DOUBLE MAP SUPPLEMENT: SPAIN IN THE AMERICAS

VOL. 181, NO. 2 FEBRUARY 1992

NATIONAL GEOGRAPHIC

BITTERSWEET SUCCESS
EASTERN WILDLIFE 66

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

NATIONAL GEOGRAPHIC

FEBRUARY 1992

COVER: Finding airspace in New York City, Canada geese winter over at Jamaica Bay Wildlife Refuge near Kennedy Airport; towers of the World Trade Center rise beyond. Photograph by Raymond Gehman.

ALCO

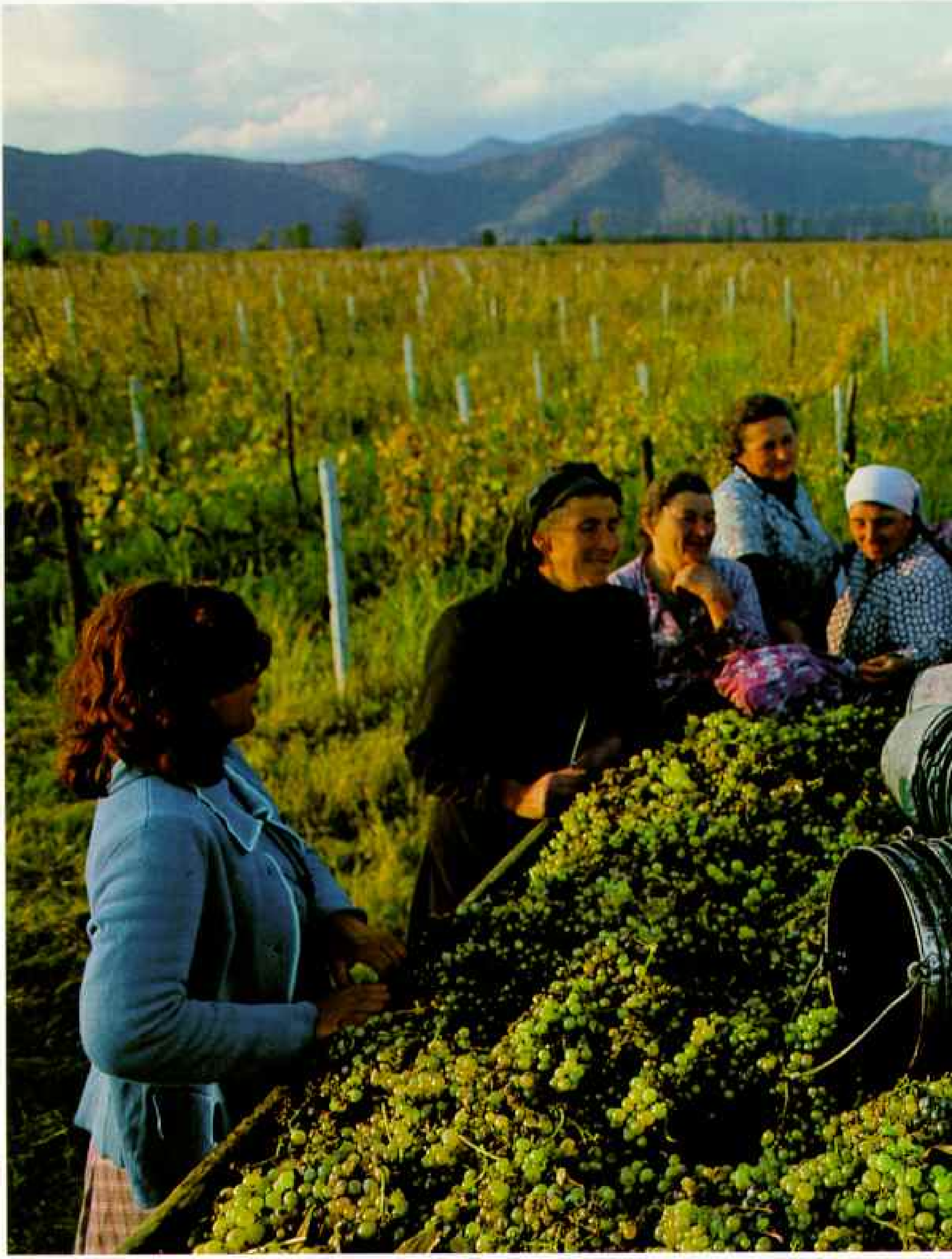
DHOL

THE LEGAL DRUG

Raising a glass of alcohol is one of mankind's most distinctive rituals. For many, like these toast-happy celebrators at a reunion in the Georgian Republic (left), alcohol loosens the tongue and tightens the bonds of friendship. Yet alcohol can also exert nearly satanic power: It ruins lives, destroys families, kills thousands on the highway. Each year more is known about this Jekyll and Hyde of the drug world. But alcohol is still a riddle that every culture attempts to solve in its own way.

By BOYD GIBBONS
NATIONAL GEOGRAPHIC SENIOR STAFF

Photographs by
GEORGE STEINMETZ



A tradition of viticulture spans thousands of years in the Caucasus Mountains, where workers in the Kakheti Valley still harvest grapes by hand to make prized Georgian wine. Grapes like these

led Stone Age farmers to the intoxicating chemical ethanol, commonly known as alcohol, which is excreted by yeasts as they feed on the sugars in crushed fruits or grains.

First the man takes a drink
Then the drink takes a drink
Then the drink takes the man
—JAPANESE PROVERB

I WAS MAYBE NINE, sitting in my grandfather's house truck—this being before RVs and their Barcaloungers—beneath a hissing Coleman lantern with him and his hunting companion somewhere in dusty Sonora. We'd had a hot day chasing quail (I was the bird dog), and now at dusk the loving cup was making the rounds: an empty tin of Bishop's Hard Candy refilled with 100-proof Golden Wedding Whiskey and 7-Up glistening over big chunks of clear ice.

The kid was allowed a few sips. It was sweet going down, and the sips became gulps. "Hey," my grandfather said, "take it easy."

I went outside, and the stars were doing flat spins in the Mexican sky.

An aversion to the whirlies in no way prevented me in college from trying all the robust permutations of dumb drinking, and eventually I settled down with a lawn mower and azalea fertilizer—a sociable man, a social drinker not longing for replays of the Stupid Period.

Why I drink, why anyone does, gets at why alcohol has pervaded human society from the beginning. It's an intoxicating drug that has carried amity and an altered state to an awkward, lonely, and inquiring species. Passing my grandfather's loving cup lacked the religious symbolism of Communion; nonetheless it was for me a profound communion.

Yet the "temperance" cultures of North

The best man brings the brandy—planted in a wedding cake—to toast the bride and groom in the Georgian Republic. A specialty of wine-growing regions around the world, brandy is made by boiling wine and condensing its vapors into a concentrate, which is then aged in wooden casks. Forty percent alcohol—about three times the strength of wine—brandy takes its name from the German Branntwein, *or burned wine, and may have been the first distilled spirit.*

America and northern Europe tend to be ambivalent toward, if not polarized by, alcohol. So much so that the "war" on drugs—attacking cocaine, heroin, and other contraband—omits inquiry into one of the most prevalent drugs in the world.

And a respected expert on addiction, after telling me why it's so important to identify early the 20 percent of drinkers who can potentially become the 5 percent whose lives are shattered by addiction to alcohol, leans over a

beer and says, "Don't quote me, but for maybe 80 percent of the population, alcohol is relatively innocuous."

If most who drink alcohol enjoy its considerable pleasures with few difficulties, many others cross the line—and those who do will deny it furiously. That is the paradox of alcohol.

ETHANOL (the alcohol that's drunk) and carbon dioxide are the natural excreta of yeasts consuming—fermenting—sugar. Sugar is in fruit, grains, sap, nectar, in all plants. Yeasts are ubiquitous. The Babylonians and Egyptians found that if they crushed grapes or warmed and moistened grain, the covered mush would bubble and become a drink with a kick.

Louis Pasteur discovered that yeasts are single-cell, living fungi and that fermentation is their act of survival. Yeasts can't get at grain directly until brewers first "malt" their barley: that is, moisten and warm it so that it germinates just enough to release enzymes that convert starches into simple sugars.

As alcohol is a toxin, fermentation is self-limiting. Once alcohol concentration reaches about 14 percent, or the sugar runs out, the multiplying yeasts die and fermentation ends. A stronger drink requires distillation.

The origins of distillation are obscure. The Arabs get credit not so much for the process, but for the word. *Al-kohl* is Arabic for finely ground antimony used as eye liner, and it came to mean any exotic essence.

So far as is documented, alcohol was first distilled in the Middle Ages, at a medical school in Salerno, Italy. Considered an important medicine, wine was boiled and the vapors then cooled and condensed to produce a more powerfully concentrated drug. A Spanish scholar gave this ragged brandy the name *aqua vitae*, the water of life.

Distilled alcohol evolved in Russia as *vodka*, in Holland as juniper-flavored *jenever* (the French called it *genièvre*, which the British blunted to *gin*), and passed through charred barrels, peat smoke, and across the Irish Gaelic tongue as *uisce beatha*, or whiskey.

There are all sorts of alcohols. Methanol, originally made from wood, now mostly from methane, is converted into formaldehyde, and from that into plastics. If drunk, methanol swells the optic nerve, causing blindness. Ethylene glycol is the alcohol used as antifreeze. Isopropanol is rubbing alcohol.

There is alcohol in rose and geranium oils, in fruits, berries, red seaweed. Traces of ethanol turn up in orange and tomato juice. It is used in gasohol in the Midwest and, mixed or pure, as a fuel in Brazil. Its low freezing point (minus 179°F) makes it useful for certain thermometers, and it once was common in compasses—that is, when the sailors weren't drinking it.

Ethanol is a solvent. It is used in lacquers, varnishes, and stains. To make fragrances and flavors, it pulls jasmine from the flower and vanilla from the bean. When you put Chloé behind your ear, it is ethanol that makes it miscible in the bottle and floats it to your nose.

I clean the capstans of my tape deck with "denatured" ethanol. That's a euphemism for poisoning ethanol with something like methanol so I won't divert it to a Tom Collins, and to spare the manufacturer an excise tax.

THE FIRST NEOLITHIC BUZZ remains unrecorded. But Solomon Katz, an anthropologist at the University of Pennsylvania, has a persuasive theory that alcohol may have been responsible for the earliest agriculture—to secure a dependable supply of beer.

Beer was easy to make, a good deal tastier than gruel, and far more nutritious. And like wine—which pushed the cultivated grape from Mesopotamia and into Egypt, and eventually throughout the temperate world—beer had a delightful effect.

"Most modern beers are very thin, but ancient beer was a food," says Katz. "Fermentation added needed B vitamins, essential amino acids converted by the yeast. And yeast also deactivated several toxic compounds in the barley, making it more palatable. Beer was better than bread in the sense that it also had alcohol in it."

Historically, people drank alcohol when they could get it: as food, in place of fetid water, as relief from the misery of life, to chase after pleasure—at births, weddings, and festivals. Wine poured down the pagan hatch, Dionysian and Bacchanalian. Alcohol was not only acceptable, it was esteemed, revered.

The Old Testament prophets had long issued warnings against excessive drink, Moses proposing death for rebellious, drunken sons. But eventually rabbis worked wine into ritual and ceremony—sanctifying the Sabbath, blessing the Passover festival.

Christ used wine as miracle by transforming

Alcohol's dark side is revealed in Moscow, where alcoholics at a detoxification center (above) suffer the agonies brought on when nervous systems addicted to ethanol are deprived of its sedative effect. Like many long-time abusers, the men also suffer malnutrition.

Less visible is the erosion of self-esteem, family, and career that occurs as a person succumbs to alcoholism—often described as a dependency, psychological or physical, marked by compulsive, uncontrolled drinking.

Millions recover through programs such as Alcoholics Anonymous (AA). Founded in 1935 by two U. S. alcoholics, AA now claims two million participants in 136 countries. "We used to hide under the bottle," says one member of a Moscow AA group (left). "Now we have something to live for."

it from water, and, at the Last Supper, imbued it with the symbol of his blood. Wine in early history was often vinegary and drunk diluted with water. The church rescued the vine from neglect in the Dark Ages and elevated fermentation of the grape to an art when monks began producing and aging fine wines.

Wine makes glad the heart of man, wrote the psalmist. The 12th-century Persian poet Omar Khayyâm—with his book of verses, jug of wine, loaf of bread, and thou—saw in wine a refuge from the hopelessness of ever knowing the ultimate mystery:

> *Yesterday This Day's Madness did prepare;*
> *To-morrow's Silence, Triumph, or Despair:*
> *Drink! for you know not whence you came, nor why:*
> *Drink! for you know not why you go, nor where.*

All things in moderation, say the philosophers. Although heavy drinking over time can damage the heart muscle, a small amount of alcohol may help lower the incidence of coronary heart disease. Apparently something in alcohol increases the level of HDLs (or "good" cholesterol) in the blood, which helps reduce atherosclerosis, the piling up of fat in the arteries.

"The epidemiologists have known this for years," says Curtis Ellison, chief of epidemiology at Boston University's School of Medicine. "But they were reticent to publish it because they were afraid of encouraging people to go out and drink and kill themselves in accidents. This isn't a plea for teetotalers to start drinking. But people who have a drink or two daily—less for women—and are not prone to abuse should know that there's nothing wrong with moderate drinking. In fact there are some benefits."

NATIONAL PROHIBITION in the U. S. did not spring suddenly from the loins of the Anti-Saloon League. The excesses of drink are there in the Bible: Noah passed out in his tent.

Socrates warned, "If we pour ourselves immense draughts, it will be no longer time before both our bodies and our minds reel."

In 16th-century Germany, drunken burghers raised more than the eyebrows of Martin Luther, who himself raised many a tankard:

"But to sit day and night, pouring it in and pouring it out again, is piggish."

In the early 1700s cheap gin flooded into working-class London, a spectacle rendered on canvas ("Gin Lane") by William Hogarth.

Across the Atlantic Scotch-Irish settlers on the Pennsylvania frontier had fired up their pot stills, whiskey being a profitable way to move excess grain. This attracted the interest of Treasury Secretary Alexander Hamilton, whose whiskey tax precipitated in 1794 a brief Whiskey Rebellion.

By 1830 Americans were on a colossal binge, drinking nearly three times as much alcohol per capita as today. Early temperance organizations did not oppose drinking in moderation. They went after inebriety and the custom of paying workers in liquor. But the Protestant revival eventually infused evangelism into the movement: prohibit liquor, period. Converts signed their temperance pledges "T.A." for total abstinence from alcohol. Teetotalers.

Saloons glutted the cities, most visibly in the slums, and moved west with the multitudes of young, aimless men who found nothing much to do but toss back whiskey until they were bungey, crack'd, gold-headed, wet, dagg'd, lappy, or moon-eye'd.

A National Prohibition Party formed an alliance with the Women's Christian Temperance Union, with momentum from the woman suffrage movement. In 1919 the Anti-Saloon League pushed through the 18th Amendment to the U. S. Constitution (repealed in 1933). National Prohibition was law, and nearly 200,000 saloons were destroyed.

Consumption (and liver cirrhosis) fell in the early years of Prohibition, especially among the poor. But moonshining and smuggling gave drinking back to the middle and upper classes, brought the Mob into the business, and prompted a rash of blindness and deaths from drinking wood alcohol.

Prohibition ushered in the speakeasy and a lot of defiant drinking. The cocktail party had come of age. In time, booze became romanticized on film: Bogey showing his teeth after a slug from the bottle, Gary Cooper and his shot of rye in the saloon, executives pulling Scotch from the drawer, crystal decanters in every living room. It looked so sophisticated, so deliciously adult. Out of this era comes an interesting cohort: Of the first six Americans to win the Nobel Prize in Literature, five—Sinclair Lewis, William Faulkner, Ernest Hemingway, John Steinbeck, and Eugene O'Neill—were alcoholics.

Trial by beer awaits any barmaid who braves Munich's Oktoberfest, when brewery tents such as Hackerbräu's (left) fill with 7,000 revelers. Some five million liters are served during the 16-day festival; Germans, world champion per capita beer drinkers, down 11 billion liters a year.

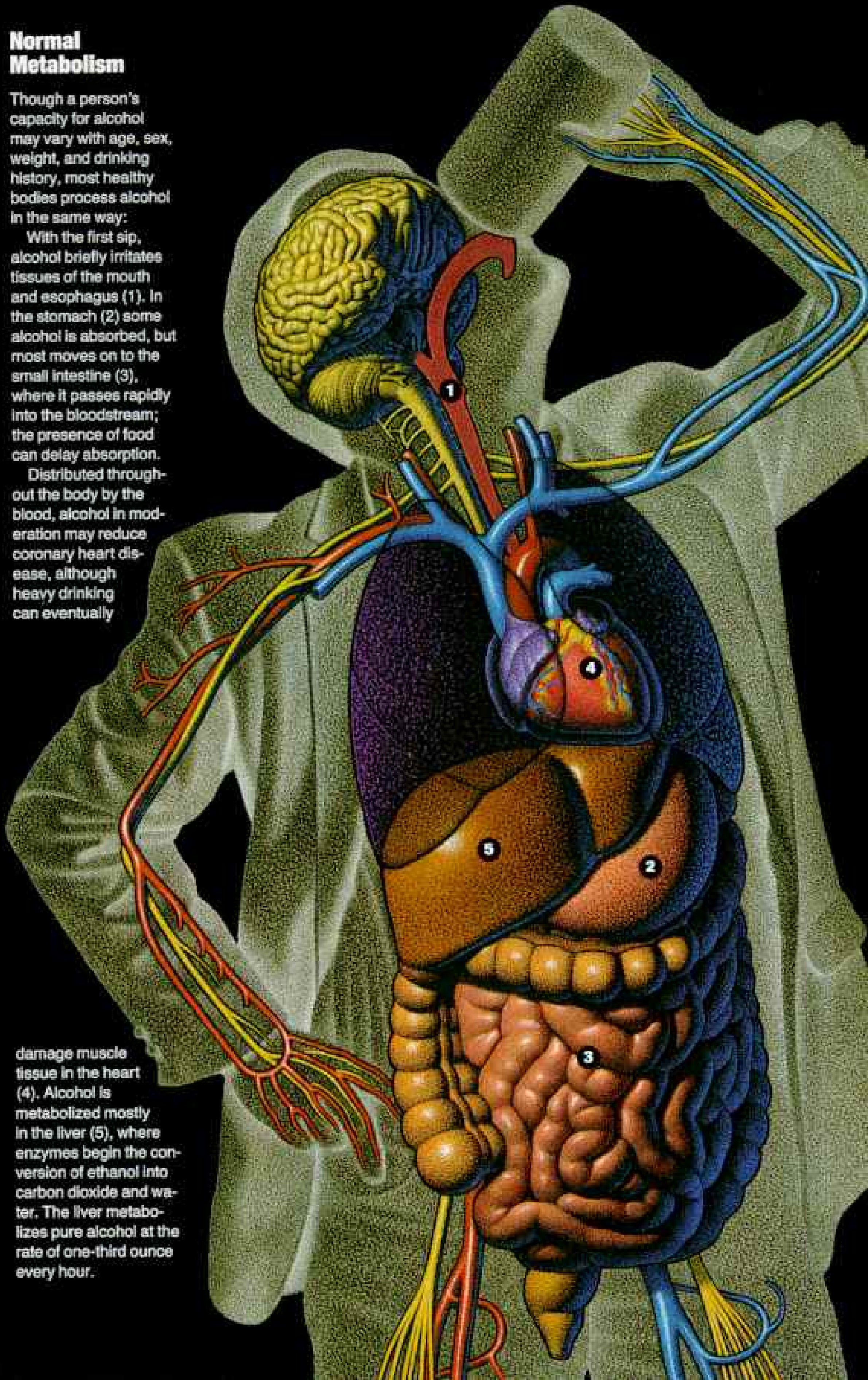
"THE POPULAR MYTHOLOGY of alcohol," wrote Berton Roueché, "is a vast and vehement book. . . . perhaps, the classic text in the illiterature of medicine." A shot of brandy chases the chill. (It actually makes you colder.) The French can't have many alcoholics, because they drink wine. (Not true. They have a high incidence of alcohol-related problems, with twice the rate of death by liver cirrhosis as in the U. S.) Similar defenses are made for beer, yet most alcoholics in Britain are beer drinkers, because beer is still predominantly what the British drink. It's not what you drink;

Normal Metabolism

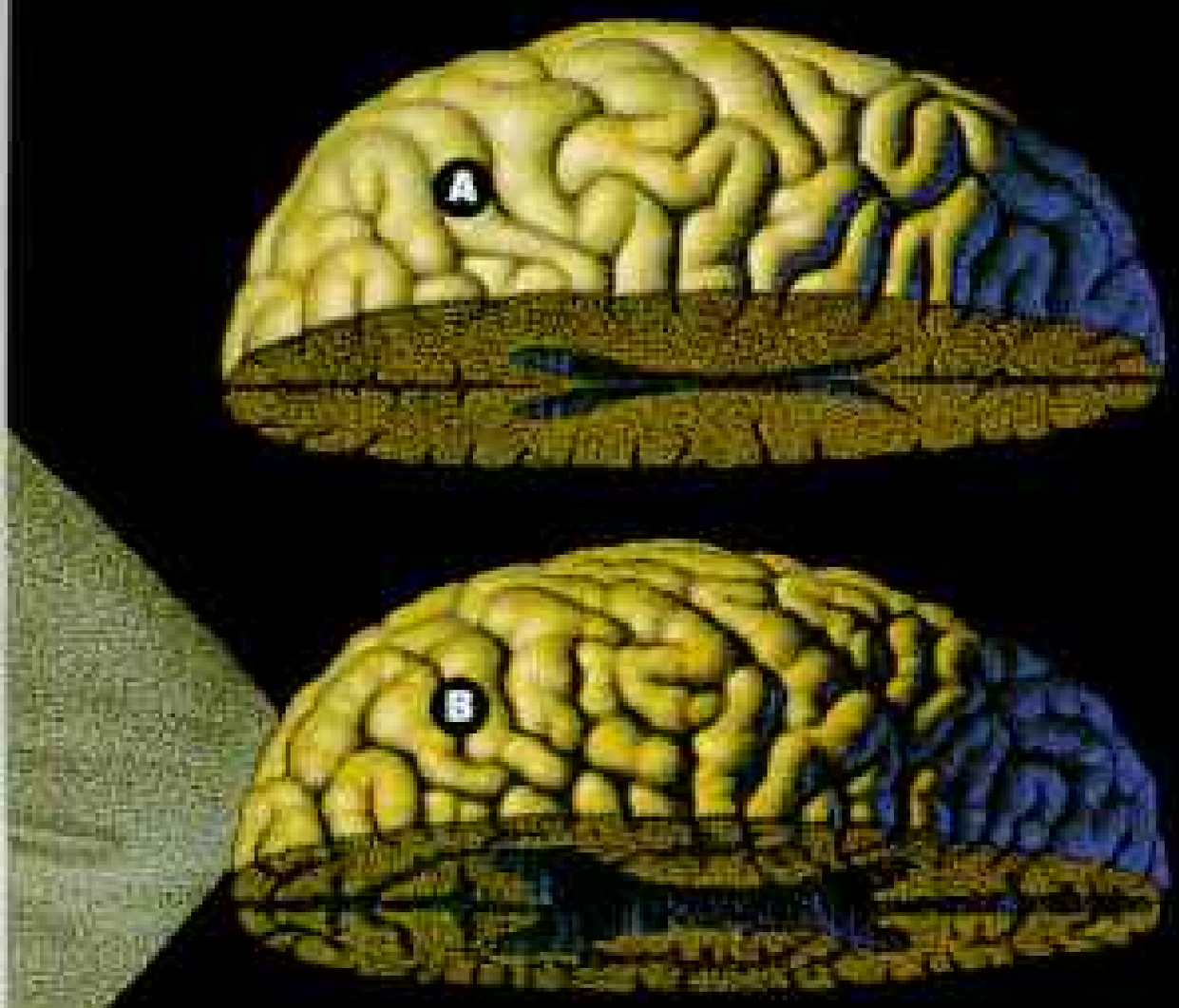
Though a person's capacity for alcohol may vary with age, sex, weight, and drinking history, most healthy bodies process alcohol in the same way:

With the first sip, alcohol briefly irritates tissues of the mouth and esophagus (1). In the stomach (2) some alcohol is absorbed, but most moves on to the small intestine (3), where it passes rapidly into the bloodstream; the presence of food can delay absorption.

Distributed throughout the body by the blood, alcohol in moderation may reduce coronary heart disease, although heavy drinking can eventually damage muscle tissue in the heart (4). Alcohol is metabolized mostly in the liver (5), where enzymes begin the conversion of ethanol into carbon dioxide and water. The liver metabolizes pure alcohol at the rate of one-third ounce every hour.

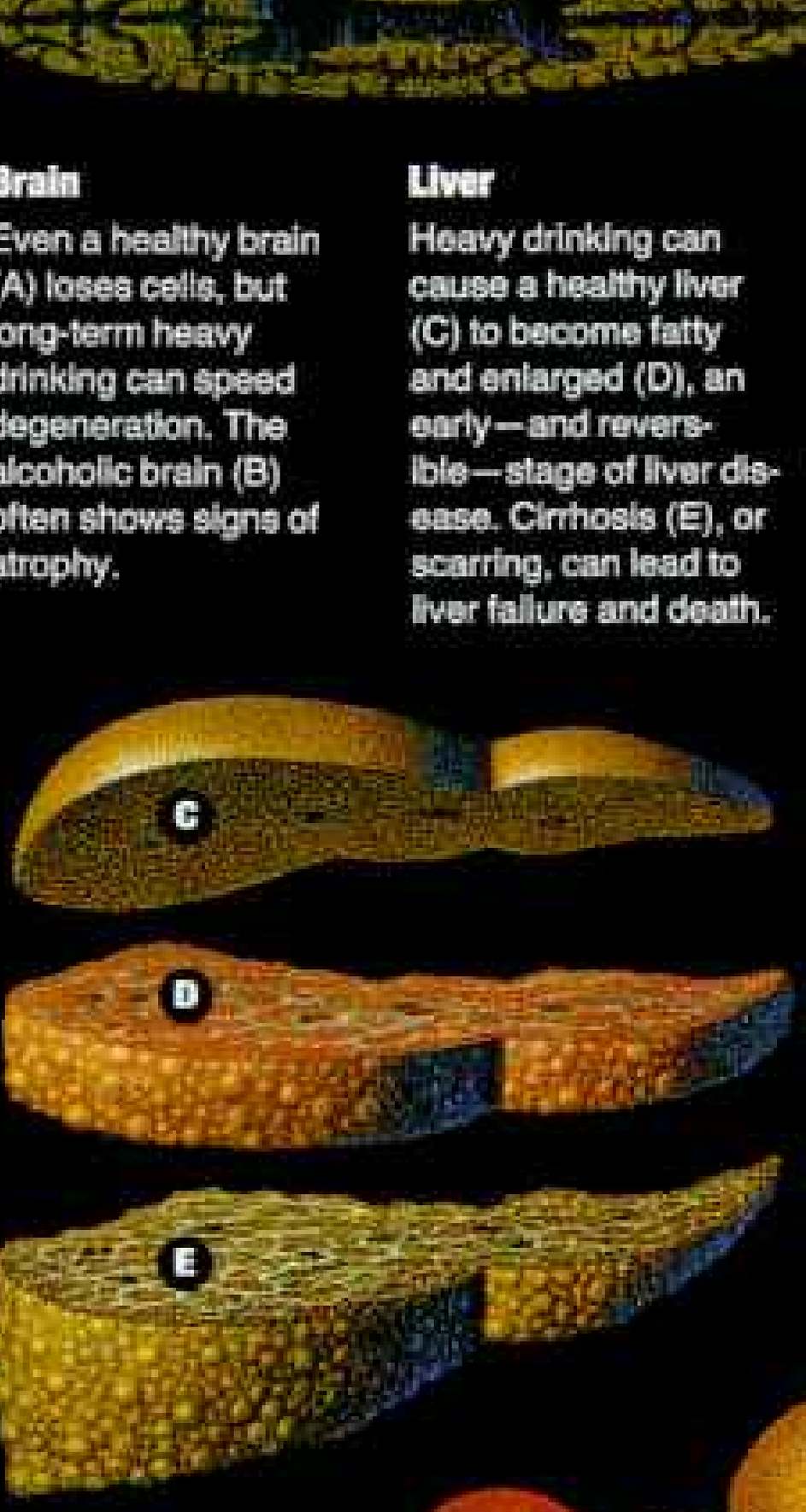


What happens when you drink



Brain
Even a healthy brain (A) loses cells, but long-term heavy drinking can speed degeneration. The alcoholic brain (B) often shows signs of atrophy.

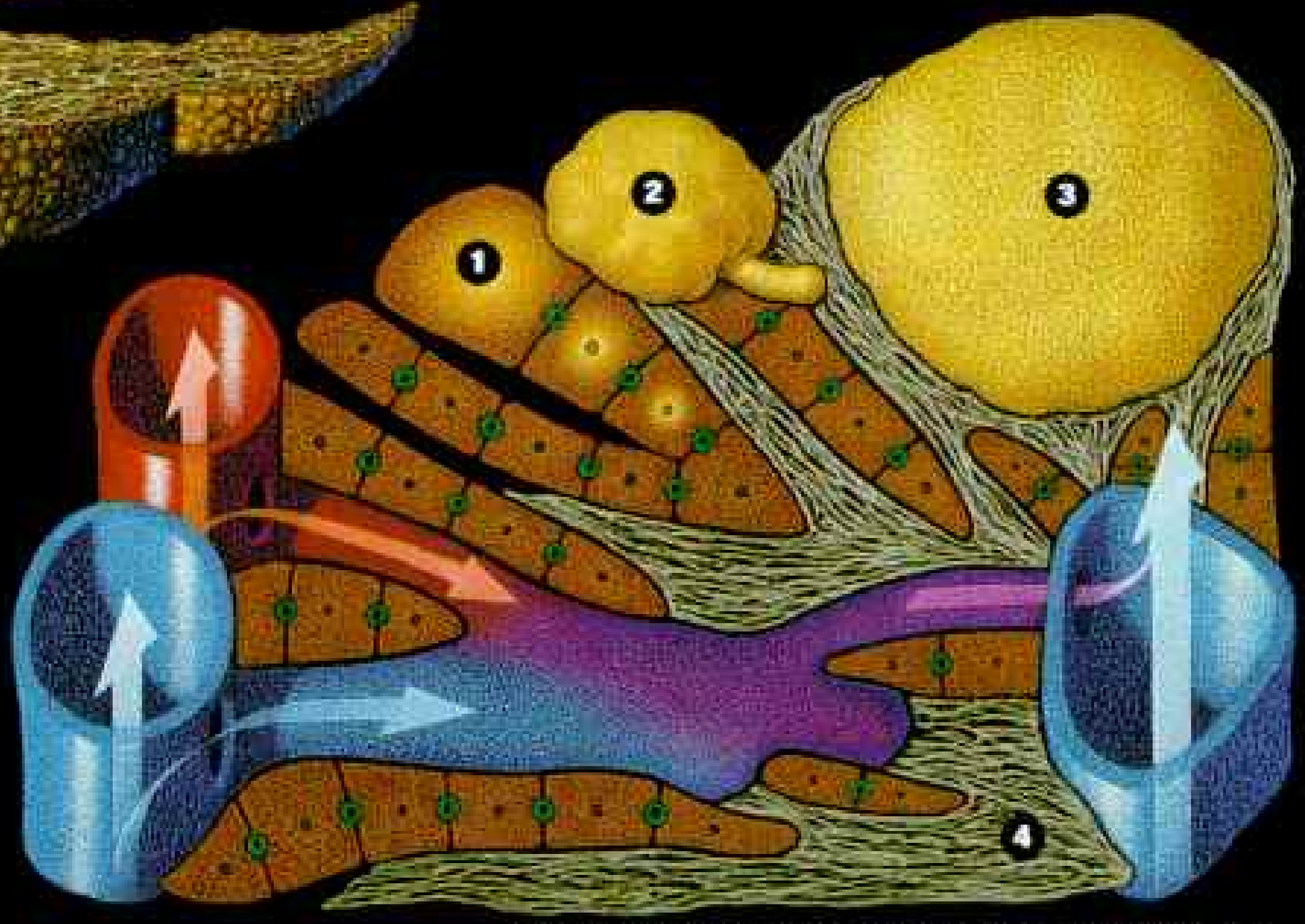
Liver
Heavy drinking can cause a healthy liver (C) to become fatty and enlarged (D), an early—and reversible—stage of liver disease. Cirrhosis (E), or scarring, can lead to liver failure and death.



THE MIND-BENDING EFFECTS of alcohol begin soon after it hits the bloodstream. Within minutes alcohol enters the brain, numbing nerve cells and slowing their messages to the body. In the heart, cardiac muscles strain to cope with alcohol's depressive action, and the pulse quickens.

If drinking continues, alcohol builds in the bloodstream, and the nerve centers in the brain governing speech, vision, balance, and judgment go haywire. As even more alcohol is ingested, the drinker may lose consciousness. With extremely high levels of alcohol in the blood, the inebriate is in danger of dying from respiratory failure.

Alcoholism increases the risk of heart disease and cancer—and liver failure. When alcohol is present in the liver (below), it preempts the breakdown of fats, which accumulate within liver cells (**1**). As fatty cells enlarge they can rupture (**2**) or grow into cysts (**3**) that replace normal cells. After years of heavy drinking, fibrous scar tissue (**4**), or cirrhosis, impedes the normal flow of arterial and venous blood (arrows) through the organ.



PAINTING BY EDWARD S. GAZSI; CHARLES S. LIEBER, M.D., CONSULTANT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Telltale heart of a Finnish alcoholic is compared with a normal heart by Martti Tenhu (left), Helsinki's chief medical examiner. Nearly twice normal size, the alcoholic's heart was enlarged by ethanol-induced high blood pressure and the scar tissue left by massive doses of vodka. "In the end it was this heart that killed him," says Tenhu, citing cardiac arrhythmia—a failure of the heart's timing mechanism common among alcoholics.

Though public drunkenness is widespread, drunk driving is rare in Finland, where special police details (above) rigorously spot-check drivers. Of Finland's traffic deaths only 17 percent—about 100 a year—are alcohol related, compared with nearly half the 45,000 highway deaths in the U. S.

it's how much alcohol goes down your throat.

Ethanol is a simple molecule; its affinity for water takes it everywhere in the body that water goes. Blood, being mostly water, is the transport, and the amount of alcohol in it is expressed as a percentage, say 0.1 percent blood alcohol concentration (BAC). Because of differences in metabolism and a greater proportion of body fat, a woman will tend to feel the effect of alcohol more quickly than a man of the same weight. Fat does not easily absorb water, thus concentrating alcohol in the blood.

Alcohol enters the bloodstream through the small intestine and, to some extent, through the stomach. (A fraction exits in breath, sweat, and urine.) If you eat while you drink, alcohol is absorbed more slowly and with less effect. But on an empty stomach or if carbonated—champagne, whiskey and soda—it moves more rapidly to all vital organs.

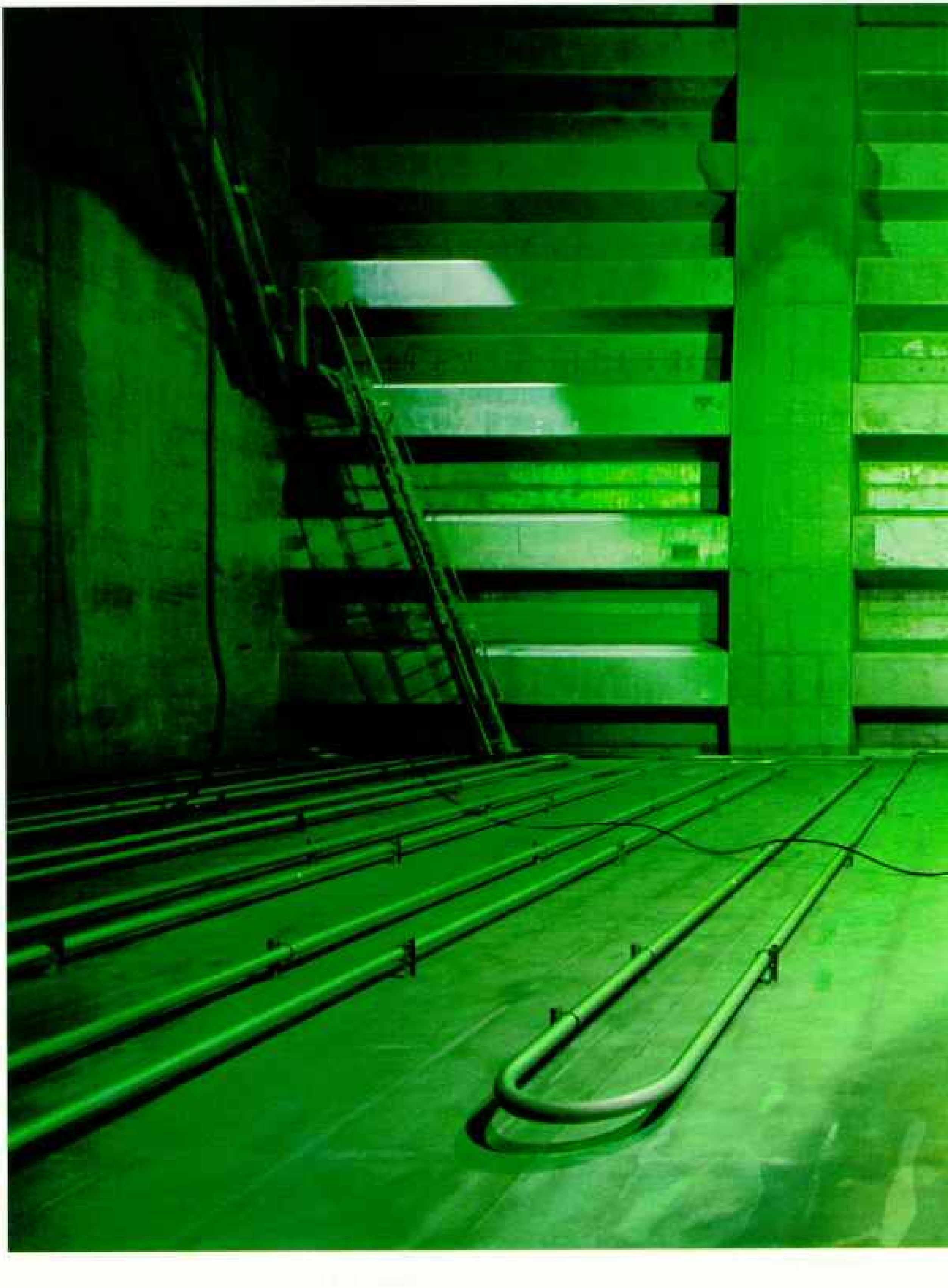
In the brain, alcohol crosses easily into and out of the nerve cells, somehow altering neuronal transmission to bring on its intoxicating effect. Expectations are important. A heavy drinker with the shakes orders a vodka tonic from a distracted bartender who forgets the vodka. Unaware, the man drinks, and feels momentary relief.

ALCOHOL is chiefly metabolized—chemically deconstructed—in the liver, through which the entire blood supply circulates every four minutes. Enzymes in the liver metabolize alcohol into acetaldehyde, a highly toxic chemical, which is then converted (in the liver and elsewhere) into acetate, and finally into carbon dioxide and water.

The process is slow, roughly three hours for each ounce of pure alcohol. Despite a vigorous folklore, virtually nothing will speed up the liver or sober up the intoxicated. Coffee on top of a toot only produces a wide-awake drunk.

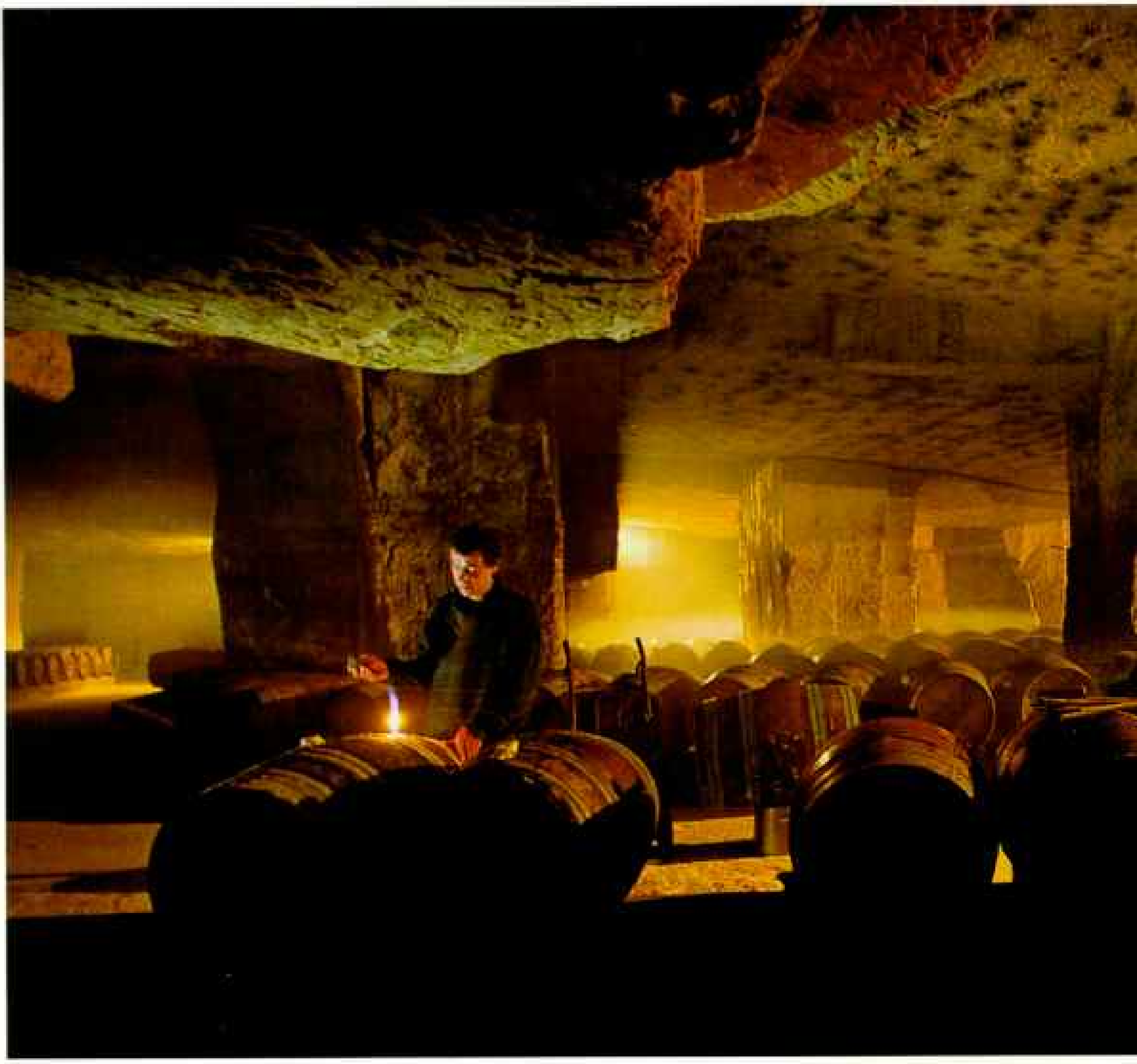
Alcohol is a depressant of the central nervous system. By depressing both inhibitory and excitatory neurons, alcohol can produce in different people (in different settings and with different expectations) the life of the party, the bore, the morose recluse, the fighter, the rake. "It provokes the desire," wrote Shakespeare long before science examined the endocrine system, "but it takes away the performance."

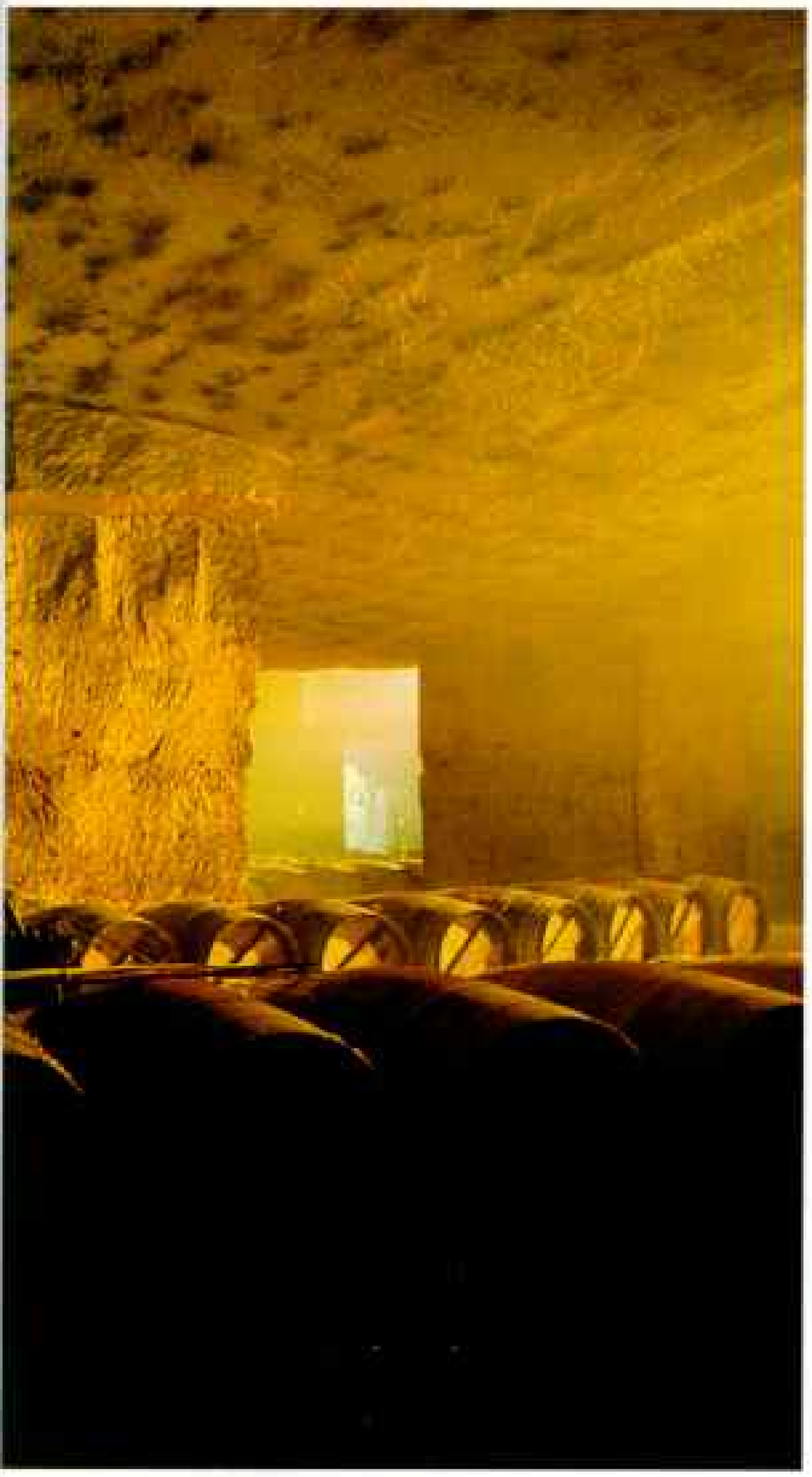
Alcohol is a historical but hazardous anesthetic, with a narrow range between deadness and dead. At a BAC of 0.4 to 0.6 percent, the



Hosed down and sterilized between loads, this 500,000-gallon tank on the Norwegian ship Bow Saphir *is routinely used to transport alcohol to ports all over the world. Filled to the brim,*

the ship's tanks have carried alcohol used in cosmetics, paints, varnishes, inks, fuel additives, drycleaning fluids—and premium vodka.





"Every wine lover's idea of heaven," writes connoisseur Hugh Johnson about Saint-Émilion, a village in southwestern France famous for its elegant red Bordeaux wines. "Nowhere is the . . . life of a little city so deeply imbued with the passion for making good wine."

That spirit lingers in the cellars of Château Belair (above), where wine makers use sulfur to burn off oxygen from the oaken barrels in which wine is aged. Storing Merlot and Cabernet in oak extracts tannin from the wood, adding to the wine's character.

French children learn to drink wine early and often—a habit that makes France the heaviest drinking nation in the world. "If you drink a bottle of wine every day, it becomes like bread," explains Pascal Delbeck, master wine maker at Château Belair.

comatose drinker goes into respiratory failure. Alcohol poisoning is death by asphyxiation.

A few drinks may make you drowsy, but they can also interrupt patterns of sleep. Over time heavy drinking can bring on brain and heart damage, gastritis, pancreatitis, anxiety, malnutrition. It can depress the immune system. Heavy drinkers show a higher incidence of throat cancers (they're often heavy smokers—likely a synergy at work). Depression is more often the result of heavy drinking than its cause.

A pregnant woman takes a drink. Within minutes her fetus has the same drink. Alcohol is one of the leading known causes of mental retardation in the Western world. It can damage the vulnerable developing brain and may impair placental function as well.

Fetal alcohol syndrome (FAS) brings into the world skinny and retarded babies. (See "The Preventable Tragedy—Fetal Alcohol Syndrome," pages 36-39.) A far greater number (those with fetal alcohol effect, FAE), however, have more subtle symptoms that are rarely attributed to mothers drinking.

"You don't have to be an alcoholic to hurt your baby; you just have to be drinking enough and pregnant," says Ann Streissguth, one of the University of Washington team that first defined this syndrome. "A really dangerous time is before you know you are pregnant, so the best recommendation is not to drink when planning a pregnancy. As few as one or two drinks a day, or four or five at a time, even if done infrequently, may have an effect. I don't necessarily mean retardation. We're talking about subtle deviations, mostly behavioral. The FAE youngsters often have trouble paying attention and thinking abstractly. The research on FAE kids is just so meager. They could be a huge population."

MRS. K, age 55, was lying face up on stainless steel. I knew her name because it was printed on her thigh with a felt-tip pen. She was slit open ready for autopsy, the vital organs on a tray at her feet. A wood block was beneath her head, her mouth wide open in a terrible last gasp.

Martti Tenhu, the chief medical examiner for Helsinki and environs, was holding Mrs. K's heart in his hand. "This is the heart of a typical alcoholic, twice the size it should be. I expect she drank a truckload of vodka in her lifetime."

He scissored open the coronary arteries, which supply blood to the heart muscle.

"Smooth as a baby's. Typical of a daily drinker. Alcohol must help somewhat in fighting arteriosclerosis, but the bad effects of heavy drinking overwhelm this good effect. Alcohol is toxic to the heart muscle and the brain. It's very dangerous to say to Finns, 'Take two or three drinks a day, and it will be good for you.' They will take ten or twenty. If you're taking ten drinks a day, you may have smooth arteries, but you're dead at 50."

He snipped open her stomach, the upper end reddishly irritated by her heavy drinking. "That's hemorrhagic gastritis."

When they drink, Finns tend toward explosive binges. There are ferries that ferry Finns nowhere in the Baltic except into stupor. They come down the gangway, vapors in the air, their duty-free bags clanking heavily with bottles of vodka.

Elsewhere in Helsinki a dozen cops line up in the middle of the freeway with hand-held breath analyzers. "Here, blow"—and the Finns compliantly blow, rarely to .05 percent BAC, Finland's threshold for driving while intoxicated (half of what it is generally in the U. S.). They don't drink and drive, and they don't drink and work ("Work interferes with drunkenness!"). But their drinking reaches the heart.

"The heart pumps 35 million times a year," Martti said. "This one is so flabby and enlarged from heavy drinking that it wasn't pumping very well, so the blood accumulated in the lungs and caused edema, or excess fluid.

A master's degree in wine is the goal for prospective wine stewards at L'École des Métiers de la Table in Paris, a culinary school where renowned sommeliers instruct in all aspects of their art. During a two-year program candidates study everything from the characteristics of soils to the nuances of taste exhibited by the world's great wines. Patrick Tamisier (above), sommelier at Restaurant du Grand Vefour, "chews" a sip of port to discern its flavor while noting its texture, clarity, and color.

It bubbles up like Coca-Cola when you squeeze them." He placed Mrs. K's sodden lungs on the scale—twice the normal weight. He squeezed them and they fizzed.

Nearly one-third of her heart muscle was useless scar tissue, caused by drinking. "There wasn't enough blood to supply this large heart with sufficient oxygen. These heavy drinkers may get heart arrhythmia a hundred times during their lives. Then one day, like this lady, they drop dead of heart attack."

IN DOWNTOWN SEATTLE, Dutch Shisler found Tommy collapsed on a bench at a bus stop, his scalded face vacant of expression, his mouth gaping as though he had run out of air and had expired with his eyes open. Fetid and bruised, Tommy was as near death as any human I had ever seen.

Tommy was undoubtedly malnourished (chronic alcoholics often avoid food, prolonging their drunk, eating empty calories from the bottle), but he was deceptively huge, and bloated.

"Come on, Tommy," Dutch said, touching his elbow, "we'll get you help."

Dutch runs the county detox vans. He picks up drunks in the downtown core, its fulcrum at Pioneer Square on Yesler, the original Skid Road (from which "skid row" is derived) that once sent logs off the hill to Puget Sound. Dutch chucked Thunderbird empties into a trash can.

Severe alcoholics will drink anything containing alcohol—Sterno, Old Spice, Windex, Nyquil, Aqua Net, Lysol—but they prefer cheap fortified wines that even wealthy alcoholics living behind security gates have been known to buy in order to conceal their expenditures. Only a small fraction of the ten million or so alcoholics in the United States slide into skid row. Alcoholism hides behind a collaboration of denial—in the board room, the East Room, the Capitol steps, out on the tractor.

Dutch and his partner, Dennis, lifted Tommy into the van and headed for Harborview Medical Center.

"We got 15,000 calls last year," Dutch said, "most of them for the same 4,000 drunks. The guys all know us, and they love us. We treat them with a lot of respect. We know they're not scum. We've been through it."

Sitting there in his black slacks and white cotton sweater, a bald fireplug of a man with a waxed mustache, Dutch looked the picture of buoyant health. He has been sober 21 years. "I want them to see how good you can look when you recover," he said. "I should be dead."

From a life of heavy drinking Dutch had developed cirrhosis of the liver, a potentially fatal disease in which alcohol kills liver cells and plugs the liver with fibrous scar tissue. Dutch's belly had swollen with fluid, and blood pressure had built up in the fragile veins of his esophagus. They ruptured, and he was hospitalized for a year, during which he bled 56 pints of blood.

"Then I went out and drank for seven more years. Alcohol gave me courage. I couldn't ask a lady to dance unless I had a few drinks."

For 20 years Dutch tended bar, drinking the profits. He ended up boozing on skid rows all over the country, finally waking up in Seattle after a blackout, not knowing where he was or how he got there. "Alcoholics like to take 'geographic cures,' thinking they're starting over. It's really an excuse to drink, because you can't face life. You go off and drink where nobody knows you or gives a damn."

Through a nurse at the Veterans Administration hospital (he married her) and Alcoholics Anonymous, Dutch quit drinking.

As we pulled up to the hospital, Dutch turned in his seat. "I was just like these guys, eating out of garbage cans. Now I put my hand out to people. I want to help them stay sober."

Dutch and Dennis got Tommy onto a gurney and rolled him into the emergency room.

ALCOHOL, in excess, is by far the most devastating of drugs—wrecking families and friendships, impairing health, filling jails, hospitals, and morgues. In 1990 it cost American society an estimated 136 billion dollars and more than 65,000 lives, 22,000 of them on highways.

The invoice for damages does not lie entirely on that severely afflicted minority we call alcoholics. Much of it is from other heavy and even moderate drinkers—there being so many more of them—who are not yet, but could become, alcoholics. (The point where heavy drinking merges into alcohol dependence is blurry.) Ten percent of drinkers in the United States drink heavily—they account for half of all alcohol consumed.

The scale of damage dramatically reflects shifts in national consumption. The French remain the world's heaviest drinkers, but in drinking a third less than they did in 1955 their alcoholism deaths have dropped by nearly 60 percent. In 30 years, as Hungarians have nearly doubled their drinking, deaths from liver cirrhosis have risen more than fivefold.

The problems vary with the drinking patterns: the binging Finn who would never drink and drive but falls on his knife in a drunken fight, the Italian who doesn't get overtly intoxicated on daily wine but dies prematurely (and painfully) from a cobbled, cirrhotic liver that never got a rest.

Why people overdrink is as complex as the

A drunken man is close to God, say the Quiché Indians of Guatemala, who mix Catholicism with traditional Maya beliefs. Good Friday celebrants throng the streets of Chichicastenango, where

rum is sprinkled in churches to speed prayers to heaven. Intoxication has long seemed to hold mystical powers; wine was used in Mesopotamian rituals more than 5,000 years ago.

drinkers and the cultural milieu in which they drink. Habits, customs, attitudes, and relative price all influence abusive drinking and the vulnerabilities—genetic and otherwise—of alcoholics.

Many experts, especially in Europe, are troubled that rigid adherence to the disease concept (you either are or you aren't an alcoholic) has made it more difficult to get at problem drinkers before they develop a severe dependence. "Tell a young, five-a-day drinker that he's an alcoholic and has to give up drinking for life," says Yedy Israel of Ontario's Addiction Research Foundation, "and he'll walk out of your office."

Alcoholism cannot be explained simply by heredity, but a history of alcoholism in the family is a sign one is at higher risk.

Scientists are also looking for biological markers —possibly variations in neurotransmitters like serotonin, certain blood platelet enzymes, and brain waves. What the researchers eventually want is to identify the influential genes.

Henri Begleiter, a neuroscientist at SUNY College of Medicine in Brooklyn who uncovered a brain-wave marker in sons of alcoholics, told me, "There are different types of alcoholics, just as there are different types of diabetics and schizophrenics. A little elevated blood sugar doesn't necessarily make you a diabetic, but you could be on your way. There are people—Churchill was a perfect example—who put away an enormous amount of alcohol and function rather well, and do not suffer any notable effects. Are they alcoholic? My answer would be no. You need a cluster of symptoms leading to dependence. Craving is pivotal.

"There are those who drink because they are depressed, and it makes them feel better. The risk takers seem to drink just to get a high. Others say, 'It makes me feel normal'—and they may actually perform better when drinking. Still others say they drink to feel different. The truth is that most people drink at various times for all these reasons.

"Alcoholism is different from Huntington's chorea, a directly inherited disease caused by a single gene—you have the gene, you get Huntington's. What you inherit in alcoholism is not a disease, it's a predisposition. I'm speculating, but this predisposition is probably neither unique to alcoholism itself nor characteristic of it. You probably inherit some genes, each with small effect, that make you susceptible not only to alcoholism but also to a number of dysfunctional behaviors influenced by your environment.

"I believe very strongly—though this is conjectural—that while biological factors predispose you, environmental factors determine the final outcome. The old nature versus nurture argument is meaningless. We are dealing with a behavioral disorder in which biology interacts with the environment. An alcoholic is made, not born."

Potent as beer but far cheaper is Mexico's pulque, made from fermented sap of the maguey plant (left). Only licensed pulquerias may sell the beverage, which quickly spoils and must be served the day it is made. In Mexico City's pulque market prospective buyers (below) sample the gluey drink.

SEOUL AT 1 A.M. is like the tail end of a fraternity bash. Drunk Koreans in suits bend over their wing tips in positions of emetic discharge. I found it odd that so many drank so much, for about half of

Business and the bottle are partners in Japan, where a group of trade unionists (above) let off steam at a convention in Atami. In Tokyo each night the streets fill with businessmen reeling from hours of drink. "It's dangerous to refuse your boss's offer to go drinking," explains a Japanese journalist. "Very important decisions are made in the drinking spots."

Yet Japan's alcoholism rate—less than 4 percent of drinkers—is half the U. S. rate. This may be due in part to a genetic trait: About half of Orientals lack an active enzyme that metabolizes acetaldehyde, a toxic chemical derived from ethanol—so when they drink, they become ill.

Three sips of sake, a traditional drink made from fermented rice, seal the Shinto wedding vows of Mr. and Mrs. Keiji Hirao (left).

Orientals carry an altered gene that makes drinking unpleasant. The mutation renders inactive an enzyme that metabolizes acetaldehyde, prolonging the buildup of the toxic chemical. In a range of reactions from mild to severe, faces flush, people sweat and sicken.

Yet in countries like South Korea and Japan the social pressures to drink are so powerful that most of the men (and now half of Japanese women) drink nonetheless. In the past 30 years South Koreans have had an explosion of heavy drinking. The country now consumes more spirits per capita than does any other nation.

On the streets of Japan you can pull a lever on a vending machine and get Scotch and soda in a can. The Japanese drink about twice what they did in the 1950s. Perhaps in no other nation is drinking so expensively and tightly woven into business. Drinking after work is not only an extension of the company, it is virtually a requirement. Refuse the boss's offer to go out drinking, and your standing in the firm begins to slide.

Tokyo is an endless bar interrupted by streets. I had drinks with a television producer in the Ginza. The hostesses descended—the men love this—pouring the Scotch, patting the ego. In their dressing rooms the women have charts of the quotas they must push. If a customer welches on his monthly tab, the hostess has to stand the bill. Few can afford to. The goons move in, pay her debt, force her out of the bar and onto the bed.

The hostess beside me was exhausted. "I like drinking. I drink when I'm depressed. This life is really awful."

DRINKING TALK in Italy is food language (*aperitivo*, a vermouth before meals, and *digestivo*, a brandy after—parenthetical to the dominance of wine at the table). The *osterias* are not dark and furtive. They open onto the street, where kids go for ice cream and old men have their coffee (and maybe a brandy) and play cards.

Alcohol consumption in Italy has been going down, as in many parts of Europe, but it is still relatively high. This is wine country, and most Italians drink. The shame in Italy is not that you drink too much but that you can't hold it.

It may be rare to see a drunk Italian, but 20,000 Italians die each year of cirrhotic livers. Roughly 9 percent of the population are estimated to be alcoholics. The sports cars roaring away from the discos often end up resembling

aluminum foil. The police almost never test for blood alcohol.

"Culture gives you rules, which are important, but no guarantees," says Amedeo Cottino, professor of sociology at the University of Turin. "Italy has had alcohol problems a long time, but always hidden. My grandfather drank only one glass of wine at meals—a one-liter glass. Recently an advertisement for Martini & Rossi announced, 'You can drink it anywhere, anytime, with anybody.' That breaks all our rules, which link alcohol with meals. This Anglo-Saxon pattern of drinking is coming, but accepting it seems to me to be dangerous. We don't look for excuses to drink. Our country doesn't require it. In your world you drink to get happy. In the Mediterranean world you drink *if* you are happy."

DRINKING has gripped the Russian character like a python. It is a custom of inexplicable tenacity, with roots beyond memory, beyond Grand Prince Vladimir's pronouncement: "Drinking is the joy of Russia. We cannot do without it." This was not lost on the Japanese at Mukden, Manchuria, in 1905, who came upon thousands of drunken Russian soldiers and skewered them on bayonets.

When a Russian wants to drink, he flicks his throat. Peter the Great, a phenomenal boozer, is said to have rewarded a loyalist with free drinking privileges by branding him under the chin. The man could then walk into any dismal *kabak* (bar), flick his throat: I'm the guy, set 'em up.

Russian drinking is by toasts and to oblivion. Straight, room-temperature vodka, down the hatch, no sipping, three glasses in a row—for starters. To your health, to your mother, to the moon—invent something. "Come on, *drink up!*" and the guest had better. Toast a birth—"washing the baby." A soldier plops his medal into a glass of vodka, passes it around the table of expectant lips. Washing the medal. Repairmen in the apartment *demand* vodka. Washing the walls.

Explanations for this are thin. "Our national tradition," a Russian said, "is to drink for any reason, or for no reason."

In 1985 Mikhail Gorbachev slammed the lid just shy of prohibition, closing distilleries, breweries, bars. Alcohol poisonings, which were killing as many as 40,000 Soviet citizens each year, dropped, but everything from shoe polish to insecticide began appearing in autopsied stomachs. And *samogon* (moonshine) drew down sugar supplies almost overnight.

Controls have eased, but there are still few places to drink. The restaurants are impossible to get into, and flats are crowded with

"I am drinking stars!" Legend quotes Dom Pérignon, the Benedictine monk credited with inventing champagne by accident while trying to make white wine. Three centuries later his concoction still sparkles for patrons of the San Francisco Opera (right) during intermission on the season's opening night.

Sipped the world over to celebrate special occasions, champagne gets its extra kick from carbonation, which speeds alcohol's entry into the bloodstream and to the brain.

disapproving relatives. Russians drink "under the blanket" in the alleys, the parks, on the sidewalks.

Buying a bottle requires inestimable endurance—three, four hours in line, assuming they don't run out before you get there. So you slip up the alley where well-lubricated workers in blue coats run a nice little blue market off the loading dock.

At a liquor store near Red Square drunks crashed the queue. Fists flew. A well-dressed woman was enraged at having waited two hours to buy a bottle of wine for her dinner guests. A nurse, with duty approaching, left carrying nothing.

Moving into the gap was Alex. "I am a graduate student in theoretical physics."

One of the theories that Alex seemed to be testing at the moment was Newton's. Swaying, he spoke very slowly with labored articulation, as though I were a cop with a flashlight in my fist.

"It's difficult finding good eau de cologne these days."

"Why do you drink it?"

"Can't find anything else. Sometimes we drink antiperspirants."

"Anything you won't drink?"

"Window cleaner."

That night I attended a meeting.

"My name is Slava, and I am an alcoholic." Slava, a former KGB man, was speaking to the Rubicon Group, one of Russia's nascent experiences with Alcoholics Anonymous (AA).

"I never liked the taste of vodka, I liked the effect. But eventually I didn't get the effect. I

tried to kill myself." Across Slava's wrists and forearms were corded scars.

The meeting was in Hospital 17, the largest one of its kind, full of alcoholics hospitalized for six months and forced to do scut work at the ZIL automotive factory. The participants described "torpedoes" containing a drug like Antabuse surgically implanted in their buttocks, causing toxic acetaldehyde to build up, with consequent pain and nausea, should they ever drink again.

Alcoholics who refuse hospital treatment are imprisoned for two years in "labor camps," where they saw and carry logs and are injected with painful drugs for "discipline." They can't get jobs once out, and if caught drinking are thrown back in. Alcoholism is a punishable disease.

Slava said, "AA is the only way out."

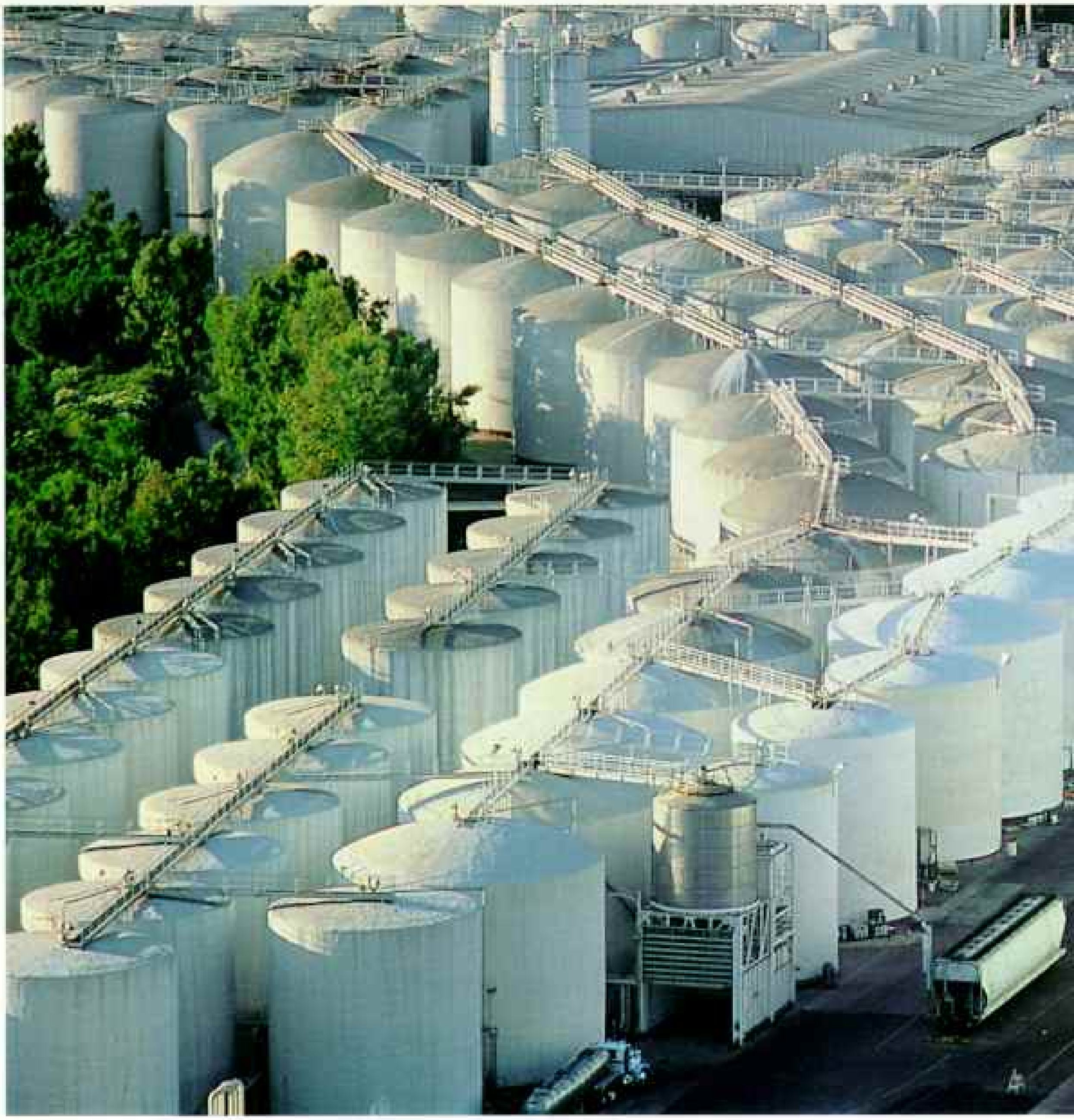
THE RUBICON STORIES resonate with the ones I heard in the U. S. and Canada. Each different, each similar. Tales of incredulity ("I had no idea it would come to this"). Tales of elaborate deception (Jill, the "lace curtain housewife," watering her husband's decanter to disguise the whiskey she sneaked, hiding Dixie Cups of vodka around the house. Gabrielle, wearing a sweat suit to medical school to hide the bruises from falls in the shower). Tales of extraordinary wreckage (Jake, whose wife drank herself to death, whose alcoholic son and daughter both committed suicide), and tales of white-knuckle sobriety.

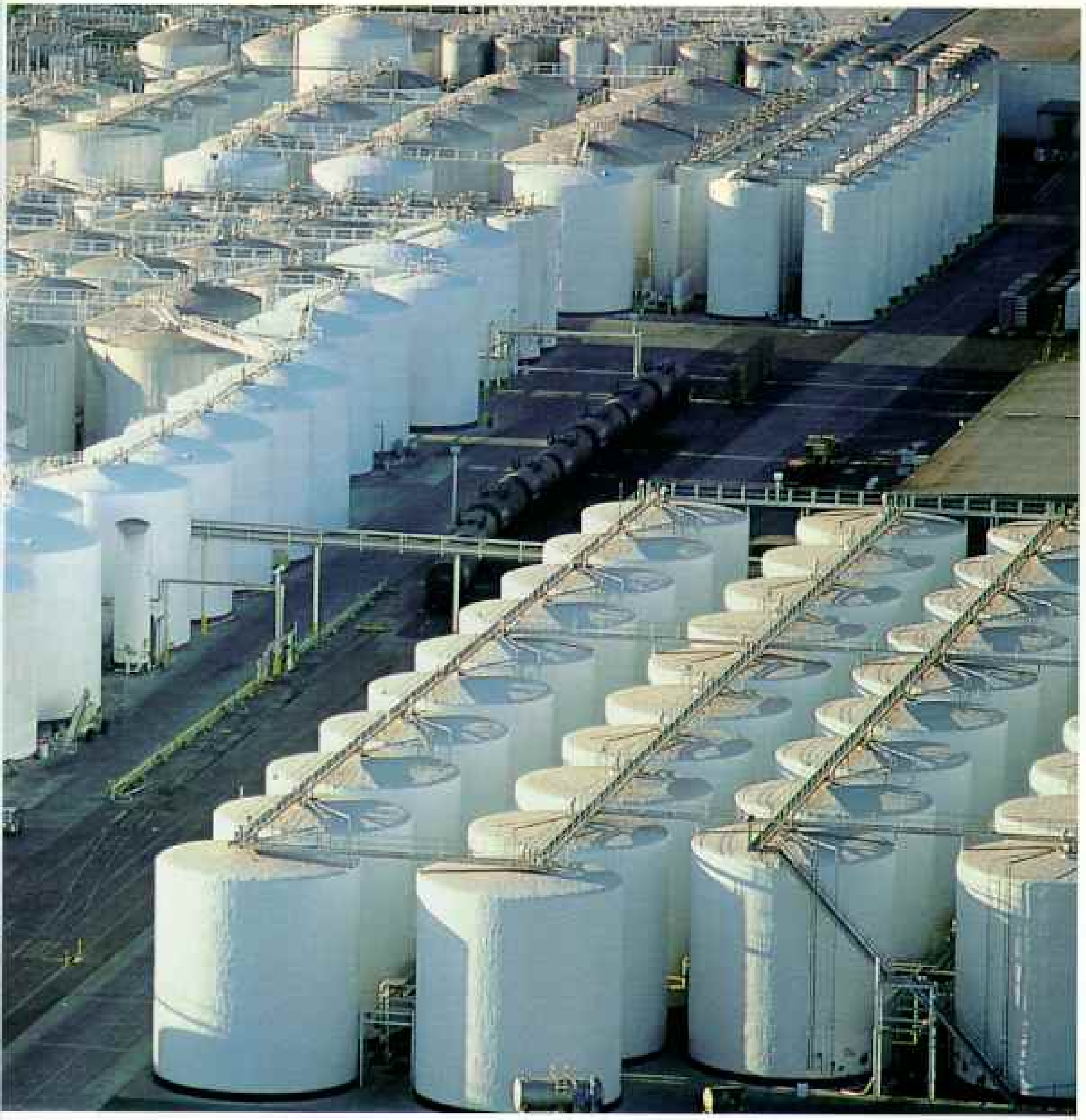
None are compelled to speak at AA, but they do, often in vivid detail—the shapes of bottles, the names of bars and brands, the taste (wretched and delicious), the craving, the hurt, the candor, the jokes (Alcoholics Alias—you keep drinking, but under an assumed name). Founded in 1935 in Akron, Ohio, by two desperate alcoholics, a stockbroker and a surgeon, AA could count in four years only a hundred members. It now exceeds two million worldwide. AA remains a remarkable fellowship of mutual and spiritual support that has endured in simplicity. No dues, no bureaucracy, no minutes, the only condition for membership being a desire to stop drinking. The cornerstone of the program is abstinence.

But AA has its limitations, as does every method of treatment. "Prolonged inpatient treatment appears to contribute nothing additional to outcome. . . . alcoholism is a disease

Desperate hours pass during the day of every alcoholic, whether a Sioux war veteran (above) reduced to drinking the alcohol in hair spray or a white-collar professional in Seattle's King County Detoxification Center (right). "Maybe 10 percent of our patients 'see the light' and get help," says county administrator Steve Freng. "The others we see again and again."

Though no genetic cause for alcoholism has been proved, recent studies suggest a genetic predisposition. The son of an alcoholic, for example, is four times as likely to become one, even when adopted into a nonalcoholic home. Yet children of alcoholics account for only a fraction of the ten million alcoholics in the U. S. "Any of us can become addicted," cautions one researcher, "if we drink enough long enough."





Refining wine is big business for the E. & J. Gallo Winery in Modesto, California (above). The world's largest wine maker, Gallo helped pioneer the use of stainless-steel tanks, which are easily cleaned, resist deterioration from wine acids, and allow precise temperature control during fermentation. Last year Gallo bottled and shipped at least a quarter of the wine sold in the United States.

In 1990 U. S. companies produced eight billion gallons of alcoholic beverages; 75 percent of that was beer. Selling it is a challenge for brewers like Stroh, whose low-priced Old Milwaukee beer competes with dozens of brands for the attention of males under 30. Selling suds with sex, one of the company's current television ads shows a group of guys in the mountains. "It doesn't get any better than this," one declares. Then an Old Milwaukee truck shows up, and the "Swedish bikini team" drops in for a party. During filming of the commercial, a member of the team (left) prepares for a camera close-up. Last year alcoholic-beverage makers in the U. S. spent more than two billion dollars promoting their products.

that is highly treatable, but . . . will require great responsibility from the patient," writes George Vaillant of Dartmouth College. "In alcoholism, as in much of medicine, we dress the wound; the individual's own resources heal it."

NATIVE AMERICANS are seen less for their diversity than for stereotype: noble savage or drunken Indian. What this simplistic convention misses is history. Many Indians refused to drink. And if other Indians couldn't hold their liquor, neither could anyone else. The trappers drank like fools. The frontier was awash in sots.

Yet the collective reality is grim. Alcohol is implicated in three-fourths of all traumatic Native American deaths. Indians have a high incidence of FAS, and three times the overall U. S. rate of death by cirrhosis.

Dale Walker is a psychiatrist and director of addictions treatment at the VA hospital in Seattle. He is Cherokee. "There is tremendous pressure in this country to conform. And when a group like the Indian doesn't, there's a sense of failure. Wouldn't it be nice if whites were right that Indian alcoholism is a genetic weakness? This ignores their tremendous cultural depression over many, many years. Their alcohol problems are huge. But the reasons are so perplexing. You hear the Alkali Lake success story, and you hear the *sadness*."

Alkali Lake is a tiny Indian reserve (one mile square) in the interior of British Columbia. By 1965 virtually the entire village was fulminously alcoholic. Bootleggers sold openly from

the trunks of cars. There were drunks in the street, gang rapes, family brawls, fractured ribs, broken windows, abandoned children.

This was dramatically reversed by the prodigious efforts of Phyllis Chelsea and her husband, Andy, who was chief, to quit drinking and get the rest of the village to sober up. With guidance from a Roman Catholic oblate, they started an AA group. For the first year no one else came. Then Mabel showed up. One night Evelyn walked in.

Andy encouraged the Mounties to shut down the bootleggers (he had been one himself), got the council to put welfare checks on vouchers (good at the store for food only), and pressed the drinkers to go to Alberta for treatment. There were threats. Andy thought it wise to carry a rifle in his pickup.

"There is a healthy environment here today," said Phyllis, now 19 years without alcohol, "but as people began living sober, they had to learn how to work together. And that involved a lot more than staying sober. We still have people who drink. They have to hide it. I imagine there are people out there who think that moderate drinking is OK, but we don't think so."

Her cousin Freddy Johnson got drunk and burned down his house. He almost killed his father in a fight. Today he is the school principal, sober, articulate.

"It doesn't make any difference how well educated or how rich you are," he said, "you can become an alcoholic. I don't want to blame the government for our alcoholism, but this little square mile has something to do with it. Unemployment here is about 40 percent. Being sober and having nothing to do is as bad as being drunk and having nothing to do. We just drank to get drunk, to get back to that high feeling. But I'd always go beyond that. And that's when problems came.

"Alcohol is a real mystery."

SUNDAY AFTERNOON I assume the autumnal position of American Guy (supine on couch) to watch football, a sport subdivided by that quintessential American art form: the warm-buddies beer commercial.

A cynic might see something slightly cockeyed in these scenes of robustly handsome yuppies coming off their lobster boats in flannel shirts and teased mousse hairdos, backlit by the slanting glow of sunset, punching shoulders, and retiring to the company of incredible-looking women in the coziest tavern on the coast of Maine.

Am I envious? Sure, having never found anything quite like this chummy tableau. These commercials have captured on one minute of tape all the romance, the yearnings, the fellowship of alcohol and mankind.

But then life isn't a beer commercial. □

Nightly bouts with the "beer bong" test newcomers to Daytona Beach, where each year 300,000 college students party their way through spring break. "All you need is a toothbrush and an attitude," says one veteran. A sobering thought: The young drinker with a "hollow leg" may be more prone to alcoholism than one who is quickly inebriated.

THE PREVENTABLE TRAGEDY

FETAL ALCOHOL SYNDROME

Text and photographs by GEORGE STEINMETZ

"When Malcolm was born, I thought my heart would break," she said. "And, oh my God, the guilt. . . ."

Ellen O'Donovan* was losing her fight against alcoholism when she discovered she was pregnant. Months later her son was born with fetal alcohol syndrome, and his battles began.

I met them both in Dublin, where my photographic coverage had brought me. Ellen and her three-year-old son, Malcolm (left), live in a small town on Ireland's north coast; they had ridden a bus for six hours to visit Malcolm's doctor, a specialist who is treating the boy for severely defective vision, one of his many alcohol-related disabilities.

First identified about 1970, fetal alcohol syndrome (FAS) is a term used to describe the damage some unborn children suffer when their mothers drink during pregnancy. Alcohol in the mother's bloodstream can be toxic to the developing fetus depending on the stage of pregnancy and how much she drinks. Damage can range from subtle to severe, causing clumsiness, behavioral problems, stunted growth, disfigurement, mental retardation.

Ellen's doctor had told her that an American journalist wanted to photograph her with her son. She consented in hopes that others could learn from her mistake, but when I began unpacking my cameras, she hesitated. Then she took a deep breath and began to talk.

"I was drinking a bottle of vodka a day that December," she said grimly, "so out of touch that I didn't even know I was two months pregnant. When I found out, I quit there and then, but the damage was done."

The O'Donovans are not alone. Thousands of babies are born with alcohol-related defects each year, ranking FAS as one of the leading known causes of mental retardation.

According to his doctors, Malcolm was undersized at birth, with kidneys and a stomach that didn't work properly; he had to be tube-fed until he was 14 months old.

His head is smaller than normal, and he also has facial abnormalities typical of FAS children—small wide-set eyes, a thin upper lip, a short upturned nose, and a receding chin. He was born with damaged corneas, and his eyelids drooped. Surgery later gave him limited sight in his right eye.

FAS is irreversible, and during our session it became clear to me that Ellen has dedicated her life to caring for her son. "He doesn't seem retarded, thank God," she said. "He's even starting to talk a little. I'm working with him every day, helping him learn to do the things normal kids do."

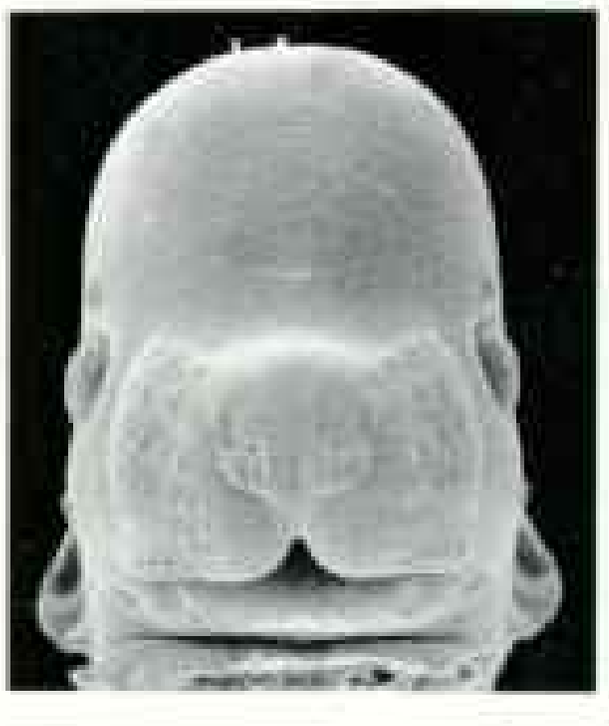
I was moved by the way she held him and comforted him in Gaelic when he started to cry. "If this little boy hadn't come along, I might have drunk myself to death," she said quietly. She hasn't taken a drink, she added, in three and a half years.

Still, it isn't going to be easy. Unemployed and living with her mother, Ellen plans each day around Malcolm and the frequent trips they make to his doctors in Dublin. When I offered to reimburse her for the bus fare, she declined. "Just tell women out there that if they want to have a baby, leave the drink out of it," she said. Then she kissed her son on the top of his head and they were gone.

**Real names are not used.*

A large dose of alcohol given to a pregnant mouse produced severe abnormalities in the developing fetus (bottom), according to doctors at the University of North Carolina studying effects of alcohol in early pregnancy.

Compared with a normal fetus (top), the one exposed to alcohol suffered eye



R. K. SULIK, UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL

damage, a stunted brain, and facial deformities similar to human babies with FAS, particularly those affected during the first trimester, when bones and organs are forming.

Blood-alcohol levels reached during the experiment approximate those that could occur in a woman of average size if she drank a quart of vodka within a 24-hour period.

I met them in every country I visited—some with tiny, twisted bodies, others with faces tragically skewed. Some were agitated, while others seemed quite normal. Each encounter was disturbing, for few things compare to the sadness of a child stunted by FAS, or made miserable by a group of more subtle abnormalities known as fetal alcohol effect (FAE).

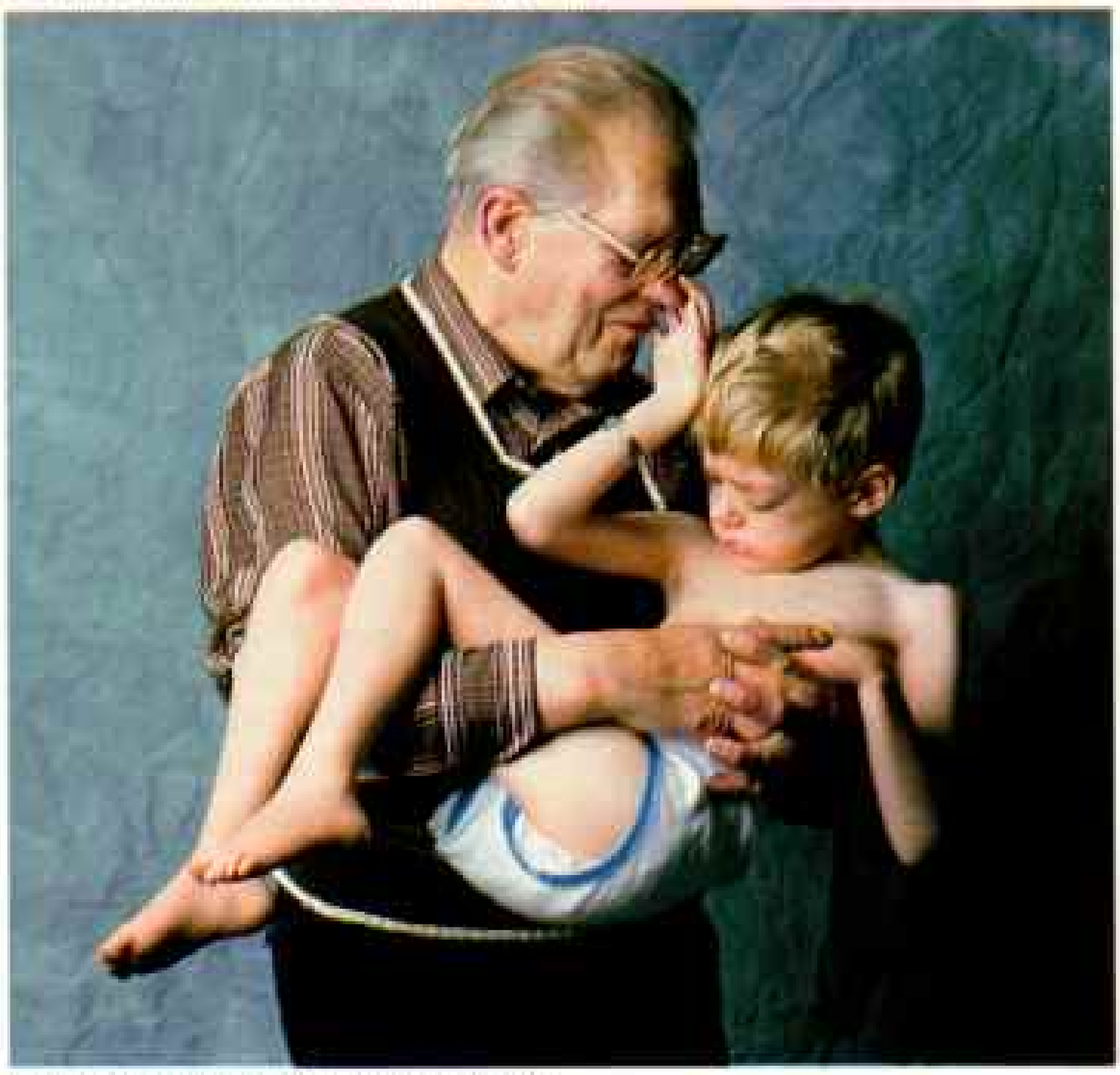
"What's really sad is how many FAS and FAE kids go through life undetected," says Ann Streissguth of the University of Washington, a specialist in FAS behavior. "It takes a trained eye to spot FAS, even in the severely retarded. And in FAE, mildly retarded kids are often misjudged because they tend to be talkative and outgoing. No one dreams their nervous systems are impaired."

As the FAE child grows, such positive traits are often muted by alcohol-related shortcomings—impaired memory, brief attention span, poor judgment and capacity to learn from experience. Some victims drop out of school in frustration or wind up on the margins of society.

Fetal alcohol damage shows itself differently in every child. In the Soviet Union I met a boy, a teenager, who was continually trying to stab his playmates with scissors; in Sweden I met a wonderful little girl who was so sweet and beautiful that I felt I was photographing an angel.

Little is known about the

FRATERNAL TWIN GIRLS, FIVE MONTHS OLD; FRANCE



FIFTEEN-YEAR-OLD BOY WITH FATHER; SWEDEN

THREE-YEAR-OLD GIRL; SWEDEN

TEN-YEAR-OLD GIRL; CHICAGO

SIX-YEAR-OLD BOY; SEATTLE

FOUR-YEAR-OLD GIRL; GERMANY

SEVENTEEN-YEAR-OLD BOY; SEATTLE

thresholds of alcohol that cause FAS. Genetics may also be a factor. Even with fraternal twins one might have severe FAS, while the other is mildly affected. Not all mothers who drink have FAS babies. Some doctors believe that any alcohol puts the baby at risk, while nearly all agree that binge drinking is perilous, especially during the first 12 weeks, when signs of pregnancy are few. As Ellen O'Donovan lamented, "I didn't even know I was pregnant. That's the tragedy of it." □

The Great Soviet Exodus

By TAD SZULC
Photographs by JAMES NACHTWEY MAGNUM

For years Soviet Jews dreamed of emigrating. Today the government lets them go. As well-wishers wave good-bye to friends and family, Israel rushes to absorb one of the largest peacetime migrations of this century.

Free to emigrate, Soviet Jews converge on the Israeli Consulate General in Moscow to secure their entry visas. Since 1989 political instability, economic disintegration, and fear of anti-Semitism have driven many from the Soviet Union; some have been drawn to Israel by the

Zionist dream. All told, by the end of 1992 half a million new immigrants will have poured into Israel, boosting its population by more than 10 percent. Despite Israel's own problems, Soviet Jews still want in. Says one émigré, "The mess in Russia is much bigger than the mess in Israel."

A toast evokes a tender kiss from Boris Wittenberg, who hosts his own farewell party in Moscow. Leaving loved ones behind to begin a new life in Israel can be disheartening, especially when confronting a train-and-plane journey of 2,300 miles. But, says Boris's teenage son, "With my father it's not a long trip."

WHEN Larisa Grinberg gets her first glimpse of Jerusalem, the ancient city that has long been forbidden to her and to other Soviet Jews, she begins to weep.

For Larisa, a teacher from Ukraine, and some 50 other Soviet immigrants just arriving as new Israeli citizens, it is an emotional moment, the end of one long journey and the beginning of another. Having spent years trying to free themselves from the Soviet Union, they have finally achieved a dream, the one envisioned in a traditional pledge that ends the Passover prayer service: "Next year in Jerusalem!"

Now these immigrants face the realities of life in their new home. Standing on the Talpiyyot ridge overlooking the Old City on a hot afternoon, they hear the first hint of the many tensions haunting the Holy Land: the whir of an Israeli army helicopter on patrol, the wail of police sirens in the distance, the straining of buses packed with too many people. Then, at the hour of evening Angelus, the mood shifts again. Church bells begin pealing, we hear the muezzin chanting, and Larisa turns to me and whispers: "With my love's picture then my eye doth feast. . . ."

Larisa explains in her Russian-accented English: "That's from Shakespeare, which I taught back home in my English literature class. You see, I knew nothing about Judaism and Jerusalem, so the first thing that leaped to my mind when I saw the city was this line from the sonnets that I've always adored."

Larisa, 30, and her husband, Sasha, 41, a surgeon, are among 350,000 Soviet Jews who immigrated to Israel between mid-1989 and the end of 1991, part of a continuing stream to the Holy Land that constitutes one of the great peacetime migrations of this century.

Few of this multitude had a chance to learn or practice their religion during more than 70 years of communist rule. But that changed under President Mikhail Gorbachev's *glasnost*, which also brought relaxed emigration policies. More than 150,000 Soviet Jews had

Bittersweet serenade at a Moscow train station marks the exit of yet another Soviet musician. One composer, who emigrated to escape the humiliation of pandering to the Ministry of Culture, likens Russia's loss of creative talent to a cultural Chernobyl. "There is no fertile soil for new vegetation," she says.

been allowed to go to Israel during the 1970s, but then the gates slammed shut for a decade.

The new immigrant flood, which has already altered Israeli society in myriad ways, may well reach a million—one-fifth of the country's present population—within three or four years. The newcomers, many of them artists and scientists, are enriching the culture and the technological capacity of Israel, and their voting power could break the longtime deadlock between conservative and liberal parties. They will certainly diminish the influence of the Palestinians—1.7 million strong—in the occupied territories of the West Bank and Gaza, lands Israel seized from Jordan and Egypt in the Six Day War of 1967.

In a region that is already deeply troubled, the immigrants add to tensions: Desperate for work, they take many jobs once given to Palestinians. For their part the Palestinians express alarm over losing out to the newcomers. "The replacement of our people by the Russians is an incredible blow," a Palestinian leader in a West Bank town tells me. "We will resist this because we have no other jobs—there's nothing to lose." Some immigrants are even settling in the occupied territories. The growing Jewish presence there looms large in Arab-Israeli peace talks launched last October in Madrid.

The influx is straining Israel's ability to absorb the Soviet Jews. "You start with a family just arrived in Israel," says Dan Biron, an Israeli friend who works for the Jewish Agency for Israel, an organization that assists immigrants, "and you see that they don't know the language. They don't know how to get health insurance, they don't know the banking system, they never wrote a check in their lives. They never had a credit card. They never used so many appliances,

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TAD SZULC, a regular contributor, is the author of *The Secret Alliance*, a new book describing the illegal relocation of more than two million Jews from Eastern Europe, North Africa, and the Middle East since World War II. JAMES NACHTWEY, a four-time winner of the Magazine Photographer of the Year award, chronicled "East Europe's Dark Dawn" for the June 1991 GEOGRAPHIC.

they never bought so many goods. So they have to be helped by someone who speaks both languages, someone who has the knowledge and who has the will. . . . Someone has to organize festivals, journeys, and lectures and set up clubs where the elderly can play dominoes." Biron's network of volunteers helps with all those things.

With jobs and adequate housing now scarce, Israel is scrambling to meet the basic needs of its new citizens. A host of government and private agencies have already spent several billion dollars to assist them, but Yitzhak Shamir, the Israeli prime minister, believes that over the next five years his country will need at least 40 billion dollars in loans, private donations, and loan guarantees to settle these *olim*, as all new immigrants are known in Hebrew. Israel has requested ten billion dollars in loan guarantees from the U. S. to facilitate commercial borrowing from banks around the world.

DURING MUCH OF 1991, I followed some olim on this latter-day exodus. It began in the Moscow winter, as they queued up in a snowstorm for exit visas, as they packed their bags and said their good-byes to loved ones, as they huddled in a cramped transit hostel in Warsaw, listening anxiously to news of the Persian Gulf war on transistor radios. I watched them emerge from airplanes in Israel—with their suitcases, boxes, dogs, cats—as they squinted and shuffled into the unaccustomed brilliance of the Mediterranean sunlight. I visited them in their neighborhoods in Tel Aviv and Haifa, where Iraqi SCUD missiles had shattered apartment dwellings. Then, following the immigrants throughout Israel, from the edge of the Sinai desert to the border towns near Lebanon and Syria, I learned, as many olim soon do, that hopes of a happier life may not be fulfilled for a long time.

Still they keep coming, for a variety of reasons. Because they fear rising anti-Semitism in the Soviet Union, because other family members have preceded them to Israel, because of political and economic instability back home—because they have an almost mystical desire to be free Jews among Jews. But unlike the pioneers who founded an independent Israel in 1948, these immigrants seem more pragmatic.

"Most of them come hoping to find a mini-America in Israel," says Amos Oz, the country's best-known novelist. As we chat in his home in the southern town of Arad, he gives his interpretation of the exodus. "The sooner they can get a house and a car—preferably two cars—and a good refrigerator full of good food, the sooner they will become solid citizens. They are the survivors of the Marxist fantasy. They come here aspiring for a middle-class fulfillment."

Semyon Minchin, a 43-year-old man from St. Petersburg (Leningrad), is still aspiring. I found him sitting outside a complex of oil-storage tanks with a .22 pistol tucked in his belt. He seemed dejected, and for good reason—in Israel he is a security guard; back home he was a surgeon. He has been here eight months and is afraid he will never pass the exam that will make it possible for him to practice medicine.

"The test is so difficult as to verge on a situation of horror," he tells me, pointing out that some unemployed olim doctors have tried suicide. "We know of such cases already," he says.

Even if Minchin passes the exam, the odds are against his getting a job. Israel's minister of health, Ehud Olmert, says Israel has too many doctors. "There's no way I am going to provide work for most of them. It's impossible," he says, pointing out that there might be positions for no more than 20 percent of the nearly 7,000 olim doctors who reached Israel by mid-1991. Just the week before, 50 newly arrived doctors had staged a hunger strike outside the Knesset, Israel's parliament, to press for relaxed standards on medical exams. Unsuccessful, they went home after two days.

"Only those doctors who are ready to work for many years for free and to work day and night will be able to find medical jobs," says Arkadii Chepovetsky, a 43-year-old cardiologist from St. Petersburg who has lived in Israel since 1990. He learned Hebrew, passed the exam that allows him to practice in Israel, and volunteered to work for free at a hospital

Many immigrants land in Israel with only their most precious cargo in hand (opposite). Most new arrivals are less than 35 years old; they reassure one another that with hard work they will eventually be able to rebuild their lives. Says one, "Hope dies last."

Grand reunion: After 15 years of separation Jaffa Agarunova welcomes her grandson, Yosef, to her home in Beersheba. Prompted to emigrate after hearing favorable reports about life in Israel, Yosef, his wife, and three sons arrived during the Persian Gulf war—on a day rattled by three air-raid warnings. They soon found an apartment, but eight months later Yosef had yet to find work. "I'm becoming an idiot," he says. "The only thing to help you survive is contact with your relatives. It's the only food for your soul."

in Jerusalem, just to get his foot in the door. Soon after, he was offered a paying job on the night shift. Now he lives in a tiny room rented from a family and spends his spare time studying for the advanced exam, the one that will allow him to specialize in family medicine and hang out his own shingle.

Like Chepovetsky, some 40 percent of the olim are highly educated, having university degrees in medicine, pure science, architecture, mathematics, classical music, and the arts. Other new citizens include fencing masters, women chess champions, and at least one expert on chemical warfare.

Much of this talent will be sacrificed. Israel already has an unemployment rate above 11 percent, and 38 percent of the immigrants are unemployed.

In the West Bank settlement of Qiryat Arba, I meet Boris Goldengorn, an economics professor from Moscow who now goes to work in orange overalls, sweeping streets. He seems cheerful enough and is still glad he left the Soviet Union, but he admits that the adjustment, coming here from Moscow's Plekhanov Institute of National Economy, is difficult. "I have many problems," he tells me, adding that he has so little money he cannot even afford to repair his broken glasses.

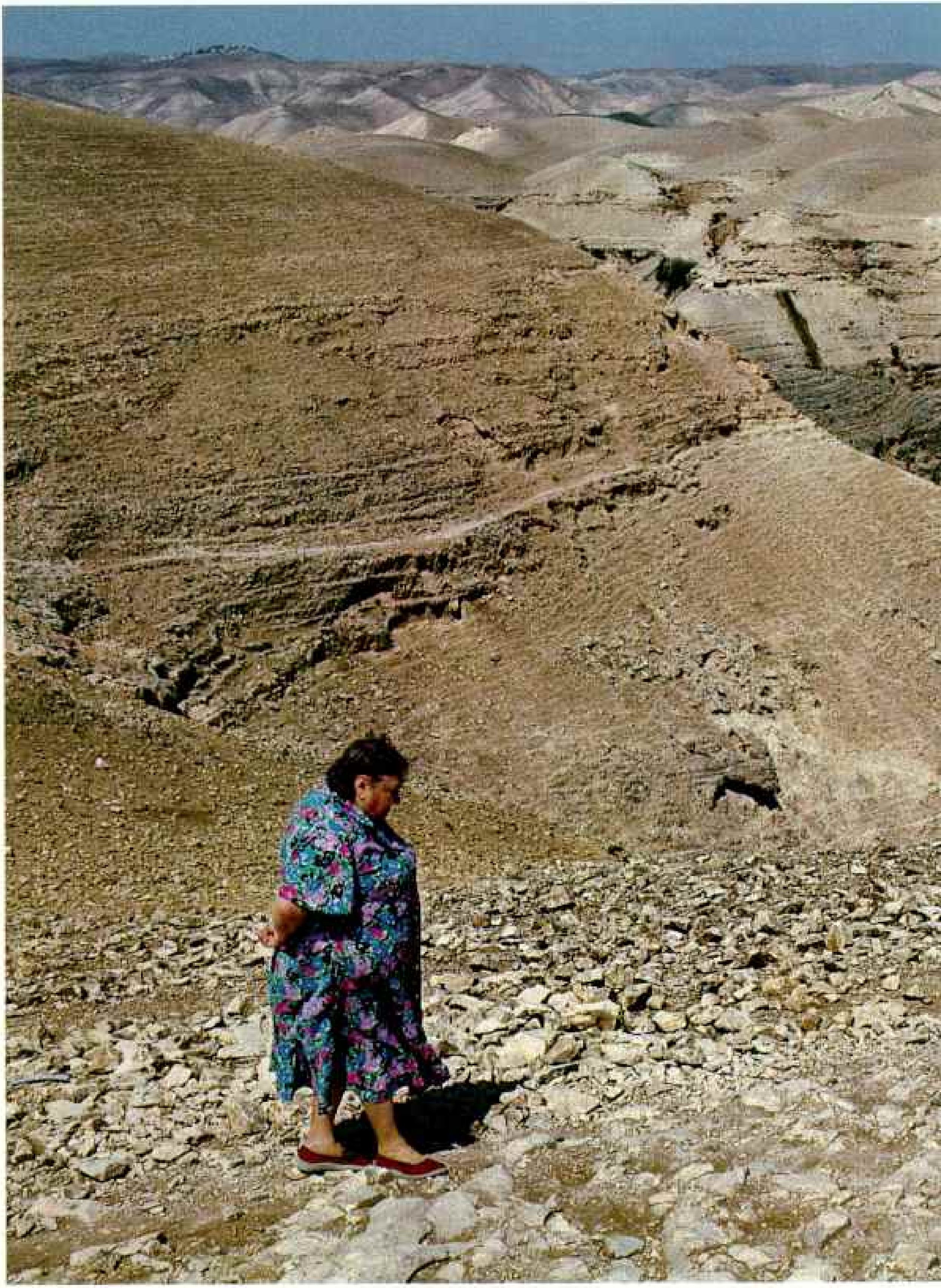
At a community center in Jerusalem an announcement in Russian appears on the bulletin board: "Need ten men, full day, from 7 a.m. to 3 p.m. Hard physical work. Salary 1,500 shekels [about $650] monthly." The jobs are grabbed by men who have taught college or conducted advanced scientific research in the Soviet Union.

For the 3,000 or so olim musicians recently immersed in Israeli society, it is especially difficult—how many clarinet players can one nation absorb? Thanks to the olim, Israel sounds better than it used to, with pickup bands and opera singers popping up everywhere. Down on the Ben Yehuda pedestrian mall in Jerusalem, among the chic boutiques, shoppers pause to hear three olim men playing an accordion, trumpet, and slide trombone. They perform with verve, seeming to have a good time as passersby drop spare change in their hats. Each musician averages the equivalent of $15 daily, vital extra income that supplements the immigrant subsidy given to help the olim through their first year. But injured pride is a problem. When I ask a flutist working in a Beersheba car wash about his musical career, he snaps, "I whistle while I work."

THERE ARE SUCCESS STORIES. At the Weizmann Institute of Science in Rehovot, one of the world's leading research centers, Alexander Lerner, a 76-year-old professor of applied mathematics is hard at work in his laboratory, surrounded by steel rings and tubing that will someday become the pumps and valves of an artificial heart he is developing. Fearing a brain drain, the Soviets were reluctant to permit departures by outstanding scientists like Lerner, whose emigration was blocked for 17 years. He finally reached Israel in 1988.

"I wanted to help people with heart problems," says Lerner, "but in the Soviet Union I had no access to large computers, and I couldn't reach the necessary level of research. When I came here, the conditions were better." He proudly shows me a prototype of his heart pump. "It works," he says.

On a hot morning in July I met nine-year-old Roman Katz at the Alyn Orthopedic Hospital in Jerusalem. Born with cerebral palsy, Roman had *(Continued on page 53)*



Pondering her next step—to emigrate or not—this tourist in the Judaean desert visits Israel on a Soviet passport. First available last July, passports let potential émigrés look before they leave—and it's a rugged view. Each Soviet emigrant can take out the equivalent of only a hundred

dollars. Although new immigrants receive some assistance from the Israeli government and Jewish organizations, they discover that Israel is no paradise. "I thought all Jewish people helped each other," says one arrival. "But they are like other people—one helps, another doesn't."

Watermelon sweetens the lot of three families—thirteen immigrants who crowd into a three-bedroom apartment. Jobs are as scarce as housing. Leonid Lerner—inventor, engineer, and World War II hero—works as a janitor, but he's been through worse. As a child, he saw the Nazis slaughter his family. "I am living 48 years extra," he says. "That's why I'm an optimist."

arrived with his parents from Sverdlovsk in February 1991, doubting he would ever walk without help. Yet five months later, after an operation and intensive therapy, he was not only walking by himself but also jumping—again and again, shouting and laughing for joy.

Good news spreads quickly in the tight community of immigrants, and I soon hear of a remarkable young newcomer named Boris Giltburg, age seven. Boris, whose family came from Moscow in 1990, is something of a prodigy: He began reading music and playing the piano at five and has already composed several short pieces reminiscent of Mozart.

He appears cool and smiling in black tie when he shows up to perform at the cultural center in Ramat Gan, a suburb of Tel Aviv. Sitting at the keyboard, he rips through some Tchaikovsky and Prokofiev like an old pro; then he does a couple of his own pieces. His tiny feet hardly reach the pedals, but when he finishes, the crowd (composed largely of Soviet immigrants) springs to its feet, drowning him in cheers.

At Boris's apartment in Tel Aviv, I learn that he is the fourth generation in a line of concert pianists, after his mother, grandmother, and great-grandmother. Boris doesn't speak English, but he listens intently to my conversation with his grandmother, Genrietta Milman, and he nods occasionally. Through Mrs. Milman, I ask Boris how he likes life in Israel. His face brightens. "Oh, very much," he answers back. "And I like the food and I'm learning Hebrew and I already know lots of kids, some Russian, some Israeli. And I like the movies!" Judging from the posters in his room, *Batman* is a favorite, and there are Russian comic books scattered about.

When his mother asks him to play for me, he skips over to the piano, turns the pages of sheet music, and places his small hands on the keyboard. Suddenly transformed, his face serious, he plunges into his music. I tape the session and play it back to him.

Boris listens to his own music with the concentration of a professional critic. "He's never seen a tape recorder," says Mrs. Milman. He is fascinated, all business. But as I prepare to leave, he is a boy again. He runs his fingers over the keys in a quick caress, then waves to me with a flourish.

"Bye-bye," he says.

IT IS EASY to spot the newest Israelis, who often seem unsure of themselves in their unfamiliar surroundings. For reasons of economy, they wear the clothes they brought from the Soviet Union, which look like holdovers from the 1950s, the men in tight suits, the women in long, shapeless dresses. The olim tend to walk more slowly and formally than the established Israelis, always in a hurry. The veterans gesticulate with wide sweeps of the arms, in an expansive Mediterranean way; the olim use small, controlled chops of the hand.

I eavesdrop as an elderly man stops a middle-aged woman on the sidewalk in front

of a post office in Jerusalem. He inquires of her in Russian—she came from the Soviet Union too but is more seasoned—whether it is legal to mail a letter in an envelope he brought from the Soviet Union if he puts Israeli stamps on it.

"Why not?" she answers.

That seems to reassure the old man, who puts the letter carefully back into his coat pocket. He makes a stab at more conversation: "So, how do you like Israel?"

The woman answers, softly and pensively, "You must pass a hard period. We did."

He absorbs the comment, then bows to her in old-world fashion and walks away with his head down. He would find many sympathetic new Israelis anxious not only to listen but also to help.

With the studied informality of veterans, the Israelis who arrived three months ago teach those who landed three days ago how to make sense of modern Israel. Not far from the same post office in Jerusalem, immigrants gather in the street to gossip and exchange pointers. I hear a heavyset man in a yellow shirt explaining the ropes to a scientist. "You go to the third floor, and there a man in an office will tell you how to register for a

"When I go to sleep," says nine-year-old Roman Katz, "I think about living on the top floor of a building and then running down the stairs." Stricken with cerebral palsy, Roman underwent two operations in Russia, but better medical care available in Israel persuaded his family to emigrate. A third operation and physical therapy, in the pool and out, have had dramatic results. "I like Israel," Roman says, "but I think about returning to Russia because I want my friends to see that I can walk."

science job." The greenhorn disappears into the Ministry of Immigrant Absorption, one of several government agencies that help settle the olim. Other agencies assist with housing and job placement, while the semiofficial Jewish Agency, financed mainly by donations from American Jews, pays for travel and the transportation of olim household goods from the Soviet Union.

More informally, Israeli families adopt Soviet families upon arrival to ease their passage through the difficult first months, giving freely of food, advice, and, most of all, kindness. They invite them home for Sabbath and holiday dinners. The idea is to make them feel wanted, not patronized.

"Often, people with suitcases just show up, dropped off by a cab, and the whole neighborhood mobilizes to bring in beds and food and whatever is necessary," says Leonard J. Davis, a U. S. citizen living in Israel.

SUCH NEIGHBORS make sure the immigrants' needs are provided for during their transition. Rabbi Jonathan D. Porath, who came seven years ago from the U. S., introduces me to his adoptive Soviet, Chaim Shatz. Shatz, 88, set foot in a synagogue for the first time in half a century when he arrived in Jerusalem from Starokonstantinov in Ukraine in 1990.

Porath, who is looking after Shatz and his family of six, speaks with amazement. "What's striking about Chaim is that he was so distant from the synagogue . . . but he has learned the Hebrew services by rote, and the congregation respects him."

Shatz himself explains the irony of it—all his life, he tells me, he had known he was a Jew, but he never learned the formal practices of his religion until now, in the twilight of his years.

"In Starokonstantinov there were thousands of people and no synagogue. We did it secretly," he says, but it was difficult to find the prescribed quorum of ten Jewish men.

And now? "I attend a wonderful synagogue," he says, brightening. "I go there every day on foot." The congregation recently asked him to open the ark during the holy services at Yom Kippur, an honor normally accorded only to the leaders of the congregation. His pale blue eyes fill with tears when he mentions it.

Despite Israel's heroic effort to make newcomers feel welcome, the country found itself

unprepared for the sudden influx. This strikes me in Karmiel, a town in northern Galilee, where Soviet families have set up a tent city in a park just across the street from the local absorption center.

Basia Gutner, a friendly 75-year-old from Soviet Moldavia, is sitting in a canvas chair in front of her tent, enjoying the May sunshine. She explains that she had to abandon her apartment three weeks ago when the landlord increased the monthly rent from $380 to $750. She could no longer afford it—nor could 25 other families dwelling in this tent city.

"Even living in a tent," she says, "I am much happier here than in Moldavia." Mrs. Gutner fled out of fear that nationalist sentiments would lead to an outbreak of anti-Semitism. "It's better to commit suicide than to go back. In no case will I return there," she says. Despite the harsh circumstances of tent life she seems fairly comfortable. The city provides the tents with electricity, and the neighborhood uses the bathrooms at a government office building nearby. The tent dwellers get along pleasantly, and a social life of sorts has developed. They visit back and forth, share meals, and chat at day's end with the lucky ones who have jobs.

In the larger cities the olim are trying to make do by moving into apartments with one another. One Saturday morning in Jerusalem I call on 12 people—all living in one four-room apartment.

Knowing they would be unable to afford the city rents, these four families from Vitebsk in Byelorussia decided to pool their resources until they earned enough to strike out on their own.

The families had forged deep friendships long before they immigrated, and fortunately no visible strains exist. We sit in their tightly packed living room as Alex Levin explains how 12 people manage with one bathroom. The men and boys use it from 5 a.m. to 7 a.m., and the women and girls have their turn after 8 a.m. "So we don't have lines," Levin, a mechanical engineer by profession, tells me with a smile.

To add to the confusion, two of the men are named Alex, so we must often backtrack to get their stories straight. I learn that two of the women are professional pianists now working as hospital orderlies, while another is an unemployed computer specialist trying to learn Hebrew before searching for a job. All the men work as janitors in a neighborhood religious school, at the relatively low salary of 1,200 shekels (about $520) a month. I am astounded by how cheerful they seem, but they tell me that their expectations weren't high.

"We were prepared for many problems," says Alex Babenko, a construction engineer, explaining how friends had written from Israel to describe the difficulty of adjustment. "I'm not disappointed." For a better job and apartment, he says simply, "I can wait."

His wife, Raia, one of the pianists-turned-orderly, chimes in. "In Vitebsk we all had perfect apartments. But what's important here is that even if we don't have an apartment for everybody, we help each other when one of us is down. Being together is much more important."

Marina Levin adds to that: "We are strong people. We understand perfectly that this country can't easily absorb hundreds of thousands of people and that during the first year we won't be able to find good jobs and apartments. But I feel that we have a future, and I have no doubts that we shall survive. We don't expect miracles today."

TO GET MORE ELBOW ROOM, many of the olim are bypassing the overcrowded cities for the empty deserts of the south and north. And to the anger and consternation of Palestinians, some immigrants are moving into the occupied territories; by late 1991 more than 4,000 of them had joined perhaps as many as 120,000 Jewish settlers already in place, encouraged by a government for whom settlement building has served to substantiate a permanent claim to the lands in dispute since the 1967 war. Other immigrants are moving into apartments abandoned years ago by young Israelis who fled the pioneer towns in Galilee and the Negev desert for the excitement of Tel Aviv and Haifa.

In his role as minister of construction and housing, Ariel Sharon, former defense minister and once Israel's most famous tank commander, oversees the government's emergency house-building program. He has drawn much criticism, at home and abroad, for planting new settlements in the occupied territories. Sharon brushes the critics aside

A touch tells Yaacov Fuchs, a blind immigrant, that ahf is Hebrew for nose. "It was terrible in Russia," he says. "I got no assistance whatsoever." In Israel, he learns living skills—how to walk and dress himself—while he learns the language. Looking for medical work, Dr. Yuri Vater (below) managed to land a job as an anesthesiologist at Tel Aviv's Ichilov Hospital, where he prepares for surgery. "I had good credentials," he says, "but mostly I had luck."

Once estranged from Jewish practice, these immigrants now embrace a biblical rite: They've just been circumcised. Many men request this procedure simply to be assimilated into Jewish society. Others want to bear this sacred mark of God's covenant with the Jews. Rabbi Izchok Zilber, raising a cup of wine in prayer, is certain that God will sustain his people. "For many years a mass immigration from the Soviet Union seemed impossible," he says. "But the Creator fulfills his promises."

and presses ahead with the same bluff determination that led his troops across the Suez Canal to counterattack Egypt in 1973 and that plunged Lebanon deeper into chaos when Israel invaded that stricken country in June 1982.

By comparison, those old campaigns were easy, according to Sharon. Providing enough housing for the olim, he tells me, "is the hardest thing I've been involved in for the past 40 years. We're building at the rate of 100,000 apartments annually, but we're about a year and a half behind time." By paying bonuses to contractors who deliver buildings rapidly, Sharon claims to have cut the average construction time for an apartment complex from 26 to 11 months.

"Three months ago I was attacked for being a complete failure in construction," Sharon says, smiling briefly. "Now it's a failure because we build too much."

Driving through the Negev, not far from where the Jews wandered with Moses for 40 years, I see some of Sharon's houses. All brick and stone, they rise like a mirage among the rocks and sand dunes of Yeroham, an old Bedouin settlement. With the recent influx, Yeroham has acquired a new vitality. Construction is booming, and once empty buildings are filling with olim, who have pushed the population from 5,000 to 6,000 in a year. The local ceramics factory and bottling plant are expanding to take on additional workers.

Yehiel Hamu, a young Israeli who teaches math when he's not working as Yeroham's immigration coordinator, says the local citizens are happy to have new neighbors.

"There is no problem with the Russians here," says Hamu, noting that modern Yeroham was built in the 1950s largely by Jews from Eastern Europe. "In five or six years the olim will be the majority."

I see what he means. As morning comes to Zvi Bornstein Street, the town's main street, immigrants are lining up in single file to buy Russian-language newspapers before work. They speak loudly, as Israelis do. The scene is noisy, with horns honking, traffic buzzing.

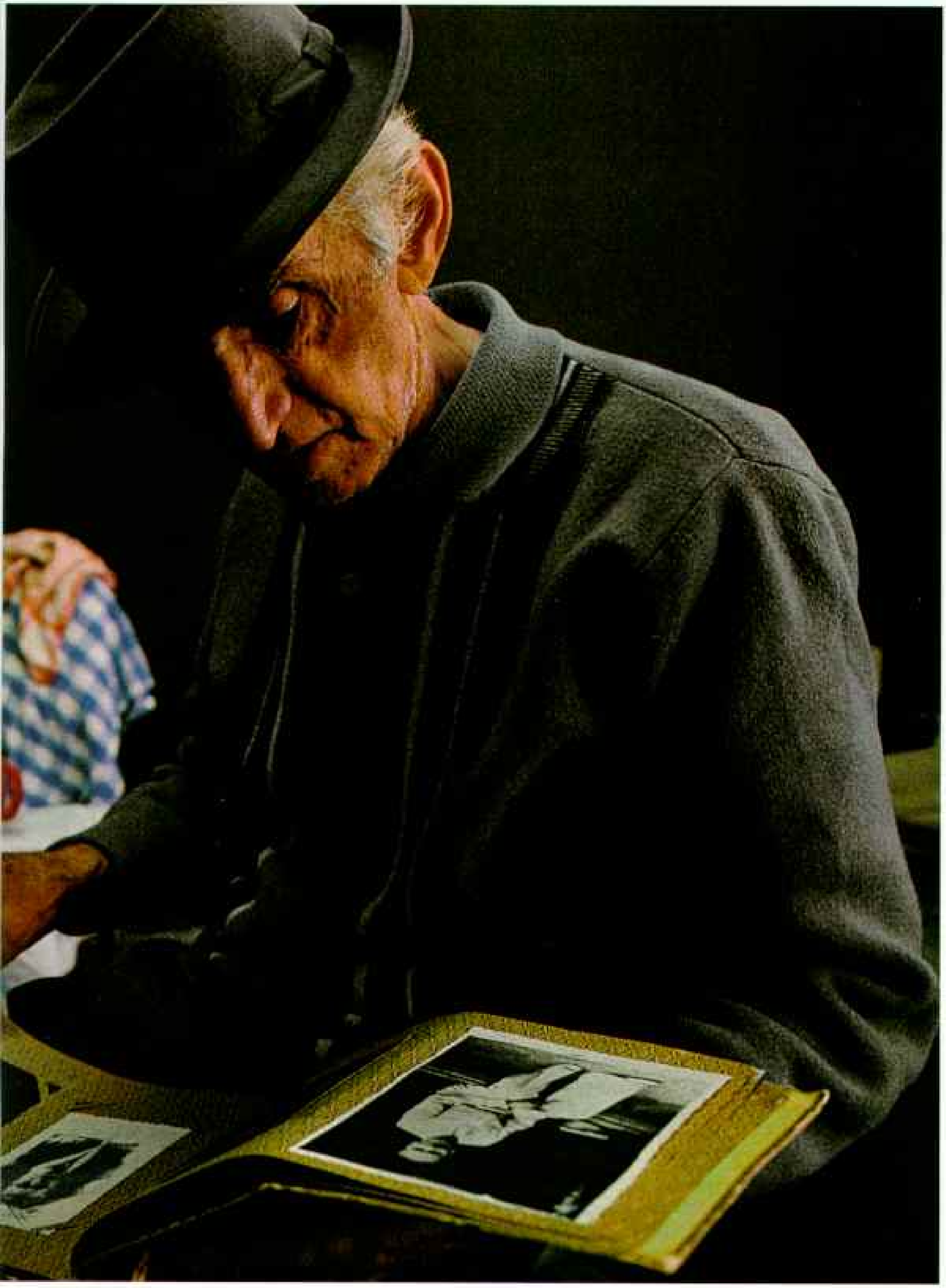
Lev Kulitsky screeches up in a cloud of dust and emerges from his Japanese compact automobile. While he gets his morning paper at the newsstand, I try to engage him in conversation. Kulitsky, a computer programmer who had arrived from Latvia the year before, is too busy for idle chitchat. "I'm in a hurry, can't talk now," he snaps in Hebrew, then

dashes off to the bottling plant, where he has a job as foreman. That industrious attitude in the olim makes many Israelis optimistic that the immigrants will not only find a useful place in their adoptive home but will also make it better.

Down the street in Yeroham, I stroll by a playground where romping children are shouting in a cross fire of Hebrew and Russian. They are fenced in, watched over by a white-haired gentleman with an automatic weapon. When I ask to talk with the kids, the guard eyes me suspiciously and blocks my way. I am a stranger in town, walking alone, and strangers are not to be trusted near schools. Fear of terrorists is ever present.

FROM THE MOMENT the olim reach Israel, they are vulnerable to terrorist attacks, as all Israelis are. Sixty-two-year-old Bela Levitsky arrived from Russia with her son, Vladimir, in January 1991; weeks later she was stabbed to death by a Palestinian youth with a butcher knife as she walked down a street in Jerusalem. Rosa Elispor, who had emigrated from the Soviet Union 17 years earlier, was also killed during that rampage.

"My father was a very religious man," says Michel Gleizer. "He was a rabbi, and he raised me as a Jew. That's why I came to Israel." The move with his wife, Esther, has been an unsettling experience. More than half their luggage arrived empty. In Jerusalem they live in a cramped



one-room apartment, with just enough space for two beds, a few chairs, and a hot plate. "It's like living at a train station," says Esther. "We had a house, a pension, but now we have nothing." Michel expected more. "I am a Zionist," he says, "but now I sit in this room."

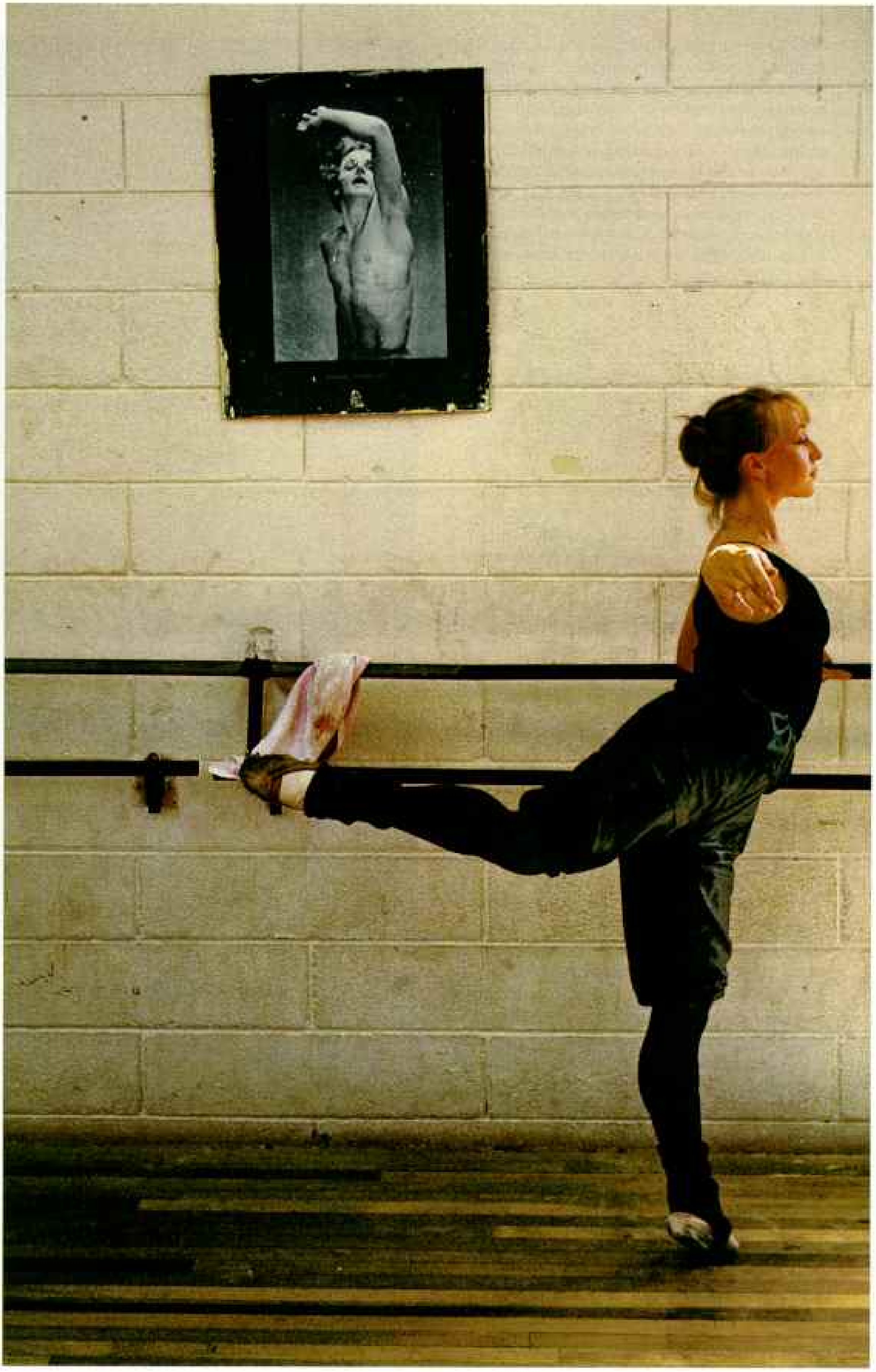
"It's very strange for people to see a mathematics teacher singing opera in the street," says unemployed David Hrishtain. In Russia he taught algebra and geometry and sang with the Leningrad Philharmonic. Today in Jerusalem he sings Tchaikovsky and Verdi for a few shekels and, he says, "for strength."

Ballerina Veronica Glan found a professional home at the Haifa Ballet, a troupe founded and directed by Soviet émigrés, who struggle to pay the dancers. "Three months ago I was full of hope," she says. "Now I think about leaving." Maybe to the U. S., adopted home of Russian ballet icon Mikhail Baryshnikov.

Tensions run high in East Jerusalem, the Arab districts that belonged to Jordan before Israel annexed them in the 1967 war. Palestinians there deeply resent the continuing military presence. I see Israeli army vehicles with machine guns mounted on their hoods creeping up and down the dusty streets of Abu Tur, a neighborhood of East Jerusalem and a hotbed of the *intifada*, the Palestinian revolt against Israelis. Even Jerusalem's Old City—with its monuments so sacred to Jews, Christians, and Muslims alike—often seems more like an armed military camp than a religious shrine.

On a sunny Friday afternoon I join groups of Soviet olim visiting the Western Wall for the first time. Hundreds of Jewish men in black—eyes squeezed shut and hands quivering with fervor—say their prayers in preparation for the Sabbath. I watch the olim as they watch the worshipers. Then as the immigrants glance around them, they see the heavily armed Border Police on the Western Wall plaza, more police at the entrance, and army sharpshooters on the roofs of the Jewish Quarter. As several families from Kiev walk past me, I overhear a woman asking her husband in hushed tones: "Alex, do you think it's safe here?" For now they choose just to watch, not to pray.

It is ironic that new Jewish settlers seem more secure in the towns they are helping to build and expand in the occupied West Bank—places like Ariel, north of Jerusalem. The countryside is lovely, like everyone's imaginary landscape of the Middle East: Olive groves rustling in the hot wind, barefoot Arab boys with sticks herding sheep, old men riding tiny donkeys, women carrying burdens of straw on their heads. But as one drives through venerable Palestinian towns like Ram Allah, there is palpable misery



Neighborhood watch isn't for the faint of heart in Efrata, in the Israeli-occupied West Bank, where expansion of settlements creates conflict between Jews and their Arab neighbors. While nearly 99 percent of Soviet immigrants live within Israel's recognized borders, the few who live in the occupied territories see their backyards doubling as political hot spots. Despite the danger, one settler, recalling the chaotic and sometimes violent conditions back home, says, "It's much safer to live here than it is in Russia."

everywhere. Here a car with Israeli license plates is a target for stones, firebombs, and hand grenades. Army camps and security checkpoints dot the region, and the hills are festooned with barbed wire, watchtowers, and microwave antennas.

Ariel sits in impregnable isolation overlooking green Samaria, its neat white houses with red roof tiles standing in sharp contrast to the mostly poor Arab villages surrounding it. Established in 1978 as a model town, Ariel is at the center of a circle of small Jewish settlements that command the area strategically. Army units guard the town and its satellite settlements, in touch by radio. Soldiers in helmets are on constant patrol in their sturdy vehicles, and there seems to be no sense of fear among the Jewish citizens.

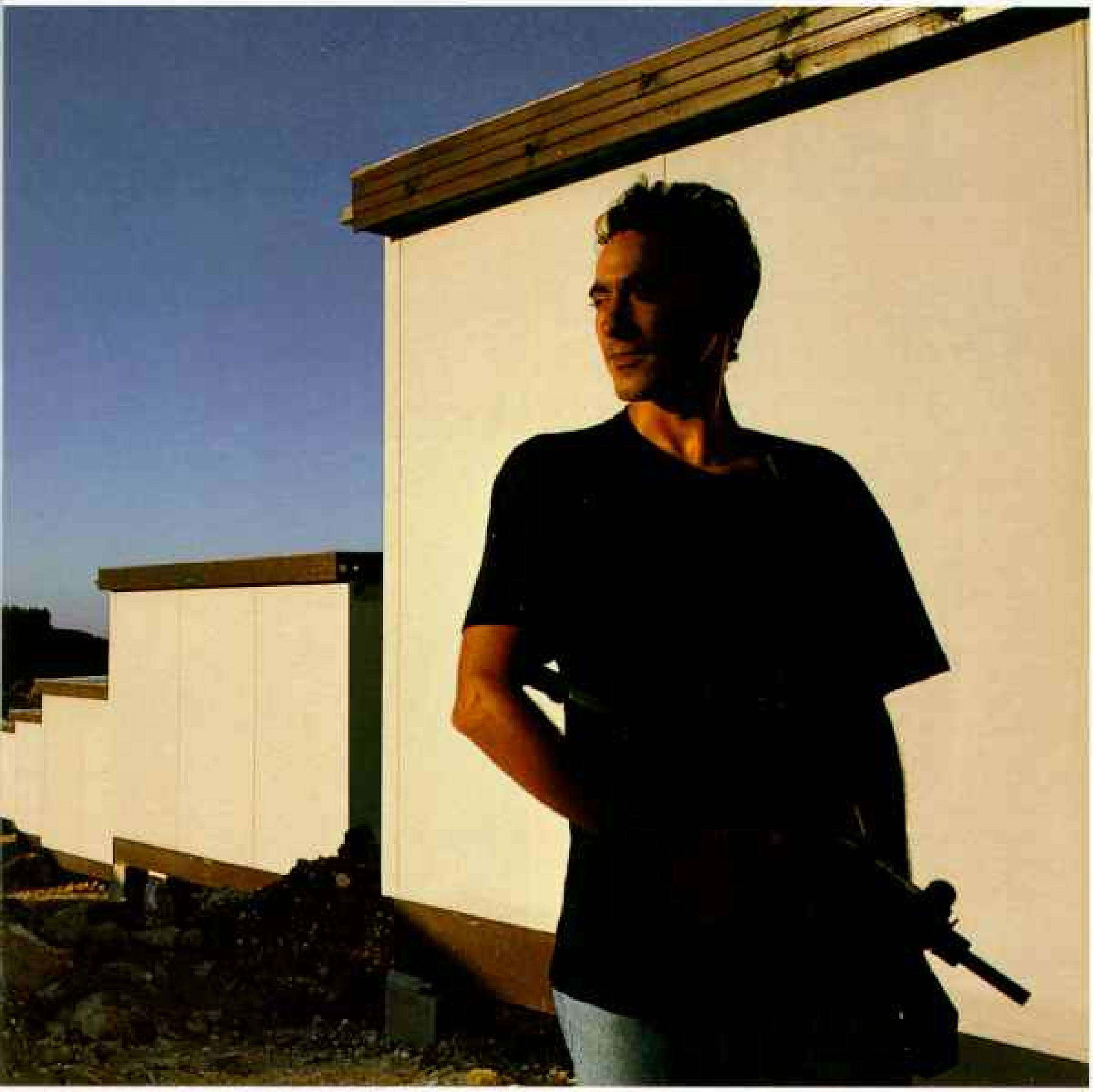
MAYOR RON NACHMAN encourages immigrants to settle in and around Ariel. "We're building things up as rapidly as possible to render impossible the creation of an independent Palestinian state in the occupied territories," he says flatly. The olim, who in 1991 accounted for some 15 percent of Ariel's population of 10,000, are attracted to the territories because there are more jobs and cheaper rentals than in Israeli cities. In all my conversations with them I could detect no nationalistic or ideological zeal—it is pure pragmatism.

Victor Birman, a 28-year-old engineer from Ukraine, tells me he pays roughly $22 a month for a small apartment in Qiryat Arba, a Jewish settlement of 6,000 on the outskirts of Hebron, an Arab city of more than 60,000. The low rent is a fraction of what one pays in Tel Aviv or Haifa.

"If you are ready to take any kind of work, and you don't care how unprofessional it is, you can easily find work in Qiryat Arba or Hebron," says Birman, who came to Israel with his wife and children late in 1990.

Pitched into a strange land without a job or adequate housing, how do so many of the newcomers maintain their strong pride and their optimism? In part it is the self-worth that grows from overcoming the odds and making the difficult journey from the Soviet Union. Then there is the comfort of knowing that other olim have been through the hard times and that many of those—and the veteran Israelis—stand ready to help.

There are also the little gestures, seemingly



so insignificant, that make the passage into Israeli life easier. On a Friday afternoon at Carmel Market in Tel Aviv, I find perhaps 2,000 of the newcomers: old and young, men and women, professors and farmhands, some from the Baltics, some from Central Asia. They all line up under the burning sun to get a free bag of cabbage, tomatoes, eggplants, and green peppers. This little gift from the municipality, given out every Friday afternoon, will save the olim a few precious shekels, and it is much appreciated. But what makes it special, and less like a handout for the indigent, comes at the end of the line, where the Israelis present each woman a bouquet of bluebells.

The mood is festive and the crowd is good-natured, smiling and chatting at the start of this Sabbath weekend. Close by, the beach is filling up with bathers. Over the Mediterranean breakers, light planes and helicopters trail streamers advertising electronic appliances and other consumer goods so desirable to the new arrivals. I notice a couple, clutching their free produce, watching the planes. The man, a young engineer from Siberia, points wistfully to the signs in the sky. She rises on her tiptoes to kiss him on the cheek. □

EASTERN WILDLIFE

Bittersweet

AN ALLIGATOR IN FLORIDA swims through a flood-control canal and ends up in the parking lot of a Miami shopping mall. A white-tailed deer is captured on a busy street in downtown Washington, D. C. Flocks of Canada geese settle on a comfortable Connecticut golf course, while once scarce wild turkeys stroll calmly past clogged commuter highways in Virginia. A foraging black bear wanders into a Pennsylvania backyard; the family calls a wildlife officer, who arrives to find them hosing the bear down while it lies on its back, feet waving in the air.

Not only have these five species survived centuries of hunting and destruction of their habitat, but, surprisingly, along the densely populated East Coast they are now thriving, thanks to good wildlife management programs (including controlled hunting) and the animals' own remarkable adaptability. But the pleasure we may rightly take at their recovery is being severely tested by the inconvenience and occasional danger they present. It appears that for humans and animals, "normal" life can mean different things.

The bear, for instance, might seem invulnerable. Powerful and intelligent, bears are also among the shiest, most retiring of animals, but because their natural predators are few, they don't seem unduly disturbed by human contact. (The same is generally true of alligators.) Bears are easily lured by vacation-home owners from the city who feed them scraps of food. Some newcomers to the Pocono Mountains of eastern Pennsylvania even spread peanut butter on their windowsills. The danger to people is obvious, but it is risky for the animals too: Bears accustomed to humans are often shot. The line between wilderness and civilization continues to blur.

Graceful on the wing but increasingly

Success

By JAMES CONAWAY

Photographs by
RAYMOND GEHMAN

underfoot, Canada geese pass Manhattan towers to feed in a Long Island marsh.

Foraging whitetails easily clear fences into pastures, farms, and gardens.

White-tailed deer are creatures of ineffable grace and beauty, with delicacy and strength and an uncanny way of disappearing into deep foliage. Their elegance, though, is belied by a voracious appetite, and they easily get used to humans.

Whitetails, so thoroughly hunted that they were a rare sight in the East at the turn of the century, have multiplied to the point that some people call them "hoofed rats." In bucolic Princeton, New Jersey, residents are reluctant to drive faster than ten miles an hour at night, lest they damage either an animal or their car.

Pressure on habitat could have doomed these five species, but they are flourishing—picking their evolutionary way along the verges of man's progress. As development opens land, it provides new opportunities. In the South, commercial pine forests were considered a poor environment for many birds, including the wild turkey. But it has turned out that the open areas left by logging are ideal for the germination of turkey-friendly grasses. After having been nearly eradicated in New England and coastal states south to Maryland in the early 1900s, the wild turkey now occupies more territory in the United States than ever before. It abounds even in parts of the Northeast. Deer have also benefited from human encroachment, because they frequently feed in meadows and other open spaces as well as in forested areas.

Above the Chesapeake Bay, the call of

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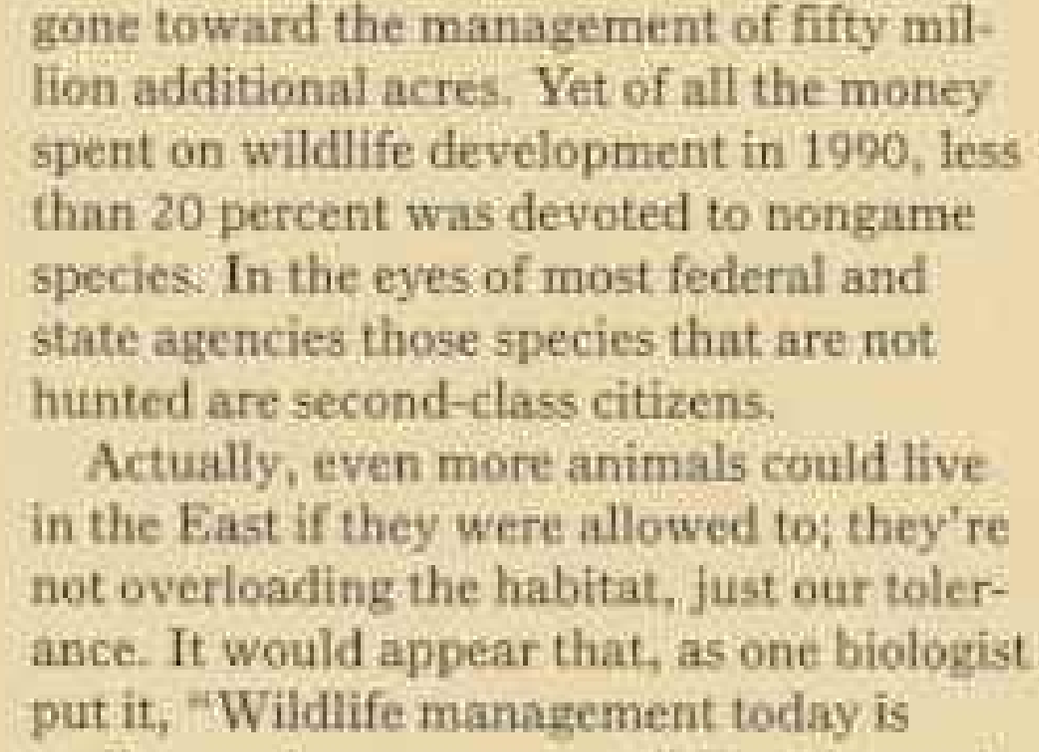
From forest to field to suburban yard, wild turkeys are edging closer to civilization.

the majestic Canada goose sends its melancholy echo through the autumn twilight. Though its voice summons hunters who help boost the local economy, the goose means trouble to farmers. Migrating flocks pause to feast on crops of grass, corn, and wheat. Gross annual revenues from hunting in Kent County, Maryland, soar into millions of dollars, but farmers feel as if they're under attack as well.

HUNTING is an important factor in the success of wildlife-management programs. In fact, the fate of large animals is intimately related to their status as game. Unrestrained hunting decimated populations decades ago, and laws to control hunting have enabled recovery. The Lacey Act forbids the transportation of illegally taken game across state lines. The Pittman-Robertson Act levies an excise tax on arms and ammunition that over 50 years has raised more than two billion dollars, most of it disbursed to state wildlife agencies for population studies, improving habitat, and other uses. The money has also purchased four million acres of wildlife habitat and gone toward the management of fifty million additional acres. Yet of all the money spent on wildlife development in 1990, less than 20 percent was devoted to nongame species. In the eyes of most federal and state agencies those species that are not hunted are second-class citizens.

Actually, even more animals could live in the East if they were allowed to; they're not overloading the habitat, just our tolerance. It would appear that, as one biologist put it, "Wildlife management today is really people management." Florida condo owners get angry at alligators that menace



Dangerous but no longer endangered, an alligator guards its hatchling.

Ear-tagged for identification, a black bear cub waits to be returned to its mother's den.

their pets and children. But alligators have been around for more than 20 million years. "People complain that alligators have moved into their backyards," mused a wildlife officer, "when the opposite is true."

"There are no natural checks," explains Bill Palmer, a Pennsylvania biologist. "We have altered nature, and most predators are gone." The planet is really burdened, not with too many of a species like deer but with too many people. In characterizing wild animals as pests we do an injustice to their tenacity, intelligence, and adaptability. Wildlife-management terms—"the resource," "the harvest"—dull our appreciation of these superb creatures and skew our vision of their place in the world.

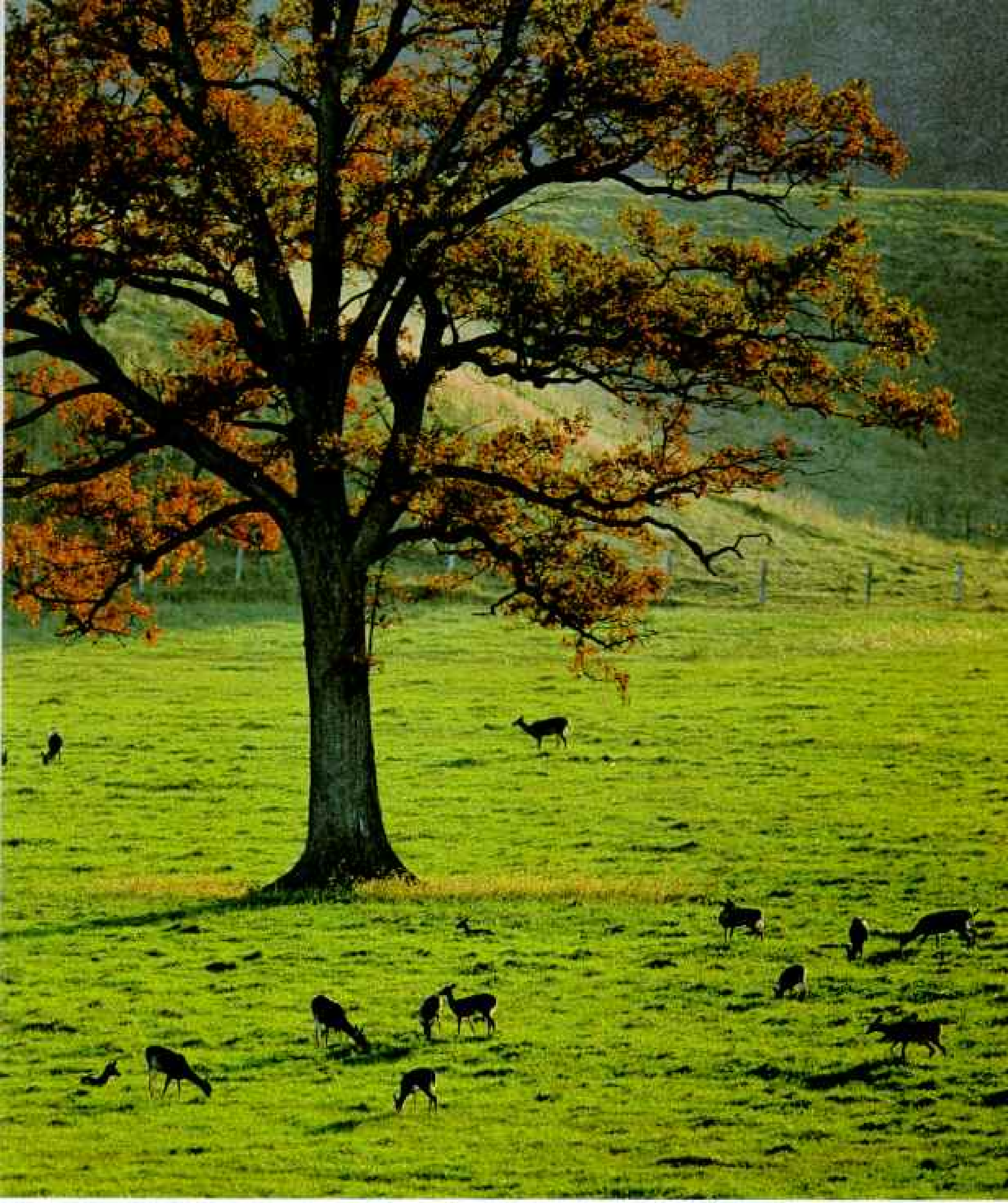
The Miller family from Maryland's Eastern Shore is willing to live with these contradictions. In 1990, Canada geese inflicted about $15,000 worth of crop damage on their farm. "The funny thing is," Gary Miller told me thoughtfully, "even though they cost us money, we like having the geese around."

White-tailed deer

PORTFOLIO TEXT BY MICHAEL KENNA
NATIONAL GEOGRAPHIC EDITORIAL STAFF

In the lengthening shadows of a century-old oak, deer by the dozen invade a farmer's hay field as late afternoon settles on rich bottomland along West Virginia's Greenbrier River.

Before European settlement



as many as 34 million whitetails roamed North America. Then unrestrained hunting, especially during the last half of the 19th century, reduced the population to less than half a million.

Finally, deer found protection in 20th-century game laws. No longer could they be hunted year-round but only during fixed seasons, with limits on the number killed.

Their comeback has been so successful—as many as 18.5 million whitetails inhabit the U. S.—that in many areas they are viewed as pests. Their browsing threatens not just commercial crops and timberlands but suburban and urban trees, flowers, and shrubs.

Cloaked in evening shadows, a white-tailed buck forages the property of Mary Aponick's Philadelphia home. Ravenous deer forced her to build a seven-foot-high fence (above, at far left) around her backyard vegetable garden.

In most East Coast states the deer population is on the rise. Pennsylvania has about a million. In 1990, 415,000 were legally killed there, with thousands more taken illegally. Another 43,000 were struck down on highways, and an unknown number fell victim to the privations of winter. Nevertheless, many suburban homeowners, farmers, and timber operators want the population culled even further, as a healthy herd can double in one year.

Since most of the whitetail's natural predators—chiefly wolves and mountain lions—have been eliminated, the quickest and most efficient way to reduce the size of herds is by hunting. Antlered bucks are what lure many like Rod Kemp to the woods (top right, foreground). A member of Twin Rocks Lodge hunting club in Lycoming County, Pennsylvania, Kemp and a million other hunters took to Pennsylvania forests for opening day of the

1990 buck-hunting season. In just 12 days they racked up 158,000. During the three-day doe-hunting season hunters killed another 226,000 animals, and 31,000 more deer were taken in the archery and muzzle-loader seasons.

Hunters are viewed by Bill Palmer, a biologist with the Pennsylvania Game Commission, not as adversaries but as allies: "It's a clientele we depend on," he explains. "Without them, the highway kill and crop, timber, and shrub damage would be greatly intensified in just a year." And, of course, many more deer would starve.

Hunters are quick to point out that funds from the sale of firearms and hunting licenses go directly to support wildlife programs, but the growing animal rights movement still objects to hunting as a management tool.

So do many suburbanites. "They grew up in cities or on the edge of cities, and they don't understand or condone hunting," says Cheryl Trewella, a wildlife conservation officer in Bucks County, who has to deal with their complaints.

Complaints abound in the housing development of Hemlock Farms in the Pocono Mountains, where a resident herd of 500 deer—double what game officials say the environment can support—finds refuge from the hunting grounds of surrounding state forests. Residents want the herd thinned but cannot agree on hunting as a means of getting the job done. Meanwhile, deer like this doe browsing in an apple orchard (left) continue to pick the community clean.

Wild turkey

A frenzy of feathers churns up dust as a capture net snares a flock of wild turkeys in Asheville, North Carolina. Wildlife managers lured the hard-to-trap birds to this spot using corn for bait, then fired off three rockets

that sent the net hurtling over the unsuspecting birds' heads. When the dust and smoke settled, they counted nine gobblers, unhurt, in the net.

Such trapping programs, in which wild turkeys from one area are relocated to another having few or none, helped save this wily bird from extinction. As many as ten million turkeys once occupied parts of North America. But by 1900, largely as a result of unrestricted hunting and widespread clear-cutting of forests, that number had been reduced to 30,000. Today wild turkeys can be found in every state except Alaska—a population of more than four million nationwide.

Trap and transfer, that's the name of the game for Joe McFee (above, at left) and Don Wilson, wildlife specialists with the North Carolina Wildlife Resources Commission's turkey relocation program. On the Biltmore Estate, in Asheville, they band one of nine gobblers captured in their rocket-fired net. Their colleague Chuck Deyton (below) releases a hen into the Sauratown Gamelands, north of Winston-Salem, in the hope of establishing a viable new turkey population in that region.

In South Carolina an alert gobbler peers from a stand of dogwood trees in the Francis Beidler Forest, part of Four Holes Swamp (opposite). In 1986 wildlife managers introduced 13 wild turkeys to this area—five gobblers and eight hens—where turkeys were rarely seen. Now the population numbers in the hundreds. South Carolina's stocking program has been so successful that surplus birds are being shipped to other states.

"The wild turkey is much more adaptable than we once thought," explains Dave Baumann, a biologist with the South Carolina Wildlife and Marine Resources Department. "Twenty years ago you wouldn't have seen them even close to residential areas; now they're showing up in peoples' yards."

Much of Baumann's work takes place in the Francis Marion National Forest, which dips to within ten miles of the city of Charleston. With more wild turkeys and fewer eastern hardwood forests to accommodate them, the birds are seeking out additional feeding grounds closer to people. "I just may have to set up a rocket net in North Charleston," Baumann says, "to save turkeys from little boys with BB guns."

SOURCE: NATIONAL WILD TURKEY FEDERATION

Black bear

Sated after gorging on cherries, a young black bear scouts the forest from a tree in the Cades Cove area of Great Smoky Mountains National Park, in Tennessee.

Bears have always been known to climb in and out of trees, but lately they've been coming out of the woods too, much to the amusement—and the anxiety—of many East Coast suburbanites who, like the earliest settlers, occasionally wake to find bears in their backyards.

"Beares they be common, being a great blacke kind of Beare," wrote William Wood about the Boston area in 1634, when more than half a million black bears roamed the continent. By 1900 commercial hunting, bounty systems (in which local governments paid a fee for each bear killed), and widespread clearing of eastern forests had drastically slashed their numbers.

Establishing protected areas, such as parks, forests, and refuges, and passing game laws to regulate hunting have helped the bear population recover. Today an estimated 200,000 black bears range the lower 48 states, 40,000 in the East alone.

Scampering to safety, two cubs make a risky crossing in Great Smoky Mountains National Park to join their mother dining at an anthill (right).

As bear numbers increase and more people seek recreation in state and national parks and forests, more bears are being killed by cars, and campers are getting an occasional dangerous swat from bears they have fed or teased.

"All bears need is a little breathing space and protection from man-induced mortality," says Craig McLaughlin, a biologist with Maine's Department of Inland Fisheries and Wildlife. Maine, which has more bears—about 19,000—than any other eastern state, uses radio telemetry to monitor the animals. A tiny transmitter attached to a collar allows researchers to track bear movements and learn about behavior. In winter, signals guide researchers to female bears' dens, where cubs can be counted and tagged. The data will be used to monitor the size of Maine's population.

Peering into a northern woods den in Maine, wildlife specialist Mark Caron checks to see if a tranquilized sow is asleep, so it can safely be moved (right). Craig McLaughlin and Randy Cross, holding the stick with the immobilizing drugs, stand ready to help measure, weigh, and attach a new radio collar to the unconscious bear, as well as note her general condition. The sow inside had just one cub, a two-month-old female, which was given ear tags.

A few miles away another cub stares over the back of its tranquilized mother (far right). The den, built under a cedar stump, was so small that researchers were unable to remove and measure the sow.

Canada geese

Flocking to the fairway, Canada geese present noisy obstacles on the third hole of the Yale University Golf Course, in New Haven, Connecticut. Yale's web-footed hazards are part of an escalating problem:

Instead of migrating along the Atlantic flyway—stretching from northern Quebec as far south as Florida—at least 130,000 geese reside year-round along the migratory route, an estimated 15,000 in the state of Connecticut alone.

Flocks containing hundreds of geese cause significant damage to crops, lawns, and coastal parks, where they foul beaches and contaminate suburban ponds. Frustrated state officials set off firecrackers, whistle bombs, and other loud devices to frighten them, but the geese usually return. Increased harvesting of the population, a solution some wildlife managers favor, may be the next step.

Setting up shop in the early morning hours on Maryland's Eastern Shore, outfitter Wilbur Schillinger unloads a flock of decoys from a pit blind he rents from a farmer (above). Decoys placed in the pond and adjoining cornfield will draw flocks of honkers overhead, giving high-paying clients a chance to test their gunning skills.

The number of Canadas in the Atlantic flyway went from about 180,000 in 1948 to almost a million in 1981. Some 600,000 of those geese wintered in Maryland. However, by 1990 the state's Department of Natural Resources reported only 251,000. Experts blame liberal hunting regulations and adverse weather conditions in the birds' Quebec nesting grounds for the decline.

Since 1990 about 13,000 Canada geese, like this female preparing for takeoff (right), have been banded and tagged in a continuing Atlantic flyway migration study. The highly visible neck collars allow wildlife managers to identify and track individual birds—data that will help determine migration patterns, survival rates, and the effects of hunting regulations.


EM3
EM3

Alligator

Protected from its chief predator—man—an alligator stalks the Suwannee Canal Recreation Area, part of Georgia's Okefenokee National Wildlife Refuge.

Alligators numbering in the millions originally inhabited

North America's southeastern swamps and coastal areas. For most of the past 200 years they have been hunted down out of fear or for profit, their population reduced to an all-time low by the 1960s. Tannery records show that from 1870 to 1965 at least ten million gator hides were processed.

In 1967 the federal government placed alligators on its endangered species list. Ten years later, with a population of nearly two million, they were reclassified as threatened in some areas, a status that permits controlled hunting. Today gators are considered completely recovered; monitoring continues to ensure their survival.

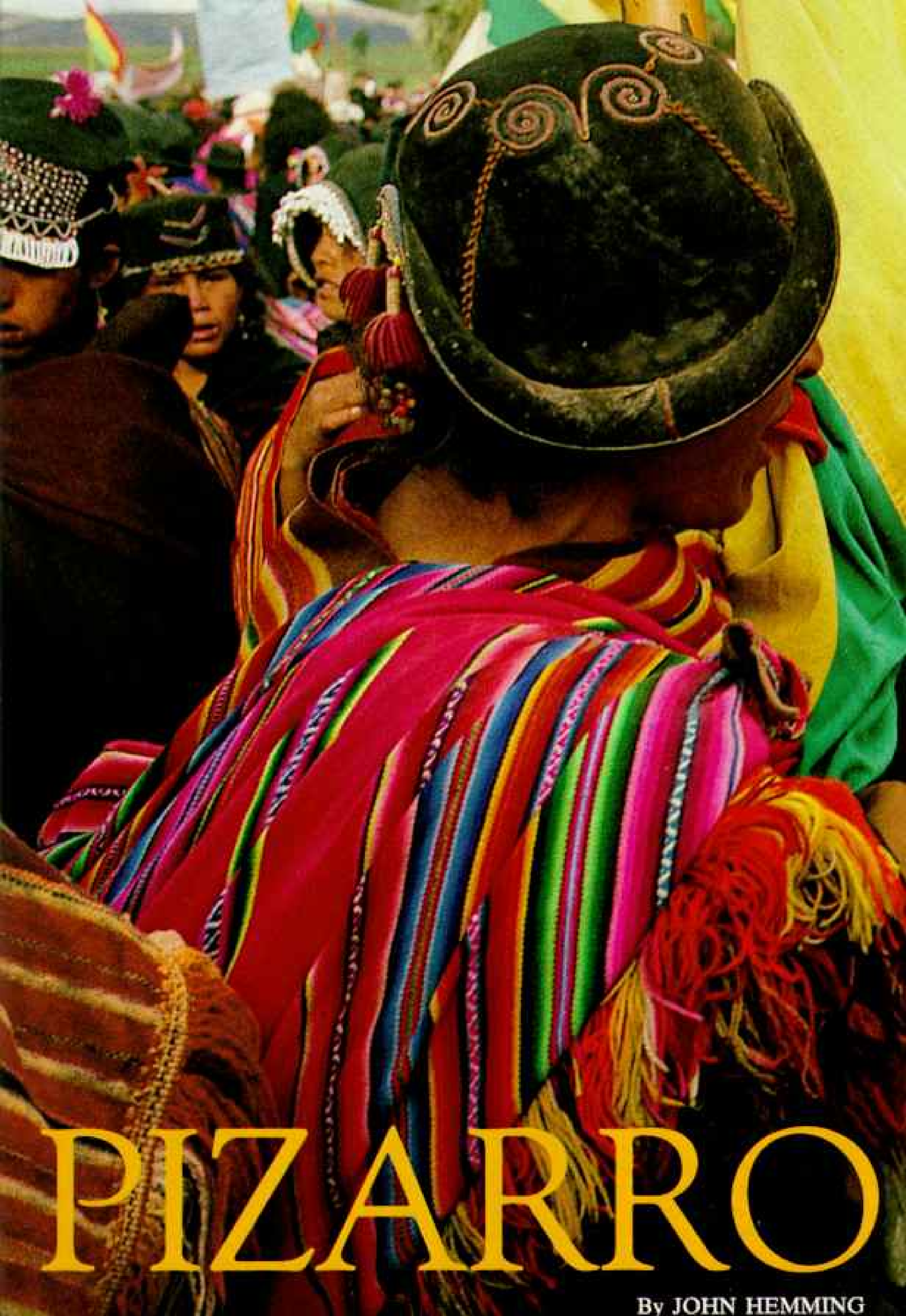
One gulp and it's gone at Gatorland's "Gator Jumparoo" in Orlando, Florida (left). Each year thousands of tourists pay to gawk at this maw-snapping spectacle, as gators leap into the air to snatch chickens suspended above them on wires.

But it is alligator hides that drive the industry. At Hunt's Alligator Breeding Ranch, in Bushnell, Florida, three slaughtered gators get hosed down and disinfected (right). The ranch processes about a thousand animals annually. Skins fetch an average of $30 a foot, while

meat sells for about $6 a pound.

As Florida development encroaches on their habitat, some alligators have entered cities and suburbs through flood-control canals and drainages. In 1990 the Florida Game and Fresh Water Fish Commission received nearly 10,000 "nuisance" complaints from frightened citizens.

Enter the official nuisance-alligator trapper. One of 44 under contract in Florida, Dave Regel (right) drags a five-footer away from a construction site in Naples. Trappers legally killed 4,053 nuisance alligators in 1990. But with a little effort, says Regel, "man and gator can coexist." □



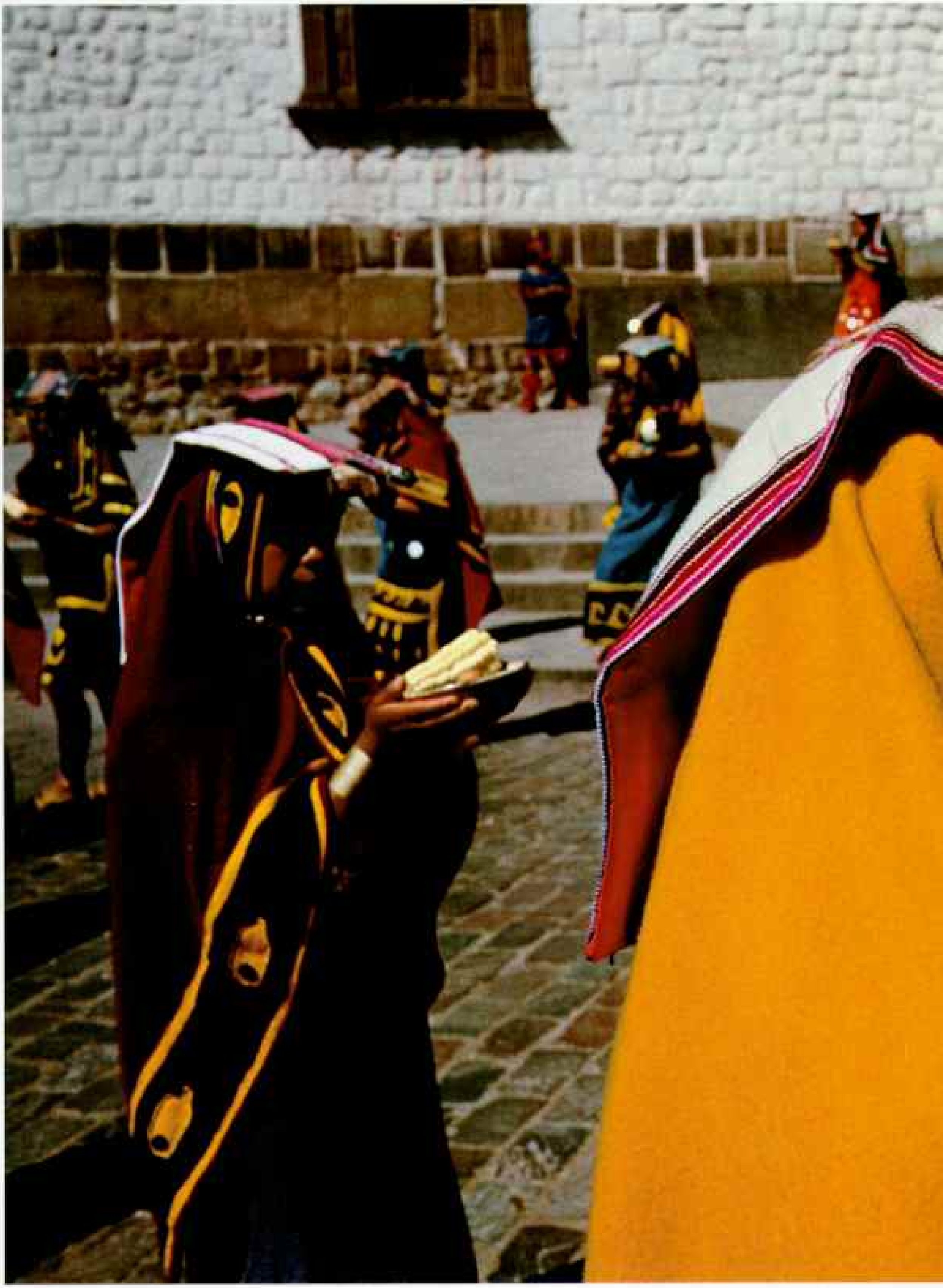
PIZARRO

By JOHN HEMMING

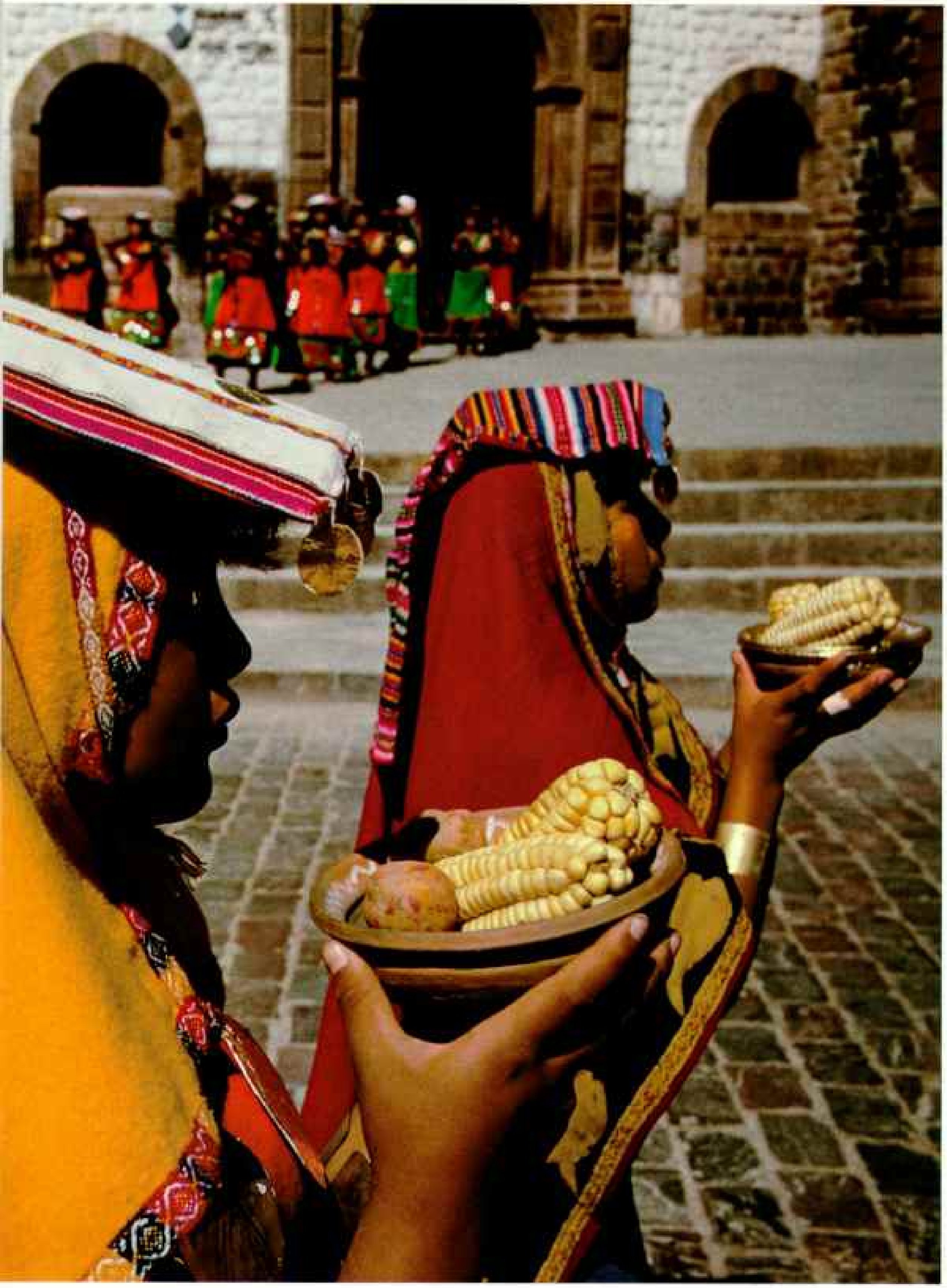
Conqueror of the Inca

Mimicking the contours of Spanish helmets, the hats of revelers in Tarabuco, Bolivia, recall the soldiers of steel who crushed a New World empire.

Photographs by **STUART FRANKLIN** MAGNUM



"Thanks were given to the sun for the past harvest and prayers were made for the crops to come," wrote Spanish priest Cristóbal de Molina of the Inca's Inti



Raymi, a sun festival reenacted yearly in Cuzco, Peru. Son of the sun god, the supreme Inca ruled a strictly regulated, collective society based on agriculture.

IN THE YEAR 1527 the supreme Inca Huayna Capac was ruling his vast empire from its northern extremity in what is now Ecuador. As one of the world's most powerful rulers, the Inca enjoyed every luxury. His state was truly kingly. He was venerated, in the manner of the pharaohs of Egypt and the emperors of Japan, as the son of the sun, and the sun was the supreme deity in the elaborate Inca system of religious beliefs.

The Inca presided over a splendid court with a formalized ritual. Thus a meeting between the empire's most senior general and his monarch would have conformed to strict conventions. When the general entered, "he took a normal load from one of the Indians . . . and placed this on his back. . . . When he saw the Inca, he raised his hands to the sun to give thanks for having been allowed to see him again. He went up to him with great reverence, weeping, and kissed him on the face, hands, and feet."

Huayna Capac was surrounded by a protective screen of women. Throughout the Inca Empire, girls were chosen to serve the state. The more attractive joined the Inca's household or were awarded by him to chiefs and dignitaries. Other chosen women toiled in secluded workshops, weaving the magnificent textiles for which the Inca are famous, or prepared food and *chicha*, maize beer, for the many government ceremonies. To maintain the purity of the royal lineage, the Inca married his sisters.

Despite this aura of majesty, Huayna Capac and his ten predecessors were men of action. He was in the north because his army was fighting to annex what is now southern Colombia. He himself was organizing the construction of a new northern capital, at either Quito or Tomebamba (modern Cuenca), that would rival Cuzco, the imperial capital of the Inca, a thousand miles to the south.

Huayna Capac's empire stretched for almost 3,000 miles along the Andes Mountains and Pacific coast of South America. The Inca thought they controlled almost all the world, for to the east lay Amazon forests inhabited only by hunter-gatherers, to the south the frigid wastes of Patagonia, and to the west the ocean.

Unknown to this mighty ruler, two alien threats were approaching from the north. One was the virus smallpox, a disease that the Spaniards had unwittingly carried from Europe to the Caribbean. Epidemics of smallpox were already ravaging the tribes of Colombia, which had no immunity to this killer.

The other threat was even more improbable. It came from 14 haggard men on an uninhabited island off the Pacific coast, 150 miles northwest of Quito and 9,350 feet below that mountain city.

Francisco Pizarro, a 50-year-old Spanish soldier, had led some 150 emaciated men to the island, which they named Gallo (Cock) because its silhouette resembled a cock's comb. The men were sickly, near starving, and mutinous after a ten-month expedition of harrowing hardship.

Pizarro had sent his partner Diego de Almagro back north in their small ship to recruit reinforcements in Panama. But his desperate men had smuggled a message to the governor of Panama, which they hid in a bale of wool for his wife. They appealed for deliverance from their fanatic leader; he was, they

The battered visage of Francisco Pizarro stares from his brother Hernando's palace, built in their hometown of Trujillo, Spain, with the spoils of conquest. As a farm boy, Pizarro never learned to read or write. Campaigns in Italy and expeditions of discovery and conquest in the New World hammered him into a hardened soldier ready to test his courage against unknown South America.

Bold ventures, big prize

Forty miles of isthmus stretched between the conquistadores in the Caribbean and the fortunes of their dreams. Vasco Núñez de Balboa worked his way across in 1513, leading his men—Pizarro among them—to the Pacific.

Helping explore Panama, Pizarro became a prominent citizen and landowner. Restless by 1524, he headed a grueling foray down the coast of Colombia. On a second expedition he bartered for Inca gold; thus verifying reports of riches, he won the Spanish king's approval for a third, decisive thrust south.

As Pizarro entered Inca territory in 1532, the last throes of a civil war preoccupied the empire. In Cajamarca, Peru, he and some 160 men defeated the Inca army and later killed their ruler, Atahualpa. After a series of skirmishes in 1533, the Spaniards took Cuzco, the Inca capital. Resistance continued into the 1570s, but the outcome was inevitable.

The Inca's own conquests, begun in the early 1400s, gave them an empire of more than 700,000 square miles with ten million people.

Runners who relayed messages over more than 14,000 miles of roads and suspension bridges kept the ends of the Inca Empire in constant contact.

PIZARRO ROUTES
- With Balboa 1513
- 1524–1525
- 1526–1527
- 1531–1532
- 1533

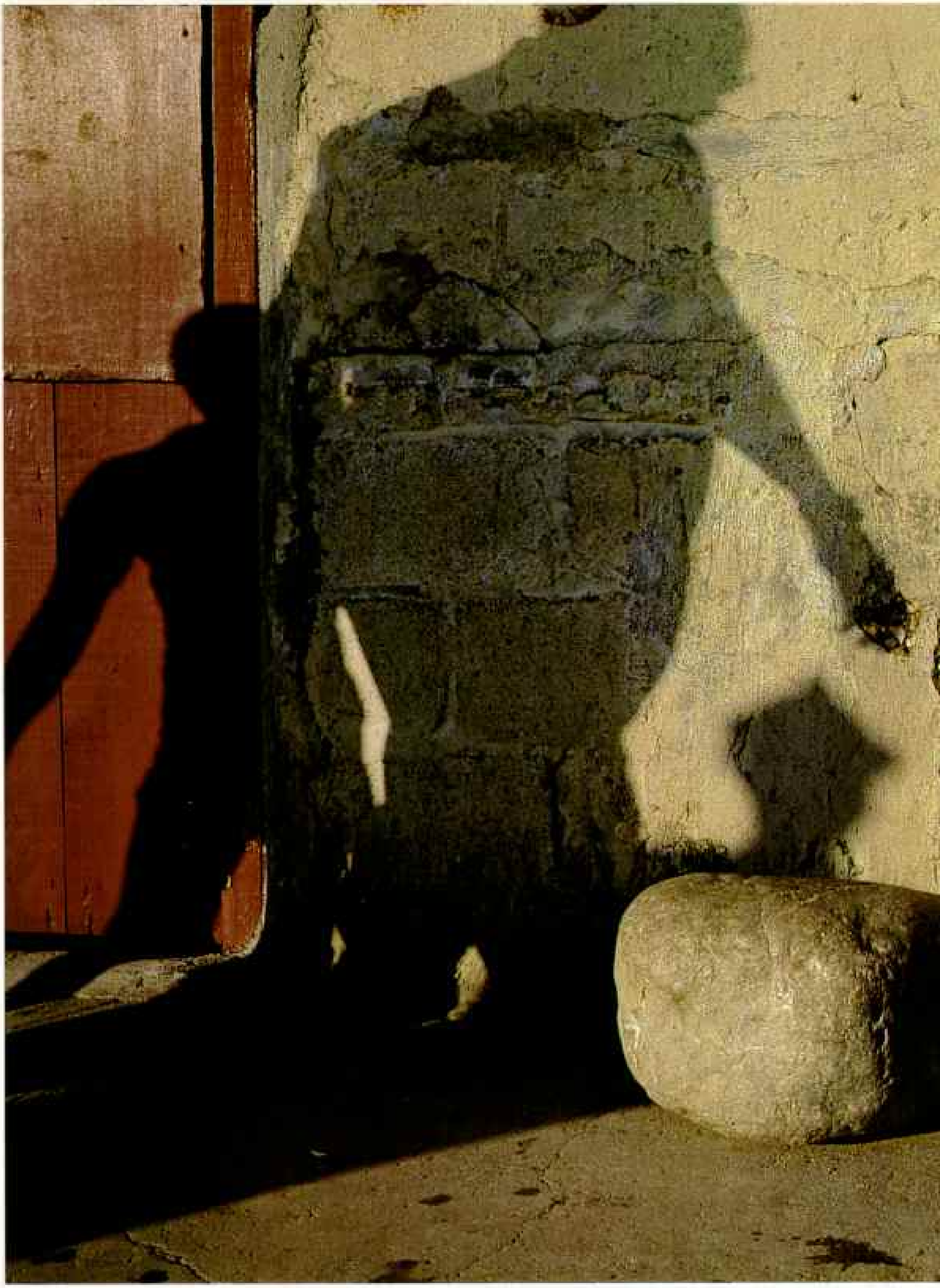
Inca Empire
Inca road system
Inca settlement
Spanish town

Date indicates year of Spanish colonization.

0 200 kilometers
0 200 miles

NGS CARTOGRAPHIC DIVISION
PAINTING BY JOHN A. BOEKER

COSTA RICA
CARIBBEAN SEA
Nombre de Dios
Gulf of Urabá
Panamá
PANAMA
Chiriquí
Chiriquí Gulf
Chitra
Pearl Is.
San Sebastián
Santa María la Antigua del Darién
VENEZUELA
COLOMBIA
Gorgona Island
Gallo Island (Isla del Gallo)
San Mateo Bay
EQUATOR
Quito
ECUADOR
Ambato
Tomebamba (Cuenca)
Puná I.
Gulf of Guayaquil
Tumbes
Amazon River
San Miguel de Piura 1532
Piura
Paita
Huancabamba
Sechura Desert
Motupe
Cajamarca
PERU
Trujillo 1535
Huánuco
Jauja 1534
Ciudad de los Reyes (Lima) 1535
Pachacámac
Vilcabamba
Machu Picchu
Wiñaywayna
Guamanga (Ayacucho) 1539
Cuzco 1534
Andahuaylas
Vilcas
Nasca
Source of the Amazon
Arequipa 1540
BOLIVIA
Lake Titicaca
Chuquisaca (La Paz)
CHILE
PACIFIC OCEAN



Morning shadows mark time-scarred Santo Domingo, Dominican Republic.
Arriving in 1502, Pizarro found a camp of adventurers. It quickly became Spanish

America's premier city, where "buildings are tall and handsome . . . [and] streets are like those of Florence," according to chronicler Alejandro Geraldini.

claimed, a "slaughterer." The governor responded by sending a ship with orders that any man who wanted to leave that crazy venture should be allowed to go.

Pizarro was tall, well built, and quite handsome, but he must then have been gaunt, weather-beaten, and raggedly dressed. Normally taciturn, Pizarro became eloquent. He was convinced that a rich empire lay to the south. He therefore used his sword to draw a line in the black, pebbly sand of Isla del Gallo and challenged his men to cross it and stay with him:

"Comrades and friends, *there* lies the part that represents death, hardship, hunger, nakedness, rains, and abandonment; this side represents comfort. Here you return to Panama to be poor; *there*, you may go on to Peru to be rich. Choose which best becomes you as good Spaniards!"

Only 13 men crossed the line. To their contemporaries they became "the 13 of glory"; the others sailed back to Panama "as if escaping from captivity by the Moors."

FRANCISCO PIZARRO had come a long way, entirely on his own merit. He was born, probably in 1477, in Trujillo, a walled town in the province of Extremadura, 130 miles southwest of Madrid. Trujillo is an ancient place that was for centuries in the forefront of the Christian reconquest of Spain from the Moors. It nestles on the slope of a granite hill crowned by an old castle. From a distance the towers of Trujillo's many churches jostle with the keeps of its leading citizens' houses behind a line of formidable crenellated walls. Everything is built of stone.

I always love visiting Trujillo because it is full of memories of the Pizarros. Understanding the conquest of Peru has been an obsession with me, ever since I spent a year after leaving Oxford University walking, riding mules and horses, or hitching rides on trucks and rickety buses to all parts of that ever fascinating country. Years of research in archives were equally

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JOHN HEMMING is director of the Royal Geographical Society and the author of *The Conquest of the Incas*. London-born STUART FRANKLIN's photographs appeared previously in the GEOGRAPHIC in "The Disease Detectives," January 1991.

Dire straits forced a dramatic move on Isla del Gallo, Colombia. During Pizarro's second expedition his troops mutinied. Drawing a line in the sand with his sword—perhaps one like this bearing his initials and title—he dared them to choose: security and poverty in Panama or risks and possible riches farther south. Thirteen men crossed the line, following him to mayhem and glory.

SWORD PHOTOGRAPHED AT GOLD MUSEUM, LIMA; PAINTING BY HERBERT TAUSS

rewarding—the eyewitnesses of those amazing events wrote as vigorously as they fought.

I have been back to Peru often. Preparing this story allowed me to return again, to delight in Peru's beauty and the friendliness of its people. But also to witness its modern struggles: to overcome poverty, overpopulation, economic decline, drug traffickers, and Marxist guerrillas.

Pizarro was the illegitimate son of Don Gonzalo Pizarro, "the Tall," a distinguished soldier who gained a title of nobility for bravery against the Moors. His mother was Francisca Gonzales, daughter of a laborer.

Francisca brought up her son in her parents' house. The boy was never taught to read. He would have played with other lads in the country around Trujillo, sometimes tending sheep or pigs. Contemporaries hostile to Pizarro sneered that he had been raised as a swineherd, but there was nothing disreputable about that. And there was little stigma attached to illegitimacy. Important men were proud to have many children, and the young Francisco would have been welcome in the big house of his grandfather on Trujillo's main square.

Pizarro is thought to have left Trujillo at 19 to join the Spanish army in Italy. We know that he sailed to the Americas in 1502, when he was about 25. At that time in Spain young men without landed inheritance could rise socially only through warfare or marriage. Many therefore sailed to try their luck in the New World; in the 16th century an estimated 200,000 Spaniards would cross the Atlantic. Young Pizarro participated in the bloody conquest of the Taino Indians of Hispaniola, the island that now contains the Dominican Republic and Haiti. He was soon in demand as a battle-hardened young veteran. For a time he followed Alonso de Ojeda, who perfected the Spanish tactic of charging straight into a mass of natives, slashing a deadly swath through their unarmored bodies.

Pizarro was about 35 when he made the famous crossing of Panama with Vasco Núñez de Balboa to discover and "take possession" of the Pacific Ocean for Spain.

In time Pizarro became one of the first citizens of the new city of Panama, founded in 1519. He was granted a quota of Indian workers and owned a share in a ranch. He

"Scarcely a league round," as historian Pedro de Cieza de León recorded, Isla del Gallo offers little more to modern tenants than it did to Pizarro and his men.

Scavenging food, the exhausted, disease-wracked mutineers had suffered several deaths a week during the five months they waited for resupply.

served as mayor. In his late 40s, he was respected and quite rich. Most men in his situation would have been content to retire after a hard and successful career.

What made Pizarro now embark on years of desperate battling down the coast of South America, spending his fortune, risking health and life, in pursuit of a chimera? The tough professional became an obsessed Don Quixote. Professor José Antonio del Busto, Peru's leading biographer of Pizarro, reminded me that he had been a keen gambler. "Later in life he loved playing dice or betting on his skills at bowls, pelota, or horseshoe tossing. But he was not a big player—he was perfectly happy competing against sailors or workingmen for penny stakes."

Pizarro was a calm, deliberate man; he had no expensive tastes. He knew only his vocation: fighting and exploring. Rather than retire, he preferred to roll the dice once more—to seek glory as leader of his own enterprise.

Pizarro formed a partnership with Diego de Almagro and a priest, Hernando de Luque, to finance exploration southward along the Pacific coast. The trio bought a ship and spent all their money on supplies and men. On November 14, 1524, Pizarro sailed from Panama in command of the first of his three expeditions of discovery. Three tough years later came the turning point, the line in the sand of Isla del Gallo.

With only 13 loyal men remaining, Pizarro felt that Gallo was too vulnerable to attack; he moved to an island farther out in the Pacific. The little group survived like castaways for seven months. They christened this hellhole Gorgona, the anteroom of Hades.

Finally in late March 1528, Pizarro's luck turned. The pilot Bartolomé Ruiz sailed from Panama to Gorgona and rescued the band.

With shouts of "Santiago," Spain's battle cry against the Moors, Pizarro's horsemen charged thousands of Inca assembled in the square at Cajamarca. Slashing into the royal retinue, the Spaniards toppled Atahualpa from his litter and took him prisoner.

They sailed south now, crossing the Equator, coasting Ecuador and Peru. At one place they were entertained by a woman chief, and they took back proof of Peru's wealth—fine cloth, gold and silver, boys to be trained as interpreters, and dignified stiff-necked llamas.

IN PANAMA the partners decided that one of them must return to Spain. No conquistador dared to move without a royal license. Pizarro went, reaching the court of King Charles in Toledo at the end of 1528. The leathery old soldier made a strong impression on the 28-year-old king. Hernán Cortés, who had vanquished Mexico's Aztec, happened to be in Toledo at that time, dazzling the court with his wealth and his conquest of an area larger than Spain itself. A cousin of the Pizarros and also from Extremadura, he probably advised Pizarro and may have lent him money. Cortés's success persuaded the king that anything was possible in the New World. So Pizarro parlayed his llamas and Inca artifacts into the title of governor and the most favorable license ever won by a would-be conquistador.

Back in the Americas, Pizarro and his partners prepared their assault. Their three ships sailed from Panama in January 1531 carrying 180 men, of whom half "were in very poor shape and sickly," and 37 horses.

Pizarro's third expedition started well: His ships took only two weeks to reach northern Ecuador. He then advanced overland down this difficult coast; it cost him 15 months of hardship. The invaders finally sailed from the Gulf of Guayaquil to mainland Peru in a flotilla of balsa-wood rafts in April 1532. They were bitterly disappointed by Tumbes, a town that had been described with much hyperbole four years earlier. Tumbes was ruined and depopulated by smallpox, the disease that probably was responsible for the death about 1530 of the ruler Huayna Capac.

The land was also torn by a civil war to decide which of the Inca's sons should succeed him. Such a struggle was normal in Inca history: The ablest rather than the eldest son became supreme Inca. Atahualpa was the son in the north with the professional army; Huascar was the son with the traditional elite in the imperial capital, Cuzco. While Pizarro's gang was entering Peru, Atahualpa's generals were winning the civil war by capturing Cuzco and the rival Huascar.

Pizarro's force moved down the northern

PAINTING BY HERBERT TAUSS

coast of Peru. His band now consisted of 160 adventurers—mostly Spaniards but also converted Jews and Moors from Granada, Levantines, Italians, and a Greek. Pizarro's officers included his younger brothers and Hernando de Soto. There was also a priest. Most of these men were farmers and artisans, but they included soldiers, sailors, mystics, tailors, secondhand-clothing salesmen, smiths, and slavers of Central American Indians.

The Inca Atahualpa was kept informed of the progress and disgraceful behavior of these strangers. A spy said they were ordinary men, capable of being defeated and enslaved.

IN NOVEMBER 1532 Francisco Pizarro made another fateful and very brave decision. The main Inca royal road between Quito and Cuzco ran along the valleys of the Andes, and Pizarro learned that the victorious Inca Atahualpa was marching south along this highway, to be crowned in Cuzco.

By chance, Atahualpa was camped at the mountain town of Cajamarca, inland from the Spaniards' advance along the coast road. Pizarro determined to take his small force into the hills to confront the Inca ruler. His men climbed out of the desert through canyons flanked by walls of rock. Higher up, the land became more fertile, with maize alongside streams and potatoes on the hillsides.

In a flat, lush valley amid the hills lay Cajamarca. A provincial center of the Inca Empire, it was an assembly point for festivals and administration rather than a place where people lived. The town contained a huge plaza and a stone-faced platform, called an *usnu*, on which government officials and priests presided over gatherings of farmers from the surrounding countryside. Around the plaza were long, low buildings in which the crowd could shelter from rains. Pizarro's men were appalled when they looked down on Cajamarca from the hills. The valley beyond the thatched roofs of the town was filled with Atahualpa's army.

The Inca himself was four miles away, at natural hot springs that still bubble from the ground in a sulfurous mist. Pizarro sent some of his best horsemen to visit Atahualpa. They rode through the silent ranks of native troops and finally reached the mighty Inca, who was seated on a low stool "surrounded by all his women and . . . many chiefs." The strangers were given chicha from golden pitchers. Atahualpa told the Spaniards to lodge in the empty buildings around Cajamarca's square; he promised to come to meet Governor Pizarro the next day.

Back in their camp the invaders debated what to do. "Few slept. We kept watch in the square, from which we could see the campfires of the Indian army. It was a fearful sight. . . . like a brilliantly star-studded sky." Pizarro moved about, encouraging the men. "There was no distinction between great and small, or between foot soldiers and horsemen. . . . On that day all were knights."

Pizarro determined that his only hope lay in a stroke of breathtaking audacity: to try to capture the Inca in the midst of his army of perhaps 80,000 men. It was agreed that Pizarro should decide on the spur of the moment whether to attempt this mad plan.

Atahualpa's army started to move at midday. "In a short while the entire plain was full of men, rearranging themselves at every step." It was a ceremonial parade. "All the Indians wore large gold and silver discs like crowns on their heads." They chanted in unison. The Spaniards waited anxiously. A young page, Pedro Pizarro, "saw many Spaniards urinate without noticing it, out of pure terror."

It was late afternoon when the vanguard of this magnificent procession marched into Cajamarca's plaza. "In a very fine litter with the ends of its timbers covered in silver, came . . . Atahualpa. Eighty lords carried him on their shoulders. . . . [The Inca] was very richly dressed, with his crown on his head and a collar of large emeralds." Atahualpa ordered a halt while his men continued to enter the square.

The square of Cajamarca was ideally suited to the Spaniards' murderous plan. The low buildings flanked three sides; the fourth side was a wall beyond which lay open fields. Pizarro had stationed his men in these buildings, with the horsemen mounted and ready to charge out. The Greek, Pedro de Candia, was the expedition's gunner. He was posted with "eight or nine musketeers and four small pieces of artillery" on the usnu platform at one end of the plaza.

Atahualpa was surprised to see the square empty of the bearded strangers. Then the Spaniards' priest, *(Continued on page 109)*

On the threshold of a room in Cajamarca, said to have held the captive Atahualpa, a woman spins yarn with the timeless whorl of her Inca ancestors.

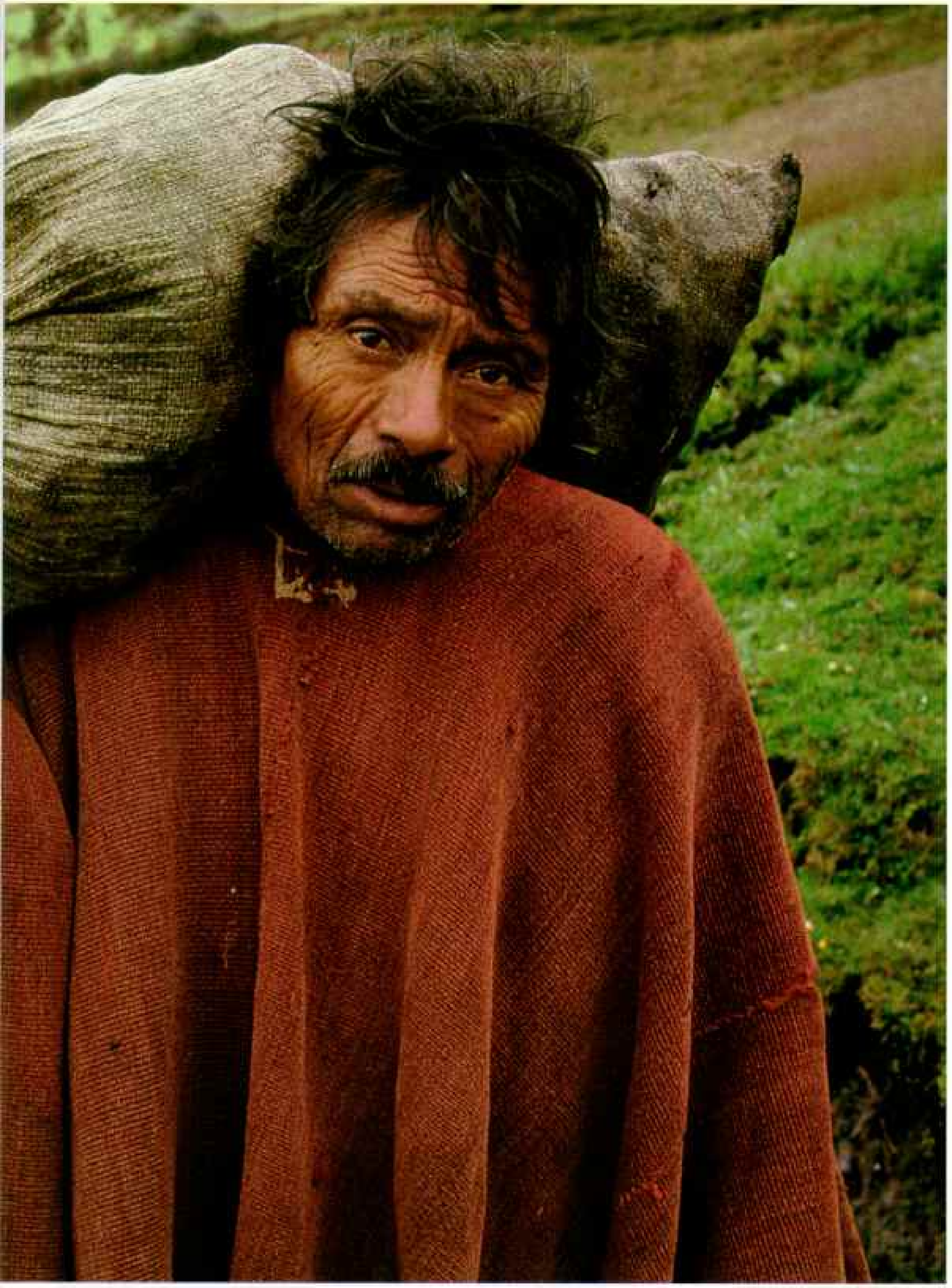
Mistaking the conquerors for mere treasure hunters, the ruler offered to "fill [a] room with different kinds of golden vessels . . . besides lumps and other pieces," noted Pizarro's secretary, Francisco de Jerez. "As for silver, he said he would fill the whole chamber with it twice over."

A few pieces, including these gold figurines, escaped the stream that flowed to Cajamarca for eight months. Melted down, the treasure yielded 13,400 pounds of gold and 26,000 pounds of silver. One-fifth went to the crown, while each conquistador got a share according to "his services, position, and the labors he had gone through." Pizarro's cut was almost seven times that of a horseman's.

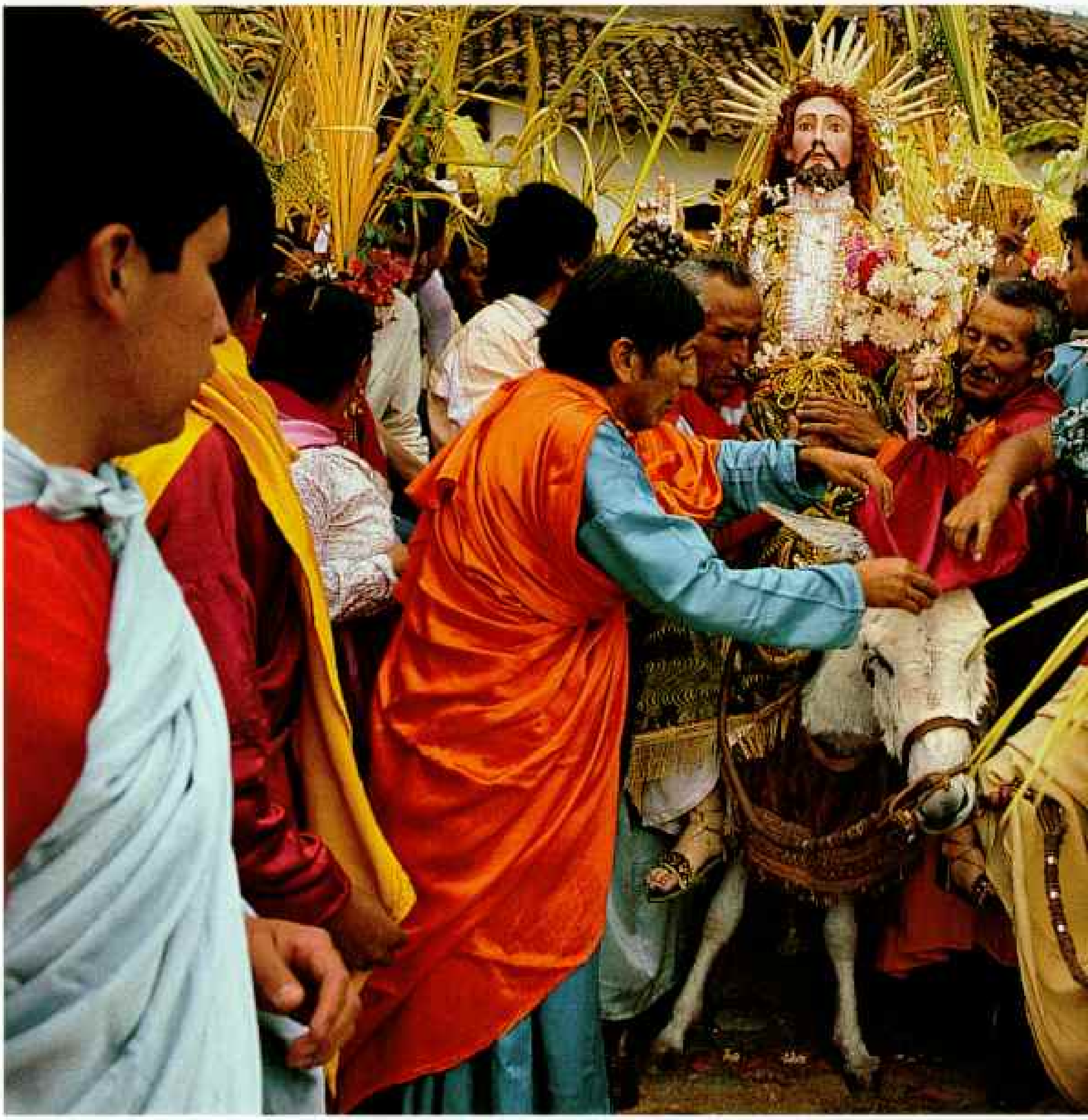
Even a king's ransom could not save Atahualpa, garroted after a forced conversion to Christianity.

PHOTOGRAPHED AT GOLD MUSEUM

Immemorial burden and blessing of Andean peoples, a sack of potatoes weighs on a farmer along a track near Cajamarca. About one-third of Peruvians are highland

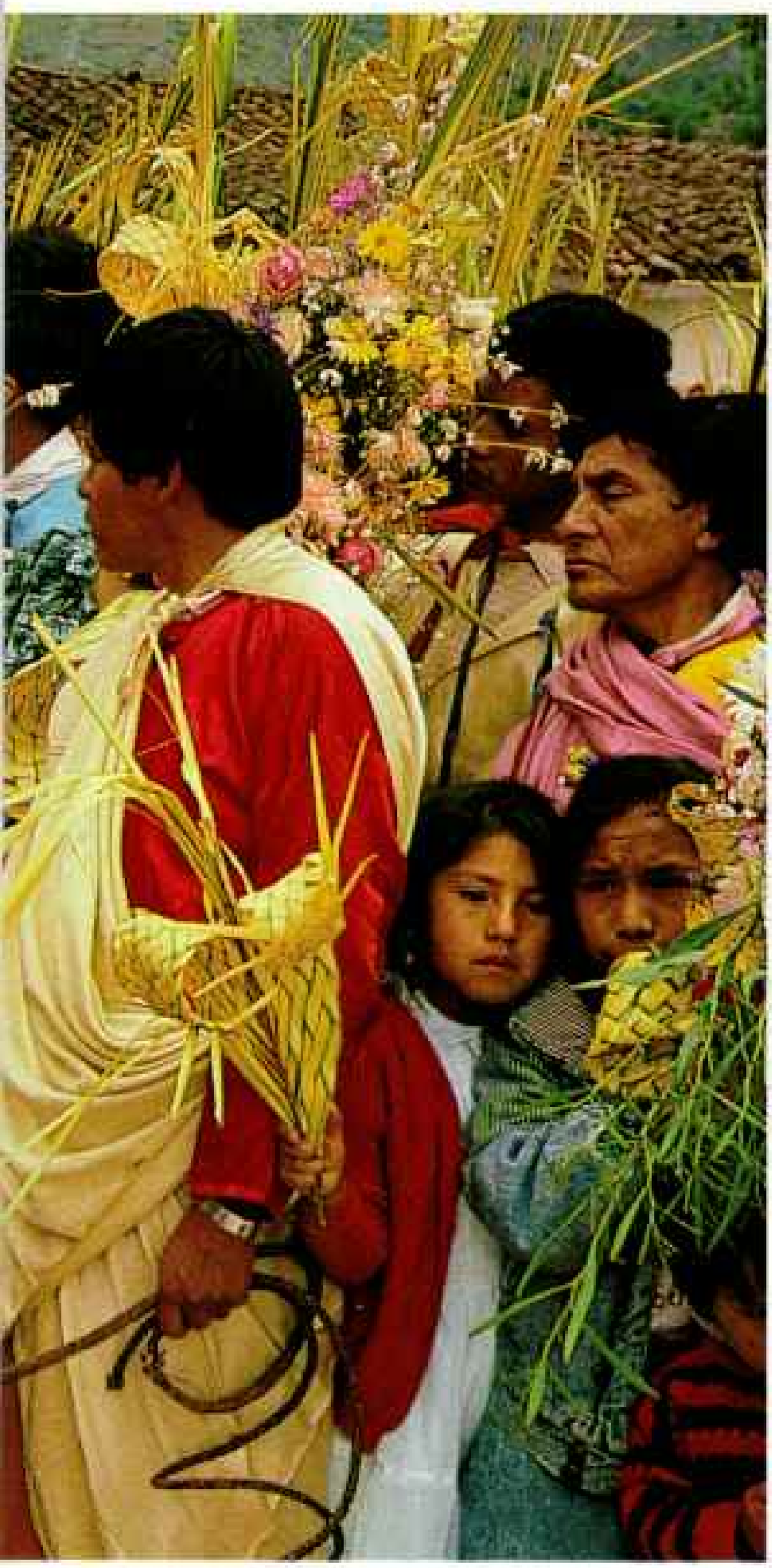


farmers who speak Quechua, the language of the Inca, and hand-cultivate traditional crops, sometimes using ancestral terraces and irrigation systems.



Holy Week pageantry in Ayacucho, Peru, includes candlelight prayers and a Palm Sunday procession.

Reflecting the devotion of his day, Pizarro's secretary trusted his report would be "to the glory of God, because [we] have conquered and brought to our holy Catholic Faith so vast a number of heathens, aided by His holy guidance." The church endures as Spain's most influential bequest to its former colonies.



the Dominican Vicente de Valverde, and an interpreter advanced through the native troops toward the Inca's litter. The priest delivered a speech about "the things of God." He held up a breviary, which Atahualpa admired for its fabric. But the Inca found the book's contents incomprehensible—despite their advanced culture, the Inca had no system of writing, although they used knotted strings to provide numerical records. Atahualpa threw the book to the ground. Friar Valverde ran back to his compatriots, shouting "Come out, Christians! Come at these enemy dogs who reject the things of God!"

Pizarro, calm and decisive but insanely reckless, gave the signal. Candia fired his cannon. Horsemen and foot soldiers charged from their hiding places, shouting and blowing trumpets; rattles on the horses added to the din. "The Indians were thrown into confusion and panicked. The Spaniards fell upon them and began to kill." The Inca were unarmed, packed into the square, totally unprepared. In their terror, they "formed mounds and suffocated one another" while razor-sharp Spanish swords sliced their bodies.

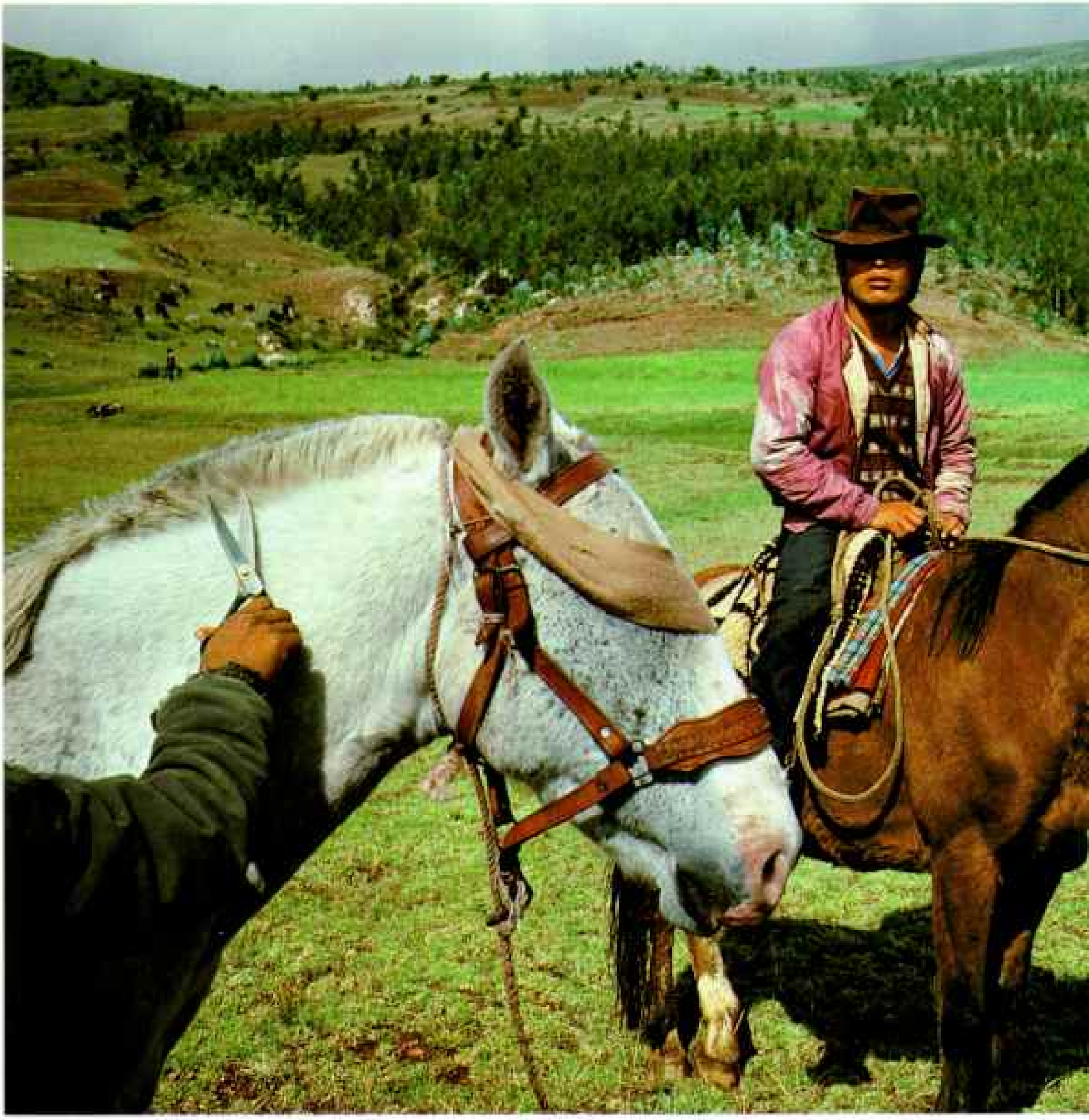
Pizarro, a poor rider, fought on foot with sword and dagger. He plunged through the natives to Atahualpa's litter, grabbed the Inca's arm and tried to pull him down. "Many Indians had their hands cut off but continued to support their ruler's litter with their shoulders. But their efforts were of little avail, for they were all killed."

Pedro Pizarro saw others replace the slain bearers. "[We] continued in this way for a long while, overpowering and killing the Indians." Finally, "seven or eight [mounted] Spaniards spurred up and grabbed the edge of the litter, heaved on it, and turned it on its side. Atahualpa was captured in this way."

The terrible carnage continued on the plain. After two hours "six or seven thousand Indians lay dead [there] . . . many more had their arms cut off." Every Spaniard massacred an average of 15 natives during those two terrible hours.

Pizarro's secretary, Francisco de Jerez, marveled that "it was extraordinary to see so great a ruler captured in so short a time, when he had come with such might." The bloodstained conquistadores could scarcely believe what they had done. One horseman concluded that "it was not accomplished by our own forces, for there were so few of us. It was by the grace of God, which is great."

THE GAMBLER PIZARRO had broken the bank. By capturing the god-like Inca he paralyzed the vast empire. Atahualpa was amazed that his captors did not kill him, as he did to his vanquished enemies. He observed the greed with which the Spaniards stole his personal table service. On the day after the massacre, Hernando de Soto confiscated 800 pounds of gold, more than 3,500 pounds of silver, and 14 emeralds. "The gold and silver was in monstrous effigies,



large and small dishes, pitchers, jugs. . . ."

Tragically for Peru, the Inca did not grasp that these 160 strangers were the spearhead of a colonial invasion. He thought that they were merely raiders after treasure. Pizarro maintained this delusion.

The Inca therefore tried to buy his own freedom. "Atahualpa said that he would give a room full of gold . . . also . . . the entire hut filled twice over with silver." The adventurers were staggered by the size of this ransom. Pizarro had the deal recorded on paper and "promised to restore [Atahualpa] to his former liberty, provided he did no treason."

Atahualpa remained a captive of Pizarro for eight months. During that time he continued to function as ruler of the Inca. He ordered long columns of llamas to bring the treasures of his empire to Cajamarca to fill the ransom room. He told his generals not to impede Spaniards who traveled deep into Peru to supervise the looting of its temples.

Atahualpa's ransom was fulfilled by mid-1533. The chamber full of treasure was melted down and divided among the adventurers; a fifth went to the king of Spain.

Pizarro's partner Diego de Almagro reached Cajamarca with reinforcements from Panama, but the newcomers did not share in

Steadied by a blindfold, a horse gets a quick trim near Ayacucho before being sold. This sturdy mountain breed descended from conquistadores' mounts, which were critical weapons of conquest. The Inca "thought more of killing one of these animals that persecuted them so than they did of killing ten men," noted chronicler Francisco López de Gómara.

the ransom. They therefore wanted to dispose of the Inca and press inland to plunder his empire. Although Atahualpa had paid his ransom, the invaders did not dare release him to rule even a part of his country. The leading Spaniards held a hasty, panicky meeting and decided to execute their prisoner. Pedro Pizarro recalled: "I saw the Governor weep from sorrow at being unable to grant him life, because of the consequences and the risks in the country if he were released."

As night was falling on Saturday, July 26, 1533, Atahualpa was brought out and tied to a stake on the square. Trumpets sounded. Friar Valverde instructed him in a deathbed conversion to Christianity. The Inca was strangled by a rope twisted around his throat.

Spanish authorities in Panama condemned the execution. They argued that Atahualpa should have been exiled to the Caribbean or Spain. King Charles wrote to Pizarro: "We have been displeased by the death of Atahualpa, since he was a monarch and particularly as it was done in the name of justice."

THE CITY SQUARE of Cajamarca is now smaller than in Inca times. It is filled with trees, shrubs, and ornamental flower beds and flanked by baroque churches and attractive two-story houses with colonial balconies. On market days Indian farmers come with families, both sexes wearing the tall straw hats that are the hallmark of the area.

To me, Cajamarca is haunted by the blood of the Inca. Sixty yards to the south of the pretty plaza is a rectangular building of unmistakable, perfectly cut Inca stonework. This is claimed to be the chamber that Atahualpa filled with treasure. However, it is bigger than the ransom room described by eyewitnesses: It is probably the lodging in which the Inca was held captive.

The conquest of Peru started with checkmate—the capture and execution of the king. The fighting came later. Pizarro's men had four battles against Atahualpa's armies during their 800-mile march along the great Inca road from Cajamarca to Cuzco. The Inca fought bravely and killed a number of invaders. But they were outclassed in weapons and tactics. For every dead Spaniard, hundreds of natives perished.

The Inca armies advanced in phalanxes, engaging hand to hand with battle-axes and maces of stone or copper. They wore wooden bucklers and feather-bedecked wooden helmets. They hurled darts from throwing sticks and fired stones from the slings they wore around their heads.

None of these weapons were effective against the conquistadores, whose swords, lances, and daggers were of razor-sharp Toledan steel. When necessary, the Spanish wore plate armor or chain mail but often contented themselves with thick leather jerkins or padded vests. Spanish helmets were of metal. The Europeans had crossbows and cumbersome guns, but these proved too slow and heavy to be used often during the conquest.

The crucial weapon of Pizarro's men was the horse: It gave a rider speed, maneuverability, and height. In battle, a mounted man has an overwhelming advantage, using his horse as a weapon to ride down the enemy and keep himself inaccessible, while continually striking downward.

AS PIZARRO'S MEN advanced into the Inca Empire, they marveled at its road system. Despite their organizational efficiency, the Inca had not invented the wheel and had no wheeled transport. Inca highways were built for human runners, columns of soldiers, or lines of llamas. The roads were quite narrow but admirably engineered—often terraced along hillsides and with tunnels or long flights of steps. They crossed gorges on suspension bridges of fiber ropes. Pizarro's brother Hernando wrote that "such magnificent roads could be seen nowhere in Christendom in country as rough as this."

Finally, on November 15, 1533, Pizarro's men marched into the ultimate prize, the Inca capital, Cuzco. Thatched roofs topped rectangular single-story houses. Cuzco was (and still is) a clean, almost austere place in clear mountain air. Its narrow streets had channels of water flowing along them, and two small streams in the city center were held in stone-lined culverts. Cuzco's marvels were its public buildings—palaces of each of the dead Inca emperors and temples of the sun and other deities—all grouped near a vast plaza.

These monuments were often brightly painted and adorned inside with fine textiles. Their artistic brilliance, however, came from the virtuosity with which Inca masons cut their stones. The walls of palaces and temples were either of "coursed" masonry, in which rectangular stones were mounted in symmetrical rows, or "polygonal," where boulders interlock with uncanny precision in a gigantic jigsaw. Inca walls were built so skillfully that they have survived the earthquakes that periodically shake the Andes.

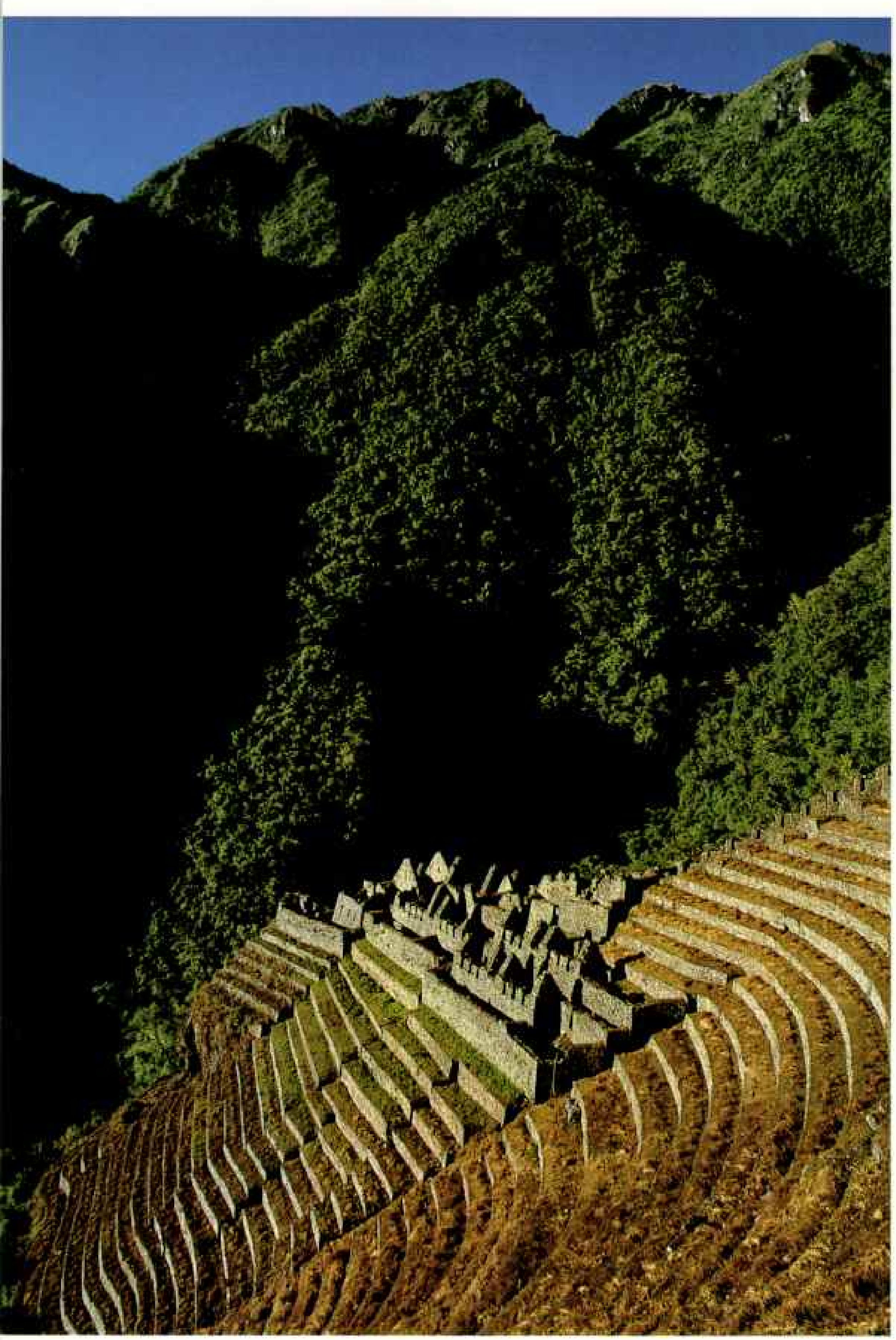
I spent many hours walking around Cuzco with Manuel Chávez Ballón, a much loved retired teacher of Inca studies. He taught me to study the bases of house walls to see the foundations of ancient Inca Cuzco. "Look! There . . . and there!" he pointed, as we retraced the lines of the city's former streets.

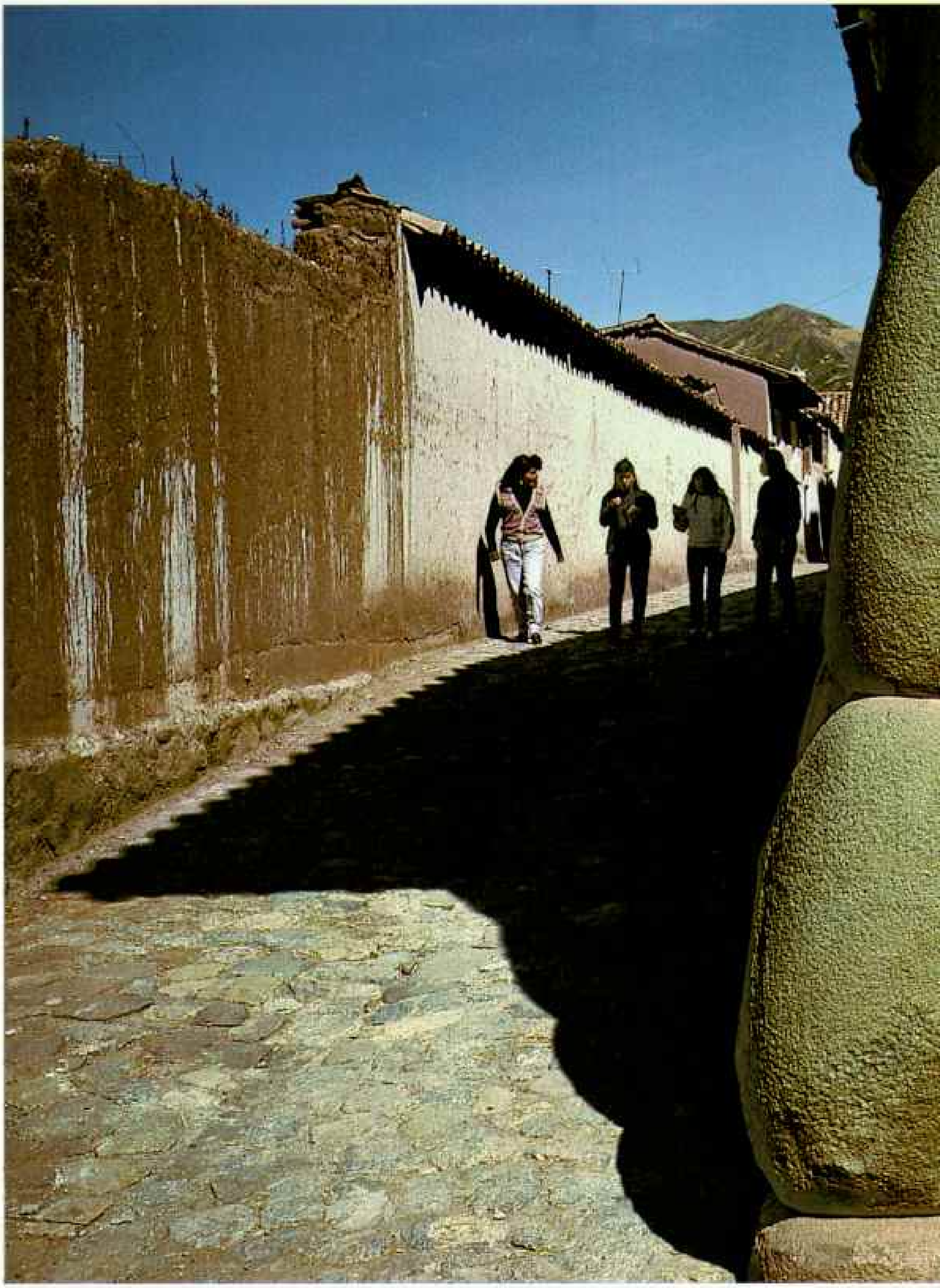
Like Cajamarca, Cuzco remains essentially an Indian city. This, with its Inca buildings, its superb colonial architecture, and its great altitude give Cuzco its powerful personality. To me, it is the most fascinating and beautiful historic city in South America.

To consolidate this prize, Pizarro elevated one of the few surviving sons of Huayna Capac to be Inca. This was Manco, who was

Garden terraces revetted in stone tame the tilted site of Wiñaywayna in Peru. Such optimal use of the land allowed the Inca to amass stores of crops against times of famine.

With the mountains as a backdrop, Spanish builders turned adobe to a lofty purpose—the Yucay Valley's first colonial church, recently restored.





"Cuzco was grand and stately and must have been founded by a people of great intelligence. It had fine streets, except that they were narrow, and the houses

were built of solid stones, beautifully joined . . . very large and well cut," wrote Cieza de León. In the modern city masterful Inca foundations stand unmoved.

In the inferno of a mine in Potosí, Bolivia, one of the many thousands of miners working veins of silver wards off fatigue with a wad of coca. Primed by plunder like this silver llama, the Spaniards sent Inca into the Potosí mines, which produced some 60 percent of the wealth Spain took from the Americas in the 16th and 17th centuries.

PHOTOGRAPHED AT GOLD MUSEUM

crowned early in 1534. Pizarro intended that Manco would be a puppet, helping the Spaniards subjugate his people.

PIZARRO, NOW IN HIS LATE 50s, set about governing and plundering the land he had conquered. The treasures of Cuzco were seized, melted down, and distributed among the adventurers. The haul of gold and silver was even bigger than that from Atahualpa's ransom.

Pizarro was a good soldier but had no experience in government. He was unprepared for the change. Aging and physically sapped by years of hardship, he made little attempt to rule Peru. To persuade Spaniards to remain in such a distant country, he awarded each senior conquistador an *encomienda*, or grant, of thousands of natives.

Indian men and women were forced to work unceasingly for their new masters. Chronicler Bartolomé de Vega was appalled to see natives transporting excessive tributes to the Spanish towns. "Men are loaded with it, and so are the women, the pregnant ones with their heads [bent down] on their swollen bellies and those who have given birth with their babies on top of the loads."

Chiefs were tortured to reveal treasure; women were raped—"no woman who was good-looking was safe to her husband."

Pizarro did appoint the bishop of Cuzco to be protector of the Indians; he also issued instructions to his soldiers not to abuse the natives too grossly. But there was little restraint or attempt to enforce any laws.

The Indian population declined catastrophically. The Inca's superb system of food storage for times of famine was abandoned, along with their irrigation canals and agricultural terraces.

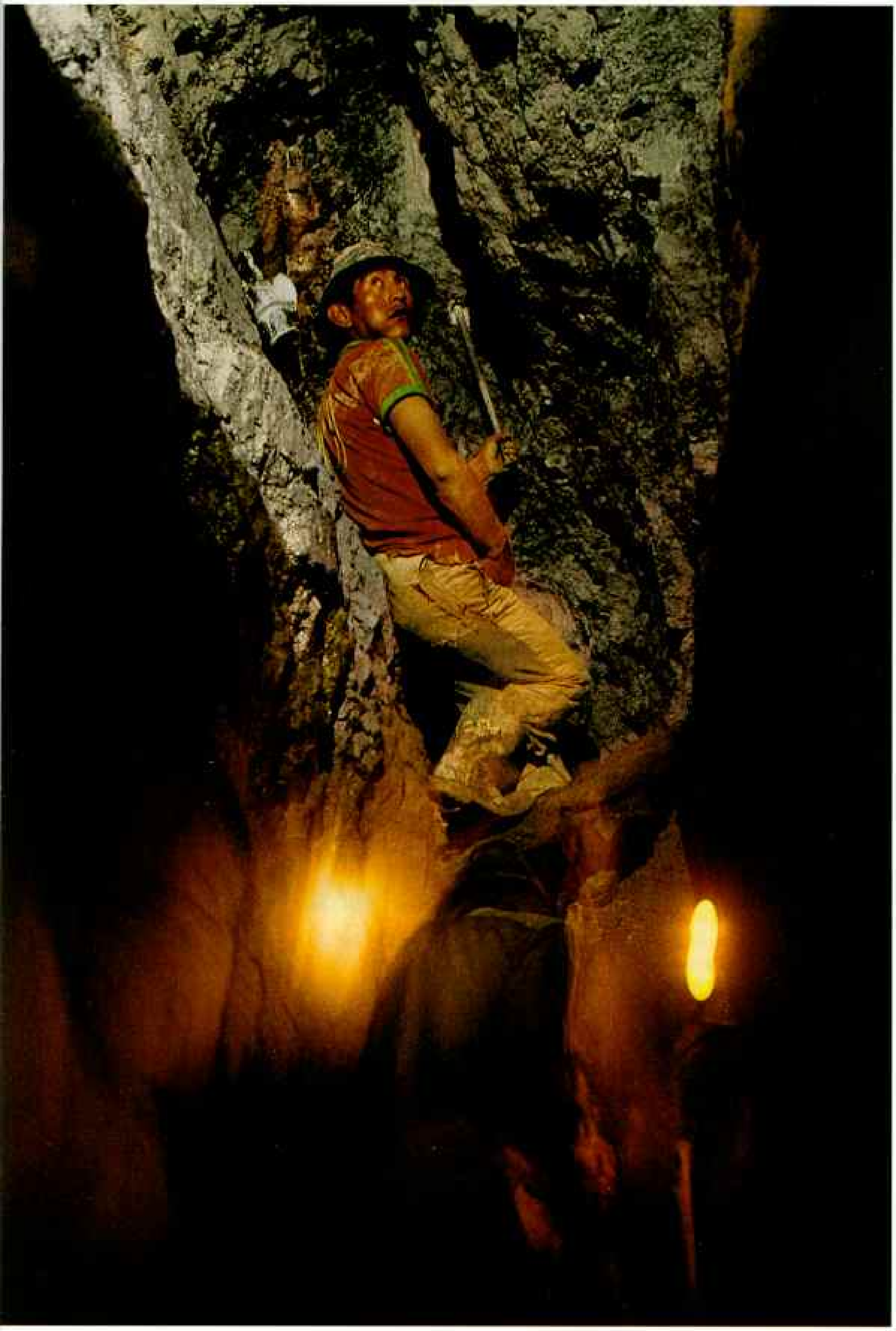
Governor Pizarro's main concern was to build towns for his Spaniards. He established seven, all of which survive. He decided that his capital must be on the coast for good maritime links to the rest of Spanish America. So, in January 1535, Pizarro created his capital in the coastal Rímac Valley. He called it Ciudad de los Reyes, the City of the Magi, but it has always been known by a corruption of Rímac—Lima.

The old governor took delight in laying out its streets and in awarding plots to his friends. He had Indians build him a residence, with Spanish tiles, arcades, and patios filled with imported olive and orange trees.

Pizarro's tranquillity did not last long. His younger brothers and other Spaniards in Cuzco insulted and abused the puppet ruler Manco Inca. Infuriated, Manco secretly mobilized his army and prepared stores of weapons. He escaped from Cuzco in April 1536 and assembled his chiefs in a ceremony at which they swore to drive the hated invaders from Peru. In May the 190 Spaniards in Cuzco found themselves surrounded by Indian forces.

Manco's rebellion lasted until December. Four expeditions sent by Pizarro to reinforce his brothers in Cuzco were all wiped out as they marched through mountain defiles. Some 500 Spaniards were killed, but the Peruvians failed to liberate their country.

Shiploads of Spanish soldiers arrived from Central America, and the siege of Cuzco was broken. Manco Inca fled into the jungle-clad hills of Vilcabamba. In those Amazonian forests, beyond the holy city of Machu Picchu, Manco Inca and three of his sons ruled a small fragment of the Inca Empire for 35 years. It was not until 1572 that a Spanish army managed to enter the refuge in Vilcabamba and capture the last of the royal Inca line, Manco's son Tupac Amaru. He was beheaded on the square of Cuzco, almost 40 years after the



execution of his uncle Atahualpa at Cajamarca. It was the end of the Inca Empire.

The Inca rebellion was not Pizarro's only problem. Other conquistadores tried to grab parts of the defeated empire. His greatest difficulty was with his old friend and partner Diego de Almagro. It had always been Almagro who organized supplies and men for the voyages and who arrived with help after Pizarro had made the first conquests. Almagro was bitter that the king invested only one partner with the title Governor of Peru. He accused Pizarro of duplicity in gaining most titles for himself.

Almagro was granted a governorship of land south of Peru, but when he marched there, he was disappointed that it seemed to contain no treasure. He was unaware that his territory included Potosí, where the Spaniards would soon discover the world's richest silver mine. So Almagro claimed Cuzco. Peru's conquerors were soon fighting one another with as much savagery as they had shown in butchering the Indians.

The war ended with Almagro's defeat by Pizarro's brother Hernando, at Cuzco in 1538. The arrogant and coarse Hernando executed 120 of Almagro's men, then condemned Almagro as a traitor and killed him. This act of vengeance was a mistake. When Hernando returned to Spain, he was imprisoned for it. For Governor Pizarro the price of the killing would be higher.

VICTORIOUS OVER Manco Inca and Almagro, Governor Pizarro settled down in his new city, Lima. He liked improving his house, tending his orchard, and walking through the streets to visit old soldier friends. He wore old-fashioned black clothes, but with the red cross of a knight of Santiago on the chest, and white deerskin shoes and hat. His only expensive item of clothing was a marten-fur coat sent by the elegant Cortés.

Pizarro enjoyed playing with his four young children, but he never married their Inca mothers or any other woman. He was indifferent to good wine, food, horses. Old and extremely rich, this most successful of all adventurers seemed unable to spend his sudden wealth. He wrote several wills: His main concern was to found and endow a lineage that would glorify the name Pizarro. He decreed that all his descendants, male or female, should bear the Pizarro name.

The executed Almagro now appeared as Pizarro's nemesis. A handful of Almagro's followers were in Lima, embittered by defeat and poverty. It was said that this group possessed only one cape, so they could emerge only one at a time onto the streets of the city with this essential symbol of a Spanish gentleman. These men rallied around a young son of Almagro. They hated Pizarro and decided to risk all to kill him. The governor heard that one Almagrist had bought weapons, but he chose to ignore the warnings.

On the morning of Sunday, July 26, 1541, Pizarro was in his palace with visitors when

A playful tug distracts a Peruvian weaver, but her hands stay with her work. Her backstrap loom is one of several kinds used by the Inca. This Inca ceremonial tunic bears images that suggest Amazonian jaguars.

Inca cloth was as fine as any found in Spain, judged Cieza de León, "some embroidered with gold and silver work, some with emeralds and other precious stones, some with feathers of birds."

COLLECTION ENRICO POLI, LIMA

20 assailants ran into the house with swords, pikes, daggers, and muskets. Pizarro's visitors ran or dived through windows to escape. The governor was in his bedchamber with his half brother Martín de Alcántara. The conspirators raced up; the 63-year-old warrior grabbed a sword and dagger. One attacker reported: "He placed himself in a doorway . . . and defended himself very well."

Pizarro killed one Almagrist, but the attackers "gave the Marquis so many lance thrusts, stab wounds, and sword slashes that he died." The Almagrist Juan Barragán admitted that "when the Marquis had fallen . . . he placed his fingers in the sign of a cross over his mouth and begged confession for his sins. [But I] took an urn that was full of water and smashed it from on high onto the Marquis's cross, and said to him: 'In Hell! You will have to confess in Hell!' It was a big jar and it broke his face, and with that great blow the Marquis finished dying."

The spot where Francisco Pizarro fell is now covered by the marble floor of a spacious hall in Peru's presidential palace. Across the Plaza de Armas in Lima stands the city's cathedral. Hugo Ludeña, an archaeologist passionately interested in Pizarro, led me down into the brick vaults beneath the cathedral. He showed me an alcove.

The dark figure of a policeman demands order among Peruvians who have put aside modern problems to observe the sun festival of their forebears at Sacsahuamán, the temple fortress above Cuzco. It was here that Pizarro's troops smashed a 1536 Inca siege, confirming Spain's conquest of this vastly rich land.

"This had been bricked over," Ludeña told me. "In 1977, workmen repairing the vault broke through the bricks and found coffins and a lead box behind. Imagine our excitement to find that the box contained a skull damaged by wounds, a jaw bone, and the hilt of a sword. Carved on the box's lid was the inscription: 'Here is the head of the Marquis don Francisco Pizarro, who discovered and won the kingdoms of Peru and brought them under the royal Crown of Castille.' "

One coffin contained a jumble of bones belonging to five individuals. Two of these were children, possibly Pizarro's; two of his children are known to have died shortly after their father. One of the victims may have been Martín de Alcántara, who was killed fighting beside his half brother. But the most interesting bones belonged to an elderly man of 5 feet 9 inches. These bones and the skull show vicious wounds. An elbow has been sliced off. Teeth sockets are fractured.

It is generally agreed that these bones are the remains of Francisco Pizarro. The cathedral's canons have moved them to an ornate, glass-fronted tomb in a chapel, but few visitors notice the memorial to the tough old soldier who destroyed the empire of the Inca.

I ASKED PERUVIAN HISTORIANS what they think of Pizarro. They share my grudging admiration for his tenacity, daring, and military leadership. The conquest of the Inca was less bloody than other Spanish adventures in the Americas, but there is no affection for the man who led it. María Rostworowski, an authority on the era, believes that Pizarro has been largely forgotten by her countrymen.

The conquest left two important legacies. One is that a third of all Peruvians today are mestizo—of mixed Indian and Spanish blood. In the mountains pure descendants of the Inca continue their traditional way of life, but descendants of immigrants from Spain and elsewhere in Europe fill the cities. The other legacy is the Catholic Church, which waged a determined campaign to wipe out Inca beliefs and which is now the religious solace of most Andean Indians.

Lima has long since lost its colonial grandeur, and the Peruvian economy has been battered by bad government. But there are signs of improvement. And in the mountains, many Indians now own their land for the first time in history.

There will be little celebration of the fifth centenary of Columbus or of the conquistadores who followed him. Peruvians are too busy surviving and trying to rebuild a great nation. I think, and hope, that they will succeed. □

PERSIAN GULF POLLUTION

Assessing the Damage One Year Later

By SYLVIA A. EARLE

Photographs by SISSE BRIMBERG

Raging candles on a macabre cake of desert, Kuwait's oil fires were set one year ago this month by retreating Iraqis. As workers fought the blazes below, researchers flew through the smoke plumes, assessing their makeup and threat to the regional and global environment. Seen from the window of an instrument-packed Convair aircraft, plumes of varying shades from wellhead fires reveal different chemical mixes. Oil on the engine cowling is from the plane itself; the wing is streaked with the air's grimy payload.

Nonsmoking section at 10,000 feet, a layer of clear air between smoke plumes gave pilot Jim Ragni breathing space last June 2. Oil peppered the windshield, a result of the plane "getting up close and dirty," in the words of Larry Radke, a scientist with the National Center for Atmospheric Research.

The work done by NCAR in this Electra and by the University of Washington, in the Convair, was sponsored by the National Geographic Society, the National Science Foundation, and several U. S. agencies, including the Defense Nuclear Agency.

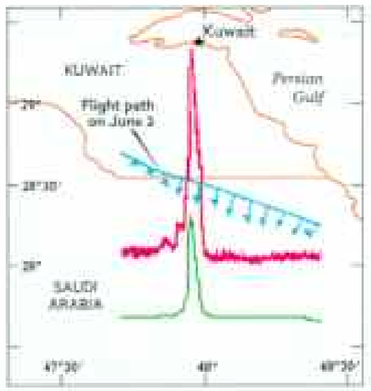
The ongoing project, supported in part by major U. S. oil companies, is one of dozens from 16 nations, all coordinated under the UN. The response included work by nine units of the U. S. government led by the Environmental Protection Agency (EPA). As chief scientist of the National Oceanic and Atmospheric Administration (NOAA), I joined several teams in 1991 to explore the effects of the fires and what is, cumulatively, the largest oil spill in history.*

As EPA head William Reilly observed, "Terrible as the disaster was, much greater would be the tragedy if we did not learn from it."

For five weeks beginning in mid-May the research planes wove through the plumes, taking readings and recording data in onboard computers. Since the plumes move with the wind, up-to-the-minute satellite data were consulted before each flight. A near-infrared, NOAA-9 satellite image (far right), made the same day as the flight shown above, reveals the southerly path of the collective plume—as well as the burning wells, shown as white blotches. Tiny white dots are unrelated heat sources.

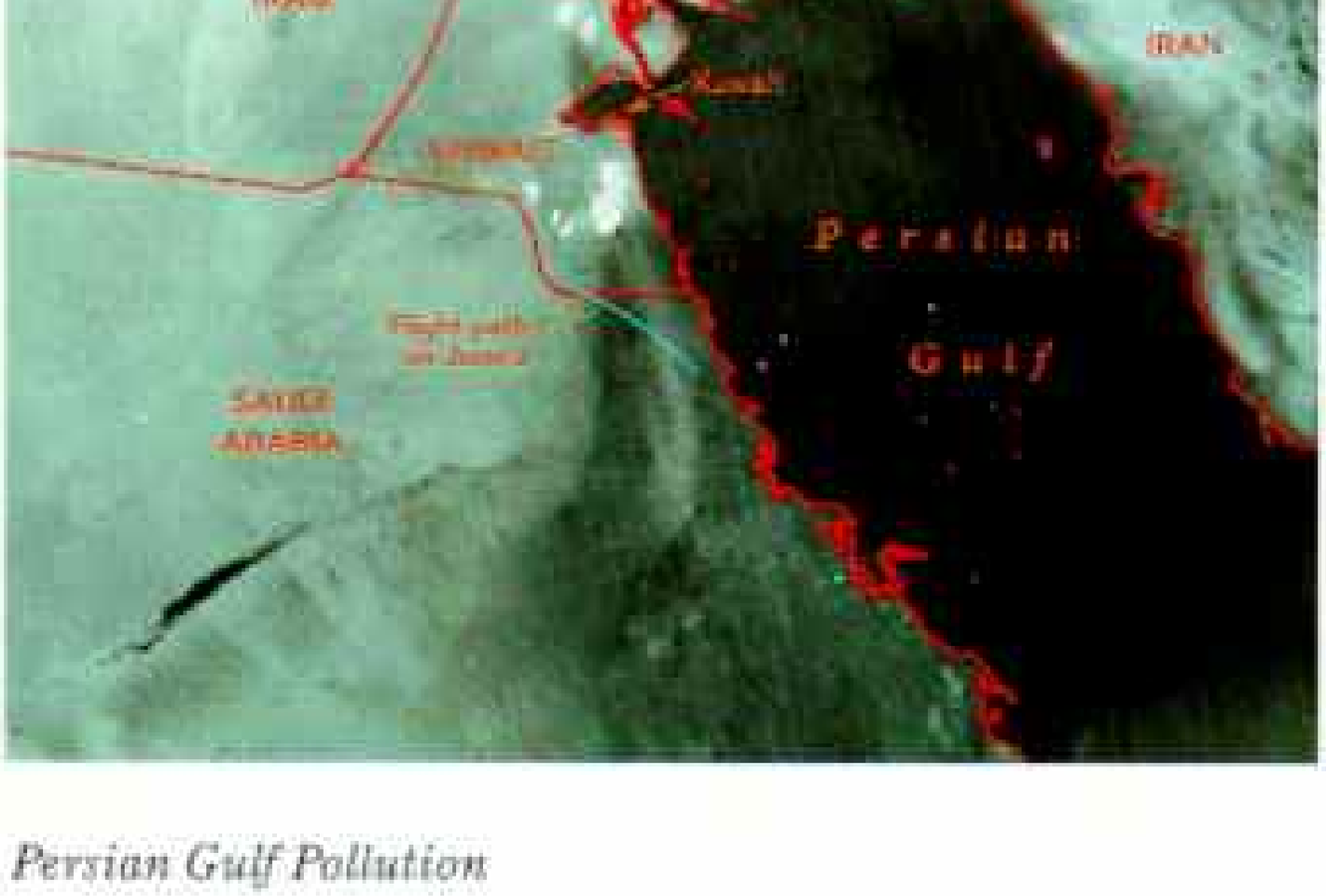
With satellite imagery as a guide, the Electra flew its course, charted by onboard computers (right). The plane's path (blue) is plotted in relation to the coast, with latitude and longitude readings. Arrows along the route show winds converging toward the middle of the plume; the relative lengths show wind speed, higher at the plume's center. The red and green lines reveal two properties indicating particle mass. Highest levels occur at the plume's middle, where the lines spike.

The research team's "lab"



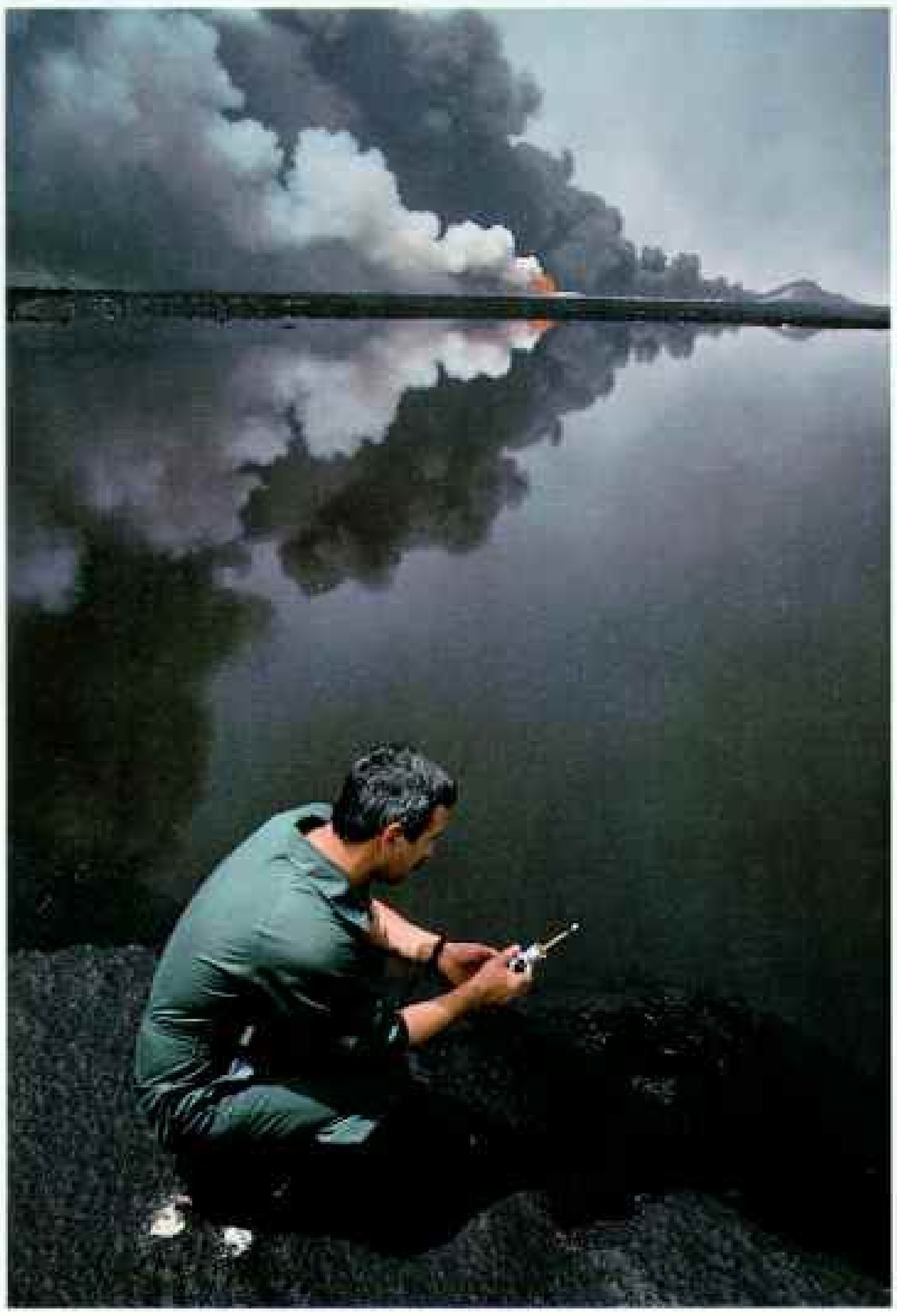
DANIEL BAUMGARDNER, NATIONAL CENTER FOR ATMOSPHERIC RESEARCH (ABOVE); NOAA DATA PROCESSED BY SEASCAPE, SAN DIEGO (RIGHT)

*See "After the Storm," by Thomas Y. Canby, NATIONAL GEOGRAPHIC, August 1991.



was huge. The entire flight path reached down the full length of the gulf—a distance comparable to the U. S. West Coast. Coordinating efforts, the Electra and Convair crews flew some 200 hours on 31 missions.

Besides processing information, NCAR is assembling a data bank based on the work of other teams, including British, French, German, Saudi, and Kuwaiti scientists. Said NCAR scientist Darrel Baumgardner, "We are going to make the data available to everybody."



Ailing sea and air were studied by a worldwide contingent of scientists—who also shared concerns for the war's lingering impact on human health.

Aboard the Electra research plane, team members wore gas masks as a precaution against the smoke. Baumgardner, seated by a window (left), removed his mask to speak with a colleague during a breather outside the cloud. Others left them on throughout each flight. Levels of pollutants in the aircraft, particularly sulfur dioxide, were high enough to cause throat irritation.

A sense of urgency was also in the air. There was no time to lose in establishing this critical baseline information. Following the flights the real work began: analyzing the reams of data. NCAR's Larry Radke and Peter Hobbs of the University of Washington—who co-directed the project—estimate that it will take two or three years to process all the information.

A Research Project Supported In Part By Your Society

On the ground it took no computer analysis to see that conditions near the wells remained extreme.

Tens of millions of barrels of oil flowed like black satin, releasing gases and threatening to leach into groundwater. Lakes of oil formed, sealing off the face of the desert and swallowing plants, lizards, insects, and small mammals. Thousands of migrating birds still make one-way visits into the alluring liquid. By the shore of one such lake (left), Kuwait Oil Company occupational hygienist Samih Serhan sampled airborne hydrocarbons and gases. Authorities plan to reclaim some of this oil, but that becomes more difficult the longer it stands.

PHILIP JONES GRIFFITHS, MAGNUM (ABOVE AND BOTTOM LEFT)

A chance to gain insight into the effects of the fires on human health came when the U. S. Army's Environmental Hygiene Agency learned that most of the 11th Armored Cavalry Regiment was scheduled for transfer to Kuwait from Germany.

Rushing to the German base, physicians from the agency—which monitors possible health hazards wherever U. S. armed forces are based—performed pulmonary, blood, urine, and DNA tests on volunteers.

"We also had some of them keep diaries of their activities," said Capt. Brian Scott.

The troops were reexamined a few weeks after their arrival in Kuwait (above) and again upon their return to Germany after about three months in the gulf region. The agency plans to have some results this spring.

"You know," Dr. Scott added, "none of this would have been possible but for striking cooperation among health and environmental agencies. Laboratory analyses alone involve the Environmental Hygiene Agency, Walter Reed Army Institute of Research, Armed Forces Institute of Pathology, Centers for Disease Control, National Cancer Institute, and others—it is unbelievable."

When smoke first began billowing into the atmosphere last year, no one could answer urgent questions about its long-term effects.

Analysis of early data from research flights indicated that global implications for climate and weather were likely to be small.

"It's definitely cooler under the plume," said Bruce Hicks, director of NOAA's Air Resources Laboratory. But in order to be transported around the globe by the jet stream, he noted, the plume needed to reach at least 45,000 feet. Instead, the smoke hovered between 10,000 and 16,000 feet, rising on occasion to 22,000 feet.

KUWAIT
Air Pollution Box Score
(May 16 to June 12, 1991)

Oil consumed—4.6 million barrels/day (About equal to the U. S. daily import of oil)

Heat output—86 billion watts (About the same as from a 500-acre forest fire)

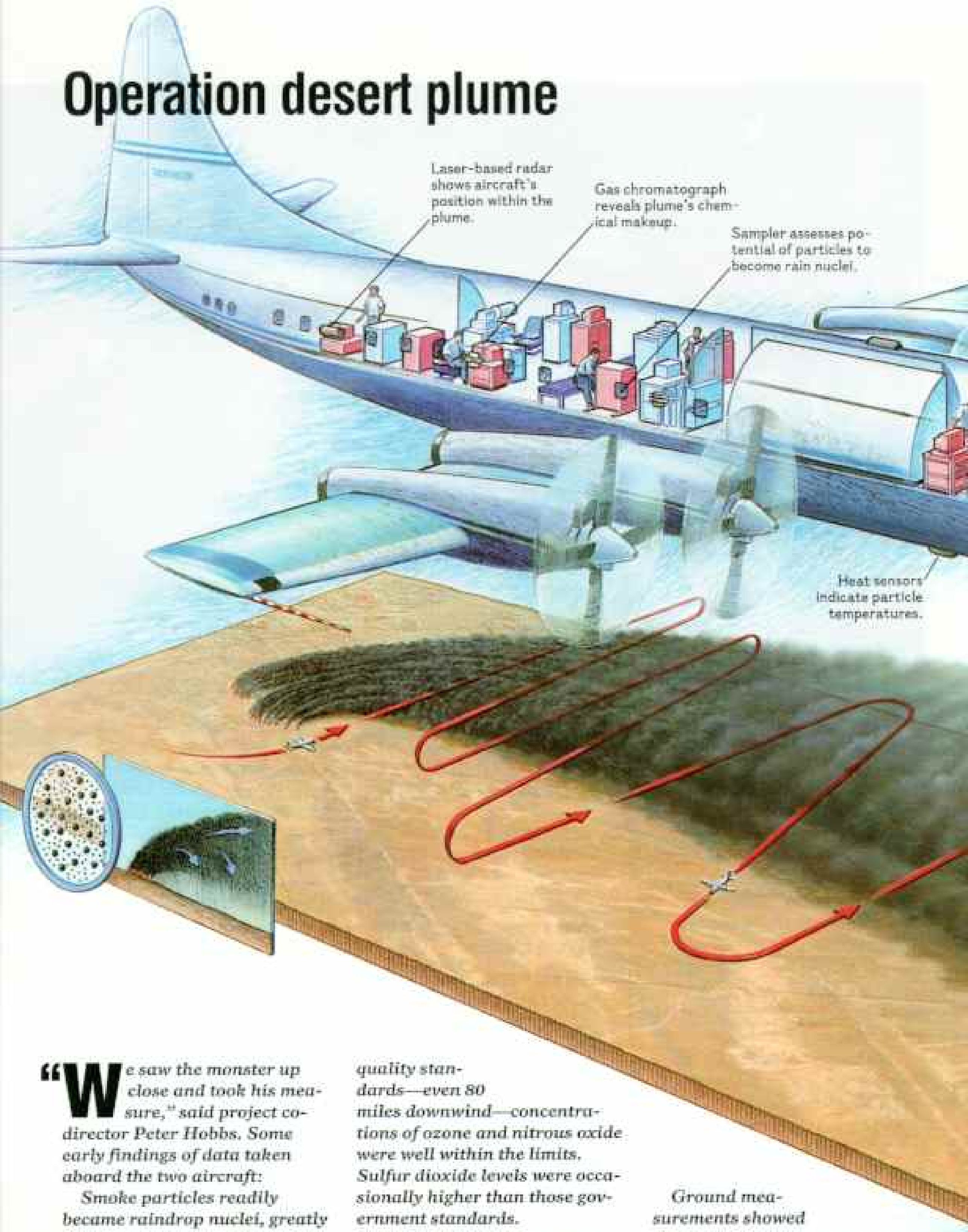
Particles (30 percent soot)—12,000 metric tons/day (Equal to about 10 percent of the particles emitted daily from biomass burning worldwide)

Carbon dioxide (CO_2)—1.9 million metric tons/day (Equal to about 2 percent of the daily worldwide emissions of CO_2 from fossil fuel and biomass burning)

Sulfur dioxide (SO_2)—20,000 metric tons/day (Equal to about 57% of daily emissions from electric utilities throughout the U. S.)

PETER HOBBS, UNIVERSITY OF WASHINGTON

Operation desert plume



"We saw the monster up close and took his measure," said project co-director Peter Hobbs. Some early findings of data taken aboard the two aircraft:

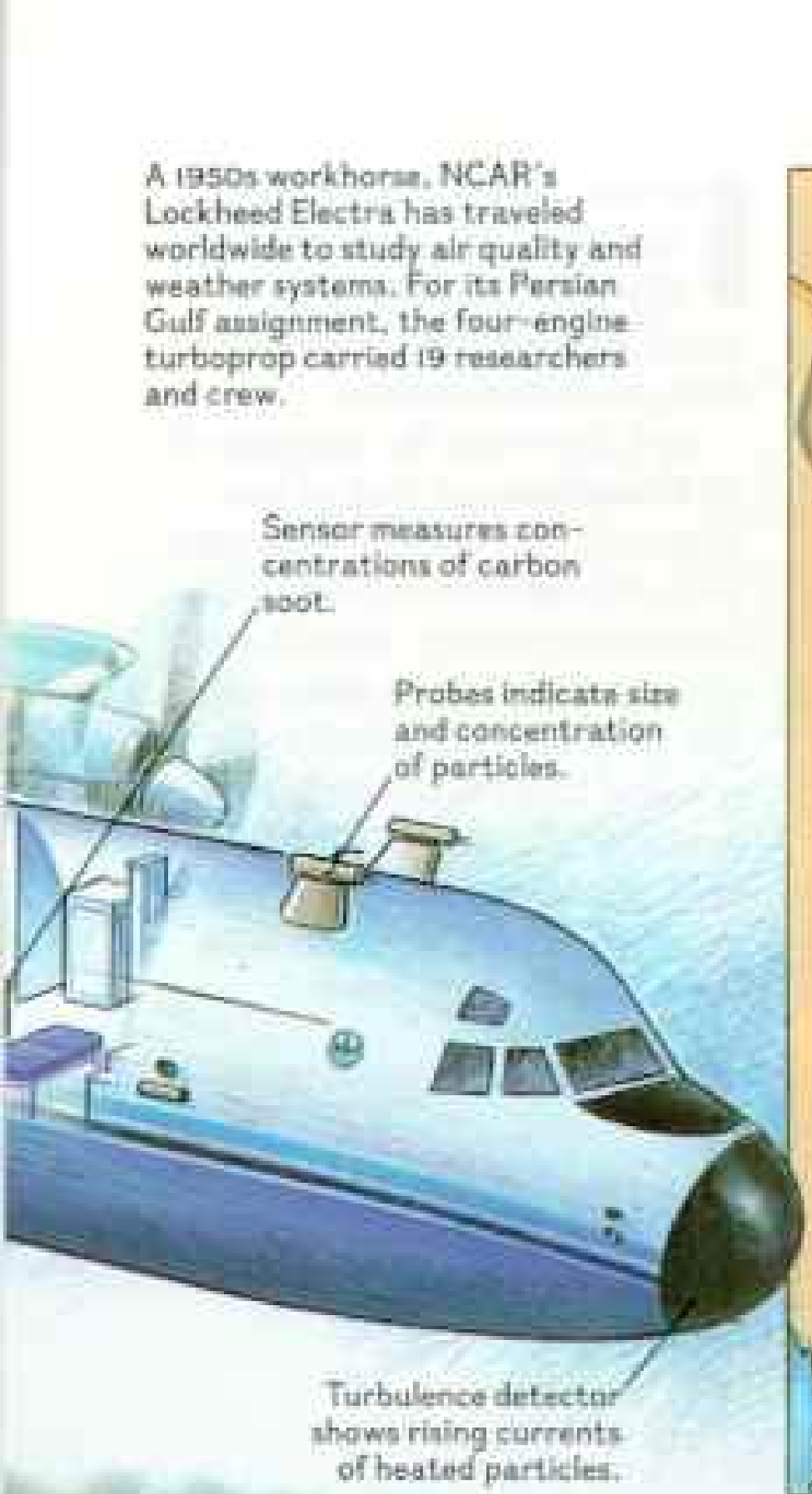
Smoke particles readily became raindrop nuclei, greatly reducing their time aloft—but increasing their potential to fall as polluted rain.

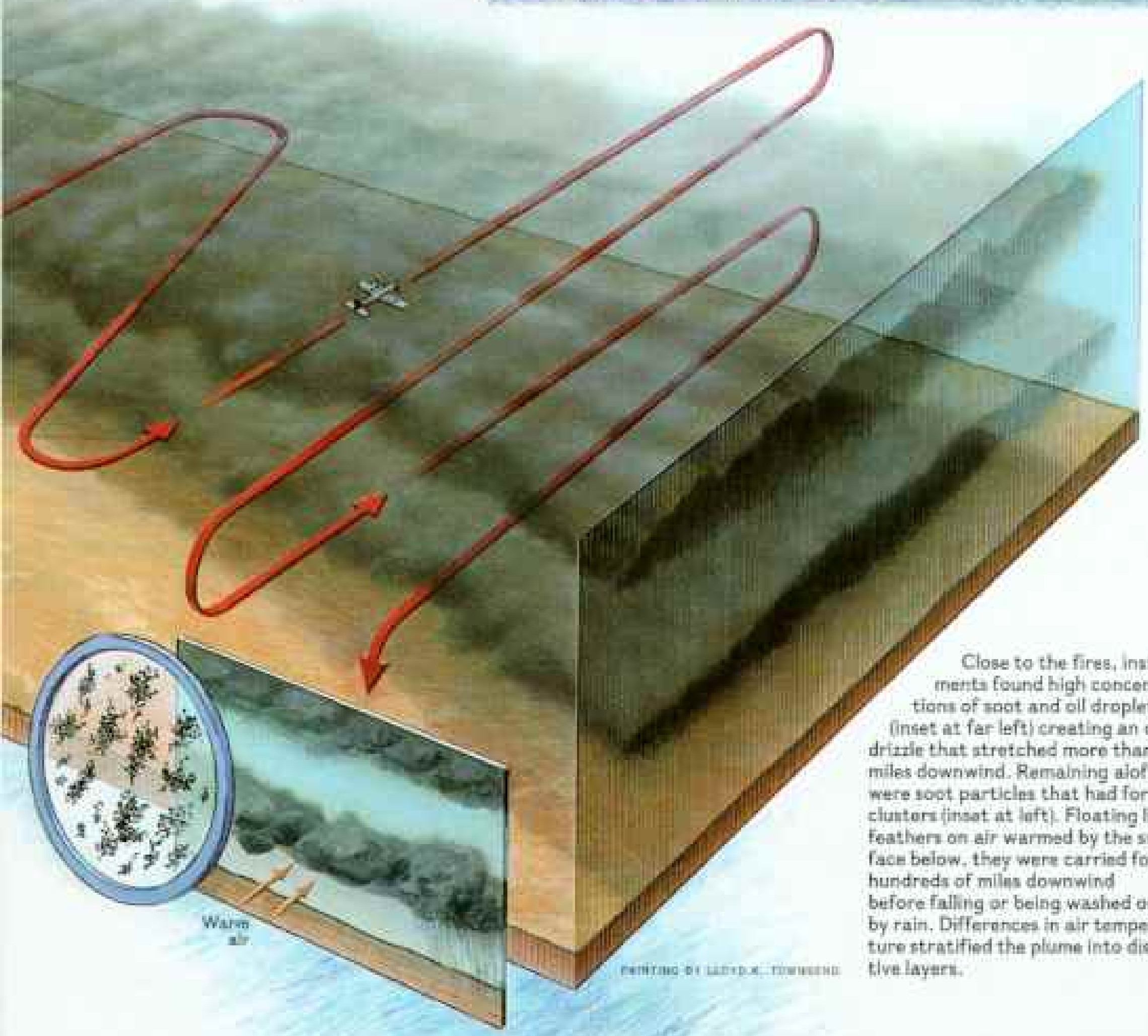
While particle counts several thousand feet up in the plume were higher than U. S. air quality standards—even 80 miles downwind—concentrations of ozone and nitrous oxide were well within the limits. Sulfur dioxide levels were occasionally higher than those government standards.

One thousand miles downwind—the greatest distance flown from the fires—pollution levels high in the plume were no worse than those typically found in U. S. urban areas.

Ground measurements showed that when the plume descended, which was infrequently, air quality was unhealthy for people with respiratory problems. Beyond 100 miles, ground levels of pollution were near normal.

A 1950s workhorse, NCAR's Lockheed Electra has traveled worldwide to study air quality and weather systems. For its Persian Gulf assignment, the four-engine turboprop carried 19 researchers and crew.





Close to the fires, instruments found high concentrations of soot and oil droplets (inset at far left) creating an oily drizzle that stretched more than 60 miles downwind. Remaining aloft were soot particles that had formed clusters (inset at left). Floating like feathers on air warmed by the surface below, they were carried for hundreds of miles downwind before falling or being washed out by rain. Differences in air temperature stratified the plume into distinctive layers.

Instant fossils—crabs, birds, and plant life were caught in oily tides that swept the Saudi Arabian coast north of Abu Ali Island (below).

As I flew over the marshes of Al Musallamiyah Bay in late August, I marveled at how similar it appeared to my first look, six months earlier, even though about half the six to eight million barrels of oil initially released had evaporated, and as many as two million barrels had been relocated from the sea to great pits in the desert, where some may be reclaimed.

Much remains to be dealt with. By August the volume of unburned oil fallout from the plume, coating land and sea, was ten to twenty times that of the original spills, according to John Robinson, leader of NOAA's gulf response team.

On a blackened beach, small white piles of sand appear like tiny star bursts in a night sky (left)—the work of crabs digging holes and pushing clean sand to the surface. At Abu Ali, deserted shells of mollusks killed by the spill shelter small fish, and on the shore wisps of grass stand startlingly green against a blackened landscape.

To measure restoration by man and nature, it is essential to know what life was like before the spill. Saltier than typical seawater and averaging 110 feet deep, the gulf is nevertheless rich. It is a unique region, noted for the productivity of its miles of blue, green, and gold intertidal sand flats and shallow sea grass meadows, studded here and there with dark algal and coral reefs and patches of mangroves.

To the arid countries on its shores, the gulf is vital. Like a forest, it absorbs carbon dioxide, produces oxygen, influences temperature, wind, and rain. For millennia the diverse sea life has sustained enormous flocks of resident and migratory birds—and people born in the "cradle of civilization."

To see what impact the oil had on marine life, I ventured at Abu Ali into bullion-colored water rimmed with blackened beaches. Like marine biologist Peter Vine, who swam under a dark canopy of fresh oil (below), I returned smeared with evidence that much of the oil had sunk to the bottom. I was impressed by the apparent good health of the sea grasses, despite soft oil amid their roots, but dismayed by glimpses of dead mollusks, crabs, and other creatures.

"A comprehensive study of damage is under way," said Yusef Fadlallah of King Fahd University in Dhahran during a shore examination. He kicked at a clod of hardened oil and half-smiled. "Of course, this is not the first spill in the gulf. Nor is it likely to be the last."

Although the gulf war spills were by far the worst, an average of 250,000 barrels—an amount equal to the infamous 1989 Prince William Sound disaster in Alaska—spill into the gulf annually. And oil isn't the only culprit. Land reclamation has destroyed shoreline habitats, mangroves, and reefs.

"When I was a boy, I remember seeing thousands of pale crabs along the shore," recalled Abdul Rahman Al-Awadhi, head of the Regional Organization for the Protection of the Marine Environment and the former minister of health in Kuwait. Today those teeming crabs are just a fond memory, not so much from the spill as from the unnoticed, gradual deterioration of the gulf.

"No one appreciated what was happening," Al-Awadhi said. "Now that we know better, perhaps we can do better."

SYLVIA A. EARLE (LEFT); ANTHONY BOMFORD, MCKINNON FILMS, LTD. (ABOVE)

MICHAEL McKINNON, McKINNON FILMS, INC.

A jet of raw, coffee-colored oil roared skyward, swept by hot, brisk wind into a silken mist. The sight was incongruously beautiful, like sunlight on mink. The mist glistened against an August sky dark with smoke.

At the edge of the pit from which the jet erupted, a man beckoned me closer. Closer? I was already near enough to feel the roar, smell the sharp aroma, and be spattered with clinging oil droplets.

"All right," I counseled myself. "He must know what he's doing." The man was a U. S. expert from Boots and Coots, one of several firms in Kuwait helping control approximately 800 damaged wells, including more than 600 roaring pillars of fire. In six months, half had been capped. The last well was capped on November 6, 1991.

I moved to the rim of the hollow and peered at the pipe collaring the stream. Something yellow and black moved with an ear-shattering hiss. A man! It seemed absurdly impossible, but a man was crouched in the pit wielding a hose that, with enormous pressure, spit a jet of sand and water at the pipe, severing it with a smooth cut. This was the next step in the arduous process of capping the well—an incremental advance toward restoring order to this much afflicted country.

Research will continue in the gulf, as scientists monitor the interplay of air, land, and sea and work to accelerate the region's restoration. The knowledge gained may help win peace with the environment—one small but precious dividend of a costly war.

Already, several natural areas, particularly some of the islands in the gulf, are being viewed with new respect—both locally and internationally—as critical wildlife habitats.

"Living ecosystems are the true treasures of the gulf," said natural historian and filmmaker Michael McKinnon, as we flew along the coastline. "The water flowing into the gulf from the Tigris and Euphrates Rivers is immensely rich in nutrients. In time, natural processes will shape new systems, but it could take decades for damaged areas to recover."

While the future is uncertain for oiled mangroves and marshes, I remembered the wisps of grass, the small fish moving into mollusk shells, the crabs digging out of blackened beaches.

"Perhaps much sooner," I replied. □

A film on the environmental effects of the gulf war will be broadcast by National Geographic EXPLORER February 23 at 9 p.m. ET on cable network TBS.

Forum

America Before Columbus

Your articles about pre-Columbian Native Americans (October 1991) are poetic, interesting, and informative. But some authors exhibit a cultural superiority that distorts reality. The Native Americans suffered from diseases, warfare, crime, mental illness, and other problems that afflict humans around the globe. The Europeans brought new diseases—and new medicines to treat illnesses. Slavery was practiced among tribes before Europeans arrived, and ecological damage was not merely a post-Columbian phenomenon. Also, I hope that future issues will not overlook positive contributions of Native Americans and Europeans to each other's cultures.

SHARON HUDGINS
University of Maryland
Munich Campus

Columbus made an innocent error in assuming he had met Asians, not American Indians. Those who substitute "Native American" for "Indian" make a semantic error. My dictionary defines "native" as "belonging to a person or thing by birth or nature; inborn; inherent." The euphemism implies that other Americans are interlopers, although even our Indians descended from immigrants.

GEORGE C. BALDWIN
Sante Fe, New Mexico

I was particularly delighted with the choice of "Native American" for the people who first discovered the North American continent. The story goes that when a European inquired of a Native American what the country was called before the arrival of the white man, the reply was "ours."

MELWYN GODINHO
Mooncoin, County Kilkenny, Ireland

I looked in vain for a report on the Aztec, Inca, and Maya until I realized the title is used to equate America with the United States. For millions of us taught that America comprises everything from northern Canada to southern Argentina, there is no confusion: Columbus discovered America, including the U. S. Your title should read: "1491—The United States Before Columbus."

RAFAEL A. MIRABEL
Cagnas, Puerto Rico

In U. S. usage the term "America" has become an accepted synonym for the United States, which was our focus in the October issue.

As one whose heritage is one-fourth Ojibwa-Chippewa, one-half Irish, and one-fourth French, I thank you for your sensitive issue. I also congratulate you on having included various Native American perspectives in the articles.

ANGELA BAYARD-GREEN
Annandale, Virginia

Have you misidentified a figure in the rock art on page 6? Isn't he Kokopelli, the hunchbacked flute player, well-known in this part of the country?

MOLLY PARKER
Los Alamos, New Mexico

Petroglyph expert Polly Schaafsma identifies the figure as an arrow-swallower. Kokopelli's flute is held down; this object points up. The shield also suggests the war theme.

Your photography captured the true beauty of our country, as the poetry did the soul of the first Americans. You have put Indian life-styles in better perspective than the distorted views in history books and movies. However, there is sadness in reading the issue; in a short time white society has destroyed much of our country's natural beauty.

ANNE PALIK
Youngstown, Ohio

Ozette

The article on the ocean-faring Makah included an artist's depiction of wooden planks being pulled from living cedar by Makah tribesmen of old. To this day ancient living cedars along the Oregon-Washington coastline and in the Cascades bear the scars of this practice. Leaving the trees from which wood and bark were taken constituted true sustained-yield forestry hundreds of years before national forests were established. Most of these living artifacts are being destroyed out of ignorance or indifference as timber sales proceed. Washington State's Gifford Pinchot National Forest is an exception.

FILIP FURLOW
Portland, Oregon

Forestry officials review all cedar-cutting plans with archaeologists, and many peeled cedars are saved. Pinchot National Forest is exceptional; its policy is to preserve fully a third of the peeled cedars.

The caption on page 42 says Makah set out from villages on the western tip of today's Washington State. Yet on the map 18 villages are shown on Vancouver Island. The island is still part of British Columbia—unless this is yet another Canadian government secret concession associated with the Free Trade Agreement!

B. DOUGLAS FORD
North York, Ontario

The 18 villages on Vancouver Island are those of the Nootka, a people related to the Makah. Both the island and the Nootka should have been identified.

Otstungo

Throughout the articles I felt the undertone of a double standard. I read of slavery, kidnapping, torture, war, and overuse of resources. Yet the implication is that since Europeans were not yet involved, this is acceptable. The description of an Abenaki raid to kidnap Otstungo women is particularly apologetic. Regardless of how the kidnappers welcomed them into their family, what of the families deprived of their loved ones?

GENE KURTZ
Arco, Idaho

As a former upstate New York farmer, I wonder how accurate the illustration on page 74 is. Judging from the dryness of the corn, these women are harvesting in mid to late October. Somewhat chilly, for the way they're clothed. More important, dried corn plants are rough and sharp-edged. The women would emerge with numerous scrapes and cuts.

MARTHA V. SPITAL
Edinboro, Pennsylvania

What appears uncomfortable to us was business as usual for Native Americans, toughened by the physical demands of daily life.

Pueblo

The archaeological work of Winifred Creamer and Jonathan Haas at Posi, New Mexico, brought back memories. In 1960, while surveying for a dam site at the Rio Ojo Caliente, I came across this pueblo ruin. The article, by necessity, is a simplification of a sophisticated, diverse culture. To highlight only the Tewa linguistic pueblos is a shortcoming. What of the Keres, Tigua, Jemez, and Zuni pueblos? It would have been helpful to summarize pueblo cultures chronologically into standard periods and cultural areas: San Juan, Rio Grande, Little Colorado, Upper Gila, Lower Gila, and Mimbres.

PHILIP P. KYBURZ
Lakewood, Colorado

Native American Heritage Map

In Arizona you designated the Papago Indian Reservation, although they changed the name to "Tohono O'odham Nation" about five years ago.

RUSSELL C. LYNCH
McLean, Virginia

These Native Americans have resumed use of their ancestral name, but officially renaming the reservation would require an act of Congress.

North Central Washington Museum in Wenatchee could have been listed. Since the Clovis find of East Wenatchee became public information (NATIONAL GEOGRAPHIC, October 1988), the museum has had an ever growing exhibit on Clovis man, with excellent copies of local Clovis points.

ROBERT C. ZINK
Cashmere, Washington

Rubies and Sapphires

In the excellent article by Fred Ward, I would comment on the caption on page 110 that says "one Sri Lankan company uses modern equipment." The young woman is using a jamb peg faceting arrangement, slightly upgraded but of a type that has been used for well over a hundred years. It is better than holding the stone in one's fingers, but only that. It doesn't compare to modern manual faceting machines found throughout the world, including Sri Lanka.

M. A. HUEBLER
Rio Rancho, New Mexico

Lord Howe Island

Your article on Lord Howe Island was a revelation. Quite a few Australians like myself are not aware of how many natural wonders lie on our doorstep.

SUZANNE HEMMING
Brisbane, Queensland

The great aviator and seaman Sir Francis Chichester made a stopover on Lord Howe Island during a flight from New Zealand to Australia in 1931. He was navigating by nautical sextant at an altitude of 2,000 feet. His Gipsy Moth seaplane was damaged in a storm, but he salvaged the aircraft, rebuilt it, and flew it back to Australia and subsequently north to Japan, where he crashed. What a story!

KEN WHEELER
Tacoma, Washington

Earth Almanac

The article "Milking a Cloud" in October 1991 was most interesting as an example of science fiction becoming reality. The Fremen in Frank Herbert's classic, *Dune*, used wind traps to funnel winds into cooler areas to precipitate moisture.

RICHARD F. STIER
Emeryville, California

Forum

A letter writer commenting on "East Europe Pollution" refers to Donora, Pennsylvania, as a ghost town. Obviously he has not visited the town. After the departure of its one and only industry, steel, Donora pulled itself back up by the bootstraps; today the borough's accounts carry a surplus, even after major improvements were made, including a new industrial park on the site of the rusty old mill, a new municipal building, and a revitalized downtown.

ANTHONY A. MASSAFRA, MAYOR
Donora, Pennsylvania

Letters should be addressed to 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.

Geographica

ROBERT STÉNUIT

Baboon Troop Adapts to Survive in the Desert

The chacma baboon, the largest baboon species, ranges through southern and western Africa, often in the harshest of climates. For a troop of 15 chacmas in the Namib Desert of Namibia (NATIONAL GEOGRAPHIC, September 1983 and January 1992), that means going without water for up to 26 days.

Conrad Brain, a primatologist at the University of the Witwatersrand in South Africa, has studied the group since 1986. He says the baboons' adaptability has enabled them to survive where surface water is available for only part of the year.

Confined in a deep gorge, the baboons depend on the waters of the Kuiseb River, which floods for a few weeks between December and March. When the riverbed dries up, the baboons get water from small seepages and high-moisture fruits like berries and figs. During these dry periods the baboons become virtually inactive, sleeping through the hottest hours of the day to conserve energy and showering themselves with cool subsurface sand, probably to lower their body temperature.

But the harsh conditions kill many newborn baboons, which Brain says threatens the troop's long-term survival.

ROBERT STÉNUIT

DETAIL OF PAINTING BY B. AVERCAMP, RIJKSMUSEUM, AMSTERDAM

From a Water Hazard, Clues to Golf History

It took Robert Sténuit 16 years to identify the four brass objects he found while excavating the *Lastrager*, a 17th-century Dutch trading ship bound for the East Indies that sank off Scotland's Shetland Islands. They were used, the Belgian marine archaeologist finally realized, in a game called *colf*, once played on land and ice in the Netherlands. Players used a tipped stick to knock a ball from one point to another in as few strokes as possible.

In other words, what Sténuit found were golf-club heads.

Colf—first played in the 14th century—was exported by the Dutch to Scotland. There it was called *goff* before it spread, first to the rest of Britain, then back to continental Europe as golf. Sténuit's discovery, reported in the *International Journal of Nautical Archaeology*, sheds light on how the game was exported to the Far East.

The club heads, known in Dutch as *colfsloffen*, or golf slippers, probably belonged to an officer or passenger, Sténuit says. Their owner, he believes, hoped to find time to play a friendly game of colf while away from home.

National Geographic, February 1992

NATIONAL GEOGRAPHIC MAGAZINE

Geographica

Smart Cars Map Route to the 21st Century

Automobiles that navigate for themselves were once a staple of science fiction. But so-called smart cars are becoming a reality. Engineers who have developed vehicle-navigation systems like the Bosch Travelpilot (below) now are enhancing those systems with satellite technology.

Researchers envision dashboard computers that use data from the Pentagon's Global Positioning System in conjunction with onboard navigational aids. Digitized maps and synthesized voices would provide drivers with step-by-step guidance. Navigation systems are already available in top-of-the-line cars in Japan, though their arrival in the U. S. is several years away.

JAMES D. WILSON, WOODFIN CAMP

Smart cars also will be able to receive information by radio from traffic control centers. The cars' computers would then determine the best routes to avoid congestion. By decreasing idle time in gridlock, "smart-car technology can reduce the volume of pollutants," says James Costantino, executive director of the Intelligent Vehicle Highway Society of America.

CHARLES A. REHER, UNIVERSITY OF WYOMING

Where Buffalo Roamed—and Died

To Plains Indians between A.D. 1500 and 1800, the sinkhole was a perfect place to kill bison. They could drive herds there, then watch them plunge more than 55 feet. An estimated 20,000 animals died at the Vore Buffalo Jump east of Sundance, Wyoming, one of the largest bison-killing sites on the northwestern Great Plains.

Surveyors laying out an interstate highway discovered the site in 1969, and some bones were excavated during the 1970s. Now its owners have donated the eight-acre property to the University of Wyoming, which will develop it as a public research facility with laboratories, exhibits, and educational programs for students and tourists. Charles A. Reher, a university archaeologist, says visitors will be able to watch excavators at work.

The bison bones will provide data about the ecology and climate of the period, as well as Indian hunting strategies, butchering methods, and nutrition.

Reher says no one is certain about which Indians used the site, though evidence suggests the Arapahoe, Cheyenne, Kiowa, Kiowa Apache, and Shoshone.

Suggestions for GEOGRAPHICA may be submitted to Boris Weintraub, NATIONAL GEOGRAPHIC magazine, Box 37357, Washington, D. C. 20013-7357, and should include the sender's address and telephone number.

Will the Nile Delta Sink Into the Sea?

For centuries the Nile River (GEOGRAPHIC, May 1985) has been the heart of Egyptian civilization and agriculture. Today the land around its delta is slowly wasting away.

After drilling sediment cores along the coast, Daniel J. Stanley, a Smithsonian Institution oceanographer supported by the National Geographic Society, concluded that the northeastern portion of the delta is sinking by as much as one-fifth of an inch a year. Changes in sea level, currents, and sediment patterns are making the problem worse.

Stanley predicts that Egypt's Mediterranean coastline could move as much as 20 miles inland in some places by the year 2100 (map, below), with disastrous consequences. More than a million people live in the area most affected, bordered on the east by Port Said and on the west by the Damietta.

Subsidence has occurred for 7,500 years without disturbing the delta because sediment carried down the Nile replaced coastal soil that had sunk. But since 1964 the Aswan High Dam has reduced the silt that replenished the delta.

National Geographic, February 1992

WILDLIFE AS CANON SEES IT

Shoebill
Genus: *Balaeniceps*
Species: *rex*
Adult size: Standing height, 110–140 cm
Adult weight: 5–7 kg
Habitat: Freshwater swamps of central tropical Africa
Surviving number: Estimated at 11,000–15,000
Photographed by Robert Caputo

Standing endlessly still amid the reedbeds, a shoebill waits for a fish to surface from the murky water below. The shoebill is highly sensitive to human disturbance, often deserting its nest or fishing spot with little provocation. And with its extreme dependence on marshland, and only small, scattered populations remaining, the future of this large, distinctive bird is at risk. To save endangered species, it is essential to protect their habitats and understand the vital role of each species within the earth's ecosystems. Photography, both as a scientific research tool and as a means of communication, can help promote a greater awareness and understanding of the shoebill and our entire wildlife heritage.

On Television

STEVE MCCURRY, MAGNUM

Nightmare in the Gulf Takes Its Toll

A cormorant struggles out of water black and thick with oil. It staggers onto land strewed with dead birds and marine life. Soon the cormorant too will die, its death throes illuminated by the fires of a burning oil well.

A year ago the Iraqi Army retreating from Kuwait damaged nearly 800 oil wells along with huge oil tanks, thereby poisoning 300 miles of coast and 600 square miles of the Persian Gulf.

Nine years before, award-winning wildlife filmmaker Michael McKinnon had begun documenting the fragile landscape—the breeding grounds of cormorants and grebes, the shallow coastal realm of crabs and oysters. That footage contrasts starkly with his extraordinary images of the war's aftermath: The river of oil that crept down the coast, sinking into the sand to kill shrimp, worms, and other tidal residents; volunteers who sought to rescue fouled birds and turtles; fire fighters who battled oil well infernos ringed with unexploded ordnance.

"As you looked out over the burning land under a canopy of black smoke," recalls McKinnon, "it gave a taste of what nuclear winter might be like. It gave visual form to our worst nightmares."

McKinnon's film airs as part of TBS's *Save the Earth* programming, a campaign to increase public awareness of the United Nations Conference on Environment and Development to be held in Rio de Janeiro, June 1-12, 1992.

"Tides of War," Explorer, February 23, cable network TBS, 9 P.M. ET

A Blending of Cultures Creates a Vibrant People

MARILYN GIBBONS, NGS STAFF

Once the Olmec, the Maya, and the Aztec ruled; then came the Spanish from across the sea. From the intermingling of traditions and peoples over the centuries has emerged the soul of today's Mexicans. Filmmaker Bill Livingston took his crew from the ancient ruins of Palenque to the modern-day barrios of Mexico City and Ciudad Juárez. A subway conductor talks about life in the crowded capital, and urban artists celebrate the vigor of a city beset with problems. One of Mexico's premier ecologists glories in the annual return of monarch butterflies to their mountain sanctuary and welcomes the end of sea turtle slaughter along the Pacific coast. In a moving visit with Rufino Tamayo shortly before his death, the famed painter speaks of what it means to be Mexican, to be inheritors of the past, architects of the future.

"The Mexicans: Through Their Eyes," Special on PBS, February 26, 8 P.M. ET

Earth Almanac

GARY LYNCH

Surfers Confront Polluters to Catch a Cleaner Wave

Shooting the curl at the mouth of northern California's Humboldt Bay, a surfer may find a bigger hazard ashore—two adjacent pulp mills that together dump 40 million gallons of water laced with dioxins and other toxic waste into the surf every day. Charging that the pollution was causing chronic skin rashes and also killing marine life, the Surfrider Foundation, 15,000 strong, went to court, joined by the U. S. Environmental Protection Agency. For the paper companies, the result was a wipeout.

In an out-of-court settlement the firms, Louisiana-Pacific Corporation and Simpson Paper Company, agreed to pay 5.8 million dollars in fines and to spend as much as a hundred million by 1994 to both clean up their effluent and pipe it farther out to sea. They must also prove that their discharge will not harm certain marine life—kelp, abalone, sand dollars, and sea urchins.

Beach boys as activists? "These youngsters today have caught the green revolution fever," says Scott Jenkins, Surfrider's environmental director. "And the older surfers want to give something back."

ECOSCIENCE CORPORATION

Biopesticides Take Aim With Natural Allies

Hundreds of weapons have been tried; hundreds have failed. The cockroach still thrives. Now, natural organisms are being pitted against insect pests. A company called EcoScience plans to unleash a biological assault with a fungus.

"The world is full of microbes that can help control pests," says James A. Wylie, Jr., of EcoScience. His favorite is the fungus *Metarhizium anisopliae*, placed in the company's special bait chamber (left). The snoopy roach need not eat—at a mere touch the fungus climbs aboard, penetrates its host, and soon kills it. Meanwhile, the dying victim has spread the insidious spores throughout its home colony.

Rare Eagle Sighted—Still Aloft, but for How Long?

Flying through the rain forest on wings spanning seven feet, the Philippine eagle, second largest of all eagles, is losing altitude. The forest habitat of the rare and endemic raptor continues to fall to loggers and farmers. However, hope flickered recently when members of a biological survey sighted at least one eagle on northeastern Luzon, where none had been reported for many years.

ROBERT S. KENNEDY

"It's a solid reconfirmation of that population," says Lee Hannah of Conservation International, one of several groups investigating Luzon's Palanan wilderness. Earlier sightings were made by Robert S. Kennedy, who estimated the Philippine eagle population at 300 to 500 (GEOGRAPHIC, June 1981)—a figure closer to 200 today. "Finding a nest in that area, where none has ever been found, would be a very important contribution," observes Kennedy.

National Geographic, February 1992

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Earth Almanac

Whales Gorge on Shrimp and Eat a Beach!

What creates ten-foot-wide pits on a Puget Sound beach (right, below)? It was a mystery until Laurie Weitkamp, a University of Washington graduate student, discovered the bizarre behavior of gray whales. "At high tide, in 12 feet of water, they roll on their sides to suck up ghost shrimp buried in the sand," she says.

Normally gray whales feed on the bottom in deeper water by using their tongues to create suction, filtering out tiny crustaceans through their baleen (right). The result: a moonscape of pits on the seafloor (GEOGRAPHIC, June 1987).

Now some feast on the shore itself. From each mouthful, researchers have found, whales strain 11 pounds of shrimp, competing with fishermen who harvest the shrimp for bait. "In three or four days," Weitkamp adds, "a gray whale eats as much as a harvester can take in a year."

FLIP NICKLIN (TOP); JAY ODELL, WASHINGTON STATE DEPARTMENT OF FISHERIES

No Quarter: Australia Targets Alien Animals

Galloping over arid rangelands, wild Australian horses, called brumbies, stir up trouble. Last year a parliamentary report escalated a long-smoldering war against these and other large feral animals introduced to the continent by early explorers and settlers.

Habitat destruction by the invaders has helped wipe out about a dozen native mammals, among them the desert bandicoot, Alice Springs mouse, and central hare wallaby.

The report was candid. "Ideally, total eradication should be the goal." It recommends stepped-up mass shooting by marksmen from helicopters, a technique now employed sporadically.

Large animals that have gone wild include:

- Brumbies—As many as 600,000 make up the world's largest wild horse herd. Some observers favor control by fencing off water holes.
- Donkeys—Imported as pack animals, they have reached 100,000 and outnumber cattle in some areas.
- Camels—Introduced about 1860 as beasts of burden, today some 40,000 threaten native plants.
- Goats—About two million cause erosion and compete with sheep and cattle for pasture.
- Pigs—They total around six million, infesting some wetlands with more than 200 per square mile.
- Water buffalo—Perhaps 140,000, imported from Indonesia, create wallows in freshwater marsh.

JEAN-PAUL FERRERO, AUSCAPE INTERNATIONAL

National Geographic, February 1992

On Assignment

SISSE BRIMBERG

Four trips to the Persian Gulf last year gave DR. SYLVIA A. EARLE special insights for her account of the gulf war's environmental toll. Chief scientist of the National Oceanic and Atmospheric Administration, Dr. Earle (above, with camera) on one mission joined Environmental Protection Agency head William Reilly (to her left) to assess the damage.

A lasting gulf memory, says Dr. Earle, was of ants emerging from the oil-caked desert surface to deposit clean sand from below.

"Nature is immensely resilient," she says. "That and efforts by people to protect the sea and land give hope for the region's recovery."

Dr. Earle has also reported in NATIONAL GEOGRAPHIC on living in an undersea habitat, tracking whales, and exploring shipwrecks.

Some GEOGRAPHIC assignments are a real handful—as RAYMOND GEHMAN learned in photographing Eastern wildlife in a Maine forest (below). He held a hibernating black bear's cubs while biologists put a radio collar on the mother.

"I was keeping them warm," says Gehman, who also photographed the Society's *Yellowstone Country*.

Gehman's most reluctant subject was the wild turkey. "I sat there day after day in a blind, waiting for the turkeys to appear. They were a real challenge."

RANDY OLSON

NATIONAL GEOGRAPHIC (ISSN 0027-9358) IS PUBLISHED MONTHLY BY THE NATIONAL GEOGRAPHIC SOCIETY, 17TH AND M STS., N.W., WASHINGTON, D. C. 20036. $21.00 A YEAR, $2.85 A COPY. SECOND-CLASS POSTAGE PAID AT WASHINGTON, D. C., AND ELSEWHERE. POSTMASTER: SEND ADDRESS CHANGES TO NATIONAL GEOGRAPHIC, P.O. BOX 2774, WASHINGTON, D. C. 20013.