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The Real Price of Gold

By Brook Larmer

Like many of his Inca ancestors, Juan Apaza is possessed by gold. Descending into an icy tunnel 17,000 feet up in the Peruvian Andes, the 44-year-old miner stuffs a wad of coca leaves into his mouth to brace himself for the inevitable hunger and fatigue. For 30 days each month Apaza toils, without pay, deep inside this mine dug down under a glacier above the world's highest town, La Rinconada. For 30 days he faces the dangers that have killed many of his fellow miners—explosives, toxic gases, tunnel collapses—to extract the gold that the world demands. Apaza does all this, without pay, so that he can make it to today, the 31st day, when he and his fellow miners are given a single shift, four hours or maybe a little more, to haul out and keep as much rock as their weary shoulders can bear. Under the ancient lottery system that still prevails in the high Andes, known as the *cachorro*, this is what passes for a paycheck: a sack of rocks that may contain a small fortune in gold or, far more often, very little at all.

Apaza is still waiting for a stroke of luck. "Maybe today will be the big one," he says, flashing a smile that reveals a single gold tooth. To improve his odds, the miner has already made his "payment to the Earth": a bottle of pisco, the local liquor, placed near the mouth of the mine; a few coca leaves slipped under a rock; and, several months back, a rooster sacrificed by a shaman on the sacred mountaintop. Now, heading into the tunnel, he mumbles a prayer in his native Quechua language to the deity who rules the mountain and all the gold within.

"She is our Sleeping Beauty," says Apaza, nodding toward a sinuous curve in the snowfield high above the mine. "Without her blessing we would never find any gold. We might not make it out of here alive."

It isn't El Dorado, exactly. But for more than 500 years the glittering seams trapped beneath the glacial ice here, three miles above sea level, have drawn people to this place in Peru. Among the first were the Inca, who saw the perpetually lustrous metal as the "sweat of the sun"; then the Spanish, whose lust for gold and silver spurred the conquest of the New World. But it is only now, as the price of gold soars—it has risen 235 percent in the past eight years—that 30,000 people have flocked to La Rinconada, turning a lonely prospectors' camp into a squalid shantytown on top of the world. Fueled by luck and desperation, sinking in its own toxic waste and lawlessness, this no-man's-land now teems with dreamers and schemers anxious to strike it rich, even if it means destroying their environment—and themselves—in the process.

The scene may sound almost medieval, but La Rinconada is one of the frontiers of a thoroughly modern phenomenon: a 21st-century gold rush.

No single element has tantalized and tormented the human imagination more than the shimmering metal known by the chemical symbol Au. For thousands of years the desire to possess gold has driven people to extremes, fueling wars and conquests, girding empires and currencies, leveling mountains and forests. Gold is not vital to human existence; it has, in fact, relatively few practical uses. Yet its chief virtues—its unusual density and malleability along with its imperishable shine—have made it one of the world's most coveted commodities, a transcendent symbol of beauty, wealth, and immortality. From pharaohs (who insisted on being buried in what they called the "flesh of the gods") to the forty-niners (whose mad rush for the mother lode built the American West) to the financiers (who, following Sir Isaac Newton's advice, made it the bedrock of the global economy): Nearly every society through the ages has invested gold with an almost mythological power.

Humankind's feverish attachment to gold shouldn't have survived the modern world. Few cultures still believe that gold can give eternal life, and every country in the world—the United States was last, in 1971—has done away with the gold standard, which John Maynard Keynes famously derided as "a barbarous relic." But gold's luster not only endures; fueled by global uncertainty, it grows stronger. The price of gold, which stood at \$271 an ounce on September 10, 2001, hit \$1,023 in March 2008, and it may surpass that threshold again. Aside from extravagance, gold is also reprising its role as a safe haven in perilous times. Gold's recent surge, sparked in part by the terrorist attack on 9/11, has been amplified by the slide of the U.S. dollar and jitters over a looming global recession. In 2007 demand outstripped mine production by 59 percent. "Gold has always had this kind of magic," says Peter L. Bernstein, author of *The Power of Gold*. "But it's never been clear if we have gold—or gold has us."

While investors flock to new gold-backed funds, jewelry still accounts for two-thirds of the demand, generating a record \$53.5 billion in worldwide sales in 2007. In the U.S. an activist-driven "No Dirty Gold" campaign has persuaded many top jewelry retailers to stop selling gold from mines that cause severe social or environmental damage, but such concerns don't ruffle the biggest consumer nations, namely India, where a gold obsession is woven into the culture, and China, which leaped past the U.S. in 2007 to become the world's second largest buyer of gold jewelry.

For all of its allure, gold's human and environmental toll has never been so steep. Part of the challenge, as well as the fascination, is that there is so little of it. In all of history, only 161,000 tons of gold have been mined, barely enough to fill two Olympic-size swimming pools. More than half of that has been extracted in the past 50 years. Now the world's richest deposits are fast being depleted, and new discoveries are rare. Gone are the hundred-mile-long gold reefs in South Africa or cherry-size nuggets in California. Most of the gold left to mine exists as traces buried in remote and fragile corners of the globe. It's an invitation to destruction. But there is no shortage of miners, big and small, who are willing to accept.

At one end of the spectrum are the armies of poor migrant workers converging on small-scale mines like La Rinconada. According to the United Nations Industrial Development Organization (UNIDO), there are between 10 million and 15 million so-called artisanal miners around the world, from Mongolia to Brazil. Employing crude methods that have hardly changed in centuries, they produce about 25 percent of the world's gold and support a total of 100 million people. It's a vital activity for these people—and deadly too.

In the Democratic Republic of the Congo in the past decade, local armed groups fighting for control of gold mines and trading routes have routinely terrorized and tortured miners and used profits from gold to buy weapons and fund their activities. In the Indonesian province of East Kalimantan, the military, along with security forces of an Anglo-Australian gold company, forcibly evicted small-scale miners and burned their villages to make way for a large-scale mine. Thousands of protestors against expansion of a mine in Cajamarca, Peru, faced tear gas and police violence.

The deadly effects of mercury are equally hazardous to small-scale miners. Most use mercury to separate gold from rock, spreading poison in both gas and liquid forms. UNIDO estimates that one-third of all mercury released by humans into the environment comes from artisanal gold mining. This

turns places like La Rinconada into a sort of Shangri-la in reverse: The pursuit of a metal linked to immortality only serves to hasten the miners' own mortality.

At the other end of the spectrum are vast, open-pit mines run by the world's largest mining companies. Using armadas of supersize machines, these big-footprint mines produce three-quarters of the world's gold. They can also bring jobs, technologies, and development to forgotten frontiers. Gold mining, however, generates more waste per ounce than any other metal, and the mines' mind-bending disparities of scale show why: These gashes in the Earth are so massive they can be seen from space, yet the particles being mined in them are so microscopic that, in many cases, more than 200 could fit on the head of a pin. Even at showcase mines, such as Newmont Mining Corporation's Batu Hijau operation in eastern Indonesia, where \$600 million has been spent to mitigate the environmental impact, there is no avoiding the brutal calculus of gold mining. Extracting a single ounce of gold there—the amount in a typical wedding ring—requires the removal of more than 250 tons of rock and ore.

As a girl growing up on the remote Indonesian island of Sumbawa, Nur Piah heard tales about vast quantities of gold buried beneath the mountain rain forests. They were legends—until geologists from an American company, Newmont Mining Corporation, discovered a curious green rock near a dormant volcano eight miles from her home. The rock's mossy tint meant it contained copper, an occasional companion to gold, and it wasn't long before Newmont began setting up a mine named Batu Hijau, meaning "green rock."

Nur Piah, then 24, replied to a Newmont ad seeking "operators," figuring her friendly manner would get her a job answering phones. When the daughter of a Muslim cleric arrived for training, though, her boss showed her a different operating booth—the cab of a Caterpillar 793 haul truck, one of the world's largest trucks. Standing 21 feet tall and 43 feet long, the truck was bigger than her family home. Its wheels alone were double her height. "The truck terrified me," Nur Piah recalls. Another shock soon followed when she saw the first cut of the mine itself. "They had peeled the skin off the Earth!" she says. "I thought, Whatever force can do that must be very powerful."

Ten years later, Nur Piah is part of that force herself. Pulling a pink head scarf close around her face, the mother of two smiles demurely as she revs the Caterpillar's 2,337-horsepower engine and rumbles into the pit at Batu Hijau. Her truck is part of a 111-vehicle fleet that hauls close to a hundred million tons of rock out of the ground every year. The 1,800-foot volcano that stood here for millions of years?

No hint of it remains. The space it once occupied has been turned into a mile-wide pit that reaches 345 feet below sea level. By the time the seam at Batu Hijau is exhausted in 20 years or so, the pit will bottom out at 1,500 feet below sea level. The environmental wreckage doesn't concern Nur Piah anymore. "I only think about getting my salary," she says.

There is one thing, however, that Nur Piah finds curious: In a decade at Batu Hijau, she has never seen a speck of the gold she has helped mine. The engineers monitoring the process track its presence in the copper compounds to which it adheres. And since the gold is shipped out to smelters overseas in copper concentrate, nobody on Sumbawa ever sees the hidden treasure that has transformed their island.

Pushed by rising gold prices and the depletion of deposits in the U.S., South Africa, and Australia, the world's largest mining companies are pursuing gold to the ends of the Earth. Few companies have gone global more aggressively than Newmont, a Denver-based mining giant that now runs open-pit gold mines on five continents, from the lowlands of Ghana to the mountaintops of Peru. Lured by the benefits of operating in the developing world—lower costs, higher yields, fewer regulations—Newmont has generated tens of thousands of jobs in poor regions. But it has also come under attack for everything from ecological destruction to the forced relocation of villagers. At Batu Hijau, where Newmont, the single largest shareholder, is wholly responsible for the mine's operation, the company has responded by ramping up community development and environmental programs—and dismissing its critics. "Why is it that activists thousands of miles away are yelling, but nobody around the mine complains?" asks Malik Salim, Batu Hijau's senior external relations manager. "Gold is what drives everybody crazy."

Most inhabitants of Sumbawa are farmers and fishermen who reside in wooden shacks built on stilts, their lives virtually untouched by the modern world. But inside the gates at Batu Hijau, Newmont has carved out of the jungle an American-style suburb, where some 2,000 of the mine's 8,000 employees live. Along the smoothly paved streets there is a bank, an international school, even a broadcast center that produces Newmont's in-house television channel. Families arrive in SUVs for free-pizza night at a restaurant overlooking a lush golf course. Up the road there is a basketball gymnasium that Newmont staffers jokingly refer to as "the second home of the Denver Nuggets."

The name is fitting for a Colorado-based gold-mining company, though there are no nuggets here. And therein lies the problem. Higher prices and advanced techniques enable companies to profitably mine

microscopic flecks of gold; to separate gold and copper from rock at Batu Hijau, Newmont uses a finely tuned flotation technology that is nontoxic, unlike the potentially toxic cyanide "heap leaching" the company uses in some of its other mines. Even so, no technology can make the massive waste generated by mining magically disappear. It takes less than 16 hours to accumulate more tons of waste here than all of the tons of gold mined in human history. The waste comes in two forms: discarded rock, which is piled into flat-topped mountains spread across what used to be pristine rain forest, and tailings, the effluent from chemical processing that Newmont pipes to the bottom of the sea.

This method of "submarine tailings disposal" is effectively banned in most developed countries because of the damage the metal-heavy waste can do to the ocean environment, and Newmont practices it nowhere but in Indonesia. Four years ago an Indonesian court brought criminal charges against a Newmont subsidiary—even jailing five of its employees for a month—for pumping pollutants into the sea near its now defunct Buyat Bay mine on the island of Sulawesi. Newmont was acquitted of all charges in 2007. Despite critics' claims that the court caved in to the mining industry, Newmont defends its reliance on ocean dumping at Batu Hijau. "Land disposal would be cheaper but more damaging to the environment," argues Rachmat Makkasau, Batu Hijau's senior process manager. The tailings at Batu Hijau are released 2.1 miles offshore at a depth of 400 feet, above a steep drop-off that carries the waste down more than 10,000 feet. "We closely monitor the quality of the tailings, pipes, and seabed," says Makkasau. "At that depth, we are only affecting some 'sea insects.'"

The deep sea may not have many defenders, but the rain forest does. And that may be one reason Batu Hijau's mountains of waste rock, rather than its submarine tailings, are fueling a conflict with the Indonesian government. Newmont's environmental department—now 87 strong—stresses its efforts to reclaim the heaps of discarded rock, covering them with ten feet of soil and letting the jungle take root. Nothing can restore the pristine rain forest, of course, and Newmont faces a further problem: After ten years of operations, it is running out of room to dump the waste from Batu Hijau. Three years ago, the company applied to renew a permit to clear another 79 acres of rain forest. So far, Jakarta has not granted it, as environmentalists point to the near disappearance of the yellow-crested cockatoo on Sumbawa. With limited space, Batu Hijau's haul trucks are now getting caught in traffic, hurting the mine's efficiency. If more rain forest is not granted soon, Newmont officials have warned, they will be compelled to lay off several hundred Indonesian workers.

The imbroglio lays bare a surprising rift between Newmont and its once friendly Indonesian hosts. Batu Hijau was supposed to be a model mine, and Newmont likes to tout its benefits: the \$391 million

in local royalties and taxes it paid in 2007, the more than 8,000 jobs it has created for Indonesians, the reported \$600 million spent to minimize environmental damage. Then there's the more than \$3 million Newmont spends each year on community development. It may be a pittance compared with the company's annual revenues, but it has provided the five villages closest to the mine with electricity, health clinics, irrigation dams, and agriculture projects.

Not all of the locals, however, feel grateful. Outside the five subsidized villages, the mine's presence has brought little more than envy (as those who don't have mining jobs resent those who do) and frustration (as the influx of mining salaries drives up the cost of living). One flash of anger came in 2006, when vandals burned down a Newmont exploratory camp in eastern Sumbawa, halting the company's testing for a new mine site.

Now the local and provincial governments, whose power has expanded since the dictator Suharto fell in 1998, are starting to assert themselves. Working with Indonesian business interests, they are moving to capture a share of the mine and a say in how its revenues are distributed. "We had no control over our destiny when these contracts were signed under Suharto," says local People's Council representative Manimbang Kahariyai. "We have to protect our future. What will be left of our environment when the mine is finished?"

Sitting in her new house in the village of Jereweh, Nur Piah is focused more on the present than the future. "So many people depend on me," she says. Her husband makes some money as a timber trader, but Nur Piah's salary—about \$650 a month—paid for their two-story concrete home. As if in tribute, she has hung on one wall a large painting of the yellow Caterpillar 793. Nur Piah's job is not without its hardships. Maneuvering the enormous truck over a 12-hour shift is especially stressful, she says, when the pit's graded roads are slicked by torrential rains. But now, after a long day, she smiles contentedly as her child, age six, falls asleep on her lap. The girl's middle name? Higrud, the Indonesian approximation of "high-grade," the best ore in the mine.

The gold ornaments come out of the velvet boxes one by one, family heirlooms that Nagavi, a 23-year-old Indian bride, always knew she would wear on her wedding day. The eldest daughter of a coffee plantation owner in the southern Indian state of Karnataka, Nagavi grew up marveling at the weddings that mark the merger of two wealthy Indian families. But not until the morning of her own arranged wedding to the only son of another coffee plantation family does she understand just how achingly beautiful the golden tradition can be.

By the time Nagavi is ready for her wedding, the university graduate with a predilection for jeans and T-shirts has been transformed into an Indian princess, shimmering in gold. An exquisitely crafted hairpiece is so heavy—five and a half pounds of gold—that it pulls her head back. Three gold necklaces and a dozen bangles act as effective counterweights. Wrapped in an 18-foot-long sari woven with thread dipped in gold, Nagavi walks slowly out of her home, trying to keep her balance as she tosses rice over her head in a traditional gesture of farewell.

The gold treasures Nagavi wears—along with the jewelry and saris packed in the trunk of the SUV taking her to the wedding hall—are not a traditional dowry. In this circle of coffee growers around the town of Chikmagalur, unlike in many poorer parts of the country, it is considered unseemly for a groom's family to make explicit demands. "This is seen as my 'share' of the family wealth," says Nagavi, gazing at the millions of dollars of gold jewelry. As with any Indian wedding, the gold also serves to display the value she brings to the union. "With daughters, you have to start saving gold from the day they are born," says Nagavi's father, C. P. Ravi Shankar. "It's important to marry them off well."

Nowhere is the gold obsession more culturally entrenched than it is in India. Per capita income in this country of a billion people is \$2,700, but it has been the world's runaway leader in gold demand for several decades. In 2007, India consumed 773.6 tons of gold, about 20 percent of the world gold market and more than double that purchased by either of its closest followers, China (363.3 tons) and the U.S. (278.1 tons). India produces very little gold of its own, but its citizens have hoarded up to 18,000 tons of the yellow metal—more than 40 times the amount held in the country's central bank.

India's fixation stems not simply from a love of extravagance or the rising prosperity of an emerging middle class. For Muslims, Hindus, Sikhs, and Christians alike, gold plays a central role at nearly every turning point in life—most of all when a couple marries. There are some ten million weddings in India every year, and in all but a few, gold is crucial both to the spectacle and to the culturally freighted transaction between families and generations. "It's written into our DNA," says K. A. Babu, a manager at the Alapatt jewelry store in the southwestern city of Cochin. "Gold equals good fortune."

This equation manifests itself most palpably during the springtime festival of Akshaya Tritiya, considered the most auspicious day to buy gold on the Hindu calendar. The quantity of gold jewelry Indians purchase on this day—49 tons in 2008—so exceeds the amount bought on any other day of the year throughout the world that it often nudges gold prices higher.

Throughout the year, though, the epicenter of gold consumption is Kerala, a relatively prosperous state on India's southern tip that claims just 3 percent of the country's population but 7 to 8 percent of its gold market. It's an unusual distinction for a region that has one of the world's only democratically elected Marxist governments, but it is rooted in history. A key port in the global spice trade, Kerala gained an early exposure to gold, from the Romans who offered coins in exchange for pepper, cardamom, and cinnamon to subsequent waves of colonizers, the Portuguese, Dutch, English. But local historians say it was the region's revolt against the Hindu caste system (before which the lowest castes were allowed to adorn themselves only with polished stones and bones), and the mass conversion to Christianity and Islam that followed, that turned gold into something more than commerce: a powerful symbol of independence and upward mobility.

Despite the long history, no era in Kerala has been hungrier for gold than the present. The road from the airport to Cochin is lined with billboards showing women adorned in gold wedding jewelry. India's biggest gold retailers all come from Kerala, and 13 large gold showrooms clog a two-mile stretch of Cochin's main thoroughfare, Mahatma Gandhi Road. (What would the ascetic Mahatma have thought?) Among the upper classes and younger consumers in Delhi and Mumbai, gold may be starting to lose ground to more understated—and expensive—materials like platinum and diamonds. But even as Kerala grows in wealth (thanks to a large number of workers in the Persian Gulf) and education (it boasts a 91 percent literacy rate), the attachment to gold persists. Dowries, though officially banned, dominate most wedding proceedings in India, and in Kerala, the largest portion of the dowry is usually gold.

"We grow up in an atmosphere of gold," says Renjith Leen, an editor at *The Week*, a national news magazine based in Cochin. When a baby is born in Kerala, a grandmother rubs a gold coin in honey and places a drop of the liquid on the child's tongue for good luck. At all major occasions over the first six months, from baptism to first ingestion of solid food, the child receives gifts of gold jewelry: earrings, necklaces, waistlets. Then, when the child is three years old, a learned family member takes a gold coin and traces words on his or her tongue to bestow the gift of eloquence.

By themselves, none of these ceremonies captures how deeply gold is ingrained in the Indian economy. "Gold is the basis of our financial system," says Babu, the jewelry store manager. "People see it as the best form of security, and nothing else lets you get cash as quickly." Hoarding gold as an intergenerational family nest egg is an ancient tradition in India. So, too, is pawning gold jewelry for emergency loans—and then buying it back. Commercial banks still offer the service, after their attempt

to stop it in the 1990s resulted in riots and suicides by debt-laden clients and a government command to continue the practice.

Many farmers in Kerala, however, prefer the speed and easy access of "private financiers" like George Varghese, who operates out of his home three hours south of Cochin. A balding man in his 70s, Varghese says he handles around half a million dollars in pawned gold a month, even more during harvest and wedding seasons. It's almost a perfect business, for even with interest rates that can reach one percent a day on short-term loans, very few people default. No Indian wants to let go of their gold. "Even when gold hit \$1,000 an ounce, nobody sold their jewelry or coins," says Varghese. "This is their nest egg, and they trust it to keep growing."

As the price of the metal goes up, however, poor Indian families are having a harder time raising the gold they need for dowries. Though the dowry retains a social function—balancing the wealth between the families of bride and groom—the rising price of gold has only fueled its abusive side. In the neighboring state of Tamil Nadu, the struggle to acquire gold has led to dowry-related domestic violence (usually when grooms' families beat the brides for bringing too little gold) and selective abortions (committed by families desperate to avoid the financial burden of a daughter).

Even in Kerala, the pressure is sometimes too much for the poor to take. Rajam Chidambaram, a 59-year-old widow living in a slum on the outskirts of Cochin, recently found a young man to marry her only daughter, age 27. The groom's family, however, demanded a dowry far out of her reach: 25 sovereigns, or 200 grams, of gold (worth \$1,650 eight years ago, but more than \$5,200 today). Chidambaram, a cleaning woman, has only the two earrings she wears; the gold necklace she once owned went to pay off her deceased husband's hospital bills. "I had to agree to the groom's demand," Chidambaram says, wiping away tears. "If I refuse, my daughter will stay home forever."

In the end, local financiers advanced a loan for her daughter's dowry. Chidambaram may have averted the shame of an unmarried daughter, but she is now burdened with a debt that she may spend the rest of her life trying to repay.

Rosemary Sánchez Condori is just nine years old, but the backs of her hands are burnished like aged leather. That's what happens when a girl spends time pounding rocks under the Andean sun. Ever since Rosemary's father fell ill in the mines of La Rinconada eight years ago, her mother has worked 11-hour days collecting rocks near the mines and hammering them into smaller bits to find flecks of

overlooked gold. On school holidays, Rosemary sometimes helps her mother on the mountain. It is child labor, perhaps, but for a girl whose family is living hand to mouth, it also qualifies as her proudest achievement. "Last year I found two grams of gold," Rosemary says, almost giddily. "It was enough to buy my schoolbooks and uniform."

In small-scale mines around the globe, searching for gold is a family affair. Of the world's 12 to 15 million artisanal gold miners, an estimated 30 percent are women and children. On the mountain above La Rinconada, men disappear into the mines, while their wives sit near piles of discarded rock, swinging four-pound mallets in a syncopated rhythm. With no child care at home and a need for extra income, the women in their long traditional skirts and bowler hats sometimes bring their children along. It is the uncertainty of the mines' lottery system—and the perfidy of many men here—that compels the women to come to the mountain. At least they know that the six or eight grams of gold they find each month, worth about \$200, will go to the family—not to the dingy bars and brothels that line the town's red-light district.

Only gold, that object of desire and destruction, could have conjured up a place of such startling contradictions as La Rinconada. Remote and inhospitable—at 17,000 feet, even oxygen is in short supply—the town is, nevertheless, growing at a furious pace. Approaching the settlement from across the high plains, a visitor first sees the glint of rooftops under a magnificent glacier draped like a wedding veil across the mountain. Then comes the stench. It's not just the garbage dumped down the slope, but the human and industrial waste that clogs the settlement's streets. For all its growth—the number of mines perforating the glacier has jumped in six years from 50 to around 250—La Rinconada has few basic services: no plumbing, no sanitation, no pollution control, no postal service, not even a police station. The nearest one, with a handful of cops, is an hour down the mountain. This is a place that operates, quite literally, above the law.

La Rinconada's frenzied expansion has been fueled by the convergence of rising gold prices and, in 2002, the arrival of electricity. Miners use pneumatic drills now with their hammers and chisels. Traditional leg-driven rock grinders have given way to small electric mills. Electricity hasn't made mining any cleaner; if anything, mercury and other toxic materials are being released into the environment more rapidly than ever before. But nearly everyone agrees that La Rinconada has never produced so much gold. Estimates vary from two to ten tons a year, worth between \$60 million and \$300 million. Nobody really knows, though, because much of the gold here, strictly speaking, doesn't exist.

Peru's ministry of energy and mines assiduously tracks the gold the country produces, and with good reason: Gold is Peru's top export, and the country is now the world's fifth largest gold producer. Output, at 187.5 tons, is more than eightfold what it was in 1992. The ministry has no office in La Rinconada, however, and locals say the gold coming out of the mines is not accurately counted, in part because mine operators routinely underreport their production figures to avoid taxes. "We're all bankrupt!" laughs one. "Or at least we say we are."

A portion of the unprocessed ore also vanishes. At one gold shop in town, a 19-year-old miner named Leo cheerfully admits that the 1.9 grams of gold he is trading for cash came from rocks that he pilfered from a warehouse his father ostensibly guards. "We do this four or five times a week and split the profits," says Leo. "Nobody notices the rocks are missing."

Many miners at La Rinconada don't officially exist, either. There are no payrolls—just those bags of rocks—and some mine operators don't even bother writing down workers' names. Bosses, of course, can get rich on this kind of indentured servitude. The manager of one of La Rinconada's larger operations says his mine yields 50 kilos (110 pounds) every three months—more than \$5 million worth of gold each year. His workers, on their monthly *cachorro*, each pull in an average of about ten grams (two-tenths of a pound) of gold, or around \$3,000 a year. Despite the disparity, the miners do not rebel against the system; in fact, they seem to prefer the slim chance of winning big once a month in the mines to the dull certainty of low wages and chronic poverty in the fields. "It's a cruel lottery," says Juan Apaza, the gold-toothed miner up on the glacier. "But at least it gives us hope."

The more unforgiving lottery may be the one miners and their families face just trying to survive in such a dangerous and despoiled place. Life expectancy in La Rinconada is a mere 50 years, 21 years fewer than the national average. Fatal mine accidents are common, often caused by crude explosives handled by inexperienced or inebriated miners. If the blast doesn't kill, the carbon monoxide fumes may. Peru has strict laws governing mine safety, but there's little oversight in La Rinconada. "Of the 200 mining companies here, only five make a full set of safety equipment obligatory," says Andrés Paniura Quispe, a safety engineer who works with one of the few companies that maintains high standards but still requires miners to buy their own equipment.

Miners cope with the drumbeat of death with a reflexive fatalism. The local saying—"*Al labor me voy, no sé si volveré*"—translates as "Off to work I go, I don't know if I'll make it back." A death in the mine, in fact, is considered a good omen for those left behind. Human sacrifices, practiced in the Andes for

centuries, are still considered the highest form of offering to the mountain deity. According to local beliefs, the chemical process by which the mountain absorbs a human brain brings gold ore closer to the surface, making it easier to extract.

But the gods surely can't be happy with how poisoned La Rinconada's environment has become. The raw sewage and garbage on the overcrowded streets are minor nuisances compared with the tons of mercury released during the process of separating gold from rock. In small-scale gold mining, UNIDO estimates, two to five grams of mercury are released into the environment for every gram of gold recovered—a staggering statistic, given that mercury poisoning can cause severe damage to the nervous system and all major organs. According to Peruvian environmentalists, the mercury released at La Rinconada and the nearby mining town of Ananea is contaminating rivers and lakes down to the coast of Lake Titicaca, more than a hundred miles away.

Residents around La Rinconada suffer the brunt of the destruction. Rosemary's father, Esteban Sánchez Mamani, has worked here for 20 years, though he rarely enters the mines these days because of a chronic illness that has sapped his energy and raised his blood pressure. Sánchez isn't sure what the ailment is—his lone visit to the doctor was inconclusive—but he suspects it originated in the polluted environment. "I know the mines have taken years away from me," says Sánchez, whose hunched frame makes him seem decades older than his 40 years. "But this is the only life we know."

The family's fate now depends on the ore that Sánchez's wife, Carmen, hauls down from the mountain. Sitting on the floor of the family's stone hut, Sánchez spends most of his days pounding the rock into smaller pieces, keeping the gold-flecked shards in a blue coffee cup. Rosemary does her homework on a sack of rice, peppering a visitor with questions about life outside La Rinconada: "Do you chew coca leaves in your country? Do you own alpaca?" Though just a first grader, she has decided that she'd like to be an accountant and live in the U.S. "I want to go far from here," she says.

Rosemary tags along as her father delivers two sacks of ore—the weekly haul—to the tiny mill above their home. This is part of the endless routine, but each time Sánchez can't help hoping he's hit the jackpot. At the very least, he hopes there is enough gold to keep his two children in school. "I want them to study so they can leave this place," says Sánchez, who never completed the seventh grade.

Together, father and daughter watch the miller perform his ancient art. Using his bare hands, the man swirls several pounds of liquid mercury into a wooden pan to separate the gold from the rock, dumping

the mercury-tainted waste into a stream beneath the shed. Thirty feet downstream a young girl is filling up a plastic bottle in the rancid water. But inside the miller's shed all eyes are focused on the marble-size silvery nugget the miller produces: its mercury-coated exterior hides an unknown quantity of gold.

Stuffing the nugget into his pocket, Sánchez trudges up the hill to a gold-buying shop. The merchant, one of several hundred in town, burns off the mercury with a blowtorch, releasing the toxic gas through an exhaust pipe into the cold, thin air. As the merchant works, Sánchez paces the room, his frayed gray cap in hand.

After ten minutes, a tiny kernel of gold emerges from the flame. Sánchez frowns. It weighs only 1.1 grams, about one-thirtieth of an ounce. The merchant peels off a few bills and, with a shrug of his shoulders, hands Sánchez a sum that, once the miller's fee is deducted, leaves the family with less than \$20.

"Better luck next time," the merchant says.

Maybe next month, or the next. Eking out a living sky-high on a glacier, Sánchez knows that luck is all he can ever hope for.

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