WET BOOTS, DRY NOTEBOOK

Writing about Water issues for NATIONAL GEOGRAPHIC

By DON BELT
IN THE AFTERMATH OF CYCLONE AILA, AUTHOR DON BELT WALKS A SOGGY ROAD IN BANGLADESH.

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Introduction

It’s been said so often, and for so very long, that it might as well be the official motto of the human race: Water is life. As I’ve traveled the world for National Geographic, I’ve seen firsthand that a vast number of people in this world spend much of every day fretting over and trying to manage their water supply—not just access to safe drinking water, which is the immediate problem, but also the distant sources of their water that often lie beyond their control.

This perennial struggle has been exacerbated by global climate change, which disrupts traditional patterns of rainfall, flooding, and irrigation all over the world. Whole watersheds are going dry or growing more erratic, with profound effects on millions of people downstream, including mass migrations because of environmental changes. And when the flow of precious water is further complicated by political borders, especially those between hostile neighbors, ordinary people are even more vulnerable.

I hope the collection that follows, which covers a variety of water-related issues in vastly different settings, will bring new perspective and help to illuminate, in some small way, the life-and-death matter of humans and their water supply.
Parting the Waters

A source of conflict between Israel and its neighbors for decades, the Jordan River is now depleted by drought, pollution, and overuse. Could the fight to save it forge a path toward peace?

by Don Belt

FOR A BIBLICAL STREAM whose name evokes divine tranquillity, the Jordan River is nobody’s idea of peace on Earth. From its rowdy headwaters near the war-scarred slopes of Mount Hermon to the foamy, coffee-colored sludge at the Dead Sea some 200 miles downstream, the Jordan is fighting for survival in a tough neighborhood—the kind of place where nations might spike the riverbank with land mines, or go to war over a sandbar. Water has always been precious in this arid region, but a six-year drought and expanding population conspire to make it a fresh source of conflict among the Israelis, Palestinians, and Jordanians vying for the river’s life-giving supply.

All of which makes the scene one morning last July all the more remarkable. Accompanied by military escort, three scientists—an Israeli, a Palestinian, and a Jordanian—are standing knee-deep in the Jordan
River. They are nearly 40 miles south of the Sea of Galilee, under the precarious ruins of a bridge that was bombed during the Six Day War of June 1967. The scientists are surveying the river for Friends of the Earth Middle East (FOEME), a regional NGO dedicated to building peace through environmental stewardship. It’s a scorching hot day in a former war zone, but if these men are concerned about the danger of heat stroke, getting clonked by a chunk of falling concrete, or stepping on a mine washed downstream by a flood, they’re hiding it well.

“Hey, Samer,” says Sarig Gafny, an Israeli ecologist in a floppy, green hat, “check this little fellow out.” Samer Talozi, a tall, self-possessed young environmental engineer from Jordan, peers over his shoulder at the tiny invertebrate his Israeli colleague has scooped into a glass sample jar. “It lives!” he says with a laugh. “That is one tough crustacean!” A few yards away, Banan Al Sheikh, a stout, good-natured botanist from the West Bank, is absentmindedly wading upstream while focusing his camera on a flowering tree amid the tall reeds and other riparian species along the riverbank. “Watch your step, my friend,” Gafny calls out after him, “and whatever you do, don’t step on a bleeping mine.”

Besides lethal munitions, this stretch of the Jordan River—perhaps 25 feet wide and a few feet deep—is so polluted that any sign of aquatic life is worth celebrating. Part of the reason is water scarcity: In the past five decades the Jordan has lost more than 90 percent of its normal flow. Upstream, at the Sea of Galilee, the river’s fresh waters are diverted via Israel’s National Water Carrier to the cities and farms of Israel, while dams built by Jordan and Syria claim a share of the river’s tributaries, mostly for agriculture. So today the lower Jordan is practically devoid of clean water, bearing instead a toxic brew of saline water and liquid waste that ranges from raw sewage to agricultural runoff, fed into the river’s vein like some murky infusion of tainted blood.

The fight over the Jordan illustrates the potential for conflict over water that exists throughout the world. We live on a planet where neighbors have been clubbing each other over rivers for thousands of years. (The word “rival,” from the Latin rivalis, originally described competitors for a river or stream.) Worldwide, a long list of watersheds brims with potential clashes: between India and Pakistan over the Indus; Ethiopia and Egypt over the Nile; Turkey and Syria over the Euphrates;
Botswana and Namibia over the Okavango. Yet according to researchers at Oregon State University, of the 37 actual military conflicts over water since 1950, 32 took place in the Middle East; 30 of them involved Israel and its Arab neighbors. Of those, practically all were over the Jordan River and its tributaries, which supply millions of people with water for drinking, bathing, and farming.

Armed confrontations over the Jordan date to the founding of Israel in 1948 and the recognition that sources of the country’s needed water supply lay outside its borders. Its survival depended on the Jordan River, with its headwaters in Syria and Lebanon, its waters stored in the Sea of Galilee, and the tributaries that flow into it from neighboring countries. Israel’s neighbors face a similar situation. Their survival is no less at stake—which makes the line between war and peace here very fine indeed. In the 1960s Israeli air strikes after Syria attempted to divert the Baniyas River (one of the Jordan’s headwaters in the Golan Heights), together with Arab attacks on Israel’s National Water Carrier project, lit fuses for the Six Day War. Israel and Jordan nearly came to blows over a sandbar in the Yarmuk River in 1979. And in 2002 Israel threatened to shell agricultural pumping stations on the Hasbani, another of the headwaters in southern Lebanon.

Yet fights over water have also led to dialogue. “There are few major sources of water that don’t cross one or more political boundaries,” says Gidon Bromberg, the Israeli co-director of Friends of the Earth Middle East. “That creates a natural interdependence between countries.” Sharing resources can actually be a path to peace, Bromberg says, because it forces people to work together. In the 1970s, for example, Jordan and Israel agreed on how to divvy up water even when the countries were officially at war. And cooperation between Israelis and Palestinians over water has continued even as other tracks of the peace process hit a wall.

“It seems counterintuitive, but water is just too important to go to war over,” says Chuck Lawson, a former U.S. official who worked on Israeli-Palestinian water issues in the 1990s. “Regardless of the political situation, people need water, and that’s a huge incentive to work things out.”
ONE DAY LAST APRIL, Bromberg led me to the natural spring that provides water to Auja, a Palestinian village of 4,500 people that climbs the barren hills a few miles west of the Jordan River near Jericho. Fed by winter rains, the spring was flowing from a small, boulder-strewn oasis, and we trekked along the narrow concrete trough that transports water to the village, several miles away. “Auja is totally dependent on this water for agriculture,” Bromberg said. “As soon as this spring dries up, there’ll be no more water for farming.”

Part idealist, part political operative, Bromberg was born in Israel and raised in Australia, then returned to Israel in 1988 to help build peace in the region. By challenging his own country to share water equitably, Bromberg has rattled the cages of hard-line Israeli politicians who see water as a national security issue—and as a resource to guard jealously.

Since occupying the West Bank in 1967, Israel has built a few dozen settlements in the Jordan Valley, in addition to the 120 or so elsewhere in the West Bank. The settlers’ water is provided by Mekorot, Israel’s national water authority, which has drilled 42 deep wells in the West Bank, mainly to supply Israeli cities. (According to a 2009 World Bank report, Israelis use four times as much water per capita as Palestinians, much of it for agriculture. Israel disputes this, arguing that its citizens use only twice as much water and are better at conserving it.) In any case, Israel’s West Bank settlements get enough water to fill their swimming pools, water their lawns, and irrigate miles of fields and greenhouses.

In contrast, West Bank Palestinians, under Israeli military rule, have been largely prevented from digging deep wells of their own, limiting their water access to shallow wells, natural springs, and rainfall that evaporates quickly in the dry desert air. When these sources run dry in the summer, Bromberg said, Auja’s Palestinians have no choice but to purchase water from Israel for about a dollar a cubic yard—in effect buying back the water that’s been taken out from under them by Mekorot’s pumps, which also lower the water table and affect Palestinian springs and wells.
As Bromberg and I followed the Auja spring east, we passed a complex of pumps and pipes behind a barbed-wire fence—a Mekorot well, drilled 2,000 feet deep to tap the aquifer. “Blue and white pipes,” Bromberg said. “This is what water theft looks like in this part of the world.”

Israel’s chief water negotiator, Noah Kinnarti, disagrees. Underground water knows no borders, he says, and points out that Israelis must also purchase the water they use. “Palestinians think any rain that falls in the West Bank belongs to them,” he told me at his kibbutz near the Sea of Galilee. “But in the Oslo talks, we agreed to share that water. They just can’t get their act together to do it.”

FOEME began confronting these tough issues in 2001, during a period of intense Palestinian-Israeli violence. But by focusing first on ways to improve water quality, the NGO mobilized support and built trust through its Good Water Neighbors program, a grassroots education initiative. It’s also working to establish a Jordanian-Israeli peace park on a midstream island. Perhaps most important, it has pressured governments to live up to the water-sharing commitments embedded in the region’s peace agreements, seeking to make the Jordan River a model for the kind of cooperation needed to avert future water wars.

“People all over the world associate the Jordan River with peace,” says Munqeth Mehyar, FOEME’s co-director in Jordan. “We’re just helping it live up to its reputation!”

When I returned to Auja in early May, its spring had been reduced to a trickle, leaving the village as dry as a fistful of talcum powder. The fields around it lay empty and exhausted, while on Auja’s one plot of flat ground, boys were playing soccer amid a swirling dust cloud they were kicking up, chasing an old leather ball worn to the consistency of flannel. I stopped by the home of an elderly farmer named Muhammad Salama.

“We haven’t had running water in my house for five weeks,” Salama said. “So now I have to buy a tank of water every day from Mekorot to supply my family and to water my sheep, goats, and horses.”
He also has to buy feed for his animals because there is no water to irrigate crops. To meet these costs he is selling off his livestock, and his sons have taken jobs at an Israeli settlement, tending the tomatoes, melons, and other crops irrigated from the aquifer that is off-limits to Palestinian farmers.

“What can we do?” he asked, pouring me a glass of Mekorot water from a plastic bottle. “It’s not fair, but we’re powerless to do anything about it.” It was a clear day, and from his front window we could see across the parched, brown valley all the way to the thin line of gray-green vegetation marking the path of the Jordan River. For a moment, its water seemed within reach. “But to get there I’d have to jump an electric fence, cross a minefield, and fight the Israeli army,” Salama said. “I’d have to start a water war!”

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The Coming Storm

The people of Bangladesh have much to teach us about how a crowded planet can best adapt to rising sea levels. For them, that future is now.

By Don Belt

WE MAY BE SEVEN BILLION SPECKS on the surface of the Earth, but when you’re in Bangladesh, it sometimes feels as if half the human race is crammed into a space the size of Louisiana. Dhaka, its capital, is so crowded that every park and footpath has been colonized by the homeless. To stroll here in the mists of early morning is to navigate an obstacle course of makeshift beds and sleeping children. Later the city’s steamy roads and alleyways clog with the chaos of some 15 million people, most of them stuck in traffic.

Amid this clatter and hubbub moves a small army of Bengali beggars, vegetable sellers, popcorn vendors, rickshaw drivers, and trinket salesmen, all surging through the city like particles in a flash flood. The countryside beyond is a vast watery floodplain with intermittent
stretches of land that are lush, green, flat as a parking lot—and wall-to-wall with human beings. In places you might expect to find solitude, there is none. There are no lonesome highways in Bangladesh.

We should not be surprised. Bangladesh is, after all, one of the most densely populated nations on Earth. In the area of one medium-size U.S. state, it has more people than geographically massive Russia. It is a place where one person, in a nation of 164 million, is mathematically incapable of being truly alone. That takes some getting used to.

So imagine Bangladesh in the year 2050, when its population will likely have zoomed to 220 million, and a good chunk of its current landmass could be permanently underwater. That scenario is based on two converging projections: population growth that, despite a sharp decline in fertility, will continue to produce millions more Bangladeshis in the coming decades, and a possible multi-foot rise in sea level by 2100 as a result of climate change. Such a scenario could mean that 10 to 30 million people along the southern coast would be displaced, forcing Bangladeshis to crowd even closer together or else flee the country as climate refugees—a group predicted to swell to some 250 million worldwide by the middle of the century, many from poor, low-lying countries.

“Globally, we’re talking about the largest mass migration in human history,” says Maj. Gen. Muniruzzaman, a charismatic retired army officer who presides over the Bangladesh Institute of Peace and Security Studies in Dhaka. “By 2050 millions of displaced people will overwhelm not just our limited land and resources but our government, our institutions, and our borders.” Muniruzzaman cites a recent war game run by the National Defense University in Washington, D.C., which forecast the geopolitical chaos that such a mass migration of Bangladeshis might cause in South Asia. In that exercise millions of refugees fled to neighboring India, leading to disease, religious conflict, chronic shortages of food and fresh water, and heightened tensions between the nuclear-armed adversaries India and Pakistan.

Such a catastrophe, even imaginary, fits right in with Bangladesh’s crisis-driven story line, which, since the country’s independence in 1971, has included war, famine, disease, killer cyclones, massive floods, military coups, political assassinations, and pitiable rates of poverty and
deprivation—a list of woes that inspired some to label it an international basket case. Yet if despair is in order, plenty of people in Bangladesh didn’t read the script. In fact, many here are pitching another ending altogether, one in which the hardships of their past give rise to a powerful hope.

For all its troubles, Bangladesh is a place where adapting to a changing climate actually seems possible, and where every low-tech adaptation imaginable is now being tried. Supported by governments of the industrialized countries—whose greenhouse emissions are largely responsible for the climate change that is causing seas to rise—and implemented by a long list of international nongovernmental organizations (NGOs), these innovations are gaining credence, thanks to the one commodity that Bangladesh has in profusion: human resilience. Before this century is over, the world, rather than pitying Bangladesh, may wind up learning from her example.

More than a third of the world’s people live within 62 miles of a shoreline. Over the coming decades, as sea levels rise, climate change experts predict that many of the world’s largest cities, including Miami and New York, will be increasingly vulnerable to coastal flooding. A recent study of 136 port cities found that those with the largest threatened populations will be in developing countries, especially those in Asia. Worldwide, the two cities that will have the greatest proportional increase in people exposed to climate extremes by 2070 are both in Bangladesh: Dhaka and Chittagong, with Khulna close behind. Though some parts of the delta region may keep pace with rising sea levels, thanks to river sediment that builds up coastal land, other areas will likely be submerged.

But Bangladeshis don’t have to wait decades for a preview of a future transformed by rising seas. From their vantage point on the Bay of Bengal, they are already facing what it’s like to live in an overpopulated and climate-changed world. They’ve watched sea levels rise, salinity infect their coastal aquifers, river flooding become more destructive, and cyclones batter their coast with increasing intensity—all changes associated with disruptions in the global climate.

On May 25, 2009, the people of Munshiganj, a village of 35,000 on the southwest coast, got a glimpse of what to expect from a multifoot rise in
sea level. That morning a cyclone, called Aila, was lurking offshore, and its 70-mile-an-hour winds sent a storm surge racing silently toward shore, where the villagers, unsuspecting, were busy tending their rice fields and repairing their nets.

Shortly after ten o’clock Nasir Uddin, a 40-year-old fisherman, noticed that the tidal river next to the village was rising “much faster than normal” toward high tide. He looked back just in time to see a wall of brown water start pouring over one of the six-foot earthen dikes that protect the village—its last line of defense against the sea.

Within seconds water was surging through his house, sucking away the mud walls and everything else. His three young daughters jumped onto the kitchen table, screaming as cold salt water swirled around their ankles, then up to their knees. “I was sure we were dead,” he told me months later, standing in shin-deep mud next to a pond full of stagnant green water the color of antifreeze. “But Allah had other plans.”

As if by a miracle, an empty fishing boat swept past, and Uddin grabbed it and hoisted his daughters inside. A few minutes later the boat capsized, but the family managed to hang on as it was tossed by waves. The water finally subsided, leaving hundreds of people dead along the southwest coast and thousands homeless. Uddin and most of his neighbors in Munshiganj decided to hunker down and rebuild, but thousands of others set out to start a new life in inland cities such as Khulna and Dhaka.

Thousands of people arrive in Dhaka each day, fleeing river flooding in the north and cyclones in the south. Many of them end up living in the densely populated slum of Korail. And with hundreds of thousands of such migrants already, Dhaka is in no shape to take in new residents. It’s already struggling to provide the most basic services and infrastructure.

Yet precisely because Bangladesh has so many problems, it’s long served as a kind of laboratory for innovative solutions in the developing world. It has bounced back from crisis after crisis, proving itself far more resourceful than skeptics might have guessed. Dhaka is home to BRAC, the largest nonprofit in the developing world, held up as a model for how to provide basic health care and other services with an army of
field-workers. Bangladesh also produced the global micro-finance movement started by Nobel Peace laureate Muhammad Yunus and his Grameen Bank.

And believe it or not, it’s a population success story as well. To whittle its high birthrate, Bangladesh developed a grassroots family-planning program in the 1970s that has lowered its fertility rate from 6.6 children per woman in 1977 to about 2.4 today—a historic record for a country with so much poverty and illiteracy. Fertility decline has generally been associated with economic improvement, which prompts parents to limit family size so they can provide education and other opportunities to their children. But Bangladesh has been able to reduce fertility despite its lack of economic development.

“It was very hard in the beginning,” says Begum Rokeya, 42, a government health worker in the Satkhira District who's made thousands of home visits to persuade newlywed couples to use contraception and plan their family’s size. “This is a very conservative country, and men put pressure on women to have lots of children. But they began to see that if they immunized their kids, they wouldn’t need to have a bunch of babies just so a few would survive. They like the idea of fewer mouths to feed.”

Working in partnership with dozens of NGOs, Bangladesh has made huge strides in educating women and providing them with economic opportunities; female work—participation rates have doubled since 1995. Its economy is growing, helped by its garment-export industry. And Bangladesh has managed to meet an important UN Millennium Development Goal: Infant mortality dropped dramatically between 1990 and 2008, from 100 deaths per 1,000 births to 43—one of the highest improvement rates among low-income countries.

In Dhaka such successes are dwarfed by the overwhelming poverty and the constant influx of villagers, prompting organizations, including BRAC, to get involved in helping village people figure out how to survive in a deteriorating environment. “Our goal is to prevent people from coming to Dhaka in the first place, by helping them adapt and find new ways of making a go of it in their villages,” says Babar Kabir, head of BRAC’s climate change and disaster management programs. “Big storms like Aila uproot them from the lives they know.”
Ibrahim Khalilullah has lost track of how many times he's moved. “Thirty? Forty?” he asks. “Does it matter?” Actually those figures might be a bit low, as he estimates he's moved about once a year his whole life, and he's now over 60. Somehow, between all that moving, he and his wife raised seven children who “never missed a meal,” he says proudly. He's a warm, good-natured man, with gray hair cut short and a longish gray beard, and everything he says has a note of joy in it.

Khalilullah is a char dweller, one of the hundreds of thousands of people who inhabit the constantly changing islands, or chars, on the floodplains of Bangladesh's three major rivers—the Padma, Jamuna, and Meghna. These islands, many covering less than a square mile, appear and vanish constantly, rising and falling with the tide, the season, the phase of the moon, the rainfall, and the flow of rivers upstream.

Char dwellers will set out by boat to visit friends on another char, only to find that it's completely disappeared. Later they will hear through the grapevine that their friends moved to a new char that had popped up a few miles downstream, built their house in a day, and planted a garden by nightfall. Making a life on the chars—growing crops, building a home, raising a family—is like winning an Olympic medal in adaptation. Char dwellers may be the most resilient people on Earth.

There are tricks to living on a char, Khalilullah says. He builds his house in sections that can be dismantled, moved, and reassembled in a matter of a few hours. He always builds on a raised platform of earth at least six feet high. He uses sheets of corrugated metal for the outside walls and panels of thatch for the roof. He keeps the family suitcases stacked neatly next to the bed in case they’re needed on short notice. And he has documents, passed down from his father, that establish his right to settle on new islands when they emerge—part of an intricate system of laws and customs that would prevent a million migrants from the south, say, from ever squatting on the chars.

His real secret, he says, is not to think too much. “We're all under pressure, but there's really no point to worry. This is our only option, to move from place to place to place. We farm this land for as long as we can, and then the river washes it away. No matter how much we worry, the ending is always the same.”
Even in the best of times, it’s a precarious way of life. And these are not the best of times. In Bangladesh climate change threatens not just the coast but also inland communities like Khalilullah’s. It could disrupt natural cycles of precipitation, including monsoon rains and the Tibetan Plateau snowfall, both of which feed the major rivers that eventually braid their way through the delta.

But precisely because the country’s geography is prone to floods and cyclones, Bangladeshis have gotten a head start on preparing for a climate-changed future. For decades they have been developing more salt-resistant strains of rice and building dikes to keep low-lying farms from being flooded with seawater. As a result, the country has actually doubled its production of rice since the early 1970s. Similarly its frequent cyclones have prompted it to build cyclone shelters and develop early-warning systems for natural disasters. More recently various NGOs have set up floating schools, hospitals, and libraries that keep right on functioning through monsoon season.

“Let me tell you about Bangladeshis,” says Zakir Kibria, 37, a political scientist who serves as a policy analyst at Uttaran, an NGO devoted to environmental justice and poverty eradication. “We may be poor and appear disorganized, but we are not victims. And when things get tough, people here do what they’ve always done—they find a way to adapt and survive. We’re masters of ‘climate resilience.’”

Muhammad Hayat Ali is a 40-year-old farmer, straight as bamboo, who lives east of Satkhira, about 30 miles upstream of the coast but still within range of tidal surges and the salinity of a slowly rising sea.

“In previous times this land was juicy, all rice fields,” Ali says, his arm sweeping the landscape. “But now the weather has changed—summer is longer and hotter than it used to be, and the rains aren’t coming when they should. The rivers are saltier than before, and any water we get from the ground is too salty to grow rice. So now I’m raising shrimps in these ponds and growing my vegetables on the embankments around them.” A decade ago such a pond would have been a novelty; now everyone, it seems, is raising shrimps or crabs and selling them to wholesalers for shipment to Dhaka or abroad.
Sometimes, though, adaptations backfire. Throughout southern Bangladesh, villages and fields are shielded from rivers by a network of dikes built by the government with help from Dutch engineers in the 1960s. During floods the rivers sometimes overflow the dikes and fill the fields like soup bowls. When the flood recedes, the water is trapped. The fields become waterlogged, unusable for years at a time.

Decades ago things got so bad in Satkhira—so many fields were waterlogged, so many farmers out of work—that members of the local community used picks and shovels to illegally cut a 20-yard gap in an embankment, draining a huge field that had been waterlogged for nearly three years. In doing so, they were emulating Bengali farmers of earlier times, who periodically broke their embankments and allowed river water to enter their fields, rising and falling with the tides, until the deposited sediment raised the level of the land. But this time the villagers were charged with breaking the law.

Then a funny thing happened. The field, which had been left open, acquired tons of sediment from the river and grew higher by five or six feet. The river channel deepened, and fishermen began to catch fish again. Finally a government study group came to survey the situation and wound up recommending that other fields be managed the same way. The villagers were vindicated, even hailed as heroes. And today the field is covered with many acres of rice.

“Rivers are a lifeline for this region, and our ancestors knew that,” Kibria says as he walks an embankment. “Opening the fields connects everything. It raises the land level to make up for the rise in sea level. It preserves livelihoods and diversifies the kinds of crops that we can grow. It also keeps thousands of farmers and fishermen from giving up and moving to Dhaka.”

But every adaptation, no matter how clever, is only temporary. Even at its sharply reduced rate of growth, Bangladesh’s population will continue to expand—to perhaps more than 250 million by the turn of the next century—and some of its land will continue to dissolve. Where will all those people live, and what will they do for a living?

Many millions of Bangladeshis are already working abroad, whether in Western countries, in places such as Saudi Arabia and the United Arab
Emirates, or in India, where millions fled during Bangladesh’s 1971 war of independence against Pakistan and never returned. Millions more have slipped across the frontier in the decades since, prompting social unrest and conflict. Today India seems determined to close and fortify its border, girding against some future mass migration of the type hypothesized in Washington. It’s building a 2,500-mile security fence along the border, and security guards have routinely shot people crossing illegally into India. Interviews with families of victims suggest that at least some of the dead were desperate teenagers seeking to help their families financially. They had been shot smuggling cattle from India, where the animals are protected by Hinduism, to Muslim Bangladesh, where they can fetch up to $40 a head.

But if ten million climate refugees were ever to storm across the border into India, Maj. Gen. Muniruzzaman says, “those trigger-happy Indian border guards would soon run out of bullets.” He argues that developed countries—not just India—should be liberalizing immigration policies to head off such a chilling prospect. All around Bangladesh bright, ambitious, well-educated young people are plotting their exit strategies.

And that’s not such a bad idea, says Mohammed Mabud, a professor of public health at Dhaka’s North South University and president of the Organization for Population and Poverty Alleviation. Mabud believes that investing in educating Bangladeshis would not only help train professionals to work within the country but also make them desirable as immigrants to other countries—sort of a planned brain drain. Emigration could relieve some of the pressure that’s sure to slam down in the decades ahead. It’s also a way to bolster the country’s economy; remittances sent back by emigrants account for 11 percent of the country’s GDP.

“If people can go abroad for employment, trade, or education and stay there for several years, many of them will stay,” he says. By the time climate change hits hardest, the population of Bangladesh could be reduced by 8 to 20 million people—if the government makes out-migration a more urgent priority.

For now, the government seems more interested in making climate adaptation a key part of its national development strategy. That translates, roughly, into using the country’s environmental woes as
leverage in persuading the industrialized world to offer increased levels of aid. It's a strategy that's helped sustain Bangladesh throughout its short, traumatic history. Since independence, it has received tens of billions of dollars in international aid commitments. And as part of the accord produced at the United Nations Climate Change Conference in Copenhagen in 2009, nations of the developed world committed to a goal of $100 billion a year by 2020 to address the needs of poor countries on the front lines of climate change. Many in Bangladesh believe its share should be proportionate to its position as one of the countries most threatened.

“Climate change has become a kind of business, with lots of money flying around, lots of consultants,” says Abu Mostafa Kamal Uddin, former program manager for the government’s Climate Change Cell. “During the global financial meltdown, trillions of dollars were mobilized to save the world’s banks,” he says. “What’s wrong with helping the poor people of Bangladesh adapt to a situation we had nothing to do with creating?”

Two years after the cyclone, Munshiganj is still drying out. Nasir Uddin and his neighbors are struggling to wring the salt water out of their psyches, rebuild their lives, and avoid being eaten by the tigers that prowl the village at night, driven from the adjacent Sundarbans mangrove forest in search of easy prey. Attacks have risen as population and environmental pressures have increased. Dozens of residents around Munshiganj have perished or been wounded in recent years—two died the week I was there—and some of the attacks occurred in broad daylight.

“It’s bad here, but where else can we go?” Uddin says, surveying the four-foot-high mud platform where he's planning to rebuild his house with an interest-free loan from an NGO. This time he's using wood, which floats, instead of mud. The rice fields around his house are full of water, much of it brackish, and most local farmers have begun raising shrimps or crabs in the brine. Deep wells in the village have gone salty too, he says, forcing people to collect rainwater and apply to NGOs for a water ration, which is delivered by truck to a tank in the village and carried home in aluminum jugs, usually balanced on the heads of young women.
“You should take a picture of this place and show it to people driving big cars in your country,” says Uddin’s neighbor Samir Ranjan Gayen, a short, bearded man who runs a local NGO. “Tell them it’s a preview of what South Florida will look like in 40 years.”

As the people of Munshiganj can attest, there’s no arguing with the sea, which is coming for this land sooner or later. And yet it’s hard to imagine millions of Bangladeshis packing up and fleeing en masse to India, no matter how bad things become. They’ll likely adapt until the bitter end, and then, when things become impossible, adapt a little more. It’s a matter of national mentality—a fierce instinct for survival combined with a willingness to put up with conditions the rest of us might not.

Abdullah Abu Sayeed, a literacy advocate, explains it this way: “One day I was driving on one of the busiest streets in Dhaka—thousands of vehicles, all of them in a hurry—and I almost ran over a little boy, no more than five or six years old, who was fast asleep on the road divider in the middle of traffic. Cars were whizzing by, passing just inches from his head. But he was at peace, taking a nap in some of the craziest traffic in the world. That’s Bangladesh. We are used to precarious circumstances, and our expectations are very, very low. It’s why we can adapt to just about anything.”
An Arctic Breakthrough

Heralding a new era of cooperation, the United States and Russia are making data from their Cold War intelligence archives available to scientists studying the Arctic Ocean.

By Don Belt

Foreword by Al Gore, Vice President of the United States:

For nearly half of century the intelligence agencies and military commands of the United States and the Soviet Union spent billions of dollars to collect information about the Arctic Ocean—everything from the properties of seawater and the topography of the seafloor to the seasonal patterns of sea ice. Taken as a whole, this treasure trove might yield answers to profound questions about the Arctic and its relationship to the ecosystem of our planet. And yet, for national security reasons, the information was held strictly off-limits to environmental scientists around the world.

In the spirit of the new openness that followed the end of the Cold War, I became determined to do all that I could to help unlock access to beneficial knowledge, including the Arctic data. After I conferred with the national security community in Washington and with my counterpart and valued colleague, Prime Minister Viktor Chernomyrdin, in Moscow, both countries agreed to make much of the Arctic information available for use in peaceful scientific research.
I am proud to announce in these pages that we have taken a major step toward that goal. The first volume of the joint U.S.-Russian Arctic Ocean Atlas in CD-ROM format is hereby released to the world’s scientific community. And we offer in the following article a representative selection from the CD-ROM.

With this atlas some of science’s most sought-after data about our environment has literally “come in from the cold.” Yet this historic achievement is more than about the mysteries of the Arctic. It is also a lesson about the possibilities for progress that unfold when Americans and Russians join as partners in the peaceful service of our planet. Though we do not yet know precisely what truths the once forbidden information will reveal about the Arctic and our world, we do know that a great portal of knowledge has swung open and that we are passing through it as explorers together.

ON AN ICE FLOE 265 nautical miles north of Greenland, a dozen large men in parkas were doing their best to keep their sense of humor. They’d been standing around for an hour, which wouldn’t have been so bad except for the wind, which was gusting to 20 or 30 knots, and the windchill was around 80 below. It was a clear morning in April, the month of perpetual daybreak in the high Arctic, when the sun hangs low in the sky like a frozen fruit, beautiful to look at but not much good.

As the men milled about to stay warm, they glanced anxiously at a 15-foot X carved in the flat snow nearby. Where the snow was cleared away, they could see a layer of thin white ice underneath—all that separated them from the abyssal depths of the Arctic Ocean. After looking it over, the men backed away and went back to milling.

Suddenly the X erupted with a colossal subaquatic roar, thrusting upward into a conical mountain of ice and snow. Chunks of ice tumbled away to reveal a block of metal rising from the sea—the dark gray conning tower of a nuclear submarine. Billows of steam poured out as the hatch was opened. Sailors in shirtsleeves materialized in the mist.

“Morning!” one called out to the men on the floe. “U.S. Navy, at your service!”

At least one observer was deeply impressed by the U.S.S. Pargo’s dramatic arrival. “To see that sub crash through the ice was absolutely
amazing,” recalls Vice President Al Gore, one of the men in the parkas that day. “It was like the meeting of two worlds.”

Bringing two worlds together—the world of environmental science and the world of national defense—would eventually produce the joint United States-Russian oceanographic atlas that Vice President Gore announces in the preceding pages. But in the spring of 1991, when Gore, then a U.S. senator, and several colleagues flew to the Arctic and boarded the Pargo, all this was just one crazy idea.

A longtime environmentalist, Gore had studied national security issues while serving on congressional intelligence and armed service committees. Along the way he became aware of the vast quantities of scientific data collected secretly by the U.S. intelligence community and the military that could also be applied to solving environmental dilemmas—rain forest decline, global warming, ocean pollution, desertification. Once convinced that sensitive material related to national security could be digitally excised from these data, Gore was determined to see much of the rest made available to science.

This is what propelled him to the Arctic in 1991 and placed him aboard the Pargo, which, after taking on its civilian passengers, sank back under the ice and set a course for the North Pole.

One of Pargo’s tasks was to test an array of instruments designed to gauge the thickness of polar ice from below. Gore was keenly interested in how data collected from these devices might be used to study global climate change: If the earth is warming, the theory goes, then the ice cube at the top of the world should be getting thinner.

Historically, of course, the U.S. Navy’s interest in polar ice had nothing to do with global warming. During the Cold War both U.S. and Soviet strategists had regarded the Arctic as a potential staging area for World War III, which would probably have featured Soviet Typhoon-class submarines punching up through the ice to fire ballistic missiles at targets on land, and U.S. subs tracking their movements. Knowing how to find thin ice would be a strategic advantage in such a war. So would knowing all you could about the Arctic Ocean’s weather—as well as its bottom topography, currents, and temperature and salinity, all of which affect acoustics.
The polar ice also provides ideal cover for prowling submarines, which could avoid detection by maneuvering among the lobes and caverns on the ice’s underside, where sonar is scattered and absorbed, making it much less effective.

After Pargo reached 90 degrees north, the commander brought the sub to the surface as he had earlier, ramming up through thin ice. Gore climbed out and got his first look at the North Pole. “It was very bright—and the eeriness of the landscape was striking,” he recalls. “Clouds of ice crystals were being blown back and forth by the wind, and I’ll never forget how the ice sparkled in the air. It was a stunning experience.”

Some 500 miles south of where Gore stood, a group of tired Russian scientists had, just days earlier, been weighing their chances of staying dry a few more hours. Riding a huge ice floe, Vladimir Sokolov had his doubts. “Pools of standing water,” he recalls, “cracks in the ice. That sinking feeling.” Evidence, in other words, that the ice platform was finally, after three and a half years of faithful service to the Soviet Union, breaking apart, softened by the spring thaw and crushed by the surrounding ice.

Since October 1987 dozens of scientists had lived and word on this cake of ice, meticulously collecting oceanographic readings, weather observations, and ice data as the floe made a sloe tour of the Arctic Ocean, pushed by winds and currents.

By April 1990, when Sokolov arrived by air to take command, the floe had turned south into the Canada Basin and stalled out. A few days later the drift station ran into what Sokolov calls an ice “meat grinder,” a pressure system that grinds the ice floe to pieces as it rotates helplessly, held fast on all sides by thicker ice. “This is when the trouble started,” Sokolov says—when the ice started to crack, when supply planes couldn’t land without falling into a crevice, when his scientists were intermittently forced to stop taking measurements and start moving buildings from place to place in search of stable ice.

This went on for a year. Then things deteriorated further, although Sokolov’s crew continued to collect data until the bitter end. They were finally evacuated by an Antonov cargo plane in April 1991. Dramatic
endings were not at all unusual for drift stations in Arctic waters. In fact, Sokolov’s expedition, known as SP-30 for Severnyy Polyus (North Pole), was judged as arousing success, as was another ice station, SP-31, drifting near the Alaska coast that spring. No one knew it at the time, but SP-31 would be the last Soviet drift station in history.

For decades the Soviets had been tireless in their pursuit of knowledge about the Arctic. Part of the reason was military, of course: Sokolov’s oceanographic data, like that from all drift stations, were considered vital for the fleet of Soviet submarines operating in Arctic waters from Murmansk and other ports. But the Soviets also had important economic and scientific reasons to be up there. Some 300 ships a year plied the Northern Sea Route along Russia’s 3,000-mile Arctic coast. Navigators needed to know exactly where the ice was and its condition; scientists sought to understand its structure and movement. Besides launching one or two drift stations a year, the Soviets flew hundreds of missions to various parts of the Arctic, usually landing on skis, then collecting data on the ice or boring through it to sample the ocean.

These activities were run from the Arctic and Antarctic Research Institute (AARI) in Leningrad (now St. Petersburg), a bustling research center and staging area where patriotism ran high and money was no object. “Those were the days when no one asked, ‘How much will it cost?’” remembers Leo Timokhov, a senior scientist at AARI and a man who has flown hundreds of sorties to the polar ice. “They would just say, ‘Do it!’”

This era had begun 54 years earlier, when the Soviet Union had organized its very first drift station. Launched on May 21, 1937, near the North Pole, SP-1 was manned by a radio operator, hydrologist, magnetician, and the group’s leader, a round, jovial member of the Soviet secret police named Ivan Papanin.

Outfitted in fur and housed in a canvas tent insulated with eiderdown, the four men trooped daily to the tents and wooden sheds where they conducted their research. They routinely lowered a cable to gauge the depth of the ocean and sampled sediment from its bottom. They also recorded water temperature at various depths, logged gravitational and magnetic readings, measured snow depth, analyzed the ice, and studied the weather.
As was the Russian practice, every observation was recorded twice—once in the hasty, semi-frozen scrawl of the field notebook, and a second time around the stove at night in the precise pencil notation that would make up the official record of the expedition. These paper notebooks would be stored at AARI and made available not only to the military but also to civilian Soviet scientists.

All went well during the summer and fall as the floe drifted south in a lazy zigzag pattern, driven by currents and prevailing winds. But by December their ice island had entered the Fram Strait east of Greenland and begun moving rapidly south, pelted by storms and chewed at by turbulent, ice-covered seas.

By February the four were up to their ankles in seawater. Arriving in the nick of time, a Soviet icebreaker plucked them from the ice—a rescue that caused a national sensation. Papanin and his mates were made Heroes of the Soviet Union and given a tumultuous tickertape parade through the streets of Moscow.

No such festivities awaited the drifters of SP-30 on their return to the motherland in April 1991. The mood in Moscow, indeed in the whole U.S.S.R., was a dark mixture of fatalism, anger, and fear. By December the Union of Soviet Socialist Republic would be history. The world, in short, was spinning like an ice floe caught in a meat grinder.

A FEISTY, FORTYISH WOMAN named Linda Zall was the person assigned to handle the letter that arrived at CIA headquarters in May 1990 from Senator Al Gore of Tennessee. Today, almost seven years later, she can still recite passages from it, like the last sentence on page one. “Gore wanted to know if we had data related to ‘sea surface temperature, sea ice type and motion, sea level data, ocean carbon dioxide, ocean chlorophyll, circulation patterns...trace species, cloud amounts, types and heights, precipitation, tropical winds, etc.’

“My first reaction when I read that sentence was, ‘Why me, God?’” she says. “It was the ‘etc.’ that really worried me.”
After the shock wore off, Zall set to work on dissecting the letter “sentence by sentence, word by word” to see what complying with Gore’s request might entail. The more she learned about the environmental data the CIA had in its “black,” or secret, files, the more merit she saw in Gore’s idea of releasing them. “But never in a million years,” she says, “did I believe the Agency would sign off on it.”

Even with its old adversary faltering, the CIA was still a product of its long struggle against the U.S.S.R. “Remember,” says Zall, “1990 wasn’t like now, when we’re sort of huggy-kissy with the Russians. Most of the old guys at the CIA and in the Navy had spent their whole careers fighting the evil empire. The last thing they wanted was to open the black door, even a tiny crack.”

Gore didn’t know it yet, but in Zall he’d found someone at the CIA as relentless as he was. Early on she’d won permission to go outside the agency and meet privately with scientists to learn how intelligence data might apply to their work. Zall pursued dozens of the top scientists in their fields—figures such as oceanographer Walter Munk, geophysicist Gordon MacDonald, planetary physicist Michael McElroy, and polar climatologist Norbert Untersteiner of the University of Washington—all of whom donated their time and effort to studying Gore’s request.

Then, in November 1991, Robert Gates became the director of the CIA. Gates, a longtime analyst, realized the agency needed to redefine its mission in the post-Cold War world. A few weeks into his job Gates received a letter from Al Gore asking him to grant high-level security clearances to the scientists Zall had recruited, allowing them to study the most sensitive material in the files at the CIA and the Department of Defense.

Seeing an opportunity to make the CIA more “renaissance,” Gates agreed. That summer Zall went into overdrive and got her group of 60 or so scientists top-secret clearances in record time. Their background checks went smoothly, although Zall nearly keeled over when she heard what Untersteiner, a high-spirited Austrian who’d been of draft age in 1944, answered when asked: “Have you ever been a member of an organization dedicated to the overthrow of the United States?”

“Yes,” he wrote on the questionnaire, “the German army.”
In a moment of pique Zall named her group of headstrong scientists Medea, after the character in Greek mythology who didn't let anything—even her children—stand in her way.

Gore was inaugurated Vice President of the United States in January 1993. By then the Medea team had hits its stride, sifting through the billions of dollars' worth of classified material gathered by U.S. satellites, aircraft, ships, submarines, buoys, and other devices. This was a bonanza beyond imagination for earth scientists, and Medea's work—shepherded by Linda Zall—would ultimately lead to the release of military historical data, including spy satellite images, and a partial redeployment of the nation's satellites to help monitor the environment.

In April 1993 U.S. President Bill Clinton and Russian President Boris Yeltsin put Gore and Prime Minister Viktor Chernomyrdin in charge of a joint U.S.-Russian commission to foster initiatives for the good of both nations. Six months later Gore quietly raised the idea of sharing material from the intelligence archives of both nations to support scientific study of the global environment. Chernomyrdin was receptive, says Gore, but “properly apprehensive” that Russia’s national security not be compromised.

Months of painstaking negotiation followed, as the two sides grappled with the fine points of how to share national security information. “We had to figure out how to give up the milk without giving away the cows,” says Viktor Danilov-Danilian, Russia’s Minister of the Environment.

The two nations forged an Environmental Working Group, headed by Danilov-Danilian and NOAA Administrator D. James Baker of the United States, and the milk began to flow. The working group’s initiatives range from analyzing environmental degradation at military facilities in both countries, to predicting earthquakes and other natural disasters, to assessing the impact of oil and gas development in permafrost regions.

The most dramatic progress so far has been in Arctic Ocean research, where shared data has led to a series of CD-ROM atlases. The first of these, released this month, is the most comprehensive collection of Arctic oceanographic data ever produced. About 70 percent of the data
is derived from the Russian archive of AARI in St. Petersburg, while the rest comes from previously restricted international studies, the U.S. Navy, and the National Oceanic and Atmospheric Administration (NOAA). The Russian contribution, which consists of some 1.4 million winter observations, represents decades of toil by scientists on both the airborne surveys and the drift stations—material drawn from 900,000 pages of documents that took 15 employees more than a year to transcribe. Subsequent atlases are being prepared on Arctic ice and meteorology.

Like many Russian scientific institutes, AARI is financially strapped. Its headquarters, including the library where the original data are shelved, is literally falling apart. Leo Timokhov, AARI’s lead scientist on the project, says he and others breathed a sigh of relief when their notebooks were safely digitized and added to the CD-ROM. “It makes me very happy to see our data secure,” says Timokhov, glancing at the cracked plaster over his head. “One never knows when the pipe will burst.” He agrees with his colleagues in the U.S. that some of the most valuable oceanographic data in history have just been rescued.

It’s too early to say what conclusions science will draw from this wealth of new information—but scientists, especially those studying long-term changes in the global environment, are eager to get their hands on it.

“This is, after all, the record of what’s happened in the Arctic Ocean in the second half of the 20th century,” says Norbert Untersteiner. “Throughout the Cold War the Russian Arctic was strictly off-limits to scientists from the West. This data changes all that. Now we’ll know, for example, if the warm water anomaly we found in 1993 was there in 1970 or 1962 or 1950. It will allow us to paint the big picture in much greater detail.”

Equally important, perhaps, is the principle behind the exchange. Everyone involved, both in the United States and Russia, believes that this kind of cooperation, when applied to the problems of global air pollution, say, or healing the acid-stressed boreal forest in Siberia, or containing nuclear and chemical wastes in the Arctic Ocean, is a source of genuine hope.
“The Russians want to understand the global environmental crisis just as much as we do,” says Vice President Gore. “Solving it will be excruciatingly difficult; we both know that. It’s at the outer boundary of what is possible to do as a civilization. But it is within our reach.”

Viktor Danilov-Danilian sees things from a different perspective. In his Moscow office, he sounded decidedly less upbeat. But even he brightened at the prospect of somehow turning humanity’s instruments of war into the means of environmental salvation.

“For us in Russia today,” he said quietly, “this is one bright speck of paint on a very dark canvas.”
Petra: Ancient City of Stone

Lost for centuries in the sands of Arabia, the ancient Nabatean capital of Petra is a living monument to water conservation.

By Don Belt

It took twelve weeks to get here from the frankincense groves of Oman, once the camels were loaded and the campfires stamped out. Then the caravan, single-minded as a line of ants, would set out through the morning mist, guarding its precious cargo from bandits, and pass uneasily, single file, through the treachery of Yemen.

Later, if things were going well, the caravan would pause to trade at Medina, drinking from its brackish wells and gathering strength for the journey ahead. Then it would strike out north across the hellish, flint-strewn sands of western Arabia, living from one water hole to the next all the way to the capital of the Nabataeans, who ruled the lands east of the Jordan River. To the camel driver of two millennia ago, this city, Petra, beckoned like a distant star.
What a relief it must have been to see the guards on red sandstone ledges, and to be waved in after paying the toll, and to breathe the cool air inside the Siq (pronounced seek), the 250-foot-high crack in the rock that was, and still is, the main road into Petra.

For the thirsty there was water, lots of it, flowing down sinuous stone channels along the roadway; for the grateful and devout there were carved altars to Dushara, the head Nabataean god, on the chasm’s sandstone walls. Boys on donkeys would dash by, shouting news of the arrival; the smell of cardamom, campfires, and searing meat promised hospitality just ahead. Finally, the caravan would swing wide around a vend to face Al Khazneh (the Treasury), that towering edifice carved from rose-colored rock, and plunge into the crowded marketplace beyond.

Two thousand years have passed, but shades of ancient Petra still endure in the desert of southern Jordan. The facades of its buildings peer out from banks of drifted sand, and you can wander freely among them, fingertips on chiseled rock. Delicate bits of Nabataean pottery lie scattered across the land like eggshells, so numerous at times that it’s hard to avoid stepping on them. And if you’re out early—before the first tourist bus pulls up just past daybreak—you might even hear echoes of the ancient city, as I have, in the local Bedouin drifting by on camels in the mist or in the murmur of voices over pots of steeping tea.

After dozens of visits I’ve come to recognize this immediacy of the past as Petra’s surpassing charm. Yet it’s also the site’s most profound dilemma: A living antiquity presents problems to those who would preserve the past, or uncover its secrets, or package it for mass consumption.

Like other nomadic peoples who wandered through the spotlight of history, the Nabataeans left little behind to explain themselves. They probably moved into Palestine from Arabia several centuries before Christ. By the first century B.C. their capital was a rich city shaped by the sophistication and wealth that Petra, a natural fortress on a pass through rugged mountains, acquired as a crossroads for trade.
Filling a power vacuum left by Greece’s decline, the Nabataeans dominated this part of the Middle East for more than four centuries before being subjugated by the Romans, then eclipsed by the Byzantines, and finally dispersed onto the back lot of history. From sherds of their pottery we know they were artists; ancient manuscripts describe them as shrewd traders and merchants. Both qualities are reflected in Petra’s public architecture, a dizzying array of temples, tombs, theaters, and other buildings chiseled out of russet sandstone. Scattered over 400 square miles and connected by trails and caravan roads, these buildings are monumental and dramatic even when judged against the Greek masterpieces of the day.

But their breakthrough achievement—the one that made all the others possible—came when the Nabataeans mastered their water supply, which enabled them to build a metropolis of 30,000 in a remote desert canyon that gets only six inches of rain each year.

Harvesting water like precious grain, the Nabataeans collected it, piped it, stored it, conserved it, prayed over it, managed it—by devising elaborate systems of hydraulics that make up, even now, the unseen musculature of Petra. Hundreds of cisterns kept Petra from dying of thirst in times of drought, while masonry dams in the surrounding hills protected the city from flash floods after bursts or rain.

That kind of planning is called for again today—as Jordan, for whom Petra is supreme in a collection of archaeological treasures, weighs decisions about how best to excavate and preserve the site while reaping economic benefit from the world’s growing interest in it.

With no oil fields and few natural resources, Jordan greets the thousands of tourists who come pouring down the Siq into Petra as joyously as rainfall in the desert. The challenge will be to keep this flood of visitors from sweeping away the very features that make the place unique.

I first met Hamoudi al-Bedoul in a Nabataean tomb, and even there he made quite an impression. It was shortly after dawn in a stone chamber twelve feet square and six feet under, illuminated only by the murky plume of daylight that filled the rock chimney we’d used to get in.
We were excavating beneath the ruins of a fifth-century A.D. Byzantine church in Petra, and the dust was already thick enough to muffle the growl of Hamoudi’s shovel as he carved chunks of hard-packed sand from a nearby grave, then deposited them gently onto the screen of my wooden sifter. I would shake the sand through, as if panning for gold, and Hamoudi would pause to heck the debris left behind, plucking out sherds of pottery with fingers as fluent and precise as the bill of a bird.

“Hallas,” he’d finally say—”finished”—with a dismissive flick of his fingertips, and I would empty the sifter into the hollow grave I was standing in.

As the sun rose, the tomb brightened, and then I could see just enough of Hamoudi under his kaffiyeh to be wary of him. He was all Bedouin—short, slim, dark—and had a face as fierce as a shrike, with a pointed beak and a sharp little beard thrust forward like a dagger.

Later, after I’d gotten to know Hamoudi, I could look past this face to the merriment in his soul, and his keen unlettered intelligence, and his exuberant love of people that took us, sooner or later, to drink tea in practically every Bedouin tent in the region.

Within his tribe Hamoudi is something of a legend for his gentle way with camels and his unabashed eye for pretty girls, whom he calls, without a trace of lechery, “Bellabooooozz!!!”

In the archaeology community Hamoudi is celebrated for his professionalism and his eagle eye, both of which figured into one of the most significant finds of this century at Petra.

A few years ago Hamoudi was digging in the ruins of another Byzantine church for the American Center of Oriental Research. In one corner he discovered church scrolls that had been charred when the building burned around A.D. 600 but were still legible. Experts believe these records of daily life in Petra may hold clues to the demise of the city after the Romans took control in A.D. 106 and rerouted the caravan trade away from Petra.
By the time Rome fell and the Byzantines built the church that lay in the ruins above Hamoudi and me, most Nabataean tombs had been looted, and only a few thousand of the living remained for the Byzantine clergy to convert to their new religion. Earthquakes in A.D. 363 and again in 551 rocked what was left of the city, although the charred scrolls record marriages as late as 582. Later the city was forsaken, possibly because the Nabataean channels and cisterns, long neglected, had filled with sand. Petra may simply have run dry.

Thirteen centuries of sandstorms and floods packed the ruined city in drifts and debris. Experts estimate that more than 75 percent of the urban center still lies hidden from view, which may account for the sense of imminent discovery that hangs in the air over Petra.

“Meeoow!” Hamoudi yelped and fell to his knees in the grave.

“Are you OK?” I said, afraid that he'd driven the shovel blade into his sandaled foot.

“OK!” he said as he stood up carefully, balancing an unbroken ceramic bowl in his palm. He turned to me, his black eyes shining like little spotlights in the gloom. “Naba-tee-an!” he grinned, holding up the 2,000-year-old bowl like a newborn baby for me to admire. “Look, full round! In museum, same same!”

With so much of Petra still underground, practically every stab of a shove yields something worth talking about. There were nearly two dozen archaeological projects under way the last time I was there, ranging from a study measuring the effect of wind erosion on Petra's sandstone facades to the unearthing of a massive building along the main street.

Some of the most spectacular recent finds involve the Siq, the cliff-lined road into Petra that was buried under sand and flood debris. In the mountains overlooking it, engineers have begun to retrace and map the Nabataeans’ network of channels, basins and dams—all built to capture and control spring water and the rainfall that gushes down toward the Siq through 19 distinct tributaries.
“We were astonished by how sophisticated their ideas were,” said Maan al-Huneidi, who manages the project, the day I scrambled for hours over waterworks with one of his lead engineers. We found dozens of sand-filled dams tucked into the mountainside that day and almost as many cisterns carved from solid rock. Miniature canals linked one catchment area to the next, moving water downhill gracefully, sometimes whimsically, in little troughs of sandstone as finely carved as sculpture.

Last year Maan’s company removed some 400,000 cubic feet of rubble from the Siq’s floor, exposing the original pavement and ancient features on the chasm walls, including ceramic water pipes and a giant camel caravan carved in bas-relief from the sandstone.

I watched one morning as dozens of tourists admired this monumental carving, which is just above eye level. Some ran their hands over the stone, bringing down a faint shower of sand, while others picked idly at the wall for souvenirs. At one point a tour guide mounted a nearby Nabataean channel to deliver his spiel; he failed to mention that the plaster crumbling under his feet was two millennia old.

That man was lucky that Aysar Akrawi didn’t catch his act the morning she and I toured the Siq together. As director of the nongovernmental Petra National Trust, Akrawi helped raise the half million dollars it cost to excavate the Siq—only to be reminded, daily, of how vulnerable it is once exposed.

“Petra is an exceptionally fragile site,” she said, moments after a little boy blissfully urinated in front of us on the sandstone steps of the Treasury, Petra’s most famous building. “To overdevelop it for tourism without protecting these antiquities is a huge mistake.”

A look at the statistics explains why the custodians of Petra might be feeling overwhelmed. In 1991 just 41,000 people visited the site; last yearly nearly ten times that number did, reflecting Jordan’s peace treaty with Israel and its reputation abroad as a relatively peaceful corner of the Middle East.
To handle the influx, Jordan recently borrowed some 23 million dollars from the World Bank to build new roads, tourist facilities, and other infrastructure in Wadi Musa, the boomtown that has grown up around the entrance to Petra. Only a small amount is set aside for site preservation.

“My first job is to clean up Petra,” says Kamel Mahadin of the Petra Regional Planning Council, a local government bureau that will administer the World Bank funding.

Following a master plan approved by the various constituencies he serves, Mahadin began by redesigning the entrance to the site, which as recently as 1996 was a cloud of rose-colored dust and noise filled with vendors, beggars, kids on donkeys for hire, all swirling around a nucleus of stone-faced tourists in tennis shows. Today the area is a quiet roadway.

Mahadin has also turned his attention to the Bedouin vendors inside Petra, decreeing that their medley of souvenir stands, restaurants, and animal rides be reorganized into cooperative ventures. Designed to protect the archaeology and make the site more presentable, these changes effectively limit vendors to a fraction of their former incomes. As one might expect, Mahadin’s office in Wadi Musa was immediately besieged with angry Bedouin, many of whom depend on tourism for a living.

It’s not easy to manage a living antiquity that people will cross an ocean to see, and he government is seeking a fair solution. “Petra has many husbands,” Mahadin sighs. “Everybody loves her. We know that mass tourism hurts the site, but we can’t just close the gate either.”

There is a quiet grandeur to Petra that eludes the casual tourist, many of whom trek down the Siq to the Treasury and back out again without pausing longer that the time it takes to buy a bottle of water and a “Petra, Jordan” T-shirt. This is exactly what I did for the first time I visited, giving the place a few hours one spring afternoon, seeing only a fraction of the hundred square miles that Jordan set aside as a national park in 1993.
From its center Petra extends for miles in all directions along a network of wadis, or dry riverbeds, and old caravan roads that once moved frankincense from Oman to Gaza and bracelets of gold from workshops in Aleppo to the suqs of Yemen. In recent years I’ve retraced those routes and felt the presence of the ancient world in everything from the plaintive traveling songs of the Bedouin to the sandpaper swish of a camel’s hoof on sandstone, each as big as a salad plate, soft as a paw.

Time pokes along haphazardly here, moving to the ever changing rhythms of sun and grass and goats. One afternoon Hamoudi and I dropped by the men’s tent at a wedding feast near Beida, a tree-lined wadi that serves as Petra’s back door. Hamoudi, who is at home anywhere, folded his lank frame gracefully onto shaded mattresses after greeting the groom’s father with fervent kisses on both cheeks. Hamoudi didn’t know this family—they were of a different tribe—but for all anyone knew, he might be a long-lost brother.

Inevitably the line of dark desert faces turned to me—the white guy in a kaffiyeh trying not to wince from the glass of scalding tea he’d been handed. Without taking their eyes off me, they asked Hamoudi where I was from. His response stirred the conversation and moved it in my direction.

“America?” said one of the younger men. “Do you know Muhammad Ali?”

In the Petra backcountry you still find some of Hamoudi’s tribe, called the Bedoul, dwelling in caves, as they have for centuries. For me, this human dimension is what breathes life into Petra and elevates the place from scenic to sublime—although I understand why most of the Bedoul, including Hamoudi and his family, live today in government houses in Umm Sayhun, a dreary little village of about 1,500 overlooking the land they once called their own.

After Petra was made a UNESCO world heritage site in 1985, the tribe moved out of the caves at the government’s request and with an understanding that they’d continue working inside Petra as archaeologists, laborers, and vendors while grazing their goats in the countryside. In Umm Sayhun the Bedoul have access to schools, electricity, and health care—services that have enhanced their lives.
Yet if it weren’t for his four children, Hamoudi, Bedouin to the core, would prefer to sleep in the open every night. In fact, many of the villagers vanish into the countryside at the first sign of warm weather, and those who stay behind usually camp out too—on the roofs of their government houses. And though squeezed into a village, the Bedoul still know this vast region better than anyone else. When a tourist wanders off in the desert and winds up dehydrated, it’s not the army, which guards Petra, that finds him, revives him, and brings him in on the back of a camel or in the bed of a pickup truck. It’s one of the Bedoul.

The Caravan Road that brought fine Chinese silks to Petra and on to Amman and Damascus passes near a massive outcrop of pale yellow sandstone about ten miles from the city center. The Bedoul call this Shamassa, the “sunny place,” and if you’re thirsty and out of water, it’s a good place to know.

I learned this the day I stopped there to rest, leaning against a warm rock as I caught my breath. There was a sunlit cliff across the way, with a grooved channel running horizontally along its base. After a time I walked over to investigate and saw that the channel turned the corner. From there it skirted a rock, made a clever little detour around a tree, and traversed a boulder the size of a school bus. Weaving with the contours of the sandstone, the channel suddenly made a sweeping left turn, ran through a basin, rounded another corner, then dived into a large, teardrop-shaped hole in the rock. I crept down to the rim; peering in, I saw nothing but black. A stone was fetched, tossed into the hole. I heard a distant splash.

A few weeks later I brought an archaeologist to see this example of Nabataean skill. A relative of Hamoudi’s, Mahmoud al-Bedoul is 23 and the only Jordanian on record to grown up in a cave—in Petra—and go on to earn a university degree in Near Eastern archaeology. I figured he’d be interested in my find. Yet when I showed him the secret little canal and cistern, he was strangely matter-of-fact.

“You don’t seem interested, Mahmoud,” I said. “Have you been here before?”
“Only thousands of times,” he laughed. “I grew up here. Every summer of my life we brought our goats and camped right here by this rock. This is the cistern of my father.”

He attached a cord to my canteen, lowered into the hole, and brought it up filled to the brim. Then he took out his shirttail, placed the fabric over the hole as a filter, and took a long savoring drink.

“Nice and cold,” he said, offering the water to me—and I saw again how discoveries large and small are imminent at Petra, and how the lifeblood of an ancient city might sustain a people from that day to this.

“But is it Nabataean?” I asked.

“Of course,” said Mahmoud, with a mischievous smile. “They left it to my father.”
The World’s Great Lake

Holding more fresh water than all the Great Lakes combined, Russia’s Lake Baikal is a natural laboratory for the study of evolution—and a buffer against hard times in Siberia.

By Don Belt

SERGEI VASILIEV, CAPTAIN OF THE ALBATROSS, still wonders if he would have found the courage to speak his mind that fateful July in 1954. But not once during their mysterious two-week cruise around Lake Baikal did the government officials ask his opinion of their plan—and to volunteer one would have been unthinkable. Barely a year had passed since Stalin’s death, and the dictator’s lifeless hand still lay heavy on the land.

All this came up one afternoon as Vasiliev, a slight and gentle-spoken man widely known as the greatest of the Lake Baikal ship captains, was reminiscing about his career on Albatross, a scientific-research ship. In the middle of a long, hair-raising story about a great storm south of the Ushkani Islands, his memory turned a corner, taking his narrative into deeper and more troubling waters than he intended.
“I remember too clearly for my own good,” he said sadly, shaking his head. And he began to explain.

He knew little about those officials at first—only that they were “very serious, very powerful men,” who had arranged to use his vessel for their first look at Lake Baikal. They were, of course, well informed about the great lake in south-central Siberia. All Soviet schoolchildren were taught that Baikal is special: It is the most ancient lake on earth and the deepest, measuring 1,637 meters from top to bottom, more than a mile. It holds one-fifth of the planet’s fresh water and 80 percent of the former Soviet Union’s—more water than all of North America’s Great Lakes combined. In school these men traced the lake’s elegant shape, like a sliver of moon, and learned to call it the Pearl of Siberia or the Sacred Sea, as Russians have for generations. But nothing in their education would have given them the sweet, pure taste of the real Baikal. No, that was for Vasiliev to deliver.

Yet as days passed, he overheard enough of their conversation to know that they weren’t admiring the lake so much as evaluating it, probing its shores for a place to put something. That worried him, knotting his stomach like the sit of sea gulls flying pell-mell along Baikal’s western cliffs—portents of a fast approaching storm. The sparkling clear water of Baikal impressed these men, though not in the way Vasiliev had hoped.

The group included experts who believed that these nearly mineral-free waters, when heated and run through the pulp of robust Siberian pines, would produce “super” cellulose, which could then be used to make exceptionally durable tires for jet aircraft—a matter of great importance to the Soviet Air Force. Some chemical pollution of Baikal would result. But that was the price of keeping up with the Americans, who were known to be making such cellulose at a plant in Foley, Florida. When presented with the group’s intelligence, Soviet leader Nikita Khrushchev is said to have declared, “Then Baikal too must work.”

I tell you all this now, at the beginning of my story, to help you understand why the Baikalsk Cellulose-Paper Plant was ever built on the shores of this great lake. And how it is that a strong man like Sergei Vasiliev, 36 summers after he ferried a commission around Lake Baikal on a ship called Albatross, might be haunted still by the sight of a pulp mill in the middle of Siberia.
“Helping to bring this monster to Lake Baikal,” he said, gazing across the lake at the tiny plume of factory smoke rising against the blue summer sky—“this is one great regret of my life.”

THE SNOWS OF SIBERIA come to Lake Baikal in early October, showering its uneasy gray waters with an inconsequential hiss, even as they drape the surrounding mountains with white and lay a thin wafer of ice over the streams that drain a watershed roughly the size of France.

By November the lake itself, a great crescent 635 kilometers (395 miles) long and 80!wide, has begun to freeze. Ice forms first in the muskrat marshes at Baikal’s northern tip, then steals south, chasing the last of the big ships that move reluctantly ahead of the season.

The fish of Baikal bite better in winter, they say, and each of the roughly 40 lakefront towns sprouts a suburb of ice-fishing shacks, many of them mounted on sled runners and heated by a wood stove. With the average winter temperature around minus 20 degrees Celcius, (0 degrees Fareheit), the ice gets thick enough—well over a meter—to support truck convoys laden with supplies for the more remote towns along Baikal’s shore. In 1904, during the Russo-Japanese War, sections of railway track were even laid across the ice to transport more than 2,000 flatcars and 65 locomotives to the battlefront.

By mid-April the ice begins to thaw and break apart, hacked to pieces by furious squalls that roar down river valleys on winds reaching 160 kilometers an hour. Then in May, after a scout plane confirms that it is clear enough of ice, several hundred ships—tugboats, timber barges, research vessels, and fishing boats—resume their labors on the world’s great lake. So huge and volatile is Baikal that sailors here talk in spring of “going to sea.”

I arrived in late June and got my first glimpse of Lake Baikal at daybreak, from the patio of a hilltop hotel overlooking Listvyanka, a busy little port on the southwestern shore. Reflecting a clear summer sky, the lake that day was luminous and blue, framed against granite crags and evergreens. I had heard Baikal likened to America’s Grand Canyon, an apt comparison: Baikal’s scale is too vast to imagine, its beauty and
character too subtle to define. Renowned Russian author Valentin Rasputin, who has written his best fiction in a cabin on Lake Baikal, once told me, “I still encounter Baikal and feel my own deafness and dumbness, my own inability to describe what I see before me. Man does not have enough feelings to respond to this wonder.”

The hillside I stood on was in the Irkutsk Oblast, a region dominated by ethnic Russians, while the rugged mountain range on the far shore, the Khamar-Daban, rose from Buryatia, land of the Buryat people. Buryat are Mongols who made their home here long before Genghis Khan swept through during the early 13th century. They were living in Russia when the frontier between Russia and Mongolia (then part of China) was drawn in 1727. Since 1923 they have occupied their own autonomous republic on the eastern and northern shores of Baikal.

Through field glasses I surveyed the lake. Just below Listvyanka its one outflowing river, the Angara, funnels the waters of Baikal west, through the hydroelectric turbines at Irkutsk, then hundreds of kilometers north to run a gauntlet of colossal dams built by Khrushchev during the 1960s. Beyond, the Angara’s waters rendezvous with those of the Yenisey, which in turn sweep north to the Kara Sea 4,100 kilometers away. So immense is Lake Baikal that if all its 336 tributaries dried up tomorrow, its volume—some 23,000 cubic kilometers of water—could keep the Angara River flowing close to 400 years.

On a distant shore I detected, after a long binocular search, the telltale cloud rising from the cellulose plant at Baikalsk.

In 1957, when the public first heard about plans for this factory, people who had mutely obeyed the Soviet government for 40 years finally howled in protest. Local scientists, writers, fishermen, and ordinary citizens banded together to fight the plant, igniting an environmental movement that was a direct forebear of all Soviet activism to come. Their protests were mostly ignored. Yet at a time in the Soviet Union when the fires of free speech were being stamped out wherever they appeared, a small flicker burned fiercely in the Siberian wilderness, on the very shore I was seeing.

After years of protest, the lake’s defenders were rewarded in April 1987, when the Soviet government issued a comprehensive decree protecting
Lake Baikal. Among other things, it abolished logging anywhere close to
the lakeshore and decreed that the cellulose plant be “reprofiled” for
activities harmless to the environment by 1993.

Exactly what those activities might be has not been decided. Nor has the
fate of this decree, in light of recent political upheavals. Meanwhile the
dumping of industrial waste into Baikal continues, and bilious smoke
still rises from the plant 24 hours a day.

From my hilltop hotel at Listvyanka I could also see ships passing
hypnotically on the smooth blue water far below. Most were working
vessels painted a businesslike charcoal gray or black. More striking were
the fine white scientific ships that carved the water like a fin, leaving
faint trails of foam in their wake. I paid close attention; I was about to
spend the next month of my life on one of them.

There were nine of us aboard Obruchev, the research vessel that
photographer Bill Curtsinger and I used to explore Lake Baikal. Our
group included Sasha Timonin, a 35-year-old wildlife biologist;
interpreter Barbara Skinner; and the ship’s Russian crew, whose names
were Viktor, Slava, Yuri, Wovchek, and Galya.

We planned first to explore the remote upper reaches of Baikal—a
breathtaking region rarely seen by foreigners until a few years ago—then
to work our way toward the cellulose plant, 635 kilometers to the south.

This would have been impossible without support from the Limnological
Institute in Irkutsk, which sponsors most of the scientific research
conducted on Baikal and which had provided us with the 18-meter-long
Obruchev and its first-rate crew. The institute also granted us the
freedom to travel when and where we pleased.

We were able to dock our ship, then walk to the nearest road and hitch a
ride Russian style, with an outstretched arm pointed at the road, into
nearby towns. Unescorted, we would strike up conversations with
ordinary people—like Lena Vilchinskaya, a young woman we met in
Severoobaikalsk, a city that looks more like a construction site on Baikal’s
northwest shore.
Lena is a pediatrician who moved here from the huge Siberian city of Novosibirsk with her physician husband so that their two children could grow up next to Lake Baikal (“we didn't want them to think the world is made out of concrete”)—and because they were promised an apartment by the government. That was more than three years ago, Lena says, and her family is still waiting.

“How long is the waiting list?” I asked.

“Seven years,” she replied, rolling her eyes in exasperation.

In the meantime they live in a schitovye doma, or “shield house,” slang for the shacks most families have thrown together using scraps of plywood and other materials scavenged from the Baikal-Amur Mainline. Better known as BAM, this 3,145-kilometer railroad links the resource-rich Siberian wilderness to the Pacific. BAM’s construction attracted thousands of people from western Russia. Today many of them live in the old railroad cars sent up the line long ago as temporary housing for workers.

What 30,000 people will do for a living now that BAM is finished is anyone’s guess, Lena says. Few wish to start over somewhere else, and most, it seems, prefer to take their chances at Lake Baikal, where at least the air is fresh and fish can be caught to supplement the meager groceries in the stores.

In the past two centuries Baikal has received its share of Russian exiles (nearly every member of our crew can trace his ancestry to some banished soul), but people find life here less confining than in many Russian cities. “It's funny,” Lena said. “Everybody talks about how terrible Siberia is, but nobody ever wants to leave.”

While waiting for us to return, the crew of Obruchev had been fishing from the ship’s stern. Fish are among the few things both abundant and free for the taking here, and our crew spent every spare moment in gleeful pursuit of grayling, pike, perch, or omul. The latter, an arctic whitefish endemic to Lake Baikal, accounts for two-thirds of the annual commercial catch.
We arrived just after someone had landed a whopper of a pike. Slava, the ship’s chief engineer, hooked his finger into the fish’s gill and posed like a sportsman displaying a trophy catch. “Beeeeeel,” he called, summoning photographer Bill Curtsinger. “Camera, Beeeeeel.”

The others crowded around, and soon Curtsinger was taking Polaroids of the crew, each posing with his trophy fish: Shirtless and bony Slava, his thin Tatar face split by a mad grin, squinting through bloodshot eyes; his assistant Yuri, a barrel-chested Buryat dressed, pixie-like, in a crew’s standard black tights and deck slippers; Wovchek the deckhand, a moody gnome, cigarette clenched in what once were teeth; and Viktor the captain, lean and self-possessed, as handsome as a fellow can be with a couple of gold teeth and a crudely drawn mermaid tattooed on his arm.

The fifth member of the crew, Galya, watched this nonsense with a shy smile. At 25 she was the youngest person on board, but with a six-year-old son (who stays at home with grandma) and her calm, matronly ways, she somehow seemed the most mature.

She was also recently divorced. “Now I have one child to take care of instead of two,” she offhandedly told Barbara, with whom she shared the galley as a sleeping cabin. As we ate our usual breakfast of black bread, our lunch of black bread and potato soup, or our supper of black bread, potato soup, and fish, Galya watched us with a Mona Lisa smile.

“OK?” she’d ask as we slurped down yet another bowl of potato soup. “Dva raza OK,” I’d say—two times OK—lacking the heart to kid Galya about a meal she’d worked so hard on. There’s only so much one can do, after all, with potatoes on a Russian ship.

Also present at our table, in a sense, was the bearded, hawk-eyed man this shop was named for—Vladimir Obruchev, the father of Siberian geology, who observed us from a framed photograph on the bulkhead.

Obruchev first came to Baikal in 1888 to do fieldwork for his definitive geology of the Russian Empire. His conclusion—that Baikal was formed by faulting of the earth’s crust—scandalized his peers. Today geologists regard
Obruchev's ideas, formed some eight decades enforce plate tectonics, to be the first modern theory about the formation of Lake Baikal.

Baikal sits in the planet's deepest land depression, a rift nine kilometers deep, located in one of the most complicated and least understood fault zones on earth. Here at least three tectonic plates interact; as these plates scrape across one another, they tear apart the crystalline bedrock underlying Baikal, which, some scientists believe, makes the lake ever deeper and wider.

The region around Baikal is rattled by an earthquake every few hours. Most are too weak to feel, though not all: In 1861 a huge quake sank 310 square kilometers of the Selenga Delta into the lake. Even as I was touring Baikal, a Soviet-American submarine expedition co-sponsored by the National Geographic Society was investigating hydrothermal vents on the bottom near Frolikha Bay—warm-water springs that indicate powerful tectonic forces at work in the rift.

This rift beneath Baikal has been opening for 25 million years or longer, and judging by the seven-kilometer thickness of sediment at the bottom, there has been a lake here for much of that time, which makes this the world's oldest body of water. Compared with other lakes, which rarely live longer than a million years before filling with sediment, Lake Baikal is like a dinosaur that lived through mass extinction.

“Imagine what science could learn from a 100,000-year-old man,” says Mikhail Grachev, director of the Limnological Institute in Irkutsk, where more than a hundred scientists study every aspect of the lake. “That’s what Baikal is like to a biologist—a natural laboratory for the study of evolution.”

Grachev’s dream is to open that laboratory to scientists from around the world—no small trick for a man whose rubles are worthless outside Russia, whose “brand-new” building is already in disrepair, and for whom phoning the United States is like trying to call the moon. But Grachev is nothing if not resourceful, and recently, with support from foreign academic institutions, he co-founded the Baikal International Center for Ecological Research. Each field season brings more scientists from abroad, to study what many consider the world’s most interesting lake.
“Compared with Baikal, Lake Tahoe is a desert,” says Grachev’s colleague Charles Goldman from the University of California at Davis. “Tahoe is 10,000 years old and has two endemic species. Baikal is over 25 million years old, with 1,500 endemics.”

Baikal is indeed a living museum of aquatic plants and animals that have evolved during its life span. It’s also incredibly rich in life at all depths. Unlike lakes in hot climates, Baikal mixes thoroughly; as its cold waters sink, they carry oxygen even to the deepest parts of the lake.

Fifty-two species of fish inhabit these waters, and more than 250 species of freshwater shrimp, including the endemic *Epischura baicalensis*, a tiny crustacean that renders the water of Baikal strikingly pure by straining out algae and bacteria. In summer millions of *Epischura* amass in the water collected from the center of Baikal in a laboratory beaker becomes tainted by the glass.

Samples taken from the southern end of the lake tell a different story. Around Baikalsk, bacteria discharged from the cellulose plant pollute some 200 square kilometers; the effluent has also devastated bottom-dwelling organisms over a smaller area. Biochemists such as Grachev are especially alarmed by the presence of chlorinated organic compounds—waste chemicals from the pulp bleaching process that take centuries to biodegrade and may one day accumulate to toxic levels in the food chain.

Less insidious, perhaps, but far more extensive is pollution from the Selenga River, a 1,480-kilometer-long tributary that rises in northern Mongolia and supplies half the water flowing into Lake Baikal. Its brown surge arrives laden with sediment and wastes from three Mongolian cities, as well as human and industrial wastes from Ulan Ude, the Buryat capital 130 kilometers upriver. The survival rate of omul spawned upstream has recently plummeted, which may have triggered a lakewide decline.

Government funding for the study of such problems has slowed down to a trickle with the Soviet economic crisis—one reason Grachev so warmly welcomes foreign scientists armed with high technology. “Maintaining international standards of science,” he says, “can keep us from wasting billions of rubles on nonsense.”
ONE GREAT MYSTERY about the lake is how *nerpa*, the Baikal seal, managed to wind up here and nowhere else on earth, fully adapted to fresh water and separated by 3,220 kilometers from its nearest relative, the Arctic ringed seal.

The most plausible theory argues that a population of ringed seals was pushed southward by advancing polar ice during the Pleistocene, eventually moving up the Yenisey and Angara Rivers to Lake Baikal. Another hypothesis envisions a Siberia flooded by ice dams, which might have changed the course of rivers and brought nerpa to Baikal along other routes—including the giant Lena River. Today the Lena rises just west of Baikal but instead of flowing into the lake turns north to the Arctic Ocean.

Slightly smaller than the ringed seal, nerpa grows about one and a half meters long, and can weigh as much as 130 kilograms (286 pounds). It hunts both night and day, diving in pursuit of Baikal such as the weird, translucent *golomyanka*, an endemic oilfish that bears live young and resembles a cross between a flying fish and a pink plastic eel. Golomyanka’s fatty flesh, abundantly available, is responsible for nerpa’s unctuous, well-fed look.

Seals live throughout Baikal but favor the remote and tranquil Ushkani Islands near the center of the lake—an archipelago of four white marble outcrops capped in green, crisp against the pastel hues of Baikal. Our guide from the Limnological Institute, Sasha Timonin, specializes in the Baikal seal. When Obruchev passed through these islands, Sasha led us to his favorite seal-watching spot—a cliff on the north end of Tonkiy Island, one of the four Ushkanis. Perhaps a hundred seals were sunning themselves on the white boulders below, their silver fur shining in the hard morning light.

When they saw us, the animals seemed more curious than alarmed. But a peal of thunder triggered panic—and in a great thrashing flurry they tumbled into Baikal and were gone. They had mistaken the sound, Sasha explained, for the report of a rifle.

Commercial hunters are permitted to take some 6,000 seals each year, mostly in April and May, when the pups born in February begin to
venture onto the ice. Most hunters use high-powered rifles or nets and work for a cooperative, which processes and sells the meat, oil, and fur. The animals number perhaps 60,000—though Sasha, who helps take the census by counting air holes in winter ice, warns that these figures could be off as much as 50 percent.

Our seals later returned, and within the hour Sasha and I were splashing through icy, thigh-deep water to rescue one old female entangled in a hunter’s net and being cut to death by a thick cord wrapped around her neck. I held the nerpa, which must have weighed as much as a large man, while Sasha cut away the net with his pocketknife.

To my surprise the seal struggled only briefly, then lay passively beneath me, head back, her large black eyes displaying the eyes of a condemned soul. The rest of the colony, which had bolted, slowly crept back to watch. When Sasha finished, we hoisted the seal onto the nearest boulder, then climbed back up the cliff. Within moments the others moved in to investigate, cautiously sniffing the air around the wounded one—as if amazed to find her still alive after this strange encounter with man.

It was a few minutes past six in the morning when I knocked on the door of Nikolai Kolbasov. He and his family live in the last house on the last street on the outskirts of a Baikal fishing village named Kurbulik, on the Chivyrkuyskiy Gulf.

This was the kind of close encounter I hadn’t expected to have in the Soviet Union. Kolbasov and I had met by chance the night before, when he and a friend paddled up to Obruchev in a soot-encrusted orange motorboat. They were having engine trouble, they said, and needed Slava’s help. A little later we opened one of one precious bottles of vodka
(rationed to two liters per person per month) to toast the rehabilitation of Kolbasov’s boat, which is called Cherepakha, the Turtle.

Like many Russians I met, Kolbasov was astonished to find himself talking freely with Americans, the people he had once been taught to fear. He shook his head, disbelieving, when I drew a map showing my hometown in relation to his. And as we parted with a back-pounding Russian bear hug, he had invited me, with touching ceremony, to go fishing with him the next morning.

He greeted me with a whisper—his family was still asleep—and poured me a glass of hot tea. I drank it while he wrapped his feet in rags, then pulled on a pair of the black rubber hip boots worn by all professional fishermen on Lake Baikal.

Two hours later we had cleaned out the fish traps he operates with a partner, shoveling the catch of perch, pike, and grayling into a second boat using a long-handled net. Most of the fish would be turned in to the cooperative at Kurbulik, but a few dozen he loaded into a battered metal box in his boat. He winked as he covered the box with a canvas tarpaulin. These fish would feed his family.

Half an hour later we pulled alongside Obruchev, and I prepared to board. Just then he peeled back the canvas, opened the box, and hauled out the biggest catch of the day, a fat pike more than a meter long. In a time of food shortages, such a fish was precious indeed.

“For you, this present,” Kolbasov said.

“Nyet, Nyet, Nyet,” I started to protest. Obruchev was running low on eggs and flour and meat, but we had plenty of fish. Then I saw the look in his eyes and thought again. Spasibo bolshoye, I said. A big thank you. Ogromnoye spasibo. Enormous thanks.

He handed me the fish. I cradled it in my arms for a moment, then passed it up to the onlooking crew. Kolbasov took my hand in a leathery grip, squeezed it hard and steady, looked me deeply in the eye.

“Go back to America,” he said quietly, kissing me stiffly on both cheeks. “Tell everyone you know that Kolbasov is their friend.”
EVERY SMALL-TOWN CEMETERY on the shores of Lake Baikal is dotted with the graves of seal hunters and fishermen and sailors (many of whom gaze eerily back from framed photographs on their headstones) who died on the lake. I mentioned this one day to Viktor as storm clouds gathered on the horizon. The west wind called *sarma*, which has killed more than its share, had picked up sharply, and things were getting bumpy. Viktor was at the wheel, vigilant as always, casually twirling his mustache with one eye on the ship’s barometer.

“You should have been here in May,” he said with a laugh.

I’d heard the story. Obruchev nearly sank on May 16, during a hellacious storm that came up suddenly from the west, pummeling the lake with hurricane-force winds. When the storm hit, the crew was half-way across, giving some seal hunters a lift from Turka to Olkhon Island. Mountainous seas nearly capsized the ship.

“What do you do in a situation like that?” I asked Viktor.

“Poopsik” he replied with a sheepish grin, pointing to the ship’s talisman—a little plastic doll hanging by a string in the corner. “Poopsik took care of us.” Below Poopsik there was a framed icon, Madonna and Child, and Viktor followed my thoughts.

“We also said a prayer or two,” he said.

We anchored one night on the eastern side of Olkhon, a 70-kilometer-long island near Baikal’s midsection, and built a campfire. As always, the minute we lowered the gangplank, Yuri bolted off to gather *bogorodskaya trava*, or “grass of God,” from the meadow above. All month he had been collecting this wispy little herb in a plastic bag for his grandson back in Listvyanka. It cures colic, he explained, and helps to settle the nerves.

At moments like this, it was easy to think of Yuri, who is half Buryat and pushing 50, as a child of nature. He is one of the few people I saw who swam with enthusiasm in Lake Baikal, dog-paddling happily about in waters cold enough to wake the dead. In winter Yuri and Sasha, who is
part seal, actually skinny-dip in Baikal through a hole in the ice, after being bathed in steam and lashed with birch branches dipped in scalding hot water—the traditional Russian banya. “Baikal makes you feel young again, like baby!” Sasha roars. “Like you have milk in blood!”

Back in May, when the big storm hit, Obruchev was several kilometers east of here, directly over Baikal’s deepest, most treacherous waters, which are lashed by wild and erratic winds. This is the region where Buryat legend says the gods of Baikal reside.

These were evil gods, the Buryat believed, and their main goal in life was to drown people. Chief among them is Burkhan, whose name appears throughout the curious mix of shamanism and Buddhism practiced by the Buryat. Equally feared is Doshkin-noyon, the god of storms, whose specialty is stealing away the bodies of the drowned. A man’s best hope is to bribe these gods.

As we roasted fish over the fire that night, the vodka came out and made the rounds. Each member of our crew, before drinking, poured a little into his cupped hand and flicked it into the fire with his fingertips. This was not a joke, I realized, seeing the solemn faces around me.

“A little something for Burkhan,” Yuri explained, his dark eyes calm and clear.

From the high cliffs on the north end of Olkhon Island, it is possible to make out the seal islands of Ushkani, 65 kilometers away across waters too deep to imagine. Turning east, you can sometimes see distant black tugboats towing the bundled rafts of logs called “cigars” from the valley of the Barguzin River. They creep southward to the huge timber processing yard at Vydrino, and to Baikalsk, where logs are ground up to make cellulose. Strung together, these cigars often stretch a kilometer behind the tugboat, moving so slowly in the distance they sometimes vanish in the bluish mists of Baikal—only to reappear an hour or so later in exactly the same place.

This promontory on Olkhon is considered holy by the island’s Buryat, who adorn the trees and bushes with semelga, amulets made from colorful strips of cloth. It is said that here, in the high forest overlooking Baikal, the last of the Olkhon shamans was laid to rest a decade ago, his
body lashed naked to a platform in the trees and burned: A soul buried in the earth will never see the sun.

Olkhon, close to the lake's western shore, is the largest of Baikal's 27 islands. And because rain clouds coming from the west usually drop their moisture on the windward slopes of the Primorskiy Range, it's also the driest. The island's one sizable town, Khuzhir, gets half the precipitation of stations directly across the lake, and most winters here are “black”—without snow. “Olkhon” is, in fact, the Buryat word for “dry.”

Surrounded by dangerous waters except during winter ice, the 500 or so Buryat on Olkhon tend their sheep in relative peace and isolation. Their brethren on the lake’s eastern shore were not so blessed in the early 1930s, when Joseph Stalin’s war against the peasantry reached the area around Baikal. As it had done so brutally in western Russia, the Soviet state seized private property and forced all farmers, fishermen, and hunters into collectives, called kolkhozy.

Then in 1934 the Red Army began a systematic annihilation of the Buryat way of life, including the practice of Lamaist Buddhism. Throughout the Buryats’ “autonomous” republic, the Buddhist datsans, or monasteries, were destroyed, and an estimated 10,000 people were murdered or worked to death during a two-year period the Buryat now refer to as the Red Barbarism.

In the valley of the Barguzin River, the region’s principal datsan at Arshan lost 500 monks and young novitiates in the purge. The army also raided homes, destroying Buddhist relics and shrines, including the krasniy ugolok, or prayer corner, found in most Buryat houses.

Today the reforms begun by Soviet President Gorbachev have bought new hope to Buddhists here, who are beginning to emerge from their long, godless sleep.

“Perestroika changed everything,” says Dashi-Nima Dondupov, a patriarch known to Buryat up and down the Barguzin River. He conducts services in the little house in Argada that once belonged to his father, a brave and learned man who not only hid the holy Tibetan texts from the Red Army in his barn—but also taught his son to read them.
Led by Dondupov, the Barguzinskiy Buddhists have successfully petitioned Moscow to let them rebuild the datsan razed in 1934. Already, young Buddhists have begun to reclaim the timbers from the datsan at Arshan. The Reds had used them, sacred carvings and all, to build a communist youth club.

“The communists said we didn’t need God,” Dondupov told me. “Well, now God has come back.”

WE WERE RUNNING LOW on supplies and morale the morning we chugged into port at Ust Barguzin, a hardworking timber town on Baikal’s east coast where the Barguzin River, one of Baikal’s main tributaries, empties into the lake.

It was a day the color of wet cement, a cold Sunday in late July. Huge black tankers and tugboats lined the river channel—working vessels manned by hard-eyed Russian sailors who cast dark stares down upon us as we passed. Obruchev, painted white with a cheerful red deck, seemed positively dainty in contrast, like a debutante who’d wandered into a bad neighborhood.

Even at this early hour, an enormous platform dredge was laboring to clear the murky channel, and its twin derricks shrieked with the grinding of metal against metal, a terrible doomsday roar. Once in a while the dredge would stop, leaving the deep, menacing voice of Boris Yeltsin to rule the empty air, booming out across the harbor over loudspeakers on the ships. His speech to lawmakers in Moscow was being carried on state radio. The economy is in shambles, he was saying; it’s time for something more radical.

Sasha, meanwhile, was working on a grocery list. He’d been trying to buy meat, eggs, milk, and other staples in every town we’d visited for the past week, with no success. The state-run grocery store, called produkti, could barely feed the people who lived there, we were told, much less a crew of a passing ship. Sasha thought Ust Barguzin might be different. He had friends here, a few in high places.

The next morning we all went into town. Hours passed as we trumped the muddy streets from one bureaucrat’s office to the next, collecting
signatures on our grocery list. We hoped to buy food directly from warehouses—possible, Sasha said, only because we were affiliated with the Limnological Institute.

Showing our signed paper as we went, we were finally able to buy potatoes and eggs from the back door of a cafeteria; from the loading dock of a warehouse we bought several sausages and hunks of fatty beef. And our daylong search for milk ended in a small gray building with white metal display cases—a “special” food store attached to a warehouse.

To the shop-manager—a dark-haired woman wearing a scowl and a white butcher’s coat—Sasha presented our grocery list. It had been signed now by seven different officials, beginning with the mayor of Ust Barguzin, who some six hours earlier had enthusiastically outlined his plan to boost the town’s sagging fortunes by making it a popular destination for foreign tourists, preferably wealthy ones.

I had heard this idea expressed before by civic officials in the towns around Baikal. And now, as I stood in line in the town’s best grocery store, shooing flies away from a metal bowl full of stiff and desiccated fish, rubbing shoulders with a crowd of Siberians resigned to Moscow-style food queues (“waiting, waiting,” the man next to me grumbled, “we spend our whole life waiting”) while listening to Sasha argue with the sharp-tongued woman behind the counter about how many cans of milk the mayor’s signature entitled us to buy, I wondered how many tourists would be willing to fly halfway around the globe to share three experience.

Near the end of our voyage, as we approached Baikalsk one misty afternoon, the crew of Obruchev grew silent and withdrawn. “We call this part of the lake the ‘rotten corner,’” Viktor explained. “The weather’s bad, the fish don’t bite, and there’s that damned factory.”

We rounded a small peninsula and there, suddenly visible through a break in the fog, were a dozen or more smokestacks, a sprawl of buildings, columns of pale yellow smoke billowing up against a gunmetal sky.

Over breakfast that morning Slava had told me that our ship wasn’t named for Obruchev until 1956, when the great geologist died. Before
that it was called Albatross, and its commander was his friend, Sergei Vasiliev, greatest of the Baikal ship captains. In other words, I had been living for weeks on the ship that brought the cold warriors—and their industrial handiwork—to the shores of Lake Baikal. Super cellulose, by the way, never worked out. Synthetics made better aircraft tires.

Rain was slashing across the windshield the morning I drove back to Baikalsk to tour the cellulose plant. There was an unseasonable nip of autumn in the August air, and Baikal itself was sleeping late, wrapped in a thick coastal fog.

Through the rain I caught quick flashes of color in the taiga, or boreal forest, along the road, and ghostly figures roaming among the trees. This was the beginning of berry-picking season, the sweetest time of year for Siberians, who love doing things that bears do. The rain-soaked woods were full of families out picking berries—raspberries, blueberries, bilberries, and buckthorn berries—with gentle, juice-stained fingers and placing them in big aluminum pails the men wore on their backs.

This was the kind of scene I’d come to expect during my weeks at Baikal, where the richness of this lake stands in stark contrast to the poverty of the people living around it.

All summer I had heard Russians speak with uncensored passion about the Baikalsk Cellulose-Paper Plant. I had heard the most humble desk clerk in Moscow call it “our national disgrace,” a conductor on the Trans-Siberian Railroad gleefully volunteer to level it with a sledgehammer, and an eminent Russian scientist refer to it in a calm, matter-of-fact way as “this monster” throughout our conservation. Because of this plant some even spoke of Lake Baikal in the past tense, as if its ecosystem were already dead.

Others, including most scientists, disagree with that dire conclusion. But there’s no doubt the plant pollutes the area. Its airborne emissions make Baikalsk one of the most polluted cities in Russia, and forests of larch and pine nearby show unmistakable signs of degradation. In 1989 the plant discharged 26,000 tons of minerals, 200 tons of suspended substances, and 2,500 tons of organic by-products into Lake Baikal. Still, cellulose making is a dirty business, and this effluent is exceptionally clean by international standards.
“If this plant were anywhere but Lake Baikal, we would call it a model for how such plants should operate,” said Genady Tikhonov, the factory’s chief technologist, a bullish 35-year-old who repeatedly waved off my umbrella as he led me from one waste-purification basin to the next through the downpour.

“We’re always the first to be attacked,” he said. “And always by people who wouldn’t lose their jobs if this plant was closed.”

More than 3,500 people work at the mill, producing Russia’s second highest volume of bleached cellulose, used to make clothing. Ministry officials in Moscow, in fact, predict a nationwide shortage if this plant is closed to comply with the 1987 decree.

That now seems like a remote possibility. Few seriously believe that, in the midst of the greatest economic and political upheaval since the 1917 Russian Revolution, the government is going to shut down a top-producing cellulose plant, fire or retrain thousands of workers, and come up with the millions of rubles it would take to turn this factory into something less objectionable. In the foreseeable future, Baikal’s survival may depend, as it has for decades, on the great lake’s recuperative power—and the will of its defenders.

On the outskirts of Baikalsk I met a small, ragtag, thoroughly waterlogged army of protesters on the highway, marching through the rain toward town. They had been on the road for three weeks, they told me, walking the 320 kilometers from Ulan Ude to air their grievance.

Nearly every one of them was disabled in some way. Their hair, their clothes, and their wheelchairs were spattered with red paint, which was dripping from the rain soaked banners they carried proclaiming “People for a Clean Baikal,” and “Will We Wait While Baikal Is Dying?” They had come, they said, to stop the poisoning of their Sacred Sea.

“We’re here for our children,” explained one exhausted Buryat woman in a wheelchair. “We must save Baikal for our children.”

Then I understood: How people who have had nearly everything taken away will fight to keep the one beautiful thing they have left.
Weeks before, Limnological Institute Director Grachev had described
the situation this way: “It’s as if a horse walks into church. You can
convince yourself there’s no problem using scientific evidence—if you
analyze the smell, take dirt samples from the floor, note shadows on the
wall. But all this obscures the obvious. The problem is, there’s a horse in
the church!”

Lake Baikal is a symbol, Sasha told me once, of all the things that give
Siberian life its distinct sweetness—the natural beauty, the purity of open
air, the hardy generosity of people and the poetry in their collective soul.

“This is what Russians mean when they talk about the Motherland,” he
said. “And nothing, nothing is more precious to us than that.”
Baja California: Mexico’s Land Apart

Lack of water—groundwater, rivers, and rainfall—makes any desert a tough environment. But on Mexico’s Baja California peninsula, now targeted for development, the margins of survival are even thinner than usual.

By Don Belt

THE WORLD WAS AT WAR in December 1944, when a young Mexican pilot named Luis Coppola Bonillas, ferrying an American B-17 bomber from Canada to England, landed in Greenland and fell in love with Baja California.

Somewhere over the Atlantic his plane hit hurricane-force winds. Coppola and his crew made an emergency landing at a weather station in Greenland, which in those days was one of the few places in North America more remote than the Mexican desert peninsula this story is about.

“There we were with the biggest war in history, and all we could do was hunt ducks in the snow and read,” he recalled. “Luckily I’d picked up a
little novel somewhere called Journal of the Flame, all about a young man's adventures on the frontiers of Baja California. To me it sounded like the greatest place in the world. By the time we got our plane off the ground, I knew my destiny was in Baja California. I can't explain it, except to say one has rocks in his head when he's young.”

Five years later Coppola was manager of the peninsula's largest airline. He was its only full-time pilot. Flying back and forth between the Sea of Cortés, he hauled chickens from La Paz to Guaymas, people from Loreto to Ensenada, and fighting bulls from Jalisco state to the bullrings in Tijuana. He flew a military surplus DC-3 his partner had picked up for $11,000. “It had seen action in Europe during the war,” Coppola said. “But the flak holes were good for ventilation.”

One hundred miles of water, more or less, divide the peninsula called Baja, or Lower, California from the rest of Mexico, and flying into La Paz on a clear day, you can see mountains along the west coast of Sinaloa, rising dreamlike through the haze above the Sea of Cortés.

This body of water is also known as the Gulf of California, although most native peninsulares prefer the more evocative Mar de Cortés, for Hernán Cortés, the conqueror of Mexico, who came here hunting pearls in 1535 and claimed the peninsula for Spain. Judging by maps from this period, Cortés may have called the gulf the Vermilion Sea, perhaps after watching its surface turn blood red, as it often does in the hour between sunset and dark.

By whatever name, the gulf has isolated Baja California and many of its islands since they tore free of the mainland some five million years ago along the San Andreas Fault system, which zigzags up the gulf before rising from the mud flats of the Colorado River Delta to menace citizens of the other California.

In a thousand small ways this isolation has shaped the natural and human history of the Baja peninsula and made it as distinct as mainland Mexico as twins raised on opposite sides of a mountain range. Both were born poor and have spent their days looking to the desert sky for miracles. But Baja California grew up lonelier and generally worse off than other parts of Mexico—mainly because here the sky so rarely cooperates.
Baja’s central desert, which covers a third of the peninsula, gets between one and three inches of rain a year—about the same as Death Valley. Except for hurricane years and a few regions that get unpredictable downpours, all Baja California is a desert full of thorns and sharp rocks and wide-eyed children who have never seen an umbrella.

As you might expect, people are spread thin over this land. Of the estimated 2.5 million persons living in the states of Baja California and Baja California Sur, some 80 percent are crowded into the big northern cities of Tijuana, Ensenada, and Mexicali near the United States border, with 160,000 living in the southern capital of La Paz. Most of the others live in fishing camps or small villages scattered around a wraparound coastline that if unraveled would stretch downtown Tijuana to somewhere, just north of Juneau, Alaska.

Because it is barren and mountainous and exceedingly lean in the things that make men rich, Baja California has repeatedly foiled man’s attempts to make something out of it.

In 1949, when Luis Coppola began flying the peninsula’s first mail route, Cabo San Lucas was a ramshackle fishing village strewn around a tuna cannery at Baja’s southern tip. “A couple of hundred people lived here then then,” he told me. “There were a few goat ranches, but most people worked at the cannery and fished in their spare time. The whole town smelled like tuna fish.”

He wasn’t the only pilot landing his plane on the dirt strip down by Cabo’s waterfront. It was used by a handful of gringos who loved the anonymity and funky charm of the place—men like John Wayne and Bing Crosby, who flew down in private planes and spent their days hauling trophy-size marlin from the waters around the cape.

These men would sometimes invite friends down to join them, and soon Coppola was shuffling passengers along with the mail between Cabo and La Paz, which was then in its heyday as a duty-free port. “That was a crazy time,” he recalled. “Baja was a last frontier, like Alaska. You thought big in those days.”
One morning in 1952 Coppola woke up thinking really big. Backed by his father-in-law, he made a “ridiculously low offer” for Los Arcos Hotel in La Paz. He fully expected the owner to laugh in his face. Instead the man pulled a ring of keys from his pockets and handed them over. “Congratulations, Mr. Coppola,” he said. “You’re now a hotelier.”

One thing led to another, and soon Coppola was opening a 24-room hotel in Cabo to accommodate the growing celebrity fishing crowd. Then came the Finisterra, a luxury hotel he opened in 1971—about the time Cabo San Lucas began popping up in major U.S. newspapers. Coppola was a decade ahead of FONATUR, Mexico’s bureau of tourist development. Around 1982 they started talking about Baja as another Cancún and followed up by expanding the international airport serving Cabo.

“In the beginning we all wanted to keep this place a big secret,” Coppola recalled. “Guys would go home and lie about how crummy the fishing was.”

He looked out at the buildings transforming the quaint fishing village of his memories into one of Mexico’s premier tourist destinations. “There are a thousand new hotel rooms being built on the cape right now,” he said with a sigh. “I guess it’s safe to say the secret’s out.”

At last count the secret was being shared by about half a million tourists a year in Baja California Sur. Their free-spending ways accounted for a third of all income and helped give Mexico’s least populated state one of the country’s highest standards of living.

For every ten vacationers strolling the dust-filled streets of Cabo, it seems, there is also a businessman in white shoes striding about with a portfolio full of architectural sketches under his arm. From those drawings spring forth projects of every description, designed to cash in on the success of FONATUR’s development at “Los Cabos”—the name coined to promote both Cabo San Lucas and the neighboring pueblo of San José del Cabo.

At Pedregal, a hilltop development overlooking Cabo San Lucas, owner Manuel Díaz Rivera watched as workers put the finishing touches on a mansion of mortar and stone. Commissioned by a Los Angeles couple, the house covers 8,500 square feet and took 70 men three years to
complete. Yet it was built for only $390,000, a fraction of what the buyers would pay for the same home in California.

“We live in a state of continuous gossip about who’s building and where,” said Díaz, who speaks in the glib, rapid-fire tones of a Mexico City native. “Yesterday I watched a cabdriver point to my house and tell a tourist, ‘That’s where Sylvester Stallone lives.’”

Word of all of this has spread to distant states in the Mexican interior, where unemployment soars. Perhaps one out of three people living in Cabo San Lucas today is a construction worker, and hundreds more arrive each week looking for work. These newcomers live in a sprawling shantytown on Cabo’s north end, far beyond the village’s ability to provide them with basic services like sewerage and water.

“This town reminds me of Puerto Vallarta a few years ago,” Luis Coppola told me. “Tremendous growth with absolutely no planning. Private enterprise can work miracles for the Mexican economy. But we need government to give us infrastructure. Otherwise it doesn’t take a genius to see the problems ahead.”

On the other hand, some see Baja California’s chronic inefficiency as not all bad, functioning as a kind of unofficial conservation program. “One of the saving graces of Mexico is that it’s not perfect,” said American Tim Means, a soulful expatriate whose company, Baja Expeditions, leads local guides to lead environmentally conscious tourists into the backcountry. “If Gringos ran this place, it’d look like Miami Beach.”

The Gringo multitudes shuttling down to Los Cabos today were just a politician’s dream on December 1, 1973—the day the long-awaited peninsular highway, Mexico 1, paved from Tijuana to La Paz, opened for business. At the border between the peninsula’s two states, Mexican President Luis Echeverría led dedication ceremonies, which climaxed with the unveiling of a 135-foot steel-beam sculpture of an eagle, Mexico’s national emblem. In a symbolic gesture, the eagle was facing north, toward the United States.

Today the colossal symbol of hope is a little worse for wear, its wings rusting in the heavy, salt-tinged air drifting from nearby Guerrero Negro, where the world’s largest solar-evaporative salt mine is located.
But no matter. The highway has paved the way for development and watered Baja’s dry-gulch economy with a steady stream of American cash.

**MEXICO HIGHWAY ONE** officially begins some 450 miles to the north, at the Tijuana border crossing, where each year some 13 million vehicles cross from one California into another, heading south. Beyond Tijuana the highway rambles along the scenic Pacific coast, its reverie interrupted by billboards and banners plugging, in fractured English, the condominiums, restaurants, and hotels built along the road for U.S. consumption.

Wherever this highway goes, it captures towns—pulling commerce away from their centers to a strip alongside the pavement. This is the contact zone between cultures, where the guy at the PEMEX gas station comes face-to-face with the man behind the wheel of the $50,000 Winnebago with dirt bikes and surfboards strapped on top. The language of Baja Californians is laced with words that have passed from English into Spanish around a gas pump. You may not find the words *autopartes, parkiar, carro, trocke*, or *lonche* in your Spanish dictionary. But you’ll hear them sure enough when a Baja Californian fixes your water pump, tells you to park your car behind his truck, or invites you to lunch.

Tourists become fewer the farther south you drive along Mexico 1. Many never make it past the curio shops and cantinas of Ensenada, home to both the Baja 1000 off-road race and the Mexican tuna fleet, where an “attorney for tourist protection” is on call to put visitors at ease. Others turn east on a new paved highway to San Felipe, a quiet fishing town on the Sea of Cortés where residents more need projection from the tourists.

Recently San Felipe has been overrun by the party animals of southern California, and the scene on Easter weekend has turned especially ugly. Said one American visitor: “If Mexicans went to San Diego and acted the way some Americans act down here, we wouldn’t just throw them in jail—we’d close the border.”

Dôna Anita Espinoza, the gray-haired matriarch of El Rosario, has a saying about this: “Bad roads, good people. Good roads, all kinds of
people.” in her coastal town 150 miles south of Ensenada, she has watched, with a twinge of regret, as good roads replaced values with gringo ways and dependencies, even as they earned her little restaurant a reputation for the best lobster tacos in Mexico.

Just beyond her door the highway turns inland, away from the cool Pacific, and sets out alone into a torrid landscape of cactus and dust and the bones of a thousand dead automobiles, picked clean by backyard mechanics.

This is back-lot Baja California, a destination you’ll never see advertised in FONATUR’s slick brochures. Its symbol is a tumbledown mission, say, or a heap of rusty mining equipment, or a clutch of abandoned ranch houses reeling in the wind. These monuments to the failed dreams of Baja Californians bristle with the sound of sand carried on the hot wind, and they invariably gather other things cast away, blocking the litter that blows incessantly across the landscape, fluttering around forever, immune to the disintegrating effects of rain because there is none.

For years the pavement ended just south of Anita Espinoza’s restaurant, and few dared to drive the rough-and-tumble dirt road between here and La Paz, 700 miles to the south. Anita fondly remembers the odd collection of American biologists, Baja 1000 drivers, and assorted wild men who passed her doors in those days. “Those were the ones I called heavy-duty Americans,” she said. “They’d stay out in the desert, make camp, eat their Wheaties. They loved this place with a passion.”

Norman Roberts is a heavy-duty American. He’s 69, moves like he’s 30, and has been scrambling around Baja California since he was seven. He wears wire-rimmed glasses and an old chewed-up straw cowboy hat, even when cooling off in the Sea of Cortés. He was a high school sophomore in 1936 when he first bounced through El Rosario in a ’29 Model A. And he recollects a trip north out of La Paz in 1948 when he and a few buddies had so much trouble after they reached El Rosario ten days later, they jumped out and kissed the pavement.

Norman told me this story in the gruff, wry, deliberate style that served him well during his veterinarian days, back when he doctored racehorses in Tijuana. That was after his snake-collecting days and before his days as a consultant at the U.S. Department of the Interior. These days he
manages investments from his San Diego home, serves on the International Whaling Commission, and writes scientific literature about the natural history of Baja California in his spare time.

Norman, his bride Gelín, and I drove south one August in his Baja truck, a four-wheel-drive camper fortified for off-road travel. Norman's truck is the only thing I've ever heard him brag about. “It'll drive forever and climb a wall,” he likes to say. He was working on a new edition of his field guide to the plants in Baja California. Gelín, a former schoolteacher from Mexico City, had never traveled south of Tijuana and wanted to see the land that one her new husband’s hear so long ago.

As we drove south from El Rosario, we passed the canteen back and forth in a kind of trance, lulled by heat waves rising off the pavement. I wiped dust from the little plastic thermometer I’d clipped to my bag; it read 110 degrees. The scene out our window was a no-man’s-land of reddish volcanic mountains and scorched vegetation. Mars with cactus.

“It's a thin line between life and death this time of year,” Norman said. “A lot of desert plants—cholla, creosote, mesquite—go into a dormant phase through drought, like deciduous trees in winter. They die by degrees—first the tips of branches, then the branches, then the stem. The roots are the last to go, and all it takes is a little rain to reverse the process.”

Indians roamed this desert during pre-Columbian times, he said. They hunted snakes to supplement their diet of beetles, mice, lizards, cactus pulp, and roasted agaves. “In other words,” he said, “you and I would have gone hungry most of the time.”

Red meat was a delicacy so prized that they customarily tied a string around each morsel, chewed and swallowed it, then pulled it back up for the next fellow. During summer they gorged themselves on cactus fruit, then dried their feces in the sun, picked out the seeds, ground them up, and ate them again. They were nomads, probably driven south into the peninsula by enemies, and spent most of their lives on the move from one water hole to another—“not unlike the old Baja travelers,” Norman observed.
As the heat began to lose its edge one afternoon near Cataviña, we turned off onto the peninsula’s original road, which bumps along in the dust next to the paved highway. “That’s the old road right there,” Norman would sing out as we traveled along, pointing with pride to some hair-raising stretch of switchbacks winding up a russet cliff. “They ought to make that road into a national monument,” he declared once. “Of course, you’re talking to a guy who thinks the whole peninsula should be a national park.”

Cataviña sits among remnants of an ancient mountain range, reduced now to huge granite boulders strewn across the land. Winds and a thousand changed in climate have sculptured these rocks into monuments to the sublime hand of erosion, and in the white sands grow plants that match them in size and majesty.

This is the realm of the cirio, or boojum—a tall, outlandish tree whose slender branches curl skyward like tentacles—and the stately green cardon, its thorny trunk squat and gnarled as an ancient oak. Norman explained that both species occur mainly in Baja California and in a few small colonies in Sonora—suggesting that they may have evolved as the peninsula split apart from the mainland and started moving toward Alaska at the rate of some two and a half inches a year.

He told me this while poking around for rattlesnakes before dinner, an old habit of his. “This is prime ‘red’ habitat,” he explained, referring to the red rattlesnake common in Baja. He stopped and turned over a fallen cardon with his foot. He learned to hunt rattlers as a boy, he said, working on commission for the San Diego Zoo. His hero was the zoo’s herpetologist—a man so comfortable with snakes that he once got bit while waving a rattler around during an animated conversation.

“Never been bit myself,” Norman mused. “Ordinarily herpetologists don’t get bit because they’re always looking down.”

“Ornithologists get bit,” he continued, “because they’re always looking up.”

The three of us made camp in a clearing and climbed a boulder, the loose grains of granite crunching beneath our boots, to watch the sunset. Later, cloaked in the light of our dying fire, we listened to the creak of
cactuses swaying in the wind and warmed our bellies with tequila from a tin cup. Somewhere out in the boulders, a coyote wailed beneath a spray of cold stars. Norman and Gelin conversed for a moment in Spanish, the language they were married in. Gelin is a merciful soul, and she gave me a brief translation. “The most perfect night in the world,” she said, her dark eyes shining.

“This is the stuff that keeps you coming back to Baja,” Norman said quietly. “The primitiveness, the aloneness of it. My problem is I never get tired of it. It seems like my compass always points south.”

MOST OF THE YEAR you can drive the length of Baja California from Tijuana to Cabo San Lucas—a journey of some 1,050 miles on the peninsular highway—and cross running water exactly once, at the little town of Mulegé. There a trickle of underground water rises to daylight two miles from the gulf and finds itself the centerpiece of a palm-lined oasis. Its sudden appearance in a land where 90 percent of all rain evaporates practically on impact seems so improbable, even bizarre, that many here believe the water must originate somewhere else. Alaska, they whisper. The water comes all the way down from Alaska.

To my mind there is no more beautiful sight than coming upon one or these rare green oases in Baja’s desert, and no regional figure of speech more pleasing to the ear than agua dulce, meaning water that is sweet, or potable. Baja Californians speak the word agua with love and reverence and a sense of ultimate consequence, much as they say Dios, the word for God. No hay agua, a rancher will say solemnly, explaining why an entire mountain range is uninhabited. There is no water. Or, “Without agua we have nothing,” a remark I heard a hundred times from the lips of farmers and fishermen and waiters and politicians all over Baja California—a land where only fools waste water, and then not for long.

“One there was nothing here but cactuses,” said Marco Antonio Nuñez, a farmer from Ciudad Constitución, a prosperous farm town northwest of La Paz that gets only about four inches of rain a year—barely enough to keep a cactus happy. For the past few decades farmers have drawn water from an aquifer to grow wheat, sorghum, and other crops for sale to Conasupo, Mexico’s national grocery store, or for export.
Then several years ago water from wells west of the highway—closest to the Pacific—turned salty. Seawater had invaded the freshwater aquifer, seeping in as fresh water was pumped out. Now, with wells growing saltier by the day, how long before the water will be too salty to use?

“Twenty years if we’re lucky,” said Alberto Jaime, a government expert on water resources. “The water table is dropping a meter a year beneath those fields. We must use these limited resources more wisely.” The average farm in Ciudad Constitución, he said, uses 300,000 cubic meters of water a year and provides two or three jobs. A hotel room, on the other hand, creates two jobs and uses just 550 cubic meters. “My friends in Mexico City ask, ‘Why don’t you seed the clouds?’ “he said. “I say, ‘Great, that’s a fine idea, but where are we going to buy the clouds?’”

Farmers in the San Quintín Valley south of Ensenada have dealt with this equation differently. “Most wells in this valley yield water so salty, it’s deemed unsuitable for agriculture,” said José Santos, supervisor of seed production for Rancho El Milagro. His company pioneered the use of drip irrigation systems, developed in Israel in the early 1960s, that deliver precise quantities of water along plastic tubes to the plants—including salt-resistant strains of cantaloupes, tomatoes, and cut flowers for export to the United States.

“When we started, everyone looked at us like we were crazy,” said Santos. “Now everyone’s doing it. We’re producing the tomatoes that used to be grown in San Diego for a fraction of the cost—thanks to cheap land, cheap labor, and those little plastic tubes.”

The mission town of San Ignacio sits squarely in the center of the peninsula, within striking distance of the highway and flanked by the alkaline wastes of the Vizcaíno Desert on one side and a devilish wilderness of rust-colored lava on the other. Like Mulegé, this town is blessed with water that rises from a spring. For decades the people of San Ignacio have collected this water in a man-made lake and tapped it, via canals, to wash clothes, sprinkle dusty streets, and irrigate oranges and date palms.

The Pacific is near enough that many San Ignacians earn their living on the water, fishing during the week, then returning to their families on weekends. They come home to one Baja town whose soul hasn’t been
paved over by the highway, and many here pass their leisure hours in the
cool of the plaza, chatting peacefully in the shade as workmen whisk the
sidewalks clean with palm fronds and the the girls of San Ignacio, whose
praises are sung from Cabo to Mexicali, pass sweetly by.

In 1716 when Jesuit missionaries first explored this area, they found
hundreds of Indians in the oasis. As they had begun doing two decades
earlier at Loreto, the Jesuits established a mission colony and built a
church.

The padres ran a tight ship, carefully screening the soldiers and
tradesmen brought in from Sonora missions to support the colony. They
strictly forbade sexual intercourse between their Indian flock and these
workers. But they couldn't shield the Indians from white man's diseases,
and during the 18th century one epidemic after another—typhoid fever,
measles, malaria, typhus, and smallpox—devastated the Indians.
Between 1743 and 1808 the native population at San Ignacio plunged
from 2,000 to a hundred. And by 1850 the Indian population of Baja
California—perhaps 35,000 when the missionaries landed—was all but
extinguished.

As the missions deteriorated, the laymen dependent on them looked for
alternatives. A fortunate few acquired land near an oasis or pushed north
with the missions into present-day California. Others fanned out to
claim ranches in the dry surrounding mountains.

Perhaps 20 of these ranches remain in the Sierra San Francisco, which
lies north of San Ignacio. It is there, in the remote mountainous interior,
that an older—some would say truer—Baja California lives on, little
changed by the tourist caravans, the highway, or the events of the past
200 years. And beyond the Sierra to the east lies the Sea of Cortés.
There, in the cool air that lingers in the hours before dawn like a truce
between the desert and the fierce yellow sky, barefoot fishermen nudge
their pangas out into the still waters of the gulf.

Depending on the season, the fishermen may motor out to check lines
they set the night before—thick cables baited with hunks of dorado to
attract hammerhead and thresher sharks—or to tend 300-foot nets
unfurled to catch manta rays. These days they might instead be taking
tourists out to troll for marlin, roosterfish, snapper, or yellowfin tuna—
species present in such abundance that the Sea of Cortés has acquired a
ten reputation among sport-fishermen as the “world’s greatest fish trap”—
implies that fish somehow take a wrong turn into the gulf and get
stuck there.

The “world’s greatest fish hatchery” is more like it. For these fish are
mostly the homegrown products of an incredibly bountiful food chain,
set in motion by the upwelling of nutrient-rich cold water from the gulf’s
deep basins and submarine canyons.

Marine scientists have counted more than 800 species of fish and 2,000
species of invertebrates in the gulf and found a cetacean population as
varied as any in the world. It includes fin, blue, gray, humpback, and
sperm whales, as well as the vaquita, or Gulf of California harbor
porpoise—an endangered species endemic to the northern Sea of Cortés.

Such variety and abundance have historically led Baja Californians to see
these waters as a cornucopia, delivering blessings that the sky so often
withholds from them.

“In Baja California nobody starves,” Anita Espinoza of El Rosario had
told me, pointing out what she regards as a key difference between the
peninsula and the interior of Mexico. “No matter how poor you are,
here you can always catch a fish to eat.”

Those days may be numbered. Mexico’s economic crisis has put new
pressure on fishing exports to earn foreign exchange. Mexico has nearly
doubled its catch in the past decade, and the gulf now accounts for 40
percent of Mexico’s total fish production.

Many small independent operators like Cristóbal Vizcaíno, a 65-year-old
fisherman from La Paz, are concerned about cooperativas—the
government-sponsored fishing cooperatives licensed to take prize
species such as shrimp, lobster, and abalone from Mexican waters.

Vizcaíno blames the growing Mexican shrimp fleet—some thousand
boats in the Sea of Cortés alone—for killing the escama, or trash fish,
and other creatures caught in their nets along with shrimp.
“They kill everything,” he told me angrily. “They pick out the shrimp, then shovel the dead fish off the deck—ten tons for every ton of shrimp. Why waste fish when people are starving in Mexico?”

“What may be more critical is what the shrimp industry does to the bottom environment,” said Greg Hammann, a fisheries biologist with CICESE, a government scientific agency in Ensenada. “Their nets drag along the bottom, plowing up habitat, and nobody knows how long it takes to regenerate.”

Nobody knows, either, how the loss of some 200,000 metric tons of trash fish each year affects the great web of life in the Sea of Cortés. But this much is certain—shrimpers aren’t the only ones taking biomass from this sea. Every fisherman I talked to has seen foreign boats fishing inside the gulf or lurking nearby, violating the various limits Mexico has declared to protect her coastal waters.

Luis Coppola’s eldest son, Luis Jr., manages Finisterra, the family’s hotel in Cabo San Lucas. Also the author of a scathing book on government corruption, the 41-year-old Coppola shows plenty of his father’s vigor. Lately he has channeled it into a bold crusade against illegal fishing in the waters near Cabo.

It all started with the Fukuju 17, a Japanese boat flying the Mexican flag that put into Cabo in May 1982. A surprise Navy inspection revealed that its hold was filled with frozen marlin, swordfish, and dorado—all species then reserved by Mexican law for sport-fishermen.

There have been at least five other incidents in recent years, said Coppola, pulling a stack of documents from his files. “We have names, crew lists, and registration papers, along with taped interviews of people who work on these boats.” All support his contention that Japanese and Korean boars have been issued permits illegally to fish the waters of Baja California.

Even more threatening, he said, are the foreign long-liners—huge vessels equipped with processing plants—that steal in at night to plunder the billfish populations near Cabo, reeling in 50 miles of baited hooks at a time.
After years of battling to stop these longliners, Coppola and his allies may be getting some results. Three Japanese boats have been seized for fishing illegally off Baja’s coast during the past year—reflecting, many believe, the attitude of Mexico’s new reform-minded president, Carlos Salinas de Gortari.

“It’s a new breed of leader we’re seeing these days—and not a moment too soon,” says Coppola. “Many people in Baja California depend 100 percent on their sport-fishing clientele. You kill those marlin and you’re writing ‘out of business’ on their doors.”

Marlin may be the lifeblood of tourism, but no type of fish has caused biologists so much concern as the sardine, a choice item on nature’s menu that serves as a barometer for the gulf’s ecosystem. Brown pelicans, gulls, terns, boobies, dolphins, and many fish depend on sardines for food.

Within the past two decades most of the Mexican sardine industry, once headquartered in Ensenada on the Pacific coast, has moved to Guaymas, and boats are pulling record numbers of sardines from the Sea of Cortés. Recently fishermen began to notice that schools were getting smaller, and so were the fish. Fearing a population crash like the one that wiped out California’s sardines in the late 1940s, the government in 1987 began declaring a brief, annual moratorium on sardine fishing in the gulf.

That was a step in the right direction, says Enriqueta Velarde, whose work on Isla Rasa, a tiny, guano-covered island in the gulf, serves as a beacon for Mexican conservation. Dr. Velarde, of the Universidad Nacional Autónoma de México, and her colleague, biologist Fulvio Eccardi, along with a team of students, man a research station each spring on Rasa, where 95 percent of the world’s elegant tern and Heermann’s gull populations gather to breed.

“Our studies had shown that the birds rely on sardines for food,” said Velarde. “But until three years ago we had no idea how much.” That year, mysteriously, the roving schools of sardines vanished from the waters near Rasa.

“It was a disaster,” recalled Eccardi. “Usually about 15,000 tern chicks survive to leave the island. That year we counted 200—and witnessed
what happens when the sardine population suddenly drops. It was a scary year for the world’s elegant terns.”

Armed with data, Velarde and her team spend much of the year in Mexico City, working with other conservationists to convince government leaders that further study and planning are urgently needed to manage the Sea of Cortés ecosystem.

“It’s essential,” she says. “Not just for wildlife but for those guys out there with the nets—Mexican fishermen—who are having a harder time making a living.”

One of the guys out there with the nets is Marcelo Lucero. Born in the tiny seaside village of San Pedro México, southeast of La Paz, he learned to fish from his father and grandfather. “Now there was a fisherman,” Lucero said. “He learned to fish from the missionaries.”

A few years ago Lucero adapted to changing times. He became a fishing guide, taking tourists out to fish the waters he knew so well.

“With commercial fishing it’s a big risk,” he said. “Maybe you catch fish, maybe no fish. But with turismo, you know you will make money. Seventy dollars a day, maybe more, plus tips.” Not long ago he pooled his resources and bought a taxi—an ’83 Dodge van painted school-bus yellow, with a big black stripe around it. I asked him why.

“Because I want to be prepared,” he said cheerfully, “when all the fish are gone.”

“What do you mean?” I asked.

He shook his head slowly. “Every year the fish are down, down, down. The commercial boats, shrimpers, Japanese, us, gringos—everybody. We all fish, fish like crazy, and there won’t be enough to go around. I think in ten years you come back and I’ll be driving a taxi all the time. No more fishing. My wife says I’ll probably die from lack of salt water.”

I WENT FOR A WALK one afternoon in the desert northwest of La Paz, on the day I understood Baja California best. On this particular afternoon a
cool wind from the west suddenly came up. Then dark clouds rolling in from the Pacific gathered over the Magdalena Plain, and it looked as if it might actually rain. My wife, Annie, and I had parked on a dirt access road behind the farms of Ciudad Constitución. On our right were fields of wheat, ripe and ready for harvest, watered from an aquifer that each year grows more salty. On our left the desert stretched uninterrupted, west to Magdalena Bay.

Annie and I—along with the farmers, no doubt—were thrilled by the prospect of a good soak. Together we walked out into the desert to welcome the first rain we’d seen in more than two months of traveling. Surely it would rain any second: We could smell rain, and it seemed somehow the desert could smell it too. On that afternoon, in that place, I could hear those sun-tortured old cactuses, cloaked in thorns and withered hide, sigh with sweet anticipation. The desert was poised for rain.

Then the clouds went away, as they always seem to, and the land became very still and quiet. The sun shone, and again the heat was clear and sharp. But for one overcast moment I had seen something as profound in its way as the Virgin of Guadalupe, the miraculous vision in the desert that gives Mexicans hope.

“We have many obstacles to overcome,” Luis Coppola had told me. “There is little water and even less planning. But Baja Californians always find a way. We are experts at adapting to our surroundings.”

With a motion of his arm he sent my imagination wandering up the long, twisting highway of hope toward Tijuana, more than a thousand miles away.

“Take a good look around you as you go,” Luis Coppola said. “This crazy desert is full of life.”
Wild Water, Proud People

Waters of the Chattooga River, the “Deliverance river,” rage through the mountains of North Carolina, Georgia, and South Carolina. They also define a rare and vanishing culture.

By Don Belt

JULY WAS DRY AS A HANDBULF OF DUST, and August just burned up and blew away. Now September is reeling off one clear, cloudless day after another, and folks around here are getting edgy. Mountain preachers are talking Judgement Day and breaking out old-time prayers for rain. Moonshiners can’t get enough water from their streams to make whiskey. Wells are going dry.

Even the mighty Chattooga, a 50-mile torrent of mountain white water and one of America’s most spectacular rivers, is tame and dispirited, a mere trickle of its former self. So any death-defying trips I might take down this wild and scenic river will have to wait, at least until we get a good hard rain.

Meantime, let me introduce you to some folks who are just as wild and maybe even more scenic than any piece of real estate. They live in the
rugged country surrounding the Chattooga River, an area roughly 25 miles long and 15 to 20 miles wide that includes parts of the Blue Ridge in North Carolina, South Carolina, and Georgia.

Until recently, many of these people made a living as had their ancestors for more than two centuries—hunting, raising livestock, growing corn, apples, and cabbage by the signs of the zodiac, and generally minding their own business. But that way of life has all but disappeared within the past 20 years, leaving the latest generation of mountaineers to scramble for their livelihood in such nontraditional pursuits as textile manufacturing and tourism. They’re trying to hang on to the remnants of their culture amid a whirlwind of change that threatens to blow them and their mountain heritage away like so much dust.

Let me say here that these are not the easiest people in the world to know. They’re hard as nails and gentle, complicated and simple, religious and irreverent—a straight-faced, Bible-reading people, fearsome in anger and exceedingly slow to forgive. Yet they’re the friendliest, most hospitable people you could ever hope to meet—folks who’ll you anything in the world for toy except give up their pride.

And that’s a mighty precious commodity here these days, thanks to a modern world that has come roaring into these hills and endangered traditions like the homeplace, the small farmer, and living off the land.

For many of them the story began with another dry spell—the drought that crippled northern Ireland from 1714 through 1719 and drove its Scotch-Irish population, already smarting from a variety of political, religious, and economic injustices, across the Atlantic.

They came to America by the hundreds of thousands throughout the 18th century, entering at Philadelphia or nearby ports, then setting out along the Appalachian valleys of Pennsylvania, Maryland, and Virginia in search of suitable farmland.

Many of those tough settlers took to the mountains, choosing to endure the isolation and hardships of the backcountry in return for the freedom to do as they damned well pleased. That included living by a hardscrabble code of conduct based on physical courage, honesty,
neighborliness, thrift, and loyalty to the family. It also meant building and farming and praying the Scotch-Irish way—without frills.

Since the turn of the century, roughly 75 percent of the land in the Chattooga drainage basin has passed from private owners and power companies to the U.S. Forest Service, and recent demand for land has driven the price of what's left sky-high. Taxes have inevitably risen, forcing cash-poor residents to sell property that had been in families for generations. Those who buy are usually well-to-do retirees of Florida people seeking relief from the chaotic social conditions of south Florida. The newcomers will gladly pay $100,000 for the rustic mountain hideaway some vacation-home developer has carved from a family farm.

“For all practical purposes, the possibility of economic survival in the traditional Appalachian way is gone,” says Rabun County, Georgia, high-school teacher Eliot Wigginton. The editor of his students’ best selling Foxfire books, which document mountain culture and folkways, he teaches the kids how to cope with a world their ancestors never dreamed of.

I talked with the late Leonard Webb, then 91 and one of Foxfire’s favorite contacts. He looked bleakly at news homes being built near his cabin on Scaly Mountain and expressed a common sentiment of his generation. “It breaks my heart to see these mountains gettin’ all skint up like this. If I’uz a younger man, I’d be on my way to Montana this minute.”

Yes, many aspects of the mountain culture are passing away, just as surely as abandoned log homes back in the dark Appalachian forest are crumbling slowly to the earth. But I’ve also found the spirit of that culture alive and well and being handed down all over Chattooga River country.

It’s alive in the traditional love for the land of men like Jack Lombard, a 55-year-old farmer from Mountain Rest, South Carolina. Jack’s an old-time turkey hunter who can cover more rough ground in an hour than anyone you’ll ever see. Yet he’s also an avid conservationist who will thrash through tangled underbrush all day long to show you scenery he considers unique.
It’s alive in the sturdy resilience of families like the Burrells, of Warwoman Road outside Clayton, Georgia. Wife Mavis puts in a nine-hour day sewing seams into men’s pants at Empire Manufacturing nearby, and husband Coyl is a carpenter hustling to feed his family during a prolonged recession.

“We mountain people,” he says, “have seen our share of hard times over the years. Mavis and I think all this is just bringin’ us back in closer to the Lord.”

And the spirit’s alive—as just about anyone in Rabun County can tell you—in the old-fashioned mountain smarts of a fellow named Frank Rickman.

Rickman doesn’t look much like a cultural ambassador, political kingpin, or red-clay Michelangelo—all of which he’s been labeled for his role in grafting mountain culture onto the 20th century. With his stout, broad-bellied swagger, graying red hair and mustache, hobnailed boots, rattlesnake skin belt, and big fierce face that always seems half asleep, Frank looks more like the brawling, stomping, storytelling, wild-hog hunting mountain boy that he also is—or, as he calls himself, “just an ol’ bulldoze man.”

Indeed, it was while running a bulldozer up and down the steep slopes of north Georgia that Rickman began to see creative possibilities in the inevitable meeting of old and new. Speculating against everyone’s advice, he and his associates sculpted a country club from red clay hills and woods east of Clayton—followed by a combination golf and ski resort, Sky Valley, north of town.

Then Walt Disney came to film The Great Locomotive Chase and was so impressed with Frank’s troubleshooting that he made him a Hollywood-size offer to join his crew.

“Walt offered me so much money I wouldn’t speak to him for two weeks,” Frank recalls with a roar and a slap of his knee. “I thought he was makin’ fun of me!”

Next came Deliverance, the movie version of James Dickey’s best-seller, filmed on the Chattooga. Rickman was hired to oversee locations, sets,
extras, and general logistics—a role he’s now played in a dozen films and
a hundred commercials, many of them drawn here on the strength of his
reputation.

More important, Rickman has fought every step of the way to include
“his people” in the bargain—hiring local men to build movie sets for
more money than they’ve ever dreamed of, contracting mountain
carpenters to build Sky Valley the old-time way.

Thirty-year-old Ed Page is another example: He learned building,
blacksmithing, mule skinning—you name it—while working with Frank
on his various projects. Now Ed’s putting that knowledge to work on the
old stables near Clayton that he and his wife, Jill, have renovated and
opened for tourists.

“We need development to give people work and keep them here—as
long as it doesn’t go too far,” he says between hammer blows on the shoe
of his prize Appaloosa stallion, Mano. He pushes his straw cowboy hat
further back on his head and turns his Rabun County accent up a notch.
“Cause us mountain boys gotta have woods to run to once in a while.”

DEVELOPMENT IS NEEDED. So is rain. These past few days the water
shortage in Chattooga country has taken a turn for the worse. Clayton,
county seat of Rabun County, is sandbagging creeks to provide its 2,000
residents with an emergency supply of water. People are putting bricks
into commode tanks. Ministers are urging everybody—Baptist or not—
to get right with God and pray, pray in their homes for rain. Just
yesterday the county prayed in unison at a prearranged hour, twelve
o’clock noon—and doggoned if this morning it doesn’t look like rain. I
may be taking this river trip a

I confess, however, that my thoughts now are not much on rafting the
Chattooga. They are on lawyers and juries and the mountaineers I’m
with, deep in the woods.

The last time the red-faced old fellow standing next to me was in court,
the judge asked him, half jokingly, when in the world he was going to
stop making whiskey. The old-timer had gone to some trouble to spruce
up for court—combed his hair, put on his Sunday shirt, done his best to
appear in a manner befitting his day in an American court of law—and his reply was significant, considering all the trouble he’d gone to: “When my toes turn up or water quits runnin’ downhill, Your Honor,” he said.

It hasn’t rained in a month, and the stream 30 feet away is about dry, but what little water there is runs downhill. And the old boy’s toes have definitely not turned up. He’s alive and kicking, just like the recipe his granddaddy gave him for the purest applejack ever made in these parts. Moonshining may be a dying art, but it’s not dead yet.

It’s been alive in these mountains since these first settlers brought it with them from the hills of Scotland and Ireland, along with a hatred for government tax on whiskey. Until 30 or 40 years ago moonshining was one of the few ways a poor mountain farmer could raise cash. It also provides the active ingredient in many of his wife’s home remedies. Nowadays, making “drinkin’” whiskey (as opposed to “sellin’” whiskey, which has given the whole business a bad name with a slapdash, inferior product) is practiced only by the boldest and most independent of small businessmen.

“Looks like rain,” I say to no one in particular, scanning the first cloudy sky we’ve seen in a long, long time.

“Yeah, boy,” the youngest of the moonshiners says, looking at the woods around us instead of the sky. Nobody else is looking at clouds either. They are nervously watching the woods for movement, any sign that lawmen are sneaking up on their still, which stands before us in full operation. If the law came, they would run like deer. Come to think of it, so would I.

The old fellow has been “run” so many times that he now leaves the actual work around the still to his two helpers and spends most of his time keeping his eyes peeled.

The elder of the two is about 35 and is wearing overalls. He started helping out when he was 10, had been run by the time he was 14. His still was “cut down” once (he suspects he was turned in by a rival), but he’s never been caught. Even so, he stops work abruptly and listens, startled, whenever a limb falls back in the forest or a car passes on the nearest road, almost a mile away. The younger one is a fresh-faced kid
just out of high school. He hasn’t been run or caught or cut down, and it shows. He is the only calm one among us.

Even without this kind of mental strain, moonshining would be a mighty tough way to make a living.

Their still consists of a five-foot copper kettle filled with ground, fermented apples and sprouted corn, mounted in a concrete furnace and heated with propane gas to produce steam. The steam is piped to a series of three wooden barrels, then trough a four-by-four-foot plywood “heater box” and a 50-gallon drum of cold stream water—where the steam condenses and trickles out into a catch barrel to wind up as 110-proof white lightnin’. Bear in mind that all this had to be hauled in after dark and built by hand.

The moonshiners’ day begins in darkness with a long tortuous hike over steep hills, carrying 50-pound bags of sugar on their shoulders to the still. A careless footprint, a piece of litter, the slightest trace could mean capture and imprisonment.

Their day ends in darkness, too, as they retrace their steps with all of the whisky they can carry. It is brought out in plastic milk jugs tied together—to be sold secretly, for a small profit, to people they hope they can trust. No wonder the old man looks weary.

“Moonshinin’s just about the hardest work a man can do,” he says. “First chance I get, I’m a-goin’ to quit.”

“It’s a way to survive and all, but it ain’t really the money,” says his helper, the older one. “It’s the damn tradition.”

IT FINALLY BEGAN TO RAIN later that night, and I’m happy to report I was a free man when it did. In fact, I was about as free as a fellow can get in this world—a few miles from the river near Mountain Rest, South Carolina, in a warm, dry country store full of happy people. I was sitting comfortably on a case of canned corn, listening to bluegrass pickers from all over Chattooga country and picking along on a borrowed guitar.
The rain came suddenly, drumming the roof of Cuzzins store like an instrument.

“That wouldn’t be rain, would it?!”
“Praise the Lord!”
“Ayyymen!!”
“Prettiest song I’ve heard all year!”

Backed into a corner of the brightly lighted store, the dozen or so musicians appeared to have little in common—old-timers in overalls, long-haired kids, mechanics in oily uniforms, college cowboys from Clemson and Western Carolina—but most of them drive long distances every Saturday night to share the magic in this room. Some, like me, just hang around the edges and keep time. Others, like Chris and Jody King of Mountain Rest, are stars.

Chris started coming here from his home over on Village Creek Road six years ago, at 16, dragging along the banjo his father gave him before he died. At first he was just a shy, dark-eyed little picker who stayed on the fringes and plunked along with the rhythm. His sister, Jody, then 15, did much the same on guitar. But the old-timers took a shine to them, mainly because they stayed after to ask questions and were able to learn songs in a week that others took months to master.

“What Jody and I did back then was to break those songs into little parts,” says Chris, now an agriculture student at Clemson. “Then we’d practice each part over and over until we were ready to put them back together as the song.”

“The first thing they did when they got home from school was pick up those instruments and play,” says their mother, Betty. “And it didn’t stop until they went to bed. It’s a wonder I’m not crazier than I am now.”

Lately, little brother Greg has gotten into the act and usually manages to grab his share of attention. The sight of a skinny 13-year-old kid in overalls and baseball cap playing a stand-up bass fiddle twice his size and clogging at the same time is something folks around here find downright comical.
Music rang out into the rainy night, where the fields were soaking it up. Later, at home, I tossed and turned through a night of imaginary wild scenes from the river trip that had become more certain with every passing hour of rain. Up in North Carolina, rain was pouring down the south face of Whiteside Mountain, and the little creeks around Highlands and Cashiers were rapidly rising. The Chattooga was becoming a river again.

IN THE COURSE OF ITS FIFTY MILES, the Chattooga grows from a halfthearted trickle to a river gone berserk, crashing headlong down the gorge. It butts heads with massive boulders, plummets from high cliffs, chews at banded gneiss bedrock, and drops more feet in an average mile than the Colorado. The upper Chattooga, especially, is a land of splendid isolation. You can hike there all day with only your own tracks among those of mink, deer, and raccoon. Or you might glimpse the solitary figure of a bearded mountain man, squirrel hunting, who materializes on a distant hillside and disappears in the brief moment you look away to avoid staring.

“'The Chattooga is a place for lonely, brave, resourceful people,'" says poet James Dickey, the author of Deliverance, who discovered the rivers of north Georgia on weekend canoeing trips while working as an Atlanta advertising writer. "'The fact that it was my own story that popularized the Chattooga is a crowning irony.'"

Feeling neither brave nor particularly resourceful, I rose before dawn and set out into the clear, rain-washed morning. I was meeting the fellow who had offered a month earlier to guide me through the Chattooga's wildest rapids, a seven-mile stretch at its very end I've been hearing horror stories about since I first came here in 1973.

The U.S. Forest Service estimates that some 21,000 people visited the river that year (up from 800 in 1971, the year before the movie version of Deliverance), and I remember thinking then that the commotion was taking its toll. Riverbeds were littered with beer cans and the wreckage of canoes. Vendors were hawking hot dogs on the rocks below the Highway 76 bridge. Local people, already angered at what they considered an insulting portrayal in Deliverance, had lost patience with having their baptisms, picnics, and fishing trips disturbed by exuberant
rafters. Worst of all, an average of four careless, ill-equipped, or just plain unlucky people were dying on the river every year.

Congress solved many of these problems in 1974, when it protected the Chattooga under the Wild and Scenic Rivers Act. Jurisdiction was given to the Forest Service, which had acquired most of the land along the corridor and began regulating river use. Now, although the Forest Service expects 40,000 to 50,000 visitors a year, there are fewer deaths on the river, thanks to rules on equipment and river conduct.

Even so, paddling a boat anywhere on the Chattooga remains a dangerous proposition. Once on the river, for one thing, there's practically no way out except by water. Bridges are few and far between, riverbanks are often too steep to scale or portage, and the nearest side road is usually miles away, through rough mountain wilderness guaranteed to confound all but the most experienced woodsman. Then too, the river is littered with rapids. There are hundreds of chances to turn a canoe into tinfoil on this river, and at least that many ways to die.

All this dawns on me as I stand in cold, soggy tennis shoes, paddle in hand, with a professional raft guide named Lamar Hudgens. We are perched on a boulder overlooking Jawbone, one of five heavyweight rapids occurring within 600 yards that deliver the Chattooga's final knockout blows before it flows out into Tugaloo Lake.

Swollen with a runoff from last night's downpour, Jawbone is a real monster—tons of water roaring through a twisting roller-coaster drop of some 15 feet, with a huge sunken boulder in the center and a rapid below it the size of a cement mixer. A slab of sharp rock jutting out over the water—Decapitation Rock—complicates things further on the right, and fully half the river seems to drop steeply away and disappear into the black hole beneath it.

Lamar tells me that several years ago an expert river guide made a slight, yet crucial, paddling mistake here and slid down the steep trough of water running under "Decap." Tons of water pouring in after him ripped his life jacket off and folded his kayak around a submerged log, pinning him inside. It took five hours to get his body out.
Lamar is a taut, wiry 32-year-old with white blond hair tied down by a headband and a reckless reputation for doing things like running the Chattooga at night.

“ Aren’t you afraid of this thing?” I ask him.

“Man, I love this river like a wife,” he says. “But I’d have to be real crazy not to be scared of it.”

On that happy note, we hike back upstream and rejoin the anxious pair waiting in our raft, a vacationing couple from Florida who’ve come here, like so many, “to run the Deliverance river.” The husband has the frame and bulk of a football lineman; she, the softness, fair skin, and horned-rimmed glasses of someone who doesn’t get outdoors much. I also have the impression she’s not enjoying this trip—her discomfort is apparent as she sits rigidly on the shoulder of the raft, grimly practicing paddle strokes in her oversize helmet and life jacket.

“Now don’t worry, y’all are gonna do just fine!” Lamar says as he shoves us off from shore, and I search his face for signs of sarcasm as the current quickens beneath us.

We went through Jawbone like drunken monkeys in a bathtub. Bodies slammed into one another. Water crashed in. The husband’s paddle flew through the air like a missile and cracked me in the mouth. And his wife, sitting too far out on the edge of the raft, did a quick backflip and was gone. I glimpsed her a second later—mouth open and gasping for air, her body small and pitiful as the river swept her like a leaf over the boulder and down through the huge rapid.

Luckily, another river guide positioned downstream threw her a rope and pulled her to safety. She was shaking uncontrollably when we beached our raft, and her husband embraced her until she was warm and steady enough to continue.

And then the strangest thing began to happen. As we twisted our way through the remaining rapids without mishap, it seemed that her confidence grew with every stroke of her paddle.
“I can’t believe I made it through that rapid,” she said with a laugh. “I don’t quite understand why, but I’m really glad that happened back there. I don’t think I’ve ever felt this alive in my whole life.”

Mountain folk admit they’re baffled by all this—by the craving city people have for risking their lives on this river and by the world of fast food and concrete and glass they come from, where people buy things instead of building them and beans come from a can. And since that world is steadily closing in on them, they’re concerned.

But for now, there are more important things to worry about. Last night’s rain soaked into the ground like a sponge, the roads are already kicking up dust. Tomorrow’s forecast is clear and hot. And tonight, unless I miss my guess, the proud mountain folk of Chattooga River country are going to be praying, once more, for rain.
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