



THE LAST GOLD RUSH

In Brazil a prospector can still find El Dorado

By Norman Gall

Harper's Magazine, December 1984

"The gold rush is a modern phenomenon. Only in modern times has this thirst for gold inspired vigorous peoples to seek it out by hard labor in the waste places of the earth."

—W. P. Morrell, *The Gold Rushes*

Each spring, the melting snows of the Andes wash eastward to awaken a thousand streams. Swollen by tropical rains, these torrents pour into the jungle rivers of Bolivia and Peru—great rivers like the Beni and the Madre de Dios—which eventually form and feed the swift, violent Rio Madeira just as it begins to cut through the ancient volcanic crust of the Brazilian shield, washing veins and grains of gold away from river banks, along with masses of rock and earth. As it runs northeast through Amazonia, the Madeira carries along as well the giant floating trees and logs for which it is named.

At the beginning of this century, when the Madeira-Mamoré railroad was being built, the river was called the long cemetery; shortly after the railroad was completed, in 1912, the English author H. M. Tomlinson, in *The Sea and the Jungle*, described the Madeira region this way:

The track went from Porto Velho into outer darkness. Men came back to the settlement through that hole in the forest. . . to tell us, in long hot nights, something of what the forest of the Madeira was hiding; and they were bearded like Crusoe, pallid as anemic women, and speckled with insect bites. These men said that where they had been working the sun never shone, for His light was stopped on the unbroken green which, except where the big river flowed, roofed the whole land.

The violence of the Madeira, one of the great tributaries of the Amazon, subsides for only a few months each year. This is when the violence of men begins. For the processes of nature have created great riches. Over the last 100,000 years, the billion-year-old Precambrian rocks of the Brazilian shield have undergone continuous tropical weathering, undisturbed by such upheavals as the creation of new mountain ranges or the scouring by glaciers such as those that covered much of North America 18,000 years ago. Surface rocks have been broken up by this weathering process and carried away by the combined leaching effect of intense heat and rain. The cycle of birth and decay, jungle vegetation sprouting and growing and dying, has contributed acid solvents to percolating ground water, which after so many millennia has washed away lighter earth material and left behind concentrated gold deposits, which today crown the stumps of eroded mountains and enrich the alluvial beds of the rivers of Amazonia.

The Madeira's gold is concentrated around eighteen cataracts, along 230 miles of wild river. The gold is in the gravel in the riverbed, and it is dug by men in diving suits, who descend through 100 feet of rough water, scoop aside sand, and hope other men will not prevent them

from pumping their new found riches to the surface. Last summer there were about 1,000 rafts working the Rio Madeira, operated by men from all over Brazil, from all walks of life, many having never before searched for gold, but now desperate for it. And the Madeira is not the only lure of Amazonia. There is Serra Pelada, the great pit in the jungle in which between 50,000 and 80,000 men crawl and climb at any one time in a scene that brings to mind Dante's *inferno*. Farther west, there is the basin of the Tapajós River, rich with gold and scarred with mining boom towns and rough-hewn airstrips. There are sights that might be conjured by Latin America's novelists: students in search of gold dig up parts of a new university campus in Mato Grosso; in Minas Gerais, after a summer rain, small boys pan for gold on village streets.

According to Brazil's Ministry of Mines and Energy, more than 250,000 prospectors, called *garimpeiros*, have fanned out along the rivers and through the interior streams and bush of the Brazilian frontier. It is the biggest gold rush the world has seen since the discovery of the South African Rand a hundred years ago. What is exciting the prospectors is the fact that the sources of gold on the Brazilian shield are largely unexplored greenstone belts of volcanic rock, like those on shield areas elsewhere—South Africa, Canada, Siberia—from which most of the world's gold has come.

The earth's great gold mines are not yielding as they once did. Production appears to be on a downward trend for the first time in 300 years. South Africa, the world's biggest gold producer—it produces two thirds of the output of the noncommunist countries—has seen a falloff of 33 percent since its peak year of 1970, when its mines produced 1,000 metric tons. Canada, the world's third-largest producer (the Soviet Union being the second largest), does not expect its production, which has averaged sixty-four metric tons annually in recent years, to make up for much of the drop-off in South Africa. Only Brazil seems to have a chance of substantially reducing this loss. Today it ranks fifth among the world's producers, just behind the United States, and output in recent years has grown rapidly. Since the big new discoveries in northern Brazil began in 1976, gold production in the country has roughly quadrupled. In 1982 Brazil produced thirty-five metric tons of gold; in 1983, the last year for which figures are available (and even when available, such figures are but the roughest estimates), production rose to fifty-one metric tons—or a little less than 1.8 million ounces, worth at current prices about \$600 million. Even more spectacular, perhaps, is the way the gold is gotten. There may soon come a time—very soon, some argue with an intention to warn—when much of Brazil's gold will have to be mined by companies with access to big capital and the latest technology. And it is true that in the last few years many jungle prospectors have availed themselves of more sophisticated and efficient tools. But the fact remains that almost all the gold mined in Brazil during the past eight years has been sifted from gravel by men crouching along river banks, or perched on tiny shelves in huge mining pits, or outfitted with diving gear 100 feet down in muddy water. In effect, near-naked men are digging beneath jungle streams to preserve gold's bedrock role in the world's monetary system.

Portuguese settlers first found gold in Brazil in the early sixteenth century, but it was not until the 1690s that the country witnessed the first and longest-lasting of modern gold rushes—a fevered surge that set in motion the enormous expansion of world gold production over the ensuing three centuries. In contrast with later gold rushes elsewhere, which usually lasted about a decade, Brazilian production grew steadily for forty years (1700—40) and did not begin to fall sharply until after 1760. The problem was not finding gold but a lack of capital and technology—resources necessary for getting men into the bush and getting the gold out at a cost that would make the mining profitable.

Airplanes, helicopters, earthmovers—man today in Brazil is using his new tools to penetrate the jungle. The first signs one sees of the gold rush in Amazonia are the landing strips, essentially rough clearings, that from the air spread like fresh roots into the jungle. These strips tend to begin as little more than targets onto which vital supplies can be dropped from single-engine planes by bush pilots who will do anything for a few ounces of gold. These targets can soon become the bumpy and precarious landing strips that serve as gateways to

the outside world. Small planes bring in, at great cost, food, drink, prostitutes, fuel oil, tools, machinery, and merchants, who “grubstake”—extend credit in return for a share of discoveries—the *garimpeiros* who want the goods. After just a few minutes on the ground, the pilots fly out again with little bags of gold dust, a few miners on board who have *bamburrado* (struck it rich), and many more physically broken by malaria, yellow fever, or hepatitis after months in the jungle. From today’s rush at jungle airports, a stranger might conclude that there are more pilots than Indians in Amazonia, and he could be right. If the plane he was on was not too dangerously overloaded, or the pilot not too drunk, a stranger might be treated to spectacular dives and banks a few dozen yards above the *garimpos* (wildcat jungle diggings) before bouncing down on another runway. In some places the runway grows, serving as the main street of a new mining community, a strip lined with the wreckage of crashed airplanes rusting before the densely packed rows of bars, discos, and trading establishments with loudspeakers going twenty-four hours a day, issuing raucous blasts of rock music and songs of sadness and lust.

Gold rushes have long been important in opening up and settling new country. It is the same in Amazonia today as in eastern Siberia in the 1820s, California in the 1850s, New Zealand in the 1860s, and South Africa, the Klondike, and the Yukon in the 1890s. Towns and mining camps appear and disappear like bubbles. The forty-niners gave their new diggings such quaint names as Dead Man’s Bar, Mad Mule Gulch, Rough and Ready, and Whisky-town. Among the jungle enclaves of Amazonia are Vietnam and Little Rat.

Most of the *garimpeiros* and the girls who prance provocatively in shorts or brightly colored polyester-satin dresses at the edge of the landing strips come from the same farms and villages of the Brazilian northeast. Many thousands of young men and women of the region, which has been blasted by drought for the past five years, now wander Amazonia, drawn from one place to the next by a rumor, a hint of fresh gold, what the *garimpeiros* call a *fofoca*.

Along the Madeira last summer, the *fofocas* ran as swiftly as the currents—and as dangerously. Armando Eduardo Silveira Clemente is a thirty-nine-year-old economist and scion of one of São Paulo’s 400-year-old patrician families. He joined the gold rush last year along the Madeira when his construction business went bad, along with the rest of the debt- and recession-plagued Brazilian economy. He explained to me how one *fofoca* swept him up.

“All of a sudden, a *fofoca* appeared just two hours downstream from where I was, across some dangerous rapids that were every day eating up two rafts and killing people before we found a way of crossing,” he said. “At the foot of the rapids, there was easy gold, shallow and heavy in a quiet pool beneath only ten feet of water. Already this summer we have produced sixteen kilos of gold from my rafts”—worth \$190,000 at world prices—“ten of them in just two weeks at that pool below the rapids.”

Of those sixteen kilos, Clemente said, he kept four after paying off his divers and suppliers—a \$48,000 net. All the divers were weak with malaria, he said, but they kept working anyway because they were on top of the gold. They took serum all day long while resting. When their turn came to begin each three-hour underwater shift, they plunged hypodermic needles into their own veins with huge vitamin injections Clemente called “cocktails.” “The dose was so big that they heated up as they dived,” he said. “When they came out, they would be in a malarial crisis again.”

Of the thousand or so rafts on the Rio Madeira last summer, only half were working at any one time because of mechanical problems. Perhaps only 100 were producing gold. The rafts are about the same size as those found on lakes at summer camps, and each one working was mounted with gravel pumps and air compressors. These were connected to the men in diving suits, who would drop underwater to dig into the gold-bearing gravel. A day might pass this way: most rafts would park along the river banks, while a few probed the sand in the river’s deep channel to find the gravel beds that held gold. Whenever one raft stopped

for a long time at one spot, and the loud clatter of gravel landing in its boxes could be heard, other rafts would leave shore and crowd around the one doing the digging. Nobody wants to do exploration: it eats up fuel oil and man-hours. "I've seen 200 rafts crowd around the same place where one found some paying gravel," Clemente said.

To reach the gravel, a diver has to dig deep into the sand of the riverbed. Other divers then swarm into the hole. They crowd one another so badly that the walls of the hole often collapse. Then all the divers have to rush to the surface. Some divers never get out of the hole. Air hoses and gravel hoses of several men can entangle in such confusion, and bind the divers to the river bottom. Others get the bends, or run out of oxygen. Many divers carry boy scout knives inside their diving suits and cut the air hoses of other divers who get in their way.

The professional diver spends all his money as soon as he gets it, because he thinks that will bring him luck. He spends long hours in whore-houses. The raft and its crew wait. "I paid \$10,000 once to my best diver—good divers are hard to find, so you have to pay them 40 percent of your gold production—and he spent it all in two days," Clemente said. "He was a man of uncommon strength, tied to the wheel of fortune. He had chronic malaria and chronic diarrhea. He felt he had to spend everything to be lucky again. He treated everybody in sight. When he came back to the raft, he told stories about himself and the girls—and brought photographs to prove them."

Good divers are a rarity in Amazonia: most *garimpeiros* do not work underwater, and most do not command a specialist's fee. They tend to be loners, men bent on making their own fortunes, much like the prospectors of the legendary eighteenth-century gold bonanza. *Garimpeiros* still die in the jungle of malaria or malnutrition while working with preindustrial technology. Nevertheless, they remain extremely effective agents of mineral discovery.

"The search for gold is very labor-intensive," says Alain Lestra, a French geologist who lives in the Amazon port city of Belém, on the Atlantic coast, and edits Brazil's first gold newspaper, *Jornal do Ouro*. "Gold is so heterogeneous. One man can get rich by digging at a small spot on a hill or a river bank, while all those a few feet around him find nothing. Men on the ground must probe very small areas. That's why the *garimpeiro* is so important."

Of the thousands of nomadic *garimpeiros* wandering about Amazonia, many have no previous mining experience. But there is a hard core of professionals whose knack for exploration comes from decades of working jungle streams—some of the very streams worked centuries ago by *garimpeiros* and fugitive slaves—in search of gold, tin, diamonds, rare industrial metals, and precious gems. An Navas had been wandering like a condemned man among the 130-odd *garimpos* of the Tapajós River basin, Brazil's leading gold-producing region, in the years before the landing strips began to proliferate. "On the Rio Marupá, a branch of the Tapajós, we found a lot of gold in 1962," Navas said. "The price of gold then was very low, and there was no landing strip; there wasn't anything. Today it takes ninety minutes for a small plane to fly from the market town of Itaituba, on the Tapajós, to the *garimpos* of the Marupá. In those days it was a long journey upriver in a small boat. Until the planes began to drop food and land on our clearings, hundreds of men could be stuck there in the jungle without anything to eat. But there was lots of gold."

But gold is only as valuable as the market for it. The intensity of the gold rush in Amazonia depends on two highly speculative and volatile price movements: the daily London gold fix, which is transmitted to the *garimpos* each morning by government shortwave radio, and the black market price of the dollar in Brazilian cruzeiros. To stimulate gold production and to buy the gold cheaply at the marginal cost of printing a few billion more fast-depreciating cruzeiros (inflation was running above 200 percent), Brazil's central bank began in 1982 to buy gold dust at slightly above the world dollar price—at the black market cruzeiro quotation—through its agents in the *garimpos* and in nearby towns. If it had not done this, most of Brazil's gold output would have been smuggled out of the country, as it had been in

the past. Through most of 1983 the black market dollar was so high, thanks to Brazil's deepening debt crisis, that it stimulated a huge increase in gold output—the biggest contribution of any country to the surprising spurt in world gold production.

The real fall of gold prices that began in 1969—the price of gold remained fixed through the 1960s—forced An Navas and *garimpeiros* like him to abandon the sites in the Tapajós that they had discovered only a few years before. But now they are back in strength. It was following the sharp rise in gold prices in the late 1970s that the *garimpos* of the Tapajós, supplied expensively by small planes at isolated airstrips, became Brazil's leading sources of gold production. To get its hands on this gold, the government is now building a new road, called the Trans-Garimpo highway, deep into this jungle. Following the advance of the heavy construction equipment is a new wave of *garimpeiros* taking advantage of the new overland access to make new gold discoveries along the way. "The great interest of the government is that gold is not smuggled out, and this is going to affect us," says a gray-haired bush pilot known simply as Pai Velho (Old Father), the proprietor of a fourteen-plane air-taxi service, who "owns" six airstrips in the Tapajós region, as well as several supply stores, bars, and gold-buying establishments. As a supplier of key goods and services to the *garimpeiros*, who must ride his planes and pay an "airport tax" to use his landing strips, Pai Velho has made out well from the gold rush. However, with the building of new roads, the nature of the business is sure to change.

Much else has already changed in the frenzy of the past two years. *Garimpeiro* technology has been upgraded enormously. Over the centuries, and until very recently, all gold prospectors worked in much the same way. Indeed, the basic technology is so old that the sluice box used in Amazonia (called the smoking cobra) is essentially the same as that used by California's forty-niners—which itself bore a striking resemblance to the sheepskins used to trap grains of gold 3,000 years ago along the Black Sea (giving rise to the Greek legend of the Golden Fleece). Now, thanks mainly to the high gold prices of recent years, many *garimpeiros* have been able to capitalize themselves and upgrade their traditional working methods. With oil-burning water-and-gravel pumps, portable stamping mills, and high-pressure water hoses for knocking down hillsides, *garimpeiros* are now able to dig deeper, recover more gold from ores, and stay longer at a *garimpo*.

With their new technology, *garimpeiros* can compete better with larger enterprises. Some of them have established "clandestine companies" of their own—"clandestine" because they are formed in a flash, never legally incorporated, and quickly disbanded if gold proves elusive. These companies share risk and production with their workers, with low capital costs and effective labor costs (\$40 monthly) that are about one fifth of the money wages of an unskilled black worker at a South African mine. The entry cost is low, with basic machinery costing about \$5,000, often provided by local merchants, gold buyers, and owners of air taxis who grubstake *garimpeiros* in exchange for production shares, as suppliers have done over the centuries since gold rushes began. One of the clandestine capitalists I met at the *garimpo* of Cuca, in southern Para, is Joao Rosa Godoi, a construction worker who began as a laborer three years ago and now owns ten gravel pumps operated by seventy men in three different *garimpos*. "I bought my first machines on credit and repaired them myself," he said. "Gold is scarce, and must be well managed. I'm a Protestant and don't spend much money. I don't smoke, drink, or gamble, and don't allow workers to bring liquor, women, pornographic magazines, firearms, or playing cards into my diggings."

The rewards of the gold rush and its investment needs have attracted many middle-class and professional men to the *garimpos*, particularly men from the crisis-stricken cities of southern Brazil. Among the laborers I met on one twenty-man digging crew were a real-estate salesman from São Paulo and a fourth-year economics student.

"I was working as an agronomist for a multinational drug company in the state of Maranhão, at the edge of the gold rush country," says Carlos Armando Bantle, a husky, twenty-seven-year-old Brazilian of German descent from the southernmost state of Rio Grande do Sul, whom I found running two gravel pumps and a team of twelve peons at the

garimpo of Cuca. “Many *garimpeiros* come from Maranhão. So many were joining the gold rush that I started wondering why I was staying behind. My dream is to get enough gold for me to study in Germany for a doctorate.”

In a treetop survey of Amazonia, any casual visitor would be compelled to pause over an enormous pit in the jungle that was once a mountain but has been transformed in recent years into a teeming hive of *formigas* (ants)—tens of thousands of half-naked men carrying plastic sacks of earth and rock in endless chains up the continually improvised and deepening escarpment of the pit; muddied bodies climbing precarious wooden ladders perched like match-sticks on each shelf of the pocked diggings.

The great pit is Serra Pelada, Brazil’s largest gold mine. Gold at the site was first discovered accidentally in 1980 by a pioneer farmer and his workers. Mining rights to the area were held at the time by a subsidiary of the giant state corporation Companhia Vale do Rio Doce (CVRD), whose geologists had camped on Serra Pelada while searching for other minerals. Such “rights” mean little, however, in the jungles of Amazonia. The Brazilian government has neither the will nor the muscle to enforce laws having to do with land claims. During the mining rushes of the American West, any small prospector could stake a claim by marking the ground clearly—as small as ten square feet in a rich area—and registering name, date, and location with the district recorder, usually a local saloonkeeper or merchant. In the mining camps of the West, prospectors lived and worked under an informal code: theft, murder, and claim jumping were major crimes; all claims had to be worked to remain valid; and no miner could interfere with his neighbor’s diggings. The unwritten code of the Brazilian *garimpeiro* is pretty much the same, but with one major difference: the mining-camp codes of the West were eventually incorporated into the common law by courts that widely recognized the rule of first possession. The *garimpeiro* who finds gold can rarely pass the financial and technical means tests required by Brazilian law to register a claim. Unable to work within the law, the *garimpeiro* works outside it—in the jungle, beyond the law’s reach.

Since being invaded by *garimpeiros*, the Serra has yielded some thirty-three metric tons of gold over the past four years—worth about \$400 million at world prices—mined *by hand* and carried away by a human chain. The gold concentrations seemed to become richer as the *garimpeiros* dug deeper. In 1981 one of them found a fifteen-pound nugget. In late 1983, nuggets weighing 79 and 137 pounds were found deeper in the pit, the larger being the second-biggest found anywhere in the recorded history of gold mining. This bonanza has kept the *formigas* busy and prosperous—at least until this year, when flooding forced the closing of the pit. At the bottom of the pyramid of clandestine capitalism built at Serra Pelada, the ants were earning \$10 daily, against an official minimum wage in the region of a dollar a day.

Within three months of the discovery of gold at Serra Pelada, as the fevered news spread throughout Brazil, some 30,000 men had crowded into the pit. To keep order in a concentration of this size in what had been virgin jungle until then, and to enable the debt-ridden military regime to buy the gold cheaply, Brazil’s National Intelligence Service took over Serra Pelada and began running it as a kind of Indian reservation for *garimpeiros*. The boss of this reservation is an army counterinsurgency specialist, Major Sebastião Rodrigues Moura, who played a key role in putting down a guerrilla insurrection in the region a decade ago. Idolized by the *garimpeiros* as “Major Curio” (after the name of a beautiful black bird), he has seen to it that liquor, women, and firearms are banned from the *garimpo* and that the *garimpeiros* are able to buy food and supplies at reasonable prices from government supermarkets instead of being robbed by the suppliers who traditionally grubstaked them. Nevertheless, financial control of the tiny diggings that cover Serra Pelada has passed more and more into the hands of outside speculators. “Shares” of the Serra are held by speculators in many cities of Brazil, and “titles” to these shares can be found scrawled on the inside covers of matchbooks and on the reverse sides of photocopies of identity cards.

Such shares are the talk of Marabá, a jungle town beside the Tocantins River whose population has tripled since the discovery of the nearby Serra Pelada. “Everybody here is putting his money in the Serra,” said Juvenal, a middle-aged taxi driver and *ex-garimpeiro*, as his old VW Beetle labored its way over the unpaved, dust-blown streets of Marabá’s new suburbs, past the fancy homes and supermarkets just built for those who had struck it rich. “I have just invested \$500 of my own money to buy one percent of a small digging in Babilonia.” Babilonia is the richest part of the Serra. It was there, Juvenal told me, that Marion, who was just a common laborer, found three tons of gold. Before he started digging on the Serra, Juvenal said, Marion had been working on a hydroelectric project, clearing jungle and laying transmission lines. Now he has 12 billion cruzeiros (\$5 million) in the bank. “He bought several farms and a Coca-Cola bottling plant, built a new house, divorced his wife, got a beautiful girlfriend in São Paulo, and flies to see her in his new twin-engine plane.” For his one percent of the *barranco* in Babilonia, Juvenal hopes to get one percent of the gold.

When I traveled through Amazonia in 1981, on the new paved road to Marabá from the jungle mountain of Carajás, I passed a small roadside cluster of stores and warehouses that was called simply Kilometer 30. When I returned this year, Kilometer 30 had become a city of 60,000 people and been renamed Curionópolis, in honor of the legendary “Major Curio,” who by then had become a national political figure, having earlier been elected to Congress in 1982 with the *garimpeiros* votes.

Last May, two security guards were killed in a gunfight with *garimpeiros* trying (successfully) to block construction of a water-storage dam by a small company with a government license to mechanize its diggings in the Tapajós River basin. This is one of many conflicts that have erupted lately as the number of *garimpeiros* multiplies and the technology improves—and as more and more companies join the Brazilian gold rush on the heels of the *garimpeiros*. Unstable politically and financially, the Brazilian government cannot enforce its own mining laws in these vast jungles without sacrificing the cheap gold it buys in the *garimpos* as well as the votes provided by the *garimpeiros*. So it leaves more and more space for confrontation between prospector and corporate man.

In his hungry and dangerous search for gold, the *garimpeiro*’s choice between digging deeper and moving on is often one of desperate urgency and not subject to the customary delays of governments and large business organizations. On the other hand, the corporate man is accustomed not only to civilized comforts in the field but also to the support of computers, satellite imagery, diamond drills, complex financial operations, heavy mining and earth-moving equipment, and fancy tools of laboratory and geophysical analysis. “It’s very expensive to keep a crew in the jungle,” one foreign geologist told me. “Company exploration personnel can have a 40 percent monthly turnover in the jungle. You can spend as much as \$100,000 to move a small exploration camp and its equipment from one site to another nearby. Companies have such huge jungle tracts to explore, with problems of access so great, that even with satellite imagery they don’t know where to begin. So company geologists often just wind up tracking the path of the *garimpeiros*.”

At the same time, the *garimpeiros* haunt the company camps, trying to benefit from the use of sophisticated technology to find new diggings of their own. In recent years, they have successfully invaded and taken away the work sites of such big companies as Utah International, St. Joe Minerals, and British Petroleum/Brascan. In most cases, the *garimpeiros* skim off the richest surface deposits and then move on. But this high-grading has taken away enough gold to make many alluvial deposits uneconomical and has discouraged more foreign investment in Brazil. The mining camps most vulnerable to invasion are the surface operations mounted by Brazilian banks and construction companies, inexperienced in mining and using simple machinery, some of which defend their claims with uniformed guards using automatic weapons and police dogs. Some have even preferred to fly in all people and supplies to their camps rather than open feeder roads that might make it easier for *garimpeiros* to invade.

Mining professionals are in broad agreement on two points about the *garimpeiros*. One is that they are incomparable and perhaps indispensable prospectors for new jungle mining sites. The second is that if company sites are not protected from invasion, the enormous mineral potential of the Brazilian shield will not be developed, because capital and technology will not be available to get at the deep deposits beneath the sites that today are providing a short-term bonanza.

The *garimpeiros* have played a crucial role in Brazil's gold boom, and will have no small part in the expected expansion of production. But their importance will eventually wane. In the past, nearly all gold rushes were short-lived. They were quickly followed by the entry of companies that were able to mobilize capital and technology to mine ore in larger volume but of much lower grade than in the deposits at or near the surface, which had been rapidly exhausted by crowds of small prospectors. (In Brazil today, for instance, the major South African mining houses are investing hundreds of millions of dollars in deepening the eighteenth-century colonial mines of the back country.

Brazil's Ministry of Mines and Energy claims that the country's gold reserves may be as large as South Africa's. These estimates are thought to be wildly exaggerated, but independent industry sources do believe that Brazil may be producing 125 metric tons of gold annually by 1990. (Last year, South Africa produced about 680 metric tons.)

No one seems to doubt that there is much more gold beneath the jungle than can be skimmed off by the *garimpeiros*. To get at these greater riches, and to provide for a much more stable settlement of Amazonia, some kind of political formula must be found to allow both *garimpeiros* and mining companies to work effectively. Otherwise, Brazil will again be plagued by the same technological backwardness that curtailed its eighteenth-century gold rush. One of the few foreign engineers who witnessed this deterioration was Wilhelm Ludwig von Eschwege, a graduate of the renowned Freiburg school of mining that produced the engineers who developed the Comstock Lode and other great mines of the American West. In the early nineteenth century he observed in despair: "The ambition and lack of experience of the government, combined with its ignorance of a badly organized and almost unpopulated country, generated many wrong laws that caused the rapid ruin of this important source of income for the State."

Mismanagement on this scale could happen again. Whether or not it does occur depends on how well Brazilians meet the legitimate needs of capital and raw hunger. Fortunately, these demands are not irreconcilable. There is no inevitability to conflict between big mining companies and the clandestine capitalism of the *garimpeiros*. Much of Japan's economic development over the past century has come from cooperation between large firms and tiny, informally constituted economic units. This kind of cooperation can come only under a clearly defined institutional framework. Brazil's ability to develop this framework may be a key to its own future stability and growth, as well as to the future role of gold in the world economy.

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ngall@braudel.org.br