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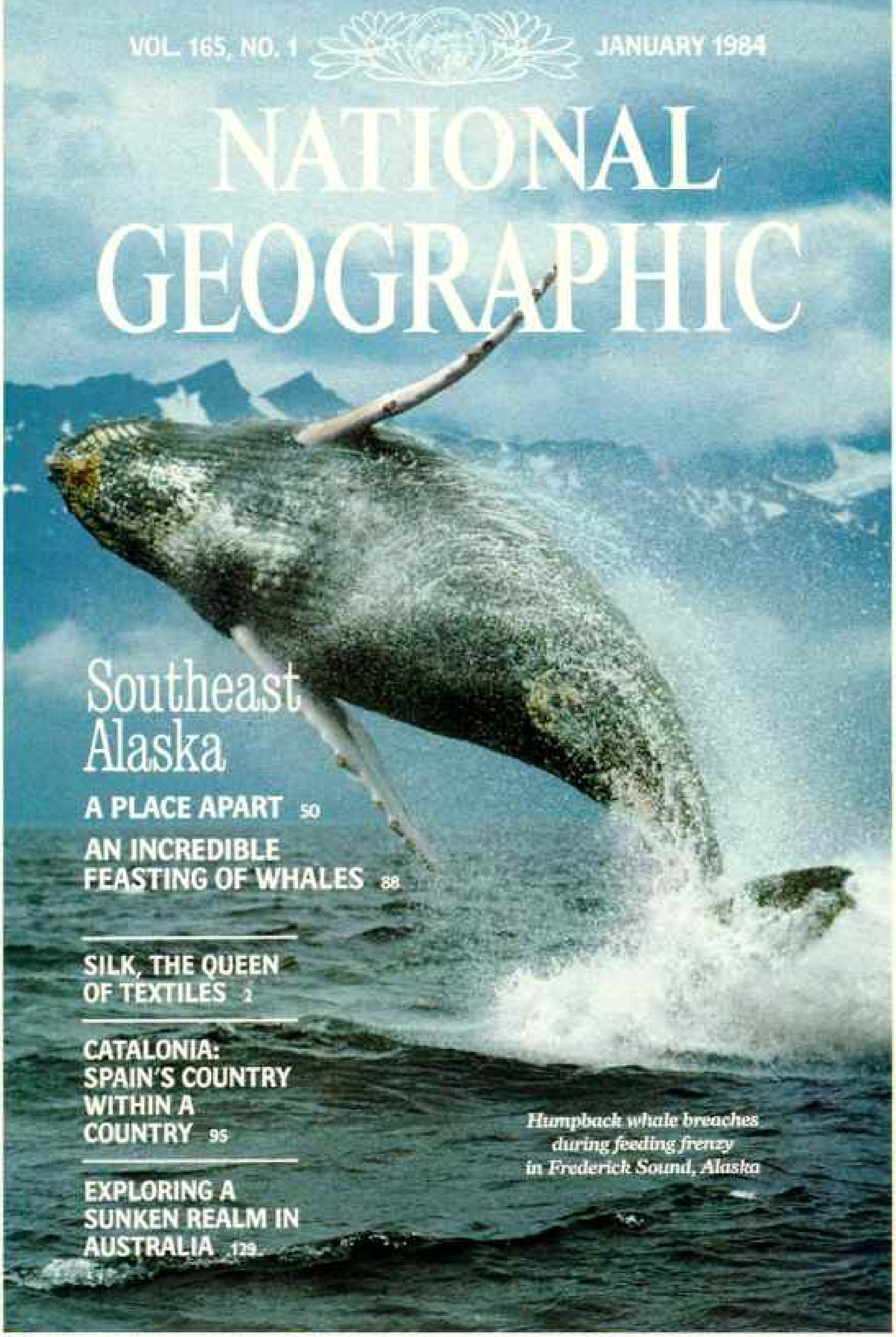
NATIONAL GEOGRAPHIC



Southeast Alaska

Humpback whale breaches during feeding frenzy in Frederick Sound, Alaska

SEE "AMONG THE WILD CHIMPANZEES" WEDNESDAY, JANUARY 11, ON PBS TV

AT LAST WE'VE REACHED 1984, the year made chillingly famous decades before its time by George Orwell's novel *Nineteen Eighty-four.* It will come as no surprise to our long-time readers that we approach the year with our usual optimism. We cannot join the morose pessimists who lament that the dreaded Orwellian future of Big Brother, of the superstate that rules through thought control, torture, murder, and degradation of its citizens has already arrived.

Admittedly, it's impossible to report on this world and not be appalled by the organized brutality and political torture and casual killing by some governments. In the past two years I've personally reported on two such depravities when I witnessed the opening of the mass graves of Kampuchea and shared the shocked aftermath of Beirut's Shatila refugee camp massacre.

Nevertheless, in truth the world is a better place today than when Orwell's novel was published in 1949.

Slavery is virtually eliminated. Famine is rare. Medical advances have totally conquered some diseases, controlled others, and dramatically reduced human suffering. More and more the rule of law and justice replaces the perverted whim of potentates and kings and religious and political inquisitions and genocides of the past, when whole societies and cultures could be eliminated with virtually no one knowing or caring. Since it is all too true that the victors wrote the history books, it was probably worse than we know.

We will be accused of looking at the world with blind optimism, but that's OK—there are plenty of others who report daily with all-seeing pessimism.

With the potential power for evil in modern technology there's plenty of reason to worry, but given the choice I would rather trust the future to the optimists.

Wilbur E. Garrett

EDITOR

NATIONAL GEOGRAPHIC

January 1984

COVER: *Leaving a signature of power and grace, a humpback whale breaches in Southeast Alaska waters. Photograph by Al Giddings, Ocean Images, Inc.*

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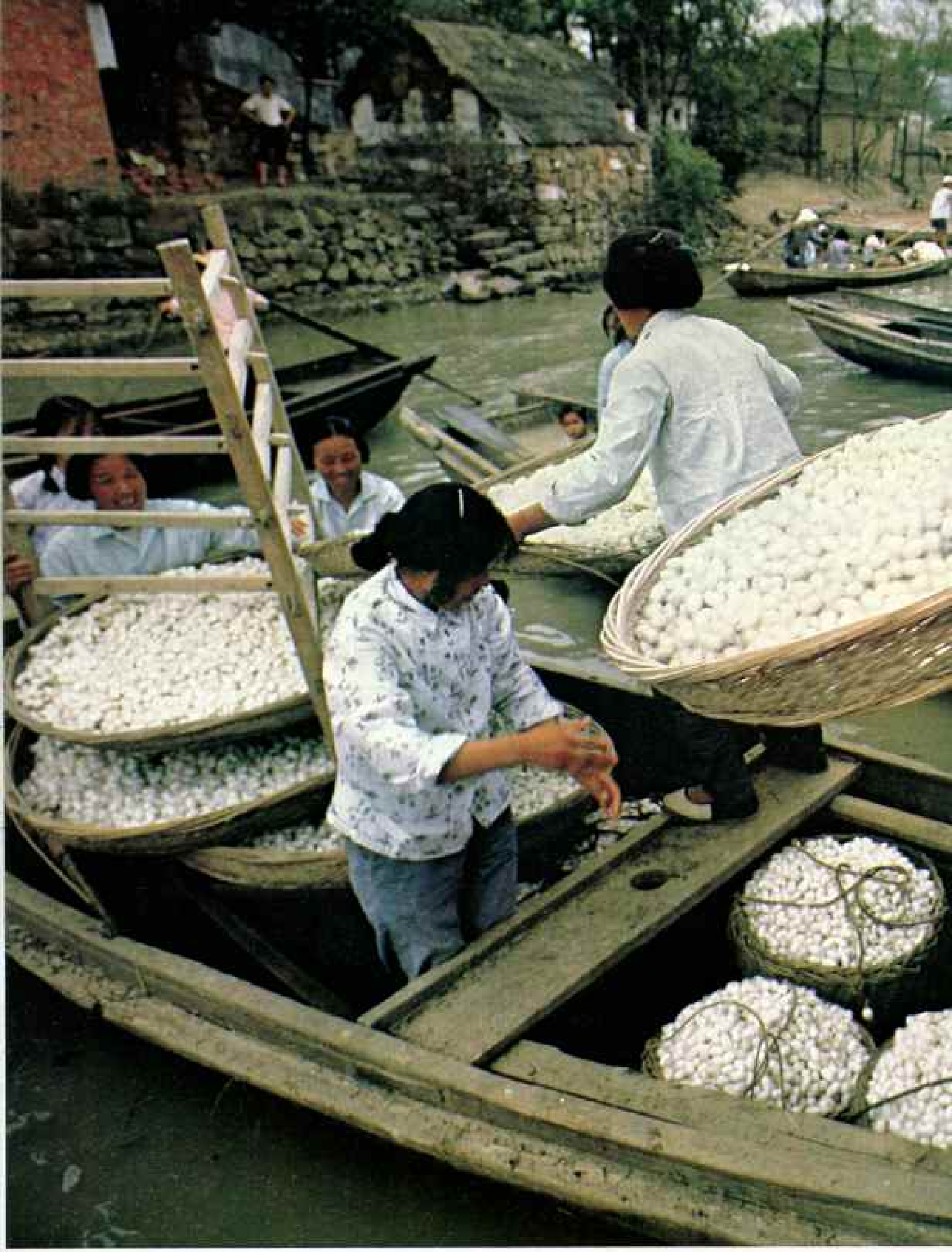
SOFT AS A SIGH,
a cascade of silk satin—hand-embroidered from a design by Zheng Wenzhong for the China Silk Corporation at Hangzhou—whispers of the exotic, the luxurious, the romantic. For more than 4,000 years this sensuous cloth, conjured from the strand of a lowly worm, has reigned supreme as . . .

The Queen of Textiles

By NINA HYDE

Photographs by
CARY WOLINSKY
STOCK, BOSTON



HOISTING A HARVEST of cocoons, a worker of the Dongshan People's Commune in eastern China heads for a government purchasing station. The commune will be paid, depending on quality and weight, about three

dollars a kilogram (2.2 pounds) for the crop. China, where more than ten million farmers raise silk, in 1982 exported some 36,000 tons of it—more than half the world's consumption—to markets in the United States, Japan, and Europe.

LIKE LIVING GEMS, pastel-hued silkworm cocoons fill a frame in the Zhenjiang Sericulture Institute at China's main agricultural research center in Jiangsu Province. Native home of the mulberry silkworm, China

boasts nearly 300 varieties of Bombyx mori, *as the animal is known to scientists. Sericin, a generally colorless, gummy substance that coats and binds the worm's thread, temporarily tints these cocoons; the colors are boiled out during processing.*

PATTERNS INTERWOVEN with tradition decorate the slung-up warp, as these vertical threads are called, being arranged by Uygur women in the Chinese Central Asian city of Hotan. The tie-dyed warp will be woven

to produce a colorful pattern, shown in the garment worn by the woman at right. Indigenous to Hotan, this rare design dates back more than a thousand years. Such satin-weave garments are included in a Uygur woman's dowry.

REMNANT OF HISTORY, silk swatches on an order placed by Napoleon with the Lyon firm now called Tassinari & Chatel (above) show the emperor's color choice. Elegant 18th-century taste steps forward in a shoe (below), made of silk brocade woven in the London district of Spitalfields, and in a French coat and waistcoat (right) resplendent with silk embroidery.

PHOTOGRAPHED AT BETHNAL GREEN MUSEUM, LONDON (ABOVE); AND AT METROPOLITAN MUSEUM OF ART, NEW YORK (RIGHT)

OF THE DOZEN PLATTERS artfully arranged on the luncheon table, only one commanded my attention—and apprehension: a dish of silkworms. Minutes before at the Liaoning Province Sericulture Scientific Research Institute near Dandong, China, I had watched a golden yellow wild silkworm crawl across the back of my hand. Now it was on my plate for lunch.

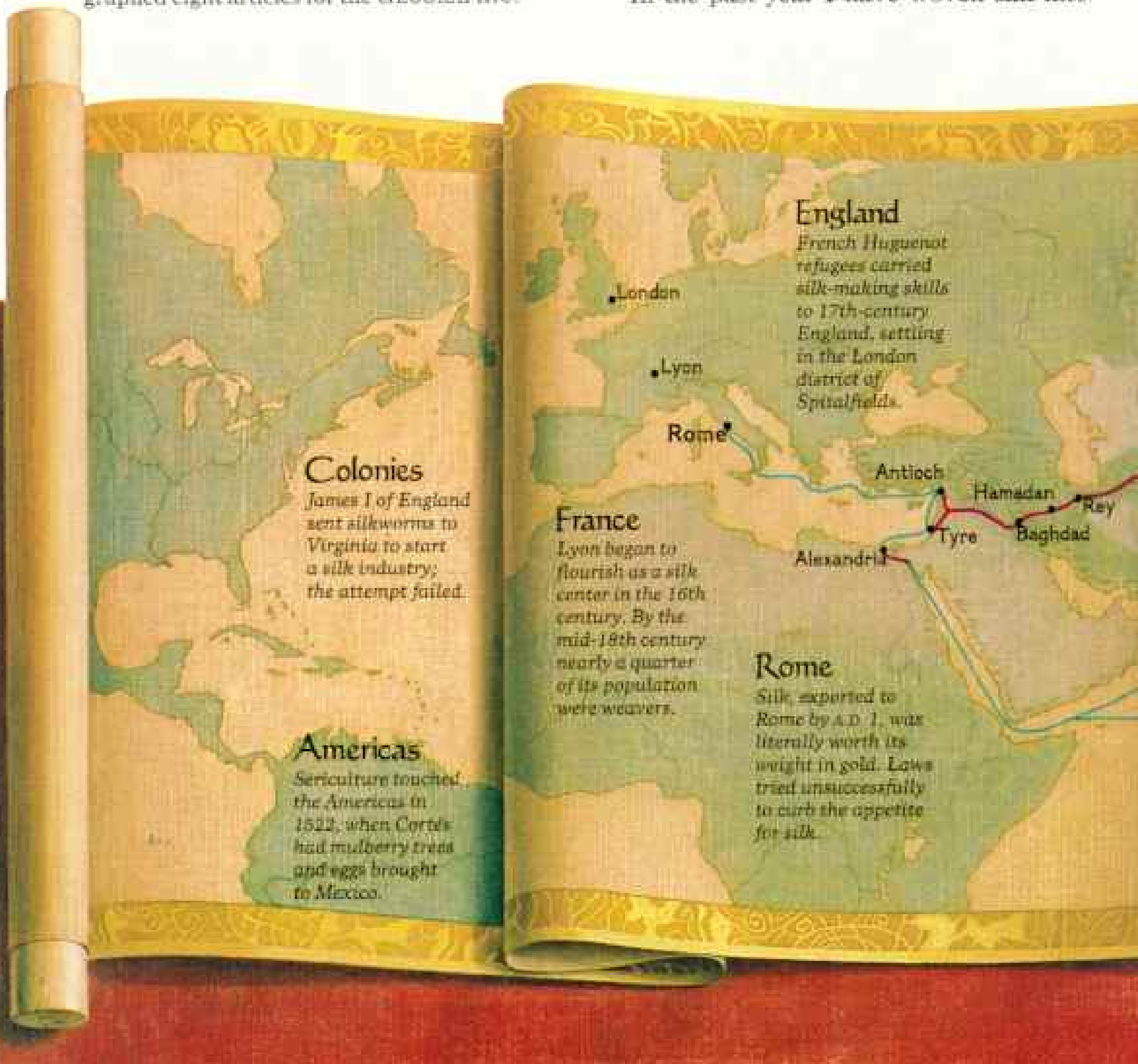
"Very good for you. Very full of protein," said a silk specialist, his broad smile anchored with gold molars. "Good for high blood pressure too."

I had developed a taste for silk as a little girl wearing a silk robe my grandfather had brought from China. But a taste for the taste of silk? The eyes of my luncheon companions shifted between me and the shiny brown beast, the size of a medium shrimp, on the plate in front of me. I temporized by asking the recipe, and learned the pupae were stir-fried in garlic, ginger, pepper, soy sauce, and oil. I had to eat it. Clutching it with my chopsticks, I took a crunchy bite. A smooth warm custard with a nutty flavor spilled over my tongue. I noticed my dinner partners spitting shells of the silkworm pupae on the tablecloth and the floor. I swallowed the thing whole.

Silk. The word is luxury itself: sleek, synonymous with splendor, sibilant with luster. The touch of silk on the fingertip evokes the very thread of history, a shimmering fabric of far places. Chinese emperors guarded its secrets and displayed its beauty to foreign visitors. Over the centuries it has reigned undisputed as the queen of textiles. Yet even in this age of high technology, to produce it we must rely on a carefully coddled caterpillar, and therein lies the miracle of silk.

In the past year I have woven silk into

Nina Hyde, fashion editor of the *Washington Post*, literally covered the world of silk for this article. Free-lance **Cary Wolinsky** has photographed eight articles for the GEOGRAPHIC.



every facet of my life. I have slept on silk sheets, soothed my face with a silk-based Chinese cold cream, and patted it with an American powder that contained silk. I have felt the heartbeat of a Chinese textile worker, whose damaged artery was replaced by a prosthesis of silk, and seen X rays of an Italian woman whose teeth were realigned with silk braces. And I have arrayed myself from silk-hatted head to silk-stockinged toe in this jewel-like fiber.

Silk has been woven into luxurious tapestries, rugs, clothes, and accessories for some 4,000 years. It enriches religion, tradition, and ritual. Traditionally, an Indian woman is married in a silk sari. Covering the corpse of a venerable Hindu with silk is a sign of respect. A silk quilt is the measure of a young Chinese woman's proper dowry.

"A woman is more gentle when she wears a silk kimono," suggests Kakoh Moriguchi, a textile artist and one of Japan's revered living national treasures. "That may be why men like women to wear silk kimonos."

Mankind has always loved silk. It is the yarn of life, extruded by that unassuming caterpillar in a continuous filament as long as a mile. Silk provides much needed work in several poor but labor-rich countries. More than ten million farmers raise silk in China today; nearly half a million workers are employed in silk-fabric production. Many Chinese connect the word happiness with the symbols for white, silk, and tree.

Silk has always had an aura of royalty. A meeting of tribal chiefs in Nigeria once offered a splendid display of the rare native silk. The Empress of Japan still feeds silkworms on the palace grounds each spring, and the Queen of Thailand sponsors silk-making lessons in the palace.

"You cannot make a revolution with silk gloves," said Joseph Stalin, but just consider the things silk can make. Silk found its way into tennis-racket strings, fly-fishing lines, and parachutes. French bicycle racers

continue to use silk tires, which they say give a smoother ride and better traction. Skiers love silk socks and undergarments because they are warm and wick moisture away from the body.

Lightweight yet stronger than a comparable filament of steel, silk has been a lifesaver in the hands of surgeons who have used its easily knotted strands in sutures. And Benjamin Franklin, who understood its strength, conducted his famous experiments with electricity using a silk kite.

The technology developed for silk weaving has enabled scientists to soar to even greater heights. "Without this technology," says Jacques Brochier, a dashing silk merchant in Lyon, France, "we could never have made the fabric for the nose of the Concorde, or the balloon that lifted the atomic bomb into the atmosphere before we began underground testing."

WHAT MAKES silk fabric look so spectacular? Silk fibers are triangular and so reflect like prisms. Layers of protein build up to a pearly sheen, making silk a luxurious, sensuous fabric. Designers revel in its feel, its look, even its smell.

"The *odeur* of silk is *magnifique*," gushed Paris couturier Hubert de Givenchy as he buried his face in a lustrous wad of yellow ottoman fabric. In his atelier overlooking Avenue George V, light from the windows played on the silk in his hands. "It is living. It moves. You know how it will react. Immediately you want to do something not only for the color but also for the hand [feel] of silk. It immediately suggests the design of the dress." He let the fabric fall. As if by magic it formed a skirt. "Can you imagine all those little silkworms? . . ."

Actually, silkworms are not worms but caterpillars. They belong to two families: Bombycidae (the commercial silkworm) and Saturniidae (the so-called wild silkworm) of the order Lepidoptera (butterflies and moths). All Lepidoptera, even caterpillars that feast on tomato plants, produce silk—but not the lustrous, long fiber that the silkworm creates.

The most common source of silk, the *Bombyx mori*, is raised domestically, but only where there are mulberry leaves to satisfy its finicky appetite. "It is much easier to prepare food for a person than a silkworm," said Toshio Ito, a leading Japanese silkworm physiologist, who helped develop an artificial diet for young silkworms now increasingly used in Japan—and based on mulberry leaves, soybeans, and cornstarch.

The more than 500 species of wild silkworms fend for themselves, feasting on oak and other leaves. When they become moths, they are bigger and more gorgeous than the commercial *Bombyx*. More robust than their domesticated cousins, wild silkworms produce a tougher, rougher silk, not as easily bleached and dyed as the mulberry silk.

China is the chief supplier of an off-white wild silk known as tussah. India has a monopoly on the muga caterpillar, which thrives in the humidity of the Assam Valley and produces a shimmering golden silk. The eri silkworm, raised on the castor plant in India, produces silk that is extremely durable, but that cannot be easily reeled off the cocoon and must be spun like cotton or wool.

Extraordinary eating machines, cultivated silkworms increase their body weight 10,000 times in their 25- to 28-day lives. Even respiration doesn't interfere with the constant gorging: They breathe through nine holes in each side. Periodically they sleep for about a day, wake up and wriggle out of their old skin (including the jaws), which has become too tight, and start eating again, occasionally munching on their cast-off skin. They do this molting four times.

After the final molting they scout a place to start cocooning. First they throw a safety net, a light web. Thus anchored, they toss their heads in a figure eight, at the same time extruding a semiliquid mixture of protein coated with a gummy substance called sericin from a spinneret, the opening of the tube leading from two silk glands that run the length of their bodies. The liquid silk, ejected at the rate of about a foot a minute, becomes, when exposed to air, the fiber that the worm uses to create—from the outside in—its own shroud (pages 24-25).

Inside the waterproof cocoon, the silkworm pupates and in two weeks metamorphoses into a moth. After spitting out an enzyme that weakens the cocoon, the moth emerges, in the words of Harvard entomologist Dr. Carroll Williams, as a "flying

machine devoted to sex." After several hours of mating, the female lays 300 to 500 eggs, then dies within two or three days. The eggs, which require a cold weather stint to trigger development, may hatch anywhere from six weeks to 12 months after being deposited.

While some cocoons are set aside for egg production, most of the crop is stifled; the inhabitant of each cocoon is killed by hot air or steam. By thus preventing damage to the cocoon by an emerging moth, an unbroken silk thread is ensured. It takes 110 cocoons to make a tie, 630 to make a blouse. The heavy silk kimono I wore one day in Kyoto was the work of 3,000 worms, which consumed 135 pounds of mulberry leaves.

Though 35 countries produce silk, their combined production adds up to only 52,000 tons of raw silk a year. That's negligible compared to cotton and man-made yarns, which are measured in millions of tons. Silk comprises a mere 0.2 percent of the world's total production of textile fibers.

Most of the cultivated silk we use, even that from Italy and France, originates in China, which produces more than half the world's estimated 480,000 tons of cocoons each year. Japan, the largest consumer of silk, once led in production but now ranks second to China; it finds more profit in computers and cameras than in cocoons, In order of importance, the other big producers are India, the U.S.S.R., and South Korea.

Someday, perhaps, these countries may find themselves left with a can of worms. Scientists have managed to clone the silk protein gene but only as an exercise in basic research. So far, no silkworm, no silk. After all, everyone knows you can't make a silk purse from a sow's ear!

Or can you? I have seen a "silk" purse made from sows' ears tucked away in a vault in the Smithsonian Institution in Washington, D. C. The brittle concoction was made in 1921 in Cambridge, Massachusetts, by the industrial research firm of Arthur D. Little, Inc., in response to Jonathan Swift's proverbial challenge.

Sows' ears and silkworms have little in common except that those worms eat like pigs—ravenously and noisily, sounding rather like the fizz of Alka-Seltzer. Their waste, or frass, is collected by the Chinese for fish food and fertilizer. At the Cloud and Dragon commune, near Hangzhou, workers filled a pillowcase with waste for a commune official who said that resting his head on it comforted his rheumatism. Frass tea is said to have medicinal qualities too, but when offered a cup in Hong Kong, I politely turned it down.

REARING of the silkworm determines the quantity and quality of the silk. Although a vigorous hybrid has been developed, crossing Japanese and Chinese varieties, caterpillars are still coddled and cosseted as fragile creatures. Consider these ancient Chinese guidelines for raising them:

- The bark of a dog, crow of a cock, even a foul smell can upset freshly hatched worms.
- Larvae should rest on dry mattresses. They must sleep, eat, and work in harmony.

Stir-fried silkworm pupae *at a Chinese commune add a protein-rich supplement to a predominantly vegetarian diet.*

- A worm out of sync with the rhythm and transformation of the majority is buried or fed to fish to avoid any variation in the silk.
- Drowsy, newly hatched worms are tickled with a chicken feather to prod development.
- The attendant, called silkworm mother, should have no bad smells, should wear clean, simple clothes so as not to stir up the air, and should not eat chicory (or even touch it).

Those traditions, little modified, survive in China today. In Hangzhou women who

raise silkworms must not smoke, wear makeup, or eat garlic. They must wear clean sandals. Some countryfolk pray to the goddess of silk once a year.

Tender, loving caution is not limited to the Chinese. In southwest Nigeria, Yoruba men may not approach or cohabit with women who are "cooking," or degumming, the silk. And in India I stalked through the forest with barefoot members of the Munda tribe of Mangalpur, who carried their slingshots at the ready to fell predatory birds that pick off the juicy silkworms as they crawl along the trunk of a tree, looking for a place to cocoon. The worms' protectors do not shave or cut their hair at this time and stick to a vegetarian diet. When they are out guarding the silkworms, their wives may bring them dinner but may not spend the night with them.

Silkworm growers in Japan who raise their brood on an artificial diet are equally fussy. At the station in Tokorozawa City, where silkworms are raised for farmers, I was instructed to wash up and change from my T-shirt and skirt to a starched white scrub suit, hat, and gauze face mask. Formaldehyde fumes burned my eyes as I put on rubber flip-flops and walked through a soapy solution to enter the sterile area. There the airflow, humidity, and temperature are checked five times a day. I felt like an incubator nurse to more than a billion day-old pinhead-size worms, nibbling away

With needle as brush, *a young woman at the Suzhou Embroidery Research Institute stitches life into a silk cat depicted on both sides of a nylon-gauze panel; a tourist records the scene.*

◀ **Silk goldfish,** *as if in an aquarium, swim in front of the author's interpreter, Mu Lan (***preceding pages***), on a 20-by-14-inch screen that took six months to embroider. Legend attributes the unraveling of silk's secret to Chinese Empress Xi Ling Shi, who in 2640 B.C. dropped a cocoon into hot water and discovered that she could unwind a glistening thread from the softened mass.*

on chunks of their man-made mulberry leaf-soybean-cornstarch concentrate that looked like huge granola bars. Nearby was a feather to prod worms that strayed from the meal.

Though the Japanese have mechanized virtually every procedure in raising silk, including plucking leaves off trees, many tasks are done by hand in other countries. I went with several women to pick mulberry leaves near a weaving village in Ban Kao Kluay in northeast Thailand. On all sides of me women had stripped entire branches of their leaves before I had yanked off a few.

The labor-intensive early stages of producing silk in China, usually women's work, are often smelly and dirty. At a factory in Dandong, women stood all day in front of reeling machines, washing the cocoons and loosening the silk thread from the gummy sericin in hot, muddy-looking water. It was too hot for my fingers, but the women said they were accustomed to it. Their fingers moved swiftly, gathering the filaments from six cocoons and feeding them constantly into each reeling machine. The number of cocoons used depends on the desired thickness of the yarn, but usually five to eight filaments suffice.

IN NUAPATNA, in Orissa, India, I crouched next to a ten-year-old girl, one of 20 girls doing thigh reeling in a dark, mud-floored room. She pulled the threads from five cocoons across her left thigh and slapped them to twist them together, much in the traditional Latin American way of rolling cigars (page 33). Girls have this task since their legs are less hairy than boys', but it surely must be the only time the modest Indian girl exposes a leg. Nearby, an alternative to thigh reeling was being practiced, with girls reeling the silk over earthen pots.

"There isn't a skill in the making of silk that does not still exist from a thousand years ago," Pupul Jayakar, the grande dame of Indian textiles, told me in her home in New Delhi. A leading figure in the renaissance of handlooms and handicrafts, she now bears the rank of minister of state.

In India the craft of silk involves the whole family. In Srinagar a young boy crouched in front of a loom, knotting a rug. "Two knots yellow on right, three knots blue on left," softly chanted his father, drawing a verbal pattern of the design.

In a household in Kanchipuram, I watched the wife degum the silk, the grandmother warp it, one child wind, and another assist the father at the loom, weaving an exquisite dark blue-and-gold sari.

And I went to Patan, northwest of Ahmadabad, to see a family involved in possibly the most astonishingly lovely example of the textile artisan's skill: patola weaving. Patola is silk intricately designed in the ikat method—a double tie-dye approach in which the warp (vertical) and weft (horizontal) yarns are individually knotted and wrapped tight enough with cotton threads that the dye won't penetrate. Miraculously, the warp and weft fit together in an intricate pattern. It's a Salvi family skill.

As many as 15 members of their extended family work on one patola, Chhotalal Salvi told me at his house on a back street in Patan. At age seven, children can untie the threads after dyeing. At ten they learn to separate the threads from the skeins. At 12 they begin to tie knots and wrap them with cotton threads. And by age 20 they can do it all. One cousin wanted to do other work. "We told him: 'This is our family art. We don't want this art to die.' So he joined in," Salvi says proudly.

Now the Salvis make 15 saris a year for the equivalent of $1,200 to $1,500 each. Each takes three to four months to tie and dye in four or five colors, another month to weave. The patterns are marked on graph paper; a master weaver disdains the graphs; he has 25 patterns in his head.

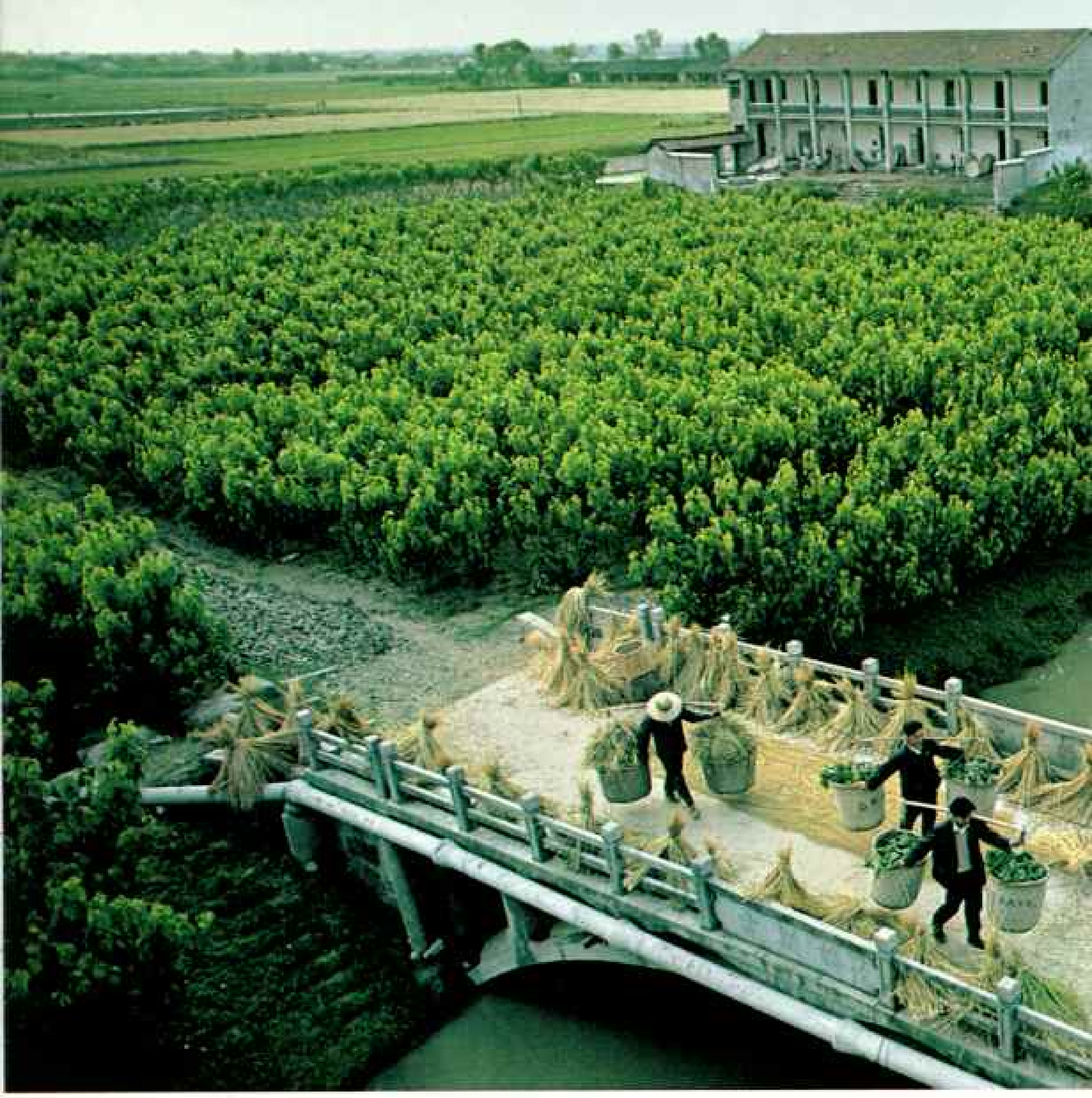
I could not resist buying a patola—not a sari but a hankie-size square made with natural dyes. Salvi reluctantly parted with it. "You have a treasure, a three-month family effort made in the evenings," he said as he accepted my $75.

IN THE NISHIJIN SECTION of Kyoto, Japan, I heard the swooshing noise from some of the 7,500 handlooms behind the shoji, or sliding paper walls, of the small houses. But only silence emanated from the Kyoto home of Keiichi Hoshino, who does *tsuzure-ori*—fingernail weaving—an art dating from possibly the fifth century.

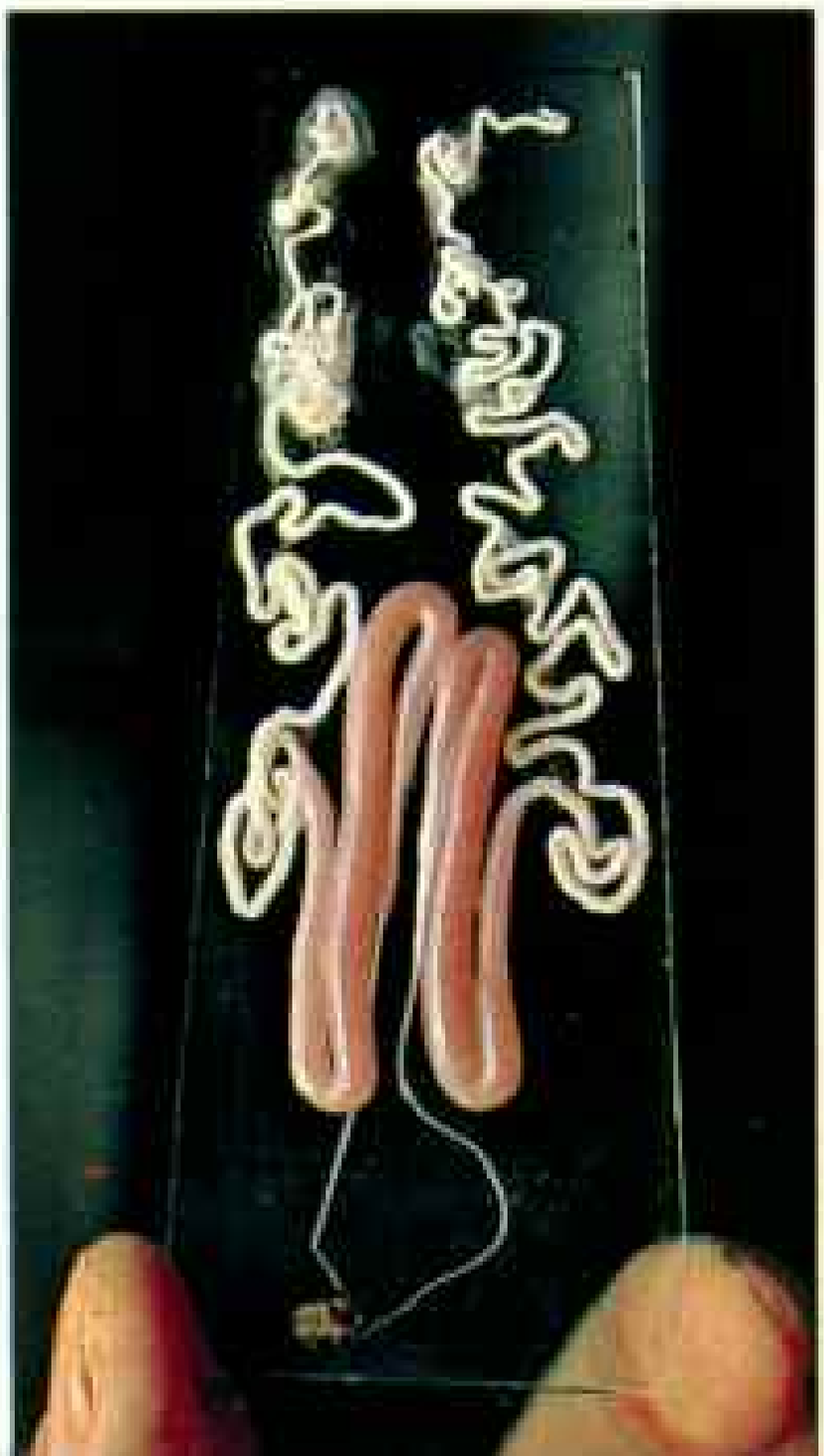
As he spoke through an interpreter, he slid a shuttle through *(Continued on page 26)*

Caravans once trudged past *the Buddhist retreat of Bezeklik, on the Gobi-skirting northern fork of the 4,000-mile-long Silk Road. Monastic complexes carved into*

the cliffs in the fourth century are currently undergoing restoration. A caretaker's garden soothes the scorched landscape with green.



Rearing silkworms *means raising mulberry trees, such as these on an eastern China commune* ***(above)****. Leaves must be plucked, chopped, and practically spoon-fed to young larvae every few hours. Eight thousand worms, enough to supply silk for ten blouses, consume approximately 350 pounds of mulberry leaves. Stripped trees are pruned and sprayed in preparation for next season's crop* ***(left)****. In Japan, scientists have devised an artificial food of mulberry leaves, soybeans, and cornstarch* ***(right)****, which may nourish close to 50 percent of that country's young silkworms by 1985.*



Tossing off *a silken strand, a mulberry silkworm ejects a smooth, lustrous protein mixture that hardens with exposure to air into a fiber* ***(above)****. Two 15-inch-long glands* ***(left)*** *coil within the silkworm's body and produce liquid silk, a giant protein molecule. The silk passes through the pink midsection of the glands, where it is coated with a sticky substance that gives the cocoon cohesiveness. The strand, up to a mile in length, is extruded through a narrow aperture called the spinneret, seen at the bottom of the slide.*

Silkworms, actually caterpillars, belong to the insect order Lepidoptera, which includes all moths and butterflies. After four molts the silkworm anchors a line to a surface and builds a scaffolding that will provide a framework for the cocoon ***(right)****—a two- to three-day project.*

National Geographic, January 1984

(Continued from page 19) several warp threads and then combed the weft with his nails, building a refined, delicate pattern found in the silk kimono sashes called obis. The nails on two fingers of each hand, deeply ridged to fit between the threads of the loom, are kept shaped with a file (page 45).

Weaving with fingernails is just one of the silk art forms woven into the tapestry of history for at least 40 centuries. Perishable and fragile, textiles succumb to wear and disintegrate: They can't be pieced together like bits of metal or stone. Still, a cocoon has survived from the late Stone Age. Impressions on a bronze urn and an axhead buried in 1300 B.C. suggest that the Chinese were weaving intricate designs in that time.

In 1982 brickyard workers digging clay near Jiangling, north of the Yangtze River in Hubei Province, uncovered a Chu tomb of the Warring States period dating from about 300 B.C. It contained more than 20 pieces of remarkably preserved silk, including silk quilts and gowns 2,300 years old and a silk-covered skeleton holding rolls of silk—a burial custom known from historical documents but never seen until then.

Shen Congwen, adviser on ancient textiles to the Palace Museum in Beijing, supervised the removal of these silks, which he considers far more beautiful than anything made in recent years. "In ancient times weaving was done from the heart," he told me when I visited him in his apartment in Beijing. "In modern times weaving is done for commerce."

I stumbled on what some say is the oldest silk. As my friend and interpreter Mu Lan

Poised on the brink *of adulthood, a newly hatched female silkworm moth perches on top of her own empty cocoon (**left**).*

At maturity the moth exudes a brown liquid enzyme that softens the cocoon, enabling it to push its way to the outside in the morning hours. Males immediately set off on foot in search of mates, since domesticated silkworms are essentially flightless. To attract males, females broadcast pheromones, a chemical scent.

*After several hours of mating, the female deposits as many as 500 pinhead-size eggs (**lower left**), carefully twisting her abdomen to avoid laying one egg upon another. Two or three days later she dies.*

Eggs require cold temperatures to develop and heat to hatch, which they do six weeks to 12 months later. Depending on the silkworm variety, one to eight generations may be produced in a year.

Because the emergence of the moth ruins the cocoon for reeling, the cocoons earmarked for silk production are exposed to hot air or steam to stifle the living pupae.

In China dead pupae are pressed for oil used in soaps and cosmetics or eaten as a source of protein.

and I were walking around West Lake in Hangzhou one evening, we drifted into a former summer palace, now a provincial historical museum, then displaying live and mechanical fish. In a corner showcase, three plastic boxes set on saffron velvet contained silk thread and silk embroidery knots estimated to be 4,500 years old.

THE ROMANCE of silk, embroidered with legends and facts, features such notables as the Venetian Marco Polo, who traveled the Silk Road and brought silk back to Venice from China. It has made modern heroes, such as the American Jim Thompson, a former intelligence officer, who created an important silk industry from Thailand's scattered craft by applying some modern technology and marketing savvy to indigenous skills before he mysteriously disappeared in 1967 in Malaysia's Cameron Highlands.

In China, the birthplace of silk and the silk-weaving art, the fiber was so treasured that it became a measure of currency and reward. The imperial court established factories to weave silk fabrics for ceremonial use and gifts to foreign powers, thereby extending influence over its neighbors.

For hundreds of years the Chinese guarded the secret of sericulture; imperial law decreed death by torture to those who disclosed it. But as the empire declined, the circle of those who knew of the lustrous and sensual fiber widened.

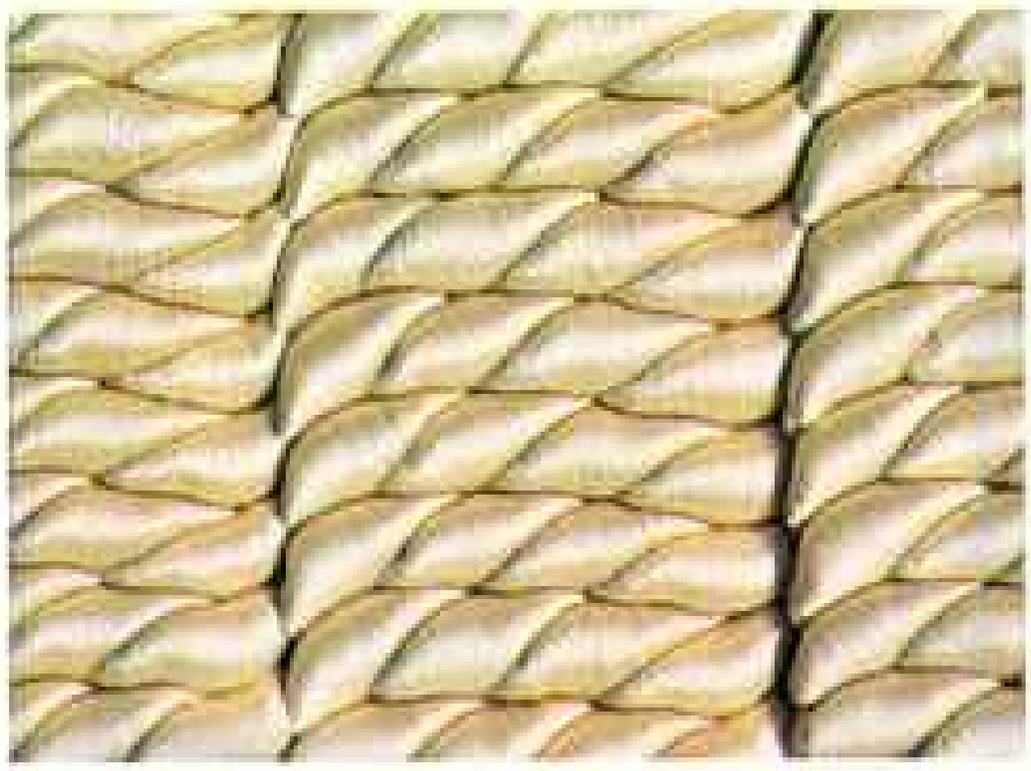
Hindu epics more than 2,000 years old refer to silk. In the Old Testament, Ezekiel speaks of it, and in the fourth century B.C.

To control disease, *Chinese scientists place female moths in metal rings to confine their egg laying. The eggs laid in each square* ***(left)*** *can then be monitored and the shells of unhatched eggs marked in red. A single diseased egg demands destruction of all those on its square, since infection endangers them all. At an egg station in Japan, eggs are kept at 0, 2.5, and 5°C while developing* ***(above)****, then shipped to growers.*

Metamorphosis from strand to skein *begins when cocoons are soaked in hot water to soften the sericin, enabling thread ends to be plucked* ***(above)****, unraveled, and plied together—usually five to eight strands at a time.*

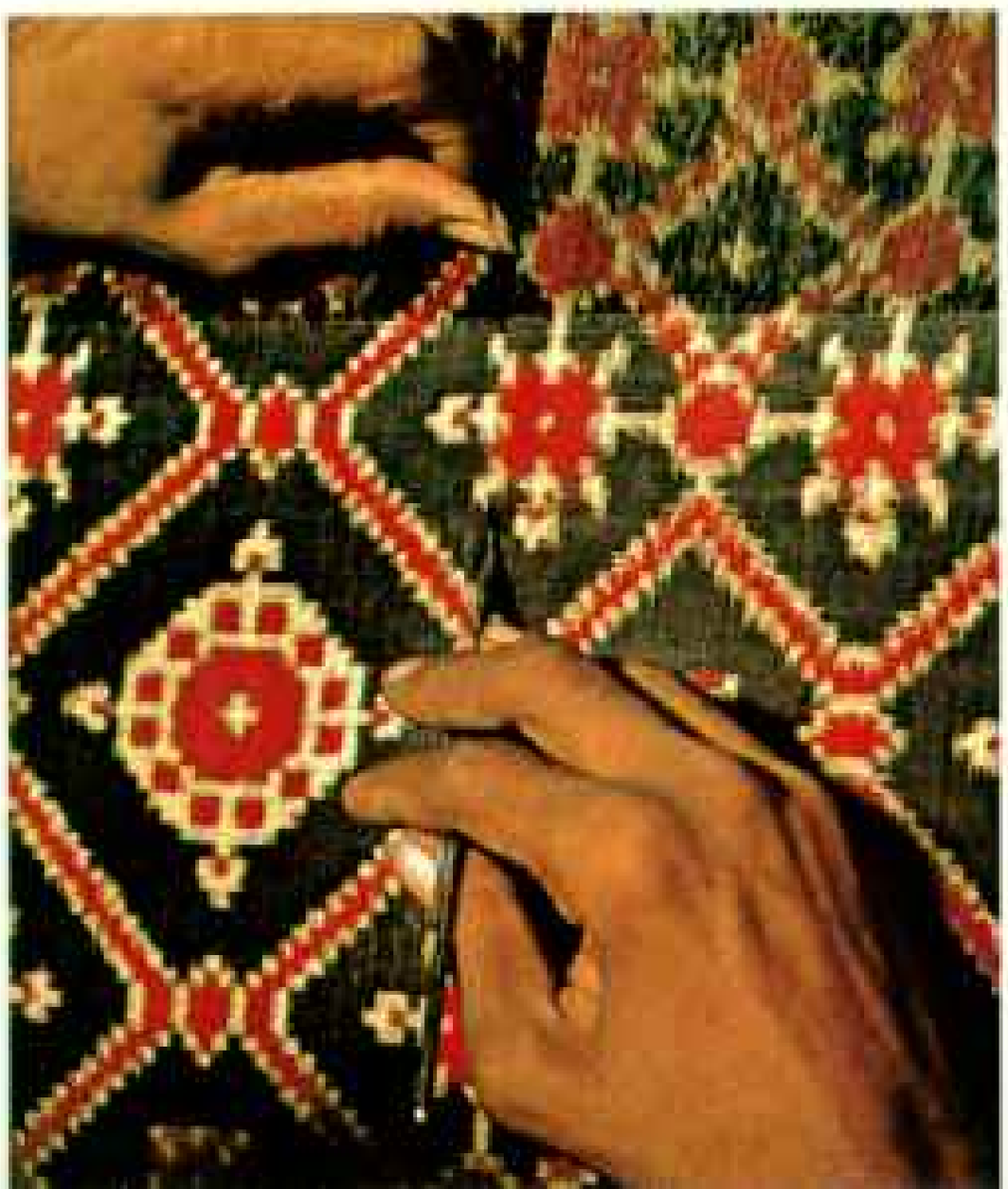
At China's Hangzhou Silk Factory the yarn is reeled, graded, color-coded by a temporary dye, twisted, washed, wound into skeins ***(right)****, and braided for shipment* ***(below)****.*

Some 35 countries produce raw silk. But compared to the manufacture of other natural fibers like cotton, which is measured in the millions of tons a year, world production of this labor-intensive and consequently expensive cloth is slight: a mere 52,000 tons.



Radiant as their garb, *Uygur women in brightly patterned dresses attend a cocoon harvest festival in Hotan, China* (***above***). *Men weave the dress fabric during the winter months* (***facing page***).

Fingers and needle adjust threads to focus the design of an Indian patola (***below***), *a cloth in which both warp and weft are tie-dyed, then woven. Chhotalal Salvi, in Patan, India, belongs to a small community that still practices the art. "Silk is the holy cloth," he told the author. "It is what you wear if you want to touch God."*



Aristotle described the silkworm as a horned worm. Bedazzled by the wealth and luxury of the Persian Empire, Alexander the Great seized treasures of rich cloth, including beautiful and greatly coveted silk. Silkworm eggs reached Japan by way of Korea early in the fourth century.

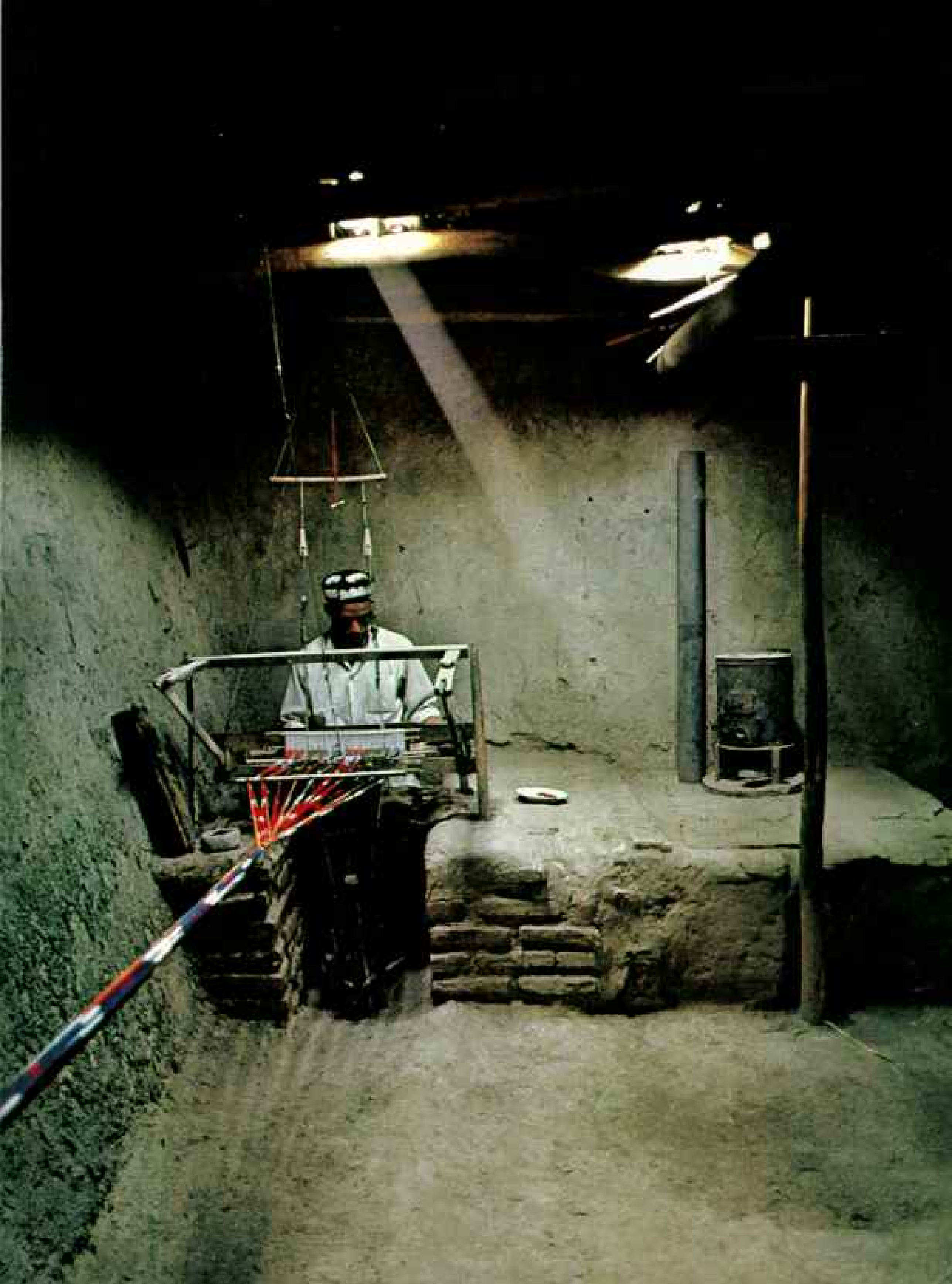
Silk was surely familiar to Westerners by the beginning of the Christian era. Two powerful civilizations, Rome and China, reigned at each end of the Silk Road, a bridge of culture and commerce that peaked in the Tang Dynasty (A.D. 618-907). Westerners were intoxicated by Chinese silks, which they unraveled and rewove to their liking. In Julius Caesar's time only the wealthiest could afford them. Laws were passed to curb lavish display of silk, said to be worth its weight in gold. Historian Edward Gibbon wrote that Emperor Elagabalus swathed himself in silk to the point that he "sullied the dignity of an emperor and a man."

THE SILK ROAD was actually a perilous network of routes. It was hazardous to monks and pilgrims carrying Buddhist teachings between India and China and even more hazardous to traders, who intended to exchange gold, wool, horses, jade, and glass for silk. The road started in what is now Xi'an, in Shaanxi Province, traversed a barren crust of earth through treacherous mountains and desert across Central Asia to Antioch and Tyre; the last lap, to Europe and Egypt, was by water to other Mediterranean ports.

Few made the entire trip; caravan loads were passed from trader to trader at each oasis and stronghold, prices going up with each exchange. Neither civilization, West or East, knew much about the other beyond the edge of the route. Yet the patterns of silks were flavored by all the different cultures along the route.

According to popular legend, the Chinese dominance of sericulture was weakened when Emperor Justinian in the sixth century dispatched several monks on an espionage mission to bring back silkworm eggs from China. They brought the eggs back to Constantinople in hollow canes, the Adam and Eve silkworms of the West, where fine silks were produced in palace workshops.

To my family's *(Continued on page 36)*

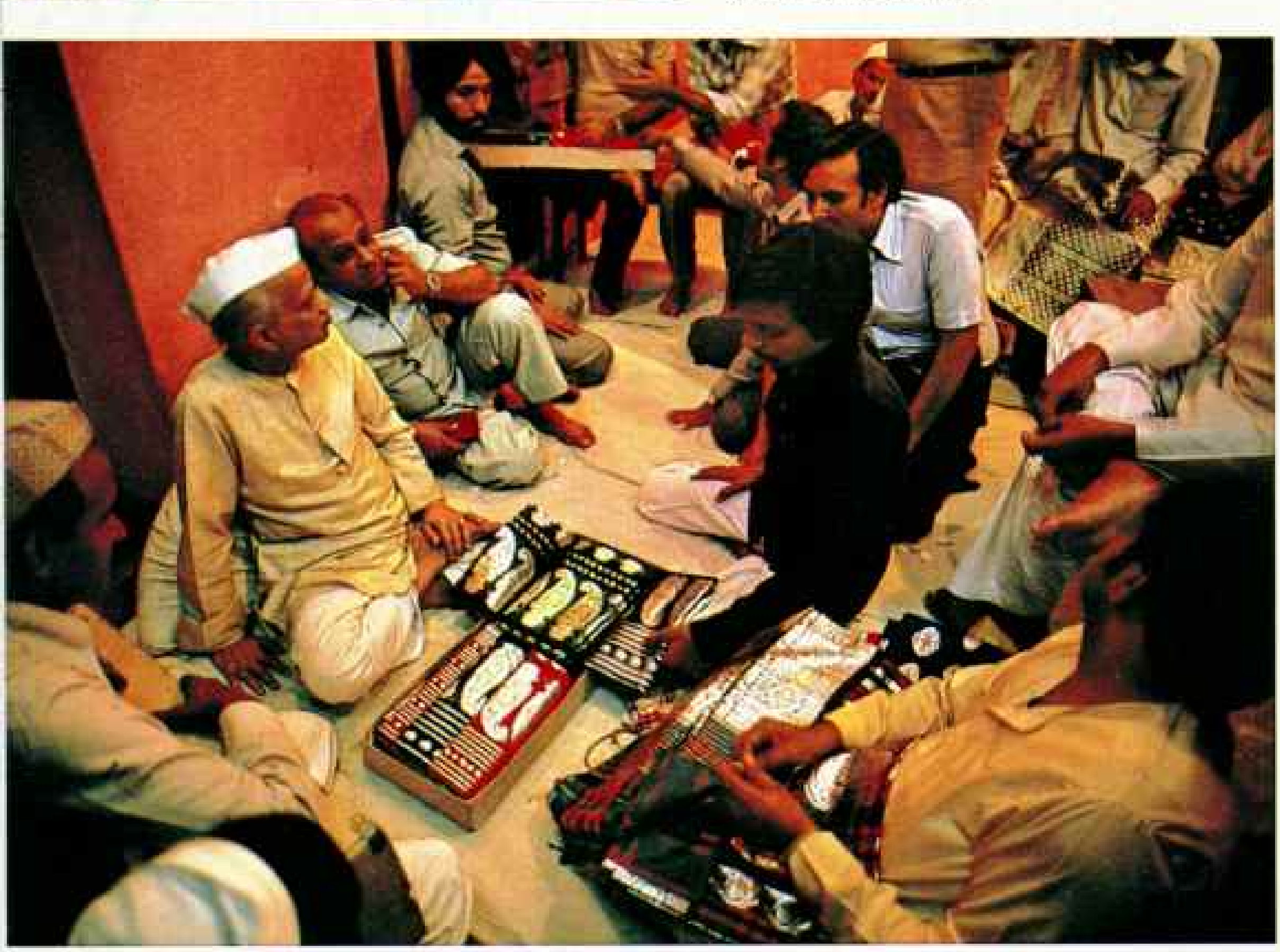


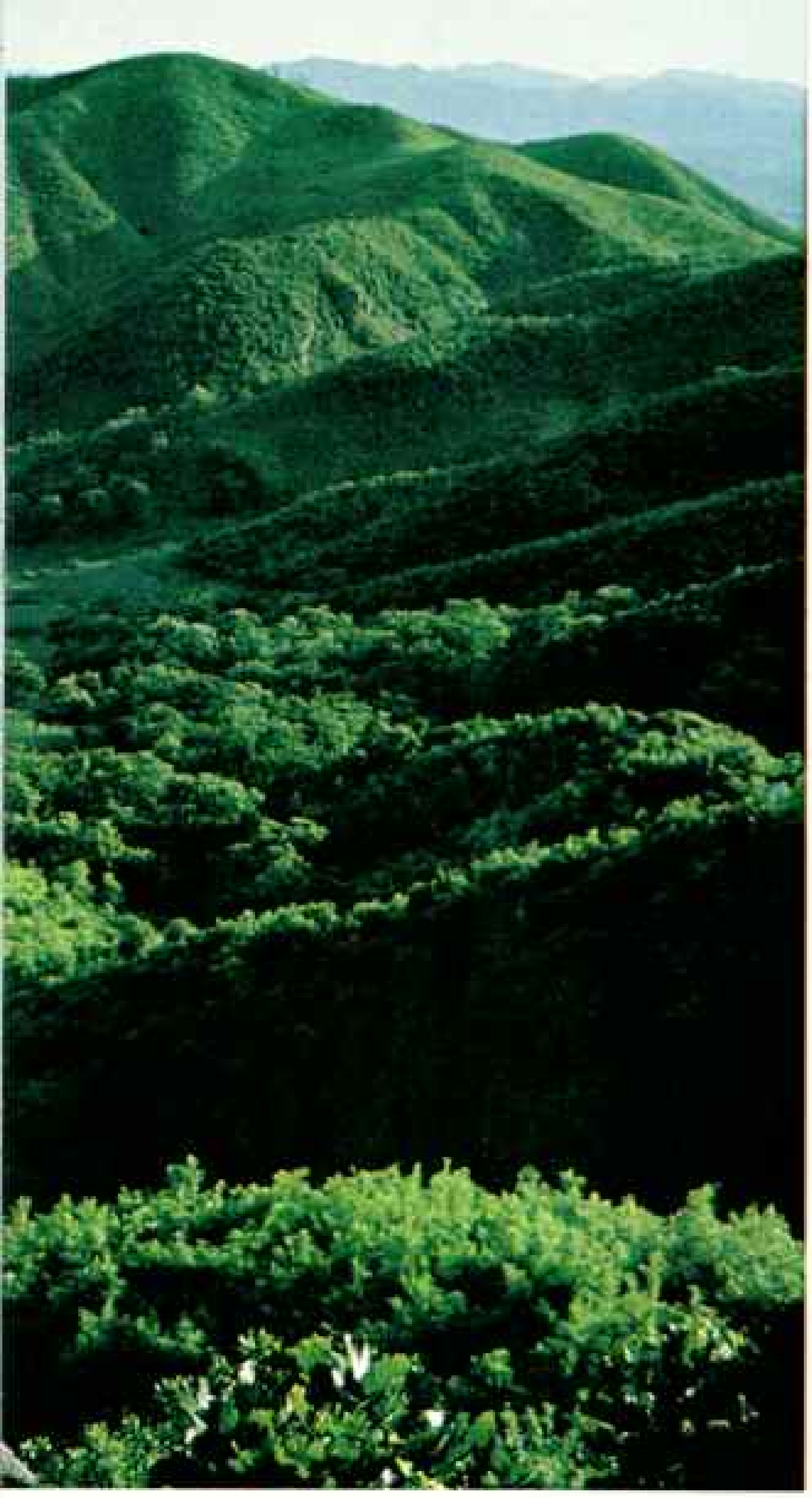
Interwoven in the loom of humanity, *the commerce of silk engages the rich, the poor, the old, and the very young. These 10- to 12-year-old girls in Nuapatna, India, engage in the traditional method of silk spinning called thigh reeling* (**right**). *Drawing the fibers from pierced cocoons, the girls twist the strands across a leg. The job pays about 30 cents a day.*

A young boy may begin his apprenticeship in the silk trade by performing such tasks as delivering Jacquard punch cards—which direct a mechanical loom's movements—to the weaver's shop (**left**).

The point-counterpoint litany of bargaining punctuates the air at Varanasi's sari bazaar, where a weaver (**below,** *at left*) *and buyers, at right, negotiate through a broker, here wearing a white hat.*

Although India produced some 6,000 tons of silk in 1982, about 80 percent was used domestically, chiefly in the making of saris, which require some five to nine yards of fabric.





Protector of the worms, *Wang Shunyi from dawn to dusk guards tussah silkworms from predatory birds and animals at the Wulongbei Commune near China's border with North Korea* ***(above)****. If necessary these semidomesticated worms, which feed primarily on oak, are moved from tree to tree for adequate feeding.*

The tussah worm ***(above right)****—considerably larger and with a cocoon more brilliantly colored than the domesticated silkworm—grows up to six inches in length and produces an egg-size cocoon. Tussah exceeds mulberry silk in strength and durability, but does not dye as well and produces a nubbier fiber.*

The harvest is sun-dried by women who shuffle through mounds of cocoons ***(facing page)*** *that are then stored in woven baskets to prevent mildew and rot. China produces some 80 percent of the world's tussah silk.*

consternation, I tried my hand at raising silkworms on the dining-room table. It is a tricky business. Despite great care, only half of the eggs hatched. I wondered how those pilfered eggs could have survived a two-year trip in a hollow cane.

Harvard entomologist Carroll Williams thinks they could have: "If the canes were kept damp so the eggs didn't dry out, and if it never was cold enough to stimulate hatching, they could have made it."

In the Middle Ages silk was woven into every conquest and trade. The rush of Islam carried silk from the Middle East across North Africa to the Iberian Peninsula. The crusaders gave relics wrapped in fabulous silks to the church. Venetians not only traded heavily but also imported silk growers and weavers to help pioneer their own silk industry. By the 13th century Italy had become the silk center of the West, and the Italian silk industry was amassing the riches that helped finance the Italian Renaissance.

The Duchess of Milan, Beatrice d'Este Sforza, wrote a friend in 1493 that she was having dresses embroidered with silk in patterns that had been designed by Leonardo da Vinci for frescoes and architecture. Today Emilio Pucci, who brought glory to Italian silks in the 1950s with brightly colored silk knits, produces just a few inches of fabric a day on wooden looms dating from about 1500.

Some of the most beautiful old Italian silk vestments are still used in churches in small towns like Gandino, near Bergamo, where the Basilica di Santa Maria Assunta has more than 350 pieces from the 15th to the

More than just another *pretty fiber, silk's warmth, strength, and luster thrust it into new roles, in addition to the time-honored ones.*

A 1,700-year-old tradition is continued at the Beijing Silk Flower Factory, where petals ***(left)*** *await transformation into blooms destined for the United States and Europe.*

In a new twist to an old fiber, silk batting, held by Dan O'Leary of Sun Silk Company in Lowell, Massachusetts ***(above right)****, fills ski jackets, comforters, and sleeping bags. The material is 20 percent warmer than down, yet about half its price.*

The front-running favorite of professional bicycle racers, silk tires, handmade by the Wolber Tire Company in Soissons, France ***(above, far right)****, are prized for their superior traction and ride.*

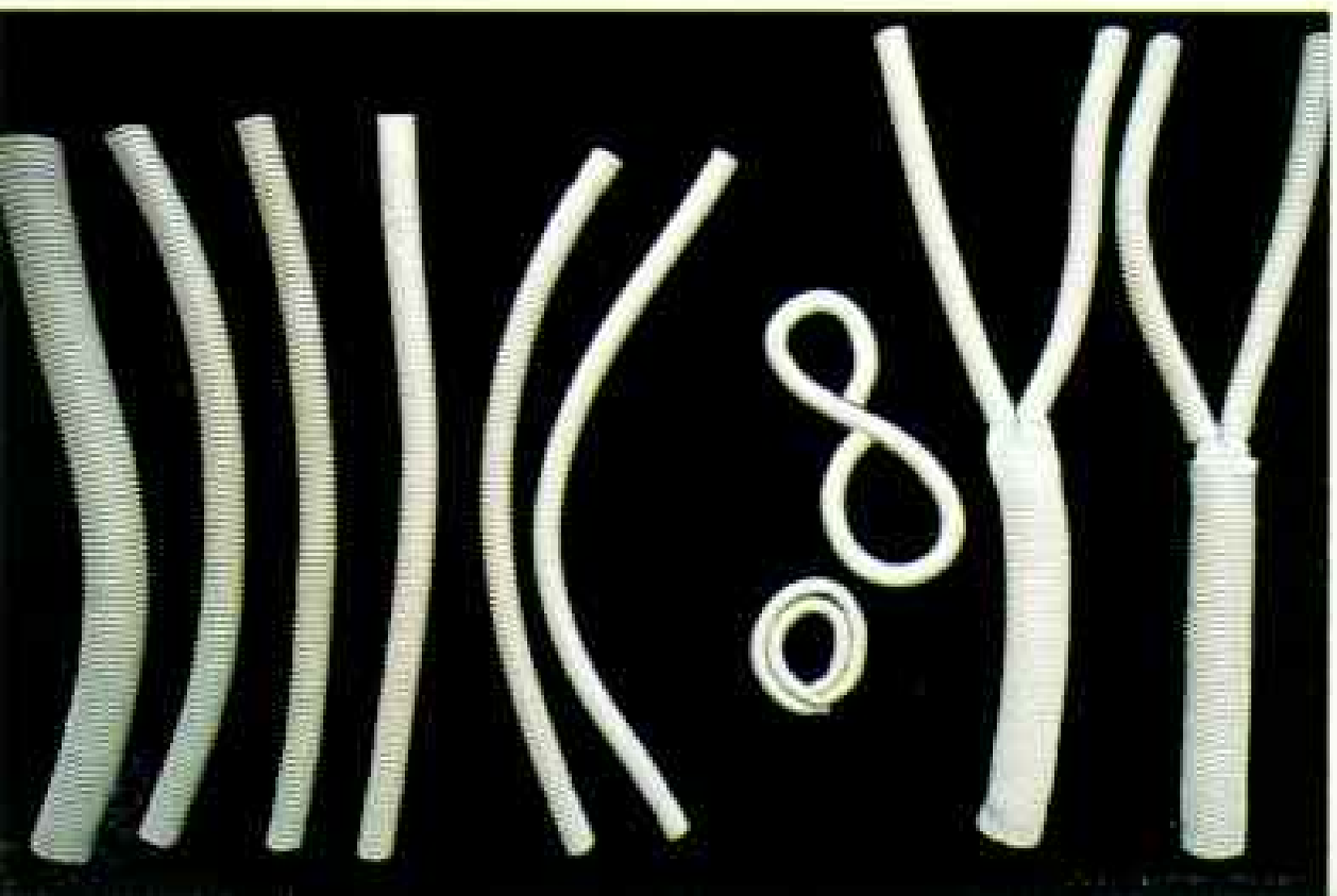
19th centuries. Gandino is in a valley, enough off the beaten path so that it never was sacked; even antique dealers have trouble finding it. Battista Torri, a retired wool worker and now keeper of the basilica, showed me the vestments and other pieces, which are kept in a dark room in the museum next door. I couldn't resist touching a ruby pile-on-pile silk velvet used in the early 16th century for the copes of Venetian doges. It was like whisking my finger through whipped cream. Then, such silk was worth more than silver; it is clear to me why.

Torri took me to the sacristy, where he keeps the vestments ready for the priests. Almost everything the church owns is used at least once each year. The townspeople know when to expect them and raise questions when they are not used.

BY THE 14TH CENTURY Italian silks were made in cities such as Lucca, Venice, Florence, and Genoa; the craft was encouraged by noble families who wore splendid silks themselves. In the quiet resort town of Como, which meanders along the lake of the same name, there are few visible signs of the industry, though it annually produces more than 15 million ties and 60 million meters of some of the most beautiful silks made today.

What's the secret? "We have a taste for everything rich and beautiful," explained Giampaolo Porlezza of Taroni, who masterminds the most deluxe silks.

Louis XI took drastic steps to curb the tremendous outflow of money from France to Italy for costly silks, boosting French silks with royal orders to weavers in Tours. Lyon



***Necessity** mothered improvisation in 1957 when Dr. Feng Youxian, a Shanghai vascular surgeon, experimented with silk grafts. Since nylon—then used in the West to replace diseased arteries—was unavailable in China, Dr. Feng fashioned a narrow tube from a silk sleeve and implanted it in a dog. In 1959 the refined prostheses (**left**) met with success in humans, and silk has since been used in 500 patients.*

began to flourish in the 16th century with assistance from Francis I, who restricted silk imports and enticed Italian craftsmen with promises of more freedom in their work. Many Lyon firms still have Italian names.

At first they specialized in silks for the changeable tastes of the rich. Jean-Baptiste Colbert, Louis XIV's clever minister of finance, set production standards and decreed pattern changes every year. The tradition of collaboration of designer, weaver, and manufacturer is exemplified by 18th-century artist Philippe de Lasalle, whose silks were highly coveted before the French Revolution. He and others helped push Lyon to the high level of craftsmanship that distinguishes it today.

Louis Pasteur was studying fermentation when a deadly plague began killing silkworms in the Alès area in 1854, long before anyone knew of microbes. "I have never even touched a silkworm," the chemist told the professor who implored his help. Nevertheless Pasteur attacked the problem for three years, despite the death of his father and two daughters and a stroke that left him partially paralyzed. He discovered two diseases that he brought under control and also made correlations that led to his monumental findings on infectious diseases. Pasteur had no patience for obdurate French farmers who insisted that they could not peer through a microscope and distinguish healthy insects from diseased ones—especially since his young daughter, Marie-Louise, performed the task effortlessly.

Despite Pasteur's discoveries, silkworm diseases spread through Europe and the Middle East, which soon became increasingly dependent on the Far East for raw silk.

In the late 18th century 18,000 Lyon looms were in operation. With the French Revolution came hard times and an end to looking stylishly rich; cotton became the thing to wear, and the demand for silk declined. The industry was almost destroyed; more than half the looms stood empty.

In 1804 Joseph-Marie Jacquard introduced a punch-card mechanism that permitted a weaver to control his loom single-handed and to produce complex patterns with increased speed and accuracy. By the mid-1830s most looms in Lyon were equipped with the Jacquard machine.

PHOTOGRAPHED AT BETHNAL GREEN MUSEUM

The silken touch *of a master reflects the genius of creation, as Paris couturier Hubert de Givenchy adjusts the sleeve of a model's gown* ***(left)****. "Working with this silk fabric is like growing flowers," he says. In 1982 at least half of the models in the Paris haute-couture shows wore silk.*

Show-offs of an earlier era, cloth dolls, such as the one made in Germany in 1835 and dressed in silk ***(above)****, displayed the latest fashions in shop-windows, or were carried to the homes of clients by dressmakers.*

PHOTOGRAPHED BY MUSÉE HISTORIQUE DE TISSUS, LYON

The passage of a gilded age *is marked by an early 19th-century silk velvet French clock made with passementerie* ***(above)****, silk knots and braiding.*

Bernard Tassinari, whose firm helped restore Louis XIV's bedchamber at Versailles, holds one of the silk tapestry panels that was brocaded in gold and silver ***(facing page)****.*

After Napoleon seized power, he matched the love of luxurious things to Lyon's need for silk orders. He decreed the elite should wear Lyon silk and placed huge silk orders for his newly acquired residences. Other sovereigns followed his lead and stopped on the Croix Rousse, the hill of weavers, to place orders for courts all over the world.

Walking the narrow streets of the Croix Rousse, I stopped to see Pierre Rocher of Prelle making gold cut velvet to cover a chair for Fontainebleau Palace. Rocher had spent 25 years weaving brocaded silk for the restoration of the Palace of Versailles, progressing an inch a day.

It took Bernard Tassinari, whose predecessors made silk for Napoleon and who now is head of the Lyon silk-weaving firm Tassinari & Chatel, 17 years to complete his part of the king's bedchamber at Versailles. Leaning over archives of orders with him, I couldn't imagine how he deciphered diagrams that look like musical notations and translated descriptions into directions for weavers. When Tassinari got the order to redo some fabrics for the queen's bedchamber at Fontainebleau, old handlooms had to be found, old techniques for producing the velvety yarns called chenille researched and rediscovered. "We always think we are more clever than before, but we learn they were more clever before us," he mused.

Old Lyon still looks very much like the Renaissance silk city it once was. It's possible to slip through the city by *traboules*, or tunnels, that silk workers used to avoid getting their silk wet or letting others see what they were doing. I discovered a traboule to be a handy shortcut on a rainy day; others use this network of passageways for daily comings and goings. They were absolutely essential to Lyon in the resistance movement for hiding out during World War II.

Lyon's silk business slipped after World War II, but recently through efforts of Lyon business groups important big silk orders have come back to the city.

ACROSS THE ATLANTIC, sericulture got its first push in the American Colonies in 1609, when James I of England encouraged it to discourage tobacco planting and fill English looms. The first mulberry plantings were lost at sea.

Ten years later, however, a more successful experiment in sericulture began. But it was tedious, demanding work, not as profitable as cotton or tobacco, so efforts in the Colonies were eventually abandoned. The Shakers in Kentucky stayed with silk longer than others, until 1922.

One American horticulturist cashed in on the craze for silk in 1835 with the promise of a fruitful mulberry tree to nourish silkworms. There was frenzied speculation; prices in 1839, one source reports, climbed to $500 per hundred cuttings, then dropped to 50 cents per hundred the next year.

We still feel the repercussions of another silk enterprise. In 1869 Leopold Trouvelot tried to interbreed silkworms with gypsy moths that fed on oak. Gypsy moths at his home in Medford, Massachusetts, were accidentally released when wind destroyed their cage. They multiplied into the millions, and in 1982 gypsy moth defoliation in the Northeast damaged more than eight million acres of trees of nearly every variety except the tulip poplar and dogwood.

What Americans lacked in patient labor to produce silk, they made up in drive to manufacture it. Silk manufacturing started in the northeastern United States in the early 1800s and flourished in places like Paterson, New Jersey, with the help of skilled workers from Europe. The natural softness of Passaic River water was ideal for silk dyeing, and industrial Paterson became the silk center of the United States. A strike in 1913 by silk workers in the factories, encouraged by the Industrial Workers of the World, became the theme of a pageant presented by idealist John Reed with a thousand silk workers at Madison Square Garden.

Although Europeans remained partial to the fine old Chinese silk, power looms increased the demand for the more consistent quality of Japanese silk; by 1915 the United States was the largest consumer of silk and Japan the major supplier. It was the demand for silk stockings that catapulted U. S. consumption of Japanese silk.

As women shed their corsets and shortened their skirts by the 1920s, only silk stockings, the sine qua non of sheerness, would do. Mercerized cotton didn't look or fit as well, and nylon wasn't on the market yet. By 1930, 70 percent of silk imports were for stockings, made largely in mills in the Reading, Pennsylvania, area where many German knitters had settled.

But with World War II the Japanese silk market was cut off and all available silk was diverted to war use. Silk parachutes were strong and elastic, and silk powder bags for large-caliber guns burned completely, leaving no residue.

That left little silk for stockings. I remember walking to school on Madison Avenue in Manhattan in the early 1940s and marveling at ladies sitting in shopwindows repairing runs in silk hose. The sky was the limit on silk-stocking prices. "How can I get a dozen pairs of stockings for my wife?" a southern senator asked a Washington shop owner during the war years. "My son wants an appointment to West Point,"

"Soft as the skin of a child," *says Antonio Ratti of the supple paisley silks he holds* ***(above)****. He sits in the archives room of the Ratti Silk Company with assistant*

was the reply. The bargain was struck.

The silk gap was partially filled by synthetics. Rayon substituted satisfactorily in most silk wear, but not in stockings. Nylon, touted as "a new silk made on a chemical base" when it was introduced in 1938, produced stockings more sheer and at the same time more durable than silk.

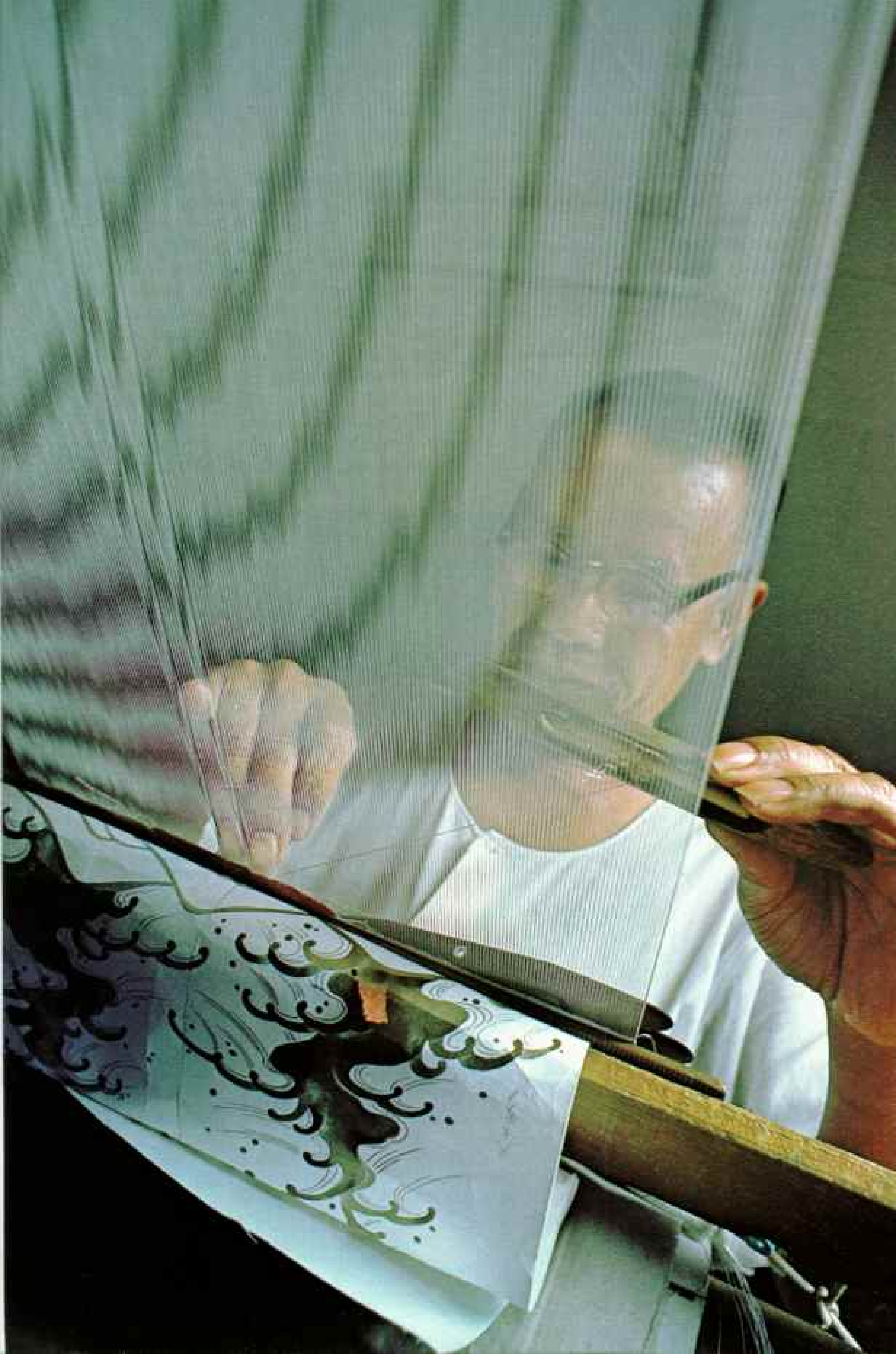
Nylon hosiery quickly made a dent in silk consumption. But when the war broke out, silk and nylon were withdrawn from private use. When it was over, nylon stockings became the standard.

Rhys Cooper, in the silk business since 1925, says the first synthetics caused little panic. "We knew the American public was receptive to anything new, but many of us also realized that silk would continue to have a role in well-to-do apparel." It did. As synthetics were improved, their easy care and lower price cut heavily into the sales of silk and other natural fibers; still, a small luxury business in silk continued.

IN CHINA in the early 1950s, however, synthetics were unavailable. Dr. Feng Youxian, chief of vascular surgery at Zhongshan Hospital in Shanghai, read of synthetics then being used as grafts in vascular surgery in the United States. "We had no synthetics. What we had was silk," said Dr. Feng, who tried to duplicate the American operation using material taken from the sleeve of his silk shirt and stitched by his wife into a narrow tube shape.

In the observation room in his hospital, Dr. Feng showed me the corrugated seamless silk taffeta prosthesis he developed; it

*Ornella Pizzagalli. Based near Como, Italy's silk city, his company in 1983 turned out silk-screen fabric—such as the piece being checked for defects (**above**)—for eight million ties. Como, center of the high-fashion fabric industry, last year exported about 300 million dollars' worth of silk goods.*



looked like a flexible straw but was soft and light (page 37). He introduced me to two patients in whom he had implanted silk prostheses and told me the operation cost each patient $15 plus the cost of hospital food. He considers his success with silk satisfactory but has experimented with synthetics. (In the U. S. the majority of surgeons use Dacron for similar operations.) "We don't say anything is perfect," he told me. "Otherwise we will have no improvement."

In recent years fascination with the easy-care quality of synthetics began to turn around. In the late 1970s a renewed interest in the comfort and quality of natural fibers swelled the demand in the United States for silk in clothing and home furnishings; it still continues. By sending nightly telexes to Shanghai, Jack Shamash, the leading silk importer in New York, orders more than 100,000 yards of Chinese silk weekly.

Japan experienced a dramatic surge in silk consumption in 1972. By then Japanese women who never had enough money to afford a silk kimono were earning their own pay and could buy several. The demand for silk skyrocketed, and so did the price. Japan imported silk from wherever it could get it, which was China, Korea—even old stockpiles in the United States.

The boom was short-lived. An increasing preoccupation with all things Western has caused a dramatic decline in kimono wearing. At the same time, the Japanese government, to support its silkworm growers, has kept silk prices far above the world market. Although there is now an eight months' supply of Japanese silk in warehouses, Japan imports some silk from China and Brazil because it is half the price of Japanese silk.

China continues to be the major provider of silk yarn in the world, but the Chinese are

Artistry at his fingertips, *master weaver Sentarō Fujita combs down the weft* ***(left)*** *with notched nails* ***(above)*** *in his Kyoto studio.*

Tsuzure-ori, as this weaving is known, allows the execution of finely detailed scenes from a painted design ***(right)****. A finished obi—the sash used to bind a kimono—may take up to a year to weave and sell for $10,000.*

KANEKO COLLECTION, OSAKA, JAPAN (BELOW)

Treasures of hand and heart

LOVE AND PATIENCE decorate a kimono being readied for a tie-dyeing process, known as kanoko, by

*women in Ohara, Japan (**above left**).*

*Blue dots temporarily mark the design to be knotted with silk thread (**above**) before dyeing. Removing the knots leaves a fine-lined, puckered pattern, such as the detail of a crane (**right**) from an 18th-century kimono (**left**).*

Such artistry transcends skill. "Techniques cannot bring a composition to life," says premier Japanese silk weaver Heiro Kitagawa. The artist's "kokoro (heart and mind) must be projected."

baffled by their failure to get a larger chunk of the silk-fabric market. "Tell us what are the new colors in America. We can provide any color at all," anxiously asked the manager of the silk factory in Dandong.

The problem is not just in the dyeing. China does not have the machinery to finish fabrics equal in quality to those of France or Italy—but it is gearing up to compete. In mid-1983 the U. S. Department of Commerce granted a Pennsylvania firm a license to export to China a $200,000 image-processing system to be used in automating the looming and embroidery of silk and other fabrics. Four other systems await licenses.

Still, it is Chinese yarn made into fabric in Italy that is revered by dress designers. From all over the world they buy fabrics from Italian silk mills. Some of these textiles are produced to the specifications of world-renowned fashion designers like Emanuel Ungaro and Karl Lagerfeld, but more often designers choose from the Italian textile companies' own lines. Fabio Bellotti, who runs the Milan firm called Rainbow, showed me the graffiti print on silk he had made after riding the New York subway. Gerolamo Etro pulled from his pocket a crumpled advertisement ripped from a slick magazine. He would ask his artists to use these colors in a Hawaiian-style print.

I traced the making of a silk tie from the Ratti factory outside Como, where the fabric for eight million ties was made last year, to neighboring textile factories. I saw craftsmanship and devotion in each of the 20 steps a tie demands. And I discovered why my husband's rep ties are so heavy; they are weighted by bathing the yarn in tin salts.

In the city of Kiryu, Japan's Lyon, the most advanced technology is being applied to silk. Computer-driven looms can even duplicate ancient Japanese silks. "Don't you worry that you will be replaced by a computer?" I asked Junichi Arai, the innovative Japanese textile designer who creates ingenious fabrics with fiber mixes and surface treatments. "The computer is my friend," he answered to my surprise. "Without the computer I can imagine 10 to 20 designs. But with the computer, I can produce more than 200 designs in the same amount of time."

Except during the war years the supply of and demand for silk have been fairly well balanced. Currently raw silk yarn is $13.60 per pound ($30 per kilogram), nearly 20 times the price of cotton.

At the Benedictine monastery outside Bangalore, India, Father Anselm told me that raising silk had become more profitable than raising grapes. "If you lose one grape crop, you are lost for a year. But if you lose one sericulture crop, you can start another soon again," he said.

WOMEN have always believed that there is no substitute for real silk for luxurious, lustrous dresses. Recently in a Washington, D. C., boutique, my eye caught a young woman modeling a royal blue silk gown. It reminded me of what New York-based designer Oscar de la Renta had said: "Silk does for the body what diamonds do for the hand." The woman's crisp taffeta skirt rustled as she spun in front of a mirror.

The sound echoed luxury, elegance, mystery. But in my imagination I heard even more: the swishing of the wedding dress of Catherine the Great; the flapping of the heavy silk banners Pope Julius II gave to his Swiss regiments; the billowing silk-trimmed sails on the ship of Sigurd the Crusader, King of Norway, as he glided toward the Golden Horn and Constantinople in 1110. Silk has dressed crowned heads and glorious palaces and added luster to pageantry through the ages.

And all from the unassuming silkworm. I checked my own tiny colony of silkworms on my dining-room table. By now one of my 20 charges had started the long process.

From minuscule caterpillar to the queen of fibers. That is the miracle of silk. □

Armor-to-go, *metal plates laced with silk cord telescoped into a carrying box for 16th-century Japanese samurai on campaign. In the West the textile allegedly helped rout Roman legions that were surprised and terrified when the Parthians suddenly unfurled massive silk banners at Carrhae in 53 B.C. But silk's most enduring conquest has been the seduction of our hearts and enchantment of our senses.*

PHOTOGRAPHED AT THE SMITH ART MUSEUM, SPRINGFIELD, MASS.

ALASKA'S SOUTHEAST

A Place Apart

By BILL RICHARDS

CECILY STERN, A WRITER, ALSO MUSCLES HER OWN FISHING BOAT OUT OF HAINES. RIGHT: FEEDING HUMPBACK WHALES LATHER FREDERICK SOUND. WILLIAM THOMPSON (ABOVE) AND ROSEMARY CHASTNEY, OCEAN IMAGES, INC.

It is a land of exuberance. Nature here delights the eye with grand spectacles. But nature also challenges the men and women of Southeast with hardships that, like any Alaskans, they both curse and endure with enthusiasm.

Landscapes of ice, rock, and water awe cruise-ship adventurers as well as the many visitors who see Alaska first in Southeast and leave the dollars that are one of the mainstays of the region's economy. Other resources are harder to come by. Dark coastal waters hold salmon and halibut for fishermen able to abide the notorious weather, from pea-soup fog to treacherous gales. Vast timber reserves feed a predominantly Japanese market, but chain saws are slowed by increasing concern for wildlife protection.

Native Tlingits, Haidas, and Tsimshians have flexed young corporate muscles since the United States opened regional wealth to them with the settlement of land claims. But the largest of all of Southeast's employers is government, accounting for one job out of every three.

DWARFED BY MARGERIE GLACIER, THE CRUISE VESSEL *TROPICALE* PLIES THE WEST BRANCH OF GLACIER BAY. NATIONAL GEOGRAPHIC PHOTOGRAPHER DAVID ALAN HARVEY

IT IS 4 A.M., and an angry October storm is slanting cold rain against the wheelhouse of the fishing boat *Peggy IV*, blowing so hard I'd almost swear it is raining sideways. We are anchored at the edge of Southeast Alaska's Lynn Canal. Big Lynn they call her here, a deep fjord 80 miles long and six miles wide. The wind carries the cold, fresh scent of glaciers, and the mountains climb more than a mile on either side of this raucous strait.

Over the radio the all-night disc jockey on KHNS out of Haines says there's a gale blowing in. She dedicates a song to all the fishermen out here tonight—"California Dreamin'."

In fact, I am dreaming of salmon—cohos and chum—running in a silver tide beneath Big Lynn's watery skirts. Come morning, Alan Stein, *Peggy IV*'s skipper, and I will join nearly 200 other gill-netters lacing the canal's waters with nets, taking one last crack at the season's final run.

Then it will be over for the year; the early winter storms are already massing to the east across the high passes in the Yukon, ready to howl down Southeast's mountain alleys to the North Pacific. From Skagway to Ketchikan, people are beginning to hunker down for a long, well-deserved rest.

Alaskans, as a rule, pride themselves on their willingness to buck the elements. All well and good for those who dwell Up North, a term Southeast's 54,000 residents don't always use endearingly about the remaining 90 percent of their state. (See **The Making of America: Alaska**, a historical map supplement with this issue.)

This is the other Alaska—a nearly 600-mile-long handle on a 550,850-square-mile pan—removed from the bulk of the 49th state by the St. Elias Mountains, one of the highest coastal ranges in the world, by an ice field that could swallow Rhode Island, and, perhaps, by a state of mind as well.

In Southeast a winter williwaw can slam an unwary boat or plane with hundred-mile-an-hour winds out of nowhere. Fogs drop their impenetrable silence for days on end. And it rains. Oh, how it rains. (Former Alaska governor William A. Egan, sympathetic to the plight of sun-starved Southeasterners, used to declare "sun holidays" when the clouds made a rare winter parting here.)

Southeasterners are of mixed emotions about all their rain. Some make the best of it, like the Ketchikan band that calls itself Thirteen Feet—after the amount of water that falls there each year. Some complain: "It's raining all day, raining all nite, nothin' to do but get into a fight . . ." sings a blues balladeer in Pelican, a tiny community of 30 drenched souls, far out on Chichagof Island.

And in truth it is cold, and wet, and lonely in waterlogged Southeast in winter. "But you know, it's kind of nice," admits George Larsen, proprietor, bartender, and house philosopher of Point Baker's trading post, down on the tip of Prince of Wales Island. "The fishermen are home, you visit and party, and everyone snuggles up like a big family. Winter's the time when it's peaceful, and you get the things done that needed doing all summer long when there wasn't enough time."

WITH SOME 1,000 ISLANDS, more than 13,000 miles of shoreline—and a measly 44 miles of year-round highway that really goes anywhere—Southeasterners don't have much choice but to head indoors when winter blows in. "Outsiders think Alaska is a guy in a trapper's cabin north of Fairbanks," complains Petersburg fisherman Gary McCullough. "Let

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Journalist **Bill Richards** has reported for the GEOGRAPHIC on Hudson Bay, the Yellowstone River, Powder River Basin, and Puerto Rico.

Alaska's Southeast

0 KILOMETERS 50
0 STATUTE MILES 50

MAPS BY SUSAN SANFORD AND ISAIAH WRIGHT
COMPILED BY GRAHAM J. TRUSCOTT
NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

White Pass
889 m
2,917 ft

YUKON TERRITORY
BRITISH COLUMBIA

Chilkoot Pass
1,140 m
3,739 ft

Mount Foster
2,172 m
7,127 ft

Skagway

Haines

Mount Fairweather
4,663 m
15,300 ft

Glacier Bay

Lynn Canal

Gustavus

Juneau

Douglas

Admiralty Island

Stephens Passage

Cross Sound

Frederick Sound

Kupreanof Island

Chichagof Island

Petersburg

INSIDE PASSAGE

Kates Needle
3,055 m
10,023 ft

Kruzof Island

Wrangell

Sitka

Chatham Strait

CANADA
UNITED STATES
ALASKA

Revillagigedo Island

Portland Canal

Baranof Island

Kuiu Island

Prince of Wales Island

Clarence Strait

Dall Island

Ketchikan

Metlakatla

Dixon Entrance

Prince Rupert

Graham Island

Straitjacketed *between mountains and ocean, some 1,000 islands shelter the Inside Passage, historic route of settlement by Indians, Russians, and Americans and today the marine highway for the 54,000 residents of the nearly 600-mile-long Panhandle.*

Alaska's Southeast: A Place Apart

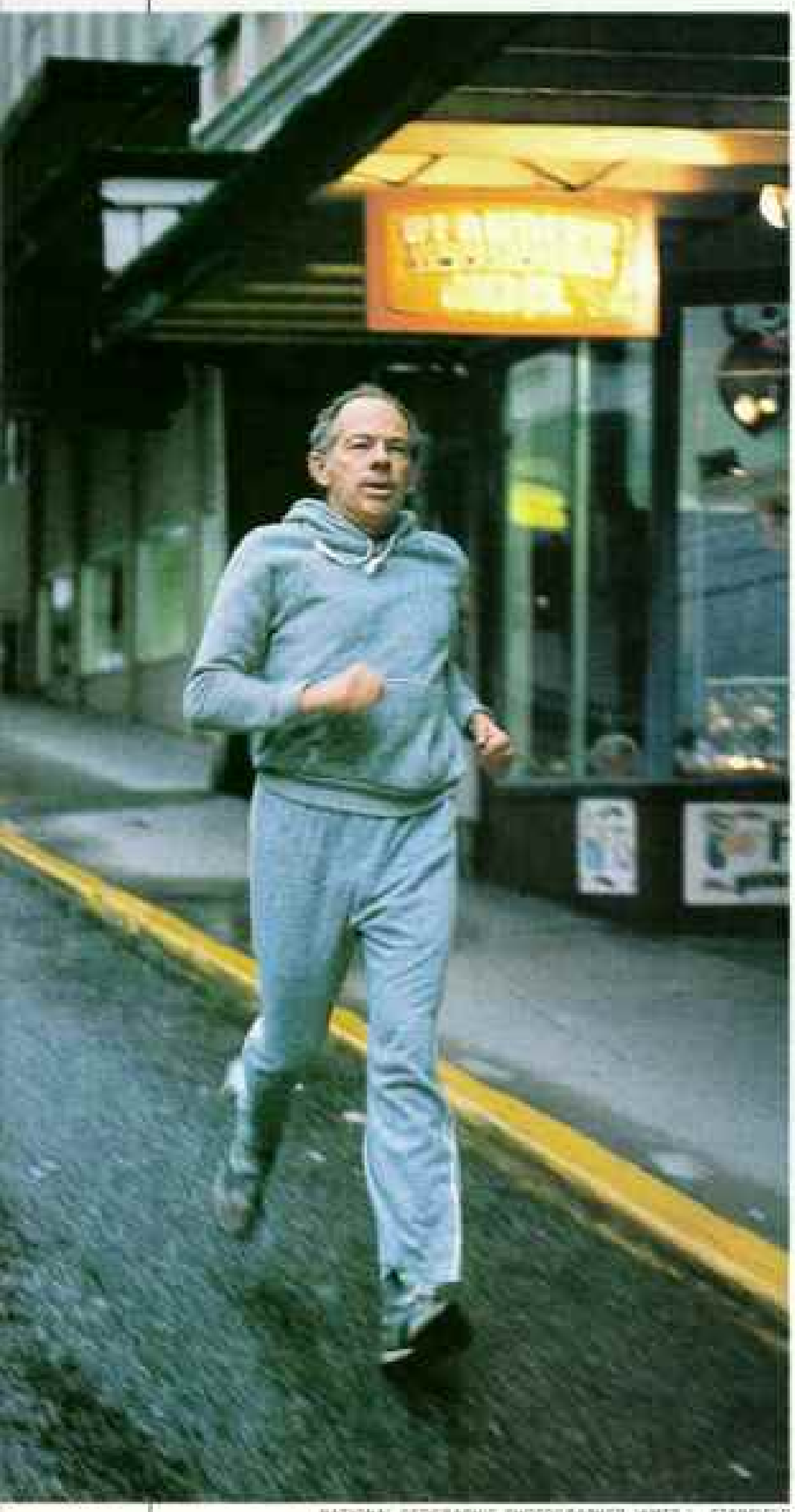
DAN DRY (LEFT AND CENTER); WILLIAM THOMPSON

Cascade of nasturtiums, *object of Billie Taylor's fond attention* ***(left)****, advertises the Kuroshio, a warm current that moves through the Pacific Ocean off Southeast and renders the coastal climate temperate. "I plant in May," marvels Mrs. Taylor. "Now here it is October, and my flowers are still growing like everything!"*

A 40-year resident of Petersburg, Mrs. Taylor remembers the days before regular ferry service between Southeast and the lower 48 began in 1967. "It made a lot of difference. Now if you have to get out, even in winter when flying isn't good, there's always the ferry."

On a welcome clear day, the ferry line's flagship Columbia *nears Petersburg* ***(top)****. In addition to Alaskans, summer passengers include backpackers who camp out on deck and make a party out of the passage* ***(above)****. Shipboard friendships and dockside partings have become a familiar Southeast scene* ***(above left)****.*

A Quarter Century of Statehood



NATIONAL GEOGRAPHIC PHOTOGRAPHER JAMES L. STANFIELD

A running start *on the day sends Governor Bill Sheffield through Juneau, Alaska's capital, accessible only by water or air. Although Alaskans voted in 1974 to relocate the capital, they failed to fund the move—much to the relief of Juneau, where the economy balances on government and tourism.*

WHEN ALASKA became our 49th state on January 3, 1959, the air was charged with optimism as the people of Anchorage, Fairbanks, Juneau, and the smaller settlements looked forward to casting off the role of ward of the U. S. government and to an eventual end to the old cycle of boom-and-bust.

No one could have foreseen that with statehood immense changes would come to the society of the far north.

Oil strikes on the North Slope provided fuel to drive Alaskan economic growth. Conservationists, seeing their greatest hope in this greatest of our wildernesses, delayed distribution of public lands, and native groups—Eskimo, Aleut, and Indian—asserted claims to tribal territories.

No sooner was Alaska granted statehood than these great forces began subdividing it and struggling among themselves. Now, on this 25th anniversary, all parties have gained something.

The boosters and boomers have expressed the most disappointment. Some even talked of secession after their dreams were thwarted by what they consider the lockup of the land. But 104 million acres are eventually to be in state hands.

Conservation groups are pleased with the creation of the largest national parks, refuges, and forests in our nation; the Alaska additions—150 million acres—almost doubled such lands.

The natives, having been converted into corporate shareholders in 44 million acres under the Alaska Native Claims Settlement Act, seem to be making it economically, especially where resources are rich, as in Southeast and the North Slope. But these 25 years have also challenged the traditions and morale of native life.

The National Geographic Society's first scientific expedition went to Mount St. Elias in 1890, two years after our founding. We have followed Alaska's course ever since, from wilderness to frontier to modern state. Thus on its silver anniversary we congratulate the Great Land that has become a great state.

me tell you, Southeast *is* Alaska. It's as wild as anywhere, and you're on the edge of danger all the time. We don't have to go looking for it. It's right here around us."

But the last salmon run of the season is a different kettle of fish altogether. No time to lay back now. Daybreak has fractured the storm into fumaroles of clouds, boiling up the mountainsides. Alan moves around the *Peggy IV*'s deck like a man possessed, paying out 1,200 feet of glacier-blue nylon-mesh net off the big drum on the bow while I back the boat in a shallow semicircle. The colors of the net and canal match; if we're lucky, the swimming salmon won't spot the trap until their gills snag.

At 38 Alan is an expatriate from Chicago, who adds to 11 years of fishing experience in these tricky waters his powers of intense concentration and a bottomless supply of energy. Gillnetting is a dangerous ballet: Catch the whirling drum and you snap a limb, miss a step on the pitching deck and you end up in the killing cold of Big Lynn's 46-degree water. Up and down the canal gill-netters are hopping and leaping in the same frenzied dance.

The drum—reversed now—groans as we haul in. One hundred feet of net yields just two flounders and a clot of jellyfish. Alan's expression is as dour as the sky. Then a perfect, three-foot chum flops at our feet . . . and another. Suddenly the bow well is awash in bright-eyed salmon.

"Pay dirt," whoops the captain. The gloom and the cold Alaskan brine sloshing over our boot tops are forgotten.

You spend 48 straight hours fishing like this, and if you're skillful, and lucky, you pocket $4,000 or more—minus the price of diesel and black coffee, the twin fuels for such bone-wearying marathons.

But is it worth it, I wonder? I know a gillnetter in Haines, at the head of the Lynn Canal, who survived a dunking while fishing solo one night. He was plucked out of the water just in time by a passing colleague who chanced to hear his screams over the wind. He is in the motel business now.

"You don't measure life here just in dollars," Alan explains, after we have pitched our catch to the cannery tender. "There aren't many fishermen in this fleet who don't complain about the work, the weather, and the danger—but they secretly love the freedom and beauty of this place."

NO DOUBT there are dissenting opinions. This is Alaska, after all, a state that seems to have added an entirely new dimension to the concept of cantankerous.

But during months of traveling Southeast's Alexander Archipelago, I found loggers, fishermen, miners, drifters, and dreamers all with the same notion. "If you can stand the moss on your back, it's heaven here," a woman in Sitka told me.

In fact, if there is a problem here, it is that Southeast seems to be gradually strangling on its own version of the good life. "These days people are more worried about being discovered than about being isolated," says Bob Pegues, mayor of tiny Tenakee Springs (population 148), a town three-quarters of a mile long and one street deep, nestled at the edge of Tenakee Inlet on Chichagof Island.

On this particular occasion the mayor and I are up to our necks in hot water, soaking up our morning bath in the communal bathhouse. If you want to get clean in Tenakee Springs, a dip in the warm, green water flowing up out of a cleft in the shoreline granite is the way to go—there's not much other running water here, unless you count the 66 inches of precipitation that falls on the town each year.

And therein lies a profound problem. Tenakee's residents prefer bathing *au naturel*, with the sexes usually separated. A while back someone counted up the women's bathing hours, then the men's, and filed a complaint with the state equal-rights commission in Juneau. An investigator arrived on the morning mail plane, and a hearing was held. After much debate the women were awarded two more hours a day in the bathhouse.

"It's like having 148 people in the house and just one bathtub," sighs the mayor. "You can get into an argument pretty quickly around here just by bringing up the subject of taking a bath."

Southeast has other problems to argue about, though on a considerably larger scale. For one thing, nearly three-quarters

A roof of ice bigger than Rhode Island *covers peaks cresting some 3,800 feet above Juneau, where prospectors Joe Juneau and Fred Harris started Alaska's first*

JAMES L. STANFIELD

gold rush in 1880. Home to 19,500 people, Juneau's expansive boundaries make it one of the largest North American cities in area.

of the region is covered by the 17-million-acre Tongass National Forest. Under the Alaska National Interest Lands Conservation Act of 1980, Congress ordered the U. S. Forest Service to offer at least 4.5 billion board feet of Tongass timber for commercial logging every decade.

Japan is an eager market for Southeast's timber. Alaska Lumber and Pulp's big pulp mill in Sitka is Japanese owned, and most of the timber cut in the region heads west, not south. Environmentalists and others worry that all that cutting will destroy critical Alaska brown bear and black-tailed deer habitat. Fishermen are concerned about what it will do to island streams where pink, chum, and coho salmon lay their eggs. Ironically, this land of seemingly endless forest doesn't have enough to go around.

STATE BEAR BIOLOGIST John Schoen flew me over Admiralty Island for a look. Below our slow-speed Helio Courier, unnamed creeks braided their way out of the forest canopy and across lush grassy flats. Brown bears squatted on alpine

meadows watching us, then ambled off after an interval decent enough to maintain their pride. John says he figures the island has a brownie for every square mile, making it one of the most heavily populated brown bear habitats in the world.

The intrusion of man with his chain saws and logging roads will frighten off some bears, John says. Intruders will almost certainly hunt and kill others. And where the forest is cut away, dense second growth eventually makes forage impossible for deer. Unfortunately, the best timber lies along the drainages. "They're going to cut the heart out of the forest," predicts John.

On the Chilkat River, north of Haines, I found a more promising development in Southeast's continuing logger-wildlife struggle. Each fall more than 3,000 bald eagles from Alaska and western Canada descend on a short stretch of the Chilkat to feast on the river's unusually late salmon run (pages 68-9). It is the largest known gathering of bald eagles anywhere, a spectacle that draws an audience from around the world.

(Continued on page 70)

WILLIAM THOMPSON (LEFT); DAN DRY

The pace of life *is not terribly brisk in Elfin Cove, population about 30, where kerosene lights the lamp of learning for Mara Place (**left**). Mara practices spelling with the aid of a computer game while a neighbor watches.*

Snugged into a tip of Chichagof Island, Elfin Cove has one telephone, one store open year round, and a mail plane that arrives, weather permitting, once a week in winter. "If we get hungry for fresh produce," says Mara's mother, "we call up the supermarket in Juneau and have it sent out on the mail plane."

*But Southeast Alaskans have learned to live with isolation, often in dwellings set far apart from others, such as this house (**above**) on Kupreanof Island across Wrangell Narrows from Petersburg.*

DAN GRY (ABOVE); WILLIAM THOMPSON

The massive claws *of an Alaska brown bear lie still* ***(far left)*** *as the drugged animal is studied by biologists on Admiralty Island. A black bear forages in Misty Fjords National Monument area* ***(above)****.*

Though the region supports a high population of both species, conservationists point to the potential ill effects of logging and mining on the animals.

How do wilderness bears relate to humans? On Admiralty, University of Alaska graduate student Susan Warner ***(left)*** *gathers data.*

***Largest known congregation** of bald eagles lines the banks of the Chilkat River north of Haines each year from October to January. Like ornaments on Christmas trees, eagles by the thousands decorate cottonwoods **(above)** before flying off to feast on an abundance of dying salmon.*

Ornithologists and bird-watchers flock here as well, eager to observe a bird endangered in the lower 48 states. Though most Alaska rivers freeze during the winter, this stretch of the Chilkat remains open thanks to upwellings of warm water. To protect the eagles' habitat, the state set aside 48,000 acres in the Chilkat Valley in 1982.

ALL BY WILLIAM THOMPSON

Rigged to phone home, *a bald eagle wears a radio transmitter fastened to its back by a lightweight temporary harness* ***(left)****. The radio's beep informs scientists of the bird's whereabouts. After a year or so the harness falls off, leaving the bird unencumbered.*

In a continuing study of the eagles' habits, National Audubon Society biologist Erv Boeker and Jack Hodges of the U. S. Fish and Wildlife Service prepare to attach a transmitter to a captured bird ***(right)****.*

Eagle-watchers along the Chilkat were elated when several radio-tagged birds were followed into British Columbia and Washington State.

Alaska's Southeast: A Place Apart

But loggers in Haines were hungry to cut the timber stands where the eagles perch by the river. By 1979, when Erv Boeker showed up, tempers were cresting toward the gunfire stage.

Erv, 60, is a former U. S. Fish and Wildlife Service eagle expert now employed as a troubleshooter by the National Audubon Society. "When I got here," he recalls, "people were telling me 'What good are eagles? You can't eat 'em.'"

With an unflappable temperament and a build like a packing crate, Erv proved to be the ideal peacemaker and negotiator. By 1982 Alaska was able to set aside 48,000 acres as a state bald eagle preserve. Commercial logging and mining are prohibited, but the land is open to traditional uses like hunting and fishing.

Not everyone, I discovered, is enamored of our national bird. Even highly patriotic bird lovers have been known to dismiss the bald eagle as a "dandified vulture." Erv, when pressed, admits he prefers golden eagles, which usually eat live prey, to the mostly carrion-eating balds.

Technically, I suppose, I agree. Bald eagles are the ill-tempered, lazy, and uncouth dinner guests of the bird world. But the sight of hundreds of them, wheeling on the air currents, crowding each other on a sandbar for a grab at a gasping salmon, or simply sitting angry-eyed above it all, is one I suspect the most discriminating birder would find impressive.

AS THE EAGLE FLIES, it is 150 miles from Haines to Sitka, on Southeast's outer coast. I made the trip by state-owned ferryboat, the preferred means of winter transportation for Southeasterners who have the time—two days if you're lucky on connections. But there are compensations. It's cheap, it's friendly, and you won't spend a week waiting in some airport cursing the fog.

Sitka presented herself to me in much the same way I imagine Russia's explorer-fur trader Aleksandr Baranov must have found her in 1799—smothered in fog and drizzle. Sitka isn't Southeast's wettest town—that distinction goes to Little Port Walter, a neighbor 50 miles farther south on Baranof Island, which has an average of 224 inches of precipitation dumped on it every year. Sitka just seems to get her weather more slowly. One early explorer, making his way up the outer coast of the archipelago, noted in his journal that "the weather had a dirty unsettled appearance, and in the night a heavy gale of wind came on . . . with thick rainy weather. . . ."

To be sure, Baranov had more on his mind than the weather. Fierce Tlingit warriors kept an uneasy truce with his Russian-American Company intruders for three years, then leveled their fledgling settlement. Baranov returned in 1804 with three Russian warships and 300 kayaks manned by Aleut hunters. After the bombardment a permanent colony was established called Novo Arkhangelsk.

While Chicagoans were still slogging through swamp and San Franciscans were huddling in log cabins, silver icons were being installed at New Archangel. But for all its sophistication it must have been a lonely outpost. The Siberian fur hunters here had a saying: "God is high above and the tsar is far away."

When Secretary of State William H. Seward purchased Alaska for the United States for 7.2 million dollars in 1867, the glossy sea otters had been hunted to extinction here. The Russians deserted their faded city en masse, no doubt muttering along with Washington about Seward's Folly as they headed home.

It would be nice, but inaccurate, to report that a slice of Old Russia still flourishes here in Sitka (a Tlingit name). But this is a fishing and logging city now, decidedly American.

"After more than 100 years, you will find very little of the Russian period left," advises Russian-born Bishop Gregory (page 83), prelate of St. Michael's Orthodox Cathedral. (The church dropped "Russian" from its former title in 1970.)

The cathedral's distinctive onion-shaped dome has crowned the city's waterfront since 1848, but now it is the new St. Michael's, the old having been destroyed by a spectacular fire in 1966. On that cold January night, Sitkans formed a human chain to rescue most of the cathedral's priceless religious artwork.

"A miracle," remembers Bishop Gregory.

It took nearly a decade, but the church was rebuilt in the same cruciform style as the original, a design Bishop Gregory says was developed by Rastrelli—an Italian—who built many of St. Petersburg's magnificent 18th-century palaces.

In a quiet corner of the cathedral the bishop points out the "Sitka Madonna," the church's most treasured icon. Sitka fishermen visit her to ask protection.

"I myself have had serious eye trouble for years," declares the bishop. "I pray to the Madonna, and somehow I still see to work and write. The doctors don't seem to understand."

These days, Orthodox services in Southeast are said in three languages—Russian, English, and Tlingit. When they departed, the Russians left behind just three priests to minister to 16,500 converts.

"We have about 800 Tlingits left in the church today," says Father Michael Williams, the church's only Tlingit priest. "It seems odd, but perhaps the Orthodox Tlingits are the last real remnant of the Russian presence left in Southeast."

THROUGH THEIR NATIVE corporation, Sealaska, Tlingits have become a potent economic force throughout Southeast. Sealaska, largest of 13 regional native corporations created as a result of the Alaska Native Claims Settlement Act of 1971, operates a spectrum of businesses from canneries to construction companies and has investments in offshore oil and gas development. A thousand full- and part-time jobs in Southeast depend on the corporation, whose 15,800 shareholders—mostly Tlingit, Haida, and Tsimshian Indians—control a net worth of almost 500 million dollars.

"We are the largest private economic factor in the region today," says Byron Mallott (page 73), as we sit in his paneled office overlooking the Juneau waterfront.

It is an impressive corporate résumé, made more so by the 40-year-old Tlingit board chairman himself. As we talk, Byron pulls a large blue atlas from his bookshelf. It lists mineral, wildlife, and marine resources for communities throughout Southeast.

"We're a big corporation, and we'll get bigger," Byron says. "But we spent a million dollars for this survey so we would know our true wealth."

Though their future seems bright now, there is a bruised and bitter history that many Tlingits cannot forget.

The darkest moment came on an October day in 1882 when a U. S. Navy and Marine

Eloquent record *of tribal lineage and history, totem poles by the hundreds once towered over villages of the Tlingits, Haidas, and Tsimshians. Now they rise largely in parks and museums. Only a few local artists still carve totems, among them Tlingit Nathan Jackson* ***(above)*** *of Ketchikan. Here he secures bolts to attach the beak of the Eagle—the totem of one of the two Tlingit groups. A pole of the Raven group lies beside it. Jackson and fellow artist Steve Brown carved these ten-foot cedar poles for the Sealaska Corporation, largest of the 13 native corporations created under the 1971 Alaska Native Claims Settlement Act.*

JAMES L. STANFIELD (BELOW); WILLIAM THOMPSON

***Guardians** of native wealth, the Sealaska Corporation board of directors (**left**)—headed by Byron Mallott (**right**)—convenes at Juneau headquarters to oversee a company worth almost 500 million dollars. Interests in salmon canning, logging, and construction make it the region's largest private employer. Too young to count among its nearly 16,000 native stockholders, Tlingit children playing in Angoon (**below**) may inherit stock or buy it when the company goes public in 1991.*












attack force shelled and destroyed the helpless Tlingit fishing town of Angoon on Admiralty Island. Time and conflicting accounts of the assault have shrouded the details and the blame. Most likely, both sides agree, it was a misunderstanding, made worse by unfamiliar languages and cultures. But the Tlingits still mourn for six of their children and "the day we paid for a crime that was not committed."

In Angoon, exactly one hundred years later, I listened to Alaska Governor Jay Hammond recount the grim tale at a commemoration. It was, the governor said sadly, "the ultimate example of a tragedy that can strike when people no longer listen."

BY THE TIME I RETURNED to Southeast in late June, she was wearing fresh new colors. Winter's gray was replaced by high blue skies. With guide Hayden Kaden I kayaked along the base of Reid Glacier, near the head of Glacier Bay. Around us fields of cotton grass and dwarf fireweed made the hillsides glow. The air overhead seemed alive with puffins, cormorants, and gulls. Seals popped their heads out of the milky glacial water to watch our progress.

Strange to consider that this remarkable bay, so bustling with life, was locked beneath an ice sheet as much as 4,000 feet thick less than two centuries ago. John Muir, the first non-Indian to explore its waters, in 1879 called it "a solitude of ice and snow and newborn rocks, dim, dreary, mysterious."

Luxury liners crammed with tourists in jogging shoes retrace Muir's perilous path now, for the ice is backing rapidly up the 60-mile-long bay, centerpiece of Glacier Bay National Park (pages 53-55). The "imposing array of jagged spires and pyramids, and flat-topped towers and battlements" that awed Muir groan and hiss in retreat.

Hayden, a genial Texas-born lawyer turned Southeast backwoodsman, led me to a small, decrepit cabin tucked back on a gravel spit across from Reid Glacier. Joe Ibach pioneered here during the early part of the century, while searching the mountains round about for gold. Muz, his wife, grew rhubarb in a tiny rock garden next to the cabin. "Read the walls," Hayden urged.

"Ward's Famous Rancher Saddle $31.95 . . . Our Best Galvanized Steel Enamel-covered Washtub $3.98 ($4.49 with cover) . . ." and more, ads for hair clippers, curtains, and cast-iron stoves cover the walls and ceiling. Joe and Muz Ibach decorated their home in Early Montgomery Ward Catalog. *(Continued on page 80)*

BOTH BY JAMES L. STANFIELD

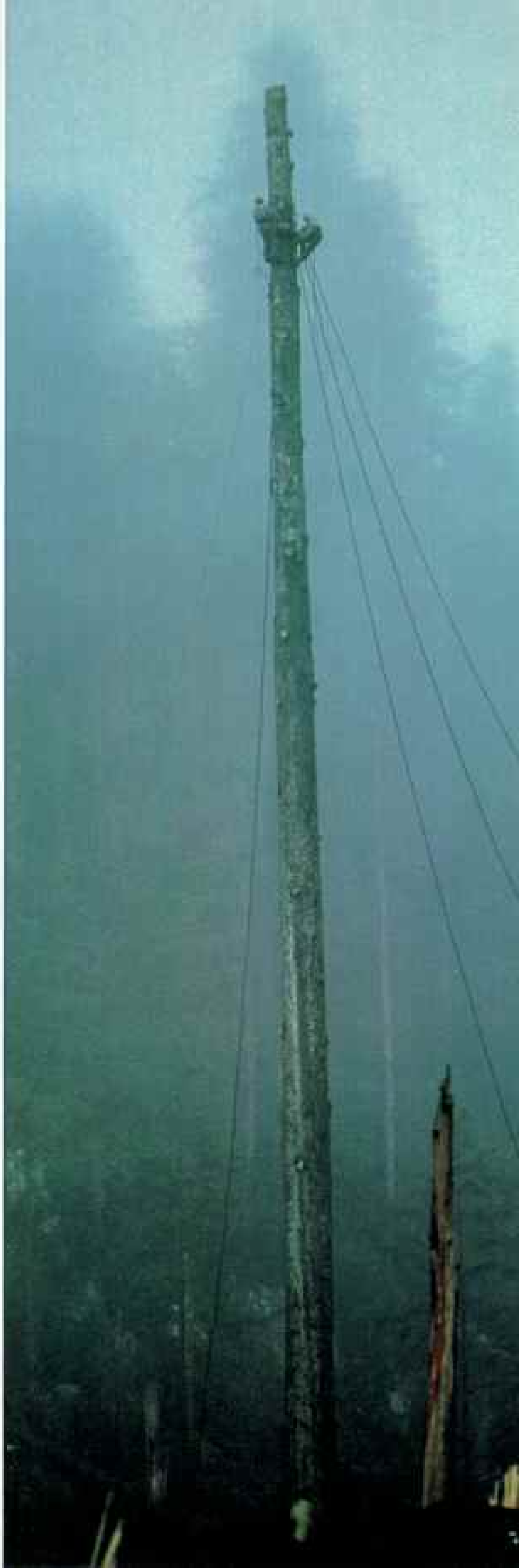
***Spirit man** of Angoon's Shark clan, part of the Eagle Tlingits, 81-year-old George Jim (**above**) follows the role of his maternal grandfather, Shark Liver, who dominates a family photomontage (**facing page**). Both hold rattles and wear headpieces—a carved wolf head and a white weasel—used in ceremonial dances. The 465 people of Angoon maintain a traditional village. "Yet the young are not learning our language," regrets George Jim, who tape-records his knowledge of Tlingit traditions for Angoon's Heritage Foundation.*

Rough-cut steps *boost a logger's reach with a chain saw* (**above**) *on a clear-cut on native corporation land, once a part of the Tongass National Forest. On the forest floor, bunchberries* (**right**) *provide browse for deer. Towering over the cut, a spruce tree is trimmed and topped* (**facing page**) *to serve as a spar tree, anchoring cables that skid logs to water for transport.*

Logs from this cut will travel whole to Japan, market for most wood products from native-owned forests and the Tongass, at 17

WILLIAM THOMPSON / (RIGHT) | BAR DEV

million acres the nation's largest national forest, covering three-fourths of Southeast. To comply with government regulations designed to promote jobs in the area, nonnative corporations must first process timber at pulp or sawmills in Southeast. Many state officials and environmentalists fear that commercial cutting will damage critical wildlife habitats, including salmon spawning streams and old-growth forests that have—until now—never known a saw.



*Taking a breather from open water, fishing boats line the docks of Ketchikan (**above**), Alaska's fifth largest city and southern hub of the industry that headed Southeast's economy until 1955. Catches of pink salmon —far and away the most plentiful of its five salmon species—peaked in the 1940s but declined alarmingly until, after statehood, management techniques improved and fish traps were outlawed for all but a handful of native fishermen. Most delectable, king salmon are also scarcest; here sportfishermen carry their day's limit (**right**). Pinks, however, are returning to the levels of 40 years ago. Warm ocean conditions, regulation of foreign catches within the U. S. 200-mile limit, and international agreements reducing fishing fleets on the high seas have all played a part. Ironically, recent bumper harvests coincide with lower prices, forcing fishermen to seek fish other than salmon. Although this year's halibut season was limited to five days, it drew fishermen in droves and crammed packinghouses (**left**).*

I wonder, did they pass the long nights dreaming of those treasures surely to come with the strike just over the next hill?

New pioneers populate Gustavus, beyond the entrance to the wilderness park. Some, like Sally and Jack Lesh, came for the promise of a less cluttered life-style. In 1959 Dr. Lesh and his wife piled their eight children into a battered school bus to escape the expanding bustle of Boston (population then 697,000). Three and a half months later they were in Anchorage (population 44,000); too big. Then on by boat to Juneau (population 7,000); still too big. Finally they ended up in Gustavus (population 107); just right.

"You feel more personally involved here," says Dr. Lesh, 61. The Leshes built their own home, generate their electricity, grow as much of their food as they can. "And our kids all grew up fine and stayed in Southeast, so I guess we made the right choice."

A young man who lived for a while in a homemade tree house when he arrived in Gustavus explained to me that some residents of the town might be thought hippies elsewhere. "But here we're all just citizens," he said.

The citizens of Gustavus and their friends were celebrating the Fourth of July when I arrived. I can report that the wild goings-on included a parade featuring the town fire truck, a town rendition of "God Bless America," a sack race, homemade pie, and a spelling bee. NATIONAL GEOGRAPHIC finished third in the spelling bee. The winner, Bill Dunn, listed his occupation as "agitator."

TO MY MIND, Stan Price is one of the last authentic pioneers left in Southeast. When photographer Bill Thompson and I kayaked to remote Pack Creek, off the Seymour Canal, we found Stan chopping wood in the shed in front of his spruce-log float house. He gave us a big hello, then invited us in to admire the 70 quarts of strawberries he just finished picking and putting up for winter.

Stan is 84. He says he knows where to find gold, but that's not why people make their way to his isolated homestead. They come to meet his friends, the bears.

Years ago, while prospecting here on Admiralty Island, Stan and his late wife, Edna Mae, rescued and raised a pair of orphaned cubs they named Suzie and Bolinda.

In time the cubs had cubs of their own, and gradually Stan became godfather to a pack of wild Alaskan brown bears. On hot summer days the bears sometimes loll around his cabin like bluetick hounds. He has counted 31 at one time sitting out on the creek delta waiting for the tide to change and bring another meal of salmon thrashing upstream. Stan calls the salmon "food stamps for bears."

After lunch he invites us to come along for a stroll to watch the bears feed in the creek. In deference to our shaky nerves, he brings a weapon—a three-foot-long stick.

"It's been my experience in the 60 years I've lived in these parts that bears and men usually get along unless someone provokes someone," he says, as we move up on a sow and her two cubs. Only once, he says, has he been harmed by a brownie. The bear, a stranger on the creek, swiped the buttons off his shirtfront, cuffing Stan against a tree and breaking his collarbone. Edna Mae chased the bear away by banging on a pot.

This sow's name is Brownie, and Stan says she is one of Suzie's original cubs. Gently, he calls hello as we approach. The bear glances up at us, then refocuses on the salmon she has chosen for dinner. The cubs box and tumble nearby. We are 50 feet away.

Traditional woodlore says this is a very dangerous spot, and with good reason. Somehow, though, I feel safe, protected by an 84-year-old man armed with a stick and a remarkable sense of kinship with some of nature's fiercest creatures. But it is not man who is threatened here. Stan says he wept several years ago when hunters shot Bolinda while she was salmon fishing on the beach, less than half a mile from his cabin.

LONG BEFORE STAN PRICE other prospectors were traveling Southeast's canals and straits in search of gold. First Sitka, then Juneau, boomed with discoveries. But the rush north did not begin in earnest until 1896, when a ragtag trio named George Washington Carmack, Skookum Jim, and Tagish Charley made the big strike on Rabbit Creek, a tiny tributary off a Yukon river called the Klondike.

For two fevered years thousands rushed up Southeast's Inside Passage in anything that would float. The loss of life in shipwrecks was appalling, but few had time to keep count. Residents of Skagway, gateway to the mountain passes to the Klondike goldfields, were paying their lodge dues in nuggets; newspapers screamed of the bonanza with headlines that said "Gold! Gold! Gold! Gold!"

At the height of the rush Skagway boasted a population of 15,000. Few stayed, though the city stabilized, after a fashion, at 800 during the 20th century on the strength of less glamorous lead and zinc. The ore was shipped until recently from Yukon mines to Skagway's tidewater dock on Lynn Canal by way of the narrow-gauge White Pass & Yukon Route.

In the summer of 1983, when I passed through, Skagway was clearly on the skids. Plummeting demand for Canadian ore had closed the mines; the railroad, with nothing to haul but summer tourists, had suspended service. The residents were eking out a living on the tourist traffic and praying for a miracle to reopen the railroad. "This winter," Mayor Rand Snure predicted glumly, "could be very rough."

EVEN IN THE BEST of times, though, hardship has been a way of life in this tough little town, and I suspect Skagway will pull through somehow. The community was born of rugged stock. Its forefathers endured some of the most grueling trials men can suffer as they headed for the Klondike over Chilkoot Pass (page 85).

There is plenty of evidence left even today to mark the hardships the stampeders bore along the Chilkoot route, a trail some have called "the meanest 32 miles in history." To me, the most telling reminders are the shoes—most of them citified brogans—discarded along the trail so long ago, now rotting slowly into the mud.

Mercifully, my three-day trek over the 3,739-foot pass was made under blue skies,

WILLIAM THOMPSON

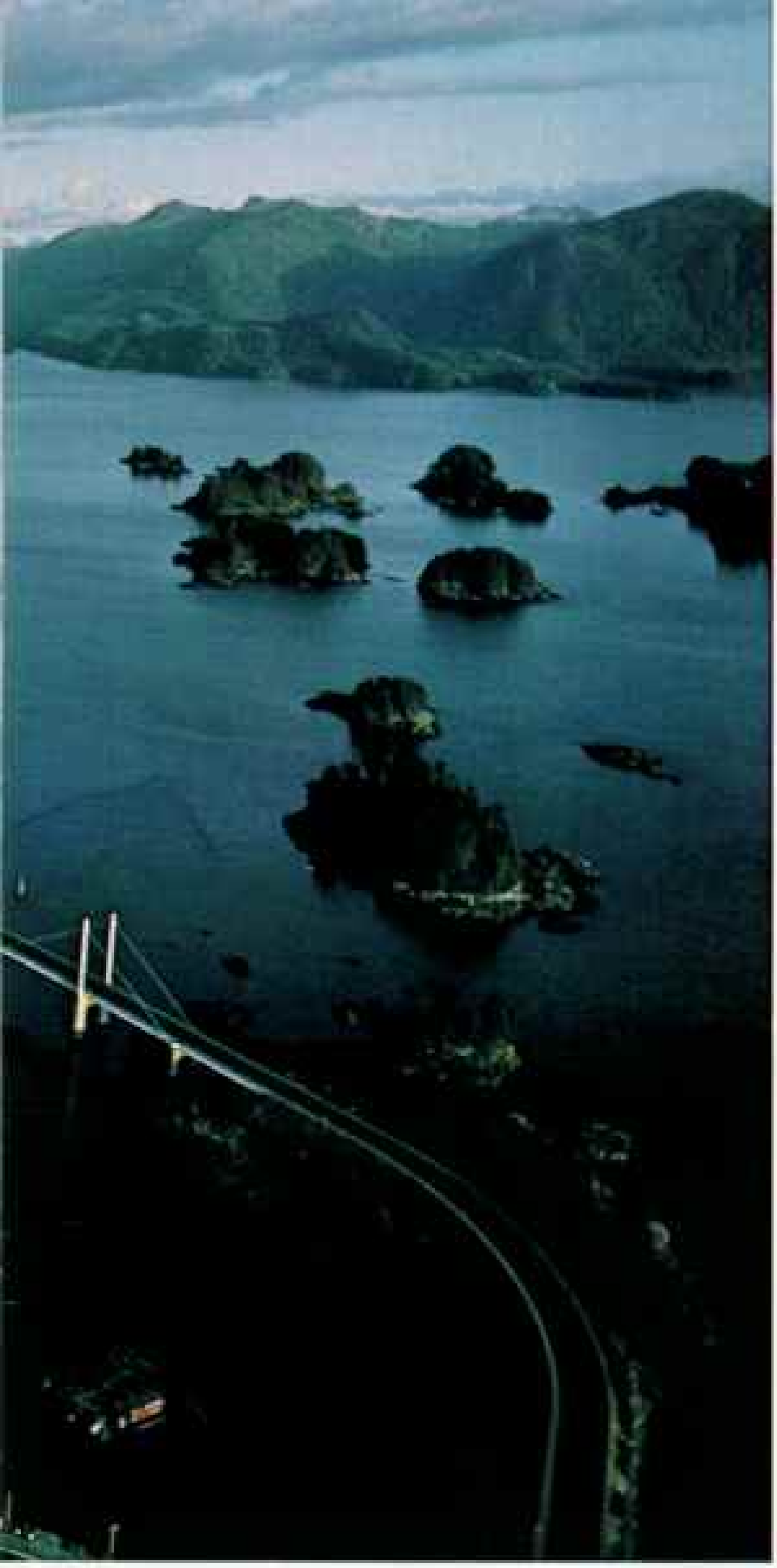
Relaxation is in the cards *at Tenakee Springs, where bartender Gwen Pegues plays cribbage with Russell Heath at the Tenakee Tavern. Klondike miners came here to while away the winter and soak in hot springs on the shoreline. The springs now serve as the bathhouse in a town whose tranquillity draws retirees from Juneau and Sitka. "Where else can you look out your window and see humpback whales cavorting in the inlet?" asks Mayor Robert Pegues.*

my only suffering a sunburn acquired as I crossed snowfields near the summit in shorts and a T-shirt. But imagine the scene as it was 85 years ago in winter: 70 feet of snow; minus 55-degree temperatures; a bitter wind plus blinding fog and blizzard. They called the foothold hacked into the ice up the final 45-degree ascent to the summit the Golden Stairs, but it took iron men—and women—to make that climb.

"A trail in Alaska," wrote one shaken Chilkoot survivor, "should not be confused with an ordinary highway. . . . It has no further meaning than that a man, and possibly a beast of burden, may travel that way over the natural surface of the ground."

Nowadays Southeasterners are struggling with another mining bonanza. Fifty miles east of Ketchikan, in a 150,000-acre holding in the midst of spectacular Misty Fjords National Monument, United States Borax & Chemical Corporation is preparing to drill into the largest known deposit of molybdenum in the world. Borax manager Don Finney outlined the staggering logistics of the task.

"We're satisfied we can develop a mine two miles long and averaging a thousand feet in depth without disturbing two million acres of surrounding wilderness, including



DAN DRY (LEFT); WILLIAM THOMPSON

***Like a microcosm** of Alaska as a whole, Sitka (**left**) has been a center for fur trading, fishing and fish packing, the timber industry, mining, military and government facilities, and tourism. Capital of Russian America and the first capital of U. S.-owned Alaska, the town still holds a legacy of its Russian founders: In St. Michael's Orthodox Cathedral (**above**), Russian-born Bishop Gregory administers Communion to a young member of the mostly Tlingit congregation. First built by the Russians, the cathedral was rebuilt after a fire in 1966.*

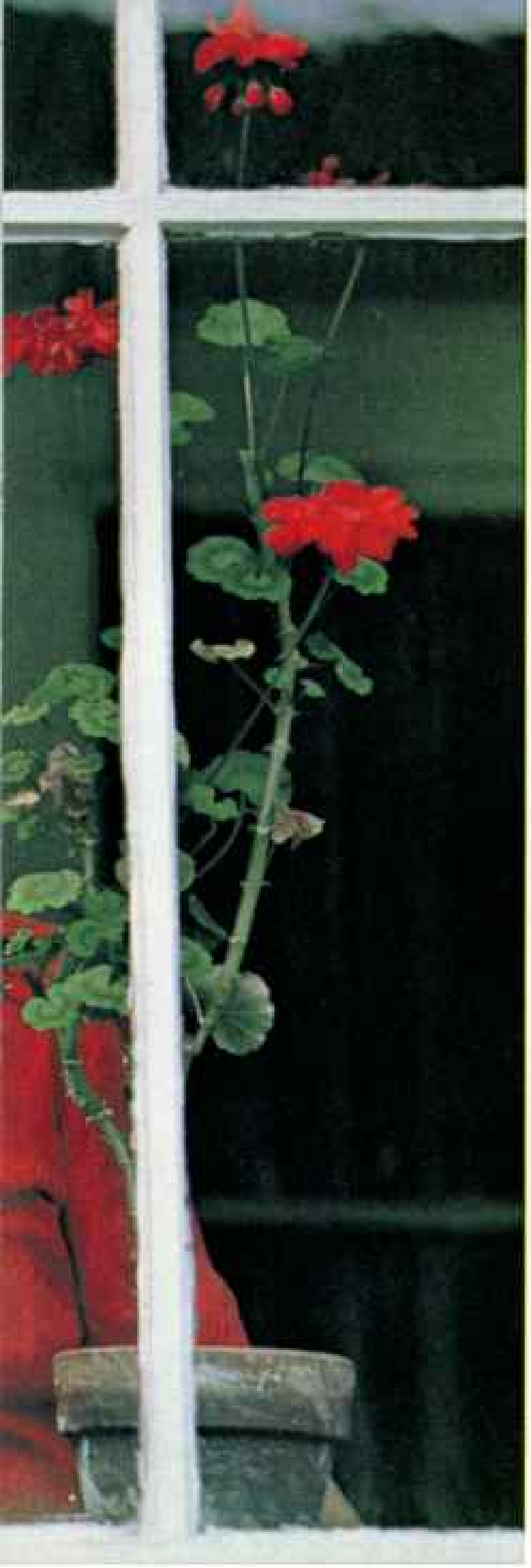
salmon spawning streams on either side of us." Borax proposes to dispose of the tailings from the massive project through a six-mile tunnel into the bottom of one of the monument's fjords. What's more, to support the project the company plans to build housing for 400 workers in the middle of the wilderness. The payoff to Borax if it carries out the job—molybdenum worth billions of dollars on today's market, with prices expected to soar.

Some doubt it can be done without causing irreparable harm. Environmentalists have mounted a legal offensive in the courts, so far without success. "Come back and see in a few years," says Mr. Finney. "You'll be amazed."

DON FINNEY'S BOAST—and his promise—set me thinking. Even in supremely self-confident Alaska, can men hope to outdo nature? The benchmark for this test may be a far more violent upheaval that rocked a distant corner of Southeast on a calm July evening in 1958.

At precisely 10:16 that night a fault line split Lituya Bay, on the wild and remote outer coast, sending 90 million tons of rock hurtling off a mountain face at the rear of the inlet. The water surge stripped rock bare to

Native sourdough, *retired railroad man George Rapuzzi (**above**)—with wife Edna, who came from Minnesota to teach school—was born to Italian immigrant parents in Skagway in 1899. During the winter before, thousands of gold-struck prospectors, some grubstaked by George's storekeeper father, flooded into Skagway and headed for the Chilkoot Pass on the trail to the Klondike. An 1898 photograph shows climbers on the final, most brutal incline to the pass (**top right**). Some never reached it, victims of avalanche or cold.*



DAVID ALAN HARVEY (LEFT); NATIONAL FILM BOARD OF CANADA (ABOVE); WILLIAM THOMPSON

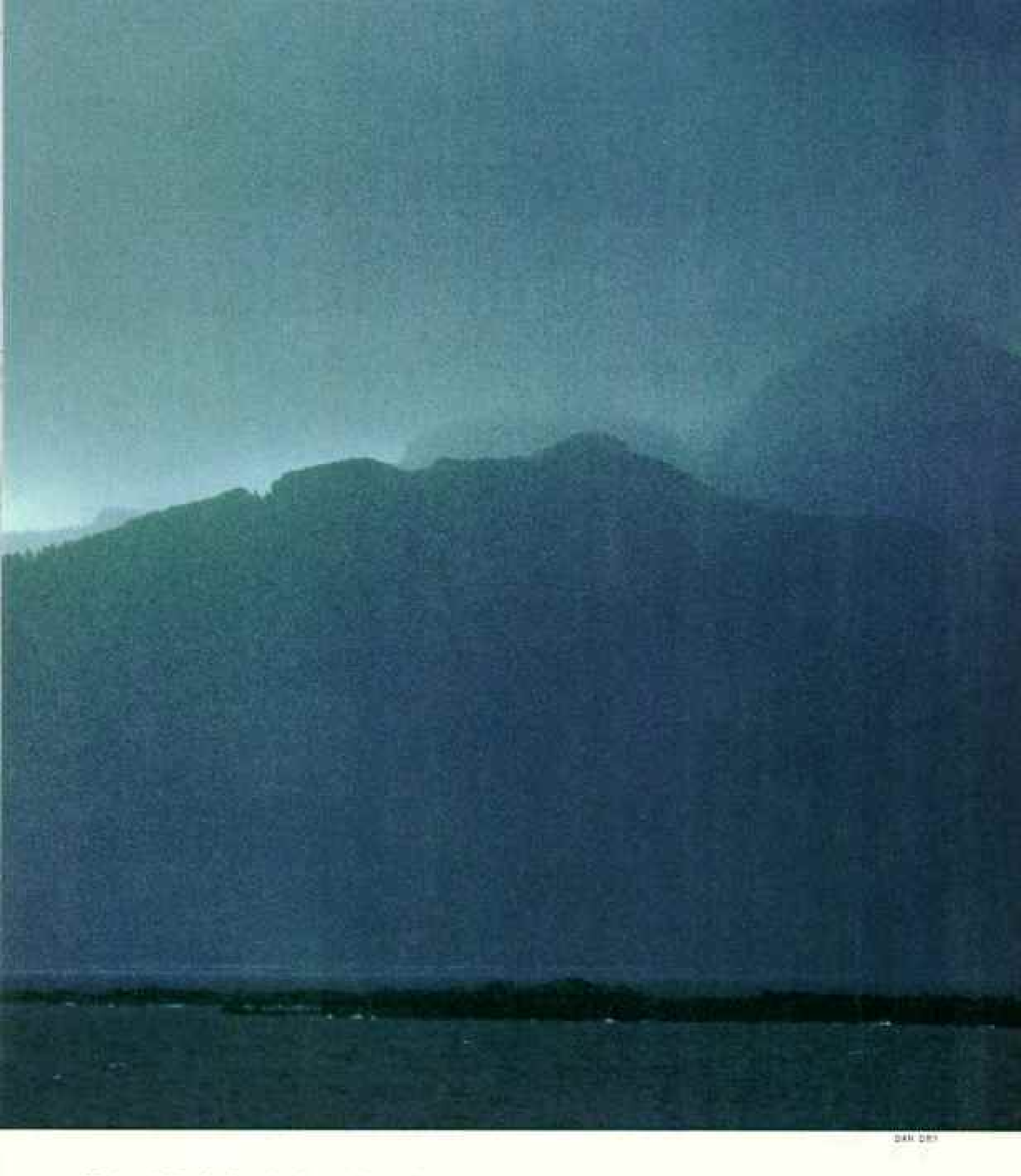
*Near the same spot mountaineer Peter Arneil (**right**) meets gale winds and near-zero temperatures on a winter trip in 1983. Avalanche conditions turned him back. "A hundred years ago or today," he says, "Alaska faces you with the same obstacles."*

Lifeline to the region's *scattered settlements, a floatplane descends under a curtain of clouds and rain near Gravina Island.*

"When the weather gets nasty," says pilot Terry Wills, a 21-year veteran of Southeast Alaska's unpredictable skies, "you better park the airplane and wait." The number of aircraft accidents in the region proves his point.

a height of 1,700 feet, sending a towering wave rocketing *into* the North Pacific at a hundred miles an hour. Scientists who raced to view the devastation found timber floating five miles out to sea. Miraculously, the crews of two of three fishing boats anchored in the bay survived.

Twenty-five years later, the captain of one of those fortunate boats waved as we passed, heading north into the bay on the



National Park Service boat *Drumlin II*. A raft of barking sea lions welcomed us at the bay's narrow mouth. Scoters flashed in the sun. And when the sun went down, the snow-covered peaks of the Fairweather Range, capped by 15,300-foot Fairweather itself, cut a ragged outline against a purple sky. Nature heals, though the scars remain in the naked rock and stunted trees that mark the monstrous wave's path.

Tlingit legend calls the creature who guards the bay Kah Lituya, and it says he is a jealous caretaker. When outsiders intrude, he shakes the water's surface, throwing up giant waves to swamp his enemies. At peace on the bay, I searched for signs of Kah Lituya before turning in. The night passed uneventfully. Perhaps he doesn't exist, or has turned his attention elsewhere.

May Southeast never find out. □

ALASKA'S SOUTHEAST

An Incredible Feasting of Whales

PHOTOGRAPHIC ESSAY BY AL GIDDINGS
OCEAN IMAGES, INC.

ROSEMARY CHRISTIAN, OCEAN IMAGES, INC. (RIGHT)

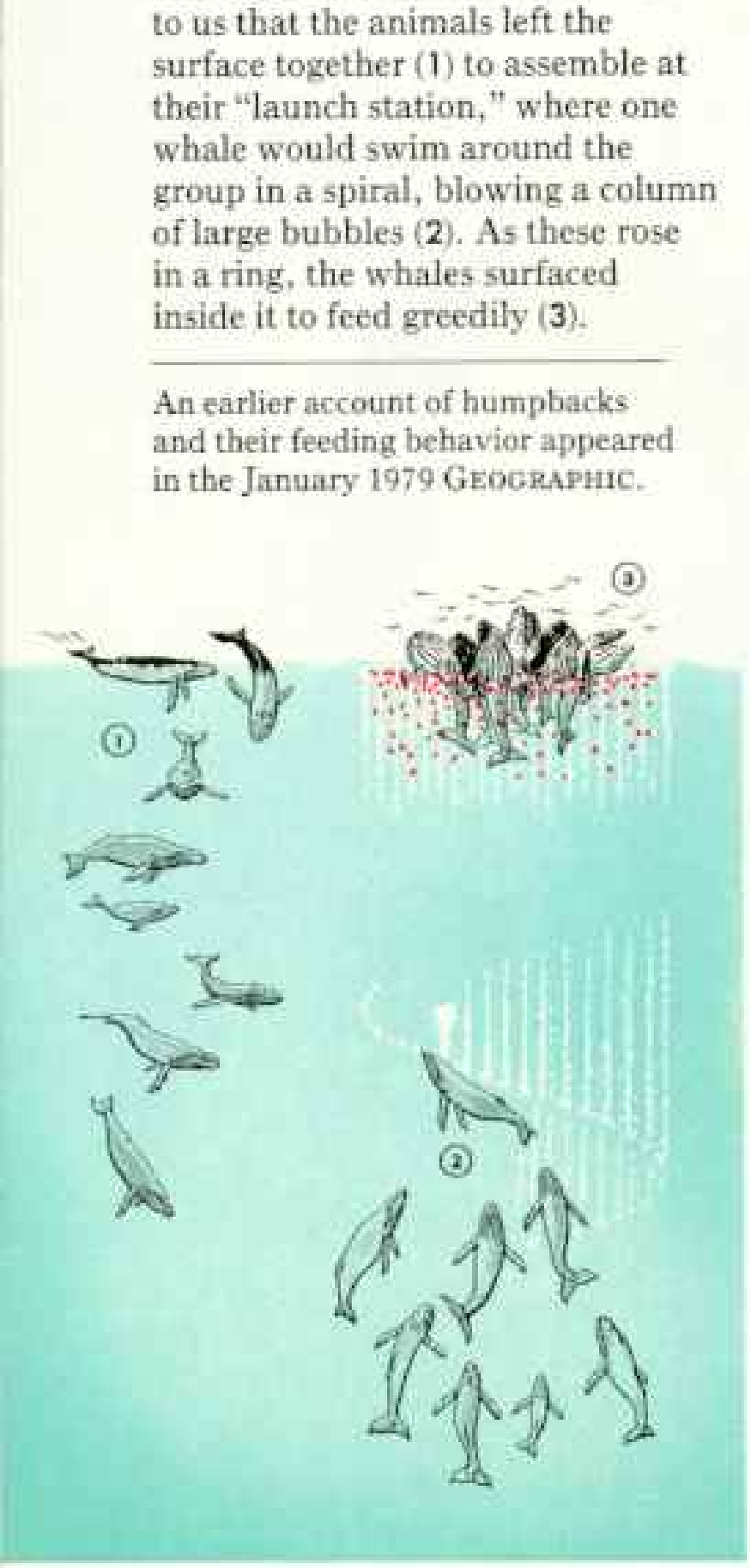
WITHOUT WARNING, a 40-ton waterfall hurtles from Frederick Sound off Alaska's Admiralty Island as a humpback whale breaches (***facing page***). For three days my film crew and I, with observers Cynthia D'Vincent and Russell Nilson on their research vessel, *Varua*, had front-row seats as eight humpbacks displayed astonishing behavior while feeding on a rich pasture of krill nourished by upwelling currents.

Hour after hour the eight remained together, repeatedly performing a ballet-like maneuver that looked to us like a means of cooperative feeding. We learned to take our cue from a hissing sound—as if from a great frying pan—made by krill and herring at the surface. When that hissing suddenly ceased, we tensed and tried to decide where to aim our cameras. A few seconds later came a thunderous roar as eight whales in circular formation, mouths agape, lunged for the sky. Following such a display, one whale (***above***), dubbed Jabba for a grotesque *Star Wars* character, sinks back to strain krill from its bulbously distended throat.

CAVERNOUS MAW spans 13 feet while gulping krill and water, to be filtered by baleen growing from the bony pink roof of the mouth. Herring, seen flying amid the spray, are also devoured by the whales.

We witnessed another technique, called bubble netting (***below***), possibly used by the humpbacks to concentrate krill into bigger mouthfuls. It seemed to us that the animals left the surface together (1) to assemble at their "launch station," where one whale would swim around the group in a spiral, blowing a column of large bubbles (2). As these rose in a ring, the whales surfaced inside it to feed greedily (3).

An earlier account of humpbacks and their feeding behavior appeared in the January 1979 GEOGRAPHIC.



DECEIVINGLY TENTATIVE, the sole juvenile in the group seems to display the limit of its breaching ability (***left***). In fact, when so motivated, both calves and adults are able to heave themselves clear of the water.

Demonstrating diagonal "lunge feeding," two humpbacks (***below***) sweep their jaws back and forth to trap organisms. Special elastic ligaments allow the whales' lower jaws to accommodate such super-wide-angle bites.

Amid the excitement none of us are completely sure of all we saw. Consider the frenzied writhings of this great food chain: Whales eat krill. Herring eat krill. Whales eat herring. Harbor and Dall's porpoises, as well as Steller's sea lions, patrol these waters that literally boil with fish, keeping underwater visibility virtually nil.

Were our whales cooperating in their feeding? At times we feel certain that they were. But Bill Dolphin, who has studied these same waters for five years while working for his doctorate from Boston University on the feeding behavior of humpbacks, has some reservations.

"What a lot of people have called cooperative feeding may actually be highly competitive," he believes. "Usually there is one great big ball of food, and each whale is out for itself. Now, I've seen pairs or trios work together with bubble nets, but I've never been lucky enough to see eight of them do so."

Dolphin has seen two humpbacks construct a net, only to be raided by two others that surface inside it. "Usually you get some very loud vocalizations and blows at the surface," he says.

I thought of several occasions when our group had surfaced very raggedly, with much snorting and wheezing. Rather than competition, it sure sounded to me like mutual reprimands: "Get back in line!" □

SPAIN'S COUNTRY WITHIN A COUNTRY

Catalonia

By RANDALL PEFFER

Photographs by
STEPHANIE MAZE

"PAPA, don't tell me the world knows anything about Catalonia and our struggles," shouted the shaggy-haired Barcelona teenager across the table from me.

"Then the world has its head in the sand," spat his father. "People should know we're having the sweetest liberation in Spain!"

Strong dinner conversation, but not unusual for Catalans today. Mariano and his son Jordi were arguing about the rebirth of their country, Catalonia, as an autonomous region within the Spanish democracy that began under King Juan Carlos in 1979. Ever since Catalans were deprived of their centuries-long autonomy by Philip V of Spain in 1714, they have fought to regain it, cherishing the Catalan language as a unifying force. Today a vigorous flowering characterizes the changes coming to the six million people who live in this Maryland-size border territory, where Mediterranean Spain grafts to France (map, page 101).

During rounds of olives, mussels, squid, and wine in my friends' apartment, I learned that Catalonia had begun to reassert its identity after nearly 40 years of repression under the *(Continued on page 100)*

Explosive cheer *of "Barça" urges the Barcelona soccer team to victory over a Madrid rival and voices all the pent-up pride of Catalonia, an autonomous region of Spain. Under the dictatorship of Franco, Catalans were forbidden to fly their red-and-yellow flag, but soccer was encouraged, and the red-and-blue flag of Barça came to stand for defiance.*

Congested as Coney Island, *the Costa Brava—"rugged coast"—teems every July and August with British, Germans, French, and Dutch, who come to sun by*

day and disco by night. Lloret de Mar and other fishing villages developed into resorts after the Franco government encouraged tourism in the 1950s.

Hidden high in the Pyrenees, *Valle de Aran became accessible in 1948 when a tunnel opened it to the rest of Spain. Visitors soon discovered the pleasant*

summers and winter's deep-powder skiing. But villagers, who speak a dialect along with Catalan, French, and Spanish, still think of themselves as Araneses.

late dictator Francisco Franco. I felt the family's bitterness as they recalled how the dictator had outlawed the Catalan tongue and folk traditions, intent on destroying the strong regionalism that has always divided Spain. I sensed their pride in their new autonomy, which, like Quebec's in Canada, has given them the right to use Catalan as their official language. It has also restored their 800-year-old governing body, the Generalitat, to rule in regional matters of trade, primary education, industry, and housing.

But the reemergence of Catalonia had pitted father and son in fierce debate. They grew agitated when Mariano talked about the changes he saw in his job at a local automobile factory. After years of control by the Franco government, the workers and managers had lost their pride and ambition; now the company faced huge deficits and the firing of thousands of men.

"But at last," asserted Mariano, "things have begun a turn for the better. Workers and managers are receiving incentives for doing better work. This is a more Catalan approach to industry. We believe strongly in hard work and just rewards."

"Garbage," Jordi shot back. "You'll die waiting for that kind of justice."

And so it went—revolutionary youth versus evolutionary age—until the mother, Roser, served the main course, *canalones*, and said, "Will you two please agree about something." Jordi said, "Mama, at bottom we both agree we aren't sure what's happening to this world." Roser looked at me. "Pardon us," she said. "You have just seen a Catalan ritual: This is how fathers teach their sons' minds to grow."

A FEW DAYS after my visit with the family I climbed along the edge of limestone cliffs 900 meters (3,000 feet) above the rolling hills west of Barcelona. I had come to see the mountain called Montserrat and its monastery (pages 110-111). "Start up there," a Catalan friend had told me; he explained that Montserrat was the soul of Catalonia. To know this country, I must climb Montserrat.

The mountain rises like a lone ship sailing through the middle of Catalonia. I looked out on vineyards and olive trees blanketing the hills of Tarragona Province, orchards spreading across the plains of Lérida, and evergreen forests reaching to the Pyrenees and the French border. Catalonia, a land as big as Holland, today comprising four Spanish provinces, looked nothing like the more familiar red-earthed Spain.

As I descended from the heights to the cliffside monastery, darkness settled on the mountain and a shrill wind began piping through the gorges. A dog howled.

Then a voice spoke, and an old man in a parka appeared, looking like one of the Seven Dwarfs. He was Brother Felipe and he would lead me to the basilica, the monastery's shrine of the Black Virgin, and to the abbot. I followed, and gradually the wind and night gave way to the soft glow of candles, the voices of a boys choir, and a dark Madonna robed in gold.

Abruptly Brother Felipe disappeared, and I found myself in the hands of the abbot. Dom Cassià Just looked like a Renaissance painting—stocky, middle-aged, eyes of a fisherman. In his study he asked me to remember the prohibitions against the Catalan language and customs under Generalissimo Franco. He told me the monastery had a thousand-year tradition of serving the Catalan culture, and the repression under Franco had roused the monks' fervor. "A conscience developed about the repression of Catalonia, and Montserrat felt a need to succor the persecuted," said Dom Cassià.

"The monastery's sympathy for Catalans brought about the publication in our magazine, *Serra d'Or*, of writings for all men of Catalan culture, believers or not, who had no periodical in which to express themselves in their own language. The magazine gave birth to articles on Catalan history, literature, art, and traditions, as well as providing a forum in the sixties and seventies for various political points of view."

The abbot led me to a window and pointed to a courtyard below. "Our monastery never intended to be political, but about 12

Author **Randall Peffer**, a teacher at Phillips Academy in Andover, Massachusetts, spent nine months in Barcelona for the School Year Abroad. Free-lance photographer **Stephanie Maze**, a former National Geographic Society translator, has covered Mexican-Americans and Puerto Rico for the magazine.

Catalonia

*LANGUAGE is the soul of Catalonia. Under Generalissimo Francisco Franco, the use of Catalan was suppressed. After the dictator's death in 1975, the government recognized Catalan as co-official with Spanish. A Romance tongue related to Provençal, Catalan is the vernacular in nearby areas (**inset**). Catalonia's domain extended to Greece in the 13th and 14th centuries.*

A trade center since antiquity, Catalonia has been periodically ruled by outsiders including Spain's dominant Castilians, who excluded Barcelona from lucrative New World trade until 1778. But the port always took advantage of its Mediterranean setting.

Since the Spanish Civil War of 1936-39, when the city was a stronghold of anti-Franco Republican forces, the resourceful Catalans have reconstructed their region into one of Spain's leading commercial and industrial hubs.

Slightly larger than Maryland, Catalonia stairsteps from the semi-tropical coast to the plains to the high Pyrenees. Of its six million people, half live in metropolitan Barcelona.

Spain's premier port, *Barcelona vibrates with a liberal, cosmopolitan spirit. Cabdrivers are as likely to argue world politics and opera as soccer. Shoppers*

stroll the bookstalls, cafés, and flower marts that line the Ramblas, foreground, a promenade near the medieval quarter of Barrio Gótico, beyond.

years ago 300 Catalan intellectuals came here asking for a safe place to meet. When word spread to the Franco government that a host of Catalans had come to Montserrat to draw up a manifesto against government repression, the authorities sent troops here. For three days we locked ourselves in the monastery. Things got rough, and there was more than a hint that the soldiers might attack. Finally we negotiated an ending. By then the press was telling all the world about the victimized Catalan patriots."

THE FEVER OF CATALAN independence of course runs high in Catalonia's capital, Barcelona. But my first impression there was of vibrancy rather than of revolution. With three million people the city seemed a swelling blend of maritime Venice, cosmopolitan Paris, and commercial Amsterdam. Its location fronting the sea and ringed by sharp hills added a dramatic touch.

Files of new buildings rose along the central arteries. Nearby, the surreal parks and buildings of 19th-century architect Antoni Gaudí defied conventional city styles. But for me the heart of Barcelona was my barrio's Plaza Molina with its tightly pressed old town houses, balconied apartment buildings, narrow streets, orange trees, and intimate squares. The plaza's most prominent character was Jaume Roma. At 72 he looked like an aged Humphrey Bogart, and almost every day he stood watch over the barrio's central intersection in the doorway of his wineshop. Rarely could I pass Jaume's corner without being snared for a chat.

So there we would stand, Jaume pressing the shoulders of his maroon sweater against the doorjamb, sucking on a black cigarette, plying me with mineral water, fruit juice, or wine. Jaume invested in several periodicals every morning, and he always had a favorite article to show me.

"Look at this craziness," he often began, slapping the paper with the back of his hand. "Look what the big shots have done now!" A big shot to Jaume seemed to be anyone who was not Catalan. He complained about Soviet big shots, American big shots, and—frequently—Spanish big shots; but when it came to Catalans . . . well, they were the "potatoes of the world."

***Sand-castle architecture** has symbolized Barcelona for a hundred years since architect Antoni Gaudí designed the Church of La Sagrada Familia, still without a roof (**facing page**). Spires suggest Catalonia's mountains; a reflecting pool, the seacoast. Biblical figures were modeled after workmen. Public donations support the few workers (**below**) remaining on a job that could take another century. Catalans always smile on the avant-garde, from Joan Miró to onetime resident Pablo Picasso.*

A book and a rose, *symbols of St. George, are presented to loved ones* ***(left)*** *on April 23, feast day of Catalonia's patron saint. All Barcelona turns out for the celebration that coincides with the opening of the book-publishing season.*

"Queen Esther" ***(right)****, featuring a car whose interior is strangely misted with water, welcomes visitors to the Teatro Museo Dalí in Figueras, birthplace of the 80-year-old surrealistic painter Salvador Dalí. Filled with irreverent stage settings, sketches, and paintings, the building is one of the most visited museums in Spain.*

He explained what he meant by this phrase: "One of these days all these big shots with the wars and inflation they are causing are going to drive each other to the bottom of the sea. Who is going to be left in the Western world? The Catalans. We're like potatoes simply sitting here in this rich earth, not bothering anybody, taking care of business. Ask Señora Lourdes up at the paper store if you don't believe me. She's got *seny*."

I went to see the señora, not to confirm Jaume's potato theory, but to ask her the meaning of seny.

She led me to a pair of chairs in the corner of her tiny shop, saying, "Life can be too busy. Sit, let's relax and talk. Now how can I help?" With these words and her deep steady eyes, this 54-year-old woman raised a barrier between us and urban Barcelona. "Seny is a Catalan word. It describes a trait usual in Catalans. When persons have seny, they are proper; they know what they want, have good sense; some people think they are driven." Señora Lourdes guessed people thought she had seny.

Hardly a week passed for me without a talk with Señora Lourdes about Catalonia, but one day when we were talking about the Catalan language she demurred. It was her mother tongue, she said, but there were others in the barrio who knew more about it.

"Oh, mother of mercy," said a woman customer who was listening, "especially Brossa. That Joan Brossa is always publishing poems in Catalan. You know he lives like a grasshopper, writing in some little nest on a roof around here. Doesn't seem to worry what happens to his body; he only cares about his poetry and his Catalan. People in the barrio take care of him."

My neighbors often referred to the gaunt, gray-haired freethinker as "our poet," as if a radical poet was as normal a part of a Barcelona neighborhood as the butcher and the flower lady. I found him working and holding court in his "atico" room, clogged with volumes and dust.

He explained that Catalan is a distinctive Romance language also spoken in the Balearic Islands and Valencia, as well as in a few places in Sardinia and southern France. He recited in some detail the thousand-year history of proud and thoughtful Catalan literature. He cursed those who called Catalan a dialect of French or Spanish, though there are French, Spanish, Italian, and German sounds in his language. He laughed when a friend of ours said that the only way to describe a Catalan speaker to a foreigner is to ask him to think of someone playing a twangy Jew's harp.

From a poet's point of view, Brossa said,

"Catalan is a marvelous language because it has the ability to grow hard or smooth, with a musicality of many shades in contrast to the church-bell sonority of Spanish. Language is the basic characteristic of Catalonia's personality and the personality of its people. Without my language I have no culture, and culture is the best weapon man has against oppression.

"Generalissimo Franco and his fascists knew this well. They tried to steal our language from us, but they failed. Now I think the worst moments for us have passed. It is Franco who is dead, and not Catalonia."

WITHIN MY BARRIO I quickly discovered that, while most citizens of Catalonia felt Brossa's pride in his country, not everyone shared the poet's enthusiasm for his language. As a Peruvian-born resident of my apartment building said, "You know, almost 40 percent of Catalonia's population was not born here, and we did not grow up with the Catalan language. Until the autonomy began, you could live here and do business in Spanish.

"Now, with this renaissance of Catalan, we foreign-born have problems. If Catalonia does not outgrow its unfortunate prejudice against the Spanish language, I think everyone here will have to learn Catalan or become a second-class citizen. How annoying; after all Catalonia is still part of Spain."

True. But for me lessons in the Catalan language and culture were rarely disagreeable. The Catalan expression *molt bona* now rolls off my tongue, but I never say it without tasting apples and remembering how I learned the phrase. Harvest season spread over the Lérida plains in western Catalonia. Mist clung to the apple trees as I walked on an orchard trek with Montserrat Gispert, a 23-year-old lawyer who was promoting Catalonia's agriculture business. A bumblebee circled her slender face, touched down on her shoulder, then hovered close to the dark curls by her ear. She made no motion to shoo it away. I saw that despite her fashionable clothes Montse Gispert remained a Catalan country girl, and, no doubt, she had often been mistaken for a rose.

"I love this land," she told me. "There is a ripeness here I cannot find anywhere else.

"We are a nation," *expressed in a toast or a political banner, describes the sense of identity that stirs Catalans. In 1980, for the first time in 48 years, citizens were permitted to elect representatives to their governing body, the Generalitat. Its president, former banker Jordi Pujol (**above**, right), recognizes "the new obsession with democratic processes." That thrust is seen in Barcelona (**right**), where diverse political parties demonstrate uncensored on September 11, the anniversary of Catalonia's loss of autonomy to Castile in 1714.*


NACIONALISTA
SOM UNA NACIÓ

The heart of Catalonia, *many believe, lies in the monastery of Montserrat* ***(right)****, tucked high in rocky bastions 40 kilometers from Barcelona. For at least a thousand years Benedictine monks, like the brother studying in a library* ***(below)****, have occupied the site. The monastery is famed for its shrine to the Black Virgin, its boys choir, and its music school. Defying the Franco ban against using Catalan, the monks issued a "religious" magazine on Catalan culture. More recently they have published and sold more than 200,000 Catalan Bibles.*

So important is Montserrat to Catalans that many baby girls are named after the place. And pilgrims and tourists come by the thousands to pray and explore the mountain that Pope Pius XII said appeared to point "the way to heaven . . . like the incarnation of an exalted spirit."


QUITA

Catalonia is like this apple." She picked one from a cart in the orchard, polished it on her blouse and passed it to me. I tasted it. *"¿Molt bona?"* she asked. I guessed at her meaning, *"¡Sí . . . sí, molt bona,* very good!"

Montse led me on a tour of canneries and cooperatives that showed off technical innovations and elaborate marketing programs for fruits, juices, and chickens. By early afternoon she said, "OK, enough propaganda. I'm thirsty. Let's go to the brewery."

There we relaxed in a company suite well-stocked with almonds and cold beer. When I wondered aloud whether this kind of socializing in midday might not get everyone fired, the Catalans laughed. "You are making a joke," teased Montse. She insinuated that Catalans would risk excommunication before giving up beer and their afternoon siesta break.

Eventually we did get back on the propaganda trail—in a slaughterhouse. Despite her country-girl roots, Montse had never witnessed the rendering of thousands of hogs into market delicacies. There was a moment in the presence of the assembly-line deaths when my guide looked ready to faint, but then she began talking to herself in Catalan. *"¡Força,* Montse, *força!*—strength, Montse, strength!" she repeated. Then, abruptly, she threw back her shoulders and pushed hanging sides of pork out of her path. "Come on," she called back to me. "Look at this: Catalonia bleeds too."

MONTSE WAS RIGHT. Native Catalans—descendants of a succession of invading Greeks, Carthaginians, Romans, and Visigoths—have often been caught in bloody conflicts. In the eighth century came the Moors' attempt to dominate the Catalans. Then during the late Middle Ages the counts of Catalonia expanded their mercantile and military empire into Provence, Valencia, Sardinia, Sicily, and Greece.

The tide began to turn against Catalonia in 1469 when Isabella of Castile married Ferdinand of Aragon and Catalonia. Gradually the Catalan nation slipped under the control of Spanish monarchs from the Habsburg and Bourbon Dynasties. The land lost its last vestiges of independence when King Philip V of Spain, grandson of Louis XIV of France, vanquished the Catalan forces in 1714.

For two centuries the Catalans chafed under autocratic kings and military leaders. In 1931 a short-lived republic provided fleeting autonomy; four years later Catalonia experienced its bloodiest epoch—the Spanish Civil War. Barcelona stood as a stronghold of the Republican forces opposing Franco's Nationalists. The proletariat militias directed from there murdered hundreds of capitalists and clergy. Before Franco defeated the Republicans, thousands of Catalans died in the war. Thousands more were executed after Barcelona fell.

CATALANS have not forgotten these old wounds. Even today, with Catalonia's clearly defined autonomy within Spain, Catalans frequently dispute whether their relationship with Spain is viable.

One day at lunch with two young friends from my barrio, Francesc and Rafin, the conversation veered to politics.

"This claim by some people that Catalonia should be a nation independent of Spain goes too far," said Rafin as crimson began rising on his fair features. "We have been a part of Spain since the days of Columbus."

"No. We have been oppressed people," retorted Francesc, thrusting out his bearded jaw like a Cuban freedom fighter, "victims of the absolute rulers in Madrid."

"So were all the regions of Spain," answered Rafin, "but for better or worse our modern history is Spain's."

"Not by choice," growled Francesc. "Catalonia is a nation. We have a language and culture different from Castile, Andalusia, and the other parts of the Iberian Peninsula. Look, we have never given up the idea that

Walking out of the Middle Ages, *hooded penitents—nazarenos—tread the ancient streets of Tarragona during Holy Week, a procession common throughout Spain. Base of the Roman conquest of the peninsula, the city enacts its traditions against a backdrop of burgeoning industries that enrich Catalan coffers.*


BINGO
CENTRE
FRATERNAL
4
ORQUESTA

The social hour *may last all day for these men of Palafrugell* ***(above)****, some of them retired, others unemployed, most veterans of the 1936-39 civil war that erased the lives of a half million Spaniards. The toll was steep in Catalonia, which resisted Franco until the end.*

In good weather women of the village of Rialp ***(left)*** *bring knitting and crocheting outdoors. Many parents in the countryside have seen their children leave for city lights and jobs. The young people join workers from elsewhere in Spain who have poured into Barcelona throughout this century, seeking a piece of the prosperous life. But city dwellers still flock to the country for weekends.*

someday Catalonia might escape the control of Madrid. Ten years ago if someone told me that we were arming to free Catalonia from Franco, I would have joined."

"So would I," Rafin proclaimed. "But that was before we had the democracy and autonomy. Now who can we blame for our problems—like 12 percent inflation and 22 percent unemployment?"

"The terrible truth," muttered Francesc. "Life is always strenuous for Catalans. We never seem able to recapture the glory of the Middle Ages and the Catalan empire, but we are always trying."

PERHAPS, in trying, the Catalans will capture the power, if not the glory, of the modern world. Javier Fuentes, the young managing director of the Quimigranel Corporation, a chemical concern, sent me to take a good look at the port of Tarragona, 80 kilometers (50 miles) south of Barcelona. A towering Roman aqueduct, cyclopean walls, and a ruined amphitheater recall the days before Jesus when Tarragona was one of the richest seaports in the Roman Empire. A great tower still guards the walled old city, and, inside, Gothic and Romanesque buildings fight for space. By contrast the harbor presents the fuming face of a Newark, New Jersey, with oil tankers pumping their crude to refineries and chemical factories that stretch into the industrial haze.

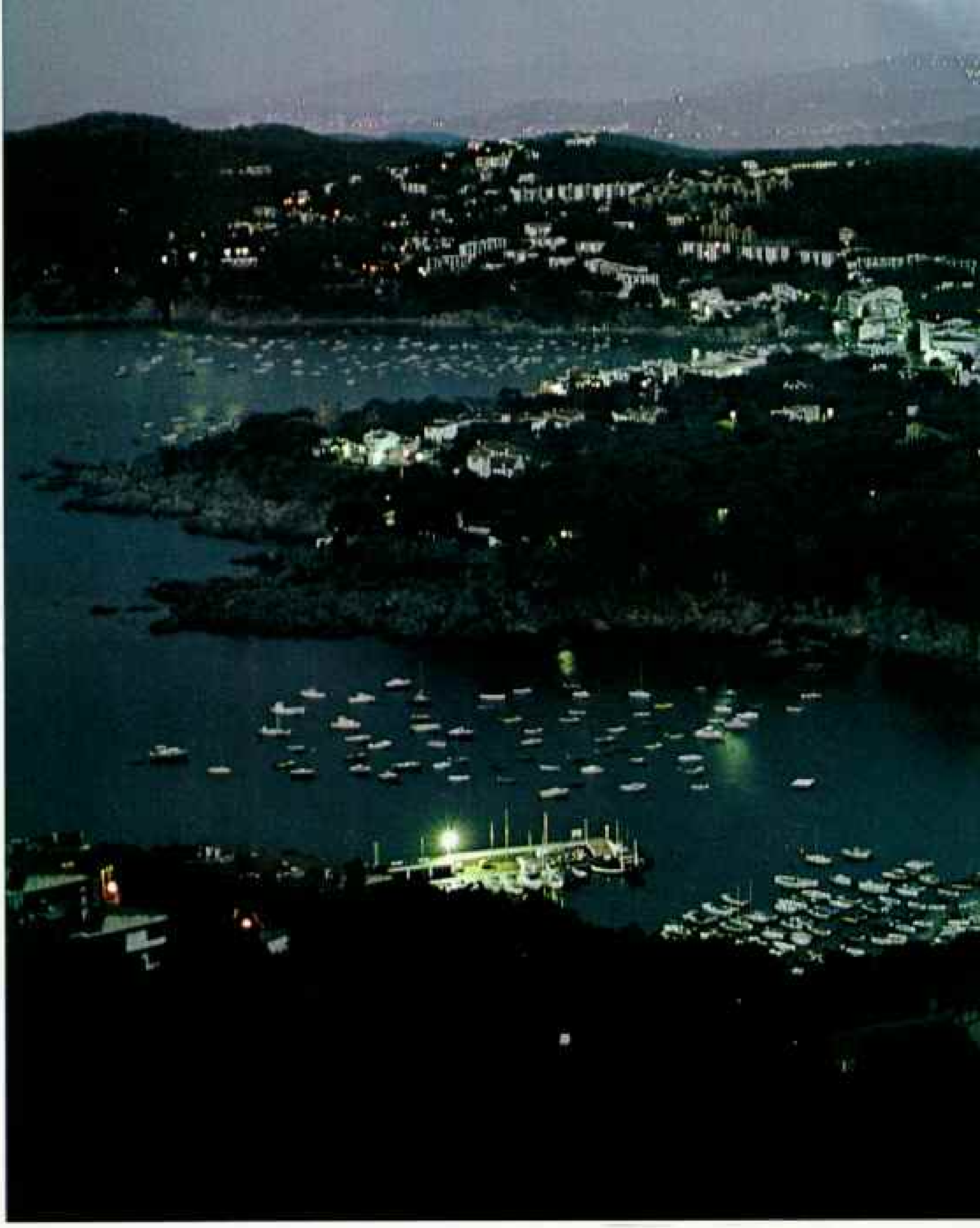
"Chemicals have made Tarragona a boomtown again," Fuentes boasted. "It's a place that is beginning to throb with international competition. Recently chemicals have been the fastest growing sector of the Catalan economy. Can you imagine what Tarragona is going to be like once Spain dismantles its protective import tariffs and we really begin fighting the Germans and Dutch for Common Market dollars? Soon you won't recognize this place."

In the café-bars around my barrio, where neighbors customarily stopped for refreshment after quitting work at 8 p.m., I heard people talking about art the way Fuentes talked about chemicals, the way Texans talk about oil—as if it were one of the region's specialties.

The most world renowned of Barcelona's painters, Antoni Tàpies, lived within a few

Rite of family, *sharing the evening meal, keeps generations close in Viella. Pyrenees guide Rosendo Caubet serves vin cau, a hot after-dinner drink steeped*

with apples, figs, raisins, and peaches, to his nephew Hilario Ramos at the home of Rosendo's sister Lucía, upper left. Wives and grandchildren wait their turn.



blocks of my apartment, and when I went to see him, an owlish man of 60 entrenched behind huge glasses, he told me how much his work owes to Catalonia.

"Though my art represents my interior feelings, the images, modified by imagination, are from Catalonia. They come from the trees and rocks of the mountains north of Barcelona. That Scandinavian-like landscape reminds me of the Catalan people. Maybe Catalans like my painting because they see themselves portrayed here, or maybe, like me, they simply have a special feeling for mountains."

Clearly, Catalans have a special attraction to mountains. I discovered this one winter weekend a hundred kilometers (60 miles) north of Barcelona in the Pyrenees when I

visited La Molina, the oldest ski resort in Spain, with a peak rising 2,537 meters (8,320 feet). The train ride, through vistas worthy of the Alps, was noisy with teenagers plucking guitars and singing.

I skied with Joan Calix, a Barcelona paper salesman who moonlights as a ski instructor. Joan took me up to 2,300 meters and showed me snowfields where we broke

***Peaceful invaders** of the Costa Brava come for beauty rather than battle. Here on the outskirts of Pulafrugell they find welcome in modern apartments and resort hotels or old farmhouses converted to guesthouses and cafés. The lure of antiquity draws them to the ruins of a Greek colony at Ampurias and castles set to guard against more warlike visitors.*

our own trails. "I'd come here just for the view," he said, pointing out France, the Cerdaña region, and the distant Costa Brava. "A few moments up here makes Barcelona traffic tolerable for another week."

Later Joan bantered with friends crowded around a table in a café, as we banqueted on rounds of fresh bread smeared with tomatoes, olive oil, and garlic.

"We have the most wonderful country in the world," he said. "Where did Columbus come after discovering America? Barcelona. Who was the first governor of California? Gaspar de Portolá, a Catalan. Where was God when he invented the ski? On this mountain—1909 was the year!" Someone might have tried to debate this last, but no one bothered. They could not have won.

IN ALL MY TRAVELS I noticed people's strong devotion to Catalan folk music, yet I really did not understand the "folk phenomenon" in Catalonia. "I cannot explain it to you," said my ever thoughtful friend, teacher Jordi Vilá. "You must come to a concert and see."

Off we went. This concert marked an emotional fiesta for Catalans: Their beloved protest singer Lluis Llach had returned from seclusion to lend his voice to a celebration of Catalan patriotism. But at Llach's recital in Barcelona's ornate Palau de la Música, his countrymen drowned him out. During an antifascist song about workers killed by Spain's National Police, people shrieked the chorus line, "Assassins, assassins."

The crowd broke into the Catalan national hymn, "The Reapers," rose, and surged to the strident Catalan words:

Triumphant Catalonia
Will be again bountiful and rich. . . .
Praise the work of the sickle
Defenders of our land.

A chant began to shake the building: "*¡Som una nació!*—We are a nation!"

When I met him later, Llach, a thin young man with a gentle face, said, "The songs are not my songs, but everyone's songs. I would like to think of myself as a revolutionary, but the Catalan pride that explodes at my recitals has little to do with me. If people act proud, they are not proud for me; they are proud for themselves and Catalonia."

Folk music is not the only obsession in Catalonia today. Soccer may exceed it, especially when Futbol Club Barcelona is hot. With more than 100,000 season-ticket holders the team, Barça, is more than big business. As Jordi Vilá told me, "Barça's a religion," and some of its holiest moments come with the contest against its archrival Real Madrid. I saw these teams play, and when Barça scored the decisive goal, a very old lady kissed me on the mouth.

I talked with Charley Rexach, owner of a sports store near my flat, who at 34 had just retired as a Barça star. He defined for me what makes Barça special: "It started with Franco. He tried to obliterate all the regional rivalries in Spain, except in soccer. He promoted soccer as a healthy way for the regions to work out their tensions. But with Barça the dictator miscalculated. Because Catalans had no political parties, no regional government, and no right to use their own language, they threw their cultural pride into Barça. At a Barça match, people could shout in Catalan and sing traditional songs when they could do it nowhere else."

AFTER HALF A YEAR embroiled in the fury of Catalonia, I needed an escape. Apparently my neighbors did too, because my usually lively barrio looked deserted on weekends. "Where is everyone going?" I asked the proprietress of the butcher shop one Friday as she bounded for a suitcase-stuffed car. "*A fora*," she said in Catalan, "out." I gave her a puzzled look. "*Al camp*," she added, "to the country." I understood, almost. "Where?" I called after her. "It doesn't matter."

I took her at her word and began driving toward a distant corner of Catalonia—the Ebro River Delta near Tortosa, south of

Turning hogs into gourmet fare, *Sofia Oriols and Marcos Jubés Casanovas, farmers in the Cerdaña region, stuff sausages beneath the walls of Torre de Riu castle. Catalonia's cuisine is distinctive, offering such delicacies as partridge and baby octopus, wild mushrooms and white endive.*

Rice bowl to Catalonia, *the delta of the Ebro River proves well suited to the water-loving staple of Spanish cookery. Catalonia's bountiful rivers have long*

been harnessed for irrigation and more recently for hydroelectricity to power river-valley industries: textiles, paper, and iron and steel.

From heavy harvest, effervescence. *Women of San Sadurni de Noya bring in the grapes for Codorniu, which claims to be the world's largest producer of sparkling*

Tarragona. Traffic packed the road, and I could see that the lure of finding a quiet place in the sun had set thousands of Catalans on the move. When I stopped in the village of San Carlos de la Rápita, I guessed I had hit land's end. Shipwrecks cluttered the harbor. The town smelled of salt hay and shellfish.

All the action centered on the fish auction—until a helicopter swooped in for a landing. Then I saw beyond the mask of the fishing fleet. On the other side of the harbor sat three oil-rig service vessels, whole fields of drilling supplies, and a squadron of choppers. I began making preparations for leaving this "paradise lost."

But something made me stay: first, just a cup of coffee; then, the spirited dancing of the café waitresses; later, some of the biggest snails I've ever eaten; and, finally, a table of fishermen who passed a wineskin. So it was one of those nights—eating paella and trying to fathom rough-spoken Catalan. I learned two things: Fishing remained the big business here, and the oilmen were welcome.

"That's what we like about San Carlos,"

wine. The family firm's cellars hold 100 million bottles. Only seven in a hundred Catalan workers till the land, this homeward-bound Pyrenees couple among them.

Shell Hispania engineer Ignaat Kluiters told me later. "It is a quiet little town with a deep harbor, well suited as a base for exploration and for servicing our two offshore wells. Since we began looking for oil off the Ebro Delta more than a dozen years ago, we have had a good relationship with San Carlos, and I think it will stay that way. If we drill more wells, the heavy development will be in Tarragona. But for now oil is just a cottage industry in Catalonia. Who knows what the future will bring?"

San Carlos has a lot to recommend it to an oilman or an escapist, but for my taste the ultimate Catalan retreat grows from a lagoon a hundred kilometers north of Barcelona called Aiguablava—"blue water." Here a hotel hangs precariously on a cliff and blends with the houses that surround the fjordlike *cala*. This is the Hotel Aiguablava, and for 43 years it has been one of the centerpieces of the Costa Brava, or "rugged coast," whose jagged shoreline stretches 145 kilometers from Blanes to Port Bou at the French border.

The thriving tourist industry along the

coast, drawing visitors from all Europe, now competes for earnings with the French Riviera. Yet whether in summer, fall, or spring, Aiguablava remains remarkably the same—never crowded, always casual, warmly affectionate.

"It's a homecoming," said hotel owner Xiquet Sabater, hugging me when I returned to Aiguablava for the spring opening. This was a fatherly welcome from a man who reminded me of Fred Astaire, and the welcome harmonized with what Xiquet told me one day as we walked the grounds of the hotel together.

"Everyone here—the guests, the employees, the neighbors—are like family. Great people of the world visit us; you would never know. They are treated like a son, a daughter, a cousin.

"I even relate the growing prestige of our cooking to this family feeling," Xiquet said. "People talk about the *cocina ampurdanesa*, the cuisine of the Ampurdán region of the Costa Brava, as if it was something new. But all these recipes that combine seafood and farm food, like lobster and chicken, in dark almond sauces are ancient Catalan dishes. As such they are a rite of family, love, respect, and culture. They are the feeding of the soul as well as of the body. Christ knew this when He chose to have *La Cena*—the Last Supper—with the disciples."

THERE WAS THE LINK between Catalonia and the spiritual world again. I could not ignore it. On the spring morning when the Catalans celebrate the all-important fiesta of their patron Sant Jordi (St. George) by giving people they love the saint's traditional symbols, a book and a rose, I made my way back to Montserrat.

Walking a mountain path, I tried to make sense of my deepest feelings about the rebirth of Catalonia, but words eluded me. Then a cluster of images hit at once. In a clearing ahead stood a young man and woman. The girl had just picked a wild rose from the flossy grass, and she held it against her lover's face while he read to her from a book in Catalan. Out of the monastery floated chords played on a piano.

My memory triggered. Some lines from Catalan poet Marta Pessarrodona rushed across my mind:

Things I esteem. . . .
The sound of a piano on a Sunday's morning
With the explosion of cold on the grass;
Or the warmth of May's light
And the tenderness of an uncertain spring.

That was the flowering of Catalonia I saw. Musical, spiritual, explosive, at times cold, often warm, natural, bright, tender, and . . . still uncertain. □

***Many arms and all eyes** lend support to a young Catalan scaling a human pyramid—Xiquet de Vals—during a festival in Villafranca del Panadés.*

*Every Sunday before the Barcelona cathedral, Catalans (**below**) join impromptu circles to step out the sardana, the orderly dance they treasure.*

Exploring a Sunken Realm in Australia

By HILLARY HAUSER

Photographs by DAVID DOUBILET

I WAS EXHILARATED beyond anything I have ever known.

My diving companions and I were crossing one of the clear, shallow, freshwater Piccaninnie Ponds in the state of South Australia. Reeds lining a limestone ridge parted with the grace and drama of a stage curtain as we swam through them. Then the bottom dropped. We were staring into an enormous flooded crack in the earth, about 46 meters (150 feet) long and 6 meters (20 feet) wide. An arrow of noon sunlight charged the blue water, illuminating Piccaninnie Chasm almost to its 57-meter depth. The water was so transparent that I seemed to be floating in midair, certain to plummet to the ground.

These are the sensations that lured photographer David Doubilet and me into the freshwater sinkholes of southeast Australia. Water-filled sinkholes occur throughout the world, but none surpass the freshwater clarity and geologic diversity found in this region.

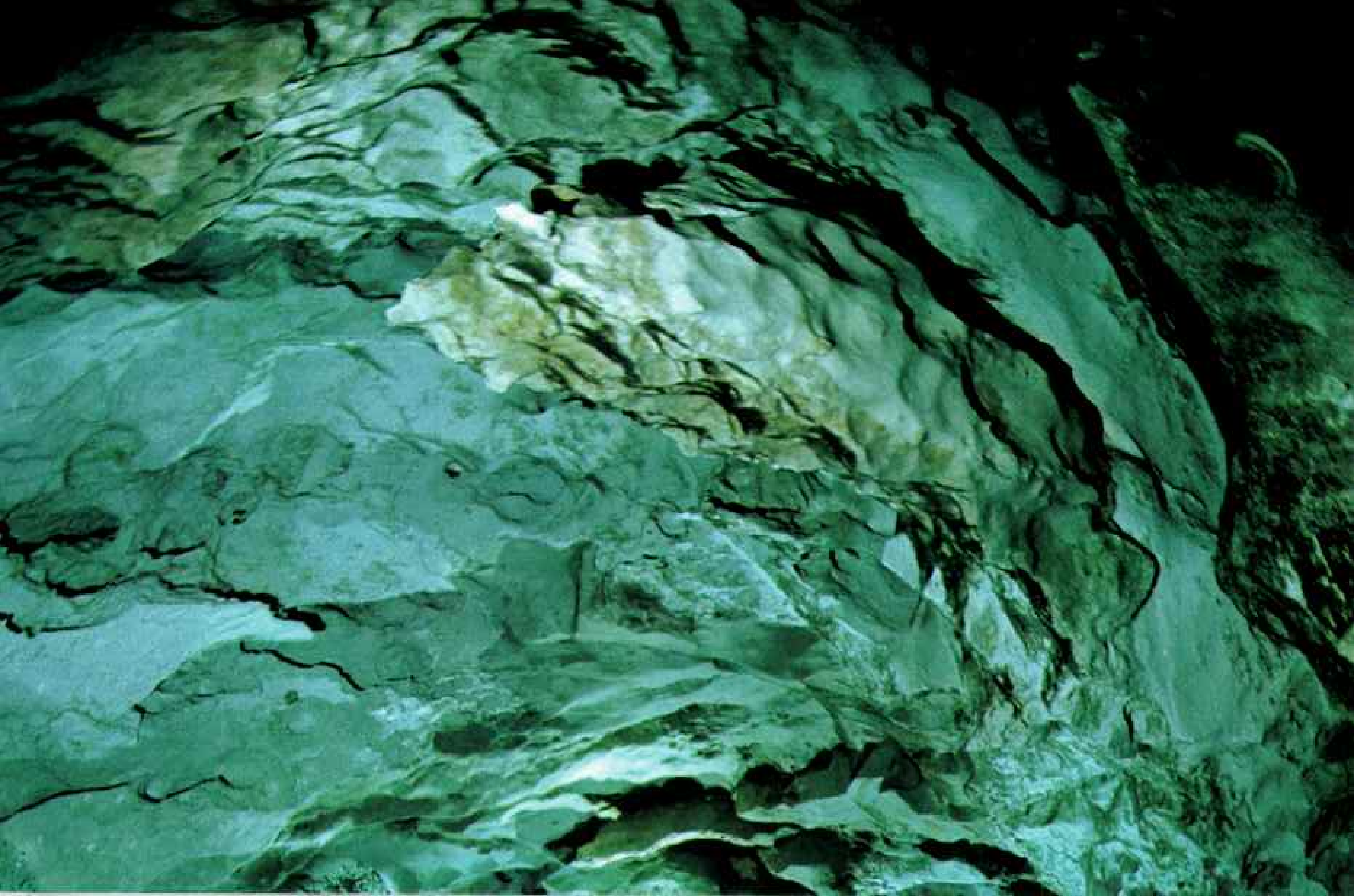
Beneath a quiet landscape given to pastures, pine forests, and herds of sheep and cattle, we entered a breathtaking limestone realm.

When parts of southern Australia were covered by ocean some 10 to 20 million years ago, the remains of sea creatures carpeted the seafloor and were reincarnated as limestone. The land rose, the sea retreated, and another transformation began. Rainwater began filtering into the porous limestone, which slowly dissolved, forming great caverns and filling underground aquifers. If you could cut a slice from this land, it would look like a giant wedge of Swiss cheese.

When the limestone just below the ground surface dissolves, the land collapses and forms shallow ponds like those of Piccaninnie. If the water table has subsided, the hole will be dry. If the limestone has dissolved along a vertical joint, the ground tumbles in and exposes shafts such as the Chasm. All are called sinkholes, an unglamorous name for often glorious creations.

Receiving strong light only at midday, the algae so rich near the surface have all but vanished when Rodney Fox, one of our guides, reaches 18 meters deep in Piccaninnie Chasm (***left***). Swimming to the right, he joins photographer Anne Doubilet, David's wife and assistant, in a massive side chamber called the Cathedral (***overleaf***). Nine strobes here light the normally dark cavern. Drifting in this nearly sunless room, I recalled the words of veteran Australian cave diver Ian Lewis: "The best diving in the clearest cave is like taking a space walk. It's the nearest thing to flying." Another diver amended, "It *is* flying."

Hillary Hauser is the author of several books about skin diving. She now works for California's *Santa Barbara News-Press*. Eminent free-lance underwater photographer **David Doubilet** lives in New York City.



LIKE A GREAT BOOT, the Piccaninnie Ponds stand out as we fly over the marshland protected since 1972 as Piccaninnie Ponds Conservation Park (***above***). Divers enter on the rough road seen at top left and swim from the dock. The Chasm drops where the pond narrows into the long heel. The Cathedral lies at the base of the heel. Another shallow sinkhole forms the foot.

Some 70 sinkholes, many of them dry, surround Mount Gambier, a city of 20,000 people built around a volcanic crater lake.

LOOKS DECEIVE in the world of sinkholes. That is part of their fascination, and their great danger.

Rigging a lifeline is crucial as Anne Doubilet, guide John McCormick, and I (***below,*** left to right) gear up to probe the Pines. Spring Cave is its official name, but pine trees in the commercially farmed Tantanoola Forest Reserve inspire its more popular title. As we stand in this drinking-clean water topped with duckweed, our precautions seem hardly necessary. Yet the Pines is one of the most dangerous of the Mount Gambier sinkholes. A wide chamber opens beneath the limestone rim and plunges 20 meters (66 feet) at a 45-degree angle before sharply narrowing. Only diving lamps break the darkness. I swam close to John as we squeezed into a corridor near the bottom, careful not to kick up disorienting clouds of ground silt.

Eleven divers perished in the region's sinkholes between 1969 and 1974. Three died in a hole, now sealed, near the Pines. Two were lost in dark corners of Piccaninnie Chasm. The state government nearly banned all sinkhole diving. Instead, concerned divers formed the Cave Divers Association of Australia and were given authority to train divers in cave safety. No one lacking its certification can dive in the sinkholes. The rules sadden some older divers who don't want to retrain with the required modern equipment. "We were the original guides," says Phil Potter, who discovered Piccaninnie Chasm in 1962. "Now we can't get in." But the association's work has so far ended cave fatalities.

GENTLE BEAUTIES beckon in Ewens Ponds, a trio of shallow sinkholes west of Piccaninnie that require no cave-diving permits. The largest measures 30 meters (100 feet) wide and 10 meters deep. Mounted policeman Thomas Ewens is said to have tumbled into one while crossing the territory in the 1860s and recovered his dignity by christening the ponds in return.

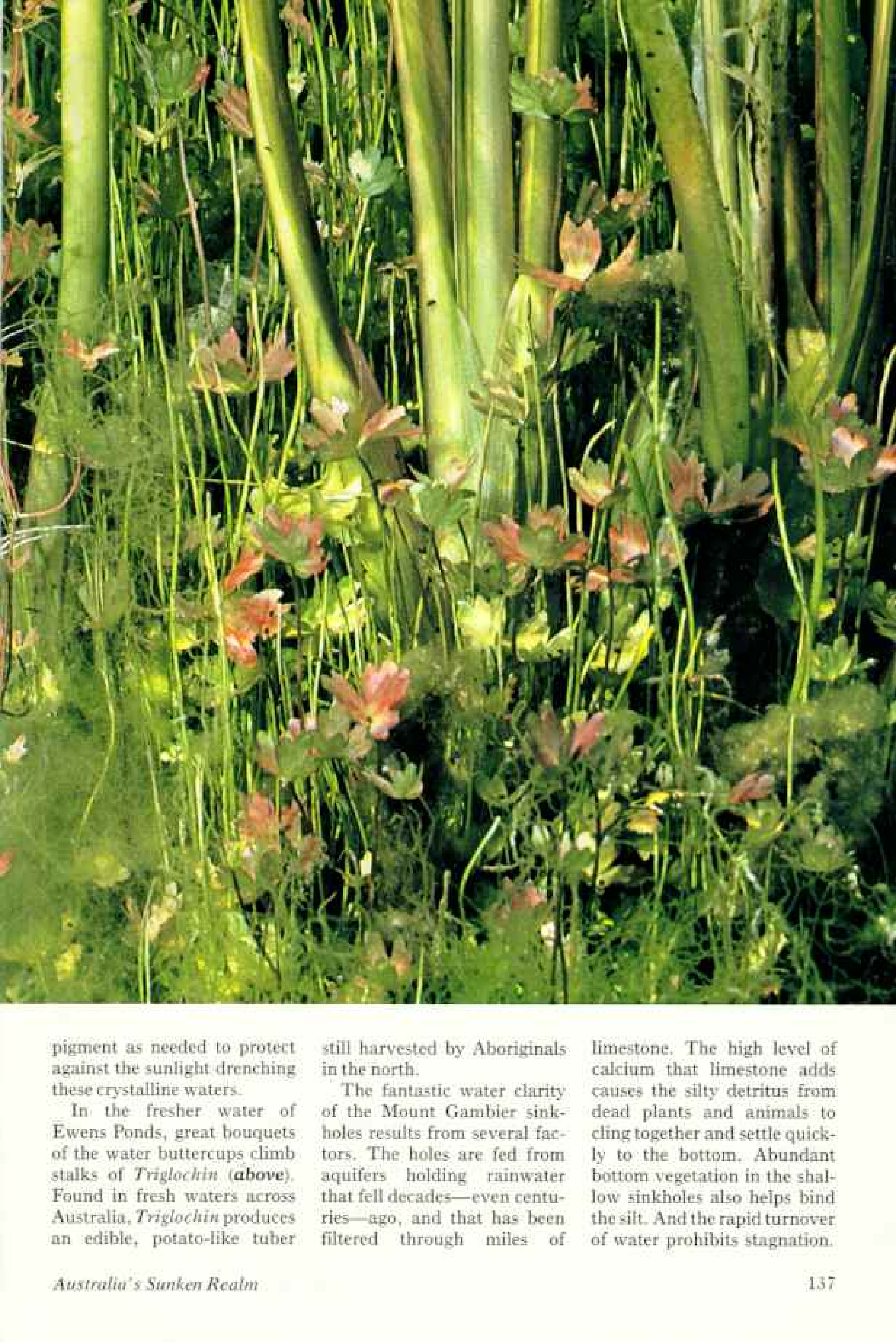
Eight Mile Creek flows south to the sea through the ponds and forms connecting channels called races.

Each day roughly 52 million gallons of water—nearly three times the intake in Piccaninnie Ponds—stream into Ewens from the underlying aquifer. The aquifer fissures are scattered across the pond bottoms, so the water appears calm in spite of this massive influx. But as the water sweeps through the races, 36,000 gallons a minute accelerate into a current Rodney Fox strains to swim against (***right***).

The relentless flow sculptures neat hedgerows from stalks of *Lilaeopsis*, a relative of celery. As we let the current take us on a gentle flight through these green corridors that appear so carefully planted and manicured, David Doubilet thought of them as an underwater English garden. I imagined myself awash in a great salad bowl as I gathered clumps of watercress. Back on shore we laced our sandwiches with the tender greens.

TANGLED CLOUD of algae camouflages a congolli, or tupong (**top**), as the fish lies in wait at the bottom of the foot-shaped branch of Piccaninnie Ponds. One of its favorite foods, small Australian trout called galaxiids feed on algae and mosses that build into green underwater castles.

Along the shoreline of Piccaninnie, wisps of algae frost the red leaves of an aquatic *Ranunculus*, a member of the buttercup family (***above left***). The slightly saline aquifer that feeds Piccaninnie seems to inhibit the spread of *Ranunculus*, which adjusts its red



pigment as needed to protect against the sunlight drenching these crystalline waters.

In the fresher water of Ewens Ponds, great bouquets of the water buttercups climb stalks of *Triglochin* (**above**). Found in fresh waters across Australia, *Triglochin* produces an edible, potato-like tuber still harvested by Aboriginals in the north.

The fantastic water clarity of the Mount Gambier sinkholes results from several factors. The holes are fed from aquifers holding rainwater that fell decades—even centuries—ago, and that has been filtered through miles of limestone. The high level of calcium that limestone adds causes the silty detritus from dead plants and animals to cling together and settle quickly to the bottom. Abundant bottom vegetation in the shallow sinkholes also helps bind the silt. And the rapid turnover of water prohibits stagnation.

CHAMPAGNE bubbles seem to rise from Ewens Ponds when oxygen streams from *Triglochin* leaves and other plants (***facing page***). Indeed, I felt like raising a toast to the unexpected sight of photosynthesis made visible.

In the presence of sunlight, green plants convert carbon dioxide and water into the oxygen that makes our life on earth possible. The oxygen from aquatic plants normally dissolves invisibly into the water. But if leaves have suffered surface cracks due to the grazing of snails or aquatic insects, the gas has another escape route. This oxygen bubbles to the surface in the same way that bubbles rise in soda water saturated with carbon dioxide.

The quantity of sunlight penetrating the clear waters of Ewens and Piccaninnie Ponds prompts such a high rate of photosynthesis that plants virtually saturate the water with oxygen. The relatively cool temperature of the sinkholes, 15°C (60°F), makes the water capable of absorbing a much greater volume of oxygen than warmer water.

Waving a dissolved-oxygen meter over a fissure admitting new water to Ewens Ponds, botanist Neil Hallam (***above***) discovers that the low-oxygen aquifer water quickly approaches saturation from oxygen production by the submerged plants. A professor at Monash University in the neighboring state of Victoria, Dr. Hallam has spent ten years studying Ewens and Piccaninnie Ponds. "The high level of oxygen shows that their waters are very clean and could support a diverse plant and animal population," he explained.

Yet animal life is not especially abundant or diverse in these shallow sinkholes. Though rich in oxygen, the water is low in the phosphorus and nitrogen needed to support phytoplankton, the single-cell floating algae that form the basis of most complex food chains.

With slower moving water and extensive marshland, Piccaninnie holds the most animal species and the largest, including aquatic tortoises, water birds, and short-finned eels that poke from crevasses in the Cathedral.

The Eight Mile Creek Swamp that once surrounded Ewens Ponds has been drained for farmland since before the Second World War. The pond water levels, now apparently stabilized, lie one and a half meters (five feet) below their original marks, and many of the plant species still found at Piccaninnie Ponds have vanished from Ewens.

TO CLOCK the rate of water exchange in the largest of Ewens Ponds, Dr. Hallam and Monash University graduate students release rhodamine, a water-tracing dye. They wedged a container holding only a small amount of the harmless dye into one of the many cracks emitting aquifer water. The dye billowed to this height in just ten minutes. In little more than six hours the pond was again clear, filled with more than seven million gallons of new water.

I marveled that in this relatively dry region, where annual rainfall averages 70 centimeters (28 inches), Ewens Ponds each year send more than 19 billion gallons of fresh water to the sea. Local farmers do not need to tap the ponds for irrigation because their wells draw from the same aquifer. One man does siphon Ewens water to raise trout.

Recreational use is the immediate dilemma. The popularity of Ewens, thrilling even for snorkelers, has taken a toll on the plant life. Dr. Hallam and the Cave Divers Association of Australia have recommended that Ewens Ponds be named a state park (a management plan is now being prepared) so the weekend crush of visitors can be regulated.

SINUOUS REACH lets the small Australian snake-necked tortoise (***above***) plunder algal fortresses that hide snails, crustaceans, and small fish in Piccaninnie Ponds.

In Ewens Ponds the once numerous spiny crayfish (***right***) still falls to thoughtless divers as an edible souvenir. Several of Australia's more than one hundred species of crayfish scavenge around the Mount Gambier sinkholes.

Animal life in the sinkholes has not been fully cataloged, and many known species have yet to be firmly identified. This underwater limestone kingdom does not easily give up its secrets. □

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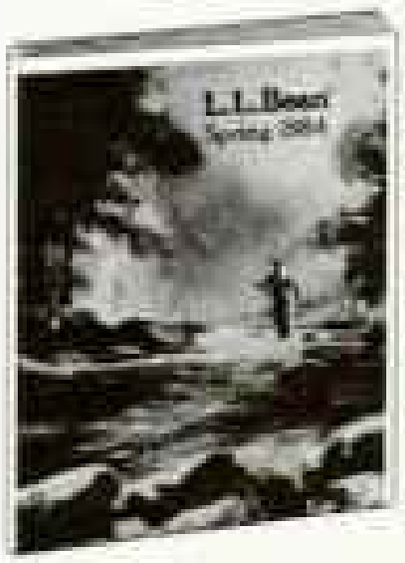

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Photographed by Udo Hirsch. ***Waldrapp Ibis:*** ***Genus:*** *Geronticus* ***Species:*** *eremita* ***Adult size:*** *About 75cm* ***Adult weight:*** *1.8—2.2kg* ***Habitat:*** *Breeds on cliffs, rock ledges and in caves. The eastern population migrates from Turkey to Ethiopia; the western population is non-migratory.* ***Surviving number:*** *Eastern population: 13 birds in Turkey; western population: 400 birds in Morocco and Algeria.*

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According to Turkish folklore, after the Flood, Noah released three birds from the Ark to symbolize peace, the beginning of a new era and fertility. The symbol of fertility was believed to be the Waldrapp ibis, a species that dates back millions of years. Along with the great auk, the Waldrapp is one of the few species to have disappeared from Europe in historical times. Presently confined to Turkey, Morocco and Algeria, it now faces complete extinction.

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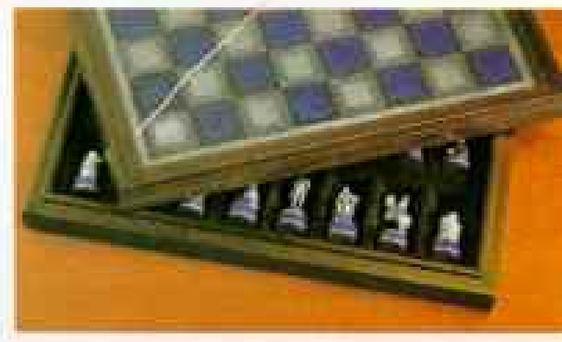

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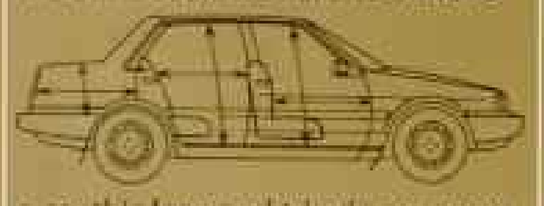
And you thought you had to pay a bundle for taut, wind-cheating styling, front-wheel drive, family car roominess and dependability. Introducing the 1984 Corolla 4-Door Sedan. It's hard to believe



a car this lean and trim is so roomy and economical.

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59 (43)

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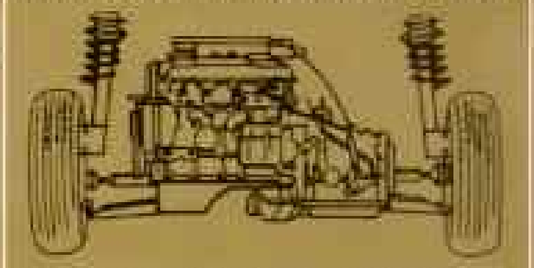

*Remember: Compare this estimate to the "EPA Estimated MPG" of other diesel powered cars with manual transmission. You may get different mileage, depending on how fast you drive, weather conditions and trip length. Actual highway mileage will probably be less than the "Highway Estimate."

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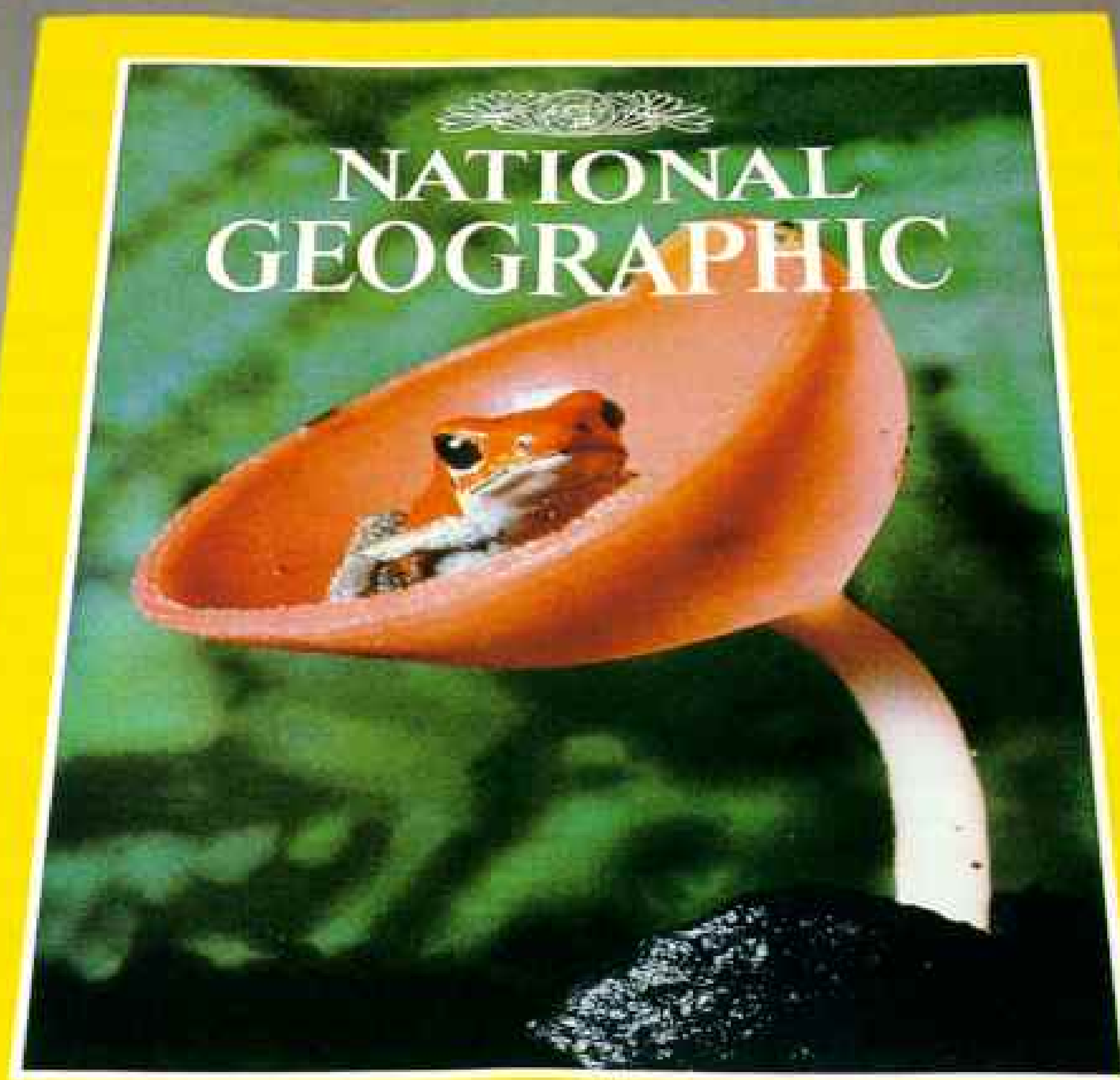

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Members Forum

Martin Luther

"The World of Martin Luther" (October 1983) is a masterpiece of synthesis and symmetry. The author has a talent for packing big, complex issues and developments into brief, succinct statements. The secondary aspects of the picture are deftly treated too, and the description of medieval urban and rustic scenes has a flavor of vibrant authenticity. Above all, Severy has managed to present a subject often wrought with controversy in an eminently fair, balanced, and optimistic manner.

Carl G. Anthon
Professor of History Emeritus,
The American University, Washington, D. C.

With regard to your article on Martin Luther and the Protestant Reformation, I have scarcely ever read such a massive oversimplification of a complex historical question. Instead of painting Catholicism in dark colors and extolling the genius of Luther, I would encourage you to present a picture that is both more accurate historically and more balanced ecumenically.

Father Gary Sumpter
Spokane, Washington

You incorrectly translate the "vow" (page 429) "*Ich will ein Mönch werden*—I will become a monk." The correct translation is "I want to become a monk."

Maria K. Bauer
Woodstock, New York

This statement, recorded years after the event and confirmed by Luther, has always been given the idiomatic translation. Our consultants, including a German historian, concur. The sense of the vow, given in terror when lightning struck, is "Save me and I will become a monk."

I quote from Merle Severy's "The World of Martin Luther": "Among Western European nations familiar to us today, only France, England, and Portugal had achieved some unity" (at the time of Martin Luther). What of a nation far older than any of the above mentioned three—one that celebrated 1,000 years of existence just a few years ago, namely Denmark?

Milda C. Söderman
Webster, Massachusetts

During Luther's time Denmark was not a single nation but part of the Kalmar Union, which included Norway and Sweden.

I am confused by a statement in your article on "The World of Luther." My 12 years of Catholic education taught me that one had to be an ordained priest before one could be appointed cardinal. But you state on page 445 "cardinal at 13. Crowned with the jeweled triple tiara as Leo X at 37, four days after becoming a priest. . . ." Have the rules of the game been changed over the past 400 years?

Maruta Grants
Indianapolis, Indiana

In Luther's day canon law was sometimes bent severely to meet the political and financial needs of the church.

Wodaabe

Congratulations on your article "Niger's Wodaabe: 'People of the Taboo'" (October 1983). When people want to do research in folk dress, I always tell them to look in NATIONAL GEOGRAPHIC first. I wait with anticipation each month to see what peoples you have covered.

R. L. Shep
Editor, The Textile Booklist
Lopez Island, Washington

The photograph on pages 490-91 shows "sheep and zebu cattle." If those are indeed sheep, I'll do chores by myself for a week. Those Roman noses and pendulous ears spell Nubian goats to me.

Deborah Ranville
Montrose, Michigan

The Wodaabe assured the author these were sheep, and two experts concurred, pointing out the convex, long faces, eyes close to the ears, and lop ears bigger than those of goats.

Japanese Crane

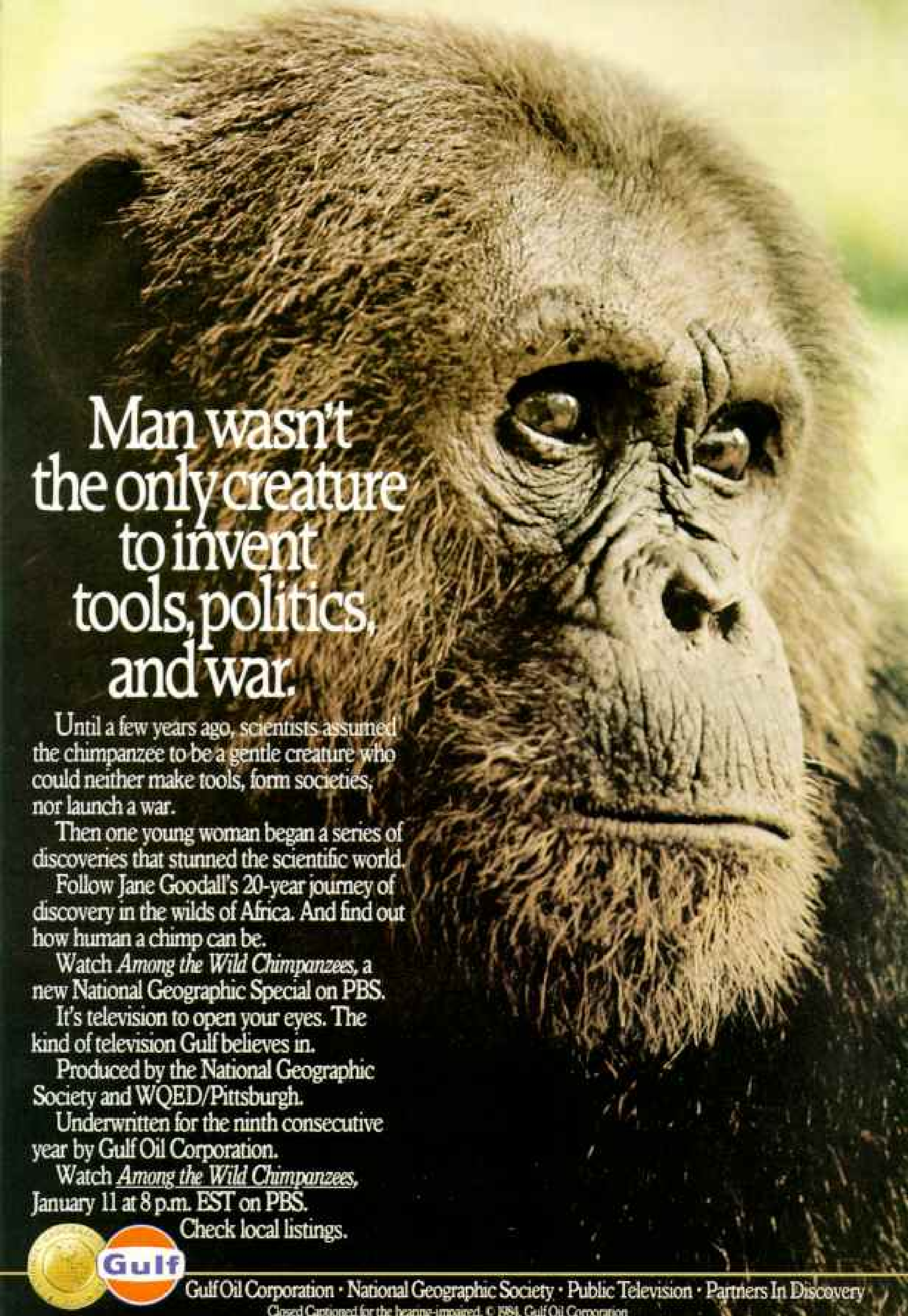
I read with awe and wonder the marvelous article "The Japanese Crane, Bird of Happiness" in your October issue. Is it known if there is the possibility that, since the Japanese have used this wonderful creature as a symbol of love for centuries, the age-old ritual of bowing to one another may have originated with the Japanese people copying the bird's antics?

Ellen U. Flynn
Alexandria, Virginia

The comparison is delightful, but the Japanese are believed to have preserved a respectful custom that originated in China.

I must write you on your pictorial essay of the Japanese crane. How simply charming and refreshing. For a few hours after reading, it just wiped all the bad news of TV, newspapers, and such out of existence. Thank you for a few hours of complete enjoyment and peacefulness!

Kenneth G. MacCrae
North Kingstown, Rhode Island



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Satellites

Your otherwise well-researched article "Satellites That Serve Us" (September 1983) was marred by the omission of Canada from the list of space-faring nations on page 329. Canada was, of course, the third nation to orbit a satellite, the first nation to establish a domestic communication satellite system (as mentioned in the article), and is probably still the single most active foreign contributor to the American space effort.

Jerome Daly
Ottawa, Ontario

The painting shows countries that have actually launched payloads. As you know, Canada does not launch its own satellites, but this does not diminish its contribution to space research.

I thoroughly enjoyed the article on satellites in the September issue, especially the outstanding photos and illustrations. However, on page 300 reference is made to the "virtual absence of gravity" regarding the upcoming Spacelab mission. Weightlessness, indeed, but "absence of gravity"? Without a gravitational attraction between earth and an orbiting satellite, the satellite would soon drift away into space.

Thomas E. Saxton
Walker Valley, New York

We should have said "virtual absence of the effects of gravity." Elsewhere in the article we pointed out that an orbiting satellite is subject to the gravity fields of the earth as well as the moon and sun, and described the environment of Spacelab as micro-gravity.

Although I enjoyed and am, to say the least, intrigued by the article, I question the use of "arrowheads" and "100,000 to 200,000 years old" in the same sentence. Surely stone tools or some other verbiage would be more accurate.

Michael R. Madden
Monroe, Louisiana

Stone tools would have been a more accurate representation of the artifacts uncovered in Egypt.

Tulsa

"High-Flying Tulsa" was not a comprehensive story of the city I grew up in, and whose racial and social mores still largely exist today. The article referred to natural barriers in Tulsa that have tended to preclude growth in certain areas. The railroad tracks and bridges that separate North (primarily black) Tulsa are but physical barriers. The real ones are the traditional racial and social attitudes of bygone years that still thrive. Yes, some progress is being made. Blacks can now live in very lovely homes, it seems, so long as they choose them in a kind of curious black middle-class ghetto. Occasionally one sees a blue-suited black professional leaving one of the buildings at 5 p.m. It's unfortunate that an article that so eloquently portrayed a dynamic city could find less than a hundred words to describe the lives of 12 percent of its citizens.

W. E. Reynolds
Paoli, Pennsylvania

Mississippi Delta

The article on the Mississippi Delta (August 1983) is, in part, an insult to professional fur harvesters all over America. I feel the statement Mr. Boyd makes, that he is sorry he has to be a trapper, is beneath your publication. It paints a very poor picture of trapping and is not objective on this often sensitive subject.

Kevin V. Weber
Parker, Arizona

The author told of helping a trapper emptying traps. He says, "Each one, living or dead, was a story of suffering" and he calls it "an ugly story." These traps are cruel and have been outlawed in most civilized countries, including England. Some of the humane societies in the United States have tried to have them outlawed here.

Helen G. Kaulfuss
Bradenton, Florida

Aleutians

The reference to underground nuclear testing on Amchitka, in what is generally a marvelous article on the Aleutians in the September issue, provokes a comment. In 1969 I was the State Department official responsible for the international and diplomatic aspects of the warhead tested on Amchitka. Visions were conjured that the test might affect the San Andreas Fault and earthquakes might destroy British Columbia.

Amchitka is still there. British Columbia did not sink into the ocean. No earthquakes were triggered. Success gave us confidence that we could have a workable warhead for the antiballistic missile should we decide to field such a system. Firm in that confidence, the ABM treaty was concluded between the Soviet Union and ourselves.

W. J. Lehmann
Rockville, Maryland

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.*

Announcing the very first vase by the world's foremost living bird artist!

BLUEBIRDS

by

Roger Tory Peterson

A serially-numbered private edition produced exclusively for the Danbury Mint by world-renowned Kaiser Porcelain.

Roger Tory Peterson is the greatest bird artist since John James Audubon. Collectors compete for the privilege of owning his original paintings and his fine art prints command premium prices.

A milestone event in collecting history!

Incredibly, Peterson's art has never before appeared on a collector vase. Now, the art of Roger Tory Peterson will be immortalized for all time on fine porcelain – *the first Roger Tory Peterson bird vase ever to be issued!*

As a registered owner of *Bluebirds*, you will have the opportunity – but *not* the obligation – to acquire any subsequent Roger Tory Peterson bird vases issued by the Danbury Mint.

Each vase will be produced by world-renowned Kaiser Porcelain.

Bluebirds, by Roger Tory Peterson, will be crafted exclusively for the Danbury Mint in West Germany by world-renowned Kaiser Porcelain. The vase will not be available in galleries or stores.

Each vase will be trimmed with *two* bands of precious 24kt gold.

Peterson's art will be featured on both sides of the vase. Each vase will be hand-decorated at the base and the crown with a band of 24kt gold. A custom-made wood stand will be furnished at no additional charge. The bottom of the vase will bear the hallmark of the Danbury Mint, the insignia of Kaiser Porcelain, the name of the work, and the signature of Roger Tory Peterson, all reproduced in gold. Each vase will be serially-numbered.

Affordably priced and convenient to acquire.

Bluebirds will be a *full-size* collector's vase – 11" high. The vase will have an issue price of just $105 – payable in three monthly installments of $35 each. *To reserve your vase, send no money now.* Simply complete the reservation application and return it to the Danbury Mint.

Vase shown smaller than actual size of 11" high.

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Reservation Application

673

BLUEBIRDS

by

Roger Tory Peterson

The Danbury Mint
47 Richards Avenue
Norwalk, Conn. 06856

For production planning purposes, please return by March 31, 1984.

Please accept my reservation for *Bluebirds* by Roger Tory Peterson, a full-size collector vase trimmed with two bands of 24kt gold and serially-numbered. A custom-made wood stand will be sent at no additional charge. I understand I need send no money now. I will be billed for the vase in three monthly installments of $35 each.

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PLEASE PRINT CLEARLY

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☐ Check if you want each installment charged to your: ☐ MasterCard ☐ VISA

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Credit Card No. Expiration Date

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Allow 8-12 weeks after payment for shipment.

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That's why the Deafness Research Foundation is so important. It is the only national voluntary health organization with a single goal – the financial support of research into all forms of hearing disorders.

The Foundation is unique – its overhead expenses are paid for by over 1,700 ear-care doctors, allied professionals, and major medical societies. Which means when you contribute to the DRF, **your tax-deductible donations go directly to research.**

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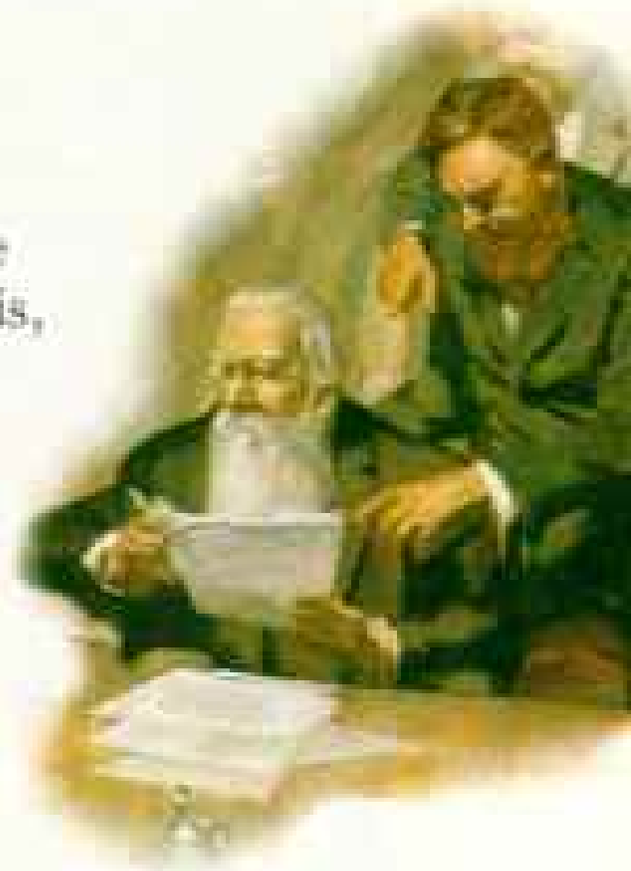
"That we may all know more of the world."



WHEN MY ASSISTANT Joyce Graves marked my calendar for January 1984, she circled the 13th and noted: "Birthday."

I wondered for a moment whose it was. Of course, it is ours—the 96th anniversary of the founding of our Society.

Normally, we are so concerned about the events of today, and of tomorrow, that we rarely take the time to look back and just remember.

It is only five blocks from where I now sit to the old Cosmos Club on Lafayette Square in Washington, D. C. On that January night in 1888, an extraordinary group of 33 men met there to organize a geographic society.

They were men who had been around. Among them: my great-great-grandfather Gardiner Greene Hubbard, a lawyer, financier, and leader in educating the deaf (**upper right**, seated); Henry Gannett (standing), pioneer mapmaker of the West; John Wesley Powell (**left**), the first to descend the Colorado River through the Grand Canyon; and Brig. Gen. A. W. Greely (**right**), polar expedition leader. Within two weeks they had enrolled 165 members. Today our membership of 10.5 million would fill 145 stadiums as large as the one in Tampa where the Super Bowl will be played. We are the world's largest scientific and educational organization.

DETAILS FROM A PAINTING BY STANLEY MELTZOFF

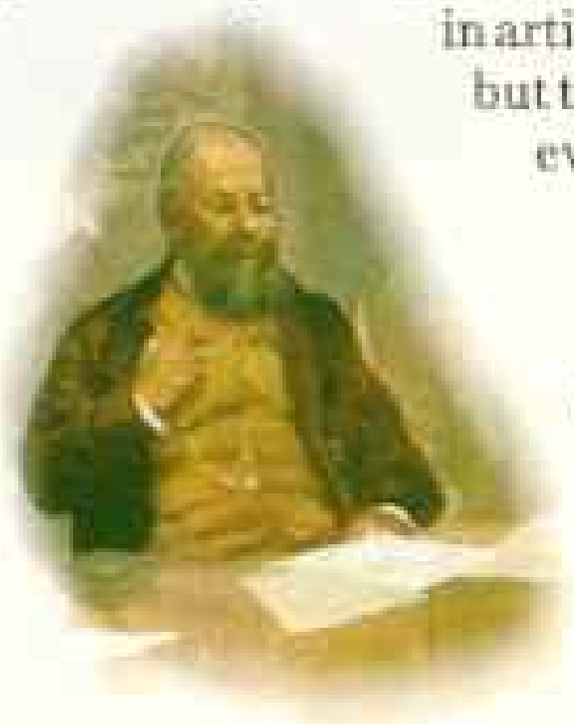
When Gardiner Hubbard was installed as the Society's first President, he predicted that "the membership . . . will include that large number who, like myself, desire to promote special researches by others, and to diffuse the knowledge so gained among men, so that we may all know more of the world upon which we live."

The Society's members have more than proved his prediction. Through modest dues, those members—not wealthy benefactors, foundations, or governments—have enabled us to "diffuse the knowledge so gained among men" in this, our official journal; in *National Geographic WORLD* magazine; in television, radio, and features for newspapers; in books, atlases, globes, and maps; as well as in films and other educational media.

The Society's "desire to promote special researches by others" now contributes nearly three million dollars yearly to support research in such fields as astronomy, archaeology, anthropology, natural history, earth sciences, ecology, and paleontology—support almost entirely from members' dues.

Some of these studies, like those of Jane Goodall, Jacques-Yves Cousteau, and the late Louis S. B. Leakey, have had a profound impact upon the course of modern science.

Each year Society-sponsored efforts such as excavations at Roman Herculaneum, exploration of lost vessels under arctic ice, the finding of the almost extinct black-footed ferret, make headlines. Yet these are the stars of a show that has, literally, a cast of thousands. Of each year's crop of grants, only a few result in articles in our magazine, but the work goes on. Not every young investigator will grow to be another Louis Leakey, but many will contribute much to knowledge of "the world upon which we live."



We will keep you informed on these and many other Society activities, plans, hopes, and even dreams—for the founding members were practical men and, therefore, well acquainted with dreams.

In the months ahead, this page will serve as our meeting hall, for the same purpose and in the same spirit as the first one.

Gilbert H. Grosvenor

PRESIDENT, NATIONAL GEOGRAPHIC SOCIETY

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On Assignment

IN HIS FIRST ENCOUNTER with a whale as a novice scuba diver off California in the 1950s, **Al Giddings** took one look and raced for shore. "Back then," he recalls wryly, "many thought that whales might attack."

Now one of the world's most respected underwater photographers and filmmakers, Giddings is mesmerized by the leviathans. Last August in Alaskan waters he rendezvoused with the research vessel *Varua* (**below**), whose excited crew had chanced upon eight humpback whales feeding voraciously on krill. Amazingly the whales lingered for three days, allowing Giddings to make not only spectacular motion-picture footage, but also still photographs that appear with the Southeast Alaska story in this issue.

His work has accompanied seven other GEOGRAPHIC articles, the Society's book *Exploring the Deep Frontier*, and TV Specials on sharks and the Galapagos Rift.

Giddings almost lost his life in 1969 diving on the wreck of the liner *Andrea Doria*. Working below 200 feet, he absorbed so much disorienting nitrogen that he nearly ran out of air while trying to locate the line leading to oxygen decompression hoses suspended at 30 feet.

Director of underwater sequences for a number of movies, Giddings faced a humbler hazard during filming of *The Deep*.

"I was doing a close-up of Jacqueline Bisset," he says, "and something kept swimming past the lens, though she was only a foot away." Finally he turned the camera around and spied the problem. While 23 expensive actors and technicians waited, Giddings surfaced. An assistant opened the housing—"and out flew a $3,000 fly."

BOTH BY ROSEMARY GRASTNEY, OCEAN IMAGES, INC.