THE MAKING OF AMERICA: DEEP SOUTH

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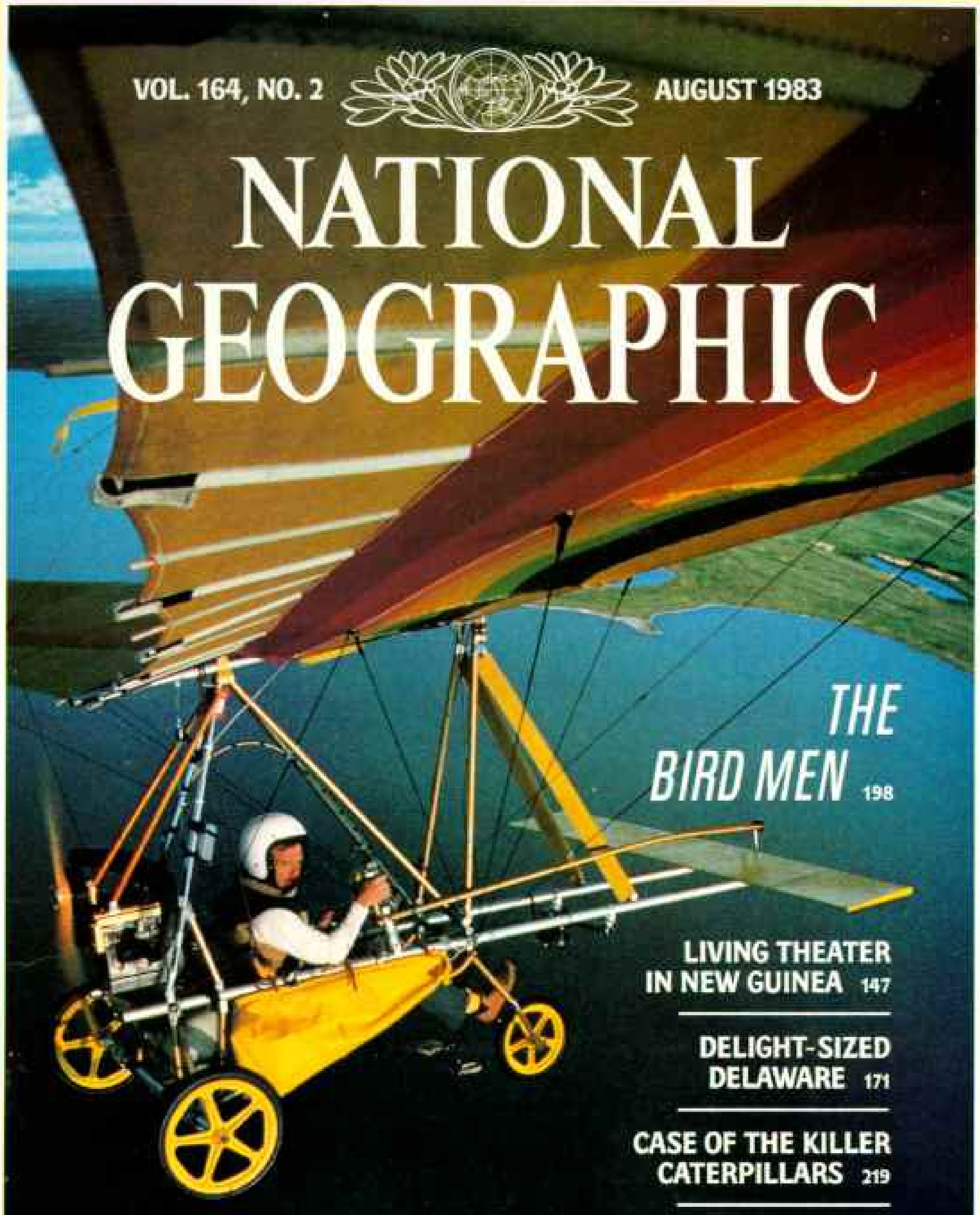
NATIONAL GEOGRAPHIC



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

IT'S HARD ENOUGH to put the round earth on flat paper, but our Cartographic Division made the process even more difficult last year by adding the element of time to our new map series, "The Making of America." With this issue you'll receive the **Deep South**, third in this 17-map series. Since historical geography does not necessarily follow political boundaries, we divided the United States into those regions where land and human events have created common interests.

George Eliot said, "The happiest women, like the happiest nations, have no history." I disagree. It would be a dull woman or a dull nation that had no history.

It's obvious from your letters that you have found neither our national history nor our maps dull. But scattered among the many compliments was a complaint to which we plead guilty—we have tended to put so much information on the maps that readability suffers. Just as it's easier to write a long letter than a short one, we've found it

difficult to delete interesting history.

For those of you who want even more information than we are able to squeeze in, we suggest you create your own city, county, or regional historical map. But be sure to start with a very large sheet of paper. Though ours is as large as paper and presses permit, it's never big enough.

Wilbur E. Garrett

EDITOR

NATIONAL GEOGRAPHIC

THE NATIONAL GEOGRAPHIC MAGAZINE VOL. 164, NO. 2

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COVER: *At the controls of an ultralight near Chase Lake, North Dakota, Charles O'Rear trips a wing-tip camera for a self-portrait.*

Living Theater In New Guinea's Highlands

By GILLIAN GILLISON
Photographs by DAVID GILLISON

"HURRY! Light more torches!" shouts Noru behind his enormous mask, a sheet of bark painted with a yellow sun and surrounded by a rainbow of red flowers and luminous leaves (*left*). "We need the light to finish my costume!" The performer is one of some 10,000 Gimi-speaking people in the Eastern Highlands of Papua New Guinea, and the Gimis represent one of more than 700 language groups in the New Guinea archipelago.

My husband, David, and I have come to know the Gimi people, to share their daily lives in a village surrounded by rain forest, remote from the world at large. We first arrived here with our six-year-old daughter, Samantha, nearly ten years ago to study Gimi arts and culture, to learn the Gimi language, to comprehend Gimi views of life and the universe. I was engaged in anthropological fieldwork, and David conducted a separate study of art and ritual (see the July 1977 NATIONAL GEOGRAPHIC). Now we have returned, working together to understand Gimi theater.

Highlanders make few of the elaborately carved ceremonial objects for which New Guinea is famous. Those are—or at least were—produced mainly along the coast or on outlying islands. High in the more densely populated interior, traditions of plastic art seem never to have developed. But the Gimis possess an elaborate performing art, staging short dramas and farces with costumes and props made from feathers, marsupial furs, leaves, flowers, berries, mosses, barks, and colored clays. Though these materials are discarded or dismantled after use, leaving no collectible artifacts, Gimi theater is, to us, an art form as complex and full of interest as the fabulous lowland sculptures now housed in the world's museums.

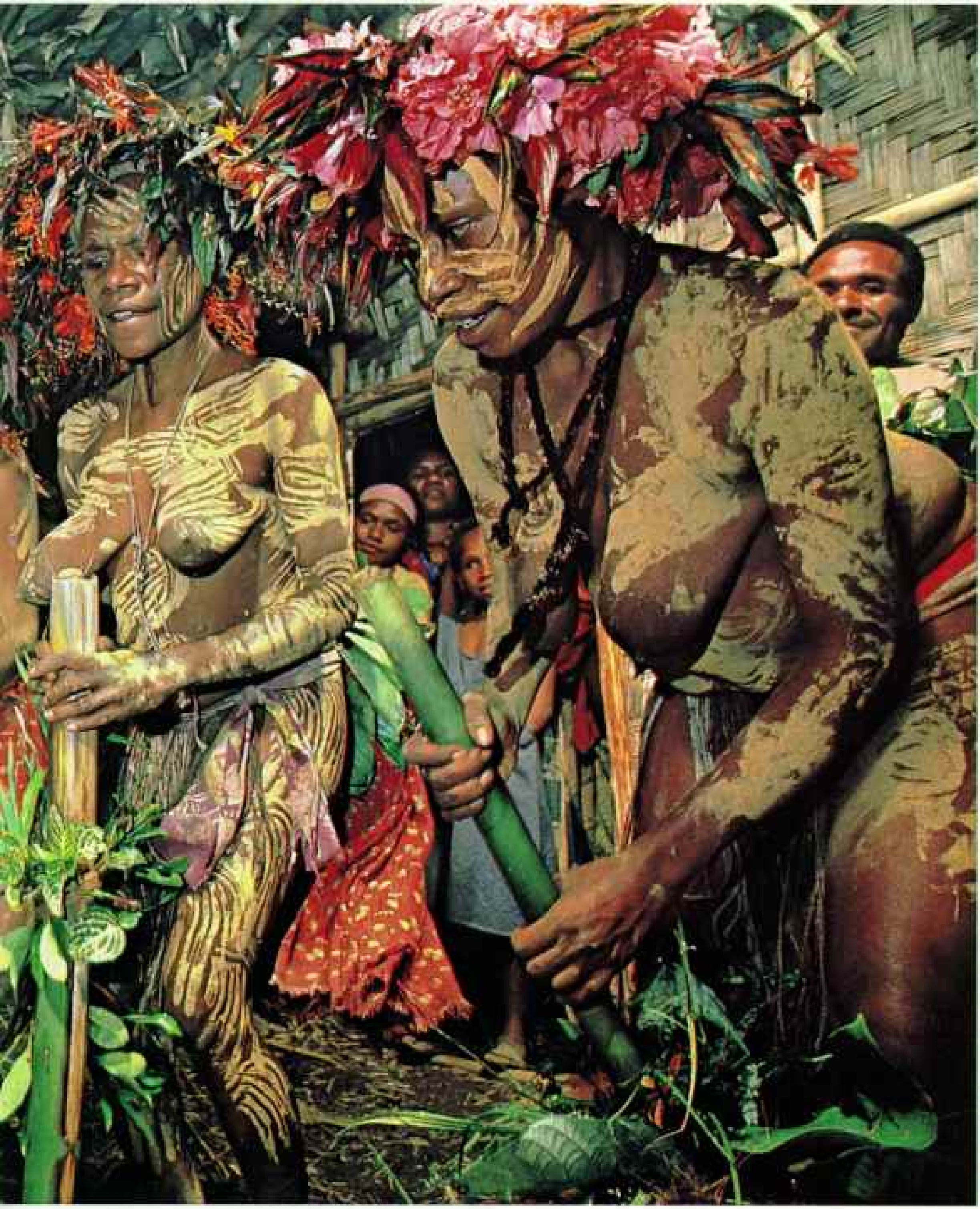
Leaving Noru and his attendants to put the finishing touches on his costume, I walk through the cool, humid night toward the center of the hamlet. In the flickering light of bamboo torches I see fantastic creatures—men and women who have transformed themselves into trees, birds, mountain spirits—milling near doorways, waiting for the chance to make an entrance. I ease my way through the crowd into a low smoke-filled thatched house.

IT IS WELL PAST midnight. I sit cramped, part of a swaying, chanting crowd. Suddenly four brilliantly decorated, flower-covered dancers (***right***) push their way into our midst, forcing us to clear a "stage" around the central fire, the only source of light in the room.

The intruders begin to pound the hard mud floor with water-filled bamboo poles, making the sounds of turbulent, churning water. "Shush, shush, shush," they chant, imitating the sound of the current surging against the banks. "Look at me, I am the river," they sing, addressing the onlookers as if they were wild sugarcane lining the shore. "I am the swollen torrent, hitting you as I run down, down, down. . . ."

Women give the night's first performances: five- to ten-minute portrayals of rivers, wild taro, bandicoots—fast-moving or abundant things of the forest floor that symbolize the fertility of primordial women.

Before marriage and society existed, Gimi myths say, women had easy access to the rain forest, the source of all reproductive power. They did not need husbands to hunt game or to help bear children. Original women had male qualities, animals once were humanlike, and forest and settlement once were indistinguishable. But men began to fight among themselves, creating divisions in the world. Now the sexes are separate and live in hamlets fenced off from the forest. Now men



own the game, father children, and dominate their wives.

"Disappear, you frogs, disappear!" men chant as the line of women players exits. "Make way for us birds to fly in!" With this mildly contemptuous song, the men dismiss the women after three or four performances, then announce their own acts.

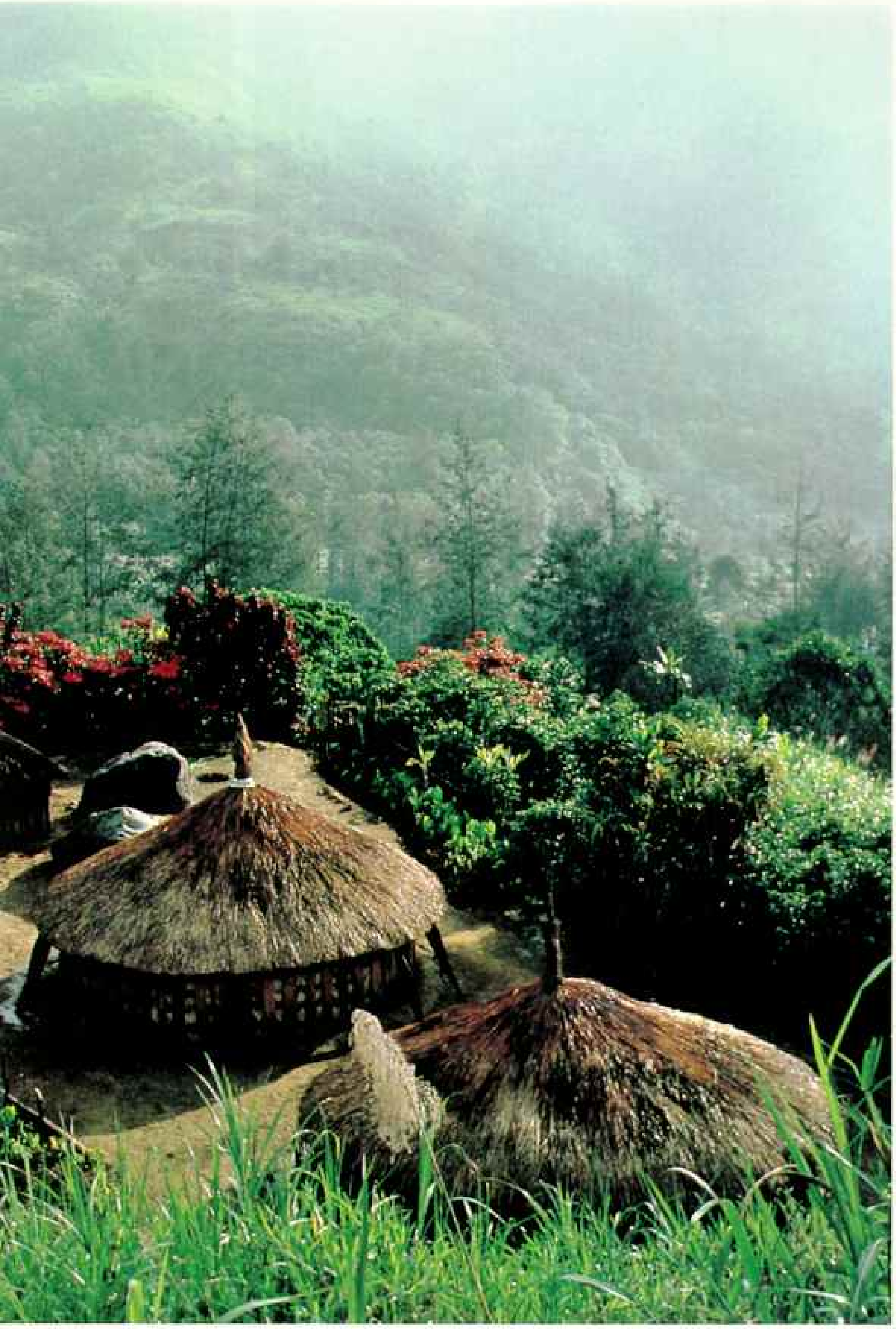
Traditional Gimi society, like most

in the Papua New Guinea highlands, is shaped by antagonism between the sexes. Many of the men and boys of our village still sleep in barracks-like men's houses built at the centers of muddy, fenced compounds (***right***). Mothers, wives, and children are ordinarily forbidden to enter men's houses or even to walk on paths leading to them. They must live in smaller, peripheral houses located at the edge of each compound. But, as performers, the women can break taboos and enter the men's houses.

Some 15 compounds scattered along a mountain shelf make up our village. Surrounding it, in increasingly distant rings, are sweet-potato gardens, dense pandanus orchards, and heavily forested slopes. Here, too, the sexes have separate realms. The men clear the land and build fences; the women do arduous daily garden work, but seldom venture into the orchards or forests where the men hunt birds and small mammals.

Once in five years or more, men of neighboring compounds organize marathon celebrations to initiate sons and marry off daughters. Hundreds of people converge on the host settlement for a week or more.

Men as well as women spectators may congregate in a woman's house to await the dramatic entertainment. Night after night, troupes of actors stop at each house to perform mimes and farces. On a single night in any one house, there may be eight or more performances, each lasting ten minutes or so and separated by intervals of singing. Anyone who can persuade one or two others to join in may organize an afternoon rehearsal in the forest and wait their turn at night in the compounds amid the crush of other expectant players.



"If you reveal these secrets to your mothers, sisters, or younger brothers, we will cut your throats with axes and dump you in the river!"

SAYING THIS, the masked man menacingly runs his tongue along pig teeth glued into the jaws of his gourd mask (***above***). Pig tusks and a bamboo rod that pierces the septum of the mask's nose identify him as a ferocious warrior. He seeks to terrify initiates with mock threats, to fill them with contempt for the world of women, which they have inhabited until now.

Men confine pre-adolescent boys in the men's houses, forcibly separating them from their mothers. Now the youths will live with their fathers, who forbid them to visit women's houses, to take food from mothers' hands, or to eat anything with female associations, such as frogs—which squat like women—or flying foxes, owls, and other birds with short beaks. Gimi men disparage such creatures as having "no noses"—another way of saying they have no penises.

Above all, men warn, the boys must not divulge to women and children what they see and hear inside men's houses.

For nearly a week, as guests assemble in the compounds, men subject the secluded initiates to ordeals of manhood. They seat the boys beside hot fires and withhold food and drink. They deprive the sweating lads of sleep, haranguing them relentlessly about

the need to avoid women, to heed clan elders, to hunt successfully, and to vanquish the enemy in battle.

This rite of passage, which signals the end of childhood, is a time of exquisite sadness for mothers and sons. Their grief is expressed by enacting a story about a group of boys lost in the rain forest (***above***). Orphaned and forced to flee far into the mountains, they are alone and hungry, wandering in search of small animals to shoot and calling plaintively for their dead parents. Eventually, uncared for, the boys perish and are transformed into pheasant pigeons, birds known for their haunting, humanlike cry.

Like any Gimi theater piece, this one will be remembered and performed again only if it strikes the hearts of the audience.

"CAREFUL! Don't let those creatures near you!" Someone shouts the warning as a pair of grotesque figures grunt and stagger about the dark hut, selecting spectators to intimidate (***following pages***). Wet clay covers their flat masks and clings to dried vines and leaves wrapped round their bodies. Red blossoms protrude from clenched fists to show they have stumbled through dense vegetation from their homes in mountain caves.

Suddenly one figure lurches toward the fire, sending ash into the air. "They see fire but have no fear!" exclaims a man in the audience. The monsters are ancestral spirits—eternally rivalrous brothers—who dramatize the importance of rules of conduct just imposed on initiates and brides.

"It's ugly men that women like, and ugly men they marry!" yells a spectator.

A MAN brandishing bow and arrows bursts into a woman's house. His face is blackened with soot and contorted by vines that press his nose flat against his face. The intruder, I'm told, portrays a villainous husband—"an ugly old man with no nose."

"Where is my wife? Have you seen my wife?" the old man asks one spectator after another, in a voice altered by his disguise. He pokes the floor with the tip of his arrow as if searching for footprints. Suddenly he spies his wife: Another performer, decorated with flowers and holding a digging stick, a symbol of woman's labor, has slipped unnoticed into the hut. She stands demurely beside the fire while her husband jumps for joy and shoots an arrow into the thatched ceiling. "Heh!" complains a woman in the

front row. "You're so excited over that beautiful girl, you're stepping all over me!" "Watch out for that arrow!" yells another.

The husband moves toward his errant wife, but she backs off so that the two performers reverse positions. They repeat their encounter, giving everyone the chance to see their faces. A man in the audience addresses the ugly husband: "I'd like to marry that lovely girl. You can't have her!" The audience erupts in laughter.

Now a third performer arrives. He is the hero of the play, the woman's kind and handsome lover. Like the husband, he carries weapons and wears a warrior's feather headdress. His face is disfigured by vines too—not to make him ugly, but to hide his identity from the furious cuckold.

At first the rivals are oblivious of each other. Each circles the fire, staring at the floor in search of footprints. "The two of them are crazy about her, crazy about her," someone shouts out of the darkness near the door. "A nice girl like that always marries a bad sort! And look what happens!" adds another.

The unhappy wife stands with her flower-covered head bowed in the shadows beyond the firelight. With a burst, the two male performers collide, trampling several in the audience. The men disengage, and the whole performance is repeated, subdued scenes dramatically alternating with violent ones. In the end neither man wins the lady.

This play is being performed to celebrate the weddings of three young women of the village who are marrying into distant communities. When it is finished, the audience laments the loss of the young women: "Red orchids, fire of our forest," they sing, "we send you far away now. Woe are we!"

The brides have been secluded in this woman's house for days. Older women have kept watch over them, made sure they hardly ate or slept, and railed at them about the need to care well for their husbands and to obey their mothers-in-law.

The brides have sat slumped in an airless corner, listening to songs that compare their virtues to the iridescence of scarab beetles, the sweet taste of mountain streams, the succulence of pandanus fruit. The songs may soothe them, but the theater demonstrates that marriage will soon bring strife.

In other versions of this drama, the main character is an ancestral spirit, the woman is a widow, and the other man is her son. Always the ugly villain wants the woman, but she is torn between him and the hero—whether he be her son or her lover.

If we consider that this play is directed toward girls about to leave home and boys whose fathers have just forced them apart from their mothers, then we may see why the ugly man is always a villain. He may represent the father, who claims the bride's affections or "takes away" the initiate's mother.

"I shoot at these birds but they do not fear me!" shouts the hunter, a man completely covered in white clay and holding bow and arrows.

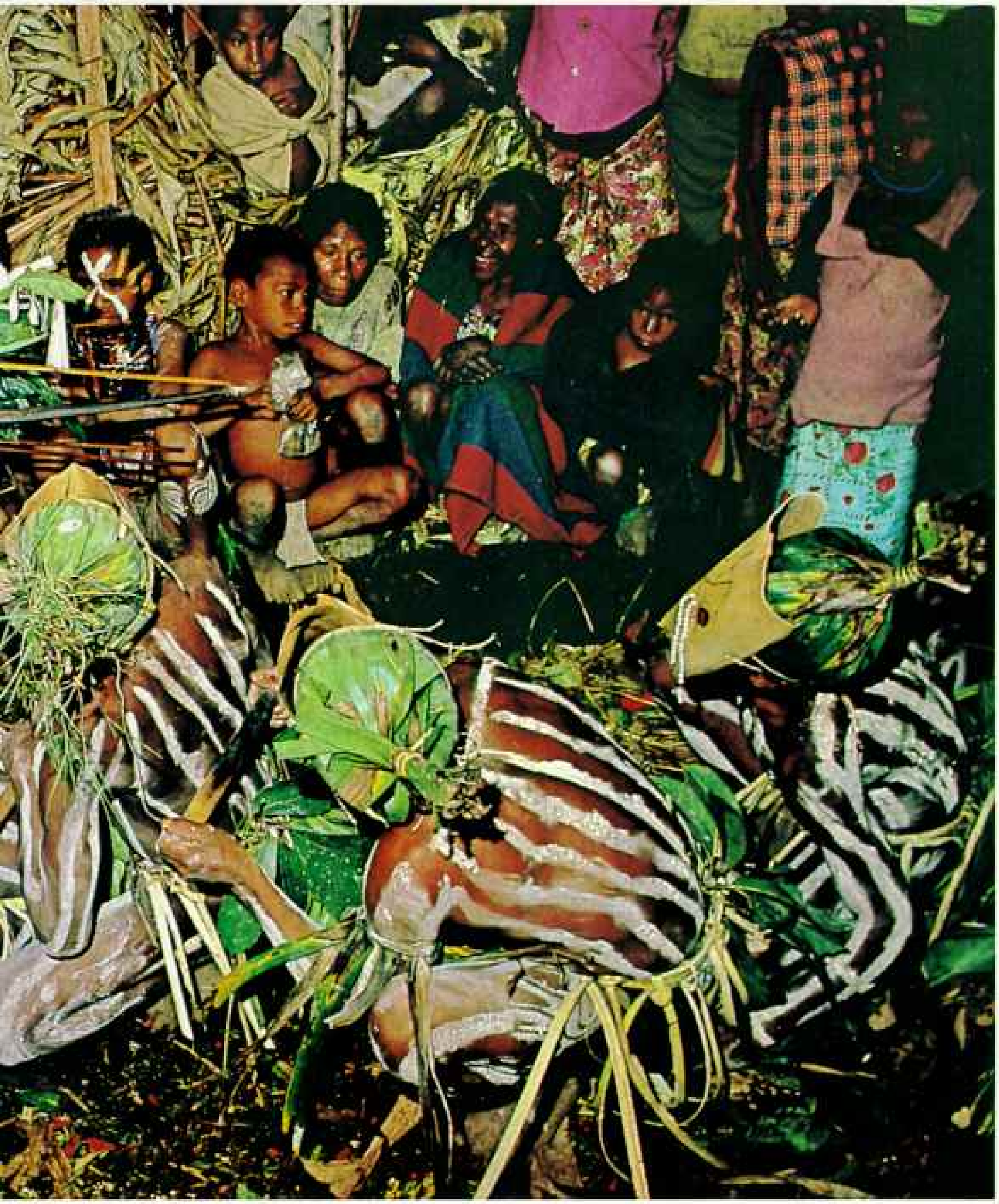
HE LOOKS DOWN at his prey, a row of white cockatoos who silently return his gaze. "Why do they look back at me?" he asks.

At the beginning of this drama, the hunter burst into the hut alone, noisily twanging his bow and running around the fire. Then he moved into the crowd the way a hunter

takes cover the moment he spies his quarry. The cockatoos—men with banana-leaf hats, bamboo masks, and white clay drawn vertically over their bodies—crept soundlessly into the room.

Now the hunter emerges from his hiding place and shoots at the birds. But they only turn their heads. Unnerved, the hunter shoots again. "What is this?" he asks in amazement. And from the audience comes a reply: "You are shooting at your brothers, don't you know?"

The birds embody spirits of the hunter's dead kinsmen, a bond that accounts for their fearlessness. The play dramatizes the idea that hunter and hunted are fated to meet.



"I'm on my way to the river's source to find pure water and a wife," the ugly old man tells the boy.

ON A PATH outside the settlement the two have met, and the boy has asked the old man, who carries a walking stick, where he is going. From their short exchange, repeated four or five times, the audience recognizes the start of a rather complex myth.

In this story the boy's widowed mother goes deep into the forest to the river's source to collect wild foods for her children. The ugly old man follows her upriver, looking for pure water to drink. When he reaches the widow, he accuses her of muddying the water and kills her. Thus he gets neither a wife nor pure water.

The old man returns to the settlement disguised as the widow and attempts to fool her children. He soon kills the widow's son, the boy he met on the path. But the boy's sister discovers his body and realizes that the "mother" is an impostor. She kills the evil old man while he sleeps. Then she runs away, carrying her brother's corpse inside a net bag.

The girl climbs many mountains until she finds the man she will marry. He puts her dead brother inside the hollow trunk of a tree and seals it shut. Soon beautiful sounds emerge from the tree. When the sister—now a bride—strikes the tree, the trunk opens and birds of paradise fly into the world for the first time.

What does the story mean? Why is it enacted during marriages and initiations? Many initiates are actually younger brothers of the brides. In the myth the heroine's marriage makes possible her brother's rebirth as a bird, the Gimi symbol of a full-fledged male. The girl must leave home and find a husband before her younger brother can be initiated, before he can "fly" into adulthood.

This myth is one of a collection of morality tales that are enacted for the benefit of the brides and initiates, separately sequestered in women's and men's houses. The dramatic and often violent stories symbolically foretell the tragic complexities of life as they enter the adult world.

"Wake, brother, wake! See the butterfly that clings to my walking stick!"

THIS PLAY is a sequel to the one featuring the older sister in the previous skit. As the sister and her new husband lie in a garden sharing intimacies, the groom's younger brother arrives on the scene to find out how babies are made. He tries to distract his elder brother by poking the lovers with

his walking stick. He dances around the oblivious pair, demanding to have his turn at their "game." Laughter fills the room.

A Gimi theory of procreation holds that the female contributes little to the formation of the fetus. She serves merely as an empty vessel—a hollow tree—into which the male deposits the ingredients to make a child.

The performers who play the soon-to-be-wed pair are both male. When plays are risqué, the sexes do not act together. But Gimi theater is a place where tabooed subjects can be broached, relations between the sexes ridiculed, and tensions eased.

"Hwa! Hwa! Hwa!" shout the warriors, giving the traditional battle cry as they shoot stage arrows into a well-padded foe.

THE SCENE is war. The enemy—an actor sheathed in protective layers of banana stem—is being shot full of bamboo arrows. In a moment he falls as though mortally wounded, then is lifted by a comrade-in-arms.

But the Gimi warriors continue to shoot at the figure, finally forcing his comrade to

abandon him. The victors then surround the body, chanting the names of clan ancestors and the places those ancestors' spirits inhabit. "To the caves of Mount Hana!" the warriors cry, mentioning one such place.

The object of the chants is to persuade the life-force that is escaping from the dying enemy to fly to the forest. There, stockpiled for the future, the spirits of dead men—both clan members and their victims—can be reused to animate new generations of the clan. In days when the Gimis fought constant wars, enemies' spirits were precious booty.

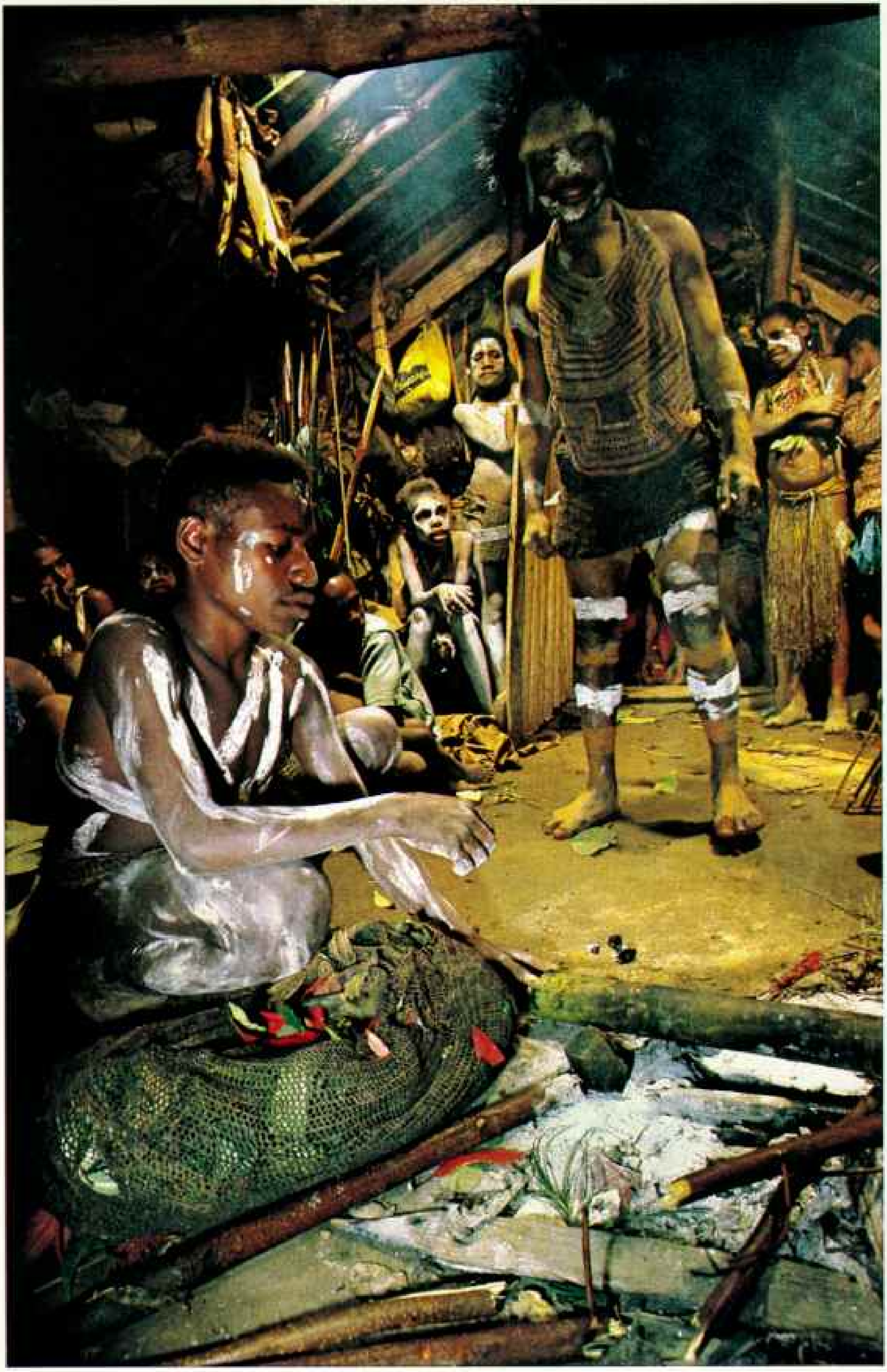
Until the Australian government pacified the area in the late 1950s, Gimi men raided other villages in the hours before dawn, ambushing the villagers and destroying their gardens. Nearly the whole male population between the ages of 15 and 50 kept themselves perpetually combat ready. To do this, warriors had to be pure, which meant they had to avoid contact with children and women, whom Gimis consider highly polluting because of their association with menstrual blood. If a man tastes food cooked in a fire whose embers were blown alive by a menstruating woman or by a new mother, or if any woman or child merely steps over his legs or hands, he is liable to fumble with his weapons in the heat of battle or fall helpless before the enemy.

For men in their prime to have regular contact with women and children once meant subjecting the entire community to the risk of attack. Since the Australians ended guerrilla wars, some of these taboos have been relaxed. But the fear of women and the ideals of warriorhood still dominate much of Gimi life and its rendering in Gimi theater.

Many in present-day audiences were once enemies. Merely by attending the celebration, they now peaceably relinquish a part of what their hosts once tried to take by force: their vital energy. The songs that the guests must sing loudly until dawn are more than an entertaining way to pass the long night hours. "Songs are our spirits," Gimis say.

By singing, the revelers release their spirits into the rafters. The owners of the houses thus acquire these spirits, and so regain some of the life-force they themselves have expended by staging the rituals.

In the Gimi way of thinking, a host community that entertains others thereby gives up part of its own life-force—part of what collectively enables the community to bring forth new life, to bear and raise future brides and initiates, to herd more pigs, to raise new crops. When members of other settlements and clans come together to sing all night long, they help replenish the hosts' precious supply of life-force.



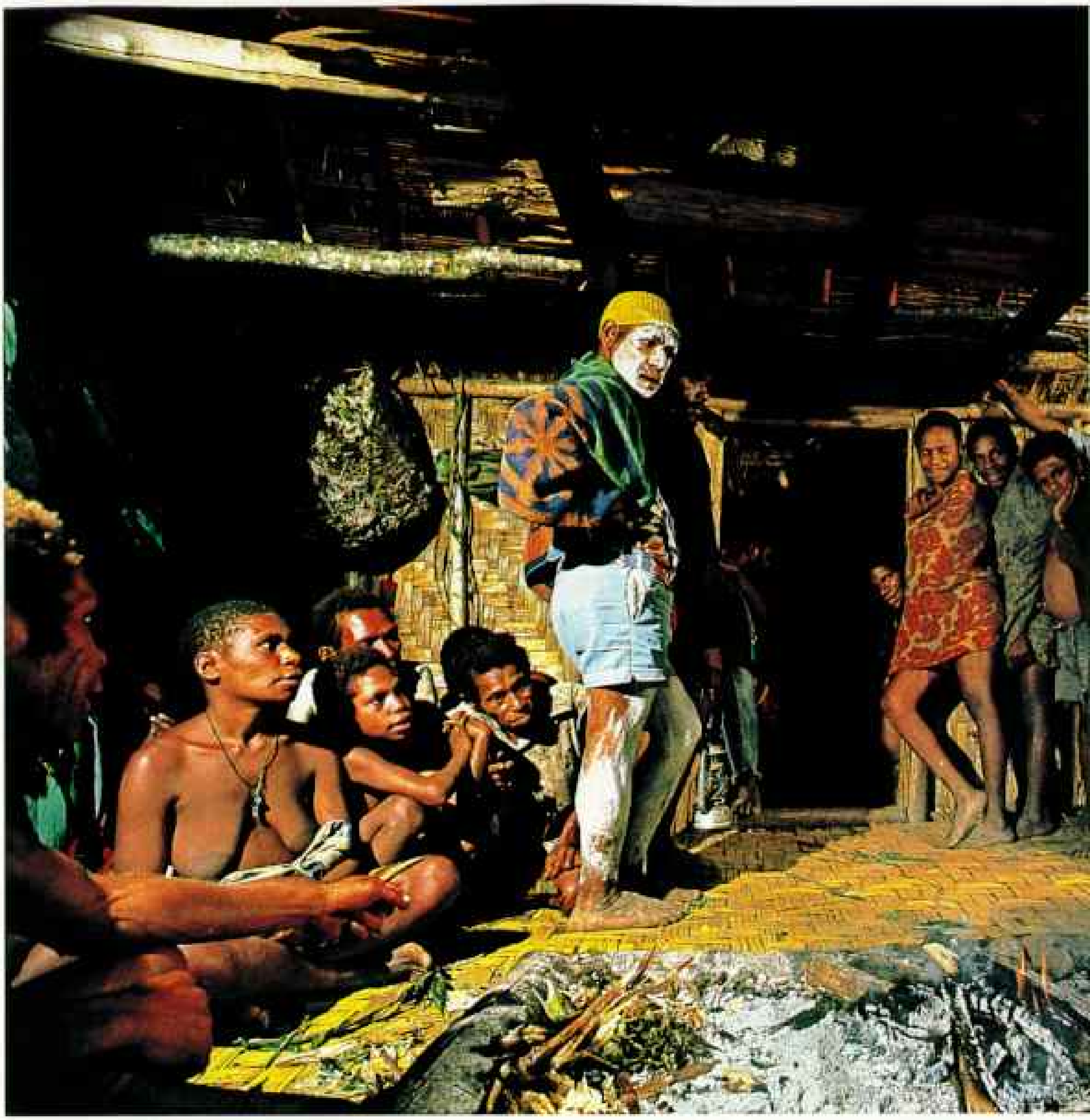
"Hey! Brave man!" yells a spectator, "she put something in your food!"

THE "SHE," a boy streaked in white clay, crouches in the foreground near the fire (***left***). He plays the part of a wife preparing a meal by rotating a bamboo tube filled with vegetables in the hot ashes. The husband arrives shouting, "I will not eat! I must be ready for trouble whenever it comes!" But his wife implores him, and finally he sits down beside her to eat.

Finishing his meal, the husband reaches for his weapons. He tries to string his bow but cannot. Again and again he tries to pull the ends of the palm bow close enough to slip on the bowstring (***below***). Each time he fails, the audience laughs wildly.

Strewn over the wife's net bag are brilliant red poinsettia petals, symbolic of menstrual blood. Seeing these, the audience knows the husband is poisoned. He collapses; then gets up to begin the play again.

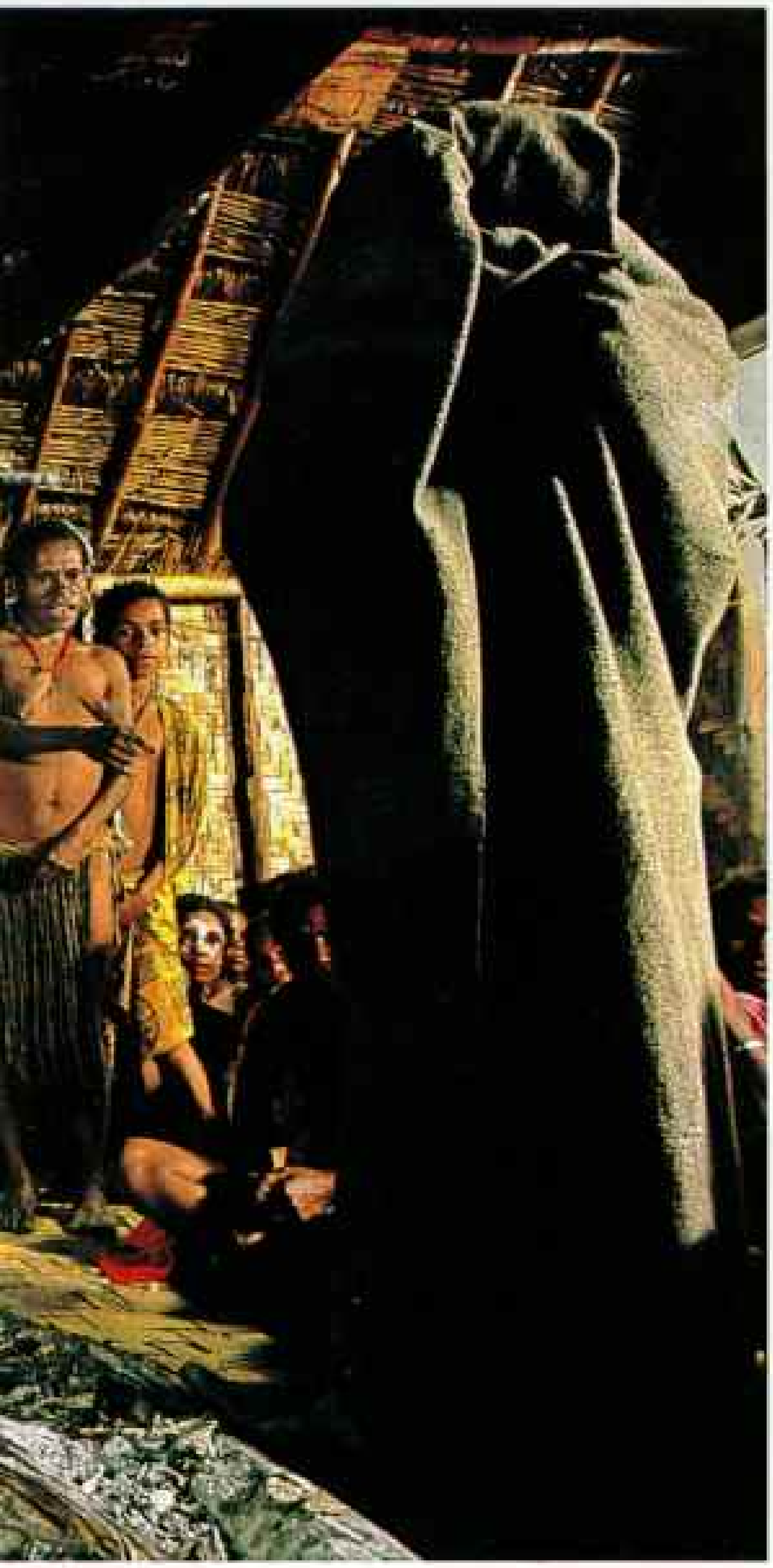
The farce is Gimi men's version of how women get the better of them. It says to brides: "We see your treachery." And to initiates: "Be ever wary of your wives." The gales of laughter from the audience do not mean that the Gimis take menstrual pollution lightly, but that humor releases the tension such a topic creates.



"We know why you've come, you've come to see your home again!"

TWO SPIRITS of the dead meet—one an Australian patrol officer, the other a Gimi ghost—in a dramatization of one of the first encounters with white men. Gimis once believed that all whites were reembodied spirits of dead kinsmen. In this scene the man in Western clothes, his face and lower legs covered in white clay, plays a government officer arriving in the village on an early patrol. While he explains his government's business and announces a census, his ghostly Gimi counterpart—shrouded in a blanket in the right foreground—arises from the grave to welcome him.

New versions of plays are often introduced by visitors to the festival. As soon as this performance ended, men who had walked four days to reach our village quietly left the house. They returned hours later, disguised in costumes of dried banana leaves and speaking a Papuan coastal language. They were portraying Papuan shell traders



of generations ago. The traders appeared incredulous at the sight of tall white figures in boats who, the traders imagined, were ancestors sailing home from some strange and distant netherworld.

Some playlets are much repeated classics about the origins and history of Gimi society. Others are satires of everyday events, such as suspected infidelities or family feuds, created for one occasion and not performed again unless they are instant hits.

When a play is successful, spectators reach out to place plumages, pearl shells, or, nowadays, cash in the hands of performers. By doing this, they acknowledge that they are utterly overwhelmed, that parts of themselves have "died"—simply left their bodies and gone into the performers. The day after the performance, players must return twice the quantity of feathers or money received. They must compensate the "victims" of their art or else risk ridicule.

Some young men see in theater an opportunity to break through the confining world of bride payments and arranged marriages. By the skill or daring of his performance a man can "strike" a woman in the audience—that is, drive her to flout convention and elope with him. This is a way for someone of low social status to win a desirable mate.

After the last performance, slow, resonant singing begins again and continues until the crowing of roosters signals first light. Inside separate houses, brides and initiates sleep undisturbed by their chaperones for the first time in more than a day. Hunger moves the rest of us, and, one by one, we leave the stale warmth of the hut.

I stumble into the cold, misty dawn, aching with tiredness, and walk toward our house in the next compound. Before I reach the fence, I hear frantic squeals of pigs being clubbed. The daytime routine of the festival has already begun. Men will slaughter most of their herds in order to provide lavishly for their guests and implicitly to challenge them to make an equal return someday.

On the narrow, muddy path I exchange greetings with women and children on their way to the gardens. By late afternoon great quantities of food will be ready for visitors.

Tonight, and for the next four or five nights, houses will be jammed with people singing. As the nights wear on, weariness will overtake the singers, and their voices will fade to a low, monotonous drone. Into the midst of the crowd will come provocatively swaying dancers, cruel husbands, melancholy birds, or monstrous ancestors—all to startle and delight the spectators.

As I reach our house, I see David waiting for me in the doorway. Above us, hidden in the crown of a fig tree, a bird of paradise calls loudly to its companions across the valley. As the sun breaks through the heavy morning mist, David splits firewood to cook our breakfast. □

DELAWARE
Who Needs to Be Big?

By JANE VESSELS
NATIONAL GEOGRAPHIC EDITORIAL STAFF

Photographs by KEVIN FLEMING

Beacons across the Delaware Memorial Bridge light the busiest corridor in a bantam state that counts its small size a great advantage.

MOST MISUNDERSTANDINGS about the place, I'm pretty certain, stem from its size. A Delawarean named Mark Mathre told me the story, not apocryphal at all, about a crew from television's "Candid Camera" show who set up a roadblock at the state line. They had no trouble persuading a number of motorists approaching from Pennsylvania that Delaware was closed for the day. The whole *state* of Delaware. Because it was filled up.

"Of course," Mark said, "any Delawareans coming home would have answered, 'We've got reserved seats.'"

Whenever they do travel and tell others where they're from, Delawareans risk being asked, "What state is that in?" They weren't much surprised last summer when a national convention of police chiefs met in Delaware, and it came out that many delegates were expecting a trip to New England. And those who live here are still gracious enough to chuckle about "Delawhere?".

"Just make sure people understand," Mark emphasized, "Delaware is a state."

If Mark's request points up a staunch Delawarean pride, it also, I think, suggests that the nation's second smallest state is somehow different, and special.

DELAWARE is a state all right—and the First State at that, having been the earliest to ratify the U. S. Constitution. But this predominantly rural enclave on the Delmarva Peninsula feels like a much more intimate domain. Only 96 miles long and at most 35 miles wide, it's smaller than many U. S. counties. Its population barely exceeds 600,000. Rhode Island, about half Delaware's size, has 60 percent more people. Milwaukee has more people. This is a small-town state, where peace, quiet, and good neighbors are surplus commodities.

"It's the little things you notice," said English-born Vicki Fitzpatrick, who settled here for Delaware's gentle beauties: deer and herons in marshland refuges along the Delaware River and Bay, sunset sails on back bays protected by broad Atlantic beaches, veils of fog curving above tidewater farmland, burgundy foliage draping an old Quaker meetinghouse.

Ironically, when Delaware goes big, it goes biggest: Half the U. S. fleet of C-5A Galaxies, the world's largest airplane, is stationed in the capital at Dover Air Force Base (pages 188-9).

E. I. du Pont de Nemours and Company, the nation's largest chemical firm, whose inventions include nylon and Teflon, took root here 181 years ago and directs its worldwide operations from Wilmington.

Wilmington, Delaware's largest city, is also a leading center of corporate law. More than half the top 500 U. S. companies and a third of the companies on the New York Stock Exchange are incorporated in Delaware, to take advantage of legal expertise and low yearly fees, though few of these firms keep headquarters here.

But even with its skyline and expressways, Wilmington feels more like a town than a metropolis. "I walk into a restaurant, and it seems half the people say hi to me by name," marveled a recently transplanted New Yorker, taken aback by the familiarity of this little big city.

I've also come to believe that everyone in Delaware knows everyone else. Irving S. Shapiro, Wilmington lawyer and retired chairman of Du Pont, supported my suspicions. "My operating premise in Delaware is that there are no secrets," he laughed. "The grapevine works very effectively."

This closeness leads to some lively politics. Who but Delawareans could sustain a tradition like Return Day? This occasion for celebration and wound binding is held the Thursday after Election Day in Georgetown in the southernmost county, Sussex. The custom lingers from an era when people had to travel to the county seat to hear election results. Today, winning and losing candidates come from all over the state to ride side by side in a parade of floats and marching

"That pumpkin house" *was the talk of Magnolia when Mayor Shirley H. Jarrell painted her home and dispelled the notion that nothing changes here but the stoplight and the seasons. "It's a good town to govern; we all know each other," says Jarrell, with son, D. R. "When I wear this hat, people know I'm free to talk town business."*

The elegance of Granogue *and like estates in the Brandywine Valley grew with the fortune of the du Pont family, who settled in northern Delaware almost two centuries ago. Granogue was built in 1923 when the family gunpowder business was expanding into the chemical empire of today's Du Pont Company. The 515-acre*

estate, still half-farmed, once held a railroad depot. The romance of steam returns when the all-volunteer Wilmington & Western Railroad runs excursions here and in neighboring Red Clay Valley. "It's a hobby keeping history alive," says fireman J. C. Nelson. "I wish you could still hear these whistles blowing far away at night."

bands. Victors have a grand time, and the defeated are scrutinized for grace.

The governor, the U. S. senators, and Delaware's lone representative in Congress turn out, even if they haven't been up for election. "I would guess," ventured 48-year-old Republican Governor Pierre S. "Pete" du Pont IV, "that well over half the state—maybe even two-thirds—personally knows at least one of us. People feel, perhaps, a little more stake in the government."

The casual, congenial governor, whose style would delight writers of *The Official Preppy Handbook*, likes to brag about his state. In six years the budget has been balanced, short-term debt has vanished, personal income taxes have fallen, and the lowest state bond rating in the country has risen to more than respectable.

How did Delaware do it? "Very good bipartisan cooperation," said Governor du Pont. "We all know each other, and if there's a problem, we can bring the people and resources together to solve it. This is why I say Delaware is small enough to work."

DESPITE ITS SCALE, Delaware is far from homogeneous. The state began as a confederacy of three counties, and, to hear talk, you might think it remains so, for county loyalty runs deep. Stacked from bottom to top—descending in size and ascending in population—are Sussex (county seat Georgetown), Kent (county seat Dover), and New Castle (county seat Wilmington). For almost a hundred years they were known as the Lower Counties of Pennsylvania until Delaware gained complete independence just in time to join the declaration of freedom from England.

But overlying county devotion is a more strident sectionalism. The world according to Delaware splits into Upstate and Downstate—Above the Canal and Below the Canal. Debating the merits of the two regions is a treasured institution.

The Chesapeake and Delaware Canal opened in 1829 to connect the two bays. World-faring ships sail this shortcut through New Castle County, no doubt unaware they are traversing a social demilitarized zone. "Our Mason-Dixon line," said Bill Frank, a journalist who has covered the state for 60 years. "Delaware is a northern state with a southern exposure. And it's a southern state with a northern exposure."

Downstaters paint northern New Castle County as an urban rat race run by aspiring sophisticates who, on the whole, would rather be in Philadelphia—and should be. Listen to Bill Collins, a dyed-in-the-wool Sussex Countian: "If I had my choice, we'd ship everything above the canal back to Pennsylvania."

Upstaters seldom retaliate. It wouldn't be proper. They just aloofly acknowledge the quaintness of "slower" Delaware, and hope that while driving to the Sussex County beaches their cars won't stall in a town where the rural accent defies translation.

The differences behind this hyperbole predate the canal, which, by accident, defined historic patterns of development.

Delaware Bay became known to Europe

Industrial might *begins in the north above the Chesapeake and Delaware Canal, where coastal Route 9 meets the Getty Oil refinery, capable of processing 140,000 barrels of crude oil daily. Getty leases much of its 5,000 acres here for farming.*

But one refinery is enough, Delaware decided, and in 1971 passed the Coastal Zone Act banning new heavy industry along the shoreline and canal.

Delaware's unique northern border, an arc of a circle with a 12-mile radius drawn from the city of New Castle, was established in 1681.

Traditional marshland living is celebrated with fried muskrat and snapping turtle soup at the fall Port Penn Marshland Folk Festival.

Mason and Dixon surveyed Delaware's northern and western borders as well as marking their most famous line, the Maryland-Pennsylvania border.

The Nanticoke Powwow gathers Delaware's surviving Indians each September in Millsboro.

DELAWARE
The First State

THE SECOND SMALLEST state started the nation by being first to ratify the U. S. Constitution. Only three states are less populated. Two-thirds of the people live in the urbanized north above the Chesapeake and Delaware Canal. Predominantly rural, Delaware has the greatest percentage of farmland on the East Coast. Size and diversity make the state an ideal microcosm for pollsters.

AREA: 2,045 sq mi (5,297 sq km).
POPULATION: 602,000.
ECONOMY: Manufacturing—chemicals, automobiles, food processing; tourism; agriculture—poultry, soybeans, corn.
CITIES: Wilmington, 70,200; Newark, 25,250; Dover (capital), 23,500.

Built-up area
National wildlife refuge
State wildlife area
State park
State forest
Marshlands

KILOMETERS 0 15
STATUTE MILES 0 15

DRAWN BY ISAAC DIDAY
COMPILED BY JOHN R. TELFER
NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

Pioneering a revival *of city living, Wilmington launched the nationwide trend of urban homesteading in 1973. Innovative banking laws and tax breaks now bring new businesses and an unprecedented building boom to Delaware's largest*

in the early 1600s, and was named for Lord De La Warr, a governor of Virginia.

The best nonmarshy coastal land was found around present-day Wilmington. Here Swedes introduced log cabins to the New World in 1638 when they built the first permanent settlement on the Christina River. The Dutch, who earlier lost a fort at the mouth of the bay through a misunderstanding with local Indians, wrestled for the territory. The English bested both.

Wilmington grew into a port of entry, welcoming Scotch-Irish in the 1700s and later Irish, Germans, Italians, and Poles. Quakers dominated the city's early industries, flour and textile mills on Brandywine Creek. Upper New Castle County, today home to two-thirds of the state's population, still leads in manufacturing.

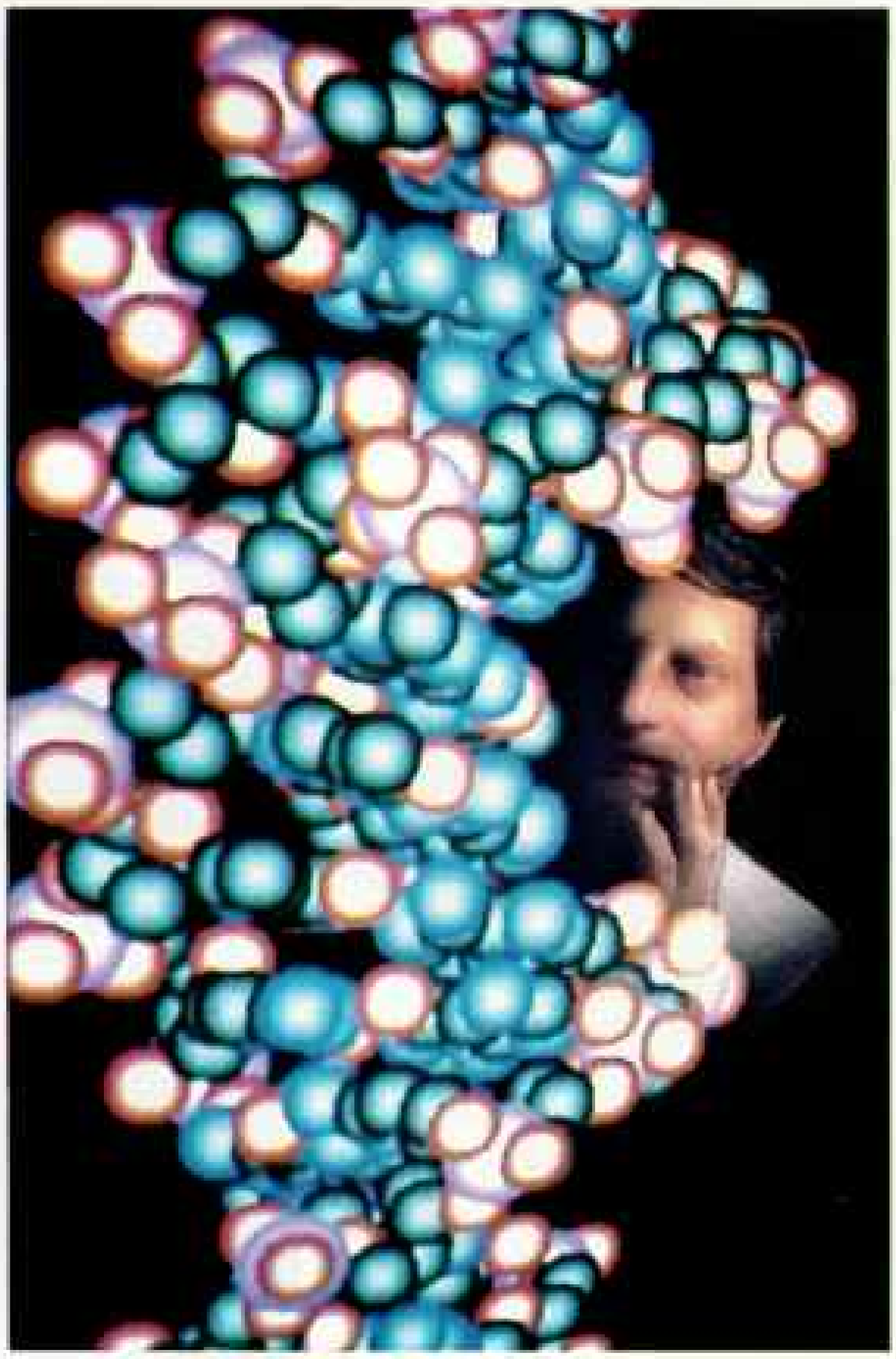
English planters, many with slaves, migrated from Maryland into Kent and Sussex Counties in the 18th century and sowed an enduring agricultural tradition. More than 50 percent of Delaware remains farmland, the largest percentage on the East Coast. Agriculture directly employs just 2 percent of the work force, but its earnings trail only manufacturing and tourism.

AS A FOREIGN CORRESPONDENT from Virginia, I plead diplomatic immunity in Delaware's cross-canal feud.

I began my explorations with language lessons from a native—photographer Kevin Fleming. The town of Lewes, he taught me, is pronounced Lew-is. Leipsic is Lip-sick, and Newark must be distinctly New-ark, or you'll be directed across the river to New Jersey.

Actually, I may have ancestral ties here myself. Vessels, I heard time and again, is a "good Sussex County name."

I sought Delaware's Vessels clan in Lewes, a quiet harbor town of 2,200 at the mouth



city—a leader in corporate law and the chemical industry. Studying a computer-generated model of DNA, Edward Caruthers probes Du Pont's latest frontier, molecular biology. Du Pont employs 8 percent of the state's work force.

of the bay and a terminus of the Delaware River pilots who yearly guide 3,000 cargo ships and oil tankers up the estuary to Wilmington, Philadelphia, and Camden.

The first stranger I introduced myself to turned out to be one Jack Vessels. We have no proof of relationship yet, but in the spirit of Sussex hospitality took to calling each other cousin. A house restorer by trade, 42-year-old Jack was transforming a 1728 home into a visitors center. Lewes draws an increasing share of the tourists who leave 135 million dollars each year along Delaware's Atlantic beaches.

This expansive 25-mile-long coastline, more than half state parkland, seems to defy crowding, even when weekends lure as many as 90,000 sun seekers. Step beyond clusters of bodies and blankets, and the surf, gulls, and gentle dunes work their magic for an audience of one.

So many of the tourists are fleeing the sullen heat of Washington, D. C., that the town of Rehoboth Beach calls itself the nation's summer capital. Delaware's beach communities—indeed, the entire peninsula—felt a sea change in 1952 when the Chesapeake Bay Bridge retired the ferries. Ocean City, Maryland, just over the border, now mirrors Miami Beach. But the Delaware towns retain quiet profiles.

MOSS WAGNER's ice-cream parlor dominates summer nightlife in Bethany Beach (winter population 330; summer population 12,000). One restaurant acquired a liquor license last summer, and the town has taken the matter to court with the refrain, "We don't want to be like Rehoboth Beach."

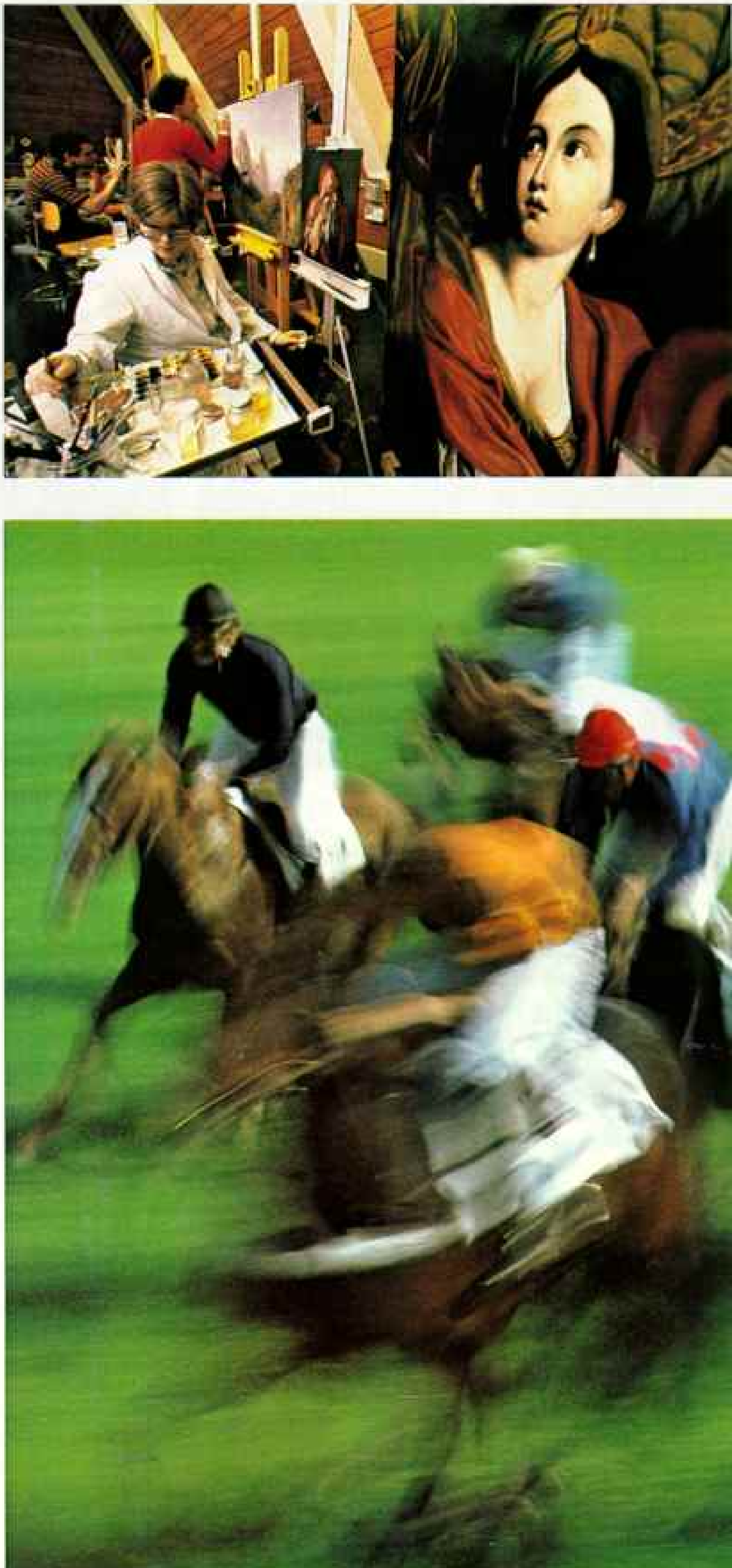
Rehoboth Beach, a conservative, church-going town (winter pop. 1,730; summer, 50,000), doesn't want to be like Rehoboth Beach either. *(Continued on page 184)*

***Grandest** of the du Pont manors, Winterthur (**top right**) was made a museum in 1951 by Henry Francis du Pont, the fifth generation to own it. Inheriting the estate in 1926, he enlarged the home and filled its 196 rooms with the world's largest collection of American decorative arts.*

"At first he thought of his collecting as simply furnishing the house," says former curator John Sweeney. "But there was also a teaching aspect. As early as 1929 du Pont had the idea that Winterthur should be 'for the education and enjoyment of the public.'"

*Pursuing that bequest, the annual Winterthur Point-to-Point Races (**right**) attract some 10,000 spectators in early May when the gardens of the 963-acre estate peak in spring bloom. Proceeds aid the museum's operation.*

*Winterthur, with the University of Delaware, established the first graduate program in American decorative arts. The two also sponsor one of the country's three major art conservation programs. In the training studio (**top left**) instructors and students restore works from Winterthur and other collections.*



A swing and a miss *seems an easy call. And with a tire for an umpire, you can't argue back. Any pitch thrown through the hole is an automatic strike by the rules of this pickup game in Leipsic, a village of 228 people fronting the Leipsic River.*

*Leipsic and other coastal towns thrived on oystering until a parasite invaded Delaware Bay in the late 1950s and wiped out the industry, today barely recovering. The few boats still docked in Leipsic, like this crabber (**right**), chug out at dawn largely for the blue crabs and fish that Delaware's fisheries supply to Northeast restaurants.*

A full-throttle day *breaks as Leipsic watermen Alan Pleasanton, at the helm, and Jimper Fox* ***(below)*** *head out to bait crab pots in the Delaware Bay and River. A good haul will land 15 to 20 bushels, but fluctuating prices and productivity make life on the water chancy. "If you can't accept that, you might as well work in a factory," says Alan, who also fishes and traps eels.*

Commercial watermen and charter fishing boats share the estuary with oil tankers and merchant ships that travel a path dredged up the center. Heavy shoaling frustrated an early explorer, Henry Hudson, who retreated in 1609 to leave his name on another bay. "The problem with Delaware Bay," says one captain, with a bit of salty exaggeration, "is that you can get out and walk almost anywhere."

"We've toughened our disturbing-the-peace laws and noise ordinance, and cracked down on group rentals," explained 42-year-old Mayor John Hughes. "We want to be a family town. We don't mind singles, but we don't want to be a swinging town."

Demographics being what they are, there are plenty of single tourists. Bars and restaurants cloned from Washington establishments do brisk summer trade.

The Washington-born mayor understands these rites of summer. Rehoboth and its famed boardwalk have figured in every summer of Hughes's life; his parents built a beach house here in the late 1920s.

"My friends and I used to have wild times," he recalled. "But the town is less tolerant of high jinks now because this is home to more people. When my wife and I moved here permanently in 1964, there wasn't another person on our block that winter, and only a few stores stayed open. Now about 30 percent of the businesses go year round, and we have a better class of stores."

Retirees account for much of the population increase, a phenomenon felt throughout Sussex County as tourists who once dashed through to the shore take off their blinders. The county population jumped 22 percent in the past decade to 98,000—the largest growth in the state and almost double the national average. Greater job opportunities are also keeping native Sussex Countians home—and luring them back—after decades of brain drain.

"It's taken a lot of people by surprise that folks are interested in Sussex," said Dick Carter, the county's 35-year-old historical preservation planner. Sussex is hoping to attract small, quality manufacturing.

"Agriculture is the backbone of the county's economy, but we want to give our people choices," he explained. "And we need more control over our destiny than rampant coastal development allows. I think our discovery by the outside world is going to be the dominant theme for the next generation, and we want to keep Sussex halfway decent."

This is the tightrope also walked by state-level development planners. How to diversify the economy—heavily dependent on chemicals, agriculture, and automobile assembly—without sacrificing Delaware's homegrown charms?

In 1971 the state blocked the Shell Oil Company's plans to build a refinery in southern New Castle County by creating the Coastal Zone Act, prohibiting new heavy industry along the coastline and the Chesapeake and Delaware Canal.

"Unfortunately, the action was interpreted as meaning Delaware wasn't interested in business growth," said Nathan Hayward III, the energetic director of the Delaware Development Office. "We set out to change that image, and I think we're doing the job."

The 1981 Financial Center Development Act broke new ground in this effort. It allows out-of-state banks to operate in Delaware, entices them to do so with tax incentives, and eliminates the ceiling on interest rates; banks can charge what the market will bear. Twelve banks including Chase Manhattan, Citibank, and Chemical Bank have established subsidiaries.

In another innovative move, the state has petitioned the U. S. Department of Commerce to establish a foreign trade zone in the Kent County town of Wyoming. Orange-juice concentrate would be imported from Brazil, processed in an old Wyoming cannery, then exported duty-free to Canada or any foreign port.

I ALSO found Delaware recycling its architectural past into a future.

Overlooking Broad Creek in southwest Sussex County, the immaculate white houses, narrow streets, and tiny general store of Bethel create an illusion of a toy village come to life. The largest homes, built at the turn of the century, belonged to ship captains and ship carpenters. In those days Bethel prospered as a shipbuilding center, sending vessels down-creek to the Chesapeake Bay.

A 1955 Delaware guidebook describes it as a ghostly, albeit charming, "forgotten backwater." Still marvelously in the middle of nowhere, Bethel has been restored as a bedroom hamlet by people who want to retire or raise children in a rural setting, yet can take advantage of services and jobs in nearby Laurel or Seaford, where Du Pont operates the world's largest nylon plant.

George and Andi Martz moved here four years after George took a teaching job in Laurel. "It sounds crazy, but when we lived

in Laurel, I never knew Bethel existed," said Andi, who grew up in Rehoboth Beach and Wilmington. "We didn't expect to stay, but the longer we did, the more we liked it. It's not the social whirl of Wilmington, but I don't have to worry when my daughter rides her bike down the street. It's a very uncomplicated life."

Most of the hypnotic miles of farmland around Bethel, like 90 percent of Delaware's tilled acreage, grow soybeans and corn. It's chicken feed; all but a fraction of the harvest nourishes broiler chickens—180 million of them last year—which account for 55 percent of the state's agricultural income.

Delaware ranks eighth nationally in broiler production, but no U. S. county grows more chickens than Sussex. The modern poultry industry began here 60 years ago when Cecile Steele of Ocean View (two miles inland from Bethany Beach and an ocean view) hatched the simple but revolutionary idea of raising chickens as a year-round eating commodity, not merely as castoffs of the fresh-egg industry.

Chicken growers today are foster parents to their flocks. Virtually all 1,200 of Delaware's growers are under contract to one of

Broiler chickens lay a golden egg *for Delaware, producing 55 percent of its farm income, and for Frank Perdue, chairman of the region's largest poultry company. Here he shoulders one of the 180 million chickens that went to market last year from this state, where the modern poultry industry began in 1923.*

the nine poultry companies on the Delmarva Peninsula. The company provides chicks and feed, then processes and markets the birds. The grower owns the chicken house and pays the electric bill. The house lights shine almost continuously to encourage gluttony as feed pans automatically refill.

Chickens grow bigger and faster thanks to breeding, nutrition, and technology. The pioneering Mrs. Steele needed four months to raise a two-pound bird. Today Judy and Fletcher Webb of Ellendale can ship a seven-to-nine-pound roaster in 12 weeks.

"We sold the dairy cows and went into the chicken business four years ago," said Fletcher, who farms 300 acres of, yes, soybeans and corn. The Webbs raise 174,000 chickens a year in two 400-foot-long houses.

We walked into one house and greeted thousands of Judy's ten-week-old "babies." "People tease me and ask if I'm knitting them bootees," she said, walking among her chattering flock. I averted my eyes as visions of dinner crept to mind. "They don't particularly care for Fletcher," she confided, "but I talk to them all the time. I think that makes a better bird."

Maybe so. The Webbs' contractor, Perdue Farms, named them 1982 roaster growers of the year.

Harvesttime farmhands *kick up Kent County dust, digging and sorting potatoes. With the decline in local canneries and the boom in poultry, most*

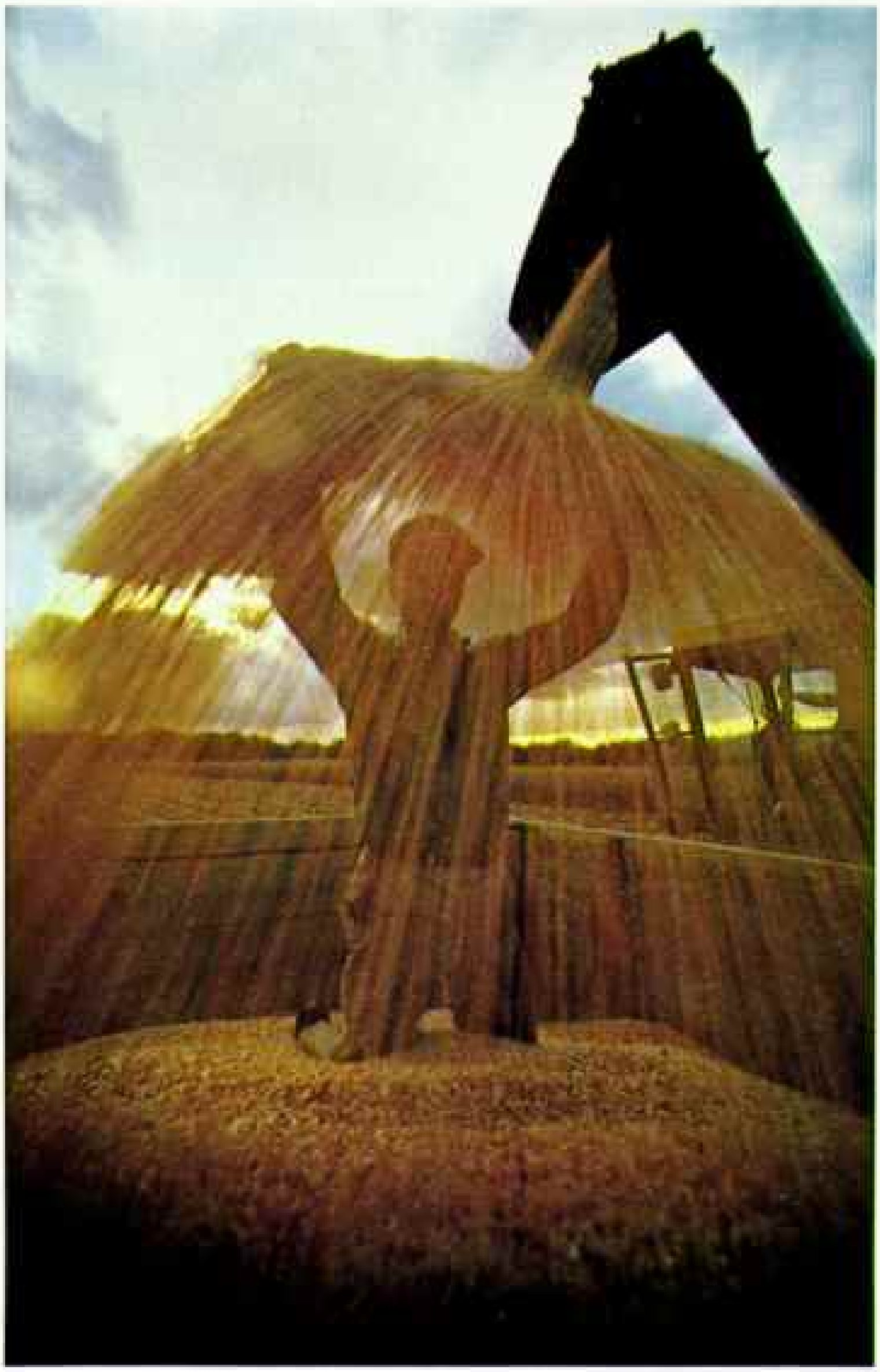
IN KENT COUNTY, just south of Dover, I found the center of the universe. It's a quiet town, and I almost drove through without realizing I was there. What made me veer recklessly to the side of the road was the sight of a magnificent home and its outbuildings painted in shades of peach. It's the mayor's house, and the sign in front declares: "This is Magnolia, the center of the universe around which the earth revolves."

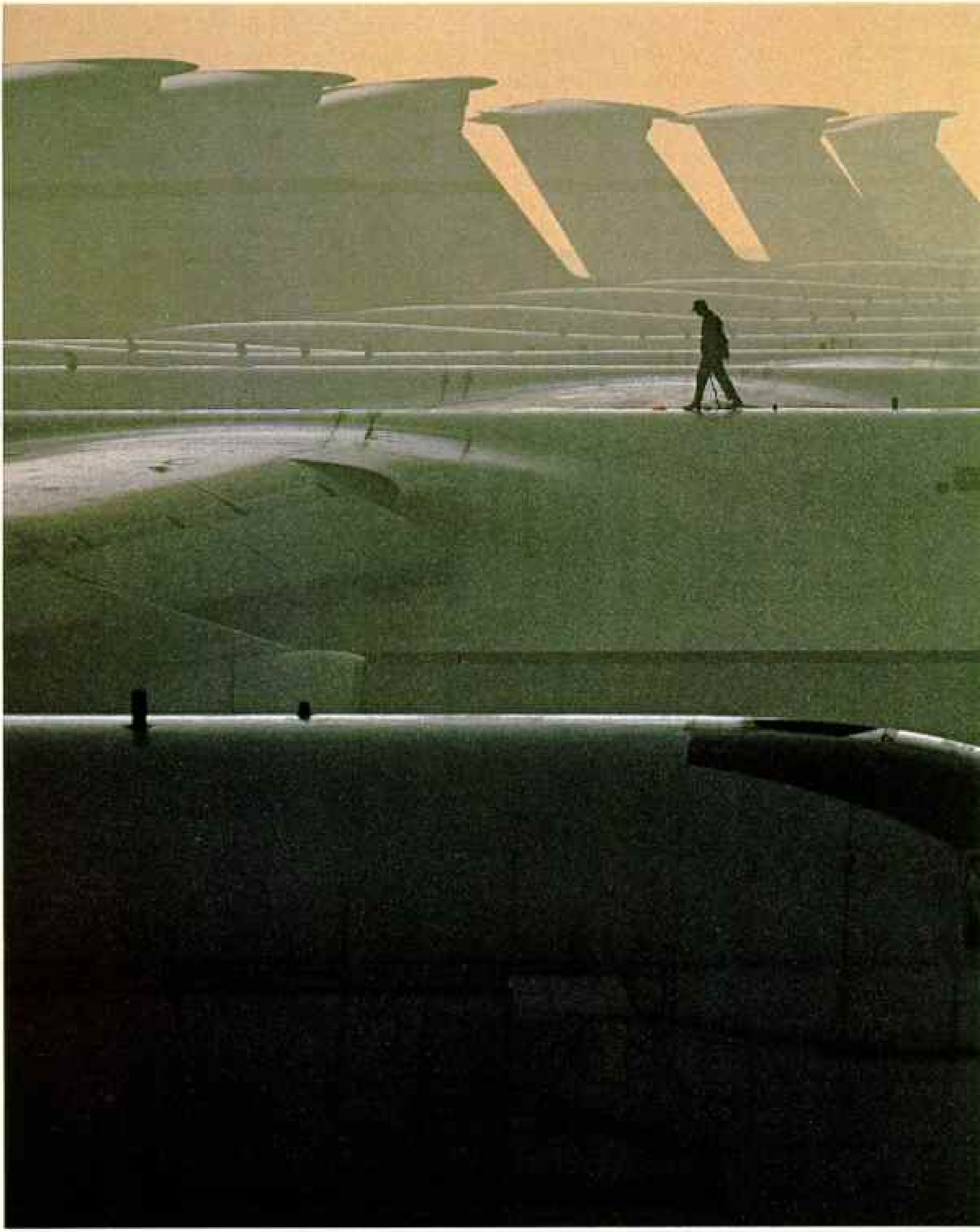
"We call Magnolia that because our boundary is a circle, a symbol of brotherhood," explained Shirley Huddleston Jarrell, a dynamo of a mayor who also teaches and raises a young son alone. She chose those arresting colors because her house was built by a wealthy peach grower at the turn of the century. A blight ended Delaware's national dominance as a peach producer about that time, but orchards thrive again in the area today.

"I find peaches and potatoes and such on my doorstep because people know I don't farm," Jarrell said of her town's spirit. "My neighbors will wash my dishes or cut my grass during the day. We help each other out. You miss that in today's time."

Whatever its position in the cosmos, Magnolia proved itself a force to be reckoned with when it challenged the U. S. Census

of the rich farmland now grows soybeans and corn for chicken feed. Lost in a shower of kernels, a worker raises a board to distribute corn in a truck bed.





World's largest airplanes, *C-5A Galaxies prep for flight at Dover Air Force Base, busiest military air cargo port on the East Coast and home to half the U. S. C-5A fleet. The 83-yard-long jet, designed to carry outsize military equipment, could hold six Greyhound buses. Peacetime missions include airlifting mobile hospitals to worldwide disaster areas and carrying limousines and security vehicles for presidential travels.*

Dover AFB also operates the nation's largest military mortuary. The more than 900 dead from Jonestown, Guyana, were brought here in 1978.

Vital to the local economy, the base may expand if the Air Force stations some of the new C-5Bs at Dover. That plane is as controversial as the C-5A, an aircraft that ran two billion dollars over budget and is criticized as needlessly large and expensive to maintain and fly.

Bureau. "The 1980 census counted only 197 people," Jarrell said. "The postmaster, the town council, and I went door to door and came up with 327 people. I could not believe they couldn't count correctly in a circle half a mile wide. We would have lost a part of our federal revenue sharing, which is very important to us since we only take in $2,870 in property taxes."

A government recount raised the official tally to 283, and the center of the universe kept its federal funds.

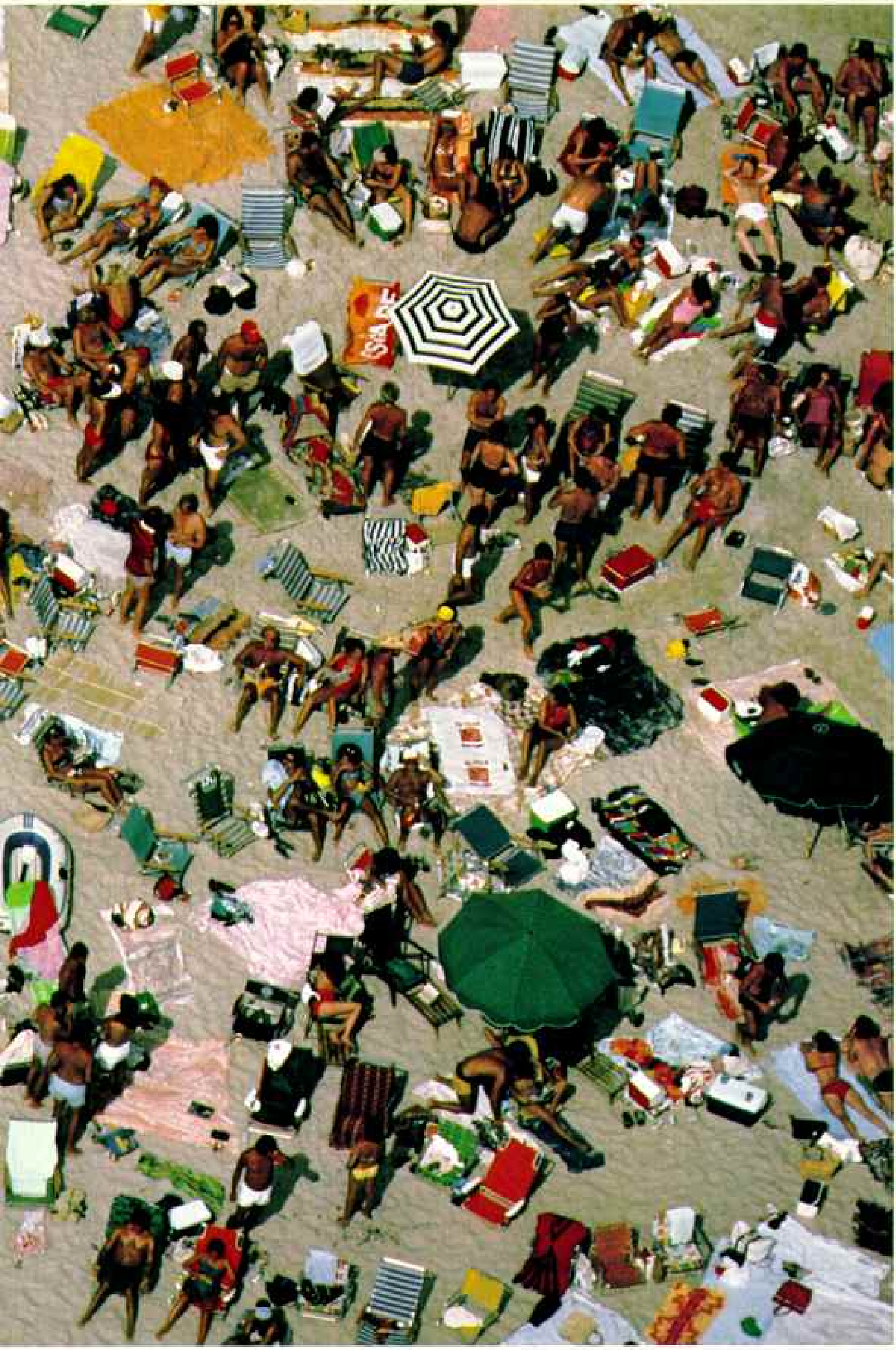
THOSE 44 UNCOUNTED SOULS in Magnolia aside, Kent County's population growth echoes that of Sussex. New housing widens the suburban spread around the historic capital of Dover. Since World War II, Dover Air Force Base and manufacturers like General Foods and ILC Dover—where the Apollo space suits were built—have lessened dependence on agriculture, though about half the county is still farmed.

An Old Order Amish community of 235 families tills land west of Dover with horse-drawn plows. There is also a sizable Mennonite community, "more progressive in worldly ways," Amish farmer Henry Byler told me. "They use cars and electricity." His ancestors, like those of most of these Amish, came to Kent early in this century, not directly from Pennsylvania but from the Midwest, where they had migrated earlier.

Byler shares his 105-acre farm outside Cheswold with his oldest child, 27-year-old Junior. But he worries about land for his younger sons. "Land's getting so it's not available," he said. "One group went out to an area of Kentucky where land is not as expensive. It's not as productive as this soil, but they manage."

East of Dover thousands of acres of federal and state wildlife refuges attract increasing numbers of Canada and snow geese that migrate each fall down the Atlantic flyway.

A beach-blanket quilt *spreads each summer when as many as 90,000 tourists weekend on Delaware's broad 25-mile-long Atlantic coast. The small beach communities winter quietly—and count multimillion-dollar profits.*



Day breaks, and the V-line squadrons soar in mournful song and precision flight that make your heart ache to join them. And perhaps warn them about hunting blinds as they head inland to feed.

"Thirty years ago, if you came home with a couple of geese, you had something to talk about," one hunter said. "There are 200,000 geese out there today because our farms are now growing soybeans and corn, and mechanical harvesters leave a lot behind."

A knockdown goose-feather pillow fight seemed to be raging when I dropped by Alan Pleasanton's picking shop in Leipsic during November hunting season. Hand a goose and $1.50 to Alan, and five minutes later it's ready for cooking. His mechanical picking machine drums off feathers with rubber fingers. Six-year-old daughter Nan does her best to help.

"Nan loves to gut," said Alan, watching most of her arm disappear into a goose. "But you just know by the time she's big enough to really help, she won't want to."

Bird picking begins the winter work cycle for Alan, a 32-year-old waterman of linebacker girth. Mid-December he starts trapping muskrats on 200 acres of marsh up the Leipsic River. February ice breakup on the Delaware Bay, 11 miles downriver, brings gillnetting for perch and rockfish, then shad and trout. April to November he sets pots for eels and blue crabs.

Few men still ply the water and marsh year round, weathering unpredictable productivity and prices. The oyster industry, once the lifeblood of Leipsic and other coastal towns, collapsed in the late 1950s when a parasite infested the bay. Seeding operations have helped, but "oysters look bleak," as Alan told me.

"Crabs and eels? Seems I worked last summer for the hell of it. I've had years I caught fewer, but I'm getting prices of ten years ago with operating costs of today. Still, if you can scratch out any kind of living doing what you want, I say you're ahead of most people."

Cross into upper New Castle County on bridges soaring above the canal, and the panorama foretells a different world. Smokestacks rise from the riverfront Getty Oil refinery, a Delmarva Power and Light generating station, and other plants mostly built before the Coastal Zone Act. The land has begun the slightest of rolls out of the coastal plain, so even the remaining farms take on a different cast.

Most of the state lives on this northern one-sixth of the land, largely in greater Wilmington and Newark (New-ark, remember), home of the University of Delaware.

The energy level quickens as you encounter expressways, the Port of Wilmington, and heavy industry, including two automobile plants, a steel mill, and the Amtrak repair yard for the Northeast. The chemical companies—led by Du Pont, Hercules, and ICI Americas—dominate manufacturing.

Yet silence caresses the pastoral areas of northern Delaware, where narrow roller-coaster roads pass old stone houses, clapboard horse barns, and split-rail fences. This is land preserved by the wealthy, nicknamed Château Country for the estates owned, most noticeably, by du Ponts.

THE DU PONT legacy in Delaware dates from 1802, when French immigrant Eleuthère Irénée du Pont built a gunpowder mill on Brandywine Creek north of Wilmington. His father, Pierre Samuel du Pont de Nemours, didn't think much of the idea.

Today explosives are just a pop in the company's 33-billion-dollar annual sales. Du Pont launched a chemical empire early in this century with dyes and pigments. In the 1930s it perfected Freon for refrigeration and invented nylon, the first totally man-made fiber. Orlon and Dacron followed. Add agrochemicals, plastics, pharmaceuticals, medical diagnostic equipment, and electronics. About 70 percent of Du Pont's goods are based on petroleum products, so in 1981 it became an oil company as well, buying Conoco for 7.8 billion dollars.

Although most Du Pont products are made out of state, their invention occurs mainly at the 147-acre Experimental Station near Wilmington.

In her laboratory there, research associate Stephanie Kwolek handed me a jar labeled 1965. What looked like opalescent nail polish was one of her earliest solutions used to spin Kevlar, a new generation of synthetic fiber five times stronger than an equal weight of steel. After a 15-year research

effort by many scientists, Kwolek's breakthrough occurred "unexpectedly," she said modestly. A significant percent of the nation's graduate-level chemists work in Delaware, but, with only a bachelor's degree, Kwolek has earned 16 patents since joining Du Pont in 1946.

Marketed in 1972 as a tire reinforcement, Kevlar has become the preferred material for bulletproof vests. Cables of Kevlar may soon anchor oil rigs, and the U. S. Army has ordered Kevlar-reinforced helmets.

THE DU PONT COMPANY and the du Pont family are no longer synonymous. The 2,000 or so living descendants of Pierre Samuel du Pont—their collective worth estimated to be at least 8.5 billion dollars—live largely outside Delaware. Their interests are diverse, their wealth less concentrated.

"The great period of du Pont family influence was 1910 to 1960," Delaware historian John A. Munroe told me as we played "what if?" and tried to imagine Delaware without du Ponts. "I think the state would be both better and worse off today," he said. "Certainly on the whole, worse. But some things might be better if the state had been forced to do them on its own. There's still a tendency to think that rich people are going to take care of things."

If the tremendous du Pont gifts were sometimes tied with political strings, they also helped push Delaware—at times kicking and screaming—into the 20th century.

T. Coleman du Pont instigated and financed most of the first paved state-long highway that opened in 1924.

His cousin and political enemy, Alfred I. du Pont, mailed checks to the elderly from 1929 to 1931 while the state stalled in enacting a pension plan.

Another cousin, Pierre S. du Pont, almost single-handedly modernized Delaware's school system during the 1920s.

Those three cousins had joined forces to keep the Du Pont Company from being sold outside of the family in 1902, and their decision to build a 12-story headquarters in Wilmington brought new direction to the city.

New blood and a building boom are surging into Wilmington today with the arrival of out-of-state banks. This corporate and chemical capital of America is putting money on becoming a financial center too.

Anticipating banking expansion and new businesses lured by city tax incentives, developers are pushing new buildings into the skyline at an unprecedented rate. Hopes and plans are ambitious for this city that grew up in the shadow of Philadelphia, which it resembles. The spirit is contagious.

"Wilmington feels like a city waiting to happen," observed one newcomer.

"We're watching a child being born," echoed Don Callender, director of the city's new Convention and Visitors Bureau. Now he and others are trying to figure out what to call this new baby. "We have an identity crisis," he told me. "Chemical Capital? Corporate Capital? These images don't conjure up all the reasons why you'd want to come to Wilmington."

Nevertheless, visitors annually spend more than 200 million dollars in the city and surrounding New Castle County, touring museums and estates like Winterthur, where Henry Francis du Pont amassed the largest and most comprehensive collection of American furnishings.

Residential downtown Wilmington has been rebounding during the past decade with renewed interest in urban living and restoration. Some of the renovation has occurred through urban homesteading, a program pioneered here in 1973 that spread across the country. One dollar buys an abandoned house from the city in exchange for fixing it up and living in it at least three years. An innovative lease-purchase plan is helping lower income families become homeowners in new developments.

Close-knit Italian and Polish communities withstood the turmoil of the 1960s when urban renewal razed blocks of black neighborhoods and Interstate 95 cut through the middle of the city. Wilmington, once an important center on the Underground Railroad, is more than 50 percent black.

NESTLED in one of the poorer black communities that escaped the bulldozers, the Christina Cultural Arts Center has emerged to provide inexpensive, quality training for aspiring artists and anyone moved by Mozart, gospel, jazz, ballet, drama, or painting. Hundreds of

students, mostly blacks, study here each year. Joseph Brumskill, the center's director, sees that percentage changing.

"People are just beginning to realize what we offer," he said. "Our purpose is to take art to the whole community, but this must remain the place where blacks train and learn of their heritage because there's no place else like it in the state."

A fashion designer, Brumskill volunteers his talents to create costumes for Opera Delaware. Its performing headquarters, the newly renovated 19th-century Grand Opera House, also houses the Delaware Symphony, whose season ticket sales have climbed from 700 to 5,000 since 1979.

That year marked the opening of the Delaware Theatre Company, the state's first resident professional drama group. "The theater here has proved to be a wonderful social occasion that unites all types of people," said Cleveland Morris, the company's cofounder and artistic director.

Perhaps, as Brumskill and Morris hope, arts can help harmonize racial relations in upper New Castle County. Five years ago school districts were merged to correct de facto segregation that had occurred as whites moved to the suburbs and left city schools almost 90 percent black. Private-school enrollment rocketed. But now integration is beginning to take hold.

Ironically, the first court order to admit black students to segregated white schools in the U. S. was directed at two New Castle County schools in 1952. That ruling went with other cases to the U. S. Supreme Court and led to the 1954 decision that separate but equal is not equal.

ONE New Castle town actually integrated its school in 1952. But I wasn't surprised to learn that about Arden, where the first bumper sticker I saw read "Don't just follow a leader, be one."

This garden town of 516 individualists northeast of Wilmington is one of the few planned utopian communities in the U. S. surviving, more or less, the way its founders intended. Arden was launched in 1900 by disciples of an economic philosophy called the single tax. All residential land is owned by three trustees who lease it to the residents. That rent is the only—the single—

Classic American realism *links Wilmington sculptor Charles Parks with painters of the Brandywine School such as the Wyeths. Parks's model of William Penn will become a life-size bronze for the town of New Castle, where Penn first landed. Shipping his 32-foot steel Madonna* (**right**)*, wrought for a California church, proved an art itself.*

Reflections of great egrets *glide through the marsh in Bombay Hook National Wildlife Refuge, 15,000 acres on Delaware Bay set aside for migrants of the Atlantic flyway. Autumn calls some 200,000 Canada and snow geese here and to marshes across the state. Deer peek shyly through the brush, mustering confidence to stroll and feed. Such simple, quiet pleasures abound in this state of gentle tableaux.*

tax. The parks covering nearly 45 percent of the town are owned by all.

"The single tax idea works for Arden, but it's not an important issue today," said Cy Liberman, chairman of the trustees. "What makes this a strong community, and such an enjoyable one, is the high level of community activity and the tradition of the town meeting. We have an active center with groups called gilds. There's a folk dancing

gild, a gardeners gild, a players gild, a dinner gild. We have Saturday suppers for about 100 people. It costs only $3.50, and it's fun to have dinner with your neighbors."

Many years back, the free spirits who settled Arden earned an overblown bohemian reputation. "Imagine," said Joan Ware Colgan, who grew up here, "even in 1963 my daughter came home from school crying because her teacher said Arden had been a nudist colony and hotbed of free love."

I found Arden's spirits still free, but their activities shouldn't raise an eyebrow today. It struck me that Arden, designed to break the mold, conforms in its own way to the Delaware ideal—professed upstate and down. That life is best lived on a scale where everyone's hand leaves a print, and that a future without the best of the past isn't worth a darn. □

THE BIRD MEN

By LUIS MARDEN
Photographs by CHARLES O'REAR

THIS IS *FLYING*. The wind presses the goggles to my face. I am strapped in a bucket seat with nothing around and beneath me but space. I look past my feet to the brown California hills and the bank of gray cloud covering the Pacific a thousand feet below.

Pressing lightly on the left pedal, I move the control column to the left. My left wing drops, and the runway revolves below me. I close the throttle, and the engine's whine drops to a mutter. Now I can hear the wind singing through the flying wires. I drop my nose—I mean my feet—and point them at the head of the runway. The grass strip floats slowly upward, and I am enveloped in the heavy sweet scent of orange blossoms. At 20 feet I flare out parallel to the ground. As in dream flight I settle slowly; the two main wheels touch the ground, and a fraction later the nosewheel comes down.

I have made my first solo flight in an ultralight airplane, a miniature flying machine of aluminum tubing and Dacron sailcloth so simple it has been called the flying bicycle. The brightly colored machines, resembling dragonflies in shape and translucence, rise in ever increasing numbers from open fields and backyards. Requiring as little as 50 feet to take off and land, the low and slow aircraft have finally brought the miracle of flight to the average citizen, and as many as 20,000 of them are flying.

INSECTS IN AMBER, *three man birds wing past the sun. Ultralight airplanes, minimum flying machines of sailcloth and aluminum tubing, enable anyone to soar with the birds. Thousands now fly from back lots and pastures.*

THE COLLECTION VIOLLET, PARIS (ABOVE); © 1971 FRANK WRIGHT (BELOW LEFT)

Pioneer flier, *Icarus of Greek legend* ***(below)*** *soared on feather-and-wax wings that melted when he flew too near the sun. Bamboo and silk were used for the world's first ultralight* ***(above)****, the translucent Demoiselle (Dragonfly), built by Brazilian Alberto Santos-Dumont in 1907 and refined in 1909. Its design anticipated today's Quicksilver* ***(right)****, here being towed to simulate flight for a student.*

To fly like a bird, to cast off the bonds of gravity and soar free, wheeling through the sky with the wind rustling past our outstretched wings—who has not done so in his dreams?

Flying is the oldest dream of man, a heritage perhaps of the days when our cave-dwelling forebears looked longingly upward at the arrowing of birds overhead as they slogged through the underbrush in pursuit of the mammoth.

Although two-thirds of all living creatures can fly, man was chained to the earth. Down the centuries, daring pioneers tried to break out of the gravitational prison with artificial wings. Drawn back to earth as inexorably as Newton's apple, many fell to their death like Icarus of legend.

Though some of the most brilliant minds of history attacked the problem, the immemorial dream was not realized until one cold December morning in 1903 when two American brothers rose from the sands of North Carolina to bring wings to man.

With the first flights of Orville and Wilbur Wright the flying age had arrived at last, but the outbreak of a world war soon turned the airplane into a killing machine. A generation later a second holocaust completed the transformation; the airplane had grown too fast, complicated, and expensive for any but the rich or subsidized.

After both wars, designers heralded flying machines for everyman, but somehow the Model T of the skies never materialized. Ironically, wings for the common man had to await the dawn of the space age to revert to the simplicity of their beginnings.

Sky knives slash morning mist *as a squadron taxis toward takeoff at Florida's annual Sun 'n Fun flying meet. Each spring the Experimental*

Otto Lilienthal, the great German aeronautical pioneer whose work before the turn of the century inspired the Wrights, had fashioned batlike wings of willow and linen with which he made more than 2,000 glides. He jumped off hills, hanging from the wings by his arms, and controlled his attitude by swinging his body. A stall and fall ended his life in 1896.

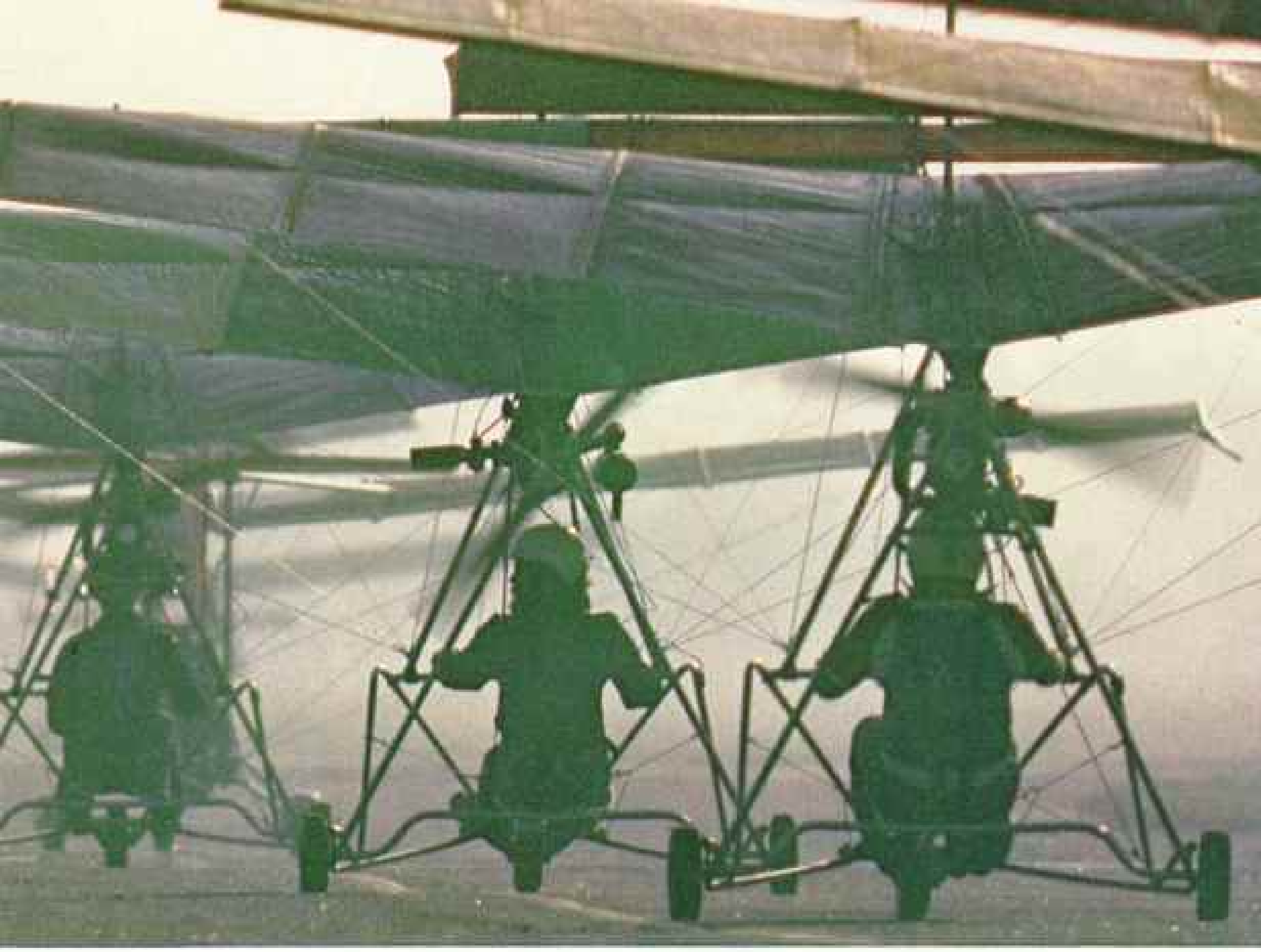
In 1951 Francis M. Rogallo of the National Aeronautics and Space Administration patented a new kind of airfoil shaped like an obtuse V. The fabric parawing, unstiffened by intermediary ribs, bellied upward on both sides of a central spar.

"I designed it to bring the fun back to flying," says Mr. Rogallo. His simple and elegant design was the spark for a rebirth of hang gliding.

The Rogallo wing was easy to construct of Dacron and tubing, and in the 1970s ski slopes seemed to be covered with brilliant butterflies as the new hang gliders trudged up the hills to leap into space. Inevitably, the fledgling man birds began to crave more than a simple glide downhill.

BIOLOGISTS have a saying: Ontogeny recapitulates phylogeny; that is, an embryo goes through all the stages followed in the evolution of a species. So with the evolution of glider into ultralight; designers of the embryo everyman's airplane recapitulated the aeronautical development of 75 years in less than a decade. Some strapped a small chain-saw engine and propeller to their backs and, buzzing like hornets, tried to stretch a glide begun from a slope. None worked well until 1975, when the stage was set for another Kitty Hawk. The Orville Wright of the new era was John Moody of Wisconsin.

"I didn't mean to reinvent the airplane," he says. "I wanted to fly and have fun. I



Aircraft Association's fly-in opens the sport-flying season. At the 1983 meeting 600 ultralights outnumbered other types of home-built craft.

bought a biplane glider in 1973, but I got tired of not flying it. In a year and a half I had accrued about ten minutes of air time.

"In March of 1975 I was ready. I rigged a ten-horsepower engine and propeller; my legs would be the landing gear. It was a cold day, and the only smooth surface was a frozen lake. I started the engine, picked up the glider, and ran. In a few yards I was airborne, skimming a few feet above the ice. I made four flights and finally flew a mile and a half down the lake.

"This was the first successful flight from the level of a powered hang glider."

Success four flights . . . started from level with engine power alone.

ORVILLE WRIGHT, DECEMBER 17, 1903

"Later I took my machine to an airport, made a circuit at 300 feet, and landed. Next day I had a call from the Federal Aviation Administration, wanting to know if I was operating an unlicensed airplane. I told them it was a powered hang glider." Not for six years would the FAA make up its mind about what to call the new machines.

In September of 1975 Moody flew 16 miles cross-country for the first time, and word of his pioneer flights quickly spread. The race to add power was on.

The Wrights' *Kitty Hawk Flyer* had weighed 605 pounds, seven times the weight of Moody's powered glider. Even with the addition of landing gear and bigger engines, powered gliders weighed only 150 to 250 pounds, hence the name ultralights.

Only four years after the Wright brothers first flew, a Brazilian living in Paris had designed the ancestor of all ultralights. Alberto Santos-Dumont, already world famous as a designer of small dirigibles, in 1907 built a miniature high-wing monoplane that weighed 243 pounds and had a two-cylinder, 20-horsepower engine that drove

ANGEL'S-EYE VIEW: *Normandy's abbey of Mont-Saint-Michel tilts under the wing of a trike, a transitional air vehicle between hang glider and ultralight. European enthusiasts fly increasing numbers of the personal aircraft.*

ALAIN BUILLOT

the machine at 48 miles an hour—common specifications of today's ultralights.

Most designers and builders of ultralights are in their 20s and 30s, like John Lasko, a young man of 25 who began flying at 15. John, of Eipper Aircraft near San Diego, supervised my first solo flight. Eipper's machine, the Quicksilver, the one I flew, is the largest selling and the most copied ultralight in the world.

John examined old drawings of Santos-Dumont's machine. The airframe, startlingly like the Quicksilver, was built of bamboo and varnished silk. When Parisians saw its translucent wing against the sky, they dubbed it Demoiselle, Dragonfly.

***Flaming maples** and white church spire, symbols of New England, pass beneath a Vector piloted by Bernt Petterssen (**facing page**). The Massachusetts-built ultralight placed first in a British performance survey.*

*Fill 'er up! A small boy stares as a Pterodactyl ultralight pulls up to a fuel pump to take on the legal maximum of five gallons (**above**).*

"The great difference between our ultralights and their ancestors," said John, "is that we use aluminum tubing and impervious sailcloth that needs no dope or varnish. We began making aircraft with engines in 1977. In early models the pilot maneuvered by shifting his weight. The current Quicksilver MX uses stick and throttle controls, climbs 800 feet a minute, and reaches a service ceiling of 12,500 feet. Yet it takes off and lands in 50 feet at 23 miles an hour.

"We have tried to reduce human flight to its essence, and I think we have succeeded."

The public seems to agree. More than 7,000 Quicksilvers have been sold, one-third of all ultralights flying. Eipper grossed more than nine million dollars in 1982.

"The recession has cut sales of general aircraft in half," said Lasko. "One month last summer we came within one unit of selling as many aircraft as Piper, Cessna, and Beechcraft combined."

TWO OTHER MAKES follow on Quicksilver's heels. They are the Rotec Rally, a design, like several others, similar to the Quicksilver, and American Aerolights Eagle, a canard (tail in front). These three companies do a multimillion-dollar business in a field that did not exist five years ago.

Besides the big three, there are more than 50 other ultralight manufacturers in the United States. Many started, in the American tradition, in garages or basements.

"Nearly everyone wants to fly," says John Lasko, "but until now you had to have a lot of money to fly an airplane."

Most ultralights are sold as kits and cost between $4,500 and $6,500. The Quicksilver is shipped in three cartons and a tube and takes about 40 hours to build. Makers have done the necessary cutting, drilling, welding, and sewing, and all the would-be flier has to do is assemble with hand tools.

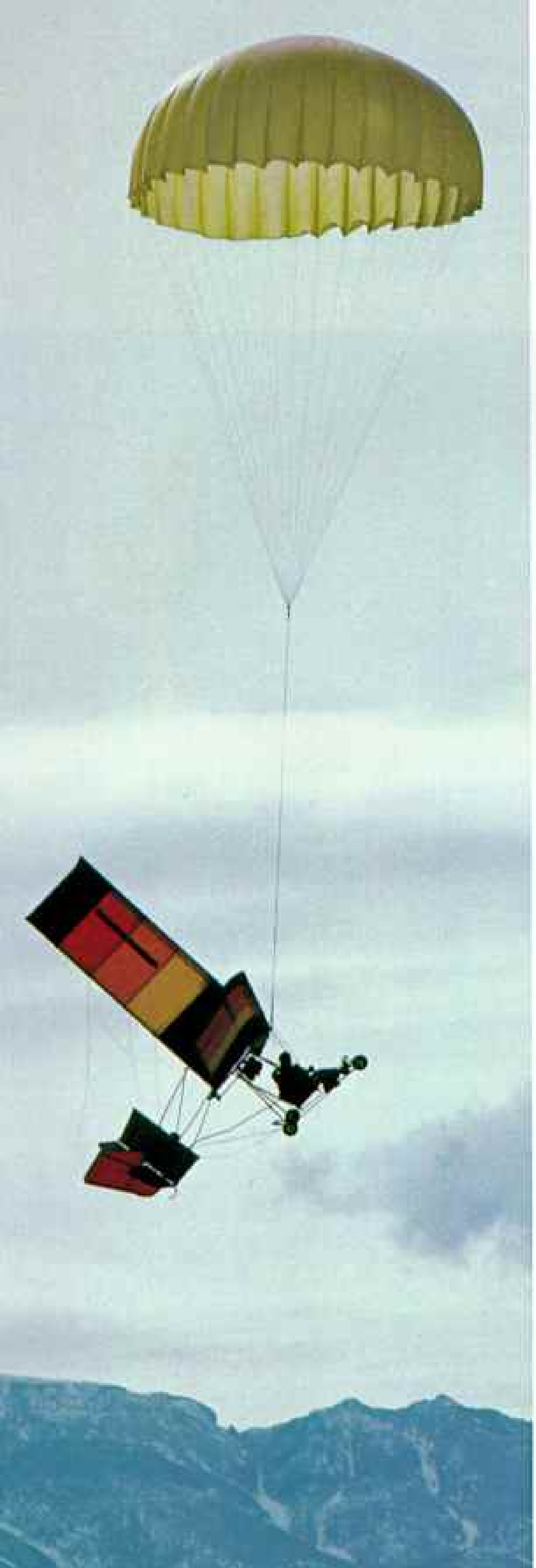
"People ask me how safe is ultralight flying," John Lasko says. "It's as safe as the pilot makes it.

"Ultralights are so easy to fly that the danger is that the new owner with no experience may jump into his machine and take off." Eipper and other reputable makers require dealers to inspect the finished machine and train the owner to fly.

Assembling your own ultralight

NATIONAL GEOGRAPHIC PHOTOGRAPHER OTIS IMBODEN (ABOVE); BRETON LITTLEHALES (BELOW)

*GIANT ERECTOR SET: Kit for building a Quicksilver flying machine is spread for inspection (**below left**) by Bob Deffenbaugh, Margo Daniels, and Tom Haddon of Gaithersburg, Maryland. A completed Quicksilver stands in background. After 40 hours of assembly, author Luis Marden takes off in his specially patterned Red Baron for a test flight (**left**). Jack McCornack ships his Pterodactyl in seven cartons and a tube (**below center**). John Horn of Wyoming (**below right**) studies instruction sheets as he spreads wing spars and fabric covering on his living-room floor. Shrink wrapping holds small parts (**bottom center**); builders cut them free as needed. One maker even furnishes the razor blade.*



"Ultralights do not have to be registered, so there are no accurate statistics. In 1981 there were 48 reported fatalities, of 12,000 to 15,000 machines flying. In the same period there were 1,251 fatalities among the 213,267 private aircraft. That makes the two accident rates amazingly close."

Lyle Byrum, president of Eipper, is an aerobatics pilot with a long career in aviation. He says: "The 7,000 ultralights we have manufactured since 1977 have totaled more than one million flying hours. There have been ten fatalities, one for every 100,000 flying hours, half that of general aviation's. I will state flatly that the properly maintained ultralight aircraft is rapidly becoming the safest flying machine aloft."

Michael Markowski, a recognized authority in the field of ultralight aerodynamics, has this to say:

"I watched a two-seater ultralight trainer take off with brakes locked. They crashed into an embankment and demolished the machine, but pilot and passenger walked away. Let's see why.

"The trainer and passengers weighed about 550 pounds and landed at 27 miles an hour. A Cessna 150 with two passengers weighs 1,600 pounds, three times as much, and lands at 55 miles an hour. The heavier and faster airplane, with more kinetic energy to dissipate, impacts with 16 times the force. The ultralight strikes the ground with only 6 percent of the energy of the larger machine. That is why ultralight pilots can walk away from a lot of crashes."

John Ballantyne, director of ultralight programs at the Air Safety Foundation, told me: "We have undertaken pilot and aircraft registration and airworthiness standards for the machines. We have already registered 600 pilot examiners.

"Our accident reports show that ultralights land so slowly and gently and carry so

Blossoming flower of life, *a parachute lowers flying machine and pilot safely to earth. Jim Handbury, a parachute maker with faith in his product, cut wing wires to simulate a rare structural failure. Pilots can wear a chest pack, but some models attached to the plane fire a ballistic charge to eject the canopy.*

National Geographic, August 1983

little fuel that a crash-and-burn type of accident is almost impossible."

> *. . . if you are looking for perfect safety, you will do well to sit on a fence and watch the birds. . . .*
>
> WILBUR WRIGHT, 1901

The Wright brothers placed a horizontal "rudder," or elevator, in front of their machine. Such an aircraft seems to be flying backward. The French call such designs *canards*, ducks, perhaps because they resemble a duck flying with outstretched neck.

At Watsonville, a seaside town south of San Francisco, Jack McCornack's company builds the Pterodactyl, a canard with wingtip rudders. "When someone asks me when this kind of flying began, I tell them 1903," says Jack. "World War I perverted the idea of the airplane, and it has taken nearly 70 years for aviation to recover.

"The early Rogallo wing had a glide ratio of four to one; it moved forward four feet for every one it sank. Our machine glides ten to one. You can climb to 5,000 feet, shut off the engine, and set down anywhere within a radius of ten miles."

Jack has flown one of his machines across the continent, and a Pterodactyl flown by James Campbell in 1981 set an unofficial altitude record for ultralights of 21,210 feet.

Another canard, the American Aerolights Eagle, is built in Albuquerque by pilot and balloonist Larry Newman's group.

"After John Moody's pioneer flight in 1975, we designed a canard with a forward lifting surface that is stall-and-spin resistant," Larry said. "As former hang-glider builders, we thought we would be selling ultralights to the same people. Not so. The typical glider pilot is 20 to 30 years old, athletic, and venturesome. Buyers of ultralights tend to be in their late 30s to 50s and married. Many are licensed pilots, but flying at $30 to $60 an hour has become too expensive. With our machine they can fly for four dollars an hour."

As I moved east, I stopped in Duncanville, near Dallas, where Bill Adaska builds the Rotec Rally, a high-wing monoplane of Demoiselle-Quicksilver configuration.

"We are not advancing aviation," says Adaska, "we are setting aviation back 75 years. Now anyone can fly; stay up two hours, go a hundred miles, spray your crop, inspect pipelines, but mostly have fun. We build the airplane for the common man."

Because ultralights are lightly wing loaded (weight divided by wing area), they are sensitive to wind gusts. Flying one in turbulent air is like paddling a canoe in the North Atlantic, not a good idea.

"You must respect the wind in the willows," Adaska says. "God's wind blows in most unusual fashions and will thrust thy body into the ground and break it, if you don't watch out."

Each spring the Experimental Aircraft Association invites home-built aircraft and ultralights to "come down to Sun 'n Fun and unfreeze your bird." At their 1979 fly-in at Lakeland in central Florida I had seen four miniature airplanes with chain-saw engines. Four years later I watched an astounding total of 600 ultralights take to the air. In early morning 30 ultralights circled overhead, droning like lawn mowers on a hot summer day. Many looked like Santos-Dumont's Demoiselle, out of Quicksilver.

Chuck Slusarczyk, a big Polish-American from Cleveland, taxied a strut-braced, fabric-enclosed, high-wing monoplane to a stop. "My Hawk is an ultralight in airplane's clothing," he said. "No reason why a flying machine has to be ugly. When I first put an engine on a glider, I would run on the grass and leap into the air, fly five or ten feet, and come down to take off again. Guys would laugh and shout: 'Your landing gear is catching hell, and you're wearing out your brakes.' They meant my tennis shoes. Everyone thought I was crazy, but I was only doing what the Wright brothers did. Progress must be made and the price paid."

> *Sacrifices must be made.*
>
> OTTO LILIENTHAL, ON HIS DEATHBED, 1896

The striped tents, the multicolored flying machines, and the happy crowds were a flashback to the world's first aviation meet at Reims in France in 1909.

One pilot said: "I flew to 1,500 feet and shut off the engine. I could hear dogs barking, a woman banging a trash-can lid, smell woodsmoke. I tell you, you're a bird."

Some pilots wore compact chest parachutes. Jim Handbury, a parachute maker, explained:

"Ultralight parachutes are designed to lower both pilot and machine. A cable runs from the chute to the airframe. Just pull the pack off your chest and throw it wherever you see blue sky."

Another pilot said: "Most people don't see themselves in the cockpit of a conventional airplane; too many knobs and switches and dials. An ultralight looks like a lawn chair with wings, and the average person can feel comfortable with it. It's like bird flight; you have wings on your back."

The question of ultralight regulation arouses lively debate. Bernard Geier, chief of the General Aviation and Commercial Division of the Federal Aviation Administration, stood on the tarmac and waved an arm at the circling ultralights.

"We consider this a sport," he said, "and we don't want to overregulate it. The FAA is not responsible for protecting the pilot against himself; it is responsible for protecting the public and the airspace.

"We don't know how many are flying now. We get estimates from 10,000 to 20,000, but as the numbers increase, you get a bigger potential for affecting air commerce. We had to make some rules."

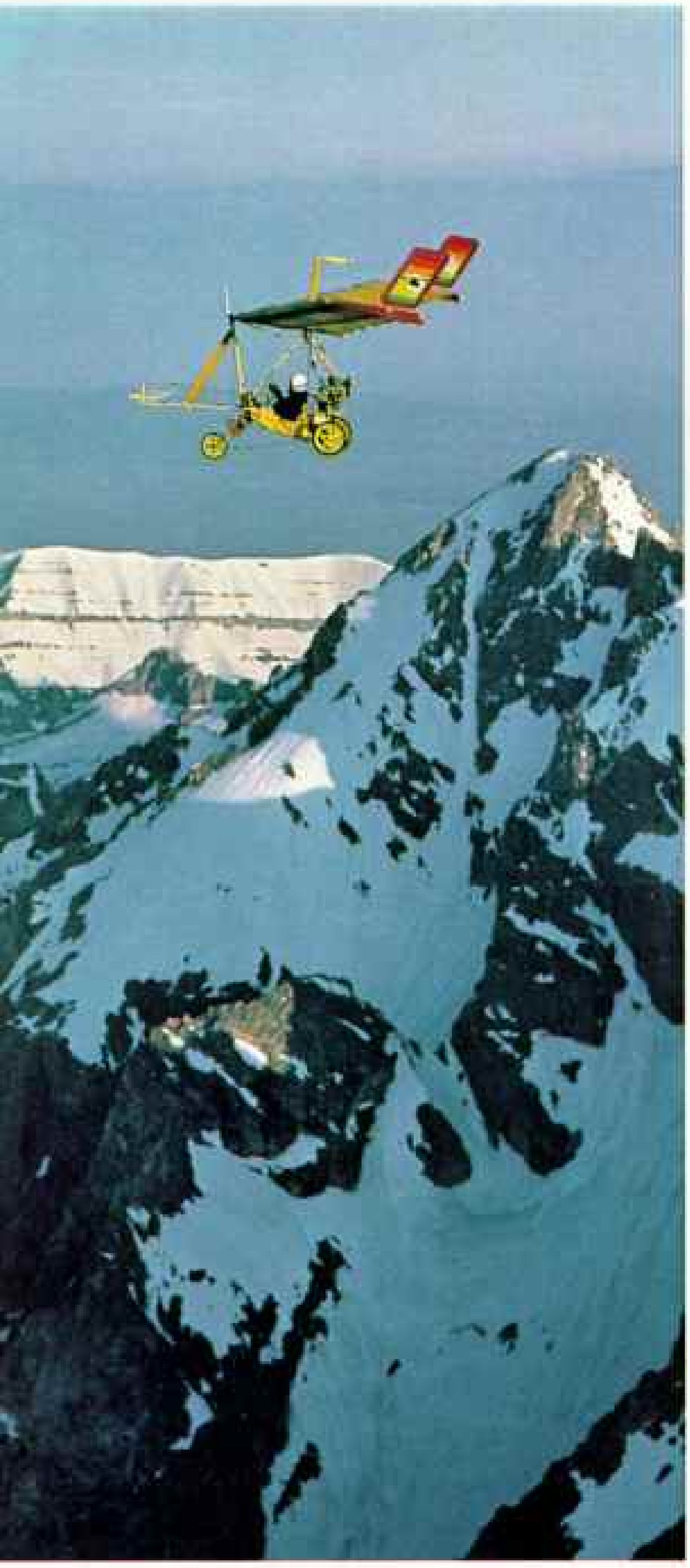
On October 4, 1982, rules came into effect stating that an ultralight may not weigh more than 254 pounds (115 kilos), fly faster than 55 knots (63 miles an hour), or stall at more than 24 knots (27 miles an hour). It may not carry more than five gallons of fuel, must stay out of controlled airspace, and may not fly at night. Operators do not need a pilot's license.

It is inevitable that so versatile a flying machine should suggest uses other than pleasure. Scientists are using them to study

***Policeman's eye** in the sky, an ultralight patrols over Downey, California (**left**). Linked by radio with a cruiser car, the flying patrolman can track fugitives or keep a vigilant eye on the public peace. Federal regulations permit certified ultralight-flying farmers to spray their own crops with insecticides or fertilizers. The cost: 30 cents an acre, about 10 percent that for conventional aircraft. Before dusting with an oil-based mixture that stays on plants longer than water and resists drifting in the wind, a farmer (**above**) uses a soap-and-water mix to adjust his nozzles.*

Flying parachute, *the ParaPlane* ***(below)*** *embodies pioneer Francis M. Rogallo's concept of a nonrigid wing. Twin 15-horsepower motors drive contrarotating propellers to push pilot and soft wing at 25 miles an hour. Pressure on pedals draws in control lines to turn aircraft right or left. Increasing power swings pilot forward, uptilting the wing and causing the machine to climb. Throttling back drops pilot behind wing, and the ParaPlane descends. Engines, propellers, landing gear, and wing fold into an automobile trunk* ***(above)****.*

Truly an ultralight, the ParaPlane weighs only 150 pounds. Steve Snyder circles National Geographic's Membership Center Building in Gaithersburg, Maryland ***(right)****.*



Free as a bird, *Tom Simko soars in his Pterodactyl at 12,000 feet in Wyoming's Grand Tetons. No license is needed to fly Tom's simple flying machine, one of more than 50 designs available. Bicycle of the air, the ultralight airplane at last fulfills everyman's dream of flight.*

sharks and the migration of butterflies. A well-organized project will attempt a flight to the North Pole. And one young couple, in matching machines, plan a leisurely no-schedule flight around the world.

ULTRALIGHTS have also caught the eye of the paramilitary. On March 7, 1981, two Palestinians in powered gliders took off from Lebanon for Israel. Both were captured, but the incident was an ominous portent.

Ultralight manufacturers have been approached by the military of several countries. Israel bought five machines in desert camouflage from one maker, and Saudi Arabia a large number from another. Enough interest has been shown for the Central Intelligence Agency to ask a leading manufacturer not to sell to a list of bad chaps.

An ultralight flying machine, a bundle of Dacron and aluminum, is nearly invisible on a radar screen. If the tubing were made of carbon or boron fiber, such a machine would simply not be there.

A retired intelligence officer told me: "Ultralights can easily be adapted for pilotless control, to send into hazardous areas with TV cameras or radiation sensors. They can be fitted with grenade launchers or submachine guns, and if you remove the pilot, they can stay aloft for 24 hours. And you are going to see smugglers flying dope across borders, piloted or by wireless control."

The truth is that the potentialities of the ultralight, for good and evil, are almost limitless. But the overriding function of the ultralight is to make possible the poetry of flight. Bob Deffenbaugh, president of Sport Flight, Inc., distributor of Quicksilvers in the Washington, D. C., area, says:

"This is a fulfillment of man's desire to have wings. One time at 1,000 feet a red-tailed hawk flew formation in front of me. He peered back and rocked his wings. I rocked mine. He banked into a right turn and I followed. He banked the other way; so did I. This went on for 15 minutes, then he suddenly folded one wing and dropped like a stone. I couldn't quite follow that act; I conceded he was still master."

Seven hundred miles north of Lakeland, Florida, the history of man's attempt to fly is relived every day.

On a high sand dune within sight of the Wright monument near Kitty Hawk, John Harris trains fledglings to fly hang gliders, then introduces them to ultralights at a nearby airstrip.

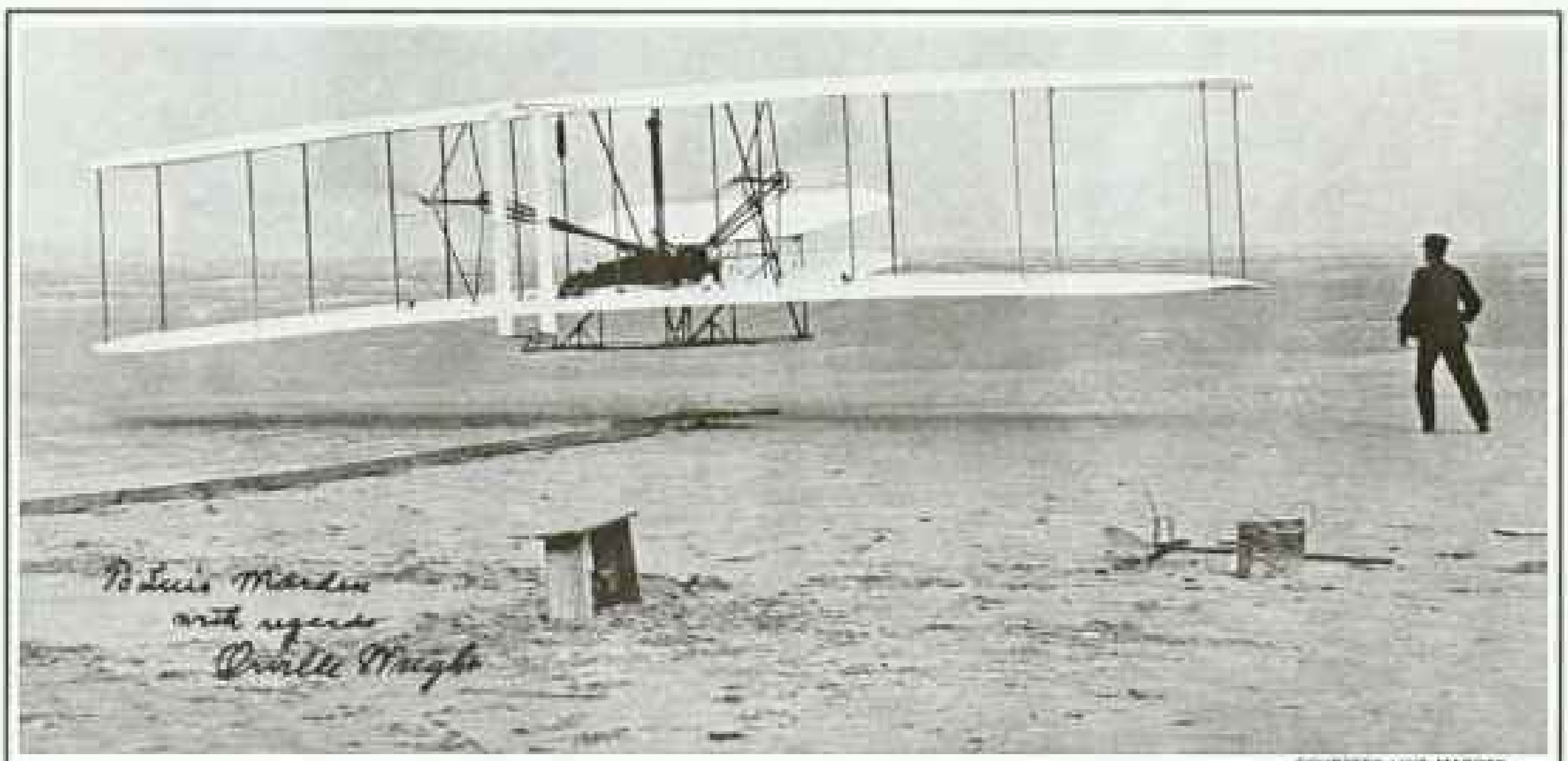
"I came to Kitty Hawk for the same reasons as the Wright brothers," says John, "steady winds, and no one gets hurt landing on soft sand. Our students are conscious of touching history. After their first glides, many of them say, 'Now I know how Wilbur and Orville felt!' "

At first light Kill Devil Hill looms black against a lavender sky. I sit in John Harris's Quicksilver at the head of the Kitty Hawk airstrip. A cold wind blows grains of sand that rattle like hail on the taut wing fabric. I start the engine, and the exhaust's bark startles shadowy birds into flight. Slowly I push the throttle forward.

> *. . . the machine started forward into the wind.*
>
> ORVILLE WRIGHT, DECEMBER 17, 1903

As I lift the machine from the runway, the ground falls away and my horizon spreads outward like ripples from a dropped stone. Light rising from the sea glows backward through the spectrum, violet to mauve to pale salmon. I drop my right wing and rotate on the monument like an insect impaled on a pin. To the north I can see the rebuilt hangar and living quarters of the Wrights. Beside them, a granite boulder marks the takeoff point of the first flight. Lining up on the boulder, I fly backward in time. Beneath me I see the white-winged biplane and two small figures in caps. One supports the machine, the other lies prone between the wings. As I pass the hangar the white aeroplane rises beneath me, and together we fly toward the sea. A sixth of a mile along the sands the biplane sinks to the ground, and I fly on alone.

To fly like a bird, to cast off the bonds of gravity and soar free, wheeling through the sky with the wind rustling past our outstretched wings—who may not do so on wakening? In the bright world of day the promise of Kitty Hawk has been fulfilled, and everyman can now soar with the birds. □



COURTESY LUIS MARDEN

Man's first flight: *Orville Wright rises from the sands of North Carolina on December 17, 1903. The first man to fly a powered craft presented this historic photograph to the author in 1940. A coin's toss gave Orville, rather than elder brother Wilbur, his place in history. In salute to the pioneers, the author flew his ultralight over the same Kitty Hawk ground, reliving the thrill of that historic moment. Today the ultralight airplane enables thousands to do the same.*

The Case of the Killer Caterpillars

WHEN I SPOTTED the inchworm eating a fly as large as itself, I was incredulous. How could a sluggish caterpillar manage to snag a fly? What sort of insect version of a movie monster was this? I thought all inchworms were vegetarians.

I captured the caterpillar, climbed out of the volcanic cone on the island of Hawaii, and returned to my lab at the University of Hawaii in Honolulu. There, I expected, my find would revert to normal plant-eating behavior.

Two days later a leaf in the bottle remained untouched, so I slipped in a fly. It landed near the inchworm. The inchworm raised itself slightly. The fly stepped closer, brushing the inchworm. Suddenly the inchworm swung sideways, snatched the fly in its talons, and devoured it, leaving a few wing and leg tips, like clean-picked bones on a plate. The inchworm, I realized, was unique among caterpillars—it was an ambush predator!

Sometimes my killer caterpillars, as much as an inch long, behave almost playfully. I've watched them rolling in water on a leaf like a dog in the dust. A tiny droplet may encase the head, as with this *Eupithecia orichloris* (**left**), and provide a portable font. But even in mid-drink they can strike. Six elongated claw-tipped front legs (***right***) enable them to seize prey with grappling-hook tenacity. Such ferocity does not preclude grace. I've seen them handle minuscule booklice with the finesse of a person eating a plum.

By STEVEN L. MONTGOMERY

Photographs by
ROBERT F. SISSON

NATIONAL GEOGRAPHIC
NATURAL SCIENCE PHOTOGRAPHER

SPRINGLIKE REFLEXES *enable the Eupithecia staurophragma, at right, to capture and hold a pomace fly. Some 200 sensory bristles known as setae cover the caterpillar's body; those in the rear trigger the ambush mechanism. The action takes about 1/12 of a second—a blur to the eye. Should the fly wriggle partly loose, the caterpillar can hold it with four legs and pull it in with the other two.*

BECAUSE they seem to be taking a measure with each looping stride, these caterpillars are called geometrids, or earth measurers, hence their common name, inchworms. A multiple exposure captures the undulating motion (***above***). The caterpillar grasps a twig with back legs, extends itself forward, then draws its back end up to its front legs and repeats the sequence.

But limited vision curtails travel. Five pairs of rudimentary eyes primarily discern light and dark. When an individual searches out a different perch, it gropes along slowly, reminiscent of a blind man with a cane.

To gather these creatures, I reconnoiter one of the forests on the island of Oahu, locate a moist, shady spot that a caterpillar might find appealing, and belly down to the ground to eyeball a plant

leaf by leaf (***right***).

What appears to the uneducated eye as a bump on a leaf may turn out to be a new species. Serendipity helps. One night while on an expedition, as I reached from my hammock to the ground for insect repellent to ward off mosquitoes, I spotted a faint glow. I looked closer and picked up a leaf with a bit of phosphorescent fungus on it. A caterpillar clung to the leaf's edge. It turned out to be a new species—one of six I've discovered among the 20 known kinds of ambushing inchworms found only in the Hawaiian Islands.

Patient watchfulness has paid off in dividends of wonder. Besides frequently rolling about in droplets of water on leaves (***facing page***), these caterpillars sometimes use their heads as battering rams to knock parasitic wasps and other insect intruders away.

Killer Caterpillars

HANGING BY A THREAD of its own making, the *Eupithecia orichloris* in this multiple exposure (***left***) reels in a silk strand payed out from a gland under its jaw—a safety line in the event of spills.

A winged adult, like this as yet unnamed species (***below***), lays about 100 eggs that hatch in some 14 days. Eggs are deposited singly or in clusters of twos and threes, which may forestall cannibalism among the larvae.

These predatory inchworms molt four times. They split their tight skins, wriggle out, and within half an hour are again ready to strike at prey. After the third molt they spin doily-like cocoons and about three weeks later molt once more, reappearing as moths. As adults they use their long proboscises, like most other moths, to suck up nectar and the juices of rotting fruit.

A brown *Eupithecia rhodopyra* (***right, above***) mimics a fern leaflet. Two green forms of the same species seem to meld into like-colored leaves (***right***). Because the same species occurs in two colors, I confront a problem. Do they change color when they molt depending on their surroundings? Or are they simply born that way? The question is in my file of caterpillar mysteries.

Mimicry, part of the caterpillar's hunting ruse, also provides camouflage from bird predators. Meticulous mimes, the insects will bite off and spit out bits of a leaflet, making a hole just big enough to back into. This allows a snug fit right along the leaf edge.

From then on, it's up to the fly. □

MISSISSIPPI DELTA *The Land of*

By DOUGLAS LEE NATIONAL GEOGRAPHIC EDITORIAL STAFF

PHILIP GOULD

the River

Photographs by C. C. LOCKWOOD

Curtain of storm *descends on homes and shrimp and oyster boats in Grand Bayou, a hamlet just above high tide in the half-drowned delta region where the Mississippi meets the sea.*

WHERE WIND AND WATER rule the land, storms and floods are the mileposts of history. On a cheerful December morning, Louis Chauvin's 10,000 citrus trees grow in dark green ranks, hung like Christmas trees with fruit. Louis Chauvin hands me a ripe satsuma orange and remembers 1965, when Hurricane Betsy drowned this grove.

"We had ten feet of water where you're standing. I came in a boat the day after, and just treetops stuck out." We sit, and our heads duck below sea level. Only levees before and behind us keep this terra firma.

Most people here have seen the power of the big winds, for we are south of New Orleans, deep in the Mississippi River Delta. A ragged peninsula of marsh and leveed lands flanking the river, it reaches into the Gulf of Mexico like a lightning rod for hurricanes. Six times in this century they have whirled out of the Gulf to spill the sea across farms and homes, most recently with Camille, in 1969.

I know that a businessman's hard head wears Louis's red farmer's cap. I also know that orange trees take five years to begin to produce. Why, then, did he replant?

He daubs his finger in the orchard's wet earth, dark and slick as grease. "This is black clay, the best of the soil from all the way to Canada. It's hell to work, but it's great for citrus. You get kind of snakebit, say you won't replant, but then you watch the fields just growing up in brush and you think, well, maybe a couple of acres."

Satsumas spill from crates around us. Navel oranges the size of grapefruit await harvest and shipment. They seem tangible, tasteable distillations of this country's allure: Deliriously fertile, it is simply too rich to be refused by those with the patience and strength to weather its occasional cruelty.

It is the patrimony of the Father of Waters, soil lifted from a drainage area over all or parts of 31 states and two Canadian provinces and deeded to southeastern Louisiana. Here the world's fourth longest river system seeks the sea through many mouths. Slowing, it drops its sand, silt, and clay to

PEARL RIVER WILDLIFE MANAGEMENT AREA
Pearl
MISSISSIPPI
LOUISIANA
NUTRIA
GAS
Riggolets
OYSTERS
Mississippi Sound
OYSTERS
OIL, GAS
MUSKRAT
BILOXI WILDLIFE MANAGEMENT AREA
Bay Boudreau
OYSTERS
Chandeleur Sound
SHRIMP
North Islands
BRETON NATIONAL WILDLIFE REFUGE
Lake Borgne
MUSKRAT
OYSTERS
SHRIMP
MUSKRAT
MUSKRAT
SHRIMP
OYSTERS
Chandeleur Islands
Alluvial City Yscloskey
Mississippi River Gulf Outlet
Eloi Bay
OIL, GAS
MUSKRAT
ST. BERNARD PARISH
Delacroix Island
SHRIMP
NORTH
ST. BERNARD
PLAQUEMINES
SHRIMP
Lake La Fortuna
PLAQUEMINES PARISH
OIL, GAS
OYSTERS
OIL, GAS
SHRIMP
Black Bay
Breton Sound
OYSTERS
GULF OF MEXICO
Pointe a la Hache
Lake Judge Perez
Bohemia
BOHEMIA WILDLIFE MANAGEMENT AREA
SHRIMP
Grand Bayou
Port Sulphur
OYSTERS
OYSTERS
OIL
OIL, GAS
Nairn
Empire
Adams Bay
Buras
Triumph
Fort Jackson
MUSKRAT
Venice
Mississippi River
OIL
DELTA NATIONAL WILDLIFE REFUGE
Barataria Bay
OYSTERS
SHRIMP
OYSTERS
OIL
NUTRIA
OIL
REFUGE HEADQUARTERS
NUTRIA
Pilottown
Pass a Loutre
Northeast Pass
GAS
Head of Passes
OIL
PASS A LOUTRE WILDLIFE MANAGEMENT AREA
GRAND ISLE STATE PARK
MUSKRAT
Southeast Pass
South Pass
Garden Island Bay
West Bay
OIL
East Bay
SHRIMP
OIL, GAS
Southwest Pass
OIL
Burrwood
SHRIMP
OIL, GAS

A life-bearing jigsaw of river, marsh, bays, lakes, and sounds forms North America's most fertile marine nursery. Key to this estuarine system's fecundity, wetlands provide shelter, nutrients, and varied salinities.

Each year about 40 square miles of delta wetlands erode or sink, due directly or indirectly to man's intervention in river and marsh.

In the world's most intensively developed offshore oil and gas fields, thousands of drilling and production platforms stipple the Gulf.

With claws drawn by branching passes, the lowest reaches of the river form the Balize, or "bird-foot," delta. Its mouths have built to the edge of the continental shelf.

MAN-MADE LEVEE

COASTAL MARSH

Fresh | Intermediate | Brackish | Saline

0 KILOMETERS 10

0 STATUTE MILES 10

DRAWN BY JAMES E. MCCLELLAND, JR.
COMPILED BY MARGUERITE B. HUSBACK
NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

***Changing the face** of politics in Plaquemines Parish—Louisiana's equivalent of a county—Ernest Johnson **(left)** this year became the first black ever elected to the parish council, after petitioning the federal courts for electoral reform that made it possible. Tweaking the cheek of friend Jimmy Martinez, Germaine Curley **(right)** also won a seat on the council, the first woman ever to do so.*

*Before Johnson's lawsuit, politics were controlled by the two sons of "Judge" Leander Perez, who ruled with an uncompromising hand from the 1920s until 1969. This year former council president Chalin O. Perez—here horsing around at Plaquemines' annual Orange Festival **(below)**—did not run for office. His brother, Leander Perez, Jr., still serves as parish district attorney, but most observers agree that the family's monopoly of local power has ended.*

build the delta seaward across the shallow continental shelf.

At least six times since the end of the last ice age, the river has changed course dramatically, abandoning an earlier delta to erosion and building a new one in a cycle that created the deltaic plain that forms much of the Louisiana coast (pages 240-41).

The modern delta—the Balize—was only about 300 years old in 1682, when the Frenchman La Salle floated down from the north. Settlement along the river followed fitfully, stunted by mosquitoes, disease, and the eternal Damoclean sword of elemental disasters.

ALL BY STEVE WALL

Even so, hardy souls arrived. The French, established by the early 1700s, were followed by Germans, Creoles, Acadians ousted from Canada, Spaniards, Anglo-Americans, blacks, Yugoslavs, Italians, Irish, Chinese, Filipinos, and Vietnamese. Ship jumpers and immigrants, refugees and fortune seekers, they washed up at the river's mouth to flavor one of the richest ethnic stews in rural America.

Surrounding them was one of the world's great marine nurseries, a kaleidoscopic spectrum of habitats created by the intersection of river and sea. The delta marsh and estuarine areas around it form the keystone of the entire Gulf fisheries and Louisiana's lead in the nation's catch.

Now this fragile region is threatened by the same cyclic laws that gave birth to it. If not for a U. S. Army Corps of Engineers flood-control structure above Baton Rouge, the Mississippi would be changing course to follow the Atchafalaya on a route to the sea 140 miles shorter than its present one.*

This distributary river already siphons off 25 percent of the Mississippi's water and has an upstart delta of its own, among the

*See "Trouble in Bayou Country: Louisiana's Atchafalaya," by Jack and Anne Rudloe, NATIONAL GEOGRAPHIC, September 1979.

Imported natives, *brown pelicans (**right**) from Florida have been reestablished in Louisiana after pesticides from the Mississippi's huge drainage decimated the Pelican State's official bird in the 1960s. Where 50,000 lived, two colonies now total 1,200.*

*A wigeon drake takes to freedom after banding by Sam Henson (**above**), manager of Delta National Wildlife Refuge. One of the oldest federal refuges, this last stop on the Mississippi flyway is a haven to thousands of water birds.*

"Up front" and "in back" *divide the delta between a riverside strip within levees* ***(above)*** *and outlying marshes.*

Virtually all deltans live up front, but many keep to marsh roots at seasonal camps ***(below)*** *for work and sport.*

youngest in the world. If nature had its way, the Balize Delta would, in its own good geologic time, simply disappear.

Cut off from the river's fresh water and replenishing flood-borne silt, the loose, soupy marsh of an abandoned delta literally sinks under its own weight, while unchecked erosion devours its surface. Flying over the Chandeleur Islands east of the delta, I learned a lesson in sand: Remote, beautiful, and desolate, the delicate, fishhook-shaped archipelago is made of remnant sandbars from the drowned St. Bernard Delta, forsaken by the river 1,800 years ago. A broad sound separates them from tattered fringes of mainland marsh. Fans and fingers of sandbars scallop gray-green shallows. All was living marsh, not so long ago.

The Corps of Engineers believes that it can prevent the river from abandoning the present delta. Many scientists shake their heads at the long-term prospect of chaining the Mississippi. But the contest over the river's course could turn out to be a moot one, as far as the delta's future goes. For unwittingly, tragically, man has created conditions that already are devouring the marsh, transforming lush, productive wetlands into open water at a hair-raising rate.

ALL ROADS into the region—all four of them—branch out of New Orleans, its mistress city. Two escort the river, to Bohemia on the east bank and, on the west, 75 miles to Venice, the last protected dry ground. Man-made levees, two on each bank, taper together at each road's end to seal off the most exposed of Plaquemines Parish's 26,000 residents from flood crest and storm surge. Northward to Baton Rouge, levees keep nearly two million people dry.

So dry, in fact, that the delta's wetlands are both starving and dying of thirst, largely

PHILIP GOULD (BELOW)

cut off from their life's source. A senior official in Louisiana's Department of Wildlife and Fisheries put it succinctly: "These marshes are going to hell on a roller coaster."

Aerial mapping has revealed the loss of 850 square miles of Louisiana's deltaic plain since 1956. The process claims about 40 more each year—and is accelerating.

Levees deny marshes new layers of silt and fresh water. Equally damaging, a cobweb of man-made canals hastens erosion, leading salt water into fresher parts of the marsh. No longer anchored by freshwater vegetation, banks crumble away before saltwater plants take root. Some canals are dredged for boat traffic; most are for pipelines and rigs tapping fabulous fields of oil and gas.

Hurricanes wreak damage that does not heal. A rising sea level, some experts believe, is hastening saltwater encroachment. To cap the situation, the delta has reached the edge of the continental shelf, where silt, channeled by the levees, drops straight out to sea. The whole adds up to the most massive land-loss problem in the coastal U. S.

Most scientists involved agree that large-scale diversion of sediment-laden fresh water into the marsh is urgent. Many feel that stricter control of new dredging, for both oil

development and navigation, is needed. While both the state and the corps plan diversion projects, the amount of land loss and the demands made on river and marsh pose a seemingly hopeless dilemma.

Dr. Sherwood M. Gagliano of Coastal Environment, Inc., among the first to detect shoreline changes, warns: "Not only wildlife habitat but also ridge land where people live is sinking. If we don't make a commitment soon, we could just lose another major resource—and part of this state."

A fortune in shipping steams through the delta en route to New Orleans, the nation's leading port, and upriver to Baton Rouge. Expanding coal transshipment facilities are designed to tap a growing share, aided by plans to deepen the river from 40 to 55 feet for bigger coal and grain carriers. State and local officials fear this will mean less water for diversion and increased saline intrusion. They remember the low water of 1980, when a wedge of ocean water slid upstream to hover near New Orleans' water intakes. A nervous city licked its lips.

The Mississippi River Gulf Outlet, dredged in the early 1960s, arrows through the marsh of St. Bernard Parish to link the river and the Gulf. The channel has deeply wounded the marsh through saltwater

Steel and muscles strain *as a roughneck uncouples drill pipe (**left**), pulled up from the sea bottom ten miles south of the delta. Round-the-clock pace of high-stakes offshore drilling keeps two crews working 12-hour shifts—and sharing high-stakes relaxation in their quarters (**above**). They live aboard rigs for a week or longer at a time, earning equal free time off the rigs and high pay that draws some 30,000 oil-field commuters from all over the South to delta heliports and boat docks. Since exploration in nearby marshes began 50 years ago, once sleepy delta towns have grown into vital support bases for the industry's massive seaward invasion—to many a deltan's profit.*

intrusion. Trapping was once so vital here that a "trappers' war" in 1926 left at least one man dead. Today most area trappers are forced to hold jobs outside the marsh.

Past the fork near the end of the single narrow highway into St. Bernard Parish—the third road from New Orleans—a wall of moss-draped trees thins and stops abruptly, unveiling the marsh and the levee curving off like a shoreline seen from the water. Houses straggle along the road beside a bayou that is the community's life. Beyond the last house, stark white arms lift skyward from crumbling, craggy giants on the bayou's banks. They are the dead live oaks of St. Bernard, strangled on salt.

South from Lafitte, at the end of the fourth road from New Orleans, I got a Cook's tour of the marsh with Dr. John Day of Louisiana State University's Center for Wetland Resources. Lafitte, a Jefferson Parish fishing village, is named for the famed pirate who haunted these waters.

On canals and lakes we moved from fresh to intermediate to brackish marsh—the most fertile. On an island at the head of Barataria Bay we picked among rotting pilings where Manila Village once stood, one of several stilt villages built by Chinese and Filipino immigrants in the past century along Barataria's vanished "Asian coast."

Back toward fresher zones, bushwhacking through palmettos on an Indian shell midden, we visited even older ghosts. Bits of pottery shaped perhaps a thousand years before lay among the clamshells and oak roots, with rusted iron, fishbones, beer cans, and shotgun shells.

"This is the highest land around," John said. "It's always been used."

Here and there were oyster shells—signs that salt has reached an area once buffered by marsh, now exposed by land loss and dredged canals. John is bitter. "These wetlands are being cut to pieces."

Little islands of oaks pinpointed other middens on the horizon, the only landmarks in a sea of grass. Pillars of smoke rose from fires set by trappers to promote the new growth favored by abundant muskrat and nutria. John waved toward it. "We ought to think of this area the way we think of Chesapeake Bay," he said. "It's almost as big and just as irreplaceable."

I live near Chesapeake Bay, and I have a Pavlovian response to its name: I think of food. Now the delta has me conditioned. I remember salty oysters served chilled on the half shell, fried catfish, baked barbecued redfish (that's red drum in Yankee talk), shrimp remoulade, gumbo, and jambalaya.

Waterfowl provide magnificent hunting on a major wintering ground. Fishing seems barely to require a hook. Once, above the Chandeleurs, I flew for miles above a single sinuous school of fish, probably mullet. Bigger shadows—shark, redfish, and speckled trout—cruised off its edges. In deeper water off the river's mouths, big-game fishermen have caught on to previously little-known stocks of marlin and other heavyweights to develop a new blue-water sportfishing region. Other species, especially bottom feeders, swarm around the multitudinous oil-producing platforms that have become teeming artificial reefs.

"*NOW DON'T* you say we sleep on moss beds or have webbed feet," Dorothy Lyons instructed me as she peeled a wash bucket of shrimp. "We live just like everybody else—except we eat better."

She's partly right. I never slept on a moss mattress here. The years since World War II have transformed life in once isolated levee hamlets and in camps scattered through the marsh. Paved roads brought outsiders and new industries. Oil drilling invaded the marsh and marched offshore. The typical deltan today works in a store or factory, or on a crew boat or drilling rig.

For those who stayed with the water, outboard motors and refrigeration freed them to "move up to the road" and still work their grounds. All but a handful of deltans now live within the levees' comforting embrace. But the intimacy with the marsh remains. The archetypal deltan is still the waterman, poling his pirogue down hidden channels to delve beneath opaque waters, or reaching out with trap and gun to reap a furred and feathered harvest from grass and sky.

And, Mrs. Lyons, I'm here to tell you that his feet *are* webbed.

Cliff Boyd is one such man. With him, I set out to see how the marsh provides his bread and butter—or, in this part of the country, his beans and rice. Hawk-nosed,

sharp-eyed, Cliff is deliberate in every move. "Every time I get to hurrying, somebody gets hurt." He settled four-year-old Randy in his flatboat's stern. "And 90 percent of the time, that somebody's me."

In crisp winter sun we wound through the marsh. Ducks rose almost vertically, fluttering in the distance like clutches of leaves falling upward. Skeins of geese twisted in faraway flight like scarves in wind.

Our work was less pretty, the down-to-earth business of death, as we poled from trap to trap. By morning's end we had nine nutrias and three raccoons, pelts worth about $100. Cliff had released three rabbits, a young coon, and three undersized nutrias. Each one, living or dead, was a story of suffering. Broken limbs, mud-sodden fur, and a churned, bloody ring around the anchoring stakes told an ugly story.

"I really don't like trapping," Cliff said softly. "But when you're feeding six kids, you got to take all the courses."

Like many, Cliff follows seasonal rounds, fur trapping in winter, catching catfish with trotlines and traps most of the year. In fall he hunts alligators, and he trawls for fish and shrimp in season. That afternoon he turned to work he enjoys, emptying catfish traps.

Watching Randy play among the sharp-finned fish, I thought of a story told to me by Bob Ellzey, starting out in his father's prominent Venice marine-supply business.

"An old school buddy named Gus and I were near the top of our class until third grade, when he didn't show up. I asked him when he was coming back, and he said, 'I'm nine years old and I got my boat!' "

Cliff said that our catch, 301 pounds, worth about $100, was a small one—I have yet to hear a commercial fisherman admit total satisfaction with a catch—but added, "I always figure like this: The good Lord's gonna let you catch what you catch."

That night at his trailer in Venice (hurricanes, especially Camille, have taken most "permanent" homes here), we supped on venison he had killed, white beans, and rice, and smoked and talked of hunting dogs and seafood prices while children and dogs raced in packs past a sign that read, "Bless our mobile home."

Later he rode me back to our starting point across the dark Mississippi. A half moon near full with earthshine kept Orion company below a brilliant Milky Way. Cliff spoke of moving here from Mississippi, where he lived as a boy.

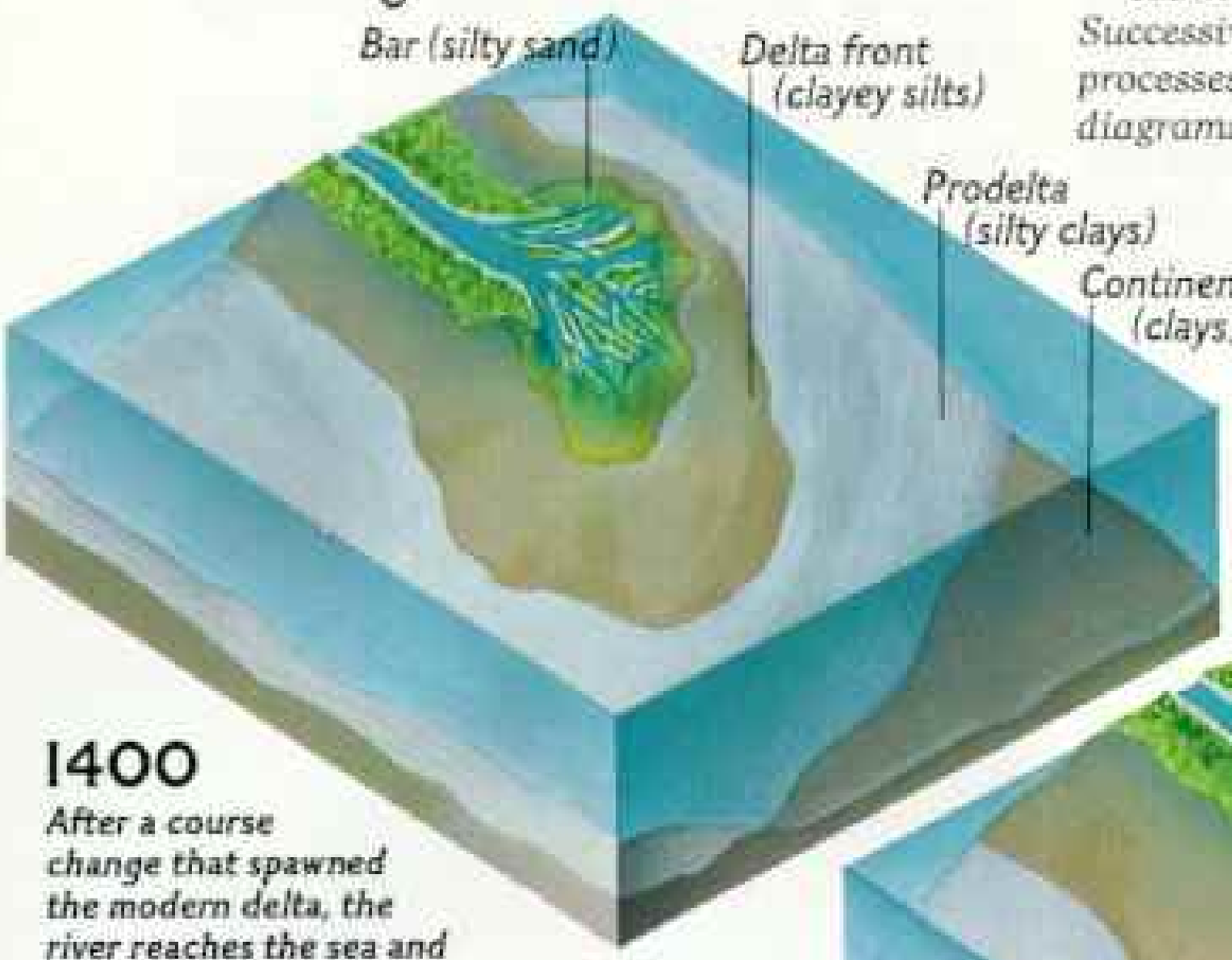
"I can make more money in a day here than in a week there. If it ever comes a real hard depression, I can still make a living here. I can feed my family. As long as I can get bullets, my family'd never starve."

Cliff Boyd's family will never starve, I'll bet, bullets or no. But I wonder if the marsh

Nature suffers *as straight-line, man-made canals—dredged for oil and gas pipelines, access to drill sites, and boat traffic—allow salt water to penetrate far deeper into the marsh than along winding bayous. Subsequent erosion causes as much as half of Louisiana's wetland loss. Where possible, canals are sealed from natural waterways and some are refilled, but much damage is unchecked.*

The dynamic delta

*TIME AND THE RIVER conspired to create the deltaic plain that comprises most of southeastern Louisiana (**bottom left**). Successive deltas grew and receded through processes illustrated in the diagonal sequence of diagrams. Today's active delta, the Balize, is now*

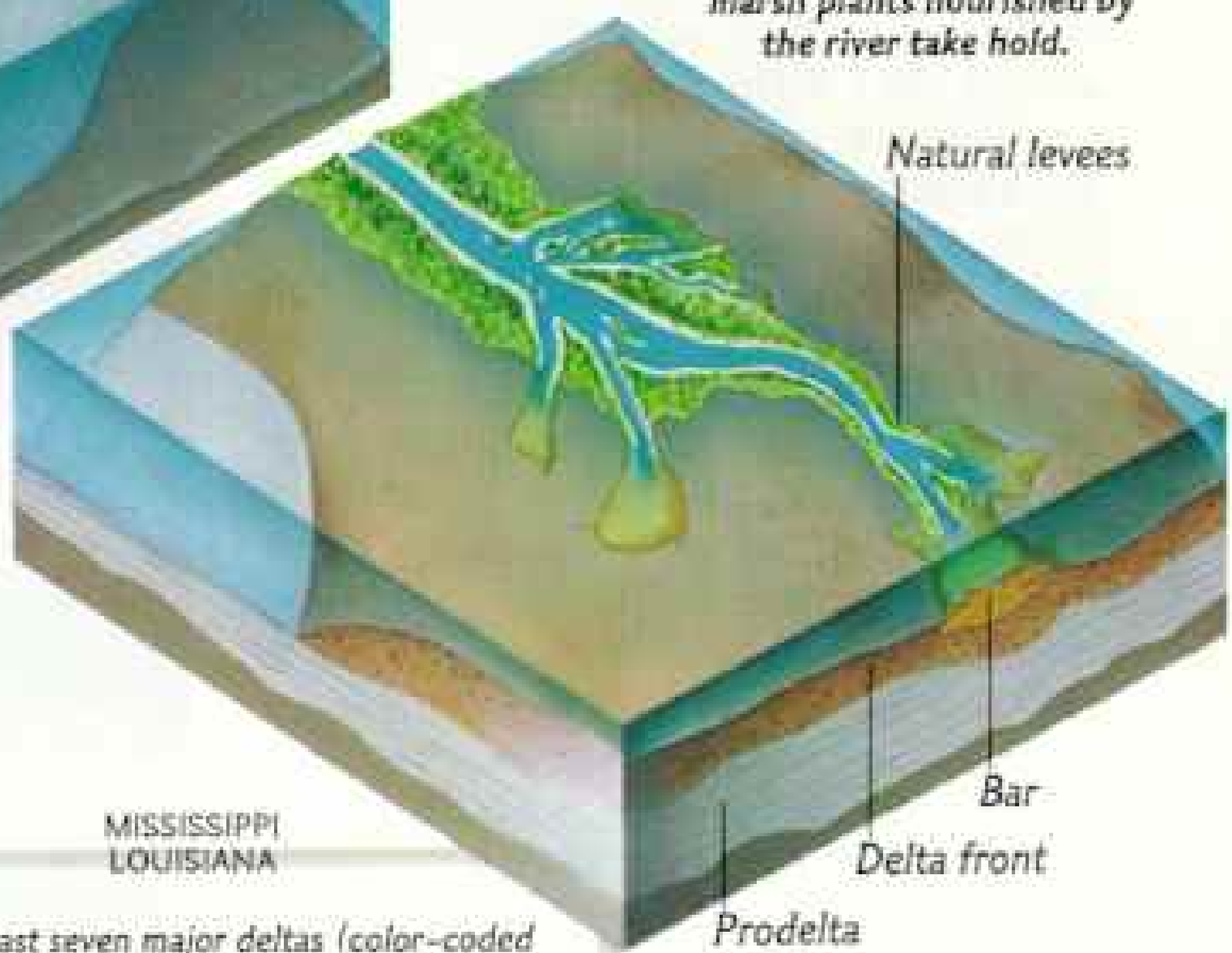


1400

After a course change that spawned the modern delta, the river reaches the sea and slows, dropping first heavier, then lighter sediments. Silt and sand collect at channel mouths. Natural levees build as floods drop sediments on the banks.

1600

Delta grows rapidly seaward on the Gulf of Mexico's shallow continental shelf. Flooding expands land area. Freshwater marsh plants nourished by the river take hold.

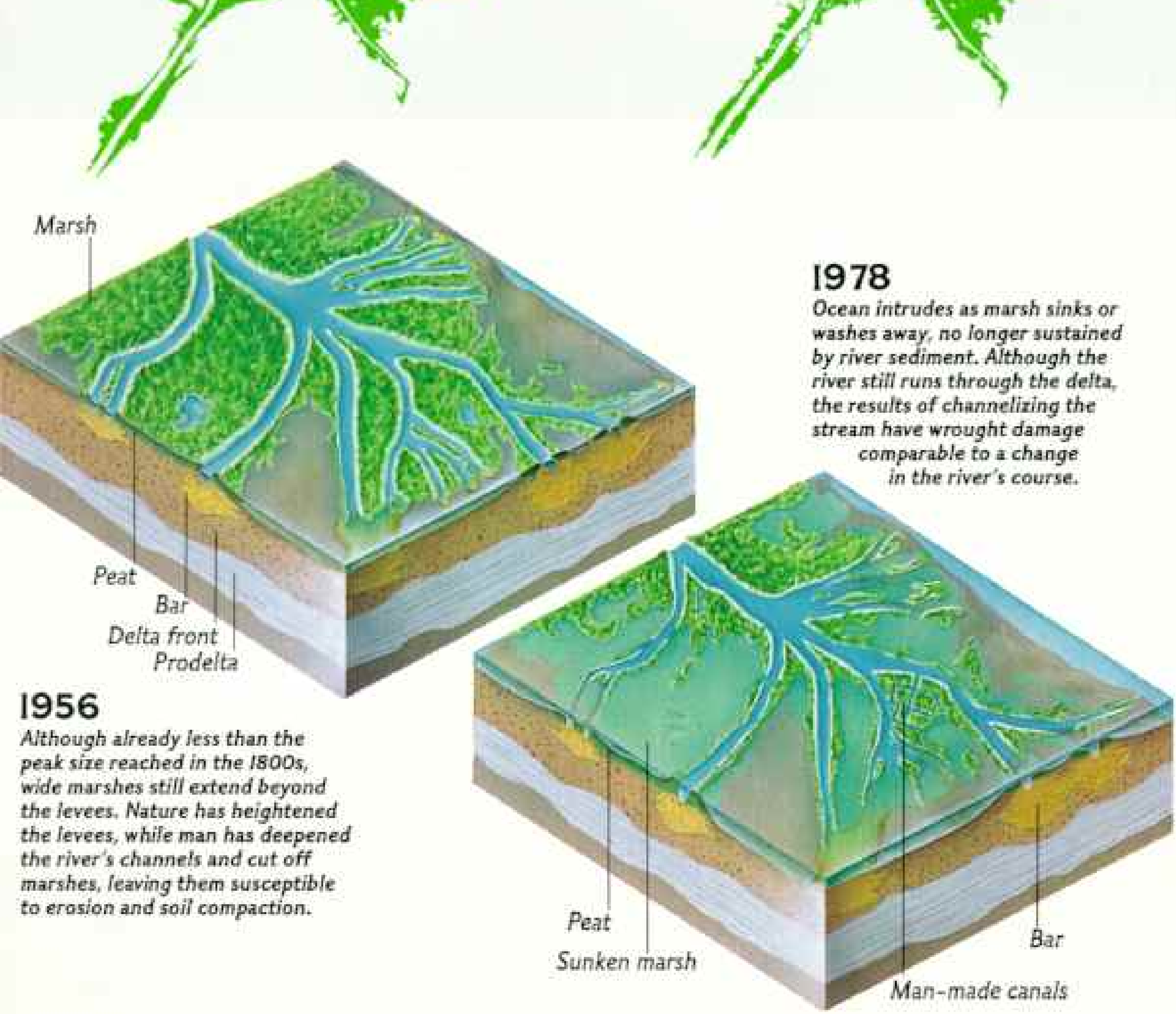


MISSISSIPPI
LOUISIANA

At least seven major deltas (color-coded to their river courses) have formed as the Mississippi changed channels over the past 9,000 years. The Atchafalaya has begun yet another. A shift to its channel is now overdue, checked by control structures where the two rivers are joined.

DATA FOR BLOCK DIAGRAMS AND MAP BELOW PROVIDED BY COASTAL ENVIRONMENTS, INC.
PAINTING BY SUSAN SANFORD
COMPILED BY DONALD L. CARRICK
NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

*decaying—comparisons of its outline in 1956 and 1978 (**below**) give a shockingly clear account of the transformation of marsh, shown in green, to open water. Man-made controls upriver have decreased the amount of sediment carried by the stream. Artificial levees along much of the lower Mississippi kept flood-borne sediment from replenishing wetlands. In the active delta, rock sills installed across breaks in the banks similarly confine the river. As a result an accelerating rate of land loss indicates that most wetlands in Plaquemines Parish, for example, will be underwater by the year 2000 unless more sediment-bearing river water is diverted into the marshes.*



School's out *for youngsters in Grand Bayou, where a school boat drops them at homes reachable only by water. One of two remaining year-round communities*

will be as plentiful a larder for Randy, and Randy's grandchildren.

THE SHRIMP CATCH, chief money-maker for most small-scale, independent Louisiana fishermen, grew from an annual average of 41 million pounds in the 1930s to a record 91 million in 1982. But commercial shrimpers' numbers increased elevenfold to a present 17,000.

Beyond that, sportfishermen are entitled to a daily catch of 100 pounds per boat for private use. With that kind of pressure on the coast's wildlife resources, men like Charlie Clark become ever more vital.

Charlie is concerned with conservation in its most immediate form: game-law enforcement. The 29-year-old state game warden is a troubleshooter whose job takes him into the marsh most nights of the year. On a particularly cold one, he took me with him.

We didn't catch anyone that night, but it was not exactly a dry run, either. A spotter plane reported a suspicious light nearby, probably from a poacher after deer or nutria. (Almost every form of hunting is illegal at night.) We idled toward it, stalking like alligators in search of armed prey.

Twice, far ahead of us, we glimpsed a will-o'-the-wisp glimmer, a sudden glow come and gone. Eyes wide, ears cocked, we probed the wall of darkness ahead, the shadows pooled on the banks. "Once you've hunted man," Charlie whispered, "nothing else is equal."

Then our nemesis loomed up—a makeshift fence across the bayou, illegally erected by poachers. It took some colorful language and revving of engines to get through it, and when we did, at the end of the bayou we found only a fresh, muddy footprint.

We drifted, listening for a shot that never came. Charlie spoke in low tones of the men he hunts: "A game violator, that's a man taking life. City people are usually here for the thrill of it. A lot don't even keep the meat.

STEVE WALL

outside the levees, the close-knit fishing village counts 100 residents along its bayou main street: "Twenty-seven houses and one big happy family," as one puts it.

Then there's your outlaw commercial types. They feel that if they don't get it, somebody else will. And they're good at it." He chuckled. "Really good. Outlaws taught me everything I know about this job. And that burns 'em up, 'cause I'm a city boy.

"Now a lot of these old trappers are true conservationists. I've made friends for life here . . . and that's friends you can knock on their door at three o'clock in the morning, 20 miles from nowhere, and borrow gas."

The faint V of a swimming nutria caught starlight. "We didn't catch that guy, but at least he's home, not out here outlawing. This job is not without its rewards."

IN THE COLLISION between man and marsh, the oil industry has played a decisive part, providing jobs for people but altering the environment that formerly supported them, and nowhere more so than in the delta. Its surface is a pincushion of producing wells, connected to pipeline channels that erode at an ever increasing rate. A tangled spaghetti from booming offshore fields joins them.

More than 22,000 wells have been drilled in the Gulf, and some 4,000 structures remain in place. Nine out of ten are off Louisiana, and the very densest clusters, veritable forests of steel, surround the delta. If the Midwest is the nation's breadbasket, then this must be its gas tank.

The leader, for the moment, in the seaward march of technology is the Cognac platform, a gargantuan jungle gym 15 miles off South Pass that tapers up through 1,025 feet of water to top out, with a flare now in place, at 1,406 feet—156 feet higher than the Empire State Building.

"We can drill 61 separate wells, angling out by directional drilling up to two miles in any direction." Drilling foreman J. C. Stevens led me along catwalks above a surging sea as twin rigs labored over our heads. Today, with drilling completed, the wells

***Avid pupils** ride to marshland lessons at their father's knee as Clifford Boyd **(below)** sets out to visit fur traplines and fish traps. Seasons for nutria and muskrat, alligator, shrimp, and fresh- and saltwater fish provide a year-round income for Cliff and others who prefer the unforgiving regimen of the marsh to surer paying jobs. "If the rest of the world*

STEVE WALL (RIGHT)

ever runs out of food," a game warden predicts, "these people will still be eating."

*Although watermen know their winding avenues by heart, transplanted street signs **(right)** reassuringly reflect spotlights at night—and a touch of bayou whimsy. Less comforting, trappers and fishermen report with dismay that familiar features are sinking beneath encroaching waters.*


8TH ST
MANHATTAN BLVD
SPEED
LIMIT
40

produce 72,000 barrels of oil and 100 million cubic feet of gas daily—enough, even at present prices, to pay back an 800-million-dollar investment in handsome time.

Stevens never quite said it, but you knew clearly that his was a showcase operation. I sensed it, too, from the men I met over a steak dinner and a post-movie bull session. They were young fellows, for the most part, working 12 hours a day in week-long shifts and studying nights, destined for jobs all over the world. Gulf coasters dominate what has become a regional profession, honing skills exported to every ocean.

Before turning in, I watched roughnecks manhandle pipe up from a hot, inky hades to replace the bit. Rain streaked past floodlights. The wind tasted of salt. On a tiny metal grille 90 feet above me, a man tethered only by a safety belt leaned out over space to lasso each length of pipe. My palms sweated as I watched, and I remembered what 22-year-old K. D. "Cowboy" Bailey had told me earlier.

Cowboy's father was killed on a rig, and his mother asked him never to work in the oil fields. He rode rodeo for a while, but after marriage, when the time came to make serious money, he went offshore.

"I like to died that first week. Now I wouldn't trade this rig for nothing."

THE REAL FORTUNES, however, have gone to men who stayed ashore, owners and leaseholders of marshland who received bonanzas in mineral royalties. None was more successful in this business than the man who, from the 1920s until his death in 1969, ruled the lower delta as a personal barony: Leander Perez.

To friends and foes alike—and both were legion—he was "the Judge." An unequivocal racist and segregationist, bombastic defender of states' rights, bitter enemy and generous patron, he dominated Plaquemines and St. Bernard Parishes with a boldness rare even in Louisiana politics.

In a political dispute in 1943, Perez barricaded Pointe a la Hache, the Plaquemines Parish seat, and sent armed deputies against state guardsmen. (No one was hurt.) He fought civil rights laws and school integration with every means at his disposal. In 1962, from a nonwhite population totaling more than a quarter of Plaquemines' 22,545 residents, only 43 blacks were registered voters. The next year Perez renovated a Civil War fort as a stockade for hundreds of anticipated civil rights demonstrators. The demonstrations never occurred, and the Judge's battle was lost in the courts. Public-school integration became a fact in 1967.

The Judge's legacy is everywhere. Streets, monuments, a park, and a lake bear his name. All sorts of problems evoke the lament, "If only the Judge were alive."

If he were, Plaquemines' ruling council might not, for the first time in its history, include a black man and a white woman.

Ernest Johnson, a construction and oil worker all his life, is unassuming, soft-spoken, and solidly self-assured. In 1975 he went to court as co-plaintiff in a discrimination case to revise Plaquemines' electoral system. At that time a five-member council was elected by parish-wide vote. "We was outnumbered so big," Johnson says, "a black never had a chance to get elected."

Now nine members are elected by districts, allowing the parish's individualistic regions and ethnic communities greater political freedom. Johnson and Germaine Curley, the first woman ever elected, became allies as underdogs against the established power structure. Put into office in 1983 by both black and white voters, Johnson concludes, "People knew what I stood for. I wasn't playing. I didn't worry about no threats. I was out to bring change."

The changes include the fact that no Perez is on the council for the first time since its formation in 1961. A feud between the Judge's two sons, Leander Jr. and Chalin O. Perez, brought a barrage of accusations, lawsuits, and indictments that led to the ouster of Chalin from presidency of the council and grand jury charges against Leander Jr., Plaquemines' district attorney. In these latest elections, Chalin did not run.

SOME TIES to the past are submerged but not gone. Natives know the St. Bernard community of Delacroix Island as simply "the island," a good name for a bypassed corner of Louisiana that kept together many generations of one of the continent's least known and oldest ethnic groups—the Isleños.

They came from the Canary Islands in 1778, along with mainland Spaniards, in an attempt to validate the motherland's brief title to her Louisiana territory. A decade or so later, French-owned plantations moved down the ridge lands, and many Isleños faded farther into the outlying marshes. Here the language and culture survived as a way of life well into this century, cut off both from Spain, and, in many respects, the United States as well.

Recent years have changed all that. Parish historian Frank Fernandez estimates that 10,000 in St. Bernard have Isleño blood but that only 500 speak Spanish. "The schools made kids lose their pride in the language," Frank said when I met him and Irvan Perez (no relation to the Judge) at Frank's home. "We didn't lose it, but the next generation did."

They are working to revive Spanish in local schools and to preserve a sense of identity. In 1976 he and Irvan visited the Canary Islands. A trickle of migration has come to the delta from the old country through the years, but theirs was the first return visit of which they know.

"After that, there was no denying our Spanish heritage," Frank said. They found family resemblances, familiar foods and place-names, and such customs as the unquestioned patriarchal authority and rigid communal mores they had known as youngsters in the delta. Above all, they discovered the miracle of a nearly common language.

"They were astounded by words we used," Irvan said. "Our Spanish was planted here and never changed much, as if someone now spoke Elizabethan English."

Irvan, who spoke no English until grade school, brought another precious gift from colony to mother country. He is a singer of *décimas*, traditional satirical songs largely forgotten in their homeland. After performing one, he saw the old women of the islands crying, and asked why. "They hadn't heard it in years, they said, but remembered it from when they were children."

Irvan's wife, Louise, who sat with Adele Fernandez in the kitchen while I talked with Frank and Irvan at the dining-room table, is descended from Italians who came to the delta in the last century as farmers. "I still don't know how he managed to marry an Italian," Frank said solemnly. "They never would have allowed that in the old days."

"I learned five words of Spanish and convinced them I was Isleño," Louise called from the kitchen.

"You all are contradicting one of our cultural heritages," Irvan called back. "When the men sit down to talk, the women aren't supposed to speak unless spoken to."

"Ha!" Adele replied. "That's one of our cultural heritages we let go." Eyes sparkling, she and Louise pulled chairs up to the dining-room table. "Women's lib's here!"

JEAN LAFITTE National Historical Park was commissioned in 1978 to portray and interpret the vivid human mélange of southeastern Louisiana at preserved cultural sites before television and the tides of mass culture further erode ethnic identities. Park historians researching delta peoples have encountered an ethnologic laboratory: Different groups exist at all levels of assimilation, facing vastly different experiences.

Creole is a word with many shades of meaning, but it generally describes Louisianans of long and mixed descent. They are as native as any group can be, yet delta Creoles live mostly in villages of their own, attending Creole-oriented school and churches. At Eddie's Oyster House, a line of Creole women nimbly eviscerate shellfish.

On the docks of Empire, a fishing center far down the west bank, the latest in a long succession of newcomers have only migrant status. They are Vietnamese, many of them boat people, tough survivors of brutal waves of emigration who found their way around half the world to settle in New Orleans and Biloxi.*

Empire is a natural base for long-distance fishing trips, far out in the Gulf of Mexico, but few of these fishermen have made their homes here. That is due, in large part, to hostility from deltans jealous of their fishing grounds. Vietnamese who fish out of Empire prefer to make the 55-mile overland trip to homes in New Orleans. In Empire they are still strangers, as they have been in other ports, other nations.

Push into Empire's marina bar and you

*Harvey Arden told the story of these fishermen in the September 1981 NATIONAL GEOGRAPHIC.

Three's no crowd *for delta ship pilots who daily squeeze oceangoing behemoths past one another on the bustling river channel (**above**). Boarding a launch at the riverside outpost of Pilottown, a bar pilot (**left**) heads for a midstream rendezvous with a ship he will guide down the river's lowest reach. Traffic of every seagoing nation sails through Southwest Pass, bound to and from New Orleans—the nation's leading port—Baton Rouge, and industrial complexes of the "American Ruhr" that line the river between the two cities.*

Pilots are bedeviled by frequent dense surface fogs, unpredictable currents during high water, and suction created by ships' passages that can pull them into banks or toward other ships.

"Statistically we're among the safest pilots in the country," says bar pilot Jack Levine. Like most of his colleagues, he is the son and grandson of pilots. Their tightly restricted association traces its lineage to days of sail and paddle. But he notes, "With 18,000 trips a year, sometimes things are going to foul up." River accidents over the years have spilled oil and a horrifying variety of chemicals, which sometimes entered marshes and threatened fishing and shellfish grounds.

enter the Adriatic, where rubber-booted fishermen from Yugoslavia's Dalmatian coast knock back morning brandies and chat in Croatian. They are "Takos," in delta parlance (smile when you say it), and oystermen—"erstermen"—par excellence.

Whether a few weeks in the New World or descended from 1830s settlers, they are part of a community that has maintained living ties of marriage and ongoing immigration with towns and villages in their Yugoslavian homeland for a century and a half.

Dave Cvitanovich, 27, born in this country, was ashamed of his bilingual upbringing until an immigrant uncle rekindled his pride. Dave has since visited Yugoslavia three times and speaks fluent Croatian.

Formal education, he admits, touched him little. "I was always studying ersters." We visited his boat to watch the crew dredging one of his leases west of Empire.

"You farm ersters like a crop," he said, "move seed from one bed to another, keep 'em away from drumfish and drills." Drum and drills, marine snails, come in with salt influxes to prey on the shellfish. Oysters reproduce best in fresher bays but grow faster in saltier areas. So the oysterman's life is a constant gantlet of choices, not to mention hard work.

Round and round a placid bayou the little craft chugged, on mother-of-pearl waters beneath a coral sky. Dredge chains shook over reefs, ran smooth in mud, and from time to time ground aboard to dump dripping, algae-bearded shells. There seemed almost a magic in the process, coming up with treasure from the dark water. Dave split open one hoary old-timer and held it out glistening, cupped in its own muddy half-shell. I ate it in a gulp—salty, slippery, gritty, alive—a flavor ultramarine.

When the getting's good—*as in the near-record 1982 season—oyster*

THERE IS A MARINE FLAVOR to all this place, with its shrimp boats riding the tide like seabirds, net wings held high, and a constant parade of big ships outbound to all points. The horizon is a siren, and the whole world lies just beyond.

At its uttermost end, the river empties into the heart of the Gulf, a freshwater pump that shoots out even beyond its self-made banks into a gyre that creates, in effect, estuarine conditions in the Gulf itself. Along the stream's final lap, 30 miles from Venice to the tip of the main ship channel at Southwest Pass, no roads or flood-control levees line the banks. Only scattered outposts hold full-time inhabitants. It is a remote and paradisiacal place that I came to think of as the Kingdom of the River.

I went there as often as I could, basing on photographer C. C. Lockwood's houseboat tied up at the Delta National Wildlife Refuge headquarters and ranging out through

boats return to harbor gunwale deep with shellfish that thrive in the complex interplay of fresh and salt water along the delta's east and west fringes.

the marsh and down to the mouths of South and Southwest Passes. At South Pass I spent halcyon days hunting and fishing and talking to shrimpers from Alabama who come for week-long stints on the rich grounds off the river's mouths.

Pilottown is this kingdom's capital, if it has one, and from there I rode with bar pilot Jack Levine on a chemical tanker to the sea buoy off Southwest Pass, and back again on a bauxite carrier bound upstream for Baton Rouge. Two wide-porched white buildings in Pilottown house the bar and river pilots, who respectively handle traffic in and out of the passes and up the river. A raised concrete walkway is Pilottown's only street, bordered on one side by willows and the river, on the other by the stilt houses of a handful of watermen and the marsh.

But my favorite spot was the refuge. Two couples lived there, Ted and Beth Heuer and Sam and Ev Henson. Ted is a young

professional launching a career in the U. S. Fish and Wildlife Service. Sam is a veteran nearing retirement, with 14 years' service at this refuge. Sam keeps bees for honey and vines for homemade wine. Venice and civilization are a short boat ride up the river. But most of the time, the Heuers and the Hensons keep to the refuge, their lives tuned to the timeless clock of the marsh.

Passerine birds arrive in spring, exhausted from their passage across the Gulf, and light down in their thousands on the first land in that watery expanse. Southbound teal come in late summer, followed by streams of other ducks and, finally, the geese, trumpeting down from the north to feed on grasses fringing the sea. With Sam and Ted, I banded ducks and explored the marsh, and learned to love this peninsula of mud and fresh water thrust out in the ocean.

On a midwinter evening Sam and I watched from bankside in the refuge as fog gathered on the river and ships rumbled past, superstructures showing above the mist's blank void. Sam knows many secrets about the marsh and the river, and he spoke his thoughts to the gathering dusk.

"They talk about what they'll do with this river. . . . Let me tell you something. This river is the god and master of all this country. It's been here 10,000 years, and it'll be here a lot longer. They're fooling themselves if they think they'll do anything without its say-so."

The last light stretched and waned and gave over to night, a crystalline sky showing overhead while the river mist glowed before us. The Mississippi flowed past in silence, a vast unending exhalation from the heartland of the continent. Then we heard the geese, invisible somewhere high up in the stars, yelping in their travels toward some destination known only to themselves. They bugled in flight like a pack in full cry, like hounds of the sky, chasing Orion across the Milky Way and down into a forever sea. □

***Man seems remote** from pristine marsh near the delta's southern tip. It may well be that despite human destruction or efforts to curb it, the river will decide the ultimate fate of the land it has built in the sea.*

A PERSONAL PERSPECTIVE

By ARTHUR C. CLARKE

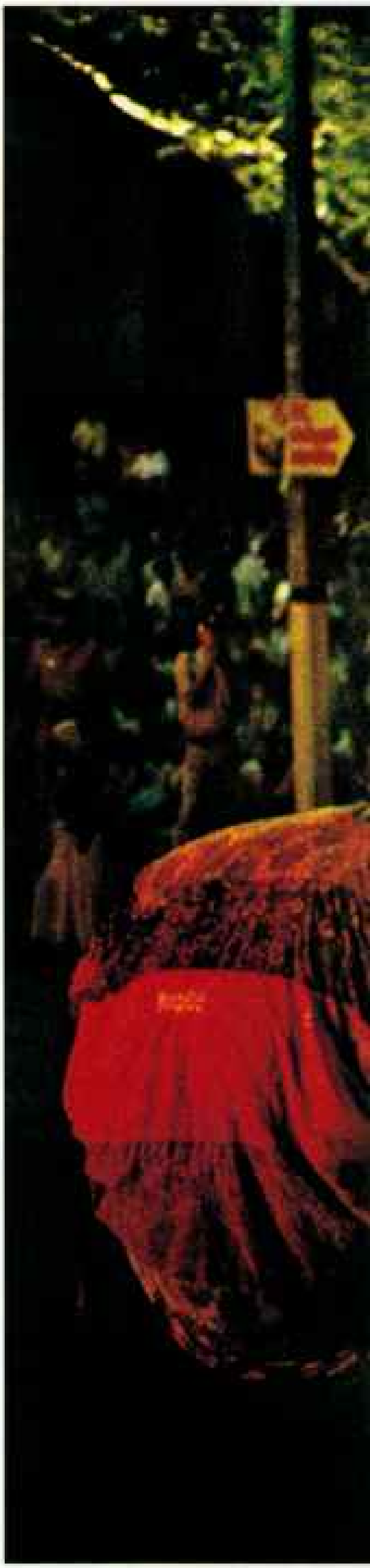
Sri Lanka's

A WORLD that contained only human beings would not be worth living in, nor would it be habitable very long. This is a lesson that our urban-centered, technologically orientated culture is painfully relearning, though our ancestors knew it well enough. A holy man once told the ruler of Ceylon: "O great King, the birds of the air and the beasts have as equal a right to live and move about in any part of this land as thou. The land belongs to the people and all living beings; thou art only the guardian of it."

That was 23 centuries ago, when coexistence of man and beast presented few problems. But in the past 25 years the human population of Ceylon—now Sri Lanka—has almost doubled. Though the small Indian Ocean island is not yet overcrowded, and much of its natural beauty is still intact, it provides textbook examples of many modern dilemmas: development versus environment; farm versus forest; indigenous culture versus tourism. There are countless beautiful, harmless, and often valuable creatures whose very existence is now threatened by greed, indifference, or ignorance. The elephant is, of course, the most spectacular of Sri Lanka's animals; its enormous appetite for succulent greenstuff puts it into direct competition with the farmer, who may be ruined overnight by a marauding herd—and can one blame him if he loads a blunderbuss with rusty nails to protect his crops? Fortunately the elephant is probably safe from extinction (pages 274-8).

But remembering what happened to the passenger pigeon in the United States less than a century ago, one cannot help fearing for Sri Lanka's smaller animals as the forests are cleared, coral reefs smashed to make lime, and land, air, and water polluted by the new industrial estates. Those creatures that thrive in man-made environments seem to be the less admired species: crows, rats, cockroaches. The beautiful birds and butterflies, the shy loris, the handsome leopard and its elegant prey, the spotted deer, all vanish before the advancing bulldozer.

It has been wisely said that in wilderness is the preservation of the world. For as King Devanampiya Tissa was told three centuries before the birth of Christ, we are its guardians—*not* its owners. * * *



Author of both fiction and nonfiction works, and a longtime conservationist, British writer **Arthur C. Clarke** lives and works in Sri Lanka.

Wildlife Heritage

Entrusted with holy duty, elephants parade with a Buddhist relic in Kandy during the Esala Perahera festival. DIETER AND MARY PLAGE

SRI LANKA'S WILDLIFE

Legacy of Lively Treasures

Photo essay by DIETER and MARY PLAGE

PERFECTION IN FLIGHT, a white-bellied sea eagle soars aloft with a fish in Sri Lanka's Gal Oya National Park. A centuries-old, Buddhist-inspired tradition of wildlife preservation strengthens the bird's stand in an island nation that boasts a network of national parks and sanctuaries.

HANDSOME in new antlers, a spotted deer in Wilpattu National Park (***left***) guards one of the many does he will mate with during the year. This Asian deer abounds in Sri Lanka's parks and helps nourish a thriving leopard population.

A diminutive chevrotain, or mouse deer (***top***), cowers in its nest at six weeks as its parents, no more than a foot tall, try to lure the two of us away.

Unaware of our cameras, a young black-naped hare (***above***) nuzzles a sprig in Gal Oya, perhaps reassured by the scent of its parents, off on a food-gathering mission.

IN THE FURY of combat, white-bellied sea eagles (***far left***) lock talons and cartwheel like acrobats before disengaging 100 feet above the Gal Oya reservoir. The mature eagle, at bottom, instigated this rarely observed dogfighting when the juvenile violated the adult's territory and snagged a fish.

When attacked, the juvenile dropped its dinner, only to see a spotted-billed pelican (***above***) scoop it from the water and flee. Thereupon the adult eagle took up the chase and landed near the pelicans' perch (***left***). But too late. Having swallowed the evidence, the interloper joined with its mate in a duet of impressive gesturing.

The man-made, fish-stocked Gal Oya reservoir lures these coastal-dwelling eagles and pelicans inland to nest. A few dozen licensed commercial fishermen also ply the reservoir, built to supply water to this dry southeastern section.

NIGHT STALKER stakes its ground in Wilpattu National Park. Fleet and industrious despite its name, a sloth bear (***above***) digs with razor claws for ants and termites, its favorite foods. Those claws and an unpredictable nature make the bear among the most feared of Asian jungle animals. Poor of eyesight and hearing, it charges wildly upon detecting any unfamiliar scent.

Stretching and preening at a water hole, a brown fish owl (***right***) nevertheless keeps a sharp eye out for its prey. We spotted the nearly hidden owl from 50 yards.

With 505 square miles, Wilpattu is Sri Lanka's largest park. The island devotes 10 percent of its acreage to parklands, the largest percentage in Asia.

Acclaimed wildlife photographers and filmmakers, the husband-and-wife team of **Dieter and Mary Plage** explored Sri Lanka's protected lands for nearly two years. "You learn to understand jungle noises," Dieter explains. "Once you train your ear to your surroundings, animals become obvious."

NO PARTNER helps this parent, a male pheasant-tailed jacana (***above***), strutting on lotus leaves near his floating nest in Yala East National Park. The female deserts her mate and seeks a new partner after laying three or four eggs, arranged to prevent them from rolling out of the shallow nest of debris.

For 26 days the male incubates the eggs, folding his wings like a cradle beneath them. Then he shepherds his new brood for about three months. The father eyes his newly emerged firstborn (***top right***),

who shortly sets out (***bottom right***) to test the oversize feet that enable jacanas to distribute weight and walk on floating vegetation. Only minutes later disaster struck. A pond heron snatched the chick while father's back was turned as he helped another chick emerge.

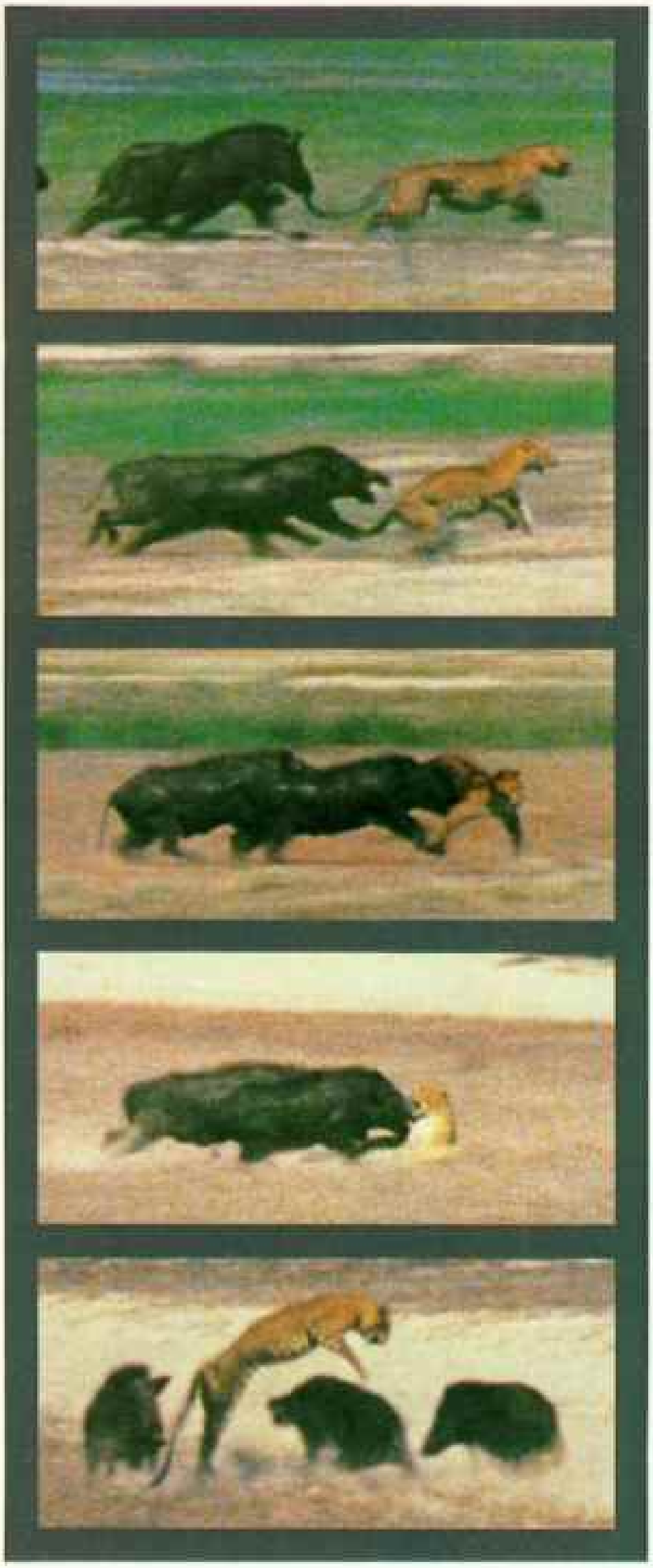
But it is our observation that the jacana's early-warning system usually foils such abductions. If a heron or sea eagle threatens, father sounds a chirp and the chicks dive, pushing their beaks to the surface for air. When danger passes, he chirps again and the chicks return.

FLASHY KIN of the domestic chicken, the Ceylon red jungle fowl (***right***) and its kind may mingle with barnyard flocks outside the parks. You see some very colorful chickens in the area.

Dazzled by a "living jewel," we patiently dogged the petite and elusive three-toed kingfisher (***middle***) along the aptly named Menik River—"river of gems."

If you want to find a fruit tree, listen for the Malabar pied hornbill (***below***), which sometimes nests in the trees that bear its food. The female enters a hole and molts. She and her mate seal the hollow with mud and dung, leaving a crack through which he feeds her. When the chicks hatch and her plumage returns, she breaks out, resealing the nest to guard the young, which emerge later.

Seven days old and ravenous, paradise flycatchers (***left***) crane necks for an insect from mother. Within five days they will outgrow their nest, camouflaged by empty spider cocoons, and cling to the branch while their parents shuttle food.



KILLER REBUFFED, for the moment. A leopard's attempt to raid a trio of wild boar piglets in Wilpattu meets ignominious failure at the tusks of three adults (***left***). In film clips from the 45-second encounter, the boars bite the leopard's tail, then charge and butt their victim, who escapes with a desperate leap. But the

next week the leopard returned and caught the piglets one by one.

Perhaps 60 leopards live in Wilpattu, considered the world's best site for leopard-watching. Fines and jail sentences for poachers help protect the animals from their only enemy in Sri Lanka. This female (***above***) took her own portrait by tripping our hidden camera.

IN THE RACE for survival the star tortoise bears the handicap of beauty. No animal in Sri Lanka is classified as endangered—thanks in part to the park system—but the star tortoise is one of the nation's rarest creatures, now seldom seen outside the parks. Where unprotected, it is preyed upon for sale in the international pet trade. This five-year-old, six-inch-long specimen strolling the beach in Yala will almost double in size as an adult.

Feral water buffalo in Gal Oya, stampeded by our car, descend from water buffalo imported from India centuries ago to cultivate rice fields. Leopards can strike down the young, but adults have no natural enemy in Sri

Lanka. Overgrazing and competitive grazing with deer have become a problem. To solve it, park officials now cull about 100 young animals each year and transport them to state experimental farms where they are mated with domesticated water buffalo to strengthen the breed for agricultural work.

RIDING THE TAIL of a 12-foot crocodile, a great egret gambles that its perilous fishing perch will pay off with a bountiful feast. The trick, of course: to eat without being eaten.

We observed this uneasy alliance

in a Yala water hole that had shrunk to about half normal size at the end of the dry season in the fall. By our count, 284 mugger crocodiles crowded the water hole to gorge on the concentrated schools of fish it contains.

As the crocodiles glide along, effortlessly feeding, fish leap wildly, and the opportunistic herons catch them in midair. But every so often, as if seeking more challenging prey, the crocs turn their jaws on their hitchhikers. * * *

Reluctant cargo, *a tranquilized wild elephant balks as trained relatives maneuver it into a truck for relocation to Wilpattu National Park.*

SRI LANKA'S WILDLIFE
A Nation Rises to the Challenge

By LYN DE ALWIS
DIRECTOR, SRI LANKA DEPARTMENT OF WILDLIFE CONSERVATION

Photographs by
DIETER and MARY PLAGE

WITH A CONFIDENCE born of experience, the big "monitor," an eight-foot-tall bull elephant specially trained to subdue and control his wild kin, sidled up to his unconscious cousin—felled by an anesthetic dart. The monitor stood patiently as his mahout attached him to the listless one with a fist-thick Manila rope, and other workers secured the captive's four legs by lines to nearby trees. After checking all connections, the team veterinarians injected the wild elephant with an antidote laced with tranquilizer—a combination designed to let the animal awaken but still remain tractable.

The steadfast monitor, undismayed by the struggling and heaving of his charge, soon had the captive maneuvered, hindquarters first, into a waiting truck. Hours later and 70 miles away, at Wilpattu National Park, the animal disembarked, its newcomer status proclaimed only by the number emblazoning its rump.

Thus another step toward protecting Sri

Four tons of elephant *taxes the truck on the 70-mile trip to the park* ***(top)****, where veterinarian Dr. Ian Hofmeyr* ***(above)*** *assists in its release. The rescue mission moved ten elephants from a populated area where they trampled crops, claimed human lives, and risked death themselves. Numbers scrawled in durable paint* ***(facing page)*** *allow park officials to monitor the transplants.*

Lanka's scattered elephant population, perhaps 2,500 of them in all; I was proud to have been a part of it.

I am a man doubly blessed. Not only have I managed to translate my lifelong interest in conservation into my life's work, but I am also privileged to work for a nation (my native land) whose reverence for the sanctity of animal life predates Christ by three centuries. When a holy man from India then converted a Sri Lankan king to the life-respecting tenets of Buddhism, this land's first wildlife sanctuary was established.

Today in the island republic, which remains nearly 70 percent Buddhist, there are more than 50 refuges offering haven for 85 species of mammals and some 425 species of birds. But nowhere is the Sri Lankan's concern for fellow creatures more manifest than in his awe and affection for our largest and most exciting mammal, the elephant.

Elephas maximus zeylanicus, a subspecies of the endangered Asian elephant, stands a better chance of survival than the mainland population. A part of the country's culture, it figures in sport, work, village festivities—and it is the only animal deemed worthy of carrying the casket containing sacred relics of Lord Buddha.

ONLY in modern times have our beloved elephants been seriously threatened by the encroachments of a burgeoning human population. Animals that once roamed free slowly became trapped in isolated forest enclaves completely surrounded by land cleared for agriculture (page 278). Their plight became even more desperate with the advent in the late 1970s of a development scheme to dam the Mahaweli River and divert its waters to irrigate some 900,000 dry-zone acres. Rivaling Egypt's Aswan High Dam in scope, the two-billion-dollar project will employ perhaps 30,000 citizens and eventually double the nation's electric power supply, while also providing for the resettlement of at least 100,000 largely landless families.

For Sri Lanka's 15 million people, this was good news. For the elephants in the development area it meant something entirely different. With their forest enclaves scheduled to be either logged to open more land or flooded as a result of new reservoirs, the


10

Only remnants of forest *remain outside the parks to shelter elephants, their once vast habitat razed for needed agricultural and industrial growth. Most of Sri Lanka's 2,500 wild elephants roam protected in the parks. The successful relocations to Wilpattu promise hope for those still at large.*

elephants faced either death or relocation.

Of course we opted then, as we have ever since, for relocation. We use the method described above for hopelessly isolated small herds. But when scores of elephants have to be relocated, we drive them, like cattle.

Indeed in 1979 we decided, to avoid breaking up a herd, to mount a drive of 150 elephants—composed of numerous small groups scattered in widely separated culs-de-sac over a ten-mile radius—some 30 miles to Wilpattu National Park. Night after night our enthusiastic rangers and other trained employees—with thunderous firecrackers, brilliant flares, bonfires, and their own raucous hooting, howling, and caterwauling—persuaded recalcitrant elephants to abandon their familiar haunts for places unknown, and not to sneak back!

Technically it was a success. The animals reached their destination without harm to themselves or their human herders. But because of its complexities, the relocation of those animals took a full 12 months. Since then we've become quicker and better.

NO MATTER WHAT the means used to relocate these animals, questions arise. Can Wilpattu, for all its 505 square miles of dense forest, provide food and water for 300 elephants where before there had been perhaps 50? And what of raids by the behemoths on the crops of bordering villages?

The government is facing those problems by providing new lakes, transplanted forage, and buffer zones between croplands and park. These are steps—important steps—but our work is far from finished.

By 1986 another 100,000 hectares (about 400 square miles) will be transformed from forest to field, and my department is charged with finding new homes for the displaced creatures—among them some 600 more elephants. One plan is to open a new park at Maduru Oya, which will connect by "jungle corridors" or "link forests" to other wildlife preserves.

Our plans, admittedly, are ambitious, and much of the emphasis is on elephants. But the plight of this most majestic animal symbolizes the magnitude and complexity of the entire wildlife problem. I believe that if Sri Lanka provides sufficient room for its wild elephants, it will have ample sustainable ecosystems for all its flora and fauna.

Too ambitious? Maybe. But such ambition has contributed to the fact that no Sri Lanka animal population is endangered.

May it always be so. □

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Think of all the reasons you want and need a station wagon. Now think of all you have to give up in today's conventional station wagon. Here are at least nine reasons why you should re-think Dodge Mini Ram...engineered without compromise to give you all that yesterday's station wagon gave you...and a whole lot more.

	Dodge Mini Ram	Chevy Impala/Caprice	Ford Country Squire
MSRP*	$9,587	$10,518	$10,293
EPA Est. MPG/Est. HWY.**	19/25	18/25	17/26
Range	684/900	342/450	323/481
No. of Passengers	8	8	6
Max. Cargo Length	120.1 in.	90.3 in.	81.2 in.
Cargo Volume***	201.5 cu. ft.	87.9 cu. ft.	99.6 cu. ft.
Standard Engine HP @ RPM Torque @ RPM	225 Slant-6 95 @ 3600 170 @ 1200	5.0 L V8 150 @ 4000 240 @ 2400	5.0 EFI V8 130 @ 3200 240 @ 2000
Side Door Entry/Loading (W x H)	38.8" x 47.3"	28.1" x 37.9"	28.9" x 37.0"
Rear Opening (W x H)	48.2" x 47.3"	48.2" x 28.7"	49.0" x 28.1"
Full Size Spare Tire	Yes	No	Yes

Today, conventional solutions no longer solve problems. That's particularly true if you want and need the comfort, convenience and versatility of a genuine station wagon. Consider the Dodge Mini Ram. It's no conventional solution—but it may well be your best.

BUILT RAM TOUGH TO LAST

For durability and security, Dodge Mini Ram Wagon is built to go beyond just plain "tough." It's Ram Tough. Steel roofs are buttressed by steel supports. Thousands of precisely-positioned welds bind the Mini Ram's body into a light but strong unit. That also helps eliminate the rattles and squeaks that so often afflict conventional station wagons and other vehicles that are bolted or riveted together.

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HEADS ITS CLASS IN VALUE AND MODEL YEAR SALES

Consider all the extra advantages Dodge Mini Ram offers you...all the ways it uniquely satisfies your station wagon needs—all of it's sheer value for your money—and a switch from conventional thinking becomes downright logical.

Here's something else to think about: In the last model year, the Mini Ram Wagon, Dodge and other Chrysler Corporation wagons outsold Ford and Chevy van wagons.††

Test drive *the* station wagon. Ask your Dodge dealer about buying or leasing one. And remember, always buckle up for safety.

JUST HOW "BIG" IS THE DODGE MINI RAM? COMPARE THE KEY DIMENSIONS:

DODGE MINI RAM

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**Use EPA est. mpg for comparison. Your mileage/range may vary depending on speed, distance and weather. | EPA est. lower | Range = EPA est. x tank capacity.
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††Based on 1982 model year retail deliveries.

RAM TOUGH

Dodge Trucks

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Members Forum

WORLD OF TRASH

Now we know! After decades of photographing pristine landscapes without so much as a discarded gum wrapper, NATIONAL GEOGRAPHIC (April 1983) has been saving it up for one big trash bash!

Morgan C. Larkin
Palatine, Illinois

Your interesting—and repugnant—article on trash reminded me of a Dutch friend and colleague who got disgusted at the waste of valuable raw materials we throw away with our used appliances. He and his students designed an economically recyclable clothes washing machine. After it has served its useful life, it can be taken apart in a very short time and at low cost so that the various metals can be salvaged easily.

Ernest G. Chilton
Menlo Park, California

Professor Rathje states that garbage never lies but people often do when questioned regarding the frequency of drinking beer. Could the liars have been responsible people who take pride in their neighborhood and picked up the beer cans?

Arthur M. McIntosh
Des Plaines, Illinois

As a preschooler I always wanted to grow up to be a garbage man—now I think I see why.

Robert M. Schoch
New Haven, Connecticut

In a city the size of New York, garbage is bound to pile up, and until a solution is found, garbage dumps will have to keep expanding onward and, most definitely, upward. I, for one, can only hope a solution *will* be found and that future generations will *not* look toward these "mountains" of garbage in the same way that Sir Edmund Hillary looked toward Everest!

Barry Hochberg
Staten Island, New York

The mere sight of 20th-century trash near a 4,500-year-old Pyramid (page 457) is a sacrilege by itself. However, the fact that four of the five products (Pepsi, Kodak, Marlboro, and Kentucky Fried Chicken) are made by American companies is an even greater sign of decadence. Aren't the Pyramids just a little too far to dump our trash?

Charles J. Zepfel
New Cumberland, Pennsylvania

Might I add a postscript? A funeral director wishing to build himself a retirement home selected a site on Kootenay Lake in British Columbia. Having a large number of empty square-sided glass embalming-fluid bottles, he used these as building blocks with liberal assistance from his colleagues in the profession.

H. G. Peck
Lethbridge, Alberta

CHATTOOGA RIVER COUNTRY

I am distressed that the writer (April 1983) saw fit to categorize us as red-necks and hillbillies. Please come back, but next time "true" the picture and look at the progressive thinkers that live here. Not all of us carry a shotgun and have cigarettes hanging out of our mouths.

Sally Long Forlines
Clayton, Georgia

The pure innocence of Eve—before the apple—shines from Margie Crisp's eyes (page 472). Thank you for a view of yet another Eden—before grasping greed erases it from the earth.

R.C.H. Schmidt
Minnetonka, Minnesota

JERUSALEM

It is not enough to say, as you do ("This Year in Jerusalem," April 1983), that the 1947 UN plan to partition Palestine failed to take effect. The fact is that the Jews did accept the Partition Plan—reluctantly, it is true, but accept it they did. The Arabs rejected it. Who knows what the political situation would be like in that area had the Arabs made the least attempt to talk instead of fight?

Morris Stern
Plainview, New York

While I find many comments with which I disagree, I think your handling was essentially accurate and evenhanded. We'll never get a chance to know whether the Arabic-Christian-Jewish problem might have been solved through fair play by all concerned. The most recent chance to do so was given to the Israelis, and their present policies leave little chance for success.

Raymond W. Fitch
Minneapolis, Minnesota

The article states, "There followed a series of major confiscations totaling some 5,000 acres of Arab land, for 'public purposes' that proved to be housing of extraordinary scale."

Lest readers get the idea that seizure of private property for public purposes is something unique to the Israeli government, I point out that "condemnation and appropriation" of real property and business rights has been going on in the United States for years under eminent domain.

Gerald S. Wolinsky
New York, New York

As a Palestinian from Jerusalem, I can only say that "modernization" is not the word to describe what the Israelis have done to Jerusalem. They have confiscated our land, bulldozed and dynamited our hundred-year-old houses, only to build "modern" stucco houses on top.

Peter Boullata
Montreal, Quebec

Joseph Judge's article on Jerusalem is abundant with half-truths, bits and pieces of historical events, and many anti-Israeli innuendos.

Oded Livneh
Fair Lawn, New Jersey

The persecution of the Palestinians in East Jerusalem is well known, and your attempts to gloss it over by simply concentrating on the Jewish population was deplorable.

Neva Chonin
Bellevue, Washington

There are those of us who value the kind of clear, accurate work you have done in presenting the facts. For all the problems, we see peoples of all faiths openly exercising their religious imperatives in the Jerusalem of today.

J. I. White
Houston, Texas

It was sad for us as Israelis to notice the phony photograph of three mourning Israeli women soldiers (page 515). The tomb on which one of the women seems to throw herself in sorrow is of a soldier who died at the age of 25 in the War of Liberation more than 35 years ago.

Ruth S. Noy, Avery Sharron
Lexington, Kentucky

The women were grieving at funerals for soldiers killed in Lebanon during June 1982 but were near older tombs.

It is thoroughly irresponsible for any publication to discuss Deir Yasin (page 514) without disclosing the practical impossibility of knowing what actually happened.

David M. Goldberg
Brooklyn, New York

Deir Yasin was controlled by an Iraqi armed unit that had raised a white flag and then fired on Irgun troops, killing the leader and others.

Paul Auerbach
Philadelphia, Pennsylvania

When the Red Cross followed Haganah into Deir Yasin and found 254 bodies in a well, one was a small child still faintly breathing. Women had been raped and men mutilated.

Joe L. Markham
Del City, Oklahoma

Controversy still surrounds the attack on Deir Yasin by members of the Irgun and the Stern Gang. The Haganah moved into the village after the bloodshed and denounced the scene as "absolutely barbaric." Officials of the International Red Cross and the British government confirmed the charges of murder and atrocity.

You refer in a picture on page 494 to "the forbidden Palestine Liberation Organization's flag." Wrong. That is the Palestinian national flag.

Thomas E. Hilton
Brooklyn, New York

First used in 1916 as the flag of the Arab liberation cause, it was adopted by Arab Palestinians. Israel does not recognize a Palestinian nation and maintains that the flag represents the PLO's interests, hence the ban.

In your scholarly and powerful article on Jerusalem, the reference to James as the brother of Christ is a mite too casual. The word translated as "brother" carried with it the more inclusive connotation of "close relative."

Fred McCracken
Attleboro, Massachusetts

James is called "the Lord's brother" in Paul's Epistle to the Galatians (1:19). The phrase can be interpreted as you suggest; no blood relationship has been established between James and Jesus.

PUERTO RICO

The status preference of Puerto Ricans (April 1983) should not be inferred from the results of the general elections since we fully understand that these are not plebiscites. The voters are not necessarily evenly split between supporters of statehood and commonwealth. The majority would rather retain their identity as Latin Americans, and surely more than 6 percent would opt for independence in a status referendum.

Rodolfo García
San Juan, Puerto Rico

Letters should be addressed to ***Members Forum****, National Geographic Magazine, Box 37448, Washington, D. C. 20013, and should include sender's address and telephone number. Not all letters can be used. Those that are will often be edited and excerpted.*

She had 11 great reasons to buy a Maytag Dishwasher, says Mrs. Ciolkosz.

They're the 11 great years of nearly trouble-free service she's had from her Maytag Washer.

"It was the dependability of my old Maytag Washer that persuaded us to buy a Maytag Dryer, Dishwasher and Food Waste Disposer," states Mrs. Pam Ciolkosz, Palatine, Illinois.

"I bought that washer about 11 years ago and have been using it constantly for my family of five," she continues. But the repairman has been practically a stranger, she says.

Larry and Pam Ciolkosz; Jonathan, 9; David, 7; Stephanie, 4.

Mrs. Ciolkosz adds that her Maytag Dryer has also been a joy. "As for my Maytag Dishwasher—it does a super job of cleaning. I like it so much better than the kind I had before.

"I feel sorry for people who don't buy Maytags. They may cost a little more, but they're worth it," concludes Mrs. Ciolkosz.

Naturally, we don't say all Maytags will equal that record. But long life with few repairs is what we try to build into every Maytag. See the ranges and microwave ovens we've added to our family of appliances.

MAYTAG

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On Assignment

DAVID GILLISON, NATIONAL GEOGRAPHIC | BELOW |

"THEY STARTED TO LAUGH" when ***Gillian Gillison*** played back her taped struggles to understand the complicated genealogy of the betrothed Kagopa, at left, and her groom. In a few days Kagopa and other brides would be secluded, as would pre-adolescent boys, and these Papua New Guinea highlanders would begin a marathon festival. Part of it was to be a series of ritual theater performances by elaborately costumed players. One of them, Noru, with photographer ***David Gillison*** (***right***), was a resplendent sun with triangular rays and a leafy corona of rainbow.

In two years' study the Gillisons saw portrayals of Gimi myths, old stories, and even household dramas and scandals. Gillian says that "those involved in the squabbles may be in the plays but never play their own parts."

The audience usually knows the stories, and "the players don't have to create a cumbersome set and dialogue as in our theater. They can get directly to the punch line." David adds, "When the play is a great success, the audience says it is 'killed,' much as we might say we've been knocked dead or laid in the aisles."

Gillian, an anthropologist with a doctorate from the City University of New York, will continue her work with the Gimis. David will photograph birds of paradise and help launch a joint venture of the provincial government, the Gimis, and the New York Zoological Society. The Gimi area would become a wildlife sanctuary with a research station, while the villagers would be principal owners of a tourist lodge served by helicopter.

Photographed by M.P. Kahl. ***Milky Stork:*** *Genus: Mycteria Species: cinerea*
Adult size: 91–106cm tall Adult weight: 2.7–3.2kg Habitat: Lakes, marshes, coastal mudflats and mangrove islands in Java, Sumatra, the Malay Peninsula and Cambodia
Surviving number: Unknown

Wildlife as Canon sees it: A photographic heritage for all generations.

Like all storks, the endangered milky stork of Southeast Asia performs a complex courting ritual. The mating birds greet each other with a display called "the up-down." In what looks like an effusive show of affection, they throw their heads and necks upward, open their bills wide, then lower their heads and necks, and swing them slowly from side to side while snapping their bills and uttering a series of hissing sounds.

The milky stork could never be brought back should it vanish completely. And while photography can record it for posterity, more importantly photography can help save it and the rest of wildlife.

Photography plays an important role in any scientific study. It can, for example, accurately record the milky stork's many behavioral displays. It can also help draw the world's attention to this bird's beauty and poetry of form. And not only is a photograph of the milky stork in flight stunning to look at, but it can lead to a deeper understanding of the whole of nature.

And understanding is perhaps the single most important factor in saving the milky stork and all of wildlife.

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Images for all time

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The steel-belted radial tires are also worthy of note. The tread pattern wraps up around the sidewall. So in sharp turns, the tire rolls onto additional tread. Not smooth rubber.

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