Highest Gov't Rating—Accredited—Prep School—Junior College—Separate Junior School—Winter and Summer School—9 miles from Atlanta—Write for catalog to **Col. W. N. Brewster, Pres., College Park, Georgia.**

★ GREENBRIER MILITARY

141st Year

The School of Achievement.

7th & 8th grades & High School and Jr. College: ROTC. Teaches "How to Study". Develops leadership. Remarkable success records. Healthful location, White Sulphur Springs' golf & swim pool. Athletics for all. Intramural & varsity. Accredited—all colleges. Summer Camp. *For Catalog, write:*

Col. O. T. Moore, Box M-305, Lewisburg, W.Va.

HARGRAVE MILITARY ACADEMY

"Winning Character Counts." Preparatory, general courses. Grades 8-12; fully accredited. Boys taught study habits; remedial reading; individual guidance. Separate Jr. School. All sports. Summer School. Catalog. **Col. Jas. H. Cosby, Box N, Chatham, Va.**

HOWE MILITARY SCHOOL

Thorough academic training in spiritual environment. Accredited preparatory, business courses. Potential Achievement rating gives each boy a goal. Jr. school. Sr. ROTC. Episcopal. Summer camp. Catalog. **S. B. Bouton, 533 Academy Pl., Howe, Ind.**

HUN SCHOOL OF PRINCETON

PREPARATION for all colleges. Experienced teachers, small classes. Grades 8-12. "How-to-Study Program." All sports, crew. Founded 1914. Summer school begins June 29. Write for catalog. **Dr. Paul R. Cheshire, 20 Winant Rd., Princeton, N. J.**

JUDSON SCHOOL

RANCH school for 100 boys 6-18 in healthful, warm, dry climate. Small classes; accredited to eastern and western colleges; riding & polo included in tuition. Tennis, swimming, fishing, pack trips. 25th year. Catalog. **H. C. Wick, Director, Box N-1431 Phoenix, Arizona**

KEMPER MILITARY SCHOOL

Boys 6-20. educational, military, recreational program. Century old tradition; modern methods. Accredited. Small classes. H. S. and Jr. College. Sr. ROTC. All sports; pool; new stadium. 100th yr. Catalog. **Dir. of Adm., 1053 Third St., Boonville, Mo.**

KENTUCKY MILITARY INSTITUTE

A SCHOOL with a winter home at Venice, Florida. Preparation for college under ideal climatic conditions all year. Oldest Private Military School in America. For catalog, address: **Col. C. B. Richmond, Pres., Box N, Lyndon, Ky.**

MANLIUS

FOUNDED 1869. For boys. Accredited. Grades 7-12. Complete college preparation includes Officers Training. Graduates eligible for advanced standing college R.O.T.C. Remedial reading. Sports. Band. Summer session. Tutorial assistance. For catalog, address: **Robert N. Weekes, Manlius School, Manlius, N. Y.**

MARION INSTITUTE

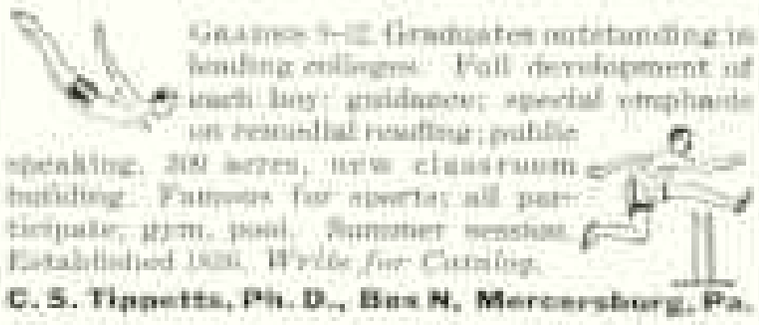
111TH YEAR. Accredited Junior College, 4-year High School. Special preparation for Annapolis, West Point. Senior R.O.T.C. unit. Sports. Accelerated program. Summer semester. Catalog. **Col. J. T. Murfee, Pres., Box N, Marion, Alabama.**

MASSANUTTEN MIL. ACAD.

ACCREDITED. Prepares for College and Christian Citizenship. Friendly supervision and study guidance. Small classes. R.O.T.C. All sports. Gym. Pool. Riding. Junior Sch., 5th grade up. Catalog. **Col. H. N. Benchoff, Hdmr., Woodstock, Va.**

MERCERSBURG ACADEMY

WHERE BOYS LEARN TO BE MEN



Grades 9-12. Graduates outstanding in leading colleges. Full development of each boy; guidance; special emphasis on remedial reading; public speaking. 300 acres, new classroom building. Famous for sports; all participate; gym, pool. Summer session. Established 1893. *Write for Catalog.*

C. S. Tippetts, Ph. D., Box N, Mercersburg, Pa.

MILLERSBURG MILITARY INSTITUTE

In the Heart of the Blue Grass. Fully accredited. 44th Year. College Preparatory and separate Junior School. New gymnasium. For catalog and "An Untilled Room", address: **Colonel W. N. Nelson, Superintendent, Box 1653, Millersburg, Ky.**

MISSOURI MILITARY ACADEMY AND SEPARATE JUNIOR SCHOOL

5th grade thru high school. Fully accredited. R.O.T.C. Friendly and inspiring teachers. Complete guidance program. All sports. Riding. Golf. 30 acre lake. 3 athletic fields. 200 acre campus. Catalog. **Col. C. R. Stribling, 953 Main St., Mexico, Mo.**

MORGAN PARK MILITARY

Contrasts development of every boy in invigorating military atmosphere. Fully accredited preparatory. Grades 1-12. Small classes. ROTC. Sports. In suburban Chicago. 68th year. Catalog. **Col. C. L. Jordan, Box 753, Morgan Park, Chicago 43, Ill.**

NYMA

The School of Distinction

develops your boy's mind, body, character, leadership. Graduates successful in all leading colleges. Experienced faculty; individual attention. Varsity and intramural sports: swimming pool, tennis, golf. Infantry, Cavalry, Artillery, Junior School. Band scholarships available. R. O. T. C. catalog.

Established 1889 · ROTC

New York Military Academy

22 Academy Avenue

Cornwall-on-Hudson, N. Y.

NORTHWESTERN MILITARY AND NAVAL ACADEMY

ORIGINAL prep. est. 1888. Accredited. 75 mi. to Chicago, 25 to Milwaukee. Any classic. Fireproof buildings. Modern facilities. 85 acres on lake. Jr. ROTC Basic. All sports; sailing. Naval Camp. Catalogs. **55 So. L. Shore Rd., Lake Geneva, Wisconsin.**

OHIO MILITARY INSTITUTE

Bring out the best in your boy. Large faculty, small classes. Lower School for boys 7-11. Upper School Certificate to Colleges. Woodland summer camps. High, healthful location. 122nd yr. All sports, pools. Write: **5551 Belmont, College Hill, Cincinnati 24, O.**

ONARGA MILITARY SCHOOL

CHARACTER first! Individual College Preparation. Fully Accredited. Teaches How to Study. Free tutoring. Business Courses. Vocational Guidance. 5th gr. up. Gym and pool. 85 miles S. of Chicago. Catalog. **Col. L. W. Adams, Box W, Onarga, Illinois.**

EDUCATIONAL TROUBLE SHOOTERS

Individualized Plan—Each Student a Class

For those with educational problems—successful college preparation and general education. **Our tests discover causes of difficulties** and we (1) devise individualized program to overcome difficulties; (2) make up lost time; (3) build confidence; (4) teach the art of concentration, and science of study.

Faculty 12; Enrollment 36; 47 years' experience. Write Edward E. Knight, Ph.D., Headmaster.

OXFORD ACADEMY

Box G-25, Pleasantville, N. J.

PEDDIE

An endowed school. Boys thoroughly prepared for college and for life. Fully accredited. Jr. School. Small classes, individual guidance. Public speaking course required. Sports. New gym, golf, pool. 150 acres. Summer session. 45 miles NYC. 59th year. Write for catalog. **Dr. C. O. Morang, Box S-N, Hightstown, N. J.**

PEEKSKILL MILITARY ACADEMY

119th year. Successful preparation for all colleges. Fully accredited. Non-profit. Individual programs. Small classes. Athletic teams for all. Swim pool. Band, glee club, rifle team, camera club, etc. **Separate Junior School**, 3rd grade up. Enumerate. Also **Summer School.** *Mention needs. Catalog, write*

Headmaster, Box 305, Peekskill-on-Hudson, N. Y.

PENNA. MILITARY PREP

FULLY accredited college Preparatory—Teaches how-to-study. Small classes. Senior R.O.T.C. Highest Govt. rating. 2 athletic fields. Swim pool. Band, Glee Club, Rifle Team. 102nd year. Near Phila. Catalog. **C. R. Moll, Dept. 55, Chester, Pa.**

PERKIOMEN

Boys taught to study in homelike atmosphere. Grades 9-12. Accredited. Remedial reading. Sports, activities for all. Wholesome dorm life. Near NYC, Phila. 70th year. Summer school. Catalog. **Stephen N. Roberts, Headm., Pennsburg, Pa.**

PLEASE FILL IN BLANK BELOW, DETACH AND MAIL TO THE SECRETARY

Recommendation for Membership

IN THE

NATIONAL GEOGRAPHIC SOCIETY

** The Membership Dues, Which Are for the Calendar Year, Include Subscription to the National Geographic Magazine*

To the Secretary, National Geographic Society,
Sixteenth and M Streets Northwest, Washington 6, D. C.: _____ *1953*

I nominate _____
PRINT NAME OF NOMINEE

Occupation _____
(This information is important for the records)

Address _____
PRINT ADDRESS OF NOMINEE

_____ *for membership in The Society.*

Name of nominating member _____
PLEASE PRINT

Address _____

* DUES: Annual membership in United States, U. S. Possessions, and countries in the Postal Union of the Americas and Spain, $5.00; Canada, $5.50; British Isles, $5.60; elsewhere abroad, $6.00. Life Membership, $150.00 U. S. funds. Remittances should be payable to National Geographic Society. Remittances from outside of continental United States and Canada should be made by New York draft or international money-order.

5-53

"What will the telephone
be like
when I grow up?"

It's hard to say, young fellow, but you can be sure there are great things ahead.

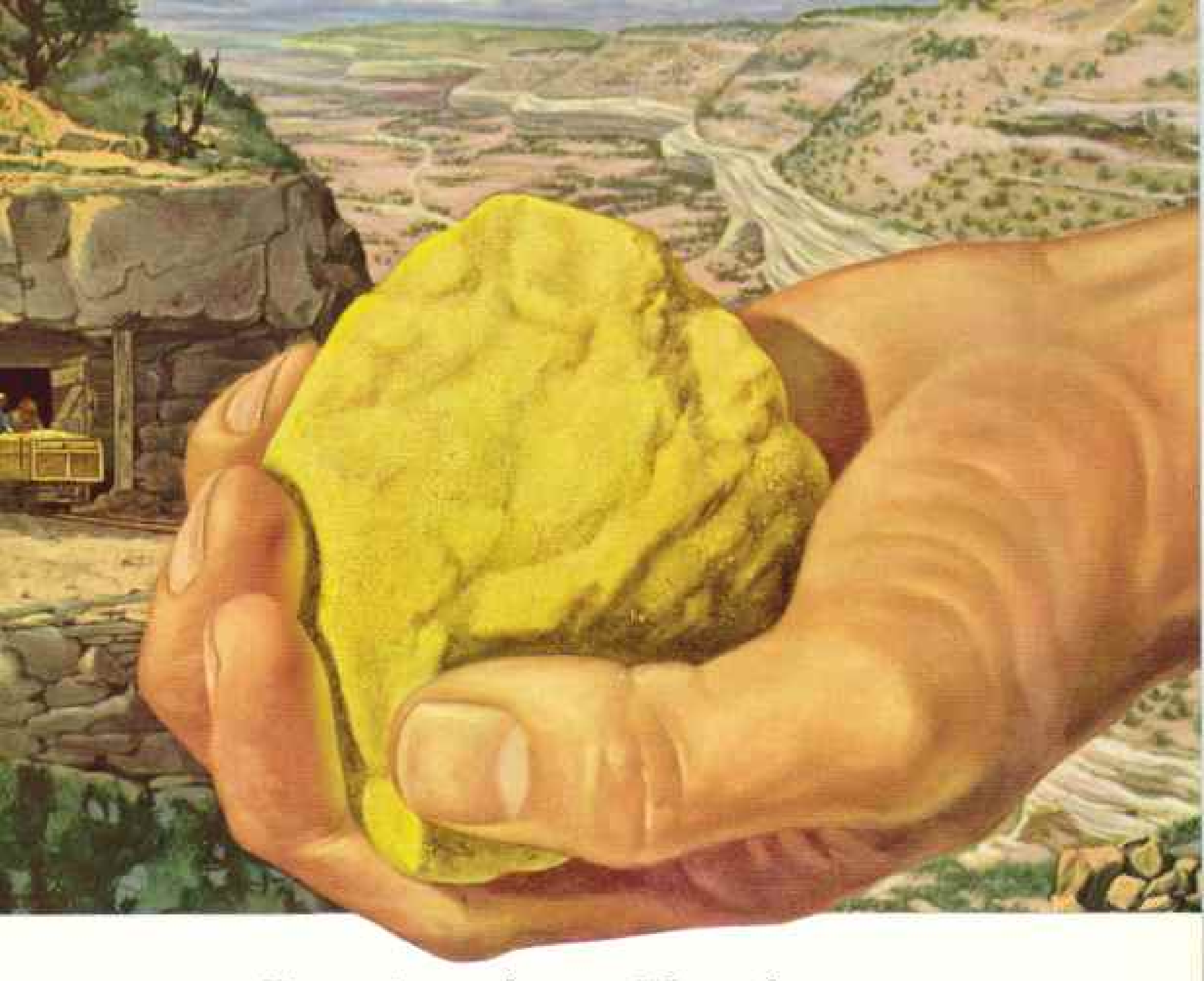
Today we telephone from moving automobiles, trains, airplanes and ships far out at sea. And radio microwaves beam telephone calls and television programs from tower to tower across the country.

The day is coming when you will be able to reach any telephone in the country simply by dialing a number.

Perhaps some day in the future you may just speak the number into the transmitter and get your party automatically.

BELL TELEPHONE SYSTEM

The Best Possible Service
at the Lowest Possible Cost



Promise of a golden future

Uranium ore from the Colorado Plateau is helping to bring you atomic wonders

Long ago, Indian braves made their war paint from the colorful sandstones of the Colorado Plateau.

THEY USED URANIUM—Their brilliant yellows came from carnotite, the important uranium-bearing mineral. Early in this century, this ore supplied radium for the famous scientists, Marie and Pierre Curie, and later vanadium for special alloys and steels.

Today, this Plateau—stretching over parts of Colorado, Utah, New Mexico, and Arizona—is our chief domestic source of uranium. Here, new communities thrive; jeeps and airplanes replace the burro; Geiger counters supplant the divining rod and miner's hunch.

From hundreds of mines that are often just small tunnels in the hills, carnotite is hauled to processing mills. After the vanadium is extracted, the uranium, concentrated in the form of "yellow-cake," is shipped to atomic energy plants.

A NEW ERA BECKONS—What does atomic energy promise for you? Already radioactive isotopes are working wonders in medicine, industry, and agriculture. In atomic energy, scientists also see a vision of unknown power—which someday may heat and light your home, and propel submarines, ships, and aircraft. The Indian's war paint is on the march again—toward a golden future.

UCC TAKES AN IMPORTANT PART—The people of Union Carbide locate, mine, and refine uranium ore. They also operate for the Government the huge atomic materials plants at Oak Ridge, Tenn., and Paducah, Ky., and the Oak Ridge National Laboratory, where radioisotopes are made.

FREE: *For an illustrated story of the fascinating uranium country of the Colorado Plateau, write for the booklet "Mesa Miracle." Ask for booklet B.*

UNION CARBIDE
AND CARBON CORPORATION
30 EAST 42ND STREET UCC NEW YORK 17, N. Y.

UCC's Trade-marked Products of Alloys, Carbons, Chemicals, Gases, and Plastics include

ELECTROMET Alloys and Metals • HAYNES STELLITE Alloys • EVEREADY Flashlights and Batteries • NATIONAL Carbons
ACHESON Electrodes • PYROFAX Gas • PRESTONE and TREK Anti-Freezes • PREST-O-LITE Acetylene
BAKELITE, KRENE, and VINYLITE Plastics • DYNEL TEXTILE FIBERS • LINDE Oxygen • SYNTHETIC ORGANIC CHEMICALS