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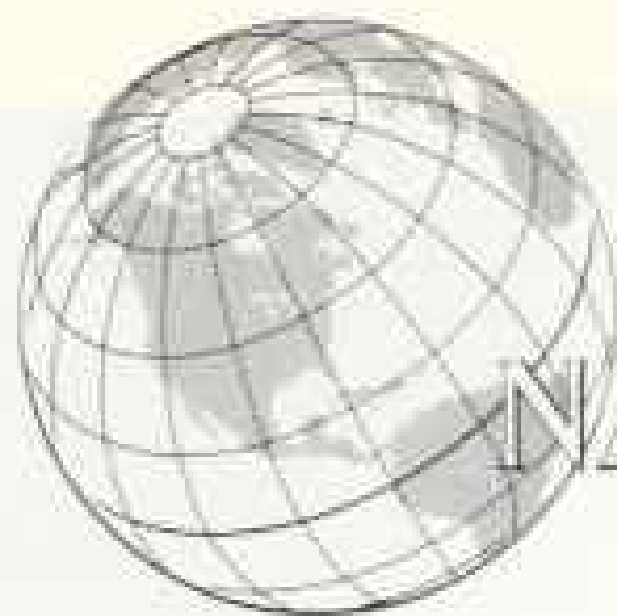
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Viet Nam's Montagnards

CAUGHT IN THE JAWS OF A WAR

Article and photographs by HOWARD SOCHUREK

THE ONLY SEAT I could find in the cramped troop compartment of the helicopter was on top of an empty coffin. It crossed my mind that I might be brought back riding inside it. We were hurtling at 90 knots through pea-soup weather—and at treetop level.

The heavily armed chopper swung suddenly sideways as the pilot skidded around the top of a 70-foot pine that rushed at us through the fog. Below, the reddish-brown thread of old French highway No. 14 writhed through impassable jungle from Kontum, 20 minutes behind us, to the major military base at Dak To in Viet Nam's embattled central highlands. Down there walked the Viet Cong.

Yesterday's People Face Today

It was October 4, 1967. For the eighteenth time in eighteen years, I was in Viet Nam—not, this time, to report on a maddening war, but to live for a time with a people trapped in its terrible jaws.

"The Montagnards? They are caught in the middle; between us and the Vietnamese, between the Vietnamese and the Viet Cong,

between animism and Christianity, between illiteracy and education—in one generation between a father who hammers iron to make a knife and a son who wants to study science. What will happen to them? That's your story."

David G. Brown, Foreign Service Officer, had so summarized his own feelings as we stood on the front steps of the new United States Embassy in Saigon.

Now I looked down on the green-velvet jungle that mesmerized the eye as it flowed below, and for the first time in a long while I thought of Lt. Col. Charles Michael Holland. The last time I had seen Mike was in a strangely similar circumstance; he had kicked me out of a C-119 cargo plane during a parachute drop at Suncheon, North Korea, in October, 1950. It had been my first combat jump.

I first heard the word "Montagnard" (MOHN-tahn-YAR) from Mike. In the cold, endless nights of that Korean winter, he spoke with me frequently about his mission during World War II as an American adviser to the primitive hill tribes of Viet Nam and how he got there.

Viet Nam, then part of French Indochina,



Soldier of fortune, Montagnard tribesman Y Bang Ong—nicknamed “Gums” for his wide smile—fought with the Viet Cong until captured by American troops. Now he wears the camouflage “tiger suit” of the “strikers,” a force of tribesmen led by South Vietnamese, with American advisers. Their mission: to patrol strategic highlands and block infiltration of men and supplies

was occupied by Japanese troops, but guerrillas continually harassed them from the highlands. One of the guerrilla leaders who lived among the Montagnards collected butterflies. Someone at the Office of Strategic Services in Washington, D. C., heard about it and prepared a fine collection of North American varieties. Colonel Holland, then a young captain, was selected to jump into the

highlands, then to stay on and support the guerrillas against the Japanese invaders.

In 1945 he parachuted into the mountains with the butterfly collection and was welcomed by a little-known, middle-aged politician named Ho Chi Minh.

The present-day leader of North Viet Nam was not the first to use the remote villages of the hill tribes as sanctuaries, nor would he



ENTRANCES BY HOWARD JOCHUMER © N.S.P.

from North to South Viet Nam. Pawns in a war of surprise and ambush, the primitive villagers often change loyalties to survive.

Embattled homeland of the Jch, one of 30 tribes in South Viet Nam known as Montagnards, wears the deceptive calm of morning. The Dak Poko's jungled valley hides trails used at night by the Viet Cong.

be the last. Throughout Asian history the highlands have been a staging and recruiting center for rebellion and revolution.

Tribes Hold Much of the Land

For more than 1,500 miles, from the Himalayas through the Yunnan plateau of China and on to the South China Sea, stretches a mountain region that isolates China from

Southeast Asia. Long before Burma or Thailand became nations in the modern sense, the hill tribes—the Kachins, Karens, Luas, Nagas, and many others—lived in this area.

In Burma, hill tribes account for a fifth of the population and occupy more than half the land. In Laos they account for about half the population and occupy 80 percent of the area. And in South Viet Nam a mosaic of



30 different primitive tribes, known collectively by the French word Montagnards—"Mountaineers"—accounts for 15 percent of the population and occupies more than two-thirds of the land (map, right).

Now I was to see some of the country that Mike Holland had seen 22 years earlier.

The jungles fell suddenly away, and we whirled over a mile-wide clearing, the Special Forces' major highland base, Dak To.

My guide and interpreter, Patrick Cohen, had been sitting deep in thought. Now he leaned forward for a better look below. A tall, thin-faced man of 32, Pat wore an unlikely uniform: short-sleeved sport shirt, blue slacks, open-toed sandals, and a long-billed blue canvas cap that advertised Honda motorbikes.

It was good enough for the only kind of war Pat ever fought, that for men's souls. He lives in the great Christian missionary tradition that in Viet Nam goes back to January 18, 1615, when Father Francesco Buzomi, a Neapolitan, landed in Hue.

A member of the Wycliffe Bible Translators, with headquarters in Santa Ana, California, Pat has spent the past three years in the highlands. He lives in a village near Dak Pek, our destination, and is one of the two or three Americans in the world who can speak Jeh, the language of the tribe in that area. He is devising a written language for the Jeh,

Focus of world concern, Southeast Asia thrusts its mountains and plains into the South China Sea. More than a million Montagnard tribesmen, of the Mon-Khmer and Cham groups, occupy the mountain backbone of former Indochina, now divided among the two Viet Nams, Cambodia, and Laos. The isolated hill folk view lowland Vietnamese with suspicion and distrust.

A large-scale wall map of Viet Nam, Cambodia, Laos, and Thailand, issued as a supplement to the February, 1967, GEOGRAPHIC, may be ordered from Department 485, National Geographic Society, Washington, D. C. 20036; paper map, \$1.10; fabric, \$2.30; index, 55 cents (all postage paid).

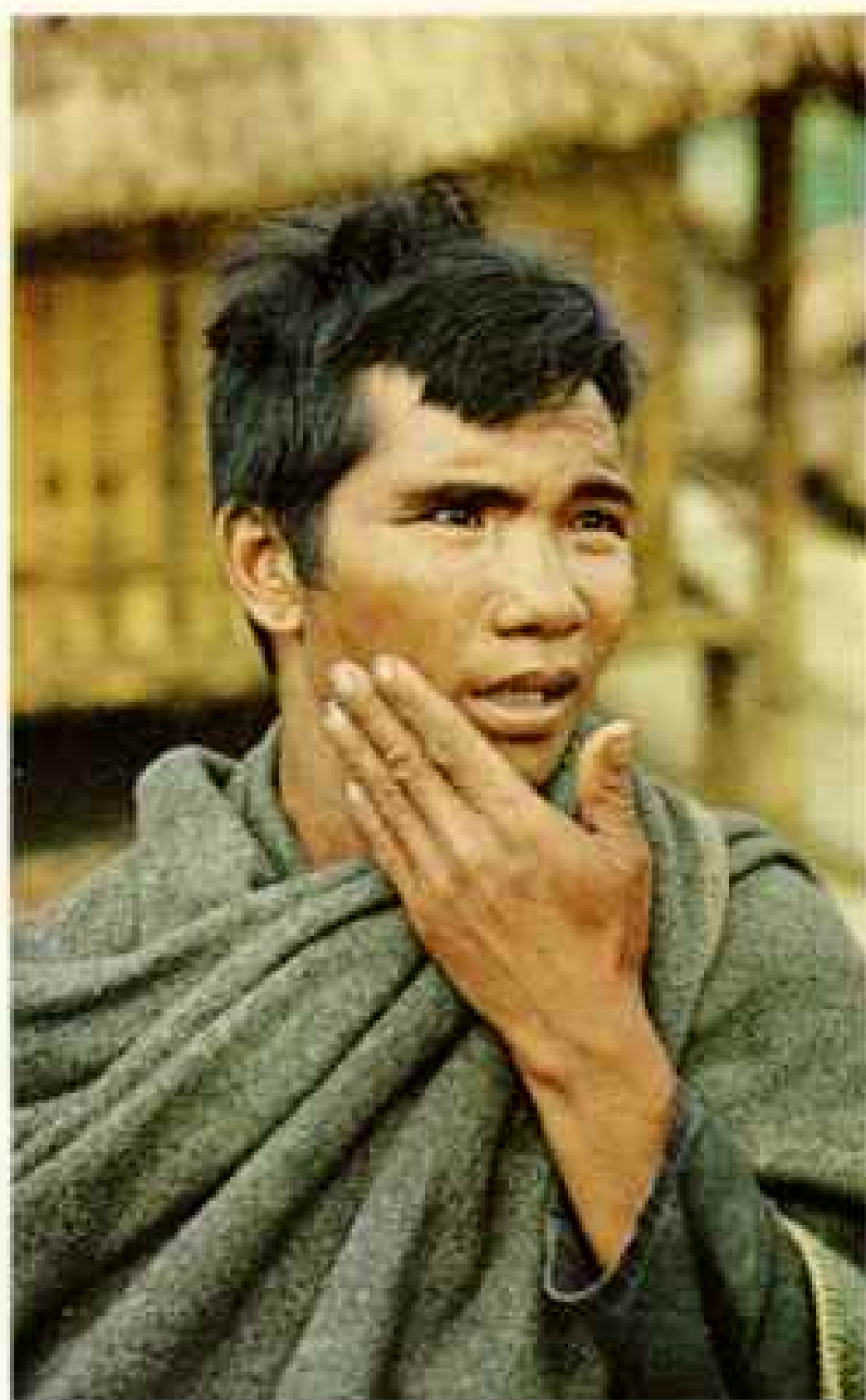
Frontier fort, the Special Forces camp at Dak Pek protects surrounding Montagnard villages. Map at right, based on the author's sketch, locates 16 villages of the Jeh tribesmen who flock here for safety. Names of many rivers and hamlets include the word *Dak*, meaning both "stream" and "village."

On the edge of danger, walled villages of Dak Go Kram, foreground, and Dak Tung crown hills near the Special Forces outpost.



MONTAGNARDS





Left to die by his own people, Roi, a Jeh soldier, shows where a Viet Cong bullet hit his jaw. Superstitious tribesmen abandoned him in the belief that violent death impels a soul to wander and cause harm. Rescued by Americans, Roi lives at Dak Pek on a pension from the South Vietnamese Government.

Tense harvest: Jeh soldiers guard a village girl as she winnows rice by tossing it on a flat basket. The Viet Cong, hard pressed to supply both themselves and North Vietnamese infiltrators, frequently raid food stocks, making protection of crops a constant duty. Viet Cong, a contraction of Viet Nam Cong San, means "Vietnamese Communist."

and has already begun to translate the Bible into their tongue—a task that may take years of patient effort. He is a wonderful and selfless man (page 459).

We landed at Dak To to refuel, and I clambered over the coffins for my first look at a large central highlands base. There was no hint then, in the rugged terrain surrounding the great clearing, that one of the most savage battles of the war would be fought here within a matter of weeks.

Highlands Defense: Frontier Outposts

"About 50 Special Forces outposts like this are scattered through the mountains of South Viet Nam," a helicopter crewman told me. "They all operate the same way—a contingent of two U. S. Army officers and ten enlisted men, and a Vietnamese Army unit of the same size. Each camp trains 200 to 700 Montagnards, 'strikers' we call them, but officially they are designated CIDG's—civil irregular defense groups. They try to break up infiltration routes from North Viet Nam.

"When the camps were organized in 1961," he continued, "different tribes started moving their villages in close to them for protection; now every CIDG outpost is surrounded by Montagnard villages. You'll see when you get



to the Dak Pek Special Forces camp. It's the most northern and most remote in the Second Corps area."

The helicopter finished fueling. On a signal from the waist machine gunner we climbed back aboard, scrambling over newly loaded mortar shells, a radio receiver, red plastic mail bags, fiberboard containers of 16-mm. movies, and cases of "dynamite pills" to combat an outbreak of meningitis.

Fog and drizzle again forced us to follow the remains of Route 14 at deck level. Here the road was washed out. Another mile and the bridge was out. This too was VC country. No convoys could come north from Dak To.

In a few moments we passed over a deserted settlement, the burned-out houses sprawling ghostlike on a misty hillside. Pat Cohen leaned over and yelled into my ear: "That's Dak Sut. I used to live there before the VC hit it. There's what's left of my old house!"

He pointed at one of the abandoned houses that now darted under the helicopter.

In August, 1965, after Pat had lived for several months in Dak Sut, a district capital, the VC had attacked and burned it. Fortunately Pat was away that night. Afterward the Special Forces had pulled out. Now the villagers were gone, some into the forest, others impressed into Viet Cong labor gangs.



As we flew beyond Dak Sut, the clouds lifted and we were able to climb to 1,500 feet. I relaxed a bit. Now we were far less vulnerable to Viet Cong ground fire than we had been at 50 feet.

The sun came out, then a rainbow appeared, and there below lay our destination, Dak Pek. We had an excellent view of the Special Forces camp, on a hilltop surrounded by log-covered bunkers and an outer trench perimeter. Sandbagged mortar pits were built on an inner perimeter. A reinforced-concrete team house with a tin roof lay at the hub of this defensive wheel.

On surrounding hills that stood like miniature pyramids on either bank of the Dak Poko were the Montagnard villages. I counted 16 separate settlements within a mile of the camp. All looked the same from the air: clusters of thatch-roofed huts clinging to the very pinnacles of the steep, forested hills (page 446). But one bald hilltop stood abandoned and crater-scarred.

"That was Dak Dru Doc," Pat said, leaning close to my ear. "The North Vietnamese Army overran it a couple of months back."

Far below a green smoke grenade exploded on the helicopter pad inside the perimeter, signaling that it was safe to land. Our warrant officer pilot started a steep turn that corkscrewed us down to the landing field. Near the ground I glanced at the chopper's altimeter: 2,390 feet. Later I learned that the Jeh live at altitudes ranging from 2,000 to 5,000 feet (for detail, see lower map, page 447).

Monsoon Rains Leave Bunkers Awash

We were met by Master Sgt. John J. Self of Spring Lake, North Carolina, the team sergeant for the 12-man Special Forces unit. Pat Cohen moved out immediately to his village, Dak Peng Sial Peng, about a mile away, and asked me to join him there after lunch.

The Dak Pek camp was in terrible condition. Three months of rain had just ended. What the VC had been unable to do, nature had done. The downpour had flooded and collapsed the log and mud roofs of almost all the underground bunkers. Only half of the communications room remained. Radio transmitters and receivers were barely visible

through the rubble of logs and mud. The team was jammed into the two remaining bunkers that had not been flooded. Team commander Capt. Donald G. Carr of East Chicago, Indiana, shared his room with four enlisted men.

Captain Carr was certainly having his troubles: the mud in the bunkers, the danger to patrols in the jungle, new refugees coming in from the hills before the rice crop was harvested, the outbreak of meningitis.

Patrols Constantly Seek Viet Cong

Sergeant Self turned over his own bunk to me. "I'm about to leave on a 28-day patrol," he said. "I won't be using it."

It was the policy of the Special Forces to keep half the camp's troops out on patrol. "The best defense is a strong offense," Sergeant Self explained.

The patrols ranged over the mountains that surrounded Dak Pek, setting up ambush positions and attempting to locate the Viet Cong and North Vietnamese forces. They operated within a 10- to 15-mile radius of the base camp.

"You will find that the Jeh are wonderful people," Sergeant Self said. "It's a shame how a few Viet Cong guerrillas can terrorize and uproot thousands of people. When I came here two years ago, the population of this camp was 3,000. Now 8,000 have settled here for protection. It's just too bad we can't do more for them."

Lunch was announced by Staff Sgt. John Hollis of Rossville, Georgia, who called out, "Garbage is now being served." After a meal of canned frankfurters and pickles dished out by young Montagnard helpers, I set out to join Pat Cohen in Dak Peng Sial Peng, population 329.

As I walked along the path, I had my first look at a Jeh villager, a small shriveled woman barely five feet high (opposite). On her back she carried a load of firewood that must have equaled her own weight. She wore a black wrap-around skirt that reached below the knees, and around her legs were wound white canvas puttees similar to those worn by our World War I doughboys.

I entered the village through a small square

Smile for a white stranger creases the face of a Jeh woman whom the author met while hiking to Dak Peng Sial Peng. She clasps a hook-bladed *mak*, a kind of machete used to clear fields, and a *chuang*, or ax. The village blacksmith made both tools. The firewood will warm her thatched house in the cool highland autumn.





STYLING BY HOWARD SCHWARTZ © R.A.S.

Girdle of spikes, woven into the perimeter wall of Dak Go Kram, protects villagers during probes by Viet Cong and North Vietnamese. A similar barrier at Dak Son, in the highlands farther south, did not prevent the Viet Cong from breaking in during a midnight attack last December. With flame throwers, they burned to death at least a hundred Montagnards.

a *marao*—a single elevated room built on huge log piles (pages 458-9). I noticed that the timber frame was pockmarked by small-arms fire.

After they reach seven or eight years of age, the village boys and girls live in the *marao*, though in separate areas. Visitors stay there too, and Pat slept in a corner on an army poncho, with a Mexican serape for cover.

"We came in on a bad omen," Pat told me.

"Great," I said. "What was it?"

"That rainbow. The Jeh believe Yang Griang, an evil phantom, lives at the end of it. He sucks up water from the rivers and gives it to the spirits of those who have died unnatural deaths. They wander in the forest and bring all kinds of hardship. Rainbows are things to be

gated, one of two points of entry. A high wooden wall studded with clumps of sharpened bamboo, like a fence of knives, guarded the entire village perimeter. At night great timber crossbars were slid across the gate to complete the defense.

I found Pat sitting in the doorway of a four-family thatch-roofed hut. One of the village families had offered to cook for him, and it was his custom to take his two daily meals, one at 10:30 a.m. and the other at 4:30 p.m., in their hut. His menu at every meal had been a can of sardines and four or five bowls of rice, sometimes with a vegetable.

Pat was living in a communal house called

dreaded, not welcomed."

"How about wandering writers who ride in on rainbows?"

"The Jeh are a kind and simple people. They will do anything to make you happy. Those women I was talking to when you came up were asking me what they always ask me: 'When are you going to take a wife?' They worry about visitors being happy. You ask them any question you wish, and they will tell you what they think you will be pleased to hear."

At first they were pleased to tell me very little; staying alive is too serious a matter for much idle chatter. We called on a young

Primitive plumbing brings clear water to a village near Dak Pek from a hillside spring 600 feet away. The Jeh believe in supernatural forces of two kinds: Yang spirits, somewhat aloof but not altogether unkindly toward men, that live in streams, mountains, and sky, and the Kanam, evil ancestor spirits that bring misery. The Jeh sacrifice pigs, chickens, and buffaloes to the Yang, who in turn keep the Kanam in check. Author Sochurek arrived on a bad omen. His helicopter arrived as a rainbow appeared, a dread sign to the Jeh. Despite a few close calls, however, Mr. Sochurek's luck proved good.

A day's meal for several villagers at Dak Wen Tung consists of mixed rice and corn, at right, and *sibi*, a salad of vegetables featuring a jungle green resembling spinach. Montagnards usually eat twice a day, in late morning and late afternoon, but during the author's visit—just before the rice harvest—meals were reduced to one a day. Tribesmen in the combat force receive army rations, including instant rice heated in a plastic bag. Villagers like to eat monkeys but fear to hunt them in the jungle because gunfire might attract Viet Cong guerrillas.

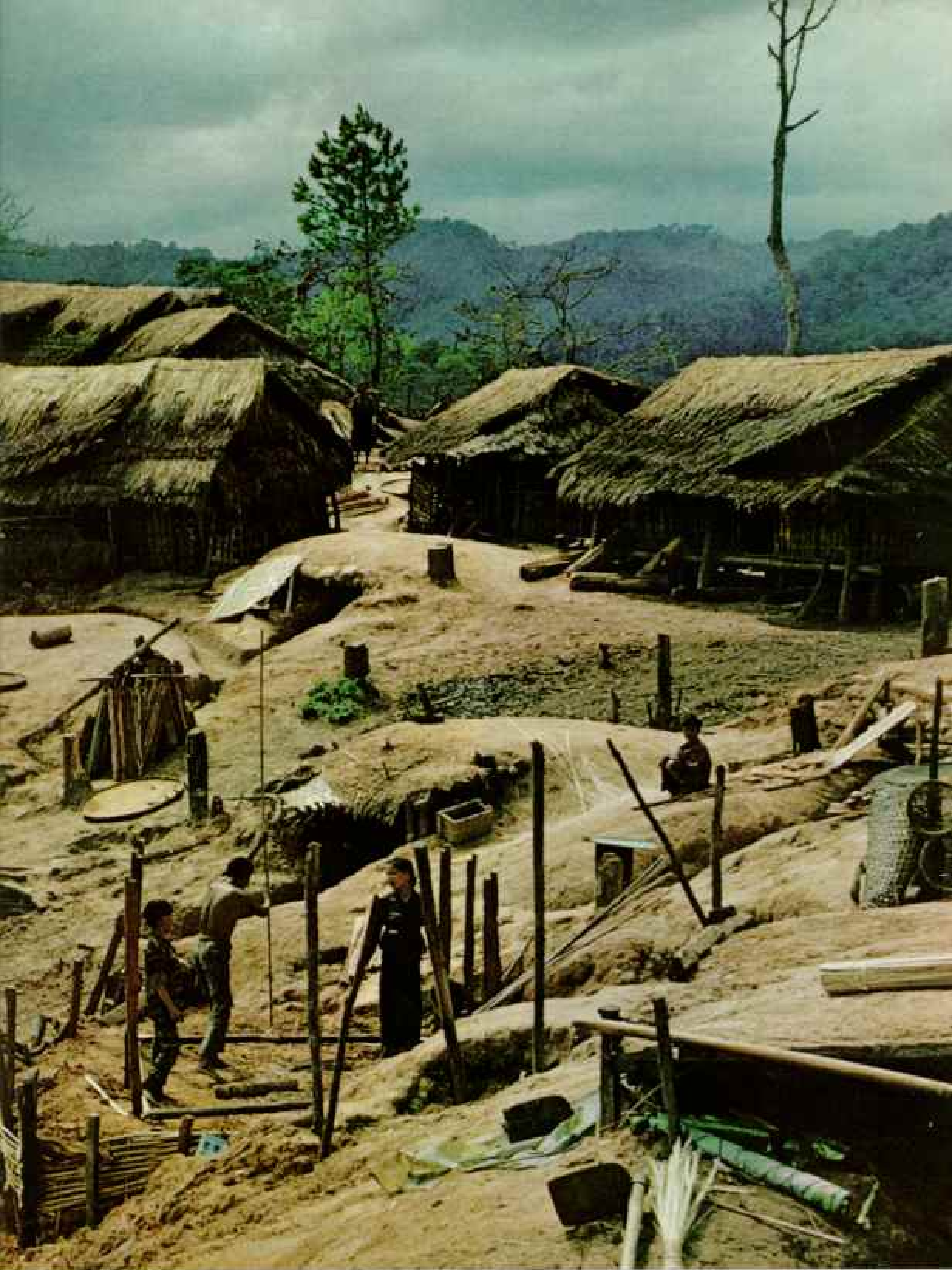


STROCHOWSKI (BELOW) AND BOURGESS (RIGHT) © N.S.L.





Life goes on, but with direst hardship, in the village-fort of Dak Peng Sial-Peng Set, blasted by warfare and pounded by rains. Refugees from the jungle moved their homes close to the safety of the heavily armed Dak Pek camp, a mile away. Forced underground



HOANGHONG © NATIONAL GEOGRAPHIC SOCIETY

by rocket and mortar fire, 250 Jeh villagers sleep in the bunkers and tunnels that honeycomb the hill. Hand flares can summon instant mortar fire from Dak Pek. The defensive barrages ring the village during the Viet Cong's frequent probing attacks.

Bundled into a bunker, a child of Dak Wen Tung, east of Dak Pek, rides in a sling of parachute silk. His underground home, built with primitive tools, must withstand the fire of Russian-made B-40 rockets now being used in the highlands.

EDDICHNORRE © N.S.A.



mother who was working a handloom inside her house; two little boys scattered in momentary fright at the sight of two white giants entering. After a while the woman began to unburden herself to Pat.

"She says the rice crop is not ripe, but the people eat the green rice anyway because they are hungry. Also the wild pigs are getting the crop. Besides that, the Viet Cong are stealing it. A friend of hers went down to the river the other day and was abducted by the VC. She wants to know if something can't be done about getting some meat, since they are afraid to shoot monkeys any more."

"Why is that?" I asked.

"The gunfire might draw the VC."

The war has had a profound impact on life at Dak Pek. Villages seeking safety move to the security area even though there may not be a crop to support them. Rather than work in the fields, the young men prefer to serve with the Montagnard combat forces, where they are clothed, fed, and paid well.

Meanwhile, the VC practice continual harassment to prove that American aid is ineffectual, and also to provide for their own pressing supply needs. In many ways the Viet Cong, who are trying to live off the countryside and support regiments of regulars from North Viet Nam, are worse off than the people in the villages.

Ugly Names Keep Spirits Away

That evening the men gathered outside the marao to smoke their pipes and spin stories.

"By the way," Pat said as we sat down among them, "if you refuse to drink rice wine with the chief, it means he will die."

In Jeh society, village leaders are chosen for their wisdom, wealth, and age. La, chief of Dak Peng Sial Peng, was a man of about 50 (page 459). He wore a faded black loincloth and a threadbare pinstripe jacket. It was double-breasted—the latest thing back in the States. He was proud of his family, particularly his four grandsons.

"What are their names?" I asked.

"This is Bayh," he answered, through Pat. He called and the others came running. "And this is Bual, Bil, and Ek."

He stood there beaming while Pat translated the names: "The first one is Snake. The others are Lizard, Drunkard, and Dung."

Pat smiled at the expression on my face.

"Jeh life is controlled by spirits," he explained, "and La believes that with names like these no evil spirit will bother to inhabit the boys' souls."



Road to nowhere, French colonial highway 14, much of it impassable because of the danger of ambush, once carried traffic 450 miles through highlands between Saigon and Da Nang. Rusting road roller, abandoned since 1954, helped maintain the long-vanished double lane of asphalt pavement. South Vietnamese engineers strive to restore this and other roads closed by war.

"How do you know which spirit is doing what?" I asked.

"The Jeh believe in two general kinds—the Yang and the Kanam. The Yang rule the sky, the earth, the mountains, and the river. They are respected and considered to be, well, not too bad. They are able to control the other kind, the Kanam, who are evil ancestor spirits that roam the forests, demanding appeasement and bringing untold misfortune to the lives of men. To handle the spirits, the Jeh sacrifice chickens, pigs, and buffaloes to the Yang, so they will help control the evil ones."

Evening is a time of pleasant conversation in the Jeh village. Men squat, warmed by huge cape-blankets, quietly smoking and talking together. Their women usually gather inside the huts, huddling around their cooking fires for warmth.

For security and comfort, I divided my time between the village marao in Dak Peng Sial Peng and the Dak Pek Special Forces camp, where Sergeant Self had given me his bed. But sleep was a fugitive thing. Every night the Viet Cong probed the defenses with mortars or infiltration.

One night I had crawled into my canvas cot at ten o'clock. There were the usual night sounds of the camp—music blaring from the tape recorder of the sergeant on duty and the thump of an 81-mm. mortar as it threw

Improvised bridge spans the Dak Pek near its confluence with the Dak Poko. On a span of woven bamboo and barbed wire, villagers laid iron matting left over from construction of the landing strip, where a disabled U. S. Caribou aircraft awaits repair.

ATTACHMENT (LEFT) AND KODACHROME © N.S.P.



harassing fire into the surrounding hills from just outside my bunker.

About midnight the concussion of an exploding shell sat me bolt upright. Two more hit in quick succession.

"Incoming! Incoming!" someone shouted.

Fury and Fears Fill Jungle Night

I grabbed my pants and boots and dashed for the mortar pit outside the bunker. The taped music strangled into silence as the generator was shut off. Someone in the camp fired a parachute flare. It exploded high above us, casting eerie, moving shadows everywhere. In the distance a mine went off. I huddled alone in the unmanned mortar pit.

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A hundred yards away a machine gun

opened up. Was it ours? Yes, thank God. It slowly swept a distant tree line, its tracers streaking light across the black landscape. There was no return fire.

Now a burst of small-arms fire rattled from Dak Peng Sial Peng. I looked in that direction, wondering if Pat was all right. I recalled that our arrival had been marked by a rainbow, a bad omen to the Jeh. Infuriatingly, I could not shake the thought.

Another flare arched up, trailing sparks, and exploded high above the camp just as the first one drifted into the nearby river and was snuffed out.

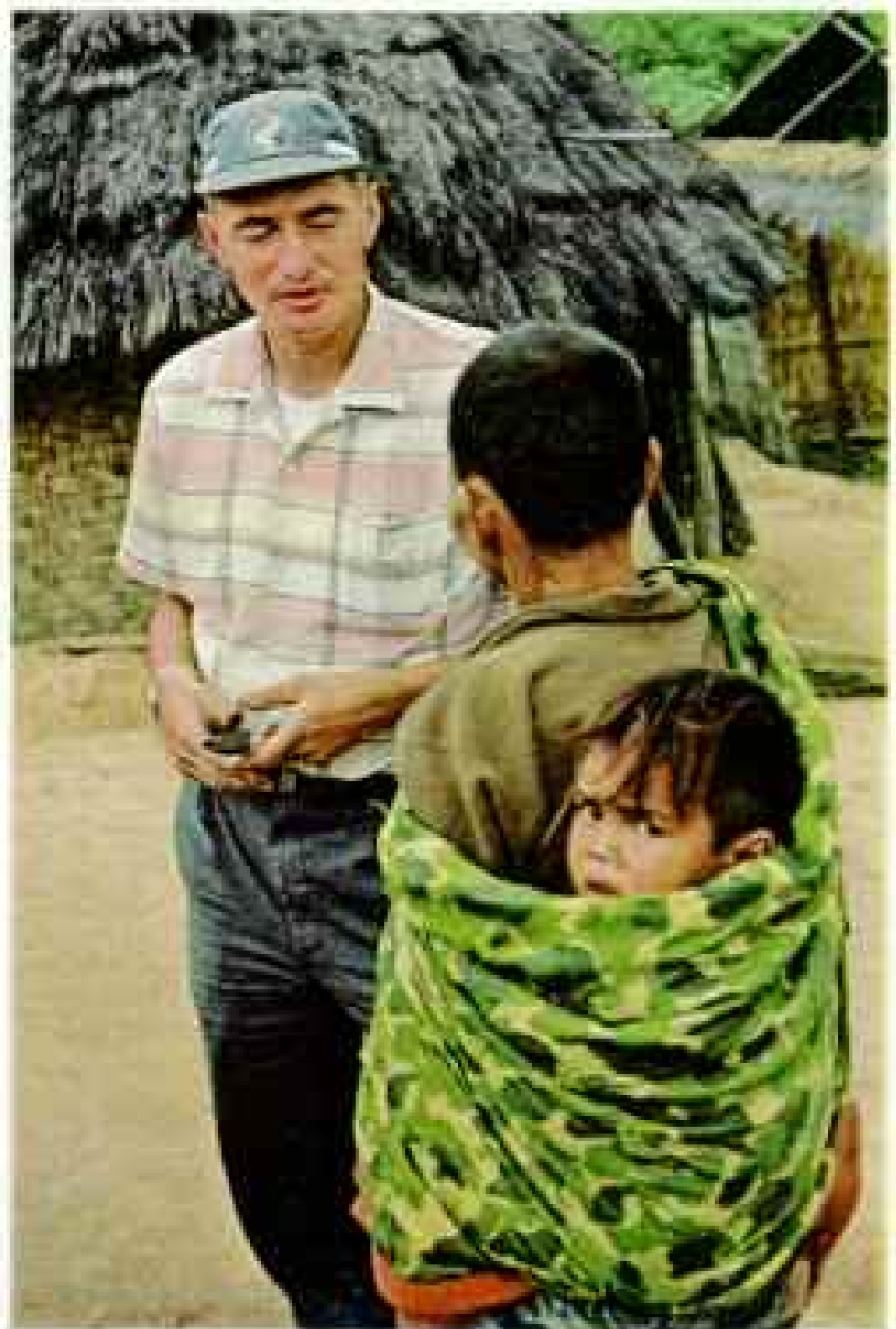
Then silence. Just the sound of the wind and the river. As quickly as it had begun, the Viet Cong probe had ended. The incoming



Draft of rice wine flows through a plastic gasoline siphon as La, chief of Dak Peng Sial Peng, samples the jar. Rice husks float atop the beverage. Men socializing in the evening often swap animal fables.

Getting the good word, missionary Patrick Cohen adds to his Jeh dictionary by conversing with friends in Dak Peng Sial Peng, his home for two years. Sent out by the Wycliffe Bible Translators, he has begun to translate the Scriptures into Jeh.

Time out from war: Weary Jeh troops rest in the *marao*, or communal house, where unmarried boys and girls—and visitors to the village like Pat Cohen—live together but in separate areas. Mr. Cohen brought the red blanket from Mexico.



ENTACHROME (LIPPER) AND KODACHROME BY HOWARD GICHNER © N.S.A.



mortar shells had landed outside our perimeter. There were no casualties. The sergeant turned his music back on.

I soon learned that Dak Peng Sial Peng, too, had escaped harm, and I met Pat after breakfast.

"Come on," he said. "Let's go collect some words."

Each day we made a trip on foot to some of the 16 villages within the five-mile perimeter of the Dak Pek area. Pat carried a small black book in which he had already written about 3,000 words with their translations.

War Fades in Daylight Hours

The Jeh villages stand on their hilltops along the valley. It was easy to see how the enemy, whether Viet Cong or North Vietnamese who had infiltrated down the Ho Chi Minh Trail, could select a nightly target. They might pick off one of the outer villages, or they might slip down the valley and hit straight at the Special Forces camp. But walking the trails to the rice fields, we could almost forget that we were in the middle of a strange and perplexing kind of warfare.

"Like most of the mountain tribes in Southeast Asia," Pat told me, "the Jeh are swidden farmers, that is, slash-and-burn dry-rice growers. They slash down the forest, burn it off, and plant rice in holes made by poking sticks into the hillsides.

"Their year is tied to the monsoon rains that sweep across from the Indian Ocean. The winter is dry and cool; in early spring they

Bamboo bellows, pumped by the village blacksmith's helper at Dak Jel Luk, blows a fire hot enough to work iron. Air forced down the tubes by wood pistons picks up speed in the narrow pipes along the ground. The primitive vulcan hammers the hot metal into farming tools. In recent years Montagnard artisans have found a strong but malleable new material—the casings from spent artillery shells.

plant the rice. It grows through the rainy season, from June to September, and is harvested in the fall.

"Right now," Pat continued, "they are waiting for the harvest—but you can see over there near Dak Tung they are trying to plant now and squeeze out another crop. The VC probably chased them away from their other village and took the first crop."

"Do they mind moving around like that?"

"They are used to moving their villages, usually about every seven years, to find fresh soil. But the problem now is safety as well as fertility, so they come here. The land may actually be better somewhere else."

I asked him how long the Jeh had been in the central highlands.

"They belong to the Mon-Khmer ethnic and linguistic group, which originated in the northern valleys of the Mekong River in Yunnan Province, China. I don't know when they came down from there, but it was a long time ago."

Jeh Women Give Birth in Forest

I found the Jeh to be a warm, gregarious, and open people. During my stay with the hill people I never saw anyone fighting, never heard harsh words exchanged, and never saw a child being spanked—or one that needed it.

Their way of life seems as old as time itself. When a Jeh is born, the mother goes into the woods and clutches a specially cut wooden staff while she delivers, sometimes standing to do so. Mother and child may not enter the main house until 10 days have passed, and then they must go in by a rear or side entrance.

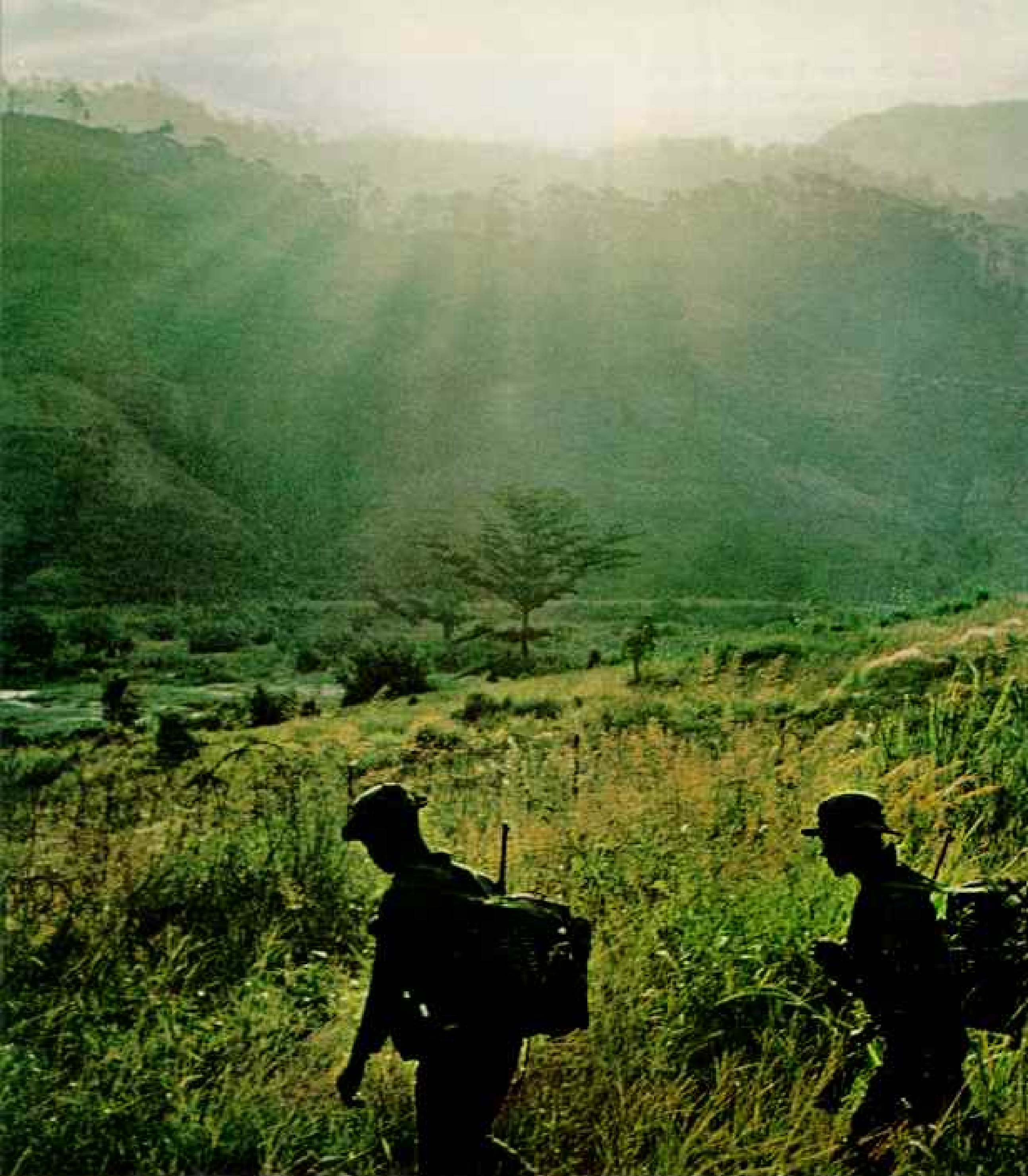
On the twelfth day after birth, all the members of the family gather about a jar of rice wine, dip their fingers into the wine, and rub it across the mouth of the newborn child while chanting a Jeh hymn which translates roughly: "Don't be crying; don't catch skin disease." A chicken is then



Craftsman's pride, these handsome tools attest the talents of Roi, blacksmith of Dak Jel Luk. Large gorse-necked *chuang*, at right, and smaller *riput*, beside it, fell trees and split wood. A *chang*, in decorated scabbard, with the *kalung* and thin-bladed *chang set* are used for carving. Men and women clear the fields with the two *maks*, at far left.

Baby-sitting father at Dak Kiep Nam plaits a bamboo *hnal* to carry the rice his wife will harvest in the fields.





Beginning a deadly game of ambush, the patrol of Master Sgt. John J. Self sets out on a 28-day scouting mission. As a soft autumn evening deepens, 250 Montagnard soldiers file from Dak Pek toward the Laotian border. North Vietnamese units launch hit-and-run

sacrificed so that the new member may have the protection of the *kayh*, the supernatural power that the Jeh believe exists in each family unit. A family with strong *kayh* can resist sickness and death.

At a later ceremony, the child receives a name. A pig is sacrificed, the baby's ear is

pierced, and as pig's blood is rubbed into the ear, the father or grandfather names the child.

These days, tribal customs sometimes clash with 20th-century values. Perhaps the man who sees this more than others is the team medic, Staff Sgt. James Phillips, from Yonkers, New York. He runs a small dispensary



KISSACHOWE © NATIONAL GEOGRAPHIC SOCIETY

attacks regularly from that area. Sergeant Self showed the author his tactical guide, a small card listing orders attributed to Maj. Robert Rogers in 1759, when he was leading his Rangers in the French and Indian War. Order No. 1—"Don't forget nothing."

where he trains Montagnards in first aid. He is also the only "doctor" the Montagnards know. One evening after Pat and I returned from touring the villages, the sergeant told me a story to illustrate his problem.

"Last summer," he said, "a mother came in after being in labor a long time. She had a

breech birth, but we were able to deliver a normal, healthy child. Right afterward, the father took his wife out into the sunshine, built a fire, and warmed the blanket to wrap the infant in—that is their custom.

"It is also their custom for the father to massage the mother's stomach; it did not help

the situation, and the woman died. When that happens, the baby—alive or not—must be buried with the mother. They hollowed out a log for the burial of both of them.

"I tried to convince someone to take the child, but the father did not want it and neither did the family. I finally gave him \$50 to let me send the child to a leprosarium in Kontum, where they also care for children. What are you going to do? It's the way they have lived for a thousand years."

Conflict Casts Doubt on Future

Will the Montagnards be able to go on living as they have? At Dak Pek, the answers were very mixed.

Many of the Montagnards would like to be an autonomous people. Having lived in their hills for many centuries, pursuing their own way of life, they feel no great compulsion to become involved in the forces clashing around them—other than in terms of simple survival. And they are often victimized by the circumstances of war. Two things that I saw while I was in Dak Pek illustrate their plight.

The first was a document.

One evening, I joined Sergeant Self on top of one of the bunkers. We sat on sandbags

and talked. The dusk was cool, and the sky held that peculiar purple-red after-color of the setting sun. Self was leaving on his patrol in a matter of hours; it would take him deep into the jungle, far into VC territory where aerial reconnaissance had discovered a new enemy buildup. We did not know then that forces were gathering at that moment for the battle of Dak To.

"You can go just five miles from here to a village controlled by the Viet Cong," the sergeant said, "and as soon as you arrive, the people start packing. And before you have flushed the VC, the villagers are ready to come with you. Let me show you something."

He disappeared into the team house and returned with a three-page typewritten document. It was a report on his conversations with a Montagnard whose village had been under Viet Cong control.

Quoting the refugee, the sergeant read: "When the Viet Cong first came here, they made all kinds of promises, saying that the revolution will bring autonomy to those who support it.

"The next time they took things. They gradually took control of all the poultry, the pigs, the eggs, and the sacks of rice that belong to the people. They even controlled the villagers. They drafted youths, used villagers as coolies for supply. The rest were made to settle in the jungle, sharpening spikes, digging holes, cultivating 'revolutionary' fields to grow food.

"This was the cause of the suffering and separation of families.

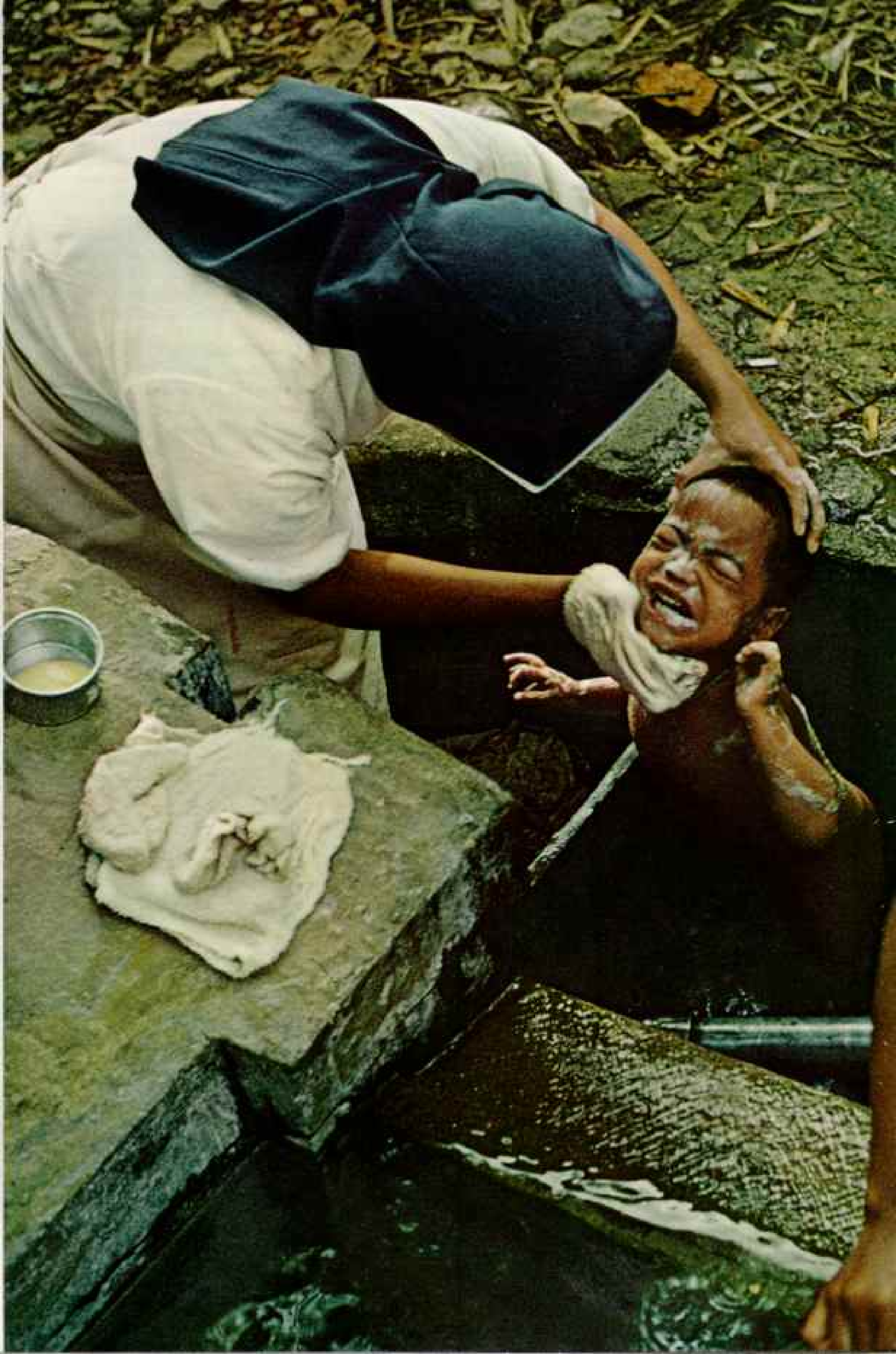
"They gave sugar first, then red pepper to the people."

Reverence for life in the midst of a strife-torn world marks the work of Sister Marie Louise of the Sisters of St. Vincent de Paul, a French order. She and seven Vietnamese nuns care for 300 Montagnard lepers and 200 of their healthy dependents at a hospital in Kontum, a provincial capital. Sister Marie Louise has spent 27 years in the highlands, aided by the Vietnamese Government and Roman Catholic welfare agencies. The youngster reacts the way children do the world over to daily scrubbing, a preventive measure against infection by the disease.

Big brother helps his sister dress after her morning bath at the leprosarium.

STYLING: JUDITH L. AND ROSEMARY © N.G.S.







Carved from jungle pine, a coffin and its lid dry in the sun at Dak Pek. Made in advance, they lie stacked under the communal house until needed.

Image of empire still lingers in a Bahnar tribal cemetery near Kontum. Wearing a *kepi*, the traditional French military cap, this totem guards a fenced grave.

Good souls go under the earth, but their remains rest above ground in log coffins, as is the Bahnar custom. Bad souls, taken into the sky, must live with the daughters of evil spirits.

My second revelation was an incident that occurred as I returned from a day of photography and was dismissing my six-man Montagnard escort. I had visited an outlying hilltop fort that was home to people of two relocated villages—Dak Peng Sial and Peng Set (pages 454-5 and map, page 447).

A Vietnamese helicopter had arrived that afternoon, not with more medicine to fight the outbreak of meningitis, as anticipated, but jammed with Saigon-made Tiger-brand cigarettes.

Vast Hidden Hoard Invites Corruption

I didn't get the full import of this substitution until I had learned more about the economics of Dak Pek. The camp has a monthly payroll of 2,500,000 piasters—about \$21,000—or 30,000,000 piasters a year—\$250,000. In the five years of its existence, more than 150,000,000 piasters have flowed into Dak Pek, well over a million U. S. dollars. The area is completely isolated by the Communists; there is no place to go, not a single shop, nothing to buy. Some Vietnamese had seen this as a chance for profit. By government helicopter they brought cigarettes, which they bought in Saigon for 10 piasters a pack and then would sell to the Montagnards for 40.

A fight about this matter was going on when I left Viet Nam, but the guilty men had not yet been replaced. In the meantime, a million dollars or more sits in Dak Pek, moldering in hidden tin cans, a source of temptation and corruption for the Vietnamese. Its value and use have not as yet been understood by the tribespeople.

If the Montagnards fear the Viet Cong and the North Vietnamese on one hand, and feel antagonism toward the South





Vietnamese on the other, they regard United States largess with primitive respect.

"They think the U. S. can do everything," Sergeant Self told me, "but we can't. They live right on the edge of survival. Go to any village. A family of six doesn't have eight ounces of meat in a whole week." He waved his arm toward the forest. "They have to eat anything they can find. Rats are a delicacy. They love to roast bats and lizards."

At that moment a boy about eight years old came into the team house.

"Take that boy," said the sergeant. "His mother and father were killed by the VC while they were out fishing. Now he stays here with us. That robe he is wearing comes from Galesburg, Illinois. A Special Forces officer, Lt. Richard Gladfelter, used to be here; he is from Galesburg. Their Red Cross chapter sends us out six or eight packages a month."

I noticed that the boy was limping. He had broken his ankle years before, but without proper medical attention it had not healed correctly.





"We are trying to help them," the sergeant continued, "but there are only 12 of us here and 8,000 of them. If just sitting down and crying about it would do some good, I'll tell you something—I'd sit down and cry."

Fierce Battle Obliterates a Village

On one of our trips, Pat and I had climbed to the top of a hill at the northernmost limit of the valley. Not a blade of grass was growing on it. It was a total ruin of red clay scarred by deep bomb craters. Here and there a passing patrol had thrown away empty ration cans. Three months before, this had been the village of Dak Dru Doc.

I had learned the story from Sgt. First Class William H. Brushwood, the team intelligence sergeant. A veteran of 17 years' service at the age of 35, Brushwood had been in

Dak Pek for six months. At 4:30 a.m. on July 3, 1967, after a month's bombardment, the Third Battalion of the 174th North Vietnamese Regiment struck Dak Dru Doc. The village had only a handful of defenders to resist 700 enemy regulars. The sharply spiked bamboo walls hardly delayed the North Vietnamese attackers; they swept in and herded the 150 villagers into the night. The able-bodied were impressed into labor gangs; the rest were released.

Sergeant Brushwood was nowhere near Dak Dru Doc that night, but by a rare stroke of luck he was able to call in an air strike by 7 a.m. He was on a two-week patrol, trying to take some of the pressure off the camp, and happened, quite by accident, to tune in on the North Vietnamese radio frequency. He listened as the regimental commander issued

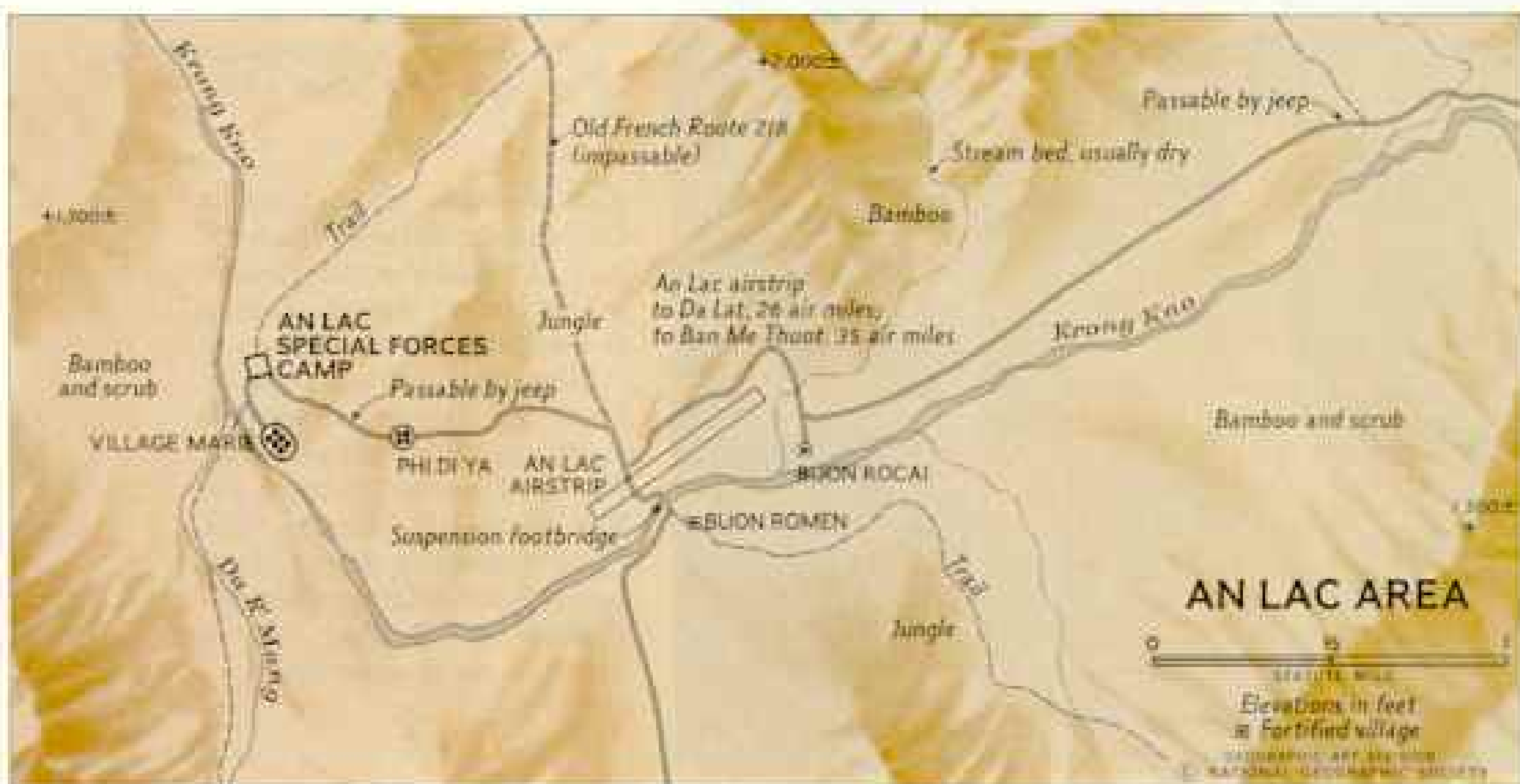


ATTACHMENT © NATIONAL GEOGRAPHIC SOCIETY

Pieces in a political puzzle, two Mnong villages settle within hailing distance across the Krong Kno, near the An Lac airstrip. About a fourth of the villagers of Buon Rocai, foreground, are thought to be sympathetic to the Viet Cong, while those in Buon Romen seem loyal to the Green Berets—the American Special Forces—and their South Vietnamese allies. Officers at An Lac estimate that 10 percent of their Montagnards may be Viet Cong sympathizers.

Author's sketch map details the Special Forces camp and airstrip at An Lac, the second Montagnard area visited by Mr. Sochurek. The Viet Cong control the roads; all supplies arrive by air. Paths hacked from the jungle funnel North Vietnamese regulars into South Vietnam from near the Cambodian border, 43 miles west. Bitter fighting that broke out just north of An Lac last fall soon inflamed the southern highlands.

Constant VC attacks are meant to punish the Montagnards for cooperating with the American and South Vietnamese. By such brutal tactics, combined with persuasive propaganda, the VC and North Vietnamese hope to lure the tribesmen to their side and thus secure the vital passages through the hills.



the attack instructions to the Third Battalion.

"They were probably using U. S. radios," he told me, "from one of the Special Forces Montagnard camps that had been overrun—maybe A Chau, or Nam Don, or Hiep Hoa." The names do not mean much to the average newspaper reader, but each one represents a savage contest in a tense mountain war.

"After the air strike and counterattack," he said, "we found pieces of bodies floating down the Dak Poko for three days.

Camp Beats Off Repeated Attacks

"Dak Pek is an area under siege. A few weeks ago the VC got to within 100 yards of the bunkers at the main camp, right here where we're standing. They pumped in five rounds of B-40 rockets. The Montagnards had a 106-mm. recoilless rifle. They depressed the barrel and fired right back at point-blank range. There's not a man here who isn't con-

vinced that the next few months will be bloody ones."

As Pat and I were leaving Dak Pek, one of the villagers who had come to the camp to see us off pointed at me and asked Pat, "How many days does it take him to walk to his village?"

My own village, on the other side of the world, still lay many days away. I was heading now for An Lac, 200 miles south of Dak Pek as the helicopter flies (maps, pages 447 and 469). In Dak Pek, men had only time to survive. I was eager to visit a Montagnard village complex that was under less pressure and closer to the Montagnard struggle for independence which I had reported earlier in NATIONAL GEOGRAPHIC.*

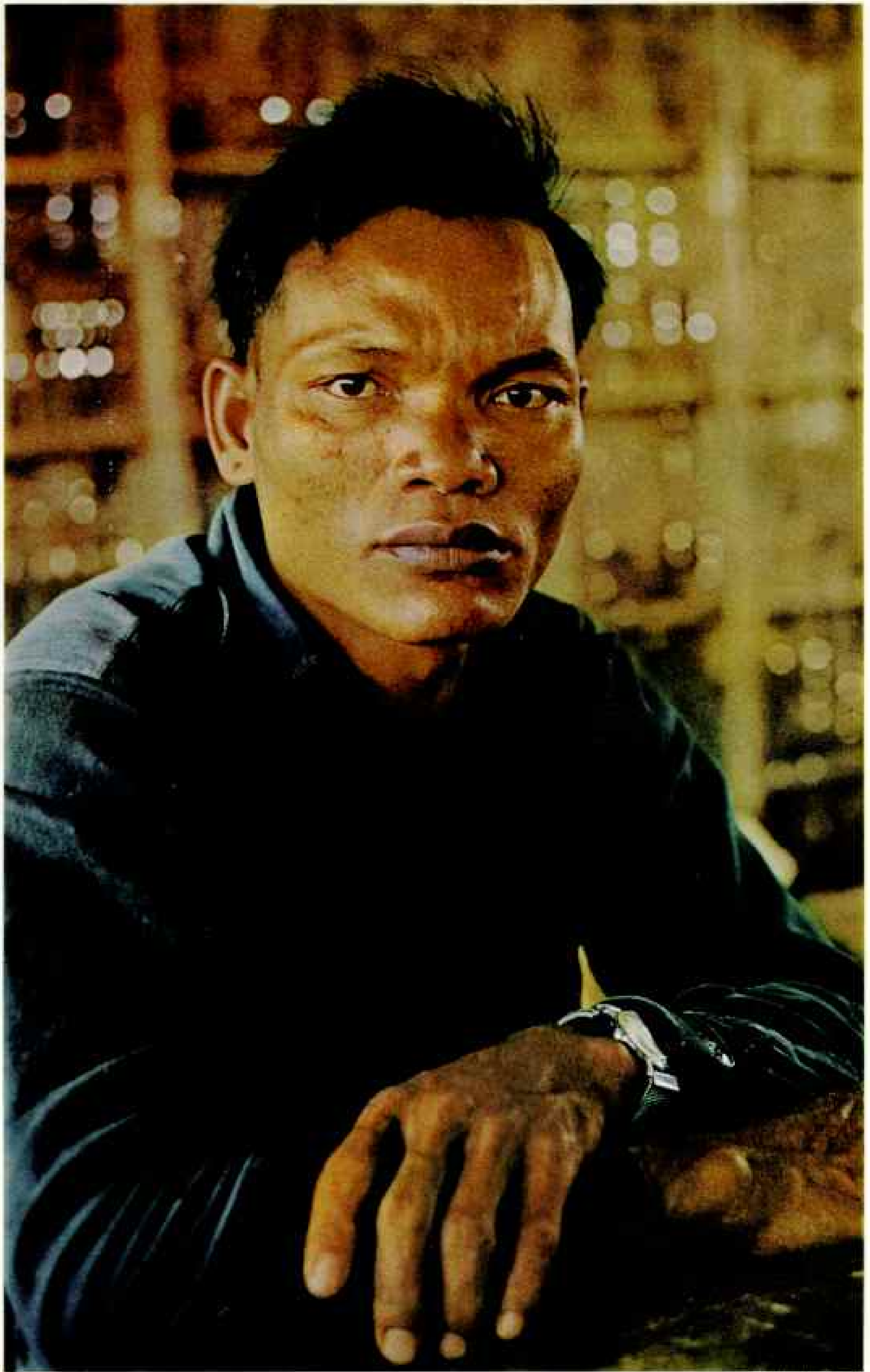
On the way there I stopped by the town of Kontum, a major highlands base, and visited

*See "American Special Forces in Action in Viet Nam," by Howard Sochurek, GEOGRAPHIC, January, 1965.



Accused chief of Buon Rocai, Y Bang Panting (right), denies a charge that he collaborated with the Viet Cong. Like many other Montagnards, Y Bang and his followers have moved with the fortunes of war. In 1962, the Viet Cong impressed many of the people of Dar Chinh village, about 12 miles from An Lac, and put them to work carrying munitions and rice through the jungles at night. Y Bang defected and rejoined his villagers, by then resettled at Buon Rocai. His sister remained with the Viet Cong and operates in a unit only a few miles away.

The accuser, Capt. Do Cao Bo, Montagnard commander of An Lac, found Viet Cong propaganda leaflets strewn through Buon Rocai and threatened to execute chief Y Bang as an example. Here he confers with the camp's executive officer, 1st Lt. Carl M. Freeman III, and a village matriarch, Hanghe Ndu. Upon Freeman's advice, Captain Bo settled for a public reprimand, and Y Bang was allowed to continue as chief.



Smiles of welcome light the faces of Muong women and children at Buon Rocai as Lieutenant Freeman pays a surprise visit. Devoted to the people's welfare, the American helped reconstruct a bridge and rebuild a burned-out village; with the aid of U. S. Army medic Owen Wright of Dallas, Texas, he expanded medical facilities to treat the sick. After four months of intensive effort, Freeman collapsed of exhaustion and malaria. Now recovered, he commands the Special Forces team at An Lac.



DETACHMENT © R.A.F.

Brass of friendship on the arm of Master Sgt. Frank Quinn indicates participation in many tribal ceremonies. A team leader at An Lac, Quinn was captured by the VC in 1962, but was released as a political gesture.

the leprosarium to which Sergeant Phillips had sent the Jeh infant. It is a pleasant place of whitewashed French colonial buildings about 10 miles outside town.

I will not soon forget the brief hours I spent there. Sister Marie Louise, a French nun of the Sisters of St. Vincent de Paul, and her staff of seven Vietnamese sisters care for 300 adult lepers and 200 of their dependents, all Montagnards. In big concrete wash troughs, they were scrubbing down the children, part of a regimen of hygiene to prevent the spread of the dread disease (page 465).



The contrast between this unselfish caring for human life and the random, continual killing that goes on in the mountains left a deep impression on one weary reporter.

Muong "Dentist" Paid in Chickens

The undulating plains around An Lac are home to 40,000 Muong tribesmen. Forests, thickets, and bamboo hedges, shelter for wild elephants and buffaloes, cover the countryside. The An Lac Special Forces camp itself is unreachable by road. A 50-mile path, climbing to 6,000 feet, winds to the nearest major



city, mile-high Da Lat. It is a four-day walk.

While the Mnong, like their Jeh brothers to the north, live by swidden farming, rotating their fields in a 10- to 20-year cycle, I soon discovered that many of the people themselves had a different look. The first Mnong smile I saw, shortly after stepping off the helicopter, was a memorable sight. Each village has a "dentist" who charges one chicken for every four teeth he treats. In the Mnong fashion, he chips and files the uppers down to the gum line and sharpens the lower teeth into points (page 484). A shiny black lacquer

made from tree sap often covers what is left.

The An Lac security area embraces three villages: Phi Di Ya, Buon Romen, and Buon Rocai. Here the men carry on their traditional tasks, sometimes with an ironic difference. One morning I watched a blacksmith in Buon Romen working his bamboo bellows. He was forging the traditional tools—machetes, lances, picks, knives, farm implements. These days, though, he makes them of a metallic windfall—casings of expended artillery shells.

Most Mnong men are masters at basket weaving. The typical basket, called the *khiv*,

is used to gather rice from the fields, while a larger container, the *maang*, stores the rice.

Woman's forte is the weaving of cloth (pages 476 and 478). Each wife weaves her husband's *suu troan*, or loincloth, a long, narrow strip of cloth with an end apron. When worn, the long band of fabric is passed between the thighs, girdles the loins, and ends with a frontal flap. For themselves, the women weave a wrap-around skirt that is held by an embroidered belt. They either go bare-

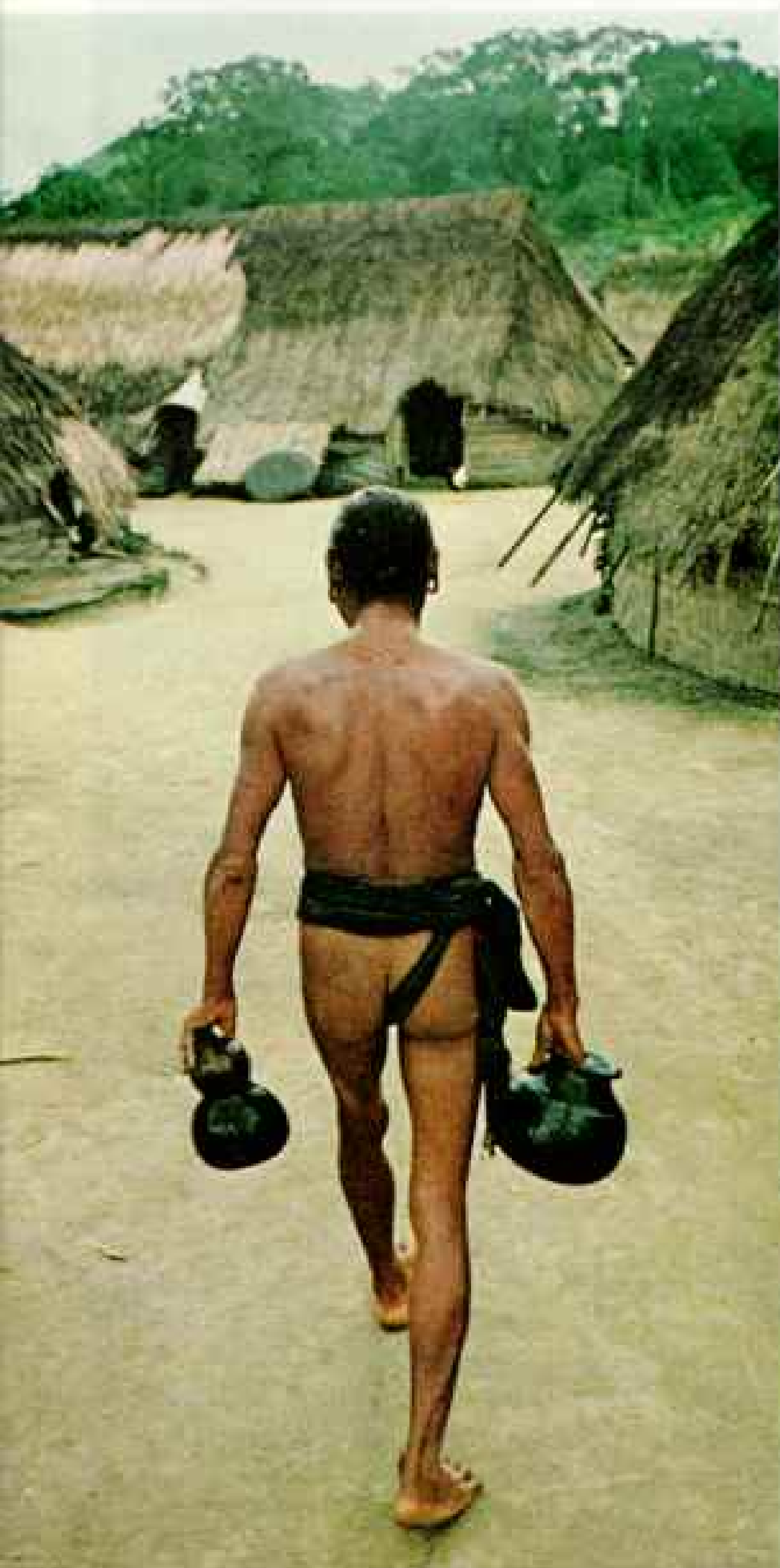
breasted or wear a long-sleeved tunic that buttons down the front, making for ease during nursing. Both men and women ornament their earlobes—the men with ivory stoppers, the women with wooden disks—and have their teeth “beautified.”

Tribesman Rises to Camp Command

I found the forces at An Lac similar to those at Dak Pek: a U. S. Special Forces contingent, headed by Capt. Robert L. Hayes II of Jesup,

Evening ritual for Muong tribesmen at An Lac includes a bath in the river and carrying water home in gourds and clay pots.

“They care,” says the author. “They can’t learn enough. The children at An Lac spend their Saturday holiday cleaning and scrub-



Georgia, a Vietnamese Special Forces contingent, and four companies of Montagnard soldiers. There were three village chiefs, two sorcerers, and one *tom bri*—a forest chief who keeps track of land ownership.

But An Lac was different in some respects. One difference was Capt. Do Cao Bo, a Jarai tribesman who had become camp commander. In Bo's life one can read the terrible struggle that has existed for 25 years in Viet Nam.* I talked to him one morning after he had re-

viewed a parade of his men. We spoke French.

"I enlisted in the French Army in 1943, at age 17," he said. "I am from the village of Plei Kenh Mek, Darlac Province, north of Ban Me Thuot. About one thousand of us Jarai people lived there."

*For other GEOGRAPHIC articles on the conflict, see "Slow Train Through Viet Nam's War," by Howard Sochurek, September, 1964; and "South Viet Nam Fights the Red Tide," October, 1964, "Saigon: Eye of the Storm," June, 1965, and "Behind the Headlines in Viet Nam," February, 1967, all by Peter T. White.

bing their school desks in the Krong Kno. They don't have to wash their desks, but they do because they are proud of education—one of the few boons of the war. Their desire to find out about the world is phenomenal."

ESTABLISHED BY HOWARD SOCHUREK © N.S.A.







In March, 1945, the Japanese captured his Montagnard artillery battery. He was absorbed into the Japanese forces, and at war's end was surrendered to the Communist Viet Minh. After five months he went back to the French Army. His reward was six bags of precious salt. He rose to the rank of sergeant first class in the French Army, then transferred to the French-formed Vietnamese Army shortly after it was organized in 1949 and became a lieutenant. He has fought the Communists in the highlands ever since.

At An Lac, Bo commands a mixed force of Koho and Mnong. Since 1943 he has seen nothing but fighting, with the French, the Japanese, the Viet Minh, the Vietnamese Army, and now the Montagnard force.

I asked Captain Bo if he was married. He was—abundantly. "As a Jarai," he explained, "I can keep as many wives as I can support." He has three; they shuttle in and out of An Lac by helicopter on a space-available basis. Only one is in residence at a time.

Tension Eased by Political Changes

The fact that Bo, a Montagnard, is commander at An Lac indicates a significant change in attitude by the South Vietnamese Government. I recalled the animosity between highlander and lowlander during the open revolts of tribesmen in late 1964 and 1965. Now I found far less tension.

The Vietnamese constitution of April 1, 1967, provides for legislative representation of Montagnards by their own officials. A government decree of August 29, 1967—the so-called Statut Particulier—was drafted by delegates of tribal groups. If implemented by the Saigon government, it will make major changes—not only in titles to land and representation at the ministry level in Saigon but also in medical facilities, schools, and improved methods of agriculture.

When I was in the highlands in 1964, the opposition leader of the Montagnards, Y Bham, was holding out in the jungles near the Cambodian frontier with an armed force estimated at 2,500 men. He is still there, waiting to see whether the constitution and the Statut Particulier are anything more than pieces of paper.

Another man who made An Lac different was 1st Lt. Carl M. Freeman III, 25, my guide during visits to the Mnong villages. Freeman, from Huntington Beach, California, had thrown himself completely into the job of camp executive officer (pages 470 and 473). He was responsible for the 2,500 people in the camp security area and the 3,000 dependents of the Montagnard soldiers.

The lieutenant's list of accomplishments was formidable. He directed the rebuilding of a bridge across the Krong Kno, for which the villagers of Buon Romen are extremely grateful;

While the men are away, women of Buon Rocai carry on their immemorial tasks. One, comforted by her pipe, weaves a strip of fabric. Another prepares the evening meal of rice, picked before it matured to help feed refugees coming in from the jungle. Log pedestals and woven baskets, like pieces of modern furniture, decorate the village's hard-packed street, sometimes used as a threshing floor.

Eight-family home, warmed by open fires, serves as rice granary, shed for tools, and sleeping quarters. A woman of Buon Rocai lights her pipe before cooking the evening meal, adding to the general smokiness of the longhouse. The interior has no partitions, but the outside wall holds a separate door for each family; tribesmen sleep on plank beds like those to the left.

Rock-a-back baby, wrapped in a multistriped blanket for a harvest ceremony, is lulled by warm sun and the chanting of prayers. His mother, of Phi Di Ya village, wears the vivid patterns favored by tribes throughout the highlands.



Weaver of Buon Roman shows her skill with a handloom. She carefully inserts a pattern stick to raise certain threads and thus determine the design. Villagers spin their yarn from home-grown cotton that often shares fields with rice.





TETACHNOWER © NATIONAL GEOGRAPHIC SOCIETY

the river has a 10-knot current and had been almost impossible to cross during high water.

He and Army medic Owen Wright of Dallas, Texas, expanded a dispensary, treating 4,500 hill people each month from An Lac and environs. The camp's four schools now have an enrollment of 1,800 students (pages 474-5). Three nights each week Freeman himself was teaching English to Montagnard soldiers.

VC Leaflets Endanger Village Chief

When the village of Phi Di Ya was accidentally burned out (the chief's son had been playing with a cooking fire), Lieutenant Freeman helped rebuild it. At all hours of the day village elders sought his help and counsel: for books, for farm tools, for medicine, for soap, for salt, to see a sick child, or to talk with tough Captain Bo, whose sentences on offending soldiers were severe.

During my stay, Captain Bo accused Y Bang Panting, the chief at Buon Rocai, of collaborating with the Viet Cong and threatened to execute him (pages 470-71). One afternoon Lieutenant Freeman set off for Buon Rocai to investigate the charges. I went along.

Chief Y Bang Panting was waiting for us at an empty school hut when we arrived. He looked extremely agitated. I learned from Lieutenant Freeman that Y Bang had once in fact been with the Viet Cong, and so I pressed our interpreter, Y Krang Rong, a Muong soldier, to have him tell us about it.

"In 1962 the Viet Cong came in great numbers, and we were forced to leave our village," Y Bang said. It was the village of Dar Chinh, about 12 miles from An Lac. "We carried munitions and rice for them and at first we worked willingly. We spent as long as a month and a half walking through the jungle at

night. Our wives cried when we left. We were afraid of the shooting and bombing. Nobody ever got killed, but many died of disease. It was very hard, and the loads we carried were very heavy. And we got tired."

Y Bang defected and returned to his village, which was now resettled at Buon Rocai. His sister, Hro Panting, however, still remains with the Viet Cong. She holds an important cadre post and operates in a village only a few miles from Buon Rocai.

"Are the Viet Cong close?" I asked Y Bang.

Freeman interrupted with, "Yes, about five feet away, buddy." The An Lac command estimates that one out of four villagers in Buon Rocai is sympathetic to the Viet Cong.

A week before my visit, Captain Bo on a routine inspection found Communist propaganda leaflets scattered along the paths leading to and from the village. Infuriated, Bo told Y Bang that he was a collaborator and considered executing him in public as an example. Freeman got word of this and asked Bo to wait until he could talk to Y Bang.

Rebels Urge Slaying of All Americans

As our meeting continued, Freeman produced one of the leaflets from his pocket. A cartoon showed an American being killed by a Viet Cong soldier. It was in Vietnamese and read: "Down with the American aggressors! They come to our country, burn down houses, kill our people, rape the women, force soldiers' wives into adultery with them. How can you stand that? Turn your weapons against them. Kill all Americans and save this country from their domination."

Y Bang denied all knowledge of how the leaflets got to the village and pleaded with Freeman to intervene with Captain Bo to spare his life.

Captain Bo at last relented. Before the assembled villagers, the commander advised Y Bang to avoid any suggestion of VC collaboration in the future, or he again might find himself facing a threat of execution.

A few evenings later I was sitting in the house of Y Bang Rlik, a village elder of Buon Rocai. Like many primitive peoples, the Mnong have built up a mythology to explain life and their place in it. As we sipped rice wine, I asked my host, "How did the world begin?" He told me this story:

"Many, many years ago men lived under the ground and all the world was a rock. They lived with their animals far below. Then one day a man and his wife were following a monkey that their dog was chasing through

an endless rock tunnel. After a long trip they emerged on the surface of the world, a great black flat rock. They returned home, gathered seeds and worms, and brought them to the surface. Soon the seeds sprang up and the worms multiplied and life on the earth began."

Like the Jeh, the Mnong live their lives in a web of superstitions, taboos, and spirits. My guide through the spirit realm was Y Bang Bu Prek, the leading sorcerer of the village of

Hard way to hold a fish:

A Mnong grips one with his teeth while hands reach for more. When fishing became poor, tribesmen discovered a new method—tossing grenades into the water. Stunned by the concussion, the large silver fish, a kind of carp, float momentarily to the surface. The villagers have an instant to gather them in before they recover or the current sweeps them away. In the highlands of South Viet Nam, summer monsoons drench the jungles and freshen the rivers after a hot, dry spring.



Phi Di Ya. He wore a constant gap-toothed smile, ivory ear plugs, a red flannel shirt, and a nondescript loincloth.

"How do you tell an honest man from a thief?" I asked him.

"Simple. Put their hands in boiling water. The hand of the honest man will not burn."

Y Bang Bu Prek had his own miracle treatment for any illness. He simply dropped spiders on the head of the sick person.

"The spider soul," he told me, "is the most important soul to have living in your head. Each night the spider soul leaves as you sleep. When it returns, you awake. Sickness occurs when the spider soul leaves the body. Spiders are dropped on the head of the sick to encourage the spider soul's return to the body. Understand?"

One evening Lieutenant Freeman came to me with an invitation. "Tomorrow, Tuesday,

Long after I retired for the night I heard Freeman leading his Montagnards in a song he had composed for them. The tune was from "Onward, Christian Soldiers." The words went like this:

*We are the An Lac strikers;
Yes we are the best.
We are the An Lac strikers;
We can pass the test.*



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is the rice ceremony," he said. "I'm throwing a pre-sacrifice beer party for the Montagnard troops. Come along."

The tin-roofed shack vibrated with the versatile lieutenant's pantomime guitar act and blaring tapes, mostly rock and roll. First he sang, and 43 primitive mountain youngsters in camouflage "tiger suits" sat spellbound by his performance. Then he danced, and his comic gyrations broke up the audience.

*When the VC come to fight us,
Though they try with all their might,
They will find the An Lac strikers
Can fight, fight, fight!*

Early next morning, with Captain Bo and Lieutenant Freeman, I went to the sacrifice.

The Mnong hold four major sacrifices each year at which either a cow or a buffalo is killed (page 485). All are to the rice spirit, Yang Coi.

One is held before the land is cleared, the second before the seed is planted, the third when the rice is half grown, and the fourth after the harvest.

I attended the third of these sacrifices. It had actually started the day before, when the sacrificial cow was led by the sorcerer to the rice field, followed by the children of the village and six musicians, each carrying a huge gong. Notches were cut from the ear of the cow. These small pieces of ear were buried under the borders of the field as the sorcerer chanted the *khual yaang* (prayer) to Yang Coi.

Muong Pray for a Good Harvest

We arrived and found a huge decorative bamboo pole, the *ntong ndah rlaa*, erected in a clearing near the village. Small bamboo cut-outs of cows and men and crossbows hung

from the pole. Altars at the base of the pole held offerings of rice, bananas, and eggs.

The musicians and two sorcerers chanted as they circled the pole:

"We live here with good water, with good fields, in fine houses. We thank you for the last harvest, and we ask you for a good new harvest. Don't let the rain destroy us. Don't let the lightning come. We, like our ancestors, make to you, Yang Coi, an offering, as they have taught us to do."

After the prayer, Y Long Rook, the village executioner, stepped forward and with a ceremonial ax killed the young cow. He was soon surrounded by the village women, all anxious to catch some of the blood of the freshly killed animal. For this, they used small bamboo containers about eight inches long. The blood is kept in the house of each family. In case of illness it is used much as if it were holy water.

The cow was then butchered. Each family in the village received an equal share of meat.

After the sacrifice, the men sat down to drink. A small lean-to had been set up to shade the large jars of rice beer, *rnoom*, from the sun. As guests, Captain Bo, Lieutenant Freeman, and I were invited to drink. I was first. The *rnoom* tasted vaguely like a mild white wine that had turned to vinegar.

Lieutenant Freeman and Captain Bo stayed with the Montagnards, but I returned to the camp. The combination of sun and rice beer had given me a headache.

That night, about midnight, Lieutenant Freeman succumbed to the crushing strain of his responsibilities at An Lac. He lost



Used as a talisman to cure the sick, a Christian cross is taken from the chapel of Buon Romen to the home of an ailing villager. Christianity did not penetrate the more remote hills until recent years. Though the highlanders adopted the symbols of the new faith, they still cling to their animistic religion, with its horde of spirits.

Anointed with blood, a sick villager kneels before Ka Phoi, the chief of Buon Romen, who conducts the Sunday religious service. During the two-hour ritual, Ka Phoi chants ad-libbed prayers and sprinkles the supplicant with the blood of a cow, sacrificed previously to the rice god, Yang Coi.





"We ask you for a good new harvest." Thus Mnong sorcerers at An Lac pray to the rice god, Yang Coi, during the third of the four great ceremonies that attend the planting and harvesting of the rice crop. At an altar decorated with fringed bamboo poles, chief sorcerer Y Krang Panting offers a symbolic mouthful of rice to his deputy, Y Krah Dac Chat. This proves to watchful spirits that the offerings of rice, bananas, and chicken eggs are good.

Each village has a sorcerer: Y Bang Bu Prek of Phi Di Ya conducts the proper rituals to gain the help of good spirits and keep bad ones in check. Ivory plugs his earlobes. In the custom of the Mnongs, Bang Bu Prek had his teeth filed; the "dentist" charged one chicken for treating four teeth.

consciousness and became delirious. He had worked so hard and cared so much for the villagers that he had completely spent himself. A "med-evac" helicopter was requested immediately, but bad weather kept it away until daybreak. At first light, Freeman was evacuated to the field hospital at Nha Trang, where he was found to be suffering from malaria and exhaustion.

Three weeks later, he was back on duty at An Lac and, upon Captain Hayes's return to the States, became the camp's senior adviser.

I returned to Saigon while Freeman was still recuperating. Somehow it all seemed unreal to me as I stepped into the full blast of the city's 95° midday heat. I had spent an hour in the new American Embassy—70° inside, with bombproof offices—learning from Thomas Conlon, first secretary in the political section, what the United States objectives were with the Montagnards. He and Foreign Service Officer David G. Brown were in agreement.

Said Brown: "The United States wants two things—first, that the Montagnards fight on our side



ENTRANCE PHOTO BY W. G. A.

and not on the side of the VC, and second, that they and the Vietnamese learn to live together in a politically stable society."

I asked what the U. S. was doing to help the Montagnards.

"We are giving budget support of about a million dollars a year to the Special Commissioner for Highlander Affairs [now the Ministry of Minorities Development]. We also support the Truong Son program, in which there are 100 teams of 70 men each, all Montagnards, working on rural development in the highlands. In addition, the U. S. Agency for International Development is assisting in the construction of several new courthouses for the Montagnards, who have their own judicial system."

Leaders Differ on Montagnard Goals

After lunch at Saigon's Hotel Continental, I went to visit Paul Nur, Special Commissioner for Highlander Affairs. A dapper, handsome man of 42, he is a Bahnher tribesman from Kong Robang village near Kontum.

We talked pleasantly about the mountain people and about Y Bham, the dissident leader who heads the Montagnard autonomy movement and who led the revolts of 1964 and 1965. Mr. Nur had been jailed with Y

Bham by the Diem Government in 1958 for pro-Montagnard political activity.

My questions were direct. "Mr. Nur, you as a Montagnard must be sympathetic to independence," I half said, half asked.

"I am a leader, and Y Bham is a leader," he answered. "We both have the same ideal—real equality—but we differ on how to achieve it. I strive to make the lowlanders aware of our highlanders' aspirations and thus attain the unity of the entire people. Y Bham wants a separate state for highlanders."

"Do Montagnards want integration or separation?" I asked.

"I have found highlanders willing to work with lowlanders if the government provides real equality," he said. "And if the government provided real equality, I think Y Bham himself would work with the government."

What the newly elected South Vietnamese Government will do remains unclear. The North Vietnamese, meanwhile, are playing upon the Montagnard desire for self-government by creating two "autonomous" regions within North Viet Nam. I recalled also that the commander of Viet Cong and North Vietnamese troops in Darlac Province, around An Lac, was a Montagnard named Y Blo, a major general in the North Vietnamese Army.

Sacrifice and feast climax the rice festival at Phi Di Ya. Villagers sing a young cow on a pile of bamboo stems and divide the meat into equal shares. Lieutenant Freeman bought the animal for the poor tribespeople and had it flown from Da Lat, 25 miles away.

EDUARD CHROME © NATIONAL GEOGRAPHIC SOCIETY





Against this persuasive political action by the Hanoi regime stand a few figures like Captain Bo who are camp commanders in the South.

I believe that autonomy is still the rallying cry of the Montagnards in Viet Nam, as it is for minority peoples in all Southeast Asia. Because they occupy a strategic position on the southern rim of China, they have an influence on the balance of power in Asia between China and the Western World. They most certainly can upset that balance in spite of their backwardness.

Which Are Monkeys—and Which Are Men?

Hurtled into the 20th century on the wings of war, the primitive hill men of Viet Nam open a baffled and baffling face to the world. As one old man, a refugee I met in Ea Tul resettlement center, told me, "No matter which side wins, we must go on living."

As I made my way through the familiar bustle of Saigon, my thoughts lingered with Dak Pek and An Lac and the other outposts I had visited. I remembered sitting around the evening fire with the village men, and recalled one story in particular they had told me:

"A long time ago monkey and man lived together in friendship. But man was jealous of the monkey. The monkey's field had lots of rice, and the man's field was poor. But if you looked at the man's field from ground level it looked rich, and if you looked at the monkey's field from a nearby hill it looked poor. By showing the fields of rice from different heights to the monkey, man tricked him into changing fields.

"Because his harvest was now so bad, the monkey had little to eat so he went to the man to ask his advice. 'You must kill your children,' said the man, 'so you will have more to eat.' So the monkey went home and killed his children.

"At night the man sneaked from the village and gathered up the flesh of all the monkey's children. In the morning the monkey found him getting ready to eat.

" 'What is that?' asked the monkey.

" 'Only bird intestines,' replied the man.

"But the monkey found that the man had taken the flesh of his children.

"The monkey ran from the man and the village into the deep forest. Now he steals the man's corn and his rice because the man has deceived him and stolen the souls of his children."

The story haunted me. I wondered how the Jeh and Mnong and the other tribes felt about it. The former French colonials, the Viet Cong, the South Vietnamese, the American Army, the North Vietnamese Army—which among them, to the Montagnards, are the monkeys, and which are the men?

THE END

Barracks town of Marié, near the Special Forces camp at An Lac, houses the families of Montagnard soldiers—a total of 3,000 dependents. Dispensary at center, and two others in the area, serve 4,500 hill people every month. Such innovations as



PHOTOGRAPHS BY HOWARD SCHUBERT © R.S.S.

medical care and schools have an impact upon the traditional way of life of all Montagnards, caught between fear of the Viet Cong and animosity toward lowland Vietnamese. Paid 1,500 piasters (\$12.71) a month, the proud possessors of transistor radios and aspirin tablets, the Montagnards have awakened to the magic of technology. Yet they live with the grim struggle of politics. For the young soldier above, the past grows more remote while the future becomes ever more elusive.

Nature's Year in Pleasant Valley

Article and photographs by PAUL A. ZAHL, Ph.D.
Senior Natural Scientist, National Geographic Staff

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AUTUMN SHAWLS THE HILLS in scarlet and gold above the author's Maryland farm. Here through the changing seasons – the joyous rebirthtime of spring, lush, fruitful summer, spangled fall, and ermine-covered, sleeping winter – the Zahls witness the miracle of ever-renewing life.



W. S. BACHMANN © BRITISH GEOGRAPHICAL SOCIETY



MARCH 20th, the day before spring. Tomorrow's daylight and dark would be of equal duration. The sky was blue and cloudless, the air chilly but not biting. Remnants of untidy snow lay in the woods, and in places the ground was still hard.

I pulled the car up near a small white house sitting lonely and high on a hill in western Maryland. My wife Eda unlocked the back door and set about gathering kindling for a fire in the kitchen stove. Less energetic, I filled my lungs deeply once or twice with the clear, tart air, and stood taking in the view.

Through a stand of bare sycamores at the bottom of the hill I saw the shine of our creek meandering southward. About six miles away it would join the Potomac not far from Harpers Ferry, West Virginia.

A few miles to the northwest, in Maryland, rested heroes of Antietam, where in 1862 Gen. Robert E. Lee's first attempt to invade the North was thwarted in one of the Civil War's bloodiest battles. Our anonymous predecessors on this land might have billeted troops of either side; certainly they would have heard the thunder of artillery. A brick church on a knoll down the valley served as headquarters for the Confederate Army's Gen. Lafayette McLaws, and later as a field hospital.

Peace Reigns in a Rustic Paradise

When the action moved south, Pleasant Valley was left as before, a checkerboard of neat farms tilled by sturdy people. So it has remained to this day.

We had bought the old farm, with some 50 acres of surrounding woods and rolling fields, a few years earlier. Just a rundown mountain place, the local people said. But to us it was paradise—undisturbed nature, a beautiful setting, complete privacy.

From Washington, D. C., we could drive to the farm in little more than an hour. Here, weekend after weekend, we could enjoy the procession of seasons: the freshness of spring, the burgeoning of summer, autumn's splashes of color, winter's dazzling white landscape (preceding pages).

In Washington we live on a busy street close to the heart of the city. On our hilltop we enjoy unbelievable solitude. Visitors need a map to find us. We don't mind that the house has only a wood-burning stove for heat. We're proud of the pre-Civil War beams in our barn and the walls

of unmortared stone that divide our fields.

But the biggest attraction is the opportunity to preside over our own bit of wilderness, to watch the exciting seasonal procession of trees and wild flowers, birds, animals, and insects. For almost two decades I have roamed the world for NATIONAL GEOGRAPHIC, photographing and writing about gorillas in the Congo, giant insects of the Amazon jungle, scarlet ibises in Venezuela, flamingos in the Bahamas, strange plants in Malaysia, corals of the Great Barrier Reef. . . *

During these long trips it often occurred to me that there was another kind of natural-science study—one I could make closer to home; a study, in fact, that almost anyone can make if he has a patch of land. Even a city backyard can be appealing, but my own hill-



top, 50 acres of it—that was irresistible.

As it happens, the Pleasant Valley area, near where Maryland, Virginia, and West Virginia come together, abounds in wildlife. In addition to the usual groundhogs, skunks, opossums, and raccoons, there are deer and, so I have been told, an occasional black bear. In the Potomac and Shenandoah, anglers catch smallmouth bass, catfish and carp, and now and then a walleye.

I never hunt (except with a camera), and I seldom fish. Here I had chosen to stay within my own fences, studying the creatures that shared my acres with me.

Our first task, on taking over, was to post "No Trespassing" signs to discourage

*For a complete list of Dr. Zahl's natural-science articles, see *National Geographic Index, 1947-1965, and Supplement, 1964-67.*

groundhog hunters in spring and summer, squirrel hunters in fall. The groundhogs responded by venturing closer to the house. But the slightest move or the merest click of a camera would send them flying to their holes. How were they to know that any such move or click would not, as before, be followed by a hail of lead and a loud noise?

Not that the farmer's hostility to groundhogs is without good cause. No pasture is immune to their diggings—deep, gaping holes that can spell a broken leg for a running horse or cow, a damaged wheel for a tractor.

I gave Eda a departing shout, and wandered out toward the old red barn. Clear signs of spring were easy to find. Although trees and bushes were still bare, buds were swelling. Fields and meadows were drab, but their damp soils and humus were packed with billions of surgent seeds. During summer and

and grass would convert water and atmospheric gases into basic carbohydrates, setting the scene for flowers and fruits. Birds and bees and myriad other creatures would emerge from winter hideaways to feed on what sun and chlorophyll were creating.

First Tiny Flowers Appear

The only conspicuous wild flowers this day before spring, popping up behind the barn in patches of soft green, were the henbits (page 495). They were prettier than their name. Their multiple rosy flowerets, examined closely, looked like charming faces, some with slit-like markings resembling winking eyes. Wild leeks and fresh grass blades speared up beside them. Dandelions would follow.

The reddish tinge to certain trees in the bare-branched woods beyond the yard was a sure sign of winter's losing its hold. The silver



ABOUT THREE ACTUAL SIZE. KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

Fiery blossoms of the silver maple bring a blush to the still gray woods as life stirs in early spring. Bees, winging amid the branches in quest of nectar, carry pollen from male to female flowers.

Like drifting clouds, dogwoods spread their sprays of white in late April and early May. The tree's true flowers are small greenish-yellow clusters at the center of the creamy petal-like bracts.

autumn these seeds had been sown by wind, shot from gaping pods, carried by rain or drainage, buried by squirrels, deposited by falling fruits, or dropped by mammals and birds.

Some seeds had germinated immediately, but most had lain dormant over the winter. Each seed, tuber, runner, corm, bulb, rhizome, root, and spore, stimulated by the warming atmosphere, was undergoing profound chemical and cellular changes. One might have wished for eyes empowered to watch genes duplicating, chromosomes aligning, splitting, and re-arranging, each cell of every growing tissue dividing into two, then four, eight, sixteen, thousands, millions (page 499). But eyes able to resolve microscopic detail might be blind to the beauty of the results.

Soon a gentle green would tint the landscape. Photosynthesis occurring in new leaves

maples were flowering a full month ahead of the more showy dogwoods and redbuds.

I walked into the woods and drew down an overhanging maple branch. Spaced along the smooth gray bough were blooms as dainty as powder puffs (above). Although the differences in structure were subtle, some, I knew, were male flowers, producing only pollen. Others were what botanists call perfect flowers, producing both pollen and ovules and alone yielding seeds. Whatever their type, maple blooms are here and gone quickly, often unobserved by those whose early spring-time awareness is concentrated on the more obvious crocuses and daffodils.

Rarely visible at any time, but always present, are organisms of another sort—bacteria, fungi, protozoa—hidden by virtue of their smallness in a world of their own. Among the



planet's major agents of decay, they thrive in soil and humus, in dead trees and fallen logs, in animal droppings and carcasses, wherever organic matter provides nutrients.

Less secret are the lichens, among the toughest of living things, and the bark algae. I could see them all around me—gray-green blotches on tree trunks, rocks, fence posts, where they thrive year round, regardless of the climate.

Strolling back to the house, I noticed buds swelling quite normally on a dwarf peach we had planted in the back yard a season before. But several young branches about two feet above the ground had been neatly nipped short. A cottontail rabbit bouncing across the

yard provided the clue. During the winter he and other local vegetarians had been forced to look aloft for food. Elevated by the deep snows, they had nibbled every soft branch within reach.

Poison Unchanged by Winter's Grip

Later in the day I cleared a residue of last season's weeds and creepers from under a rose bush near the back porch. Without bothering to wear gloves, I tugged at some withered poison ivy vines that, when clad in shiny green leaves, had plagued us the summer before. If it were June, I thought, I certainly wouldn't be doing this. But a day later itchy red blotches on my wrists proved





Pink flowerets pop from among the green leaves of dime-size henbits. Even before the snow disappears, these hardy midgets peep from pastures and lawns.



WOODSTOCKS BY PAUL B. EARL © M.S.E.

Woodland delicacies rise from a bed of yellow violets. For a few days in spring, morel mushrooms sprout from the damp earth, raising spongy heads on thick stalks. Morels are delicious, but amateur mushroom hunters must beware of look-alike fungi that can cause illness and even death.

Indomitable mayapple, strong with new life, pushes through a dead leaf. When it breaks its bonds, one or two broad new leaves will spread like a canopy above the single flower. The blossom gives way to yellow, lemon-shaped fruit that ripens in July.



Fragile reservoirs, bloodroot blossoms cup rain water in their petals. Among the first harbingers of spring, the pearly flowers burst from the earth in late March or early April. Quick to bloom and soon to fade, they often go unseen except by the most alert rambblers.



RODOLPHUS NATIONAL GEOGRAPHIC SOCIETY

Underground stem, or rhizome, of the bloodroot secretes a scarlet juice when cut. American Indians used the almost indelible fluid as war paint and as a dye for garments and handcrafts. The stems, spreading in all directions beneath the soil, often sprout into a miniature forest of bloodroot plants.



that the noxious oils of *Rhus toxicodendron* are resistant to time and cold, and deserve more than summertime respect.

Three weeks later we were on the hill again. It was Easter Sunday; the forecast: "high in the 50's, with scattered clouds... possible light showers."

We drove through the gate and along the creek in the hollow. The ground on the creek side of the track was marshy, and since our last visit large patches of fresh, shiny, lime-green sprouts had taken over. I stopped the car and asked my teen-age son Paul to get me a sample. He jumped across the stream, knelt, and stabbed his pocket knife into the

soil, returning quickly with the sprout held at arm's length.

"Smells like a skunk that's been eating onions," he said, wrinkling his nose.

No wonder, for this was skunk cabbage, a member of the arum family and among spring's earliest arrivals, usually in swamps and bottomlands. Low on one side of the plant, just above the knife cut, a curiously tapering leaflike spathe of mottled brown and green cupped a cherry-size sphere with scores of tiny yellow-stamened flowers.

My wife had wandered off along the stream in search of mayapples. She soon found a great many, poking their waxy bright-green tips up

through the ground litter (page 495). Within a week each tightly furled shoot would open like a parasol. By early May it would show a distinctive white flower, which would later drop its petals and develop into a conspicuous berry, or "apple."

The mayapple's root is poisonous. The plant is a North American variety of the Old World mandrake, once esteemed for its supposed medicinal and magical properties.

Along the stream that same day we also found bloodroot, each slender stalk rising from a single wrap-around leaf and ending in a fragile flower with white petals and delicate yellow stamens (opposite). The name derives from the orange-red sap saturating the rootstock.

Green plants always tend toward the light. Paul knew this was for maximum photosynthesis. But strictly in terms of the mechanics involved, he wanted to know how a plant is able to move, inasmuch as it lacks muscles and nerves.

His question would be answered during a forthcoming biology course in high school. But that was still a year ahead, so I proceeded to fill in, touching on one of the most fascinating discoveries of modern plant physiology, the existence of internal regulators, or hormones, which provide the subtle influences for growth toward light.

Light and Gravity Direct Plant Growth

Chemicals called auxins are the best known of the regulators. Although present in all tissues of a plant, auxins are concentrated where cell division is most active—in buds, root tips, expanding leaf edges, rapidly growing areas. Because they are sensitive to strong light and quickly become devitalized by it, auxins may speed or slow tissue growth.

Here lies the explanation of phototropism, the growing-toward-light phenomenon. If light falling on a seedling is diffuse, the sprout tends to grow straight up. But if the light is more intense on one side than on the other, auxins in the light-favored tissues are partially inactivated, retarding growth on the sunny side of the plant. The shady side of the stem keeps growing as before, and the plant bends like a bow toward the light.

But what about roots, which grow downward? If a germinating seed is turned upside down, its growing roots will turn 180 degrees, heading invariably earthward. This effect—geotropism—seems to be a simple reaction to

the forces of gravity. But why do only the roots respond thus and not the plant's other components? Special large grains of starchy material on the lower lining of root cells may be a factor; but precisely how their presence induces downward growth is still a matter of speculation.

On the second of May, early in the morning, I was leaning on a fence post watching for groundhogs in a field where patches of last year's thistles, dead and straggly, mixed with fresh bluegrass, wild onion, and dandelions. Suddenly a shower of goldfinches rained in, apparently from nowhere, and landed on the thistle stalks, to peck vainly for seeds.

Their yellow and black feathers were somewhat dull and shabby, betraying the

Threads of life seek nourishment from the soil. From the tap and lateral roots of radish seedlings sprout hairs that absorb minerals and water for the plants' growth. Like tiny time capsules, seeds that have lain in the ground through winter's grip pop open and begin to grow when soil temperature and moisture proclaim the promise of spring.

ADDACHIRINE, ENLARGED FOUR TIMES (C) R.S.S.





Myriad flecks of fresh green deck a towering tulip tree—often miscalled “tulip poplar”—in the first days of May. This venerable giant has probably seen more than a hundred springs. Struck by lightning two summers ago, it suffered severe damage (page 501).

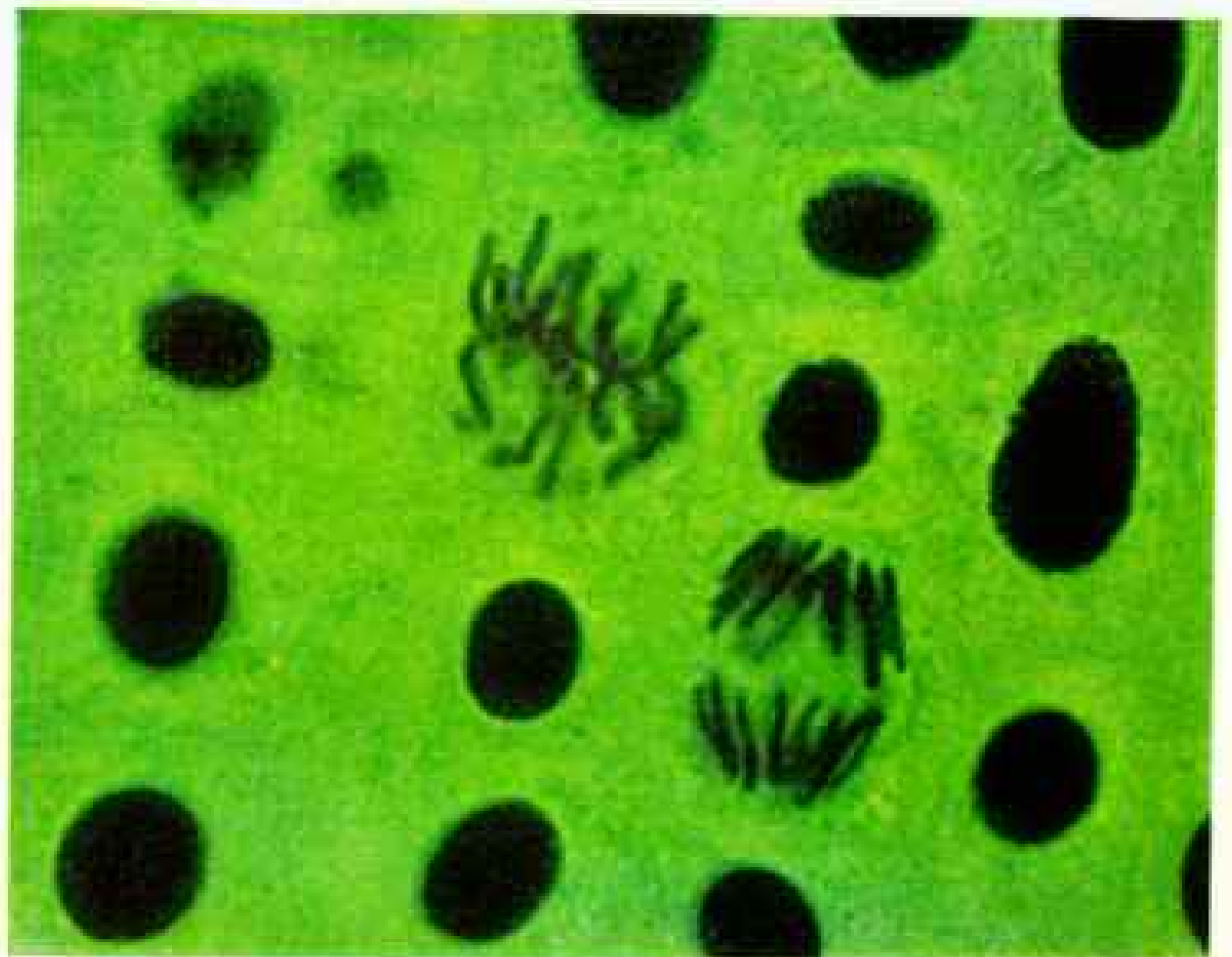
In beauty the majestic tulip tree matches its melodious Latin name, *Liriodendron tulipifera*, which means “tulip-bearing lily tree.” Actually, though its cup-shaped blossom (right) resembles the tulip, the tree is related to the magnolia. In the open the tree spreads limbs close to the ground, but in the forest its trunk rises straight and bare as a Greek column for 40 to 80 feet.

Bowl of sweetness: Insects swarming to a tulip tree's flower may find as much as a teaspoonful of nectar. Dashes of orange on the greenish-yellow corolla attract the honey makers. Seeds dot the central spike in the two-inch-wide flower.



KIDACHRONES © R.S.S.

Miracle of mitosis, or cell division, creates new growth. Each cell in this cross section of an onion tip, magnified 600 times, contains a nucleus, here stained dark for visibility. At right center, an elongated nucleus shows the beginning of growth. Soon it will split into twin sets of rodlike chromosomes, upper center, each containing duplicate genes. As division progresses, the chromosomes align themselves, pull apart, and move in opposite directions. After they have completely separated, new cell walls enclose each of the two new nuclei.





rigors of a long migration flight, perhaps from as far away as Florida. But they were the first goldfinches I had seen this spring, and they brought to the awakening world a bright touch of cheery exuberance.

After darting briefly amongst the bare thistles, the group was off across the field, flying a bouncy up-and-down course and chirping a glad-to-be-home song.

Until July, when a new crop of thistles would provide fresh, nutritious seeds, the finches would manage on primrose and chicory seeds, tender shoots and buds. Nesting in midsummer, they would rear their families, prepare their young for flight, and in Oc-

tober, prodded by the first frosts, head south.

Early May is Eda's favorite time for walking in the woods, for that's when she finds mushrooms, the best you've ever tasted.

Throughout the valley the thickly wooded north slope of our hill is known as prime for spring mushrooms—both the “blacks” and the “whites.” By blacks our neighbors mean morels (*Morchella*), and by whites ordinary field mushrooms (*Agaricus*). To verify the edibility of the mushrooms we find, we always carry a field guide. The importance of absolute certainty cannot be overemphasized, since an error could mean severe sickness or death.

The morels appear unpredictably, their



PHOTOGRAPHS BY PAUL A. ZAHL © N.G.S.

Forks of fire stab the earth during a fierce electrical storm—"one of the worst I ever witnessed," recalls Dr. Zahl. While making this time exposure, he saw a bolt strike the tallest tulip tree on his farm. "It sounded like an artillery shell exploding."

Scarred victim of the enraged heavens, the tulip tree wears a gash from crown to ground. Pieces of bark litter the grass on all sides. Mrs. Zahl, inspecting the damage, feared the leafy monarch had suffered a death blow. Two big limbs died, but the tree has so far survived.

precise occurrence dictated by rain and temperature. They last only a few days. If the collector is too early, he finds no clues; if too late, he sees only deteriorating stalks, often nibbled by squirrels or slugs.*

The day the finches arrived, Eda had good luck. She found three morels on the forest's edge, their crinkle-capped shafts sprouting up among yellow violets under a leafing tulip tree (pages 494-5). They were only a beginning. In half an hour she had collected a dishpan full, all in peak condition. The Zahls dined well that night.

Next morning we saw a gray fox loping across the south field, obediently followed by her kit. Suddenly realizing our presence even at long range, they broke into

*See "Bizarre World of the Fungi," by Paul A. Zahl, NATIONAL GEOGRAPHIC, October, 1965.





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White of winter: Fresh-fallen snow coats the limbs of a pear tree. January blizzards often mantle the eastern seaboard in white, after cold fronts move down from the north and collide with warm low-pressure centers coming up from the Gulf of Mexico. In the aftermath of such fierce storms, biting northwest winds may pile the powder into huge drifts that isolate farm families.

White of spring: In May the pear tree's boughs wear white again—this time fragrant, bee-enticing blossoms that presage a bountiful fruit crop in late summer. Grass and wild flowers carpet ground that lay brown and frozen in winter, and the farm's part-time handyman—author Zahl—becomes reacquainted with his wheelbarrow.

PHOTOGRAPHS © R.A.S.



a run and flashed back into the woods. These were the first foxes we had ever spotted on our hill. If we kept chickens, perhaps we'd see them more often. Mating in January, the female fox has a litter of four or five about two months later. When there is only one, as in this case, a long hard winter may be assumed to have taken its toll.

Weekend after weekend we watched spring swell over the land. Now and then a cool day would slow things, but as the mercury rose into the 70's and 80's, the forest green steadily intensified. Tulip and willow trees set the pace, followed by the maples, birches, and elms, then the oaks, beeches, ashes, sumacs, sycamores, and hickories.

Somewhere along the way, dogwoods brought their lacy whiteness to the woods (page 493), and the redbuds their splashes of soft purple. By mid-May insects droned, and at night moths began to fan around the porch light. By early June the woods were fully leafed, and when the wind blew they made a sound like surf.

Summer Brings New Beauty — and Pests

Then, almost imperceptibly, summer was upon us. I recall a visit early in July when the mercury stood in the low 90's. Thistles, spiderwort, daisies, honeysuckle, jewelweed, chicory, Queen Anne's lace, mallow, and a host of other flowering weeds crowded our fields and fence rows. The Queen Anne's lace stood tall and swayed gracefully in the breeze (pages 510-11); the spiderwort spread along the ground; the honeysuckle scrambled over fences and climbed up tree trunks.

Now at last the goldfinches found seeds in the thistledown; swallowtail butterflies fluttered amongst the daisies; bees and wasps buzzed everywhere. Occasionally we heard the take-off whir of a group of quail and the Gatling-gun sound of woodpeckers at work.

Young Paul lolled in a hammock under the grape arbor, reading; our daughter Eda Kristin sat on the back porch arranging some black-eyed Susans, Maryland's flower. And in the garden patch behind the house my wife was tying up the vines of her prized ornamental gourds.

Suddenly she gave a yell. I hurried to her, carrying my camera and tripod; as it turned out, a spray gun might have been more fitting. Squash bugs were smothering her vines, wailed Eda, and couldn't I do something?

Instead, I set up my camera and focused on the scores of squash bug hatchlings loading the stems and leaves near the ground. Patches



Like a featherweight helicopter, a black-winged damselfly alights on a leafy pad. Smaller cousin of the dragonfly, the damselfly folds its wings while it rests; the dragonfly's wings always remain extended. Damselflies use their spiny legs to capture and hold mosquitoes and other summer prey.

Peaceful pool of plenty offers creatures a home—and gives the Zahls myriad specimens. A fresh-water bubble snail (lower left), transferred to an aquarium, streams pearls of air as it plummets bottomward. The counterclockwise twist of the shell





© R.E.T.

identifies this egg-laden mollusk as *Physa heterostrophia*. In autumn the author's daughter Eda Kristin nets tadpoles and crustaceans in Israel Creek (below); in spring, the branch rages with melting snow from nearby hills.



of tiny brown eggs were glued to the leaves, and here and there a red-legged adult, a hundred times larger than her smallest young, sat perfectly still and watchful. The wingless immatures were in various stages of growth—evidence, along with the egg patches, that laying had been staggered (page 514).

Such sap-sucking insects, among the farmer's cruelest foes, account for enormous crop losses. They do the damage with a hair-thin, juice-sucking hypodermic, which they plunge deep into the soft tissues of growing plants. Corn, grass, weeds, wheat, and oats are common victims, and here were our gourd vines, too, under heavy attack. Our own fault, perhaps; for fear of harming the bees and butterflies, we had done no spraying, thereby giving aid and comfort to a host of pests as well.

Aphids, also sap-suckers, appeared by the hundreds and thousands on a climbing wild rose we had planted against an old stone chimney. These insects do vast damage to crops by spreading viral and fungal plant diseases. Most animals reproduce by the fusion of germ cells; not so the summertime aphids. Without mating or even coming close to a male, summer females give birth to strictly female progeny by the process of parthenogenesis. All during spring and summer, as long as food is available, they reproduce their precise kind by the millions—virgins bearing virgins.

Not until autumn do certain of the young mysteriously develop into conventional males and females. But by then so short a time is left that the males do little but mate and die. The females last a little longer, depositing their eggs where next spring's buds will provide immediate food for a new crop of exclusively female hatchlings.

Studies indicate that this sudden, short-lived sexual phase among aphids is induced by biochemical changes in the host plant's sap as autumn and winter approach.

Ants and Their "Cows" Preserved in Amber

If aphids possess a redeeming feature, it is their ability to produce a metabolic by-product known as honeydew, a sugary substance eagerly sought by flies, bees, and ants. Some types of ants have gone so far as to domesticate aphids for their honeydew yield. Solicitously they tend their aphid "cows," even transferring them bodily, when necessary, from plant to plant—from one "pasture" to another. Paleontologists have found ants and aphids embedded side by side in amber solidified millions of years ago, proving this curious relationship to be an ancient one.

Fortunately for roses—if not for ants—aphids are beset from all sides. Fly larvae consume them in masses; so do ladybugs, praying mantises, lacewings, chickadees, flycatchers, warblers, and vireos. Fungi also destroy them.

In August I decided to photograph wasps. For weeks I had been watching the development of a wasp comb stuck up under the eaves of the smokehouse. I had noticed it first back in May, a cluster of five whitish cells suspended by a single thread attached to the roof beam and attended by a lone wasp—a queen of the papermaking *Polistes*.

With her sharp jaws she had scraped wood from trees



Field of fluff, dandelions engulf Eda Zahl. The gentlest breeze will send airborne seeds winging away to other fields. In earlier spring, the plant produces a



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tender green leaf whose bitter-fresh flavor enhances salads. Its shape, like that of a lion's tooth, inspired the name dandelion, a corruption of the French *dent de lion*.



"I really love them," says Mrs. Zahl of the harmless snakes that evoke fear in many people. Black rat snake, fastest species in Maryland, earns farmers' friendship by eating crop-destroying rodents. Its forked tongue acts as a sensing device.

and shrubs nearby and chewed and salivated it to pulp, applying mouthful after mouthful until the first few compartments of her future tenement were completed. Then, pushing the tip of her abdomen through the lower opening of the goblet-shaped cells, she deposited in each a single opalescent egg, cushioned with a shiny blob of nectar—instant nourishment for the future grub. Meanwhile construction continued, cell after cell adding to the original nucleus.

Within two weeks I counted 15 cells in the cluster; several near the center were covered now with bulging white caps (opposite, left). In each of these the egg had hatched and the grub, gorging on its built-in nectar supply, had sewn itself into a silken cocoon and developed into a pupa.

Crammed like a mummy in a sarcophagus, an adult wasp took form. The cell's cap ruptured and the creature slowly freed itself—now a sting-bearing female worker who would spend the rest of her life helping the queen build more cells and gathering food for hatchlings. Later, as summer waned, the colony would produce a crop of males in time for mating.

By mid-August the comb was the size of a saucer, comprising some 150 cells and a population of about 60 workers. To get the picture I wanted, my lens would have



STICHOMERES BY PHILIP K. ZAHL © R.I.S.

Winged architect, a queen *Polistes* wasp mixes a sticky secretion with wood pulp to enlarge her nest of paper. She provides nectar for the first grubs, which develop into workers. They in turn prepare pellets of chewed-up insects for later, more numerous larvae. When mature (cell at lower left), each larva spins a cocoon from which it emerges as an adult. For protection while photographing *Polistes*, Dr. Zahl wears a sting-proof veil.

to come within about two inches of those 60 stingers. I put on a long-sleeved flannel shirt, canvas gloves, and a beekeeper's veil. Then I climbed a ladder and went to work.

Surprisingly, my extreme closeness did not seem to alarm the colony. All members were fanning their wings rapidly, but this, I knew, was not a gesture of threat but a normal method of ventilation. I focused on the target, then pressed the button to trip the shutter and fire the synchronized flash.

Like a flock of birds frightened by a gun shot, 60 wasps exploded into the air. They circled angrily, but ignored me and soon re-settled. This encouraged me to remove my right-hand glove in order to establish more sensitive control of the camera. Uncannily, my subjects sensed my new vulnerability, for on the next flash, five or six zeroed in on my exposed flesh, stingers first. I let out a yelp, lost my balance on the ladder, and saw the ground rapidly approaching.

I picked myself up, still holding the camera, grateful for no broken bones. But there on the back of my bare right hand were four distinct punctures. Around them the skin was blanched and puffy and the pain was severe. Some people are more sensitive than others to wasp venom; I was fortunate, for within ten or fifteen minutes the fire subsided. Fully

gloved, I climbed the ladder to try again. Wasps have survived on the planet for at least 75 million years, and I think I know how they've managed it.

If the plants prevailed on our hill during the spring months, July and August belonged to the insects. To be sure, the birds were still there in numbers, and their songs filled the air. Rabbits, squirrels, field mice, frogs, snakes, and turtles held their own—but mainly this was now the insects' world, the scene that summoned all their energies into feeding, mating, egg laying, preparing for the long winter famine.

Insects Hold Unique Place in Nature

Maurice Maeterlinck once observed that although we feel a certain sympathetic familiarity with other animals and even with plants, there is something about insects that seems alien to the habits, ethics, and psychology of our world. While the higher animals are to some degree able to learn from experience, insects are generally less so endowed. Creatures with limited learning capacities must lean more heavily on instinctual behavior patterns—which insects, in fact, do to a marked degree.

This becomes at once the insects' strength and weakness. Because nothing can stop the

Raising parasols of white, Queen Anne's lace covers the countryside in summer. Chicory adds accents of blue.

A wild form of the cultivated carrot, Queen Anne's lace delights wayfarers, who see it as a roadside beautifier. But the prolific weed plagues farmers and dairymen, who must rout it from their fields and pastures.

Barbed seed (below) sends a furry taproot down into the soil. Soon the stem will shoot upward, to a height of nearly three feet, and put on a spray of blossoms. Those who peer closely when the plant is in full bloom will detect a curiosity: One tiny purple flower grows in the center of every snowy cluster.

As the days shorten, summer's flower clusters wither and curl upward, creating prickly bowls. Now many wild flowers with broad, feathery heads can share a name with Queen Anne's lace—"bird's nest." A stem of wild cress (far right) catches winter's snows to form a frozen cotton ball.





mechanism once it has been set going, it is a strength; because the individual is often helpless to adapt should his environment alter suddenly, it is a weakness. But nature is rarely at a loss; by means of genetic variation and mutation she is able to produce new species that can meet the requirements of many varying environments. On this earth live more than 700,000 kinds of insects, representing almost every conceivable form, function, and habit.

Insects have produced some unique variations on the senses. They smell, for instance, not by means of a nose but with antennae lined with olfactory pits. When they wave their "feelers" they are, in effect, sniffing. Many have eyes that see in virtually all directions; a few are nearsighted, some are blind.* Some insects, like the locusts, have true ears on the abdomen, or, like the crickets and katydids, on their forelegs. Ants have no ears at all, but they can pick up sound waves by means of sensitive tactile hairs. An insect's taste is usually acute—a

*See "Nature's Alert Eyes," by Constance P. Warner, NATIONAL GEOGRAPHIC, April, 1959.





Polka-dotted pinks brighten summer meadows. Cousins of the carnation, these wild, or Deptford pinks, spring up in pastures and along roadsides. The small blossoms—only half an inch across—often escape the eyes of those hurrying past.

condition necessary for discrimination in the selection of food.

Insects have no lungs; they breathe through tiny skin apertures. Blood fluids circulate not through conventional arteries or veins but simply through spaces between the creatures' vital organs.

Insects lack internal heating systems, so their temperature stays the same as their environment. They speed up in hot weather, slow down in cold. One type of cricket is so sensitive that you can calculate the air temperature by counting its chirps per minute.

In September we noticed pumpkins yellowing in the valley, and heard mowers and harvesters tuning up and going to work. By late October, autumn—the most splendid season of all—was splashing her extravagant colors around.

With miraculous suddenness sumac leaves turned red. Then other species joined the prismatic procession—deep oranges, bright yellows, flaming golds—until the entire hillside glowed in glorious hues. Finally many leaves turned russet and fluttered down to earth. There was a change in the air; the sun



SCOTT BROWN (3) N. A. S.

Fieldside floral display: Beneath a canopy of Concord grapes, Eda Zahl arranges bouquets of wild flowers gathered from her farm. With goldenrod and Queen Anne's lace she mixes pink-purple sprays of joe-pye weed, named for an Indian medicine man in colonial Massachusetts who reputedly used the plant to treat typhus. Teasels dry on the table.

burned at noon, but the nights were cooler.

Botanists tell us that autumn color is the result of leaf aging. During this process, complex molecular changes occur in every cell of every leaf. First to deteriorate and fade are the green chlorophylls. Slightly more stable leaf pigments, the yellows and the reds, previously masked by the denser greens, remain to tint the leaf. But eventually, depending on weather and latitude, they too break down; a structural weakening occurs where the leaf is attached to the branch and then, with a slight breeze, the leaf falls.

For all his knowledge, the botanist cannot explain precisely what triggers the cycle. Early frost? A combination of warm sunny days and chilly nights? Precipitation or the lack of it? There are many theories; none is unanimously accepted.

Dry Leaves Swirl in Stark December

We came back in early December. A few hardy thistle flowers survived in the fields. Here and there a stalk of goldenrod still glowed. A bumblebee, wings tattered, poked listlessly for nectar. A flock of starlings banked



low in the sky, and a colony of crows squawked in the woods behind the arbor. Wasp combs hanging under the eaves of the house and barn were empty and paper-thin.

The forest was almost entirely skeletal, and although leaves still sagged from the oaks, other deciduous trees now stood disrobed on ground scattered with their former garments.

A wind whipped our hilltop, shaking the buildings, bending the trees, sweeping the fallen leaves into heaps and piles. Crackling dry, they swirled and drifted like the snow that would follow.

Eda and I laid bark mulch around our favorite shrubs, secured the doors and windows, drained the pipes and pump, padlocked the cellar. As we drove down the lane, bound for the city, we turned up the car heater. But neither cold nor threat of storm would keep us away for long.

The snows were late in coming to western Maryland that winter. December was bleak but not white. Christmas came and passed, and still nothing but clear, cold skies.

Then one day in Washington we heard the forecast: A cold front pushing down from Canada was about to clash with warm moist air moving up from the Gulf of Mexico. This could mean snow-

Voracious squash bugs, enlarged six times, forage amid a clutch of gleaming eggs. These pests take their common name from the squash, pumpkins, and other gourds that fall prey to their appetites. As they feed, the destroyers wilt plants with a toxic injection. Gardeners can sometimes locate colonies of the bugs by their noxious odor.

Unwilling host, a tomato hornworm provides food and lodging for a horde of braconid wasps. Earlier, a female wasp had thrust her eggs into the body of this caterpillar. The resulting larvae ate their way to the surface where they formed white cocoons. By parasitizing the hornworm, such wasps help rid tomato and tobacco crops of a leaf-eating pest.

fall along the entire eastern seaboard, including a certain Appalachian hilltop. This was our cue, for we wanted to experience our wilderness in the full fury of winter.

Seeking more information, I consulted the *Hagerstown Almanack*, respected oracle of these parts: "when you hear an owl holler," I read, "you can expect bad weather . . . when a cat comes in to curl, stormy winds are bound to swirl . . . a hard winter is when you see many woolly worms in the fall with mostly black instead of brown on their back . . ."

Well, we had heard no owls holler. We had no cat. We *had* seen woolly worms a few months back, but I couldn't recall whether they were mostly black or brown.





REPRODUCED © R.S.A.

Balancing the U. S. Weather Bureau against the almanac, we arrived on our hilltop to wait. Even with the wood stove going, the old clapboard farmhouse was too cold, so we moved cots and blankets into what had been a smokehouse, a tight one-room stone building with a deep fireplace. With a supply of dry wood and food, we were ready for anything.

Winter here, we knew, could produce icicles a yard long and drifts deep enough to swallow a parked car. With this in mind, we had left our automobile along the main highway half a mile from the hilltop, and hiked up.

By late afternoon of that January day a gentle beginning grew swiftly into a snowfall so dense that within minutes the valley was white. As starless night obliterated even the whiteness, and the cold deepened, we retreated to the fire-side warmth of the smokehouse. Crystals softly falling outside continued to pile one upon another, hour after hour.

Next morning I had to push hard on the door to force it through a three-foot drift. The snowfall had stopped, the air was cold but still, the sky sullen but no longer threatening as I made my way across the yard, leaving a double track of knee-deep holes. The branches of every tree, the twigs of



Bewhiskered face, here magnified 15 times, belies the beauty of a nymphalid butterfly. Hornlike antennae serve as taste, touch, hearing, and smell sensors. Blotchy eyes with hundreds of minute lenses guide the butterfly to nectar-bearing flowers whose colors give off ultraviolet rays visible to the insect but not to humans. To reach nectar buried deeply in blossoms, it uncoils its long, hollow tongue, now tucked between its eyes.

Pulsing with russet grace, a nymphalid feeds on a thistle. Fish-eye lens captures the tranquil scene.



STUDY PHOTO BY PAUL S. ZAHL, NATIONAL GEOGRAPHIC STAFF © U.S.G.

"Like a moth attracted to a flame." Insects circling a porch light on the Zahl farm call to mind the oft-quoted phrase, for which scientists now have an explanation. Nocturnal moths use the moon as a beacon; by keeping the lunar image at a fixed angle on the eye's retina, they can maintain fairly straight courses. When they make use of an electric lamp or a candle flame, however, the moths find themselves flying in ever smaller circles until they crash into the light source. For this two-second exposure, Dr. Zahl painted the near side of the light black.

every shrub and bramble were etched in white. Nothing moved except smoke curling from our chimney, and me. But the immobility imposed by deep snow and freezing cold was misleading. I was well aware that nature has a full bag of tricks for outwitting weather extremes.

Approaching a fence behind the barn, I recalled a gravid praying mantis I had found there under a rail late in September.* She had spent the summer months fattening up on

flies, aphids, grasshoppers, and butterflies; had mated (possibly devouring her consort immediately afterward) and deposited a froth of white bubbles there under the rail. In this mass she would embed two to three hundred tiny eggs. It would be the terminal act of her life, for at the first sustained freeze she would perish, along with others of her generation,

*See "Praying Mantis," by John G. Pitkin, NATIONAL GEOGRAPHIC, May, 1950.





KUDACHUMBEY © NATIONAL GEOGRAPHIC SOCIETY

Thistle in midsummer bloom signals the start of the mating season for the late-breeding American goldfinch. Swallowtail butterfly hovers above a foraging male finch. Winged seeds of the plant (above) feed hatchlings, which do not appear until August, as well as the parent birds. Sharp prickles jutting out from the leaves of the bull thistle discourage grazing animals.

having secured the future of the species (page 522).

Tough enough to resist the teeth of most winter predators and effective as an insulator, the froth would shelter the eggs until spring-time, when rising temperatures would set off a series of changes in the tiny embryos. In mid-May a new wave of hungry young mantises would emerge (page 523).

Gently I moved my gloved hand along the fence rail, brushing off the snow. Underneath, where rail met post, I found a lump of hardened froth, and farther along another, harboring life in abeyance.

The praying mantis life cycle—feeding

during summer's abundance, mating, egg laying, death—is common to a good many temperate-zone insects. Katydid, for example, follow this rule, as do gypsy moths, most shorthorn grasshoppers, walking sticks, and aphids. But variations and exceptions are myriad. The eggs of some moths and butterflies—the Luna, Polyphemus, Promethea, Cecropia, for example—hatch into summer caterpillars, then duly spin themselves into cocoons for the winter.

Some caterpillars feed for a time, then drop to the ground, where they survive the winter unchanged under leaves and in soil pockets. The extraordinary monarch butterfly migrates to southern climes, often thousands of miles away, returning next spring to glue



Lifting the lid on a city, the Zahls uncover an ant metropolis beneath a rock. In summertime, citizen ants labor furiously, caring for unhatched young and occasionally waging war with rival colonies. With autumn's onset they gather in tight huddles for a sleep that lasts all winter. "The brain of an ant is one of the most marvelous atoms of matter in the world, perhaps more so than the brain of a man," wrote naturalist Charles Darwin.

Scrambling into action when their roof disappears, worker ants rescue cocoons beneath the sun-warmed stone. Obeying instincts developed over millions of years, they haul the young to the safety of a subterranean gallery. Mistakenly called "eggs," the cocoons actually shelter the final, or pupal, stage in ant metamorphosis.



ILLUSTRATION © NATIONAL GEOGRAPHIC SOCIETY

her eggs to the leaves of fresh milkweed.*

Next summer's damselflies and dragonflies were spending the winter in a pre-adult stage in the bottom muck of our ice-clogged stream. Fireflies, which in June and July had set our fields aglow, survived in the guise of tiny grubs snuggled in the forest duff, like the larvae of many other beetles.

Wild honeybees meet winter in their own peculiar way.† With the coming of cold weather, the members of a hive cling together in a sort of living ball. Those near the center shimmy and shake like dancers at a discotheque, wings fluttering, legs churning, antennae quivering. As dancers tire, they make way for substitutes moving in from the outer layers. Metabolic heat released by those

*See "Mystery of the Monarch Butterfly," by Paul A. Zahl, NATIONAL GEOGRAPHIC, April, 1963.

†"Inside the World of the Honeybee," by Trent Davidson, appeared in the August, 1959, GEOGRAPHIC.

hundreds of active little bodies warms the entire colony.

Wasps, bumblebees, hornets, and their kind have no such ingenious survival method. They die in winter's cold—all but the fertilized queens, who manage to survive curled up in hidden crannies. In spring they quicken and sally forth to start new colonies.

I probed the snow near a spot in the backyard where during the summer I had placed a stake. I pushed away enough snow to clear some of the rocks, then began to turn them over. The soil beneath was dry and grooved, and although there was no sign of ant life, I knew that just below the surface, tunnels led to galleries where viable queens, workers,

kingdom. The inevitable blossoming of spring proves dramatically the winter durability of many plants.

Skunks, badgers, raccoons, tree squirrels, and chipmunks, whose internal temperatures do not shift substantially in winter, may snooze for days and even weeks at a time, but they often stir within their lairs and even venture forth. Among our hilltop mammals, only the groundhogs and some species of moles and bats may be said to undergo the internal glandular changes characteristic of true hibernation, but even these can be awakened in midwinter if brought slowly back to room temperature.

My steps across the snow led me to a low



PHOTOGRAPHS BY NATIONAL GEOGRAPHIC SOCIETY

Praying mantis ejects a frothy nest as autumn heralds her death. After she deposits her eggs, the froth hardens quickly. With spring, hundreds of babies emerge through narrow passages in the walnut-size casing to hang from silken threads as they dry in the sun (right). Dr. Zahl placed this egg mass in his rose garden, hoping the greedy insects would rid it of destructive aphids. "We would have needed thousands more," guesses the author, "to control the pests."

and males were sheltered. A spade could quickly have uncovered them.

Termites, too, live through winter in the adult stage, as do common houseflies, many beetles, chinch bugs, crickets, cockroaches—all with their own defensive secrets. Hidden away in chinks and hollows, they are rarely seen from October until May, unless stirred into life by the warmth of house or barn in which they have sought refuge.

Exactly what enables adults of one species and eggs, larvae, or cocoons of another to withstand freezing is unknown, but obviously the phenomenon is not confined to the animal

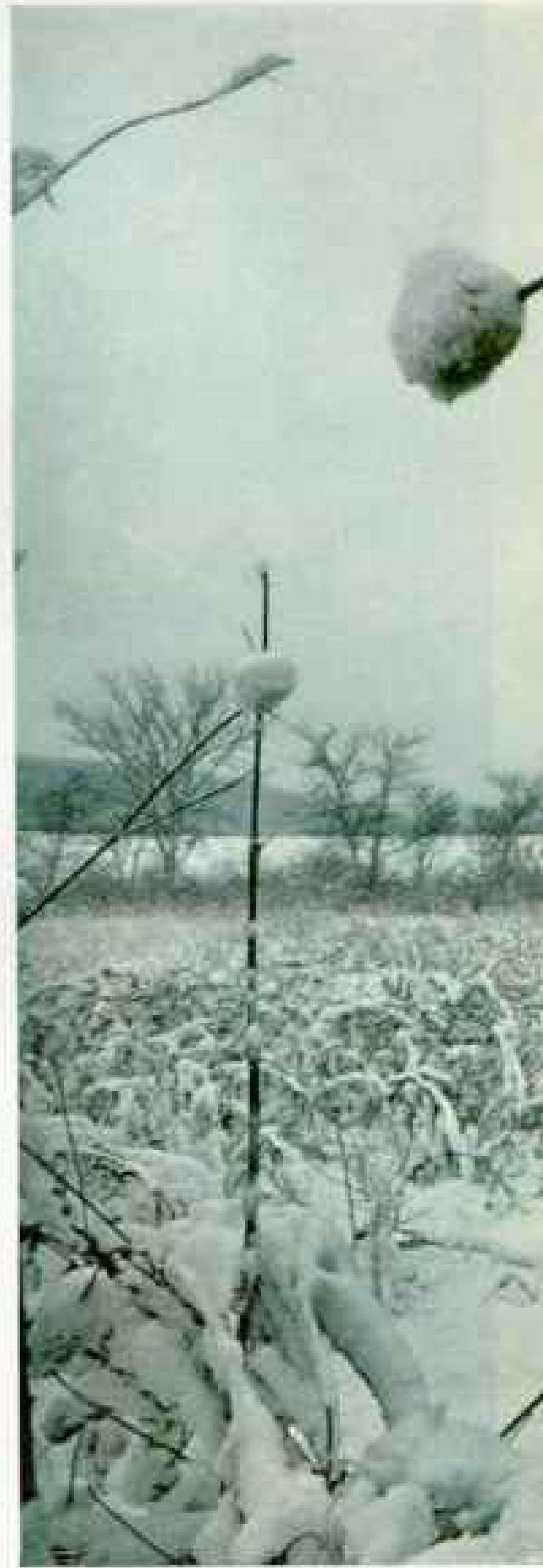
wall of piled field stones—forbidden territory to any summer visitor not wearing boots, a taboo easily enforced merely by mentioning snakes. Although we had never seen venomous species here, the possibility of a copperhead or a rattlesnake was never to be ruled out.

Garter snakes and black snakes are the more obvious denizens of any western Maryland stone pile. Black snakes as long as a broomstick could be seen here almost any warm spring day, slithering toward the field in search of mice, or to the barn for pigeon eggs (page 508). We do not molest them, and the respect has been mutual.





Withered by the frosts of fall, six-foot stems of teasels snap in Eda Zahl's hand. She harvests the floral skeletons for winter decorations in her Washington, D. C., home.



Now snow covered the rocks, and there was no need to watch one's step. Snakes, turtles, frogs, toads, lizards, slugs, snails, worms, and salamanders have no choice; lacking efficient thermal systems, they must adopt the temperature of the rock clefts and mudholes where, during their winter torpor, they survive on stored energy.

But not all life here had been stilled by freeze and snowfall. While my own tracks through the deep white stuff were gross boot holes, I found some dainty footprints here

and there, little impressions almost artistic in design, that barely broke the surface. Drawn from their warm lairs to nibble on soft bark, to search for seeds, or just to stretch and run—a squirrel, a field mouse, a rabbit had gone before me across the snow-packed hillside.

And in the field below the barn I came upon a disarray of grayish feathers, likely the leavings of a hawk's or an owl's meal. Indeed, I was surprised to discover how many of the birds had stayed on, somehow managing to



REPRODUCED BY PAUL A. ZIHL © NATIONAL GEOGRAPHIC SOCIETY

Long white sleep grips Pleasant Valley, and the tall teasels bend low beneath their cold coverlets. Weeks ago geese and ducks winged southward, the snakes sought refuge in barns and hollow trees, and the groundhogs burrowed deep. It will be a hard winter, and spring indeed may be a little late.

shiver it out. The crows were the most conspicuous. They were cawing in the woods; and now and then one would fly in dark silhouette across the whitened field.

I poured grain and sunflower seed into a bird feeder, although I suspected that my offering might fall prey to the bolder squirrels. Moving away to watch, I soon became aware of a stir in nearby trees. Bright little eyes, from heaven only knows where, had spotted my handout. Abruptly a flock of at least thirty juncos—"snow birds"—swooped down out

of the branches and fell upon the food. A scattering of nuthatches and sparrows and a single bluejay joined them.

The sky was leaden and, as the day passed, more snow threatened. We emptied the remaining birdseed into the feeder and began our trek down the hill and across white fields. County snowplows had cleared the highway and partially exposed our car. Some vigorous shoveling freed us, and we headed home. The hilltop slumbered. But spring would provide the awakening elixir.

THE END

Robert V. Fleming

1890-1967

By MELVILLE BELL GROSVENOR, LL.D., Sc.D.

Editor-in-Chief and Chairman of the Board, National Geographic Society

THE NATIONAL GEOGRAPHIC Society, in its 80-year history, has had many great Americans on its Board of Trustees, and to their wise counsel and devoted service your Society owes, in large part, its success in increasing and diffusing geographic knowledge throughout the world. None served with greater dedication, distinction, and dynamic ability than Robert Vedder Fleming, Trustee since 1929, Treasurer since 1935, and Vice President since 1958, who died last November 28 at the age of 77.

For half his lifetime Robert V. Fleming played a vital role in the affairs of our Society. No major expansion or new educational project was undertaken without his always-ready advice.

The senior officers and editors of the National Geographic Society receive much credit for its growth. But without Bob Fleming to protect and nurture our resources we could never have accomplished all that we have. In the words of a resolution adopted by the Board of Trustees last January 25:

"As Treasurer of the Society and Chairman of its Finance Committee, Dr. Fleming devoted his ability and efforts to assuring that the Society's resources and facilities always kept pace with its phenomenal growth and expanding goals. When Robert Fleming became Treasurer in 1935, the Society's membership numbered slightly more than one million; at his death its rolls listed more than six million members. His sound management of its finances helped make funds available for greatly increased research, exploration, and public service grants, for new publications

and the Society's entry into television, for tenfold expansion of the School Bulletin service, for inauguration of educational filmstrips, for huge presses, and for worthy new buildings to house the Society's expanding activities."

I vividly recall my first meeting with Bob Fleming: I drew him as a golf partner. He was only in his mid-thirties, but as President of the Riggs National Bank in Washington, he was already on his way toward nationwide fame in banking circles. As a golfer, he played formidably in the mid-70's. I trailed him badly in age, confidence, and skill, but that day I played over my head and we won. Always competitive, Bob was delighted. Our friendship grew. Soon he seemed like an uncle to me.

Strong Personality Inspired Confidence

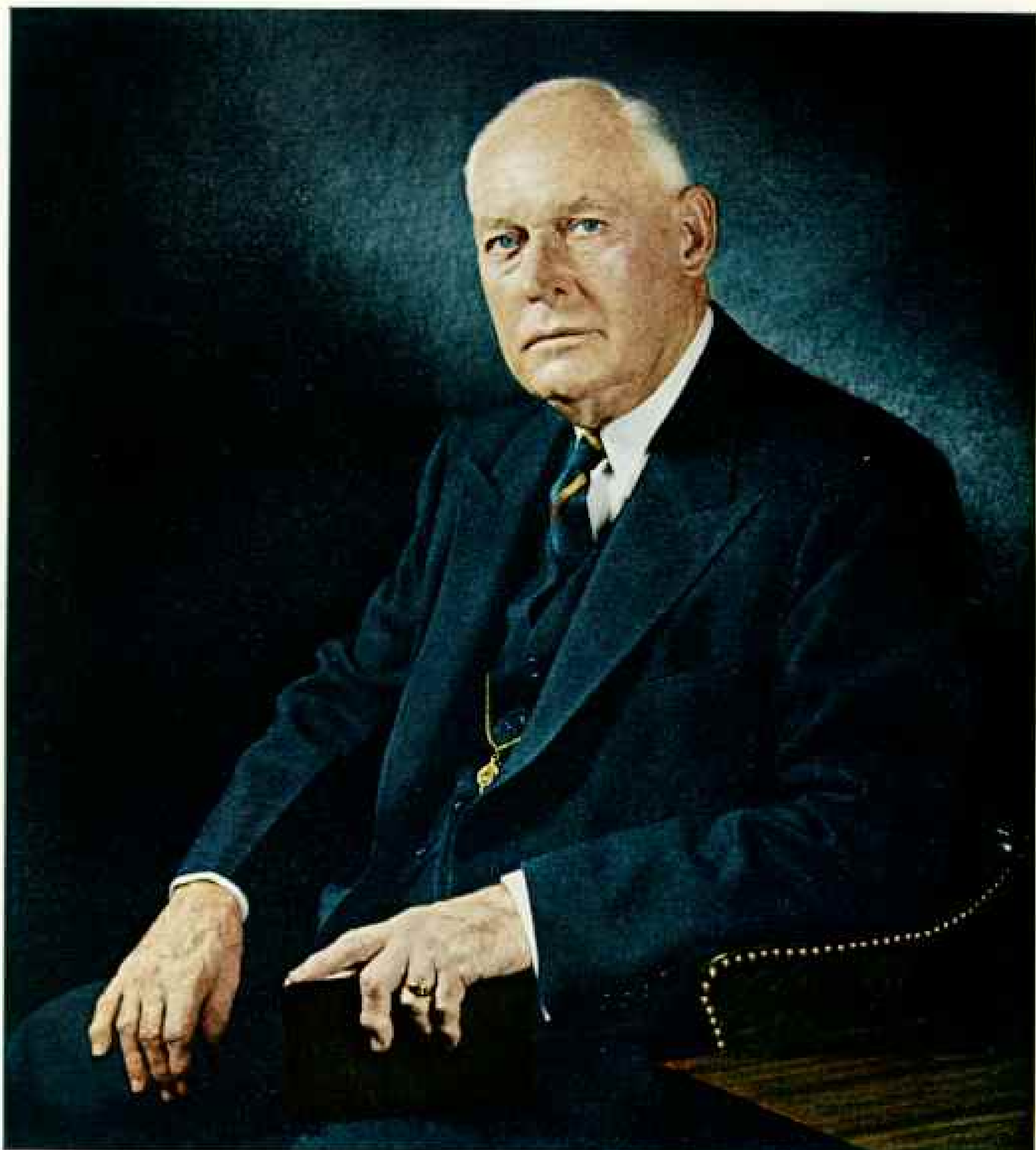
Bob had the stocky strength of a Winston Churchill, and he inspired the same kind of confidence. To me he always seemed permanent and invincible.

During the dark financial depression of the early 1930's, Bob Fleming was in the vanguard of Washington banking officials who organized to weather the crisis of financial failures. When panicky depositors began a wild run on one loan association, Bob and a group of fellow bankers appeared on the scene.

"All your deposits are safe," they told the knots of fearful people in the lobby.

Meanwhile, guards had begun to unload sacks of currency from an armored car.

The bankers' show of confidence—and the money's timely arrival—immediately stopped the run. The crowd melted away, and that loan association still flourishes in Washington.



REPRODUCTION BY ROBERT S. GRAY, NATIONAL GEOGRAPHIC STAFF

All his life Bob Fleming helped others. As a youngster, he wanted to be a surgeon. His father's death made that dream impossible, "but Mr. Fleming always had a surgical mind," one of his associates recently observed.

That keen intellect served him and his country well. He started as a 17-year-old messenger boy with the Riggs Bank and rose swiftly to the top. From his office, across Pennsylvania Avenue from the Treasury Department and the White House, he became an unofficial but continuing counselor to every administration, regardless of party. He headed the American Bankers Association in the 1930's and chose as his nationwide theme "taking the mystery out of banking."

Friends marveled at his vast store of energy. For a generation he was Chairman of the Board of George Washington University, and he served the Smithsonian Institution as a member of its Board of Regents and Chairman of its Executive Committee. Indeed, he aided so many local causes that he came to be called "the Capital's No. 1 citizen" and "Mister Washington."

"He gave his full attention to each problem. He always took time for people," recalls his son Robert W. Fleming. "That's the reason he sometimes ran behind schedule."

Presidents and other great men of our time enjoyed his delightful company.

When he served as chairman of President



*To - Bob Fleming
 who ever looks like a landing game
 Dwight D. Eisenhower*

ARTHUR ELLIS, WASHINGTON POST; LARRYEL THOMAS; HERRICK FLOWER (LEFT); BRIG. GENERAL VARELA



Friend of Presidents, Dr. Fleming greets Lyndon B. Johnson in 1964 at the dedication of the National Geographic Society's new headquarters building in Washington. Dr. Fleming acted as unofficial adviser to Secretaries of the Treasury under Mr. Johnson and five previous Presidents.

Autographed picture prized by Robert Fleming, left rear, shows him in President Dwight D. Eisenhower's party at the 1958 baseball season's opening game in Washington, D. C. With them are Gen. Alfred M. Gruenther (left) and attorney George E. Allen.





Snip of the shears opens a 1957 Bell telephone exhibit at the Smithsonian Institution. Dr. Fleming, a Smithsonian Regent, assists Dr. Melville Bell Grosvenor, grandson of Alexander Graham Bell.



BATEE (LITTLECHANCE (TOPPER) AND W. C. GARRETT, BOTH NATIONAL GEOGRAPHIC STAFF © N.G.S.

Report from the printer: Charles W. Lake, Jr. (right), President of R. R. Donnelley & Sons Company, Chicago, shows a vinyl mold used in producing NATIONAL GEOGRAPHIC. His audience: Dr. Melvin M. Payne (left), President of the Society, Dr. Thomas W. McKnew, Advisory Chairman of the Board of Trustees, and Dr. Fleming, Vice President and Treasurer.

Vigorous wind-up by former pitcher Fleming opens the 1936 sand-lot baseball season for the Riggs National Bank team. Dr. Fleming served as President of the bank, and later as Chairman of the Board.



Eisenhower's Inaugural Committee in 1957, he won the friendship and gratitude not only of statesmen but also of a big police officer who continued to drop into Bob Fleming's office for regular personal visits over the next 10 years. In the same spirit, one young man told me, "When I was first thinking about marriage, I needed advice and my own father was dead. So I went to Mr. Fleming—he was like a father to many of us."

"Steady Counsel . . . Instantly Available"

With the same fatherly vision, he guided the Society's Finance Committee during our greatest period of growth. Through prudent handling of funds, we were able to buy new high-speed color presses, build new office buildings, and increase our public service and research grants.

At an earlier stage of the Society's history, my father Gilbert H. Grosvenor thanked Robert V. Fleming in these words: "Through many difficult problems and situations—the Great Depression of 1930 to 1937, World War II, the Korean War, and the continuous Communist threats—your steady counsel and wise, generous advice, always instantly available, have immensely benefited the National Geographic Society."

Bob Fleming trained us all in his methods, and so he bequeathed a practical legacy as well as a rare human example when he quietly passed away last November.

At the funeral I spoke with President Truman's Secretary of the Treasury, John W. Snyder. "We used to have lunch together every week," Mr. Snyder said. "Bob Fleming's penetrating knowledge of finance was of great value to the federal administrations of every President since President Hoover in complicated financial and fiscal problems of the Government. During my six and a half years as Secretary of the Treasury, he rendered immeasurable service to the Treasury Department as counselor, adviser, and friend."

Later the same day, I encountered the present Secretary of the Treasury, Henry H. Fowler—and he used almost the same words as his predecessor from another generation.

I was still thinking about this example of our friend's constancy and reliability over the years when I returned to my desk. On it lay a letter from Bob Fleming, written just before his death. He was fretting over his "clearance from the doctors . . . to be present at the Board of Trustees meeting." He was still the Society's dedicated Treasurer, still looking ahead. He never ceased to be young in heart.



The Netherlands: Nation at War With the Sea

By ALAN VILLIERS

Photographs by ADAM WOOLFITT



BOONCHHUIJ © NATIONAL GEOGRAPHIC SOCIETY

Racing an old work horse of lake and sea—a heavy *skútsje*—crewmen prepare to jibe on sparkling Pik Meer. Heavy leeboards substitute for a keel on this vanishing cargo carrier of watery Friesland Province. With a fourth of their land below sea level, Netherlanders know their mighty rivers and pounding North Sea both as servants and as implacable foes.

“IF WE HAD NOT ALWAYS FOUGHT the sea, there would be no Netherlands as we know it now,” said the head of the Rijkswaterstaat, the State Water Department.

We were talking in his office at The Hague, in a building that had been a German Gestapo headquarters in World War II. A quiet, middle-aged man, Director General J. van de Kerk gestured toward the North Sea as he spoke.

“Time and again the sea has risen to wipe sections of our alluvial coastlands off the map. Of our 12½ million people, half work and live on land that could be swept by storm-driven tides.

“Dunes and dikes—thousands of miles of them—protect



EXTENDING (PHOTO) AND REDUCING (C) R.A.S.

Lady in lavender attends the Queen's annual opening of Parliament at The Hague (pages 566-7). A constitutional monarchy, the Netherlands combines devotion to its royal family with a historic passion for personal independence. As early as 1579, a treaty that united the seven northern Dutch provinces guaranteed freedom of religion.

Resplendent in spiked helmet, a Royal Netherlands Marine stands guard for the opening of Parliament.

Serious spectators size up trotters at the annual Grand Prix of the Netherlands in Groningen, a northern city of more than 150,000 people. Raincoats, everyday attire, guard against showers that sweep in from the North Sea frequently and unpredictably.





ENTRICHROMES NATIONAL GEOGRAPHIC SOCIETY



Buckskins and broad-brimmed hat bring a touch of the Wild West to a carnival at Maastricht, capital of gently rolling Limburg Province. In this finger of Dutch territory between Belgium and Germany, the Netherlands' billiard-table terrain turns hilly and climbs to its highest point, a "peak" 1,053 feet above sea level.

us. If they gave way, half our country could be made uninhabitable in one outside tide.

"Dunes and dikes are the old way to control the sea. We have to do better than that. So we are working on our Delta Project. It is the largest flood-control project in our history, and it will cost us about a billion dollars. But it must go ahead."

The Delta Project is a stupendous piece of water engineering, ranking in immensity with the United States' Tennessee Valley Authority and Egypt's Aswān High Dam. Now in mid-course, with completion scheduled in ten years, the project comprises a tremendous series of dams and sluice gates to shut off most of the Rhine-Maas-Schelde Delta from the North Sea (pages 542-5).

While primarily a flood-control plan, the Delta Project will also add more than 25,000 acres of reclaimed land to Netherlands territory. It is a direct, continuous, and utterly audacious fight by man against all the wild power of the open sea.

Dutch Continually Alter Geography

Such daring undertakings are a Dutch tradition. A generation ago, though many said it could not be done, Dutch engineers tamed the Zuider Zee, a great arm of the North Sea that thrust far inland. Throwing up a 20-mile barrier dam, they shut off the Zuider Zee from the North Sea and turned it into a fresh-water lake, the IJssel Meer (map, page 536). Since 1927 a growing network of dikes and pumps inside this enclosure has been creating those rich areas of land recovered from sea or lake bottom that the Dutch call polders (page 539).

An old saying holds, "The Lord made heaven and earth, but the Dutch made Holland." Officially, they made the Netherlands, though many people call the country Holland after its two main western provinces, North and South Holland.

Whatever one calls it, the Dutch have not only made much of their homeland. They do astonishing things with it and in it. As a seaman, I had long been familiar with its efficient ports. As a visitor, I knew its profusion of tulips and daffodils, its bountiful vegetable farms, its rich dairying.

Men in baggy pants and wooden shoes, women in floppy caps and voluminous skirts I knew too, and the windmills, the flat ditch-divided fields, dotted with plump cows, the flavorful old cities built around canals. But friends told me this image of Holland was now utterly outmoded.

I went to see for myself, and I found they



Black breath of panting merchantmen hangs above quays at Rotterdam, a commerce-clogged gateway between the sea and the Rhine, world's busiest river. Beneath giraffe-like cranes, barges scurry past squat freighters and a many-windowed tour vessel; a



EXCHROME (R) NATIONAL GEOGRAPHIC SOCIETY

floating crane unloads cargo at left. Streaming from earth's far corners, heavily laden ships file up the New Waterway to Rotterdam, unload into river craft, then cram their holds with exports funneled here on western Europe's web of waterways.



0 10 20 30
STATUTE MILES

Superhighways — Other Roads —

Railroads — Canals —

Places with Scheduled Air Service +

Elevations in Feet

Below Sea Level
Land Under Reclamation
Land Reclaimed



- The Delta Flood Control Project
1. Haringvliet Dam, completion 1971
 2. Brouwershavense Gat Dam, completion 1972
 3. Eastern Schelde Dam, completion 1978
 4. Veerse Gat Dam, completed 1961
 5. Zandreek Dam, completed 1960
 6. Gravelingen Dam, completed 1965
 7. Volkerak Dam, completion 1970

CARTOGRAPHIC DIVISION
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A FOURTH OF THE NETHERLANDS lies below sea level, a geographic oddity produced by centuries of struggle against the sea. Today in the Zuider Zee and Delta Projects, the Dutch perform prodigies of dam construction, flood control, and land reclamation. With one of the world's greatest population densities (1960 to the square mile), the Netherlands zealously husbands its hard-won soil. It has gained world renown for its dairy products and flower



bulbs. But it is the sea that most colors Dutch life; sturdy Dutch-built ships sail every ocean, and Rotterdam ranks as the world's busiest port.

AREA: 12,978 sq. mi. **POPULATION:** 12,500,000, mostly of Germanic origin. **GOVERNMENT:** constitutional monarchy. **LANGUAGE:** Dutch. **RELIGION:** almost equally Protestant and Roman Catholic. **ECONOMY:** trade; industry—electronics, textiles, food processing, chemicals, diamond cutting; agriculture—dairy products, flower bulbs; resources—natural gas, oil, salt. **MAJOR CITIES:** Amsterdam (pop. 868,200), capital and commercial center; Rotterdam (pop. 731,900), chief port; The Hague (pop. 604,800), seat of government. **OVERSEAS AREAS:** Surinam and the Netherlands Antilles.

were right indeed, though the old endures here and there, and tourists by the hundreds of thousands flock to see it. I rode canals through the heart of traditional Holland, saw Frans Hals paintings by candlelight, yarned with clog-shod cattlemen and old sea dogs in picturesque regional costume, watched diamond cutters pursue their 16th-century craft, and strolled through hothouses vibrant with 10,000 crimson tulips.

But I had to search for all this, for the airplane, the automobile, electronics plants with world-wide markets, and many other thriving new industries have changed the look, the feel, and the tempo of Holland.

I saw engineering wonders everywhere—not only great hydraulics projects but a harbor that has moved out to sea, an “impossible” new subway pushed through waterlogged land, a giant new airport built on the site of a long-ago naval battle.

Above all else, of course, Dutch talents focus on that one all-important problem: the centuries-old threat of sudden, devastating flood from sea and river.

“In our country the story of disaster by flood is long and terrible—and scares nobody,” Director General van de Kerk said.

Roman soldiers 2,000 years ago found the wild Frisians clustered defiantly at their *terps*—mounds of earth they had built above the waves’ reach. Sometimes covering as much as 40 acres, these mounds provided refuge against the tides. The Dutch have pursued a policy of defense against the sea until modern times. Now they are on the offensive.

Model Simulates Delta Problems

The Delta Project will do more than hold the sea at bay; it will shut out the tides and control the rivers when they rage with winter’s ice or spring’s flood. It will combat the troublesome seepage of salt into low-level soil, for behind the planned dams engineers will create great fresh-water lakes between the islands of Zeeland, where the sea now reigns.

With this fresh water, the Dutch will wash excessive salt from agricultural land. And new roads across the great new dams will open up and develop a large section of the south Netherlands.

Director General van de Kerk arranged for me to visit the Hydraulics Laboratory at Delft, the same old sleepy town once chiefly known for its distinctive *delftware*. At the laboratory—where the Delta Project originated and is



DETAILS BY ADAM WOOLFIT © N.E.S.

On a pillow of blossoms, a tulip farmer and his dog bask in the spring sun. Growers cut the heads so the bulbs will become larger. Wooden *klompen* keep feet dry in soggy fields. The windmill, once vital to removing unwanted water, now stands doomed; electric pumps have largely replaced this landmark of the lowlands.



still being worked out—I studied a small-scale model covering 1,400 square yards (next page). It is a sort of working relief map, taking in all Zeeland with the adjacent waters of the North Sea and the Rivers Rhine and Maas, as far as they are affected by tidal movements.

“It is obviously simpler to create and study problems with a model in a laboratory than in the field,” Professor H. J. Schoemaker, the laboratory director, said. “We can set up almost any combination of wind, sea, tide, sea bed, and channels, and see what will happen when we build our dams. We can re-create the disastrous floods of the past, back even to the catastrophe of 1421, and plan how best to cope should the same conditions arise again.”

Scope of Project Dwarfs the Pyramids

Mr. A. L. van den Brandeler, an engineer for the Rijkswaterstaat’s Delta Department, showed me how the Zeeland model worked. I watched water trickle slowly along the shallow channels in model rivers, winding toward a large pool representing the nearer waters of the North Sea. Immersed in the water or just touching its surface, wired instruments recorded currents, eddies, and water levels, and transmitted this information to control panels.

“Everything is speeded up in the model, of course,” Mr. van den Brandeler said. “A day’s tidal movements last only about five minutes here.”

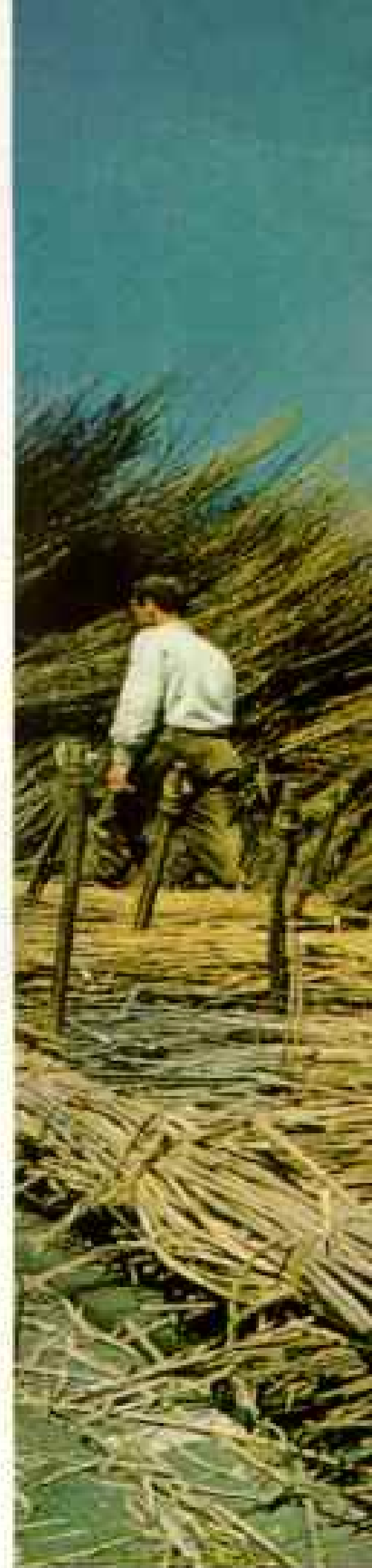
Slowly I gained some idea of the staggering problems involved. There will be seven huge dams, four fronting the sea, three inshore; the Eastern Schelde barrier alone will require more building material than three Great Pyramids of Egypt. Yet only in the extreme southeast can one find a quarry or a gravel beach in all sandy, alluvial Holland. As a result, the Dutch must import most of the stone used in their vast projects from elsewhere in Europe.

Visiting the great delta, I talked with hydraulics engineers, dam builders, planners, workers. I became used to the smell of boiling bitumen, the sight of muddy water pouring from huge dredges. I saw men standing up to their

Two millenniums of shifting battle lines: At the time of Christ, hardy Frisians had already settled in Europe’s boggy northwest lowlands, building their villages on laboriously shaped mounds called *terps*. Connecting the mounds with embankments, these early Dutchmen evolved dikes and reclaimed land from the sea—the first polders. By A.D. 1200 the wild North Sea had smashed inland and created the *Zuider Zee*, and southern rivers had swept away delta lands. Again Hollanders advanced, obeying the Law of the Spade: “Dike or depart.” Harnessing the wind, they dotted the land with windmills that pumped out lakes and swamps; they planted hardy marsh grasses that helped hold and build the land. Twentieth-century Dutchmen boldly sealed off the *Zuider Zee* and devised the Delta Project (pages 542-5).

Flat as the sea that covered it, the Eastern Flevoland polder stretches to the *IJssel Meer*. Prefabricated barns dwarf homes; shocks of grain dot distant fields. Once part of the *Zuider Zee*, the polder reclaims 133,400 acres.





Defenses fail! Pouring through a breached dike, waters of the Lower Merwede River flood the town of Papendrecht, 27 miles from the sea. Workers pile sandbags to keep the break from widening. The disaster struck in 1953, when a freak combination of tides and hurricane-force winds unleashed rivers and sea in a rampage that claimed 1,800 lives and drove more than 70,000 persons from their homes. The Dutch reacted by launching the colossal Delta Project.

Like Gullivers in a watery Lilliput, scientists at the Delft Hydraulics Laboratory adjust a sluice on a working model of Haringvliet Dam (page 544). Copper stakes set up turbulence similar to that of the actual river. Using a model of the whole delta, Delft engineers analyze nature's forces and develop ways to control them.





PLACING STAKES (UPPER LEFT), KNOCKING HOME (UPPER) AND EXTENDING BY JOHN WOODLITT © N.A.S.

Weaving a dike's wave-proof vest: In a time-tested technique, polderboys plait willow bundles around a grid of stakes, fashioning a yard-thick mattress that may stretch 600 feet across. Floated to a dike or dam, the mat will be weighted with rocks and sunk. Resisting rot under water, the switches blunt the ceaseless scouring of wave and current.

thighs in the cold sea while they steadily drove steel bars into place or fitted stones above fascine mats—huge mattresses of hand-plaited twigs and branches used to bolster dams and dikes (above).

At the Haringvliet site, Mr. van den Brandeler told me, "We've been working here since 1957. We had to make an island before we could go to work at all." He said it as if making islands to order was an everyday job.

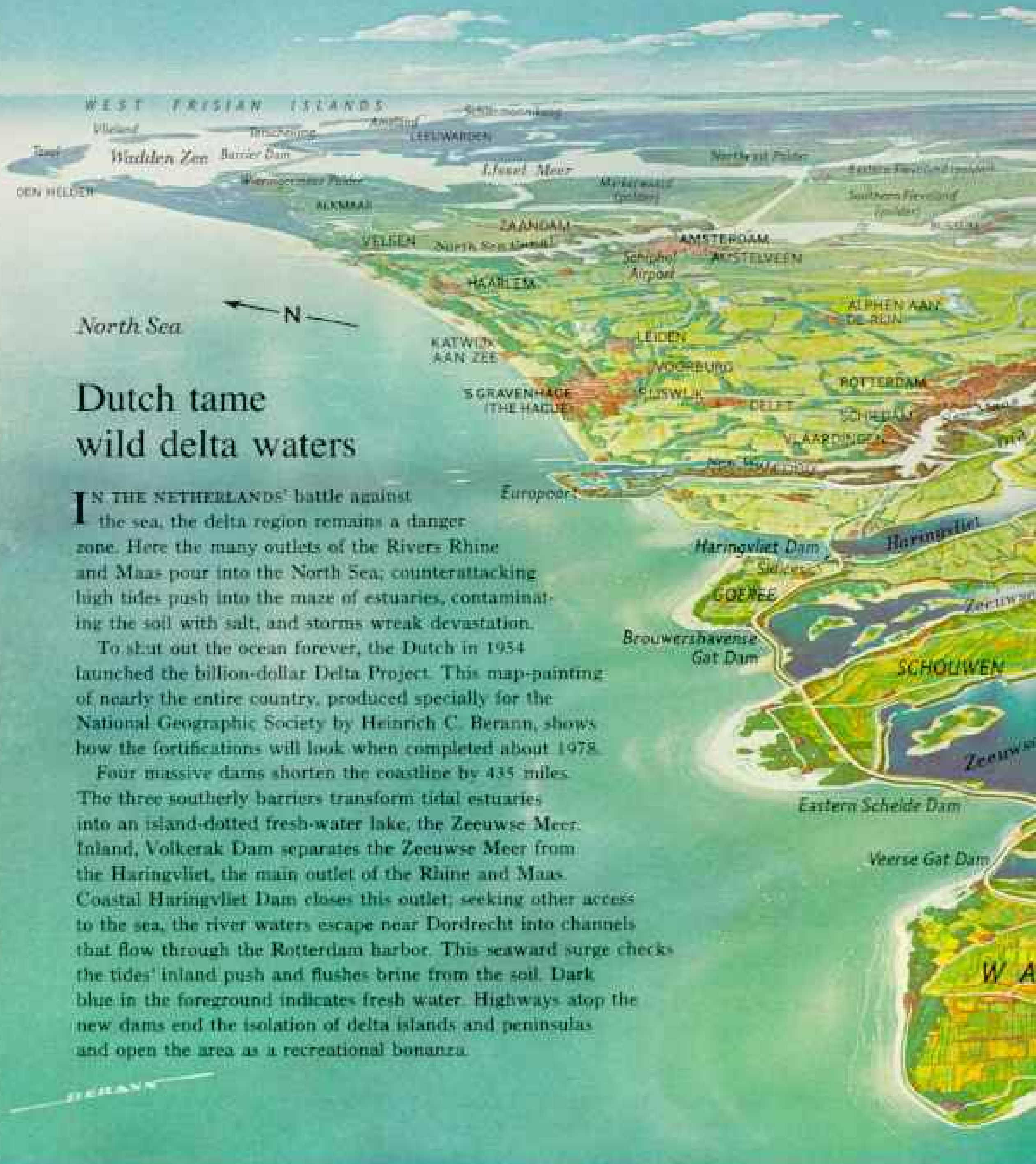
We went out there and sat in the sunshine in a sheltered spot, as Mr. van den Brandeler explained the construction and purpose of the island:

"First we built a ring embankment almost a mile long and half a mile wide. Then we pumped the water out of the enclosure and the dry bottom became our island [page 545].

Look over there and you can see why we needed it."

He pointed to a long line of 17 enormous prestressed concrete chambers down the island's middle. These house the all-important steel sluice gates. In front of the gates, men were finishing great aprons of packed stones laid on foundations of sand and gravel above a nylon web, used in place of fascine mats. Even the smallest pieces of stone were placed with infinite care, for these aprons must accept the most turbulent rush of flood waters and not be scoured away.

"The Haringvliet is the main outlet to the sea for both the Rhine and the Maas," Mr. van den Brandeler explained. "So this is where we built our 'tap'—our sluice-gate system—which is the pivotal point of the Delta Project.



Dutch tame wild delta waters

IN THE NETHERLANDS' battle against the sea, the delta region remains a danger zone. Here the many outlets of the Rivers Rhine and Maas pour into the North Sea; counterattacking high tides push into the maze of estuaries, contaminating the soil with salt, and storms wreak devastation.

To shut out the ocean forever, the Dutch in 1954 launched the billion-dollar Delta Project. This map-painting of nearly the entire country, produced specially for the National Geographic Society by Heinrich C. Berann, shows how the fortifications will look when completed about 1978.

Four massive dams shorten the coastline by 435 miles. The three southerly barriers transform tidal estuaries into an island-dotted fresh-water lake, the Zeeuwse Meer. Inland, Volkerak Dam separates the Zeeuwse Meer from the Haringvliet, the main outlet of the Rhine and Maas. Coastal Haringvliet Dam closes this outlet; seeking other access to the sea, the river waters escape near Dordrecht into channels that flow through the Rotterdam harbor. This seaward surge checks the tides' inland push and flushes brine from the soil. Dark blue in the foreground indicates fresh water. Highways atop the new dams end the isolation of delta islands and peninsulas and open the area as a recreational bonanza.

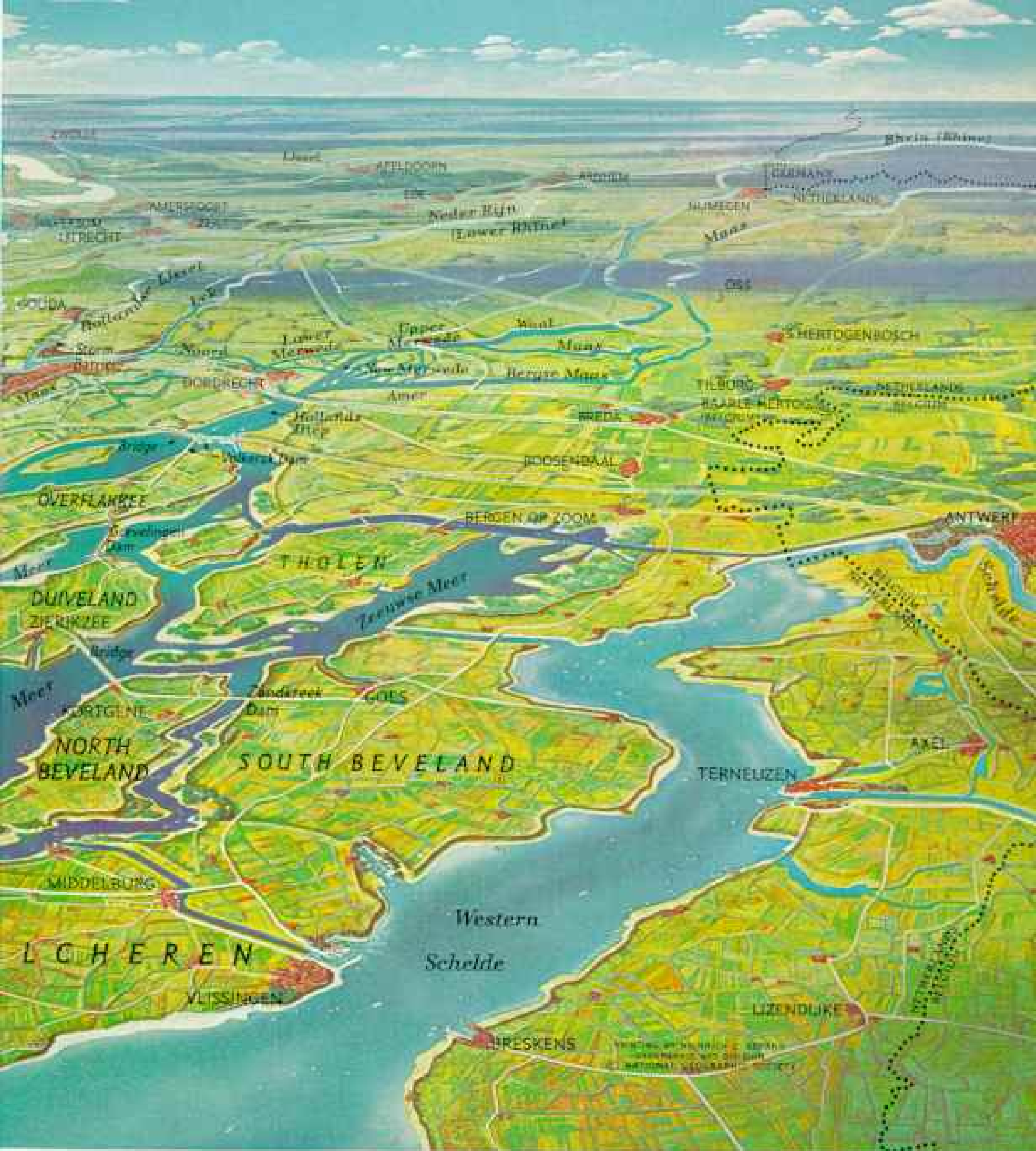
"When the sluice-gates are all ready, we will flood this island. We will leave the gates open until we can dam off the remainder of the estuary. When we have done that and have built a lock on one side of the estuary to let local shipping and fishermen in and out, we will put the sluice gates into operation. Then they will open only when the sea level is below the river level. In dry summers the gates will be kept closed. We will waste no fresh water."

Those farsighted Dutch engineers have thought of everything—even culverts through

the Haringvliet piers for migrating eels, so that no Hollander need forgo the delicacy of smoked eel. Thanks to the runways, the young eels may still come through in their millions from the distant Sargasso Sea region, where they were hatched, and the adult eels depart, to swim back there and deposit their eggs.

Big fresh-water lakes will build up behind the dams. These will be wonderful for sailing, but it is the plain, unadulterated fresh water itself that the southern provinces need most.

The great sea routes admit vast quantities



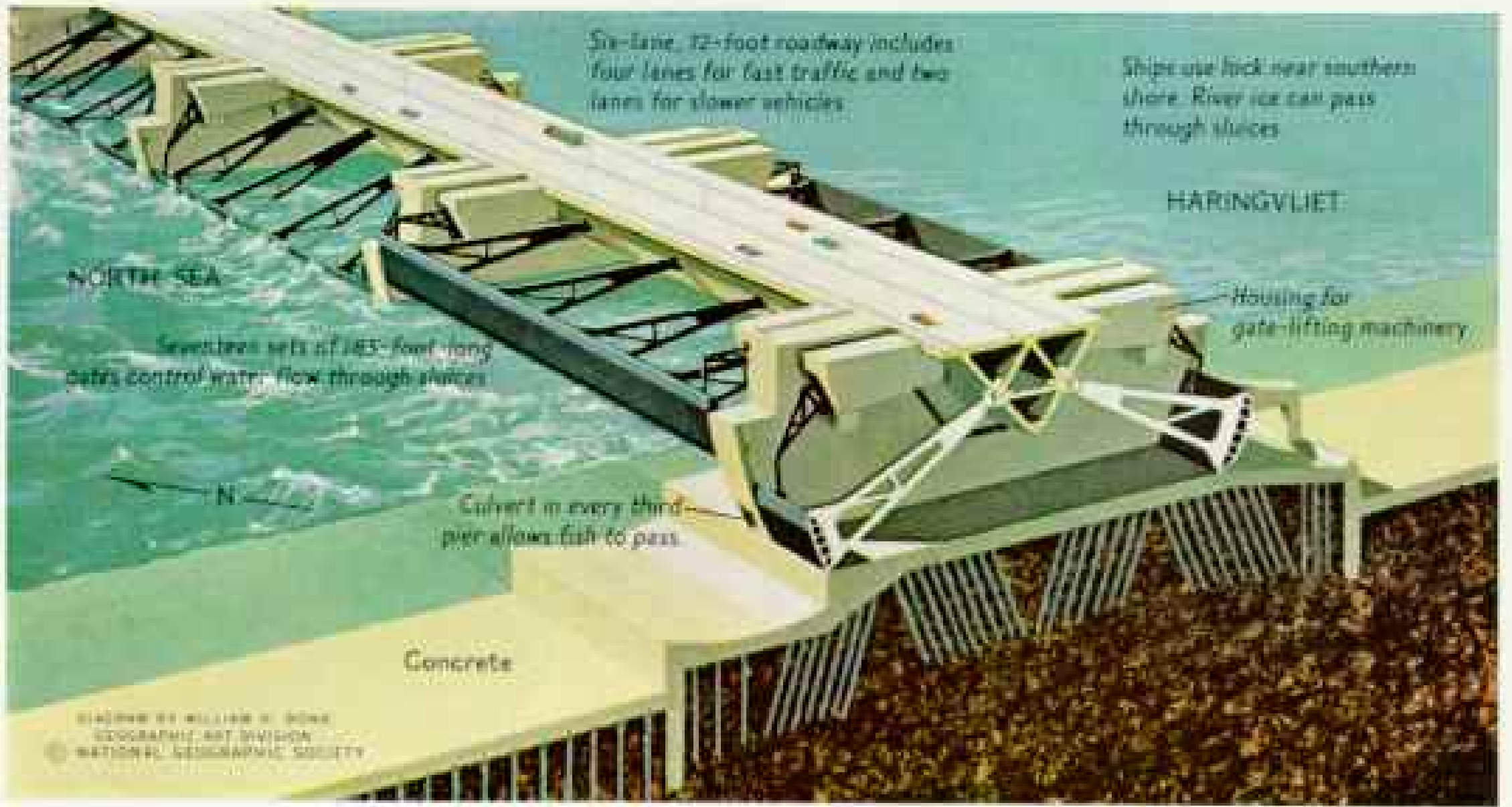
of salt inland; in the North Sea Canal alone it is estimated that every use of the main locks brings in enough to fill a 30-car freight train.

"The salt is in solution," Mr. van den Brandeler pointed out. "You don't notice it. But the soil, the farmers, and even the cows do. Excessive salt in the land cuts the forage. The cows get less to eat, and of course give less milk. The fresh-water lakes will help us solve this very serious problem."

Though the Delta Project will chiefly benefit the one province of Zeeland, nowhere did I

find criticism or resentment of the cost and the taxes. I talked with all sorts of people about the project—young couples unable to marry because of the acute housing shortage; students living in old ships in the docks, traveling many miles daily to their universities because they could find no other accommodation; verbose cab drivers; and worried fishermen and oyster farmers, concerned with the project's threat to their livelihood. All said, in effect, "It is necessary. We must get on with it."

The monumental Delta Project stands as



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Masterwork of Dutch ingenuity, gigantic sluices form the keystone of the Delta Project. The 3,500-foot-long complex will control the Haringvliet's flow into the North Sea.

To anchor the sluices against surging waters, 28,000 concrete piles grip the bottom at angles. Beneath a six-lane expressway, huge piers cradle a 150,000-ton triangular structure. On it pivot ponderous sluice gates, placed in pairs to face both sea and river. A computer, digesting ever-changing data on water and wind, tells the gates when to lower or lift.

Close-ranked colossi prepare to meet the river's might; 500-ton sea gates of three sluices (background) stand open. So vast is the project's scale that should sea-bound ice pile up between the gates, an icebreaker could steam in between the piers and free the jam.

ILLUSTRATIONS BY ARTH WOODCOTT © W.A.C.



the largest symbol of the energy and boldness that suffuse the new Netherlands. But other examples are to be seen everywhere; the great new Schiphol Airport near Amsterdam is one.

Like so much in Holland, Schiphol should not be there at all, but beneath the waves. Its "elevation" is 13 feet below sea level. *Schiphol* means "ship hole"—ship haven—and it's the only airport in the world that has been the site of a naval battle. The event was recorded in a painting by Hendrick Cornelisz Vroom showing a furious fight in 1573 when Spanish ships defeated a Dutch fleet. The clash occurred during the 80-year war in which the rebellious Protestant Netherlands threw off the yoke of its Catholic Spanish rulers.

The enormous buildings of the new Schiphol rise in fantastic shapes. The control tower lifts its green-glassed operations room high on a sturdy shaft, welcoming the age of the jumbo jet. Long corridors, some containing moving sidewalks, spread from the huge



Throw-away island, man-built and man-destroyed, parts river waters so engineers can build sluices for the Haringvliet Dam. To make the mile-long isle, the Dutch fashioned an oval dike, excavated a building pit 50 feet deep, then pumped it dry. Construction crews worked nine years before the sluices stood nearly complete (above, viewed from the north). The island's task done, the Dutch returned it to the sea (below, seen from the south).



terminal building like the fingers of a giant's hand. From the corridors, travelers may walk directly into their airliners through enclosed, movable tubes called aerobridges.

In the terminal itself, computer-controlled signs flash up-to-the-second flight information. There is even an underground garage from which motorists may enter the terminal building without going outdoors.

"We don't want our travelers to get lost," Schiphol official R. G. Wijnholt told me. "And we're planning for eight million a year. The same thing goes for air freight. We don't want it to get lost either, or delayed."

Plans for handling freight include an automated warehouse with a floor area of 20,000 square yards, all supervised by computer. When Queen Juliana opened the new Schiphol in April, 1967, no wonder she referred to it as the gateway to northwest Europe, not only for passengers but for air freight as well. The old Schiphol handled 100,000 tons of air freight a year. The new is already geared for a quarter of a million.

What with all the excavations necessary to create the new Schiphol, I wondered whether

any old galleons had been found buried in the sand from that long-ago fight. Or cannon, or cannon balls? The painting showed ships and galleys by the dozen slugging it out. But nothing had turned up in all that old sand, and 16th-century warships seemed so remote from the vast modern airport that it was hard to believe a battle was ever fought there.

Dutch Know-how Creates Famous Planes

In a far corner of the Schiphol Airport stands the main plant of the famed Fokker aircraft company. An airplane manufacturer in Germany when World War I erupted, Java-born Anthony Fokker built fighting craft that made military history.

In 1919 Fokker went to Amsterdam and opened a plant, and later moved to the United States and became a citizen. His trimotor transports helped pioneer new routes for civil aviation. Fokker craft took Adm. Richard E. Byrd over the North Pole and across the Atlantic. In a Fokker trimotor called *Friendship*, Amelia Earhart in 1928 became the first woman to cross the Atlantic by air. The name was revived for Fokker's high-wing twin turboprop transport that flies today.

With Herman Somberg of the Fokker staff, I walked through the plant. F-27 Friendships, with many national markings, stood in long lines. Approaching final shape was the new F-28 Fellowship, a twin-jet, 65-passenger, 500-mile-an-hour airliner with tail-mounted speed brakes—which open like clam shells to slow the plane. I noted the accents of Northern Ireland among workmen attaching the wings, and the German tongue of other workers.

"We're international here," said Herman. "Those wings came from the Short Brothers

Scorning mass production, an artist decorates delftware at De Porceleynne Fles, the 315-year-old firm that makes the town of Delft world famous. Glazing and firing will transform the gray into regal "Delft blue."

Meeting across the centuries, connoisseurs confront life-size merchant-soldiers portrayed in Rembrandt's famous, but misnamed, "Night Watch." When cleaned in 1947, the masterpiece in Amsterdam's Rijksmuseum revealed a daytime scene with glowing interplay of lights and colors. The Dutch take pride in a heritage of art that includes such masters as Rembrandt, Hals, Vermeer, and Van Gogh.

EXTRACTION © NATIONAL GEOGRAPHIC SOCIETY









& Harland plant in Northern Ireland. They send their men to fit them. Other components came from Germany, France, the United States, and Canada. We have a work force of 3,000 men here, and 5,000 in all Holland."

He showed me something of the meticulous testing that goes into the design and manufacture of Fokker aircraft. There was the frame of a Fellowship—just the frame, fitted with the hydraulic system, the landing wheels, the pilot's seat, the rudder, and other essential working parts in full size, but no skin or wings. It looked like the skeleton of some flying steel dinosaur. On the wall was its "flight plan," though of course it never moved.

"Its parts do all the moving. It is testing the controls, undercarriage, nose wheel, and speed brakes. These work all the time and get the same wear and tear as they would in an operating airplane, while electronic instruments collate and record the data. We can test everything to destruction, and hurt nobody."

In downtown Amsterdam I called on the burgomaster to find out how the old-fashioned, crowded city was meeting the pressures of

F. L. VAN DER VLIET, EXTRACTED BY A. L. GOLDMAN, REPHO DUILLIETTE © N.A.S.



Wrong-turn victim emerges from an Amsterdam canal, fished out by a Fire Department crane. An average of 50 cars a year tumble in, a hazard now being reduced by canal railings.

Quayside cafe lures afternoon patrons in Amsterdam; a bubble-top tour boat cruises past neo-baroque St. Nicholas Church. In a glistening web, scores of canals thread the Netherlands' capital. Here, as in many Dutch cities, every building must rest on piles.



ENTOURAGE BY ADAM WOOLFEYTT © R. S. S.

Devoured by their own creation, technicians complete an F-28 Fellowship airliner at Amsterdam's Fokker aircraft plant. Newly in production, the twin-jet craft adapts well to short runways, as does its predecessor, the F-27 Friendship—flown by half a dozen U. S. airlines and used in 40 other countries.

the 20th century. Amsterdam's growing pains are compounded by law, for every antique façade of the tall old houses that are the tourists' delight must be maintained just as it is, or permission sought for any proposed change. Furthermore, the city's picturesque canals make adaptation to the age of the automobile difficult.

The burgomaster works in the Town Hall—a romantic old building which was once home to the Dutch Board of Admiralty. Outside, on the narrow roadway, squeezed between the large building and the adjacent canal, I could hear limousines, cabs, and once a horse-drawn coach-and-four pulling up. I could see pretty brides and nervous, dressed-up grooms alight from the vehicles to disappear into the building. All Dutch weddings begin with a civil

ceremony, and Amsterdam averages 20 a day (and, I was told, only three divorces).

I could hear the strains of a large street organ playing distantly. The clip-clop of horses swept me back through the centuries. I thought of that great seaman, the Englishman Henry Hudson, who passed along those streets on his way to seek a northwest passage to China for the Dutch East India Company, a mission on which he would explore the Hudson River. The artist Rembrandt had walked there, and the tragic Anne Frank, a quiet heroine of World War II, had lived out the last years of her brief young life in harassed hiding.

Burgomaster Ivo Samkalden, 55-year-old former university professor and Minister of Justice, received me in his dark-paneled office. The Burgomaster of Amsterdam, I learned, is a sort of combination of city manager and lord mayor, with the control of the harbor and presidency of the University of Amsterdam more or less on the side. The national government selects him; the Queen appoints him. In fast-growing Amsterdam he has a man-size job, particularly in housing.

Pressure for New Homes Rises

"We've been town planning in Amsterdam since 1609. Now we have to take in some surrounding countryside as well," the burgomaster told me.

Like other people, Amsterdamers today tend to live longer, marry younger, raise smaller families. The Dutch are among the longest-lived people on earth—averaging 71.1 years for men, nearly 76 for women. With all this, the Dutch are a nation of individualists who love and demand their own front doors. The number of persons per home has dropped from 4 in 1947 to 3.7 today, while the population has risen from 9,716,000 to 12,500,000. The result is a housing problem, especially in the cities.

"There is only one answer," Burgomaster Samkalden said, "carefully planned spreading into the surrounding countryside, with good road and rail connections, even though this means taking some agricultural land."

Amsterdam planned itself out of its own city limits several years ago with a dynamic, controlled expansion that caught the admiring notice of town planners all over the world. It used up all remaining open space within its boundaries by building five garden cities, quickly followed by four more. Yet there still are not enough houses to meet the demand.

One of Burgomaster Samkalden's cherished plans is a large-scale replacement of some



Carat of sunshine sparkles on a diamond-polishing machine; an expert eye plots the next facet at A. Van Moppes & Son in Amsterdam's gem-cutting district. When cut to 58 facets, this stone will bring \$1,300.

Visored warrior of industry burns defects from a slab of steel in the Royal Netherlands Blast Furnaces and Steelworks at IJmuiden. Although the nation mines little coal and no iron ore, its position astride Europe's sea lanes enables it to import raw materials cheaply enough to compete for world markets.

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RODCHROME (LEFT) AND EXTREMOME © A.S.S.





DETACHING © NATIONAL GEOGRAPHIC SOCIETY

Freshmen on a frolic whoop it up as a tractor pulls them through the streets of Groningen. Thus a fraternity at Holland's hallowed Groningen University introduces students to townsfolk.

Bright lights and bunting contrast with a Gothic cathedral tower during a two-week celebration at the University of Utrecht. With the theme "Jimmy Walker for Mayor," the students spoof flamboyant New York politics of the 1920's. Renowned universities such as Utrecht, Groningen, and Leiden reflect the Netherlands' historic emphasis on education.

So many automobiles—and, before them, horses and carts—have fallen into Amsterdam's canals that the city fathers long ago set up the Amsterdam Voluntary Rescue Brigade, which now has 3,500 members. Today the brigade instructs visiting motorists how to behave if faced with a ducking: Above all, don't dither and slither! If you have to ditch, go in boldly. Then the car has a good chance to land squarely and float awhile. Other points of advice:

Don't panic.

Don't try to shove the car doors open at once. Let the water trickle in a while, even if this means opening the windows slightly.

With the car half full, open the doors and swim. Chances are a Rescue Brigade man will be around by then.

Have \$11 ready to pay to members of the Fire Department after they deposit your car on shore. The money will help the city recover the \$2,000 it spent for the special crane that lands dunked vehicles (page 549).

The frequency of such dunkings—about 50 a year—has declined greatly in late months, thanks to a program of placing guard rails along the canals. At \$3 a foot, the city must still erect more than 30 miles of railings, but only a few taxpayers have complained thus far, and they haven't done so very loudly.

The industrial diversity of Amsterdam—shipbuilding, metals, clothing, machinery, food processing, printing—reflects the fact that in Holland today roughly four times as

older parts of the city that no longer come up to acceptable standards.

"Before we can demolish these," he told me, "thousands of homes must be provided. These will rise in urban developments outside the city. Of course, all this takes time."

Dutch Automobiles Face Unusual Hazards

Ingenuity in the solution of civic problems is a well-developed Dutch characteristic. Amsterdam, for instance, has had to find ways to keep its cars out of its canals. Parking facilities spread along the waterways, where the small cars stand in serried ranks between stately elms. Roads are narrow, and it is easy to back or skid into a canal. Fortunately, most canals are not deep, though many are deep enough to drown in.



The Rebirth of Rotterdam

DOWN FROM THE SKY screamed German dive bombers on May 14, 1940. For 40 minutes death and destruction rained; fires swept from block to block. Next morning the heart of Rotterdam was a smoking desert.

At war's end the Dutch sprang to rebuilding. Where the old city core had presented a maze of narrow streets and picturesque but space-consuming row buildings like those in a block still standing (right), the new heart would be 70 percent open space—parks, parking, boulevards, lawns. Today Rotterdam bustles in a miracle setting of steel and glass, brick and concrete. Built upward instead of in rows, modern apartments give each tenant his own balcony (lower right). Typical of the new grace and glitter, a 2,232-seat concert hall, home of the Rotterdam Philharmonic, glows beyond a sculptured maiden (below).

In memory of its agony, the reborn metropolis erected Ossip Zadkine's bronze "Devastated City" (left), a grimacing giant with arms raised against the skies and its body gutted, as was Rotterdam's.



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ROSBACK HOME LABORS AND SATACHOMES BY ALLAN WOODLEY © N.B.S.



Like cannoneers handling golden shot, porters hustle cheeses for weighing at the famous market of Alkmaar. In a centuries-old Friday ritual, farmers and buyers bargain over spherical Edam cheeses and flattened Gouda wheels. When a handclasp seals a purchase, impeccably dressed porters in suspender harnesses (below) hook onto cheese-piled barrows that often exceed 300 pounds. Hat and harrow colors identify companies of the antique Guild of Cheese Carriers; flags add a festive touch to market day. Edams shipped abroad traditionally wear a protective rind of red wax.



many persons work in industry as in agriculture and fishing combined.

Of all the city's industries, one of the oldest remains probably the most glamorous. Diamond cutting and setting, established in Amsterdam in the late 1500's, is an attraction for tourists as well as a business, though not now as large as it once was. Removal of so many Jewish craftsmen by the Germans during World War II brought that about. But the industry carries on and visitors from throughout the world still come to watch veteran polishers at work and admire the finished diamonds flashing and gleaming as if full of concentrated sunshine (page 551).

"Nearly all diamonds are slightly imperfect," said the attractive young woman who escorted me through a diamond-cutter's shop. "You must examine them carefully with a magnifying glass in a north light. Look

for the 'three C's'—color, clarity, and cut."

I reminded her of a fourth C, even more important—cash. She smiled.

The wartime blow to the diamond industry has been more than compensated for by the considerable increase in the nation's clothing trade, which gives employment to 75,000, many of them in the small family firms the Hollander loves. The colorful fashion displays in the shops along Amsterdam's Kalverstraat and in the big department stores in all Holland's cities are mainly Dutch in origin. Knowledgeable buyers come from throughout Europe (and also America) to see what Amsterdam's designers are offering.

"It is difficult nowadays," youthful Dr. Went Zwerver, economic adviser to a trade association, told me in his office on Van Eeghenstraat. "One of the difficulties is the dominance of youth in shaping fashions.



ERIC LINDHOLM © NATIONAL GEOGRAPHIC SOCIETY

Today young men and women go for extremes. Youth wants to be different. As soon as the general fashion looks like it's catching up with them, they change again. So what comes next? To guess wrong in the clothing trade can be an expensive business."

Rotterdam Plans a Big Future

Rotterdam ranks as the Netherlands' second city, after Amsterdam, and, like No. 1, it is experiencing growing pains. Already the world's busiest seaport, it intends to stay that way. It accommodates more than 30,000 ocean-going vessels a year, handling 76,000,000 tons of oil alone. Since it is Europe's greatest oil-refinery center, it must be able to accept the largest, most deeply laden modern tankers. Ore, grain, fuel, and general cargo flow through the port by the millions of tons (pages 534-5).

Standing at the mouths of the Rhine and the Maas—the busiest, most navigated river complex in the world—Rotterdam is truly the water gate to northwest Europe (map, page 536). Rivers and canals connect with the Ruhr and Switzerland.* Rotterdam's enterprising city fathers are well aware of their favored position and foster their advantages. Ten years ago, when supertankers and ships of a quarter of a million dead-weight tons seemed incredible, Rotterdam prepared for them.

I called on tall, strong-faced Frans Posthuma, Managing Director of the Rotterdam Municipal Port. This dynamic Frisian engineer, with his able staff, is largely responsible for the city's present big-ship harbor and industrial area, called Europoort. I found him

*Rotterdam's importance as a port was described by William Graves in "The Rhine," NATIONAL GEOGRAPHIC, April, 1967.

in his modest office overlooking the port, so close to the shipping that once a blundering steamer thrust her bows right into the room—and into several other rooms on four floors.

In a corner I noticed a small heap of 16th-century cannon balls, used in the Netherlands' war to throw off Spanish rule.

"We dredged those up during construction of our Europoort," Mr. Posthuma said, offering me one with a smile.

Giant cranes swung their immense jibs within a few yards of the windows. Little Dutch coasters, big liners, and freighters moved about the harbor. Barges lined with spotless laundry blowing in the wind lay six deep at the quays.

If ever a city was devastated by war, and its port looted, gutted, wrecked, and all but

annihilated, it was Rotterdam at the end of World War II. With sustained courage, with almost superhuman efficiency and drive, the port has been not just restored but lifted to premier place in the world.*

The genius behind this was Mr. Posthuma, who also serves as consultant to the World Bank and United Nations, and who has been called upon to advise countries with port problems all over the world. He was on his way that afternoon to a conference in Japan.

Canal Makes Possible a City Subway

Rotterdam's very success brings problems. The port has extended almost to its limits inland. So now it is extending out into the North Sea by building long breakwaters beyond the former harbor entrance. Within these huge

encircling arms, the waters will be greatly deepened by dredging to accept monster ships drawing 62 feet in channels 1,000 yards wide.

"Dredging up all that sand, breaking down the dunes beneath the sea, is expensive," Mr. Posthuma explained. "But we do not waste that sand. We use it to reclaim nearby areas, to provide sites for refineries, chemical plants, and other industries that use the raw materials the ships bring in."

Rotterdam is improving its internal as well as international transportation. The first four miles of the city's new rapid-transit

*See in NATIONAL GEOGRAPHIC: "Mid-Century Holland Builds Her Future," by Sydney Clark, December, 1950; and "Rotterdam—Reborn From Ruins," by Helen Hill Miller, October, 1960.

Too big for stairs, a piano takes another route. A beam jutting from the gable holds block and tackle—a common feature of Amsterdam's narrow houses. A variety of decorative gables gives the city a distinctive roof line.

Glass salad bowl of Europe, the Westland district glistens with hot-houses. In a triangle between The Hague, Rotterdam, and the Hook of Holland, background, farmers grow a profusion of tomatoes, lettuce, cucumbers, and other vegetables year round. With carefully nurtured soil and intensive cultivation, Hollanders far surpass other Europeans in yield per acre.



EXTREMES (ABOVE) AND MODERIES © N.G.S.





system, part subway and part elevated, went into operation just last February. How was it possible to build underground railways in land that is always waterlogged?

Burgomaster Willem Thomassen explained: "We dug a canal on the track of the planned subway. Then we built the underground tunnel in concrete sections. When they were ready, we floated the sections along the canal, joined them up complete with stations and everything, and sank them in place on piles. Then we filled in the canal."

Speeders Caught by Cameras on Poles

Much impressed by all the Netherlands' engineering accomplishments, I left them behind now to savor the beauty of the Dutch countryside in spring. I sped by automobile to

see the flower gardens of Keukenhof, then at their glorious best.

The fast motor road bypassed Delft and The Hague. I noticed that my companion, Paul Warnaar of the National Tourist Office, drove very carefully, with a wary eye on speed, though no police were in sight.

"Look at those light standards," he said. "Some have cameras high up. That's the traffic cop. If I exceed the speed limit, radar switches on the camera, which is focused on the car's number. A few days later I'll get a copy of the photograph and a demand for payment of the appropriate fine. I have to pay up—and they won't even let me keep the photograph."

After that I watched the cameras too, and Paul's speedometer.

Along our way, golden daffodils smiled



FISHING (LEFT) AND EXCALIBUR BY ADAM WOOLFITZ © N.E.C.

Blonde in a bonnet refreshes at Marken, where townsfolk delight tourists by wearing the picturesque dress of an earlier era. Many Dutch villages have their own costumes; this girl's hat comes from Volendam.

Once an island in the *Zuider Zee*, Marken today connects to shore by a road-carrying dike, and by 1980 will lie well inland, surrounded by a polder.

Drying fish nets frame a farmer, who hauls hay along a dike-top road. Here men of Makkum take eel, perch, and smelt from fresh-water *IJssel Meer*. Anchored in fish runs, the nets channel their captives through successive segments, steadily reducing chances of escape.

with sun-splashed radiance from the well-kept fields, where men in wooden shoes and leather knee pads bent to their task of maintaining perfection.

"Wooden clogs keep feet dry and warm in wet fields," said Paul. "Twenty-five thousand Dutchmen can't be wrong—that's the number in the bulb industry—and many of them still work in clogs. But don't think our flower and bulb growers are old-fashioned. They are the most efficient in the world, and they work hard to stay that way."

Researchers Coax Blooms in All Seasons

We turned off the main highway before Keukenhof and made first for the little town of Lisse and its gardens, where from the end of March to the end of May hyacinths and

tulips smile in serried ranks with the colors of a thousand brilliant rainbows. Visitors pour in from the ends of the earth to admire them and order bulbs.

Amid the tulip fields near Lisse, a group of small buildings houses the State Bulb Research Center and Horticultural School.

"Research keeps us busy," said pretty Anneke le Roi, who works in the bulb center as a lab assistant.

"Fighting plant diseases, controlling pests, developing better and ever more beautiful flowers from our bulbs gives us plenty to do. One of our aims is to have flowers in bloom the year round, not just in their special seasons. The tulips are the most difficult. The hyacinths and daffodils are the simplest to keep flowering."





She showed us a table laden with small tulips growing in pots, with the bulbs resting on wire grids, the roots below them in some solution and no earth at all. What strange liquid was this, I asked, in which plants did so well?

"Just water," she smiled. "We call these our housewives' tulips. Special conditioning does it." (I bought some for my wife.)

Wall maps in the big reception room displayed data important to tulip-growing in countries all over the world, from the U. S. A. and Canada to South Africa, Australia, and Argentina—records of soils, temperatures, rainfall. Flags on the maps also showed where Dutch bulbs were shipped in quantity. Dutch know-how goes everywhere.

Waist-high Tulips Yield Rose-size Blooms

The 70-acre gardens of Keukenhof are the great show place, organized by the growers themselves. The massed tulips wait there in military precision to be admired, as if they had passed inspection an hour or two earlier—masses of them in precise plots, each plot full of perfect blooms of exactly the same color. Under glass in hothouses big enough to take half a dozen tennis courts, skilled crossbreeding had produced waist-high tulips with blooms as large as big roses. These experimental blossoms blushed in deep crimsons, as well as in colors nature probably never intended for them.

"We have been growing tulips since the first bulbs reached Holland from the Middle East in the 16th century," said Marianne Houtzager, one of the "flower hostesses" of Keukenhof.



Awash in a wave of color, a bulb grower piles up tulip heads, useful only for garlands and as compost. Tons of excess blossoms become cargo for barges, which dump them at sea.

Tulips bloom in rainbow rows at Noordwijkerhout; a canal helps keep the water table 20 inches beneath the ground in a below-sea-level region constantly bailed by pumps. Each spring tides of color sweep a vast garden that stretches 15 miles from Haarlem to Leiden, and each summer farmers harvest three billion bulbs—tulips, gladioluses, irises, daffodils, hyacinths.

Looking at the colorful blooms everywhere around us, I wondered what those 16th-century tulips might have been like.

"Why, you can go to Vanhof & Blokker's place at Limmen near Alkmaar and see for yourself," said Marianne. "They've got a sort of museum there, a real garden of old bulbs descended straight from those times and not changed at all."

Ancestral Varieties Smell Sweetest

I went. Alkmaar, 30 miles from Keukenhof, lies a few miles inland from the North Sea. There, sure enough, I found the old originals. Jerry Rietveld and David de Jager showed me them, growing in part of their fields. There were at least 15 varieties more than 100 years old, and some dated back to the 16th-century strains. A horticulturist named Piet Boschman had started the collection 40 years before, while there was still some of the old stock about. He began collecting the venerable varieties just for interest.

Compared with the modern varieties, they were puny, stunted things, looking to my unskilled eye hardly like tulips at all.

"Bend down and smell that Lac Van Ryn," said David de Jager, pointing to a pint-size plant that was trying to break out some light violet blooms tinged with broken white.

I did, and found that its perfume was incredible, glorious.

David smiled. "Our forefathers knew what they were doing when they chose that," he said. "All the modern skills cannot reproduce that fragrance. Growers come here for Lac Van Ryns to transfer some of the vigor and fragrance back into their new blooms."

Like the tulip industry, other pockets of old Holland survive in the midst of modern flux. Here and there Dutch regional costume is still worn—not national costume, for there is no such thing. One may get a good idea of the days when these local styles were in everyday use from the splendid open-air museum at Arnhem. Here a 100-acre park includes a clothing museum preserving fashions of the past, as well as period farmhouses, barns, windmills, and exhibits of rustic industries.

Similarly, in the Fries Museum at Leeu-

warden in Friesland, rooms furnished in the old manner show figures in costumes that once were commonplace but now are practically extinct. It used to be considered wrong for Frisian women to let their hair be seen in public. So they wore black skull caps, topped by tight-fitting helmets of silver or gold, covered by lace caps, all crowned by whatever hat might be the Frisian fashion of the time.

In present-day Leeuwarden the only traditional costume items visible are wooden clogs, which I saw on farmers in the Friday cattle market. These clogs are assuredly sensible footwear.

Leeuwarden is so cattle-minded that it has raised a civic statue to the Friesian-Holland cow—*Ū's Mem* (Our Mother)—which stands beside a busy road. The symbolic *Mem* is depicted with an udder like a huge barrel, filling the area between her rear legs.

In the town's cattle market, I saw many cows just as big-uddered as *Mem*. They yield milk by the ton yearly. Tall, raw-boned farmers were examining and admiring them, talking together in the throaty Frisian tongue. Now and again I saw a pair of farmers, after lengthy harangue beside some docile cow, smack their horny hands together in great glee as they made a bargain. Then they retired to the crowded cafe.

Stranded Sea Dogs Fish No More

The best places to see Hollanders in old-style but everyday garb are probably the old fishing ports of Volendam, Marken, and Spakenburg.

At Volendam by IJssel Meer—once the *Zuider Zee*—salty old men in baggy black breeches and seamen's jackets, with tiny peaked caps atop their big blond heads, sit on the waterfront benches or aboard the little port's few remaining *botteri*. A *botter* is a shoe-shaped, single-masted fishing cutter, high in the prow and broad in the body, developed to fish the North Sea in the days when the *Zuider Zee* was open.

Many fishermen have moved their boats out beyond the dam, but some of the older men took the closing of the *Zee* as a signal to retire. Now that they are out of business, the

Scions of seagoing tradition, officer-cadets trim sail aboard the *Urania*, training ketch of the Royal Naval College at Den Helder. Learning seamanship in the time-honored way, the lads cruise the North Sea each summer. The Dutch vied with the Spanish, French, and English for supremacy of the seas in the 17th century, Holland's golden age, and spice-laden East Indiamen brought wealth to her burghers.





stranded old sea dogs just sit there in the sunshine with their memories, and a few of them retain their botters as places to loll and yarn with visitors.

I yarned with 70-year-old Jan Bont in the well of his botter about the sailing days in the North Sea when a living came hard and drowning easily. He was glad the Zuider Zee had become an inland lake, accepting quietly and with faith the decisions of his more exalted countrymen, though they had taken his accustomed living away from him and taxed him still.

"My children have a far better living than I knew," said the old man. "They have a choice of livings, and their children will do better yet. We don't live in the past here. The future has caught up with us. But a few of us are too old to join in."

In summer now, the sea dogs' waterfront has gone largely over to the tourist trade. Flash bulbs flare and crowds jam the souvenir stalls. But there is nothing touristy about those fine old boys with their strong, weather-beaten faces. They are real, and so are their costumes.

"Folding" Wheelhouse Ducks Under Bridges

Holland has no need to dress up for tourists. Old and new, there is plenty to see. A good way to see much of it is from the canals and waterways, by chartered yacht or floating *botel*, a shallow-draft motor vessel full of cabins, designed to cruise the larger canals and the Rhine.

Nancie, my wife, had come over for the tulip season, and we took passage for a week in a botel called the *Holland*. A slim-bowed, spacious-hulled miniature liner, the *Holland* is 200 feet long and 31 feet wide. She has three decks and employs a retractable wheelhouse to get under low bridges. We cruised pleasantly by day past an endless pageant of



Cinderella coach carries Queen Juliana to the ceremonial opening of Parliament on the third Tuesday of September. The annual pomp at The Hague belies the usual role of the Netherlands' democratic sovereigns. Disdaining court life, they intimately concern themselves with their subjects' welfare and share a close family life with their four daughters. The eldest, Princess Beatrix, is heir presumptive to the throne.

"Royal but not regal," Dutchmen proudly say of their monarchs. Here Queen Juliana dresses with simple formality for the opening of Parliament. Her consort, Prince Bernhard, salutes the colors of the Royal Netherlands Marines, which dip low as the Queen passes.



RODRIGUEZ (YELLOW) AND CRYSTOPHERS © R.E.P.

Aristocrat of Dutch cities, The Hague charms visitors with broad avenues, old palaces, and stately mansions. Long a center of diplomacy, it serves today as permanent seat for the International Court of Justice. Beyond Court Pond, Parliament buildings enclose 13th-century Knight's Hall.

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Fearless firemen, children in gleaming helmets join a parade in Eindhoven's pre-Lenten carnival. In a three-day revel, costumed crowds surge through the streets, and dancing lasts until dawn. Such carnivals flourish in the Roman Catholic south, but find little favor in sedate northern provinces.



In wing collars and old lace, couples perform in the "Farmers Wedding," a carnival theme unique to the town of Venlo. Bouquets of kale emphasize rusticity. Drawn in a carriage, the young people ride crowded streets to the town hall, where the burgomaster solemnly "marries" them, and townsfolk toast their happiness.

All nose and mouth, a clown cavorts at the carnival in Eindhoven.



ships and barges, and by night berthed quietly in some interesting city like Dordrecht, Nijmegen, or Gouda.*

In Dordrecht we wandered narrow streets where buildings lean toward each other at picturesque angles. In Haarlem, at the Frans Hals Museum, we viewed 16th- and 17th-century paintings by candlelight. In the town's 15th-century Church of St. Bavo, where Hals lies buried, we listened to a recital on the 5,000-pipe organ that Mozart had played in 1766, when he was ten.

Colorful history, quaint old towns, and adventurous seamen and merchants have left a great heritage in Holland. Palaces, castles, churches, fine buildings, superb art, marvelous museums—all these abound. But the discerning also visit the new marvels, and one of those most worth seeing is the Philips

"Evoluon" at the North Brabant city of Eindhoven.

Philips is one of the world's leading electronics firms, so well known internationally that people in other lands sometimes overlook its Dutch origin. It first opened its doors in Eindhoven more than three-quarters of a century ago. Today Philips is Eindhoven: Almost half the adult work force of the city is employed by the company.

"Evoluon" Lauds Man and Machine

It all began when Dr. Gerard Philips set up a small business back in the 1890's to manufacture incandescent electric lamps, and his

*Life on the canals of Europe was described in the *GEOGRAPHIC* in "Inside Europe Aboard *Fantec*," by Irving and Electa Johnson, August, 1964, and "Paris to Antwerp With the Water Gypsies," by David S. Boyer, October, 1955.



ETCHING BY ADAM WOOLFIT © W.S.

younger brother Anton joined him. Gerard was an inventive genius, full of ideas for developing the use of electricity. Anton was a supersalesman. Their father was a banker. It took five years to earn the first modest profit; since then, the Philips organization has spread round the world, and now produces everything from TV tubes to shavers, from the smallest transistors to large computers.

There is only one Evoluon. The word was coined by Dutch exhibit specialist Jacques Kleiboer, who helped set up its displays. The structure looks like an outsize flying saucer bound to the earth by a pattern of slender pylons, so skillfully poised that builders and architects come from all over Europe to admire it and see how it was constructed (following pages). Nearby rises a steel-and-concrete tower 150 feet high, surmounted by a

carillon with 61 bells ranging from 25 pounds to 3 tons.

"The carillon and the tower were a 75th-anniversary gift from Philips employees," Martin Sturing of the Philips organization told me. "The Evoluon was planned and built by the company. The idea was to mark our progress with something stimulating—not just a museum or an exhibition of products. We tried to catch the spirit of the great period of evolution we all live in. Our theme is man and technology—the continued evolution of technology and science for us all—under man's control. That is the important thing."

I walked around the Evoluon's concentric-circled balconies, the largest as wide as a four-lane highway and more than 250 yards in circumference. I saw displays telling the story of the telephone, dominated by a large



Mighty mushroom, the "Evolution" rises 98 feet at Eindhoven, home of the Dutch electrical empire of the Philips company. The 252-foot-wide concrete dome, built in 1966 to honor Philips' 75th anniversary, holds exhibits illustrating the evolution of technology.

In quest of absolute zero: Frigid vapors curl from vacuum flasks holding liquid nitrogen and helium at Delft Technical University, a center of Dutch research. Temperature of a crystal inside the apparatus drops to within a fraction of a degree of absolute zero, -273.15°C ., by the conversion of heat to magnetic energy. Light reveals levels of the liquids; mask guards against splattering.

Like a torch of victory, a natural-gas well flares at Slochteren, in Groningen Province. A fabulous reserve discovered in 1959 holds at least a trillion cubic yards of high-grade gas, transforming the once fuel-short nation into a major European supplier.



EXCHROME LABOUR AND REPRODUCTION © N.A.S.



photograph of inventor Alexander Graham Bell. Not far away was a likeness of Thomas A. Edison. Electronics, nuclear power, an ultramodern language laboratory, the story of man's fight for food and quest for health are all pictured with compelling imagery.

In its stress on evolution through technology, the Evoluon epitomizes the aspirations of modern Holland. But what of that inimitable Dutch spirit which is turning the aspirations into reality? I think that was summed up best for me by His Excellency Joseph Luns, the Netherlands' Minister for Foreign Affairs.

Dutch Vision Led Toward Common Market

Fifty-six-year-old Foreign Minister Luns has 30 years of experience in the service of his country, 15 of them as Foreign Minister. A tall, slim man, immaculately dressed in a dark-blue suit, he received me graciously in his home in The Hague. Spring sunshine stole into the large room from the square outside while he talked on a never-forgotten subject—the country's condition at the end of World War II.

"Knocked down on her knees, with 280,000 civilian dead, the polders of the IJssel Meer flooded, Walcheren dikes breached, harbors gutted and blocked with wreckage, their installations carried away, her great industries bombed, her people weakened by hunger and privation, the Netherlands emerged from those terrible years to face the loss of all Indonesia.

"While we struggled to bring back a full life to our motherland, our people experienced a new vision of European unity. So we started the Benelux plan [economic union of Belgium, the Netherlands, and Luxembourg]. This showed the way to Europe's Common Market, and we joined that, and NATO too. Our policy is one of cooperation with others for the common good, while we ourselves cope with our own special problems.

"We are geographically a small country, yet we rank sixth of all in donations to underdeveloped nations, though we have to spend an appreciable part of our national income just to keep our land safe from the sea. Our people must accept these things and the sacrifices that go with them because, with our way of life, we well appreciate the need for them."

A few days later I went again to Schiphol. Along the busy, ordered streets of Amsterdam the taxi sped, on into the country, and then into the great new airport. I thought of the small land I was leaving and its quietly courageous, efficient people.

What kept them there? None of them seemed in the least worried. I thought I had learned something of the answer: foresight, ability to plan a true course and keep to it no matter what the difficulties, determination that Holland shall prosper, and, come what may or cost what it will, never again shall a Dutch widow weep because of inadequate dikes smashed by the sea.

A nation of individualists? Yes, perhaps—but when necessary, surely the most cooperative individualists in the world.

THE END



Dory on the Banks

A DAY IN THE LIFE
OF A PORTUGUESE FISHERMAN

Article and photographs by
JAMES H. PICKERELL, Black Star

REALM OF NO HORIZON: Portuguese dorymen stroke through the fogbound Grand Banks, carrying their catch to the mother ship. Mechanization sweeps the fishing fleets of the world, but these men cling to the ways of their forefathers. Braving the open sea in frail craft, they seek fat cod with hand lines.

PHOTOGRAPH BY NATIONAL GEOGRAPHIC SOCIETY

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"NEVOEIRO!" murmured Joaquim Marques Rosa, pointing to the northeast. "Fog!" I stood up in our 16-foot dory and watched it roll in, enshrouding other frail fishing boats on the placid sea.

Apprehensively I glanced at the dory's compass. We could still see our mothership, the four-masted schooner *José Alberto*, and I noted that it lay east-southeast of us. As I watched, it too disappeared in the fog.

Suddenly we were alone—a 27-year-old fisherman who understood no English, and I who spoke no Portuguese—fogbound off the west coast of Greenland, in Davis Strait.

We were above the bank called Store Hellefiske ("big halibut fishing" in Norwegian), hoping to catch big cod. With other vessels of the Portuguese fleet—its 66 ships and 5,400 men form the world's largest codfishing armada—the *José Alberto* sailed here last April. After a month on the Grand Banks of Newfoundland, the Portuguese had migrated toward the Arctic Circle in search of more plentiful fish (map, page 576).

Earlier that morning Joaquim and I had breakfasted on hot codfish soup, bread, and a cup of brandy—traditional Portuguese fisherman's fare. Then our dory was lowered over the side, one of 60 that fanned out from the ship.

As soon as we hit the water, Joaquim grabbed an oar and pushed off. Long experience had taught him to move quickly, for in rough seas waves can smash a dory against the ship's side.

But today there were no angry waves. Nor was there wind enough for Joaquim to hoist his little sail. He rowed for about a mile, then set out a buoy, tying to this an anchor line. Near the anchor, he made fast one end of his fishing line—aptly called a long-line, since it stretched nearly a mile when fully extended.

Consisting of 19 separate lines for ease in adjusting the length, this long-line bristled with a thousand hooks. These were attached with leaders every few feet. Joaquim baited the hooks with chunks of frozen mackerel, flicking them over the side at the rate of 10 per minute. Occasionally he clenched the line

in his teeth, pulling on the oars to keep it taut as he strung it along the bottom 200 feet below, where the cod feed (page 577).

Among a dozen codfishing nations, only the Portuguese still fish in this time-honored way. They use much the same method as did their forefathers who first came to the Grand Banks more than four hundred years ago.* But the long-line still gets good results. On it Joaquim has caught a ton of cod in a single day.

After he had payed out about 150 hooks, he looked up and said, "*Peixer*—fish." He could feel the first cod hitting the bait. A good fisherman can tell roughly how many fish he's getting by the feel of the line. Too little action, and he will pull up and try his luck in a different spot.



EXTREMITY (ABOVE) AND MISCHIEF © R.S.S.

Tot of brandy at launching time, a tradition in the Portuguese fleet, helps a doryman face another day on the cold sea.

Over the side at sunrise go the *Luisa Ribau's* dories. With lines, bait, and lunch boxes stowed, the men raise their oiled lugsails and search the Banks for likely-looking water. "A waste of wallowing sea," wrote Rudyard Kipling of the Grand Banks in *Captains Courageous*, "cloaked with dank fog, vexed with gales, harried with drifting ice . . . and dotted with the sails of the fishing fleet."

Another dory drifted near us. In it stood Joaquim's brother-in-law, José Bernardo Gomes Cruz. They exchanged greetings, and José moved on.

From my sea-level perch, it looked as if the waves had swallowed his dory, leaving him standing knee-deep in the ocean.

The rhythmic plunking of hooks in the water was interrupted when Joaquim and I turned to watch the fog billow in. There followed an eerie stillness broken only by the lapping of waves against the boat.

As Joaquim resumed the baiting of hooks, I picked up a scoop and bailed water that splashed in. All too little of this dory rode above the surface—only about a foot and a

*See "I Sailed With Portugal's Captains Courageous," by Alan Villiers, NATIONAL GEOGRAPHIC, May, 1952.





Adrift on a sullen sea, dorymen pull in their long-lines a last time before returning to the

In quest of cod, the Portuguese dory ships—more than half the entire fleet of 66—sail from Lisbon each April; trawlers ply the seas with their nets for most of the year. First, dorymen probe the Grand Banks, then sail north to the grounds off the west coast of Greenland. The men hope to see home again by October, with luck, they'll have a full cargo.

half of it—and I was determined to keep it as high in the water as possible.

Now I began to feel the Arctic cold, just above freezing. The icy air penetrated my sweater, two shirts, and long underwear. Despite three pairs of heavy socks, my toes felt frozen.

Wooden Soles and Leathery Hands

Joaquim pointed to my rubber hip boots and shook his head. Then he propped his huge leather boots on the seat of the dory and showed me their inch-thick wooden soles. These insulated his feet from the cold.

Nothing, however, protected his hands. My own felt numb in fur-lined gloves. Watching him bait the cold steel hooks, I decided his powerful hands must be made of leather.

If he could stand the cold, so must I. But what about the thickening fog? I knew dorymen sometimes lose their way in it, some never to be seen again. I also knew that Portuguese fishermen do not show fear, no matter

how bad the situation. Joaquim's placid face did not reassure me.

Suddenly I heard a rich baritone wafting through the fog. Joaquim heard it too.

"José," he said, smiling.

Somewhere out there his brother-in-law was singing a Portuguese folk song. Hearing another voice in this gray wilderness, I felt like singing myself.

I had little cause for concern. After Joaquim dropped his last hook in the water, he opened his lunch box and pulled out a small two-way radio. Soon he was talking with Capt. Alvaro Abreu da Silva on the *José Alberto*.

Had we used all our bait? No. How were the cod hitting? Fair. Would we be ready to come in at three? Yes.

Ship-to-dory radio is a new wrinkle in cod-fishing, and Joaquim had one of the few sets in use. Eventually all the dorymen will have them, for the radio has demonstrated that it is a timesaver. Some day it might also prove to be a lifesaver.



SHOONERS BY PAUL VERHOEVEN (ABOVE) AND JAMES W. PICKERILL, BLACK STAR © N.S.P.

mother vessels. A motorized dory ship and the four-masted *Adelia Maria*, one of six schooners in the Portuguese fleet, stand by to take cod. Brooding iceberg rides the waters of Davis Strait.

His mouth an extra hand, Joaquim Marques Rosa tightens his line with his teeth to keep it unsnarled. To lay out the line, Joaquim secures one end to a buoy, then pays out baited hooks. Years of practice enable him to coil nearly a mile of line—with as many as a thousand hooks and leaders—so that it runs free out of the basket.

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Strong arm boats a hefty fish. Doryman (inset) gaffs a lightly hooked cod. A docile fish, the cod rarely shakes loose from the barb. Dories of the schooner *José Alberto* wear the Cross of Christ on their bows.

Disaster threatens as an overloaded dory swamps; helping hands grab the fisherman. Moments later, in another dory, he rescued his floating fish while shipmates retrieved his boat.

PHOTOGRAPHS BY PAUL VERHUYEN (INSET) AND JAMES H. FURBER, BLACK STAR © R.I.C.

Joaquim began pulling in the line, his strong arms lifting 50-pound fish as if they were minnows. A twist of the wrist and a slap against the inside of the dory dislodged the hook from each cod's mouth.

The weight of the fish soon had Joaquim's end of the boat perilously low in the water. A few more cod, I thought, and down we go. This water was too cold for swimming.

I pulled some of the fish toward me to redistribute the load. Joaquim flashed an approving smile and swung another big one aboard. Later he gestured for me not to stand on the fish; this would only make my feet feel colder.

He dropped the line back into the water, using the rest of his frozen mackerel. In earlier days a fisherman shot his bait, bringing down seagulls with a shotgun. One captain ventured an explanation for the change: overfishing. "Now," he said, "it is necessary to give the codfish a better dish."

Outboard Motor Powers a Modern Dory

Fishermen, too, must eat. Joaquim handed me a small loaf of bread cut down the middle and stuffed with tinned tuna; his own was filled with marmalade. The bread was baked fresh daily aboard the *José Alberto*. I washed my sandwich down with red Portuguese wine.

As we finished our lunch, I was startled to hear a motorboat. It was almost upon us before I saw it, a dory with a 5½-horsepower outboard motor.

The doryman offered to take aboard some of our catch, but Joaquim declined; we could handle what we had and were likely to get. A wave of hands and the dory sputtered off into the fog. I was amazed that it had found us. But these fishermen read current and drift better than I follow road signs.

Several motor dories were being tested on the Banks. And, like the radios, they were earning their keep.

"They give a fisherman greater range and don't sap his strength," Captain da Silva later told me. "Someday all the dories will have motors."

The ships, too, have gone modern. Most are





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JOHN W. FERRER, 1984 (1984) © 1984

Sails set, a Portuguese fishing schooner heads for the cod grounds of the Grand Banks.

Expert with a knife, a fisherman helps clean the day's catch.

Sail-wrapped boom stabilizes a dory while a fisherman hauls in his cool-laden line.

Join Portugal's "Lonely Dorymen" aboard a fishing schooner

A SON OF A FISH swims very well," goes a Portuguese proverb. Portugal's men of the sea say it another way: "A son of a fisherman must be a very good fisherman."

And he is. For more than four centuries, young Portuguese men have followed their fathers to the Grand Banks of Newfoundland—and in recent years to Greenland's banks—to fish the cold waters for cod.

You'll meet these intrepid men on Tuesday, April 16, when your Society presents on CBS "The Lonely Dorymen," an unforgettable hour of color television.

Set off for the Banks on schooners under full sail. Suddenly you find

yourself adrift in a flat-bottomed dory emblazoned with the scarlet Cross of Christ. Your companion, a bull-shouldered fisherman, baits the hundreds of hooks of his long-line. Oblivious to fog, rain, and Arctic wind, he labors 18 hours a day and hauls up cod by the score.

On the fishing schooner *Joví Alberto*, watch an assembly line in wet aprons and plaid shirts clean and split the cod. In the hold, trained hands shower the fish with salt.

Amber lights glow in the Arctic night, and lusty voices break into song. The deck trembles as heavy boots dance to the tune. Toast a veteran doryman's birthday. Then

drink to him once more, for this day he caught the most cod.

A doryman is lost. You strain to make out a shape in blinding fog. The ship's foghorn calls again and again—and guides the lost one back to safety from the cold and perilous sea.

Produced by the National Geographic Society in association with Wolper Productions, Inc., "The Lonely Dorymen" is narrated by Alexander Scourby and sponsored by Encyclopaedia Britannica, Inc., and Aetna Life & Casualty. 570A





EXTENDING FLOWER LEFT) AND BROADCASTING BY JAMES H. PICKERELL, BLACK STAR © N.Y.S.

later I saw him in another dory gaffing floating fish. Other men recovered his boat.

Joaquim pitched the last cod aboard. His catch weighed almost half a ton—a third of that when cleaned, salted, and dried. He had earned about \$12.

Despite three wage increases since 1959, the fishermen cannot often afford, when at home, to eat the fish they catch. A staple until recently, dried, salted cod is now almost a luxury. It sells for the equivalent of 50 cents or more a pound in Portugal. The *José Alberto's* provisions included plenty of dried, salted fish from the previous year's catch—a concession to the men, who prefer it to fresh-caught cod.

Joaquim received additional pay for helping clean and salt the fish. One needs skill to bone a cod quickly and without waste. After supper I watched the fishermen work assembly-line fashion (following pages). They deftly severed the heads, cut out the backbones, tongues, and cheeks, then laid open the fish and removed the viscera. Livers were saved to be rendered into cod-liver oil.

In the old days cod cleaners sang as they worked. Now phonograph records supply the music. Unchanged, however, is the traditional ration of warm brandy.

A captain I met, a non-drinker, once forgot the brandy. His crew never said a word. When

he did remember to have it served a few days later, one old salt shot a withering glance at the pilothouse and poured his share down a cod's gullet.

"After that, I never again forgot the brandy," said the captain.

It was nearing midnight when Joaquim split and gutted his last cod. Then deck hands moved in to clean up the mess, filling barrels of brine with fish heads, the main ingredient of tomorrow's soup.

The split cod went into the hold, where they were packed in salt (opposite). Captain da Silva watched this operation closely. Too little salt and the cargo would rot. Too much and the cod would become tough. "We want a load of fish, not a load of salt," he said.

He also wanted a full load. A rough sea every three or four days would suit him fine. "The fish settle better in a rocking ship," he explained, "making room for more."

In the evening the *José Alberto* and other ships tune in government-sponsored radio broadcasts from various towns in Portugal. But these are no ordinary programs. Wives, mothers, and children come on the air to

speak to their men at sea. More than once I have seen tears well up in a man's eyes at the sound of a tiny voice.

Joaquim looked forward to the day he would hear his wife. He had not seen her and their two young sons since April. Not until October would he return to them, when the *José Alberto's* hold should be filled with a million and a half pounds of salted cod.

The 28 trawlers of the fleet stay away even longer, usually making two trips each year. They move often in search of fish and they keep nearly every cod they net. The men with the long-lines concentrate on the big ones.

Trawlers Spell Sailing Ships' Doom

Fishing by hand is a hard way to make a living, even with such inducements as free insurance and medical treatment, discount clothing and food, and exemption from military service. Joaquim works 18 hours a day, 7 days a week, braving rain, fog, below-freezing cold, and occasionally snow. Only winds blowing stronger than 15 knots deter him. It would be suicidal for dorymen to venture out in rough seas.

By law, he is guaranteed six hours sleep a day. But this had been a relatively easy day: He would be in his bunk seven hours. Aching in every bone, I could have slept around the clock.

With the captain interpreting, I asked Joaquim if he expected his sons to follow in his footsteps, as he had followed in his father's.

"No," he replied. "I want them to go to school and get a good education. I want them to have an easier life."

The codfish—or rather the lack of them—may also have something to say about the future, for the more efficient trawlers are sweeping up an ever-larger share of the catch.

Some day, if the trend continues, the dorymen of Portugal will no longer bring their long-lines to the Banks, as they have done year after year for centuries. THE END

Deck awash with cod, men labor into the night cleaning their catch, a chore that earns them extra wages. Teams of three remove heads, viscera, and backbones. Livers are saved to make cod-liver oil; heads go to the cook for soup; tongues and cheeks are fried.

Experts handle a critical operation: In the hold, men layer fillets and salt. Too much or too little of the preservative can spoil the entire cargo. The fish lose more than half their volume as the salt draws off moisture; pumps discharge the brine into the sea.

RODCHIKOVA (BELOW) AND ESTEADHIME © N.E.S.







DETAILS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER JAMES E. RUSSELL. © N.G.S.

"No man has given more to the development of aviation," said the Chief Justice of the United States, Earl Warren, right, when he presented the National Geographic Society's Hubbard Medal to Pan American Board Chairman Juan T. Trippe. Both men are Trustees of the Society.

Golden tribute to bold vision, the Hubbard Medal bears the name of the principal founder and first President of the National Geographic Society, Gardiner Greene Hubbard. Recipients of the coveted medal, first awarded in 1906 to Robert E. Peary for his trail-blazing Arctic expeditions, include Astronaut John H. Glenn, Jr., and Mount Everest's first conquerors—Sir Edmund Hillary and Sherpa Tenzing Norgay.

National Geographic Society Honors Air Pioneer Juan Trippe

"WE ARE GOING TO SEE travel time to Europe again cut in half," the soft-spoken Hubbard Medalist said, "perhaps two and a half to three hours to go from New York to London. And we are going to see every place in the world within 12 hours of this room."

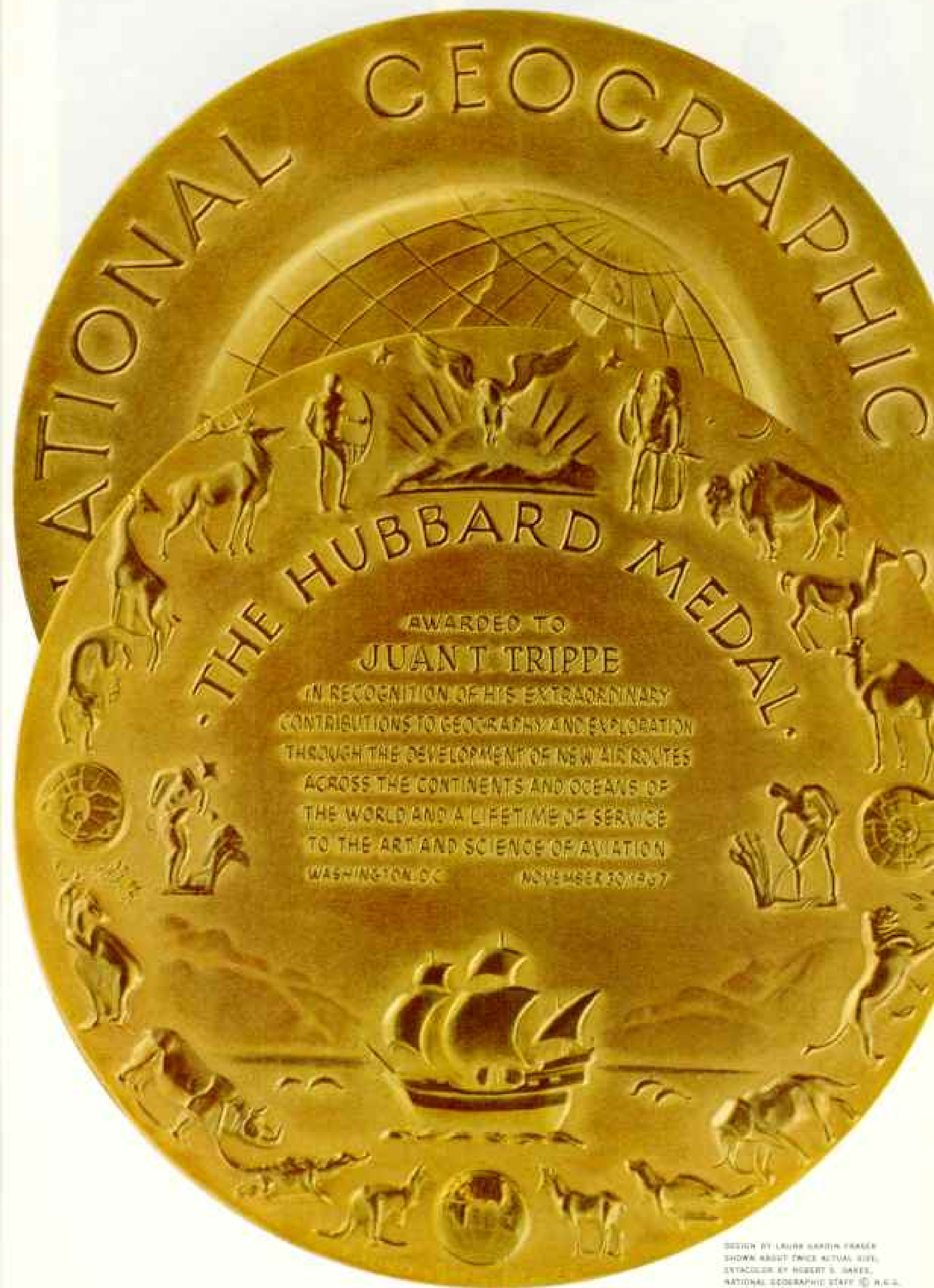
The room, in the heart of Washington, D.C., was the paneled auditorium of Explorers Hall in National Geographic Society headquarters. And the vision, propounded one evening last November, was that of Juan T. Trippe, aviation pioneer, Chairman and Chief Executive Officer of Pan American World Airways, and for more than 25 years a Trustee of the Society.

Mr. Trippe had just received the Society's Hubbard Medal in recognition of "his extraordinary contributions to geography and exploration through the development of new air routes across the continents and oceans of the world and a lifetime of service to the art and science of aviation."

Thus Juan Trippe joined other great leaders of aviation who had received the Hubbard Medal—Adm. Richard E. Byrd and General of the Air Force Henry H. ("Hap") Arnold, both of whom served the Society as Trustees; Charles and Anne Lindbergh; and Lincoln Ellsworth. A rare distinction, the medal has been awarded only 23 times in 62 years.

Society President Melvin M. Payne welcomed a distinguished banquet company gathered to honor Mr. Trippe, among them the Secretary of the Treasury and Mrs. Henry H. Fowler and the Secretary of Transportation and Mrs. Alan S. Boyd. To confer the medal, Dr. Payne introduced the Chief Justice of the United States, Earl Warren, a Trustee of the Society.

"When Juan Trippe founded Pan American more than 40 years ago," said Mr. Warren, "long-distance air travel did not exist. It was a great moment in the history of world transportation when Pan American began its overseas air travel in 1927 with a flight from Key



DESIGN BY LAUREN HARTIN FRASER
SHOWN ABOUT TWICE ACTUAL SIZE.
ETCHED BY ROBERT S. JAMES,
NATIONAL GEOGRAPHIC STAFF © N.G.S.



Architects of the Air Age: Charles A. Lindbergh, first to fly the Atlantic, and Juan T. Trippe, founder of the first globe-circling airline, Pan American, confer in 1929 at France Field in the Canal Zone.

West to Havana. It was a short hop by today's standards, but Mr. Trippe had a dream. He imagined vast, busy highways in the sky to join distant peoples in good will and profitable trade."

The Chief Justice recalled how the dream became a reality. Safe, multi-engined planes were built for Pan American. Airports were carved from jungle wilderness. Navigation and weather stations rose on barren mountain slopes. By 1934, Pan American Clippers served all Latin America.

Then came the greater task of spanning the vast Pacific. Desolate islands—Midway, Wake, Guam—were transformed into way stations for travelers and planes.

Conquest of the Atlantic for commercial aviation—with the successful flight of the *Yankee Clipper* from Port Washington, Long Island, to Lisbon—arrived in 1939, but World War II abruptly changed the program. Pan American pilots trained military crews in long-range flying techniques. The airline ferried troops and cargo to battle zones. After



COURTESY PAN AMERICAN AIRWAYS (LEFT); ERNEO GALLORINI

Pan American Clippers like this Sikorsky S-40, soaring over steaming jungles and desolate mountaintops, first linked all of Latin America in the early 1930's. By 1947 the fleet operated around the world.

the war, under Mr. Trippe's leadership, Pan American girdled the globe with regularly scheduled flights, and pioneered American overseas jet service in 1958.

"Mr. Trippe has helped give man a new awareness of his planet," Mr. Warren said.

Accepting the medal, the air pioneer predicted even more dramatic advances.

"Progress has been made," Mr. Trippe said, "but we will see greater progress in the next 10 years than we have seen before in any previous 10-year period.

"We will see the 380- and 400-passenger 747's. Travel abroad will again double. We will see the great American supersonic aircraft, the SST's. On world-trade routes we will see reduction in tension between nations. We will know one another far better than was possible ever before.

"We are confronted with a race—a race between the atomic bomb and the jet transport. In my opinion, the jet transport, flying the trade routes of the world, will win the race."

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COVER: Teeth hold a fish from a Viet Nam stream as a Montagnard tribesman gropes for more. An underwater grenade explosion stunned his quarry (page 481).

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And, quite naturally, that is the one you're going to judge us by.

So if, by your second cup of coffee, we've got you loosening your seat belt a notch, we know we've done our job well. And everyone's happy.

But if you were all set to dig into a piping hot steak, and the best we could come up with was a little cold turkey, we can't expect you to be too happy about it.

That's why we call ourselves the one-meal airline. Not because we only serve one type of meal—far from it.

But because we're well aware that, to you, we *are* a one-meal airline; namely,

the one you get on your next Delta flight.

If we serve you an unappetizing dinner, you'll think Delta Air Lines serves nothing but unappetizing dinners. Period.

And no amount of excuses from us ("Too bad you weren't flying to Miami, sir. The service on our Miami flight was excellent.") are going to change your mind.

Now, we know that serving almost a million perfect meals a month is no easy task. (Especially at 30,000 feet.)

But that's no reason why we can't try.



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Cadillac Motor Car Division

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Stone Age hunting ground yields a major find

SLICING A TRENCH into the past, workmen bare the evidence of a prehistoric hunt at Murray Springs, Arizona. Supported by a National Geographic Society grant, Dr. C. Vance Haynes of the University of Arizona discovered the bones of mammoth and bison killed by Stone Age spearmen 11,200 years ago. Nearby lay an implement ten inches long, carved of mammoth bone, unlike anything ever before found in the New World. Dr. Haynes (below) thrusts a spear through the eye of the tool to demonstrate its probable use in straightening a weapon's shaft.

Grants from your Society enable scientists to explore man's prehistoric past. Your friends can aid such exploration—and read the results in the *GEOGRAPHIC*—if you nominate them for membership (below).

PHOTOGRAPHS BY IAN BELL (LEFT) AND HELGA THOMAS (RIGHT)



NATIONAL GEOGRAPHIC SOCIETY MEMBERSHIP

Mail to: The Secretary, National Geographic Society
Washington, D. C. 20036

\$6⁵⁰ CALENDAR YEAR 1968 MEMBERSHIP DUES INCLUDE
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Annual dues in the United States and throughout the world are \$6.50 U.S. funds or equivalent. To compensate for international postage and exchange differentials, please remit: for Canada, \$7.00 Canadian funds (\$7 U.S. acceptable); for all other countries, \$8 U.S. funds or equivalent. 80% of dues is designated for subscription to the magazine.

Life membership for U.S. and its outlying areas, \$300 U.S. funds or equivalent; for Canada, \$316 Canadian funds (\$300 U.S. acceptable); for all other countries, \$250 U.S. funds or equivalent. Remittances should be sent direct to National Geographic Society.

448

I **NOMINATE** for Society membership the person named at left. (Use separate sheet for additional nominations.)

(**GIFT MEMBERSHIP**) I nominate and enclose \$_____ for dues of the person named at left. Send gift card signed:

I **DESIRE INFORMATION** concerning membership and the *NATIONAL GEOGRAPHIC*. (Fill in at left.)

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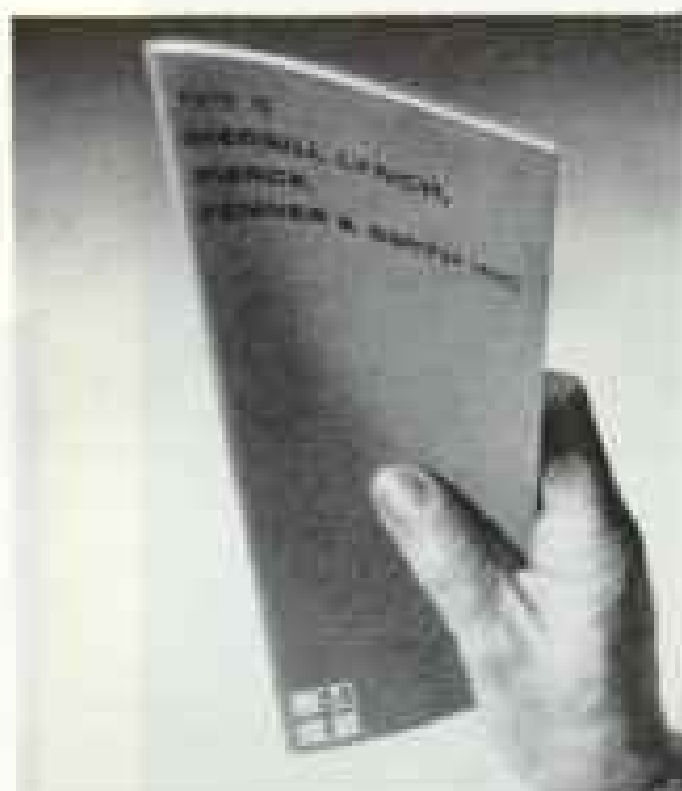
The principal secret of success in investing today is information. That's why we spend more than \$5 million a year to collect, analyze, and distribute it. Scan these 17 reasons why people invest through Merrill Lynch — the sum of which, we believe, makes us superbly qualified to be *your* Investment Information Center. Then write for our free 40-page booklet with *all* the reasons why more people use Merrill Lynch than any other broker in the world.

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13. Merrill Lynch puts teeth in its policy: "The customer's interest must come first." Whenever the firm makes a public

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offering of stock, no officer or employee is permitted to buy for himself until all customer orders have been filled. When the Research Department issues a new report on a stock, no officer or employee may buy or sell the stock for his own account for a period of 48 hours. Merrill Lynch discourages all trading in risky "penny stocks"—and *refuses* to open accounts for the purpose of buying or selling them.

14. Merrill Lynch account executives are not paid a straight commission on sales. Merrill Lynch pays its account executives a *salary*, plus adjusted compensation twice a year. The amount of additional compensation each man receives depends not only on the value of business he generates, but also on his success in giving as much personal attention and service as each customer needs. *Seventy-five* percent of the account executives who started with the firm are still with it.

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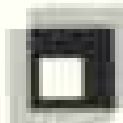
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Dodge



This is the Coronet 500 wagon

that has a two-way tailgate...

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a magic window that cleans itself...

(Optional, of course.) Touch a button, and your dirty rear window disappears into the door. Press another button, and it is washed, neatly dried, ready to be raised again in seconds. So relax, tune in the stereo, adjust the power seat, set the automatic speed control, and get ready for some of the easiest highway cruising you've ever known. These options and more can make your Coronet 500 wagon just as luxurious as you want it.



and a price that lets you put on air.

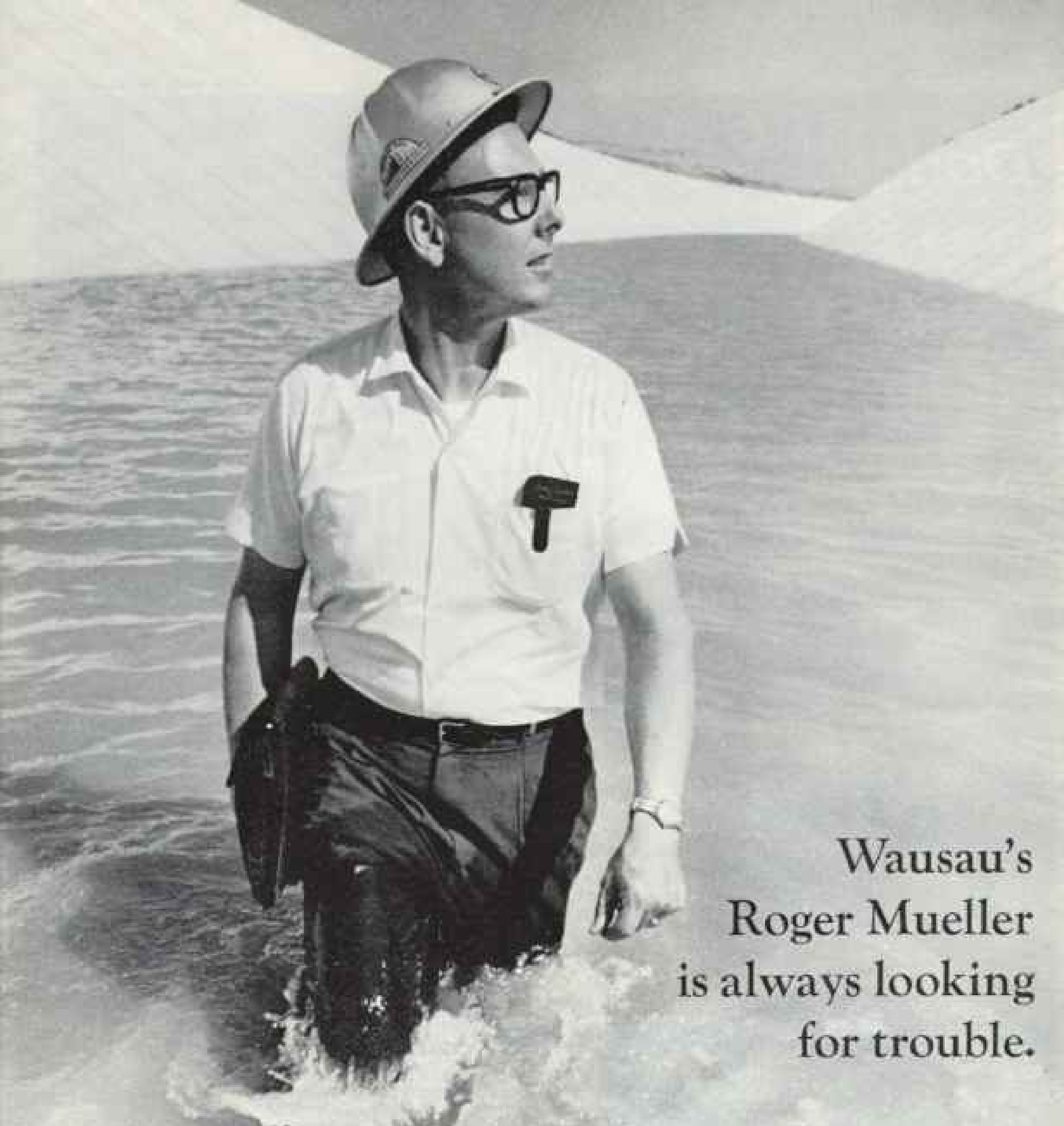
No joke. Coronet 500 is priced just about enough below comparably equipped Impala and Galaxie 500 wagons to let you start thinking about optional **Airtemp** air conditioning.* Airtemp keeps you cool in summer, warm in winter, and shuts out road noises. (No wonder they call Coronet 500 the welcome wagon.)

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is always looking
for trouble.

Wausau Story

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Ask your Employers insurance man about *prosurance*. It's the professional approach to all forms of business insurance, by the people who know business insurance like nobody else in the business. One of our 202 offices is near you.



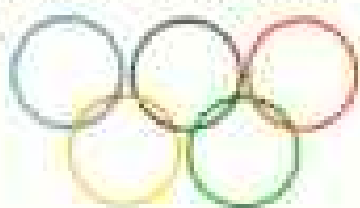
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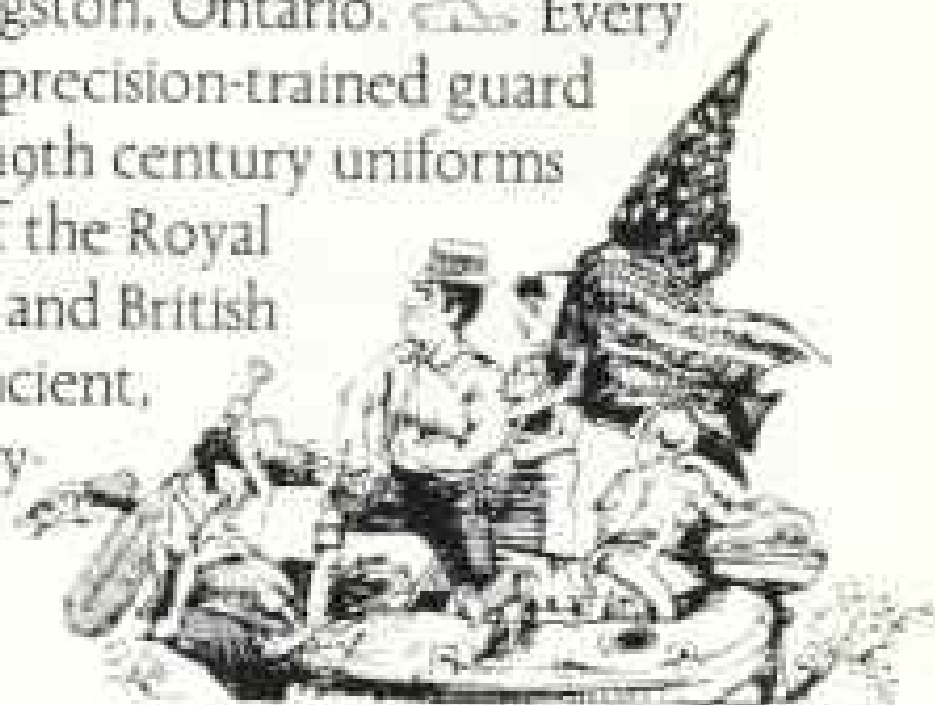


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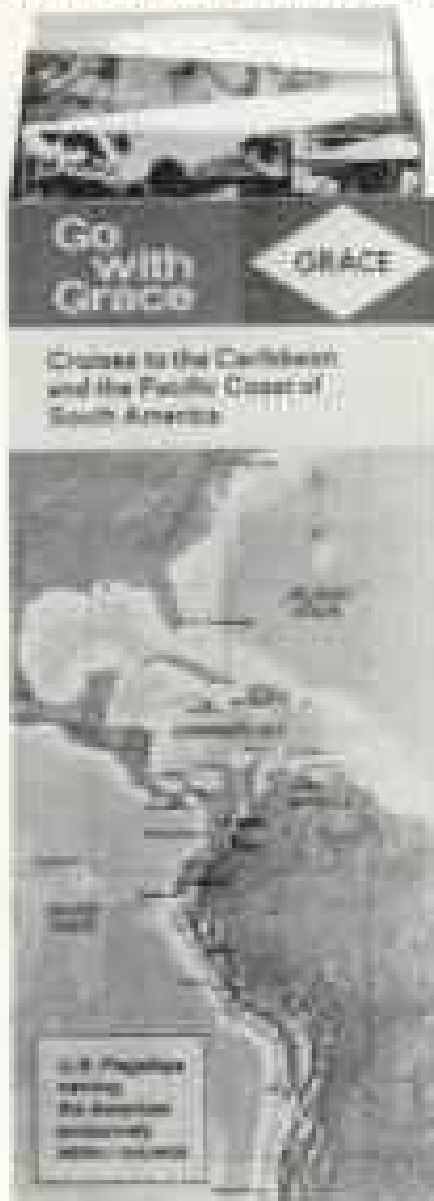


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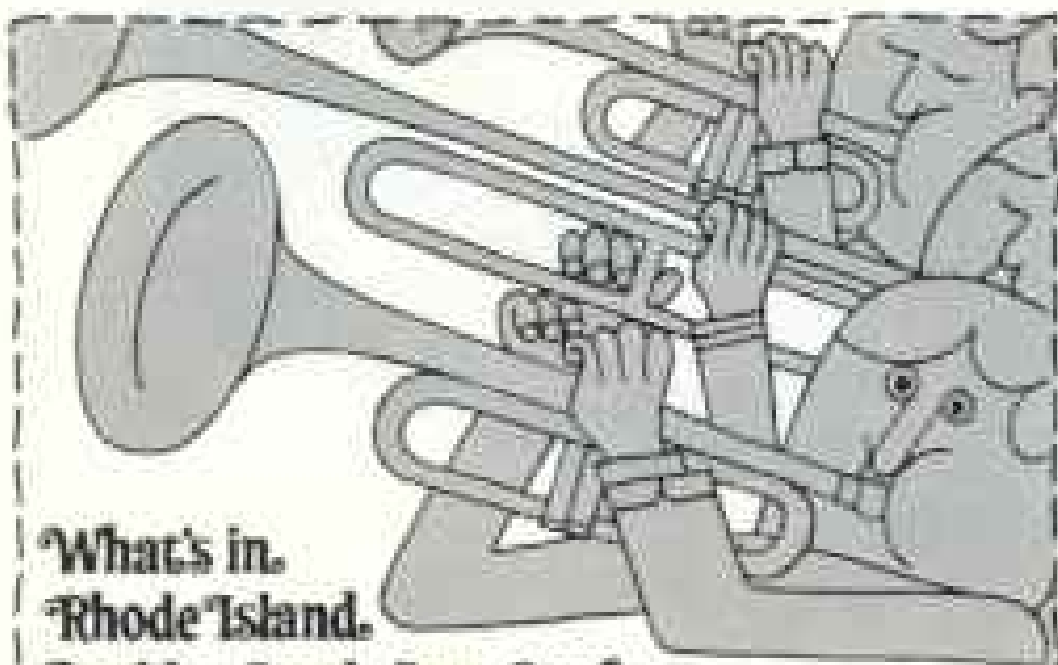
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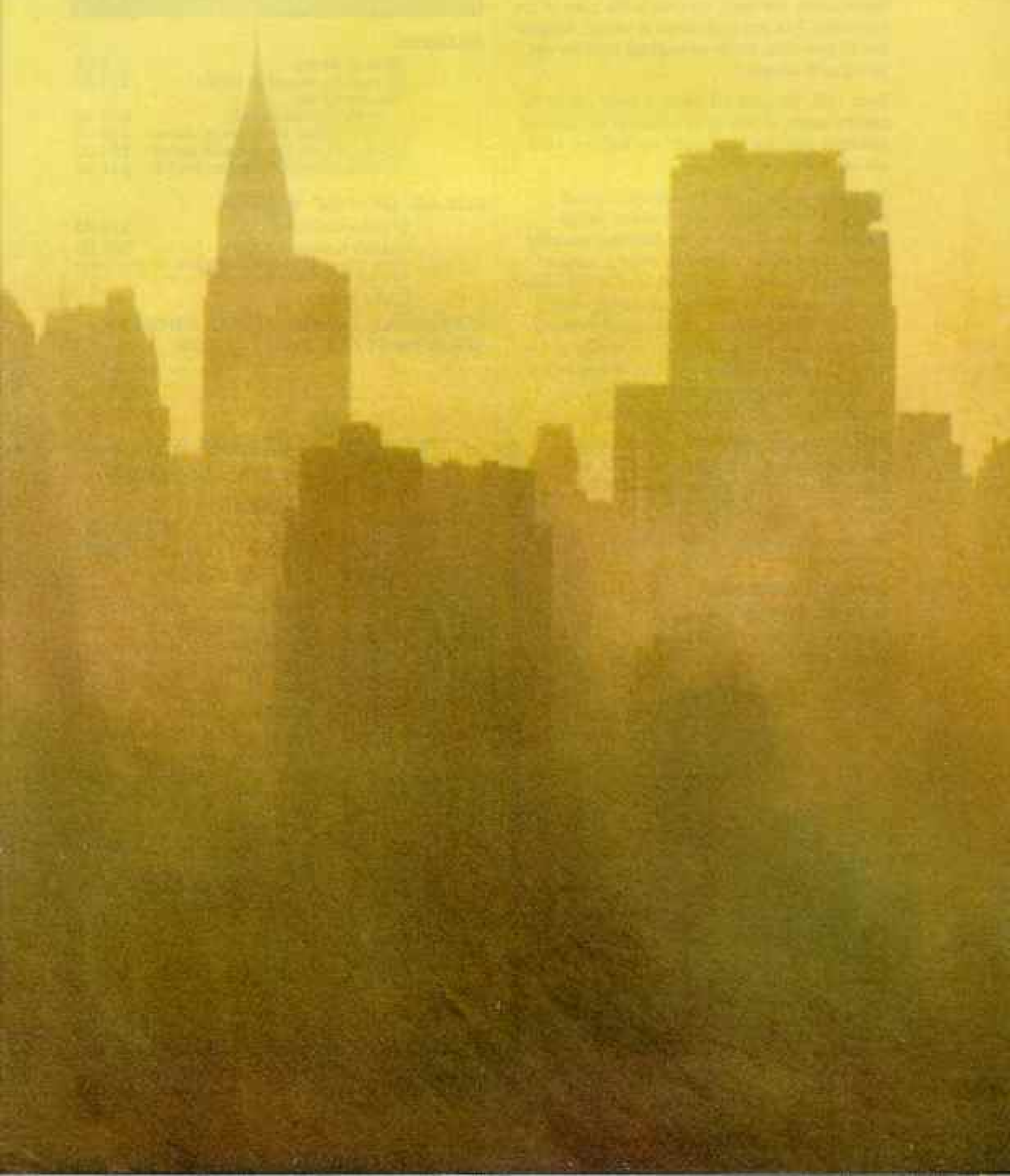
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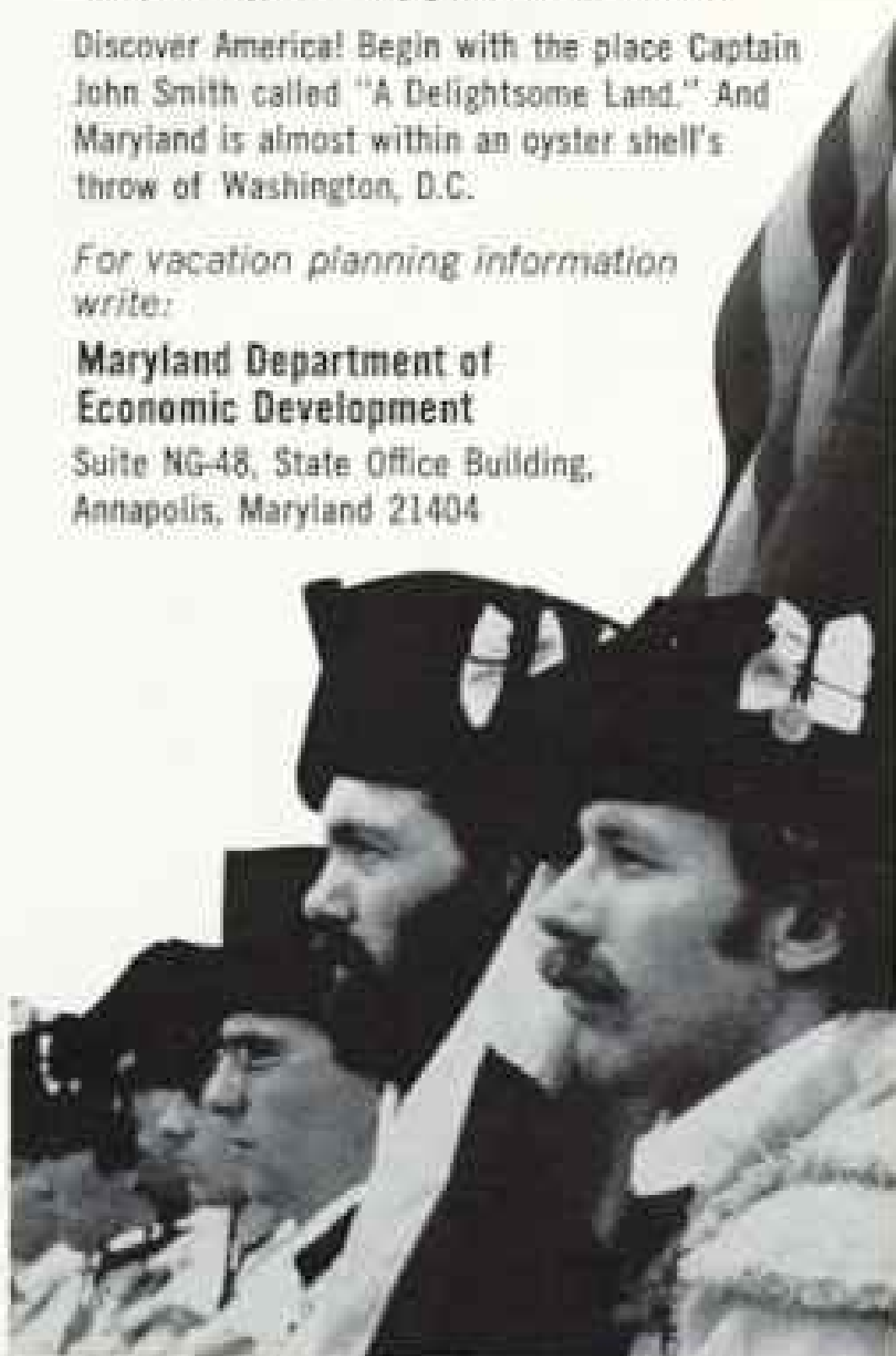
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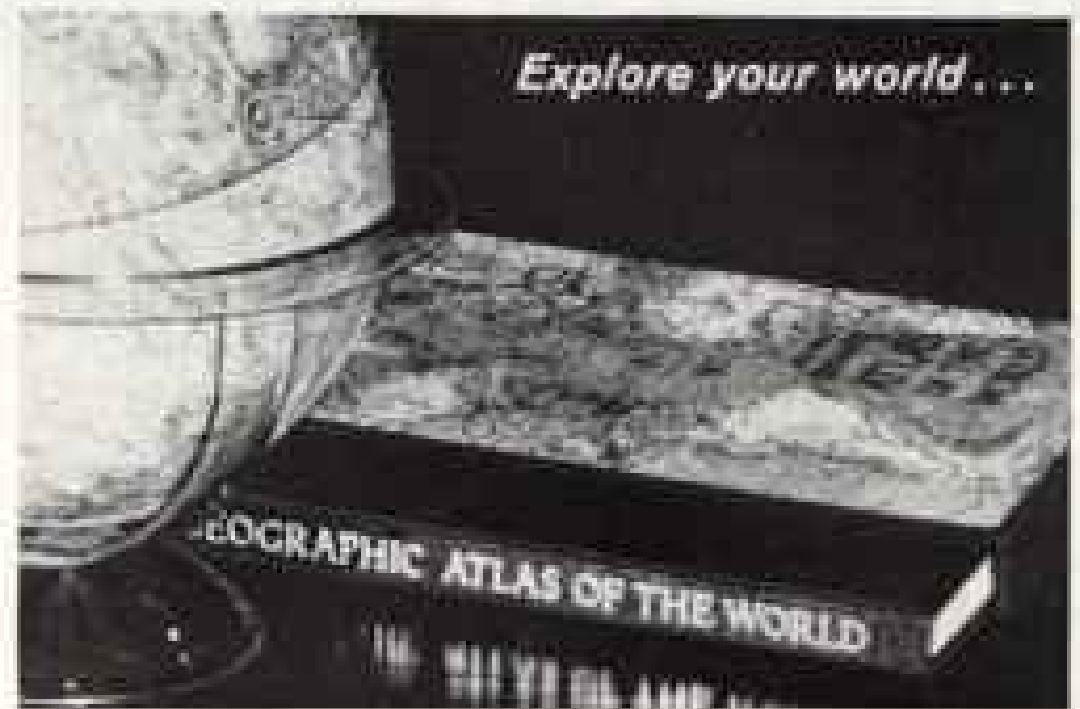
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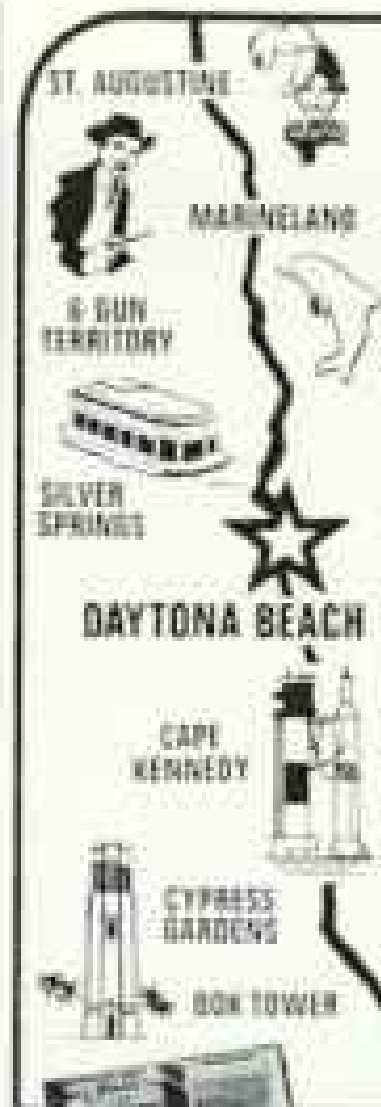
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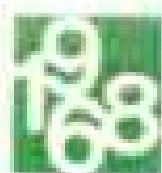


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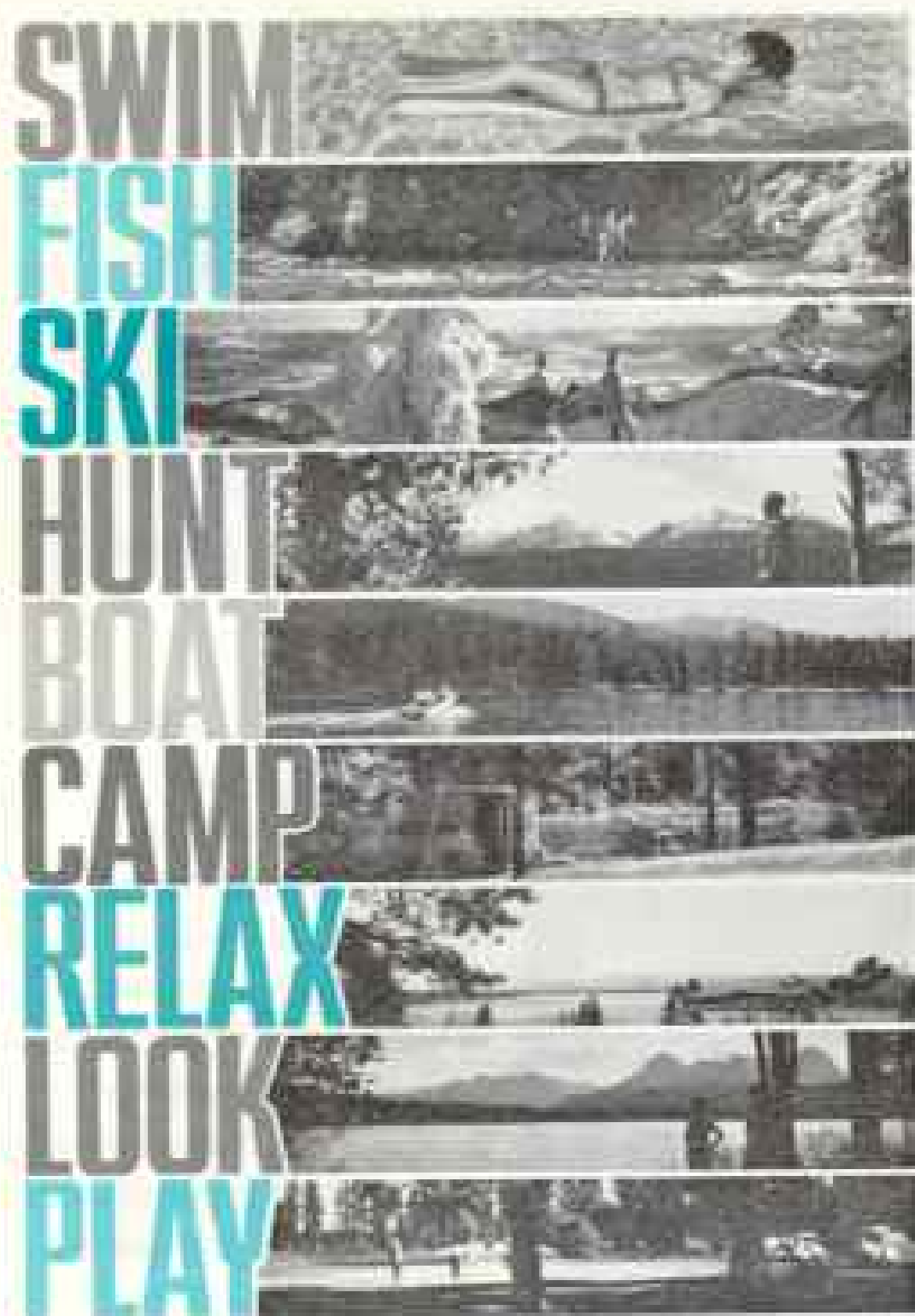


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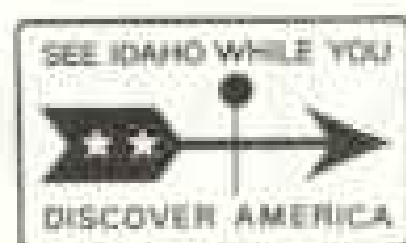
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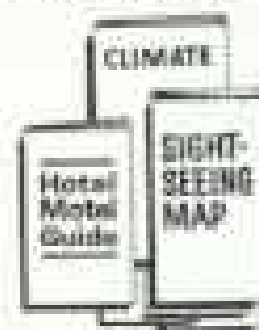
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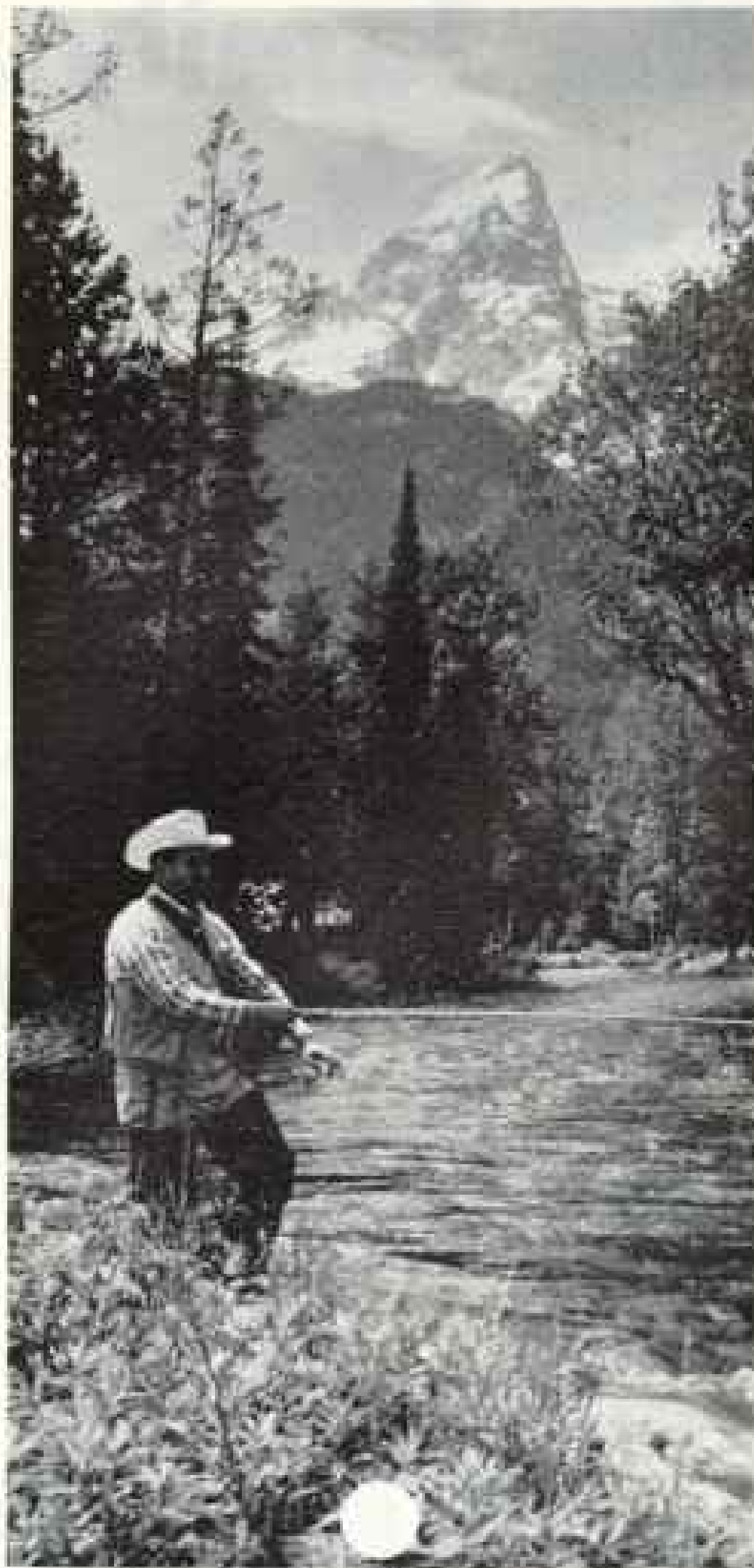
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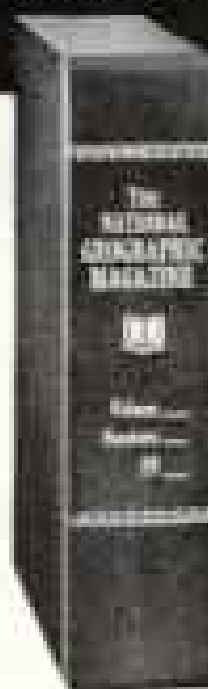
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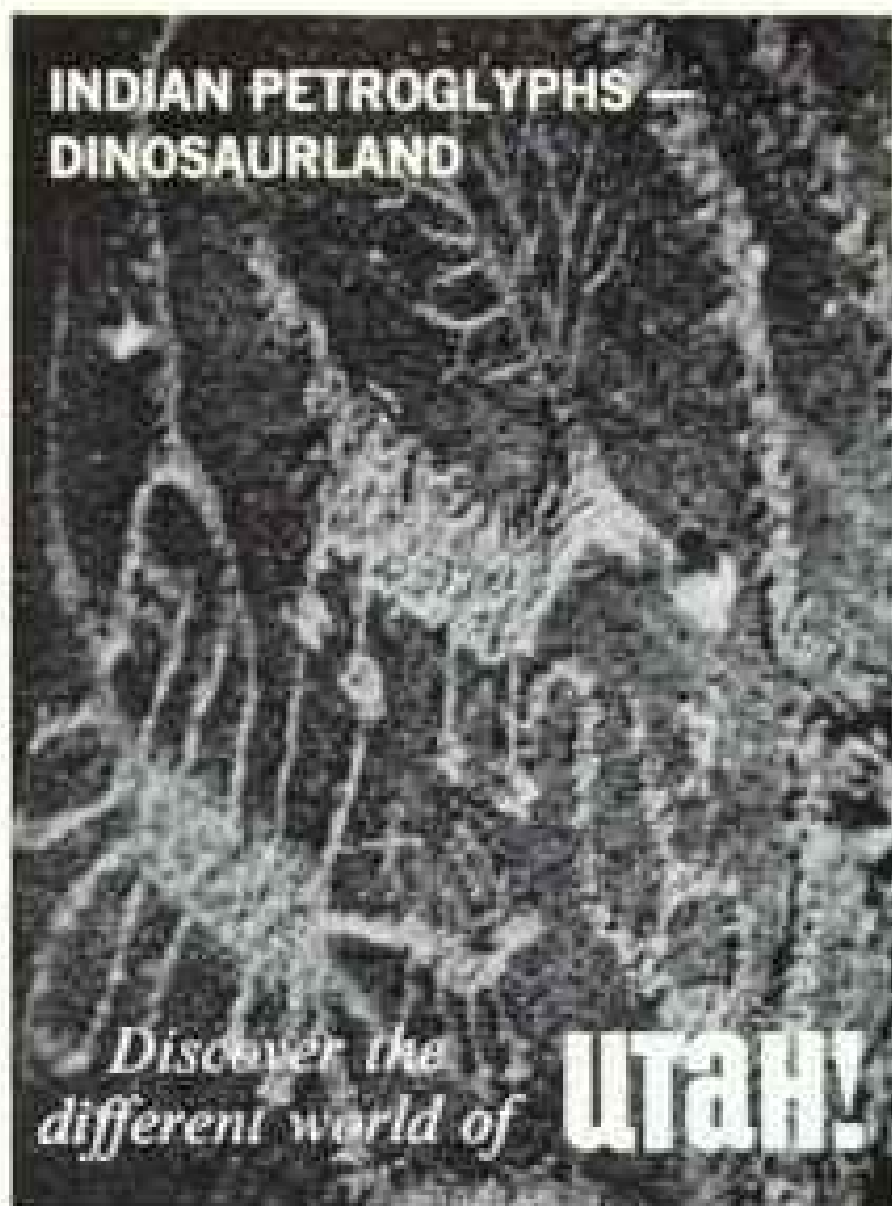
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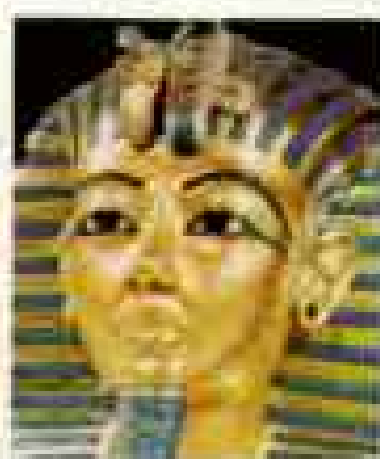
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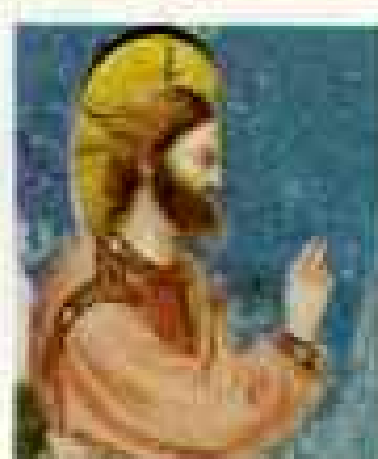
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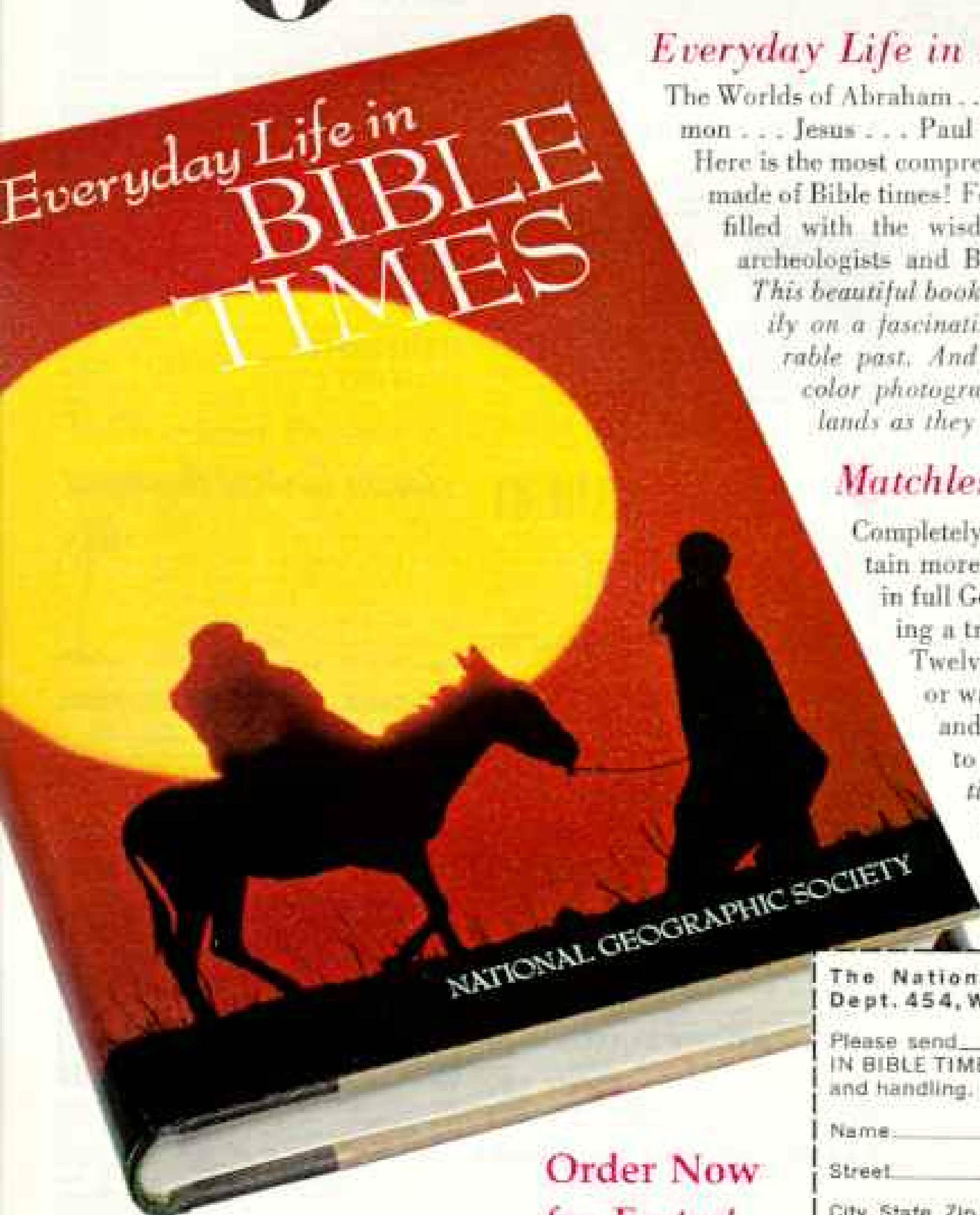
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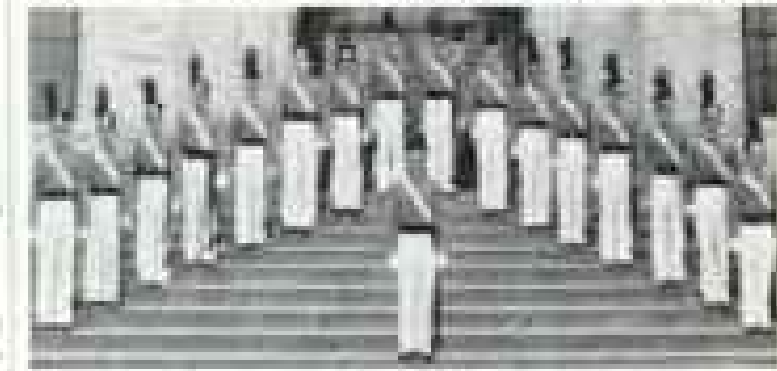
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