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Amazonia: Tin in Rondonia

Manaus, Amazonas (Brazil)

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Mr. Richard H. Nolte  
Institute of Current World Affairs  
366 Madison Avenue  
New York, New York 10017

Dear Mr. Nolte:



Rondonia is an inhospitable corner of the Amazon basin, until recently inhabited only by primitive Indian tribes and scattered rubber-gatherers. Now, Brazil's most rapid population increase is taking place in this federal territory, some 200% in the last decade. The reason is in-migration; the cause is the discovery of tin.

I spent several days there—most of it in the mining camp of Santa Barbara, amid the tropical forest—as little as possible in the territorial capital of Porto Velho, where unpaved streets create all-encompassing clouds of red dust.

Extraction of latex from the hevea brasiliensis, called seringueiras in the region, provided the means for both the discovery and exploitation of cassiterite. It was very near Sta. Barbara, on the land concession of a seringalista, that the heavy, dark ore was found amid alluvial sands. Gladly giving up the hard life of rubber-gathering, seringueiros are flocking to Rondonia from Acre, Amazonas and Par  to provide the manpower for the new boom. Most of these men came from Northeast Brazil originally or are descendants of migrants from that area who fled its harsh droughts late in the 19th century. Called caboclos, they have the copper-skins of their Indian ancestors and the black, wavy hair and features of their Portuguese sires.



The physical characteristics and the life history of Euclides, manager of the Santa Barbara camp, are typical. He was born in a small town in the interior of the poor, Northeastern state of Paraíba. Raised amid poverty, he heard rumors of the wonders and riches of the Amazon and at 16 left his home for the upper Purus River in Acre. He lived in isolation along a tributary stream and maintained a trail through the forest which he walked twice a day to slash the rubber trees and, later, collect the "milk".

Soon he was married and began the accumulation of his seven children. As they grew, so did his concern for their lack of education and contact with civilization. He decided to take his family back to the Northeast, this time to Fortaleza, the capital of Ceará. Along with other squatters, he put up a shack at the edge of town, enrolled his children in school, and with his savings opened a small store. But he could not make a living. He left them behind and went north to the Amapari-Araguari region of Amapá, where he worked a few years as a garimpeiro, panning for gold and diamonds.

Again with small savings, he returned for his family and took them up the Amazon to Manaus where they had access to the schools and a raft-house floating on one of the rias which back up from the waters of the Rio Negro. With them settled, he left once more in search of a livelihood, this time along the Rio Madeira southwest to Rondônia where he renewed his seringueiro activities for another 13 years.

Living most of his life in anopheles-infested jungles, he had contracted two kinds of malaria which increasingly cut his energy, far from medication to combat it. It was, therefore, a welcome offer when the tin company, CESBRA, asked him four years ago to take over the camp, where living conditions are relatively good, a pharmacy provides free aralen, and his family lives within four hours in Porto Velho.

Another seringueiro, Joaquim Pereira da Rocha, who had first discovered the tin sediments, switched to a garimpeiro operation late in 1958; that year, as in all previous years, Rondônia produced no tin. In 1959, eighteen tons trickled out from the laborious and wasteful panning process.

Usually working in teams of two, the garimpeiros shovel out the alluvium alongside or within a stream bed. In a day they may work about a cubic meter of material; it is washed and swirled in a concave receptacle, called bateia (batell), until the heavier cassiteritic sediments settle to the bottom. This crude method results in about a 40% loss of the potential within the material handled. When the garimpeiros are through, the stream area is a welter of potholes and piles of discarded impurities which make a more rational exploitation of the same bed unprofitable.

Rondônia's tin production in 1961 was still at a low of 35 tons; late that year the major private tin producing and processing enterprise of Brazil, Companhia Estanífera do Brasil (CESBRA), established a geological center in Porto Velho. About the same time, the mining concession of Jacundá, owned by Isaac Sabbá, called "King of the Amazon", began mechanizing under the guidance of the experienced



A caboclo,  
along the Jamarí River.

Dutch firm of Billiton. Production in 1962 jumped to 678 tons. Whereas in 1958, cassiterite ores mined in Brazil totaled only 693 tons, exclusively from Amapá, Paraíba and Minas Gerais---by 1965 the total was 2833 tons, Rondônia far in the lead with 2459 tons, trailed by Amapá, Minas Gerais and Goiás.

The boom is still gathering momentum. CESBRA continues to rely upon garimpeiros to feed its tin smelter in Volta Redonda. International companies have come in to investigate but, at least to public knowledge, have not obtained concessions. But tin is king, and a fervor surrounds its exploitation. Companies are beginning to dispute unsurveyed lines; garimpeiros are resorting to murder to defend their claims; the Ministry of Mines in Brasília is bombarded by high pressure appeals for concession titles.

Considerable geological sampling indicates rich reserves which could make the area a leading world producer. Recovery in Rondônia by means of placer mining is much easier and cheaper than, for instance, in Bolivia where underground exploitation of veins results in a complex ore from which other minerals must be separated. The cassiterite of Rondônia promises a 70% tin content.

But the Brazilian territory is still in the process of exploration,

in a terrain whose geological features are hidden by dense vegetation. Typical of most tropical areas of the world, high temperatures and heavy rainfall have transformed prehistoric rock into lateritic soils, usually red and acidulous. Milleniums of decomposition have greatly reduced the volume of the original rock, bringing about high concentrations and superficial deposits. Tin in this area is usually associated with granite outliers of high relief accompanied by good drainage. Transported sediments are often richest when resulting from pre-existing drainage systems, thus further complicating the geologist's work by denying him the crutch of current hydrography.

Eighty-two miles from Porto Velho, CESBRA's concession at Santa Barbara covers 85 square miles, or 54,000 acres of heavy rainforest, except for the occasional denuded outcroppings. The only aerial photography to date was made at an altitude of 70,000 ft., revealing only small hints through a stereoscope.

The geologist must, therefore, rely upon manchete and footwork to search out the deposits. After walking a promising area behind his "bush" man, he calls in the survey team to set up a grid system based upon north-south, east-west lines cut through the undergrowth. Where the soil is concretionary, pits are dug at 40-meter intervals along these lines. Channel samplings, 10 cm.<sup>2</sup>, are taken from these penetrations.

Apparently less accurate but more convenient, especially in sandy soils, are drillings made by the Banka platform drill. This portable apparatus was designed by a Dutch engineer and came into use in 1858 on the island of Banka in Indonesia. It is rugged, withstanding misuse by inexperienced workmen. In Rondônia a crew of 13 is employed for its operation. Men drive a 4" casing into the ground by means of a mallet; meanwhile, the platform on which they stand is rotated to enforce the percussion action. At 1 1/2 meter intervals, a ball-valve sandbailer is lowered to bring up samples.

Each of these steps is carried out under trying physical conditions. The geologist's favorite among his men is Paulo, his "bush" man, upon whom he depends for the original exploration. About 5'4" tall and not more than 110 lbs., he is surely almost all Indian. His slightly-bowed legs---and feet shod in calf-high rubber boots take him at the pace of the born woodsman around the world---a near trot. He leads to cut the brush; second man keeps his distance to avoid the flailing manchete. Jungle wisdom holds that coming through "the bush" with solid footsteps and determination, rather than timidity, better assures that animals and reptiles clear the way.

Tramping along behind Paulo demands a high degree of attention. The eyes seldom lift from the ground which is a spongy mass of organic matter. Every step is measured to avoid spikes and holes, and feet must be lifted high to clear roots and vines. Decaying trunks must be hurdled or skirted, and hands placed only where Paulo's have grasped so as to avoid the painful bites of the tree ants. Falls are common, Paulo himself tripping occasionally. Behind him, such tumbles are particularly dangerous as his manchete has often slashed saplings,

leaving oblique spikes sticking up a few inches.

The Amazon forest is a diffuse overlay of entangled vegetation. No plant stands free. Graduated levels of trees block the sunlight which cuts through the soft atmosphere with only occasional sharp-edged rays. The most majestic stretch upward 160 ft. to form a canopy of dark green, waxy leaves. In Rondônia the three giants are the faveira, the sumadma (ceiba pentandra), and the castanheira; the last named produces the Brazil nut, in Portuguese the castanho do Pará. A cluster of the white-meat nuts are encased in a hard shell the size of a softball; when ready, it plummets through the underlying growth with ballistic resonance. Like many trees of the Amazon, the castanheiro is deciduous, but the time of shedding and flowering varies from tree to tree.

At the intermediary height are the lesser trees, such as the babaçu palm and the quina-quina. Both have proved valuable aids to men. To the caboclo, the babaçu's chief value is its stiff frond which roofs all the huts of the area; when working in the jungle, he throws up a sideless tapirí in half a day which, slung with hammock, may serve as home for weeks. If short on food, he may also extract the tender heart. Civilization has put the yellow oil of the babaçu to use in the manufacture of soaps, cosmetics and cooking oils.

The quina-quina has an ugly, ensnarled trunk bearing a horny bark of legendary fame. A nibble of this coating is first tasteless, followed by the pursing bitterness of quinine. When suffering malarial fevers, the native strips the bark to brew an acrid tea.

One takes pity on the trees for it seems they are like the hard-working relative from whom the others of the family scrounge. At the heights are epiphytes and parasitic plants nestled in the crotch of limbs. Great mud blobs of termite nests leech onto the trunk which is further blotched by algae and lichen; boles with insides devoured and outsides rotted have discouraged the lumbering industry in Amazonia.

But, above all, this is a forest of lianas which literally hang heavy on the trees. One variety, called cipó bravo or "savage vine", can encoil its heavy roots and body around a tree until it kills it. The festoons of these climbing plants may swoop from tree to tree; sometimes vine and tree fuse into one baroque column; sometimes a vine sprouts slender and free-standing and increases in circumference, as a stalactite, until it reaches a high limb. The milky substance from most of these vines is poisonous, and only the native can pick out the one which gives an innocuous liquid, bleeding as much as a quart for every meter.

But the fatal danger for these trees is the wind and the rain. Because of soil composition and water level, root systems spread laterally and are proportionately small for the body above ground. During the wet months, October to April, atmospheric turbulences cause storms which easily uproot a castanheiro or sumadma. Its heavy

fall, wrenching a myriad other plants with it, echoes for miles through the forest. To the man in the jungle, the peril of such crushing weight far exceeds that of snakes and animals.

In the rainy season, torrential downpours come on suddenly, and at all times the forest drips and steams. In the dry season, the heat of the sun infuses the enclosed area beneath the tree cover; insects swarm. In fact, insects are the dominant characteristic of the drainage basin of the Rio Madeira. It seems that the various regions of Amazônia have their specialties among the flora and fauna, sometimes depending upon the water level---there it is animals, another place birds, yet another flowers. For Rondônia, it is insects.

Bird calls are sporadic, but the hum of tiny wings is constant. Especially in the white, still heat of mid-day, the ears are attuned to them. At all times, the skin is accosted by them.

Formigas, vintequatros, sacasaias, piúmes, aranhas, carrapatos---the Brazilian vocabulary abounds with them. Though the bites of many are poisonous and bring immediate suffering, it is the delayed effect of the anopheles which is the scourge of the country. Malaria is as prevalent as the common cold in a New York winter. Euclides' plight is repeated again and again. Paulo shrugs his shoulders about his case, brought to Rondônia from h's seringueiro days in Amazonas. New men, arriving in the camp from the malaria-free south, usually fall prey to it within a couple of months---first loss of appetite, muscular soreness and backache, compounded by high fever, chills, nausea and exhaustion. The skin turns yellowish, and the eyes take on a jaundiced film.

Though antimalarial pills have proved highly effective, even the educated Brazilian resists them or takes them only spasmodically. As with most Latins around the world, he is concerned for his figado, his foie, his liver. So he is forced to resort to the remedy, aralen, which in large dosages brings on optical malfunction. At the thatch-roofed, one-room pharmacy of the camp, an apprentice administers it by needle into the vein.

The tarantula is respected but not dreaded. He is so big, as much as 4" in diameter, that he is easily spotted and moves awkwardly. Also, he is seasonal, appearing about November, early in the rainy season.

Ants come in a wide assortment of sizes and bites. An attack by a large vintequatro does just what his name suggests---24 hours of severe pain, swelling and fever. The sacasaias move in herds but are not venomous; however, if you are in their path, they will run over you, stinging all the way. The geologist, asleep in the night, awoke with great pain and dashed for the shower to wash off the invaders. Forgetting the mosquito net draped over the bed, he fell entangled to the floor which swarmed with the voracious little beasts. In the bush, the ant trail is common, swath the width of a broom, swept as clean, all vegetation and debris devoured or carried ahead.

At the office recently constructed in Santa Barbara for assaying



ABOVE. The camp at Santa Barbara. Left to right, sleeping quarters, carpentry shop, pharmacy, dining room-kitchen, grocery store, storehouse, mule shed and sleeping quarters.

geological samples, the technicians wage a running battle with vermin. The termite ants invaded before construction was completed; table tops and floor are coated with the dust of their night's work and must be cleaned each morning. To discourage them, the rafters were saturated with creosote, but they only seemed to enjoy the added flavoring. In addition, close work with photographs and maps is practically impossible by early afternoon when tiny flies swarm around the eyes.

Piumes are minute gnats whose prick brings a blood blister. In another Rondônia camp of CESBRA, the workers always tuck their pants inside heavy socks, button down long sleeves, secure handkerchiefs under their hats to protect their necks; but their exposed hands, front and back, are a mass of blisters.

To finish off this partial list, ticks carry typhus, and, graduating from insects, bats offer rabies. The vampire bat is not a problem at Santa Barbara but at the other camp, it is a plague. Mules, the chief means of jungle transport, once attacked are usually doomed; the bats return, night after night, their bites containing an anti-coagulant that sustains a hemorrhagic wound. The blood is licked, not sucked.

It would not be doing justice to nature to leave off without mentioning snakes, although they are not the specialty of the Madeira environment. The bushmaster and fer-de-lance are habitants of Amazônia, but the snake feared in Rondônia is the sucuri or anaconda. Sloughs

dense with shrub bamboo are avoided when possible---most dangerous in water, the muscular coil around a leg cannot be escaped. Basking on a low limb, the snake has been known to use its bony head as a club to daze its victim, then join him on the ground for the final assault.

For all these hazards and discomforts, man comes to work the rubber and now the tin. The garimpeiro earns poorly, about 20 cents per kilo of concentrate, washed and sacked. But the era of the garimpeiro is passing; he is becoming the laborer in a highly capitalized and mechanized operation.

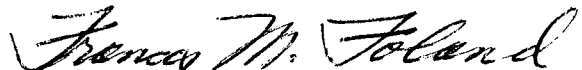
CESBRA expects to have a modern placer mining operation underway within a few months. Bulldozers are pushing back the jungle to scoop out a reservoir and pit. Machinery sits waiting to be installed. A monitor ejecting a jet of water at high pressure will scan embankments, washing tin-bearing sands and gravels into a sump. Settlings will be pumped onto a specialized sluice box, the palong, where heavier materials will be concentrated by gravity as they work down the sloping conveyor of wooden riffles. Mineral jigs or vibrating tables will further the recovery process to the point of a 60-70% cassiterite content. Sacked and loaded onto trucks, it will then jolt thousands of red dust kilometers down through Diamantino, Cuiabá, Belo Horizonte, to reach the smelter in Volta Redonda.

Waiting two hours in the Porto Velho airport for the DC-3 flight delayed from Acre, I had time to observe the two habitués of the drab, dust-covered building. One--a tall, nice-looking man of middle age--runs the snack bar, pouring quantities of beer and cafezinhos; once a successful mining engineer, he finally conceded to his rampant malaria and gave up his jungle-oriented career. The other--a man in his 30's called "the half-wit"--had vacant stare and mouth ajar. He dragged one crippled side from group to group, begging money. He had been a top garimpeiro in Rondônia, but one day a falling tree found him.

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This report is the first of a proposed series on Amazônia---to explore its characteristics and potentials. The Amazon basin occupies some two million square miles, or 60%, of Brazil, plus large parts of the Guianas, Venezuela, Colombia, Ecuador, Peru and Bolivia. There is renewed interest in the area now, and many surveys and projects are underway to try to develop it.

Sincerely yours,



Frances M. Foland

Illustration: The New Yorker  
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