

INSTITUTE OF CURRENT WORLD AFFAIRS

DRP-7

4284 Hemlock Road
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Canopy Research in Costa Rica

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Dear Peter,

In June and July I traveled to Costa Rica primarily to look over the site where the Automated Web for Canopy Exploration will be constructed. I was accompanied by Nick Nichols, a photographer from GEO magazine of Germany.

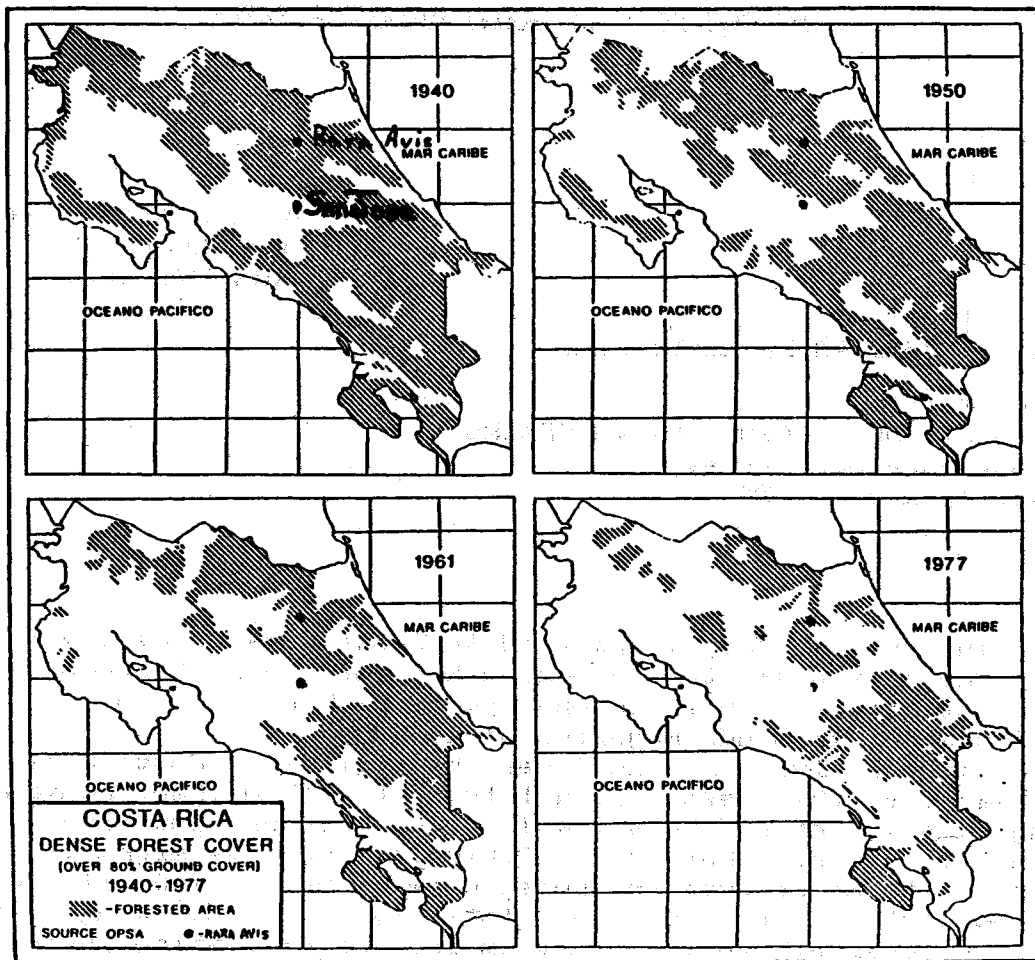
After arriving in San Jose, the capital of Costa Rica, I proceeded to the Museo Nacional to talk with Michael Grayum, a long time friend and botanist from the Missouri Botanical Gardens. He said that Carara Biological Reserve might be of interest to me because the dozen or more pairs of Scarlet Macaws living at the reserve seemed relatively tame. He thought that it might be possible to include them in a tree-climbing photograph.

Nick and I spent the next day at Carara. Almost immediately we began seeing the large, red parrots cavorting in the treetops. Unfortunately, we had no photographic success with the birds, and turned our attention to the reserve's other natural wonders.

A park guard took us for a jeep ride along a river to where large numbers of birds were feeding near a swamp. The heat was intense and I was thinking about taking a swimming when I noticed two knob-like projections drifting in the water. These were the eyes of an eight-foot-long crocodile, an animal that is known to eat large game.

The next day Nick and I went to Finca La Selva, a tropical research station owned by the Organization for Tropical Studies, on the lowland Caribbean slope of Costa Rica. In February, I had left my climbing equipment with Robert "Buck" Sanford, a tropical biologist from the University of California at Berkeley, who is doing very interesting tropical rain forest work. Buck studies roots, a subject about which almost nothing is known, and his research is changing our views about what is taking place in the

Donald Perry is an Institute Fellow who is developing a new system of access for conducting research in the tops of jungle trees.



DEFORESTATION

subterranean jungle.

It was while Buck was assessing root growth and mortality in the Amazon basin that he accidentally unearthed some very significant findings about above-ground jungle communities. Wherever Buck dug he found layers of charcoal. This puzzled him because it has been taught that lowland tropical rain forests do not burn, especially Amazonian rain forests. Buck related to me the following story about discovering charcoal in the region of San Carlos de Rio Negro in the north central Amazon Basin.

I asked Pedro Fogon, a 60 year old Bare Indian, what all the black stuff in the soil was. Pedro said, "Don't you know doctor? This is from the fire at the beginning of the world."

"How stupid of me," I said, "of course, the fire at the beginning of the world, now tell me about this."

Hours of myths resulted during which Buck began to suspect that "the fire at the beginning of the world" was not a myth after all, especially since he was finding charcoal at many locations. Dating the charcoal showed that the occurrence of fires ranged from 6,000 years ago, which predates the known time of the first human occupation of the Amazon region, to 250 years ago. Buck also found a pot shard that was given an age of about 3750 years, more than twice the age of the earliest human artifact from the interior Amazon Basin (Sanford, et. al, 1985, Science 227:53-55.)

It would be interesting to know if the charcoal layers resulted from fires that swept through large areas of the Amazon, or were the result of local and limited slash and burn agriculture. Only a few years ago, nature, combined with slash and burn agriculture, showed us just how extensively lowland rain forests can burn. In 1982-1983 climatic conditions were so dry in Borneo that traditional slash and burn agricultural methods led to innumerable small fires that quickly spread out of control into a conflagration of major proportions -- about 10 million acres were burned over a three month period (Malingrean, J.P., G. Stevens, and L. Fellows, 1985, Ambio 14:314-321.) Biological theories suggesting that tropical rain forests have existed for long periods of time in an undisturbed state must now be considered in error.

When I met Buck on this trip he had found layers of charcoal and artifacts at La Selva and was furiously collecting data to extend his theories to include Central America. I believe his work is also important because he had not set out as an archaeologist to discover antiquities (archaeologists usually work at sites already known to have been inhabited), but as a biologist to examine roots, therefore his samples of rain forest prehistory are relatively unbiased. Buck's archaeological discoveries must be considered among the most remarkable in the New World for they suggest a possible way to estimate prehistoric population densities in the Amazon and Central America while modifying our preconceptions (theories) about tropical rain forest dynamics.

I have new information about the vine, Norantea sessilis, that is pollinated by birds' feet (DRP-2.) This was collected by Manuel Santana, a field biologist who often assists with my field work. He collected this information in the silk cotton tree, Ceiba pentandra, where I had left my climbing ropes following my February trip.

Two new crucial bits of information concern when norantea flowers open, and when nectar begins to flow. This information provides clues as to whether the plant is pollinated by night-active or day-active animals. If the nectar began flowing at night for example, and that is when flowers opened, then perhaps bats would be the most likely pollinators. As it turned out, the flowers are completely open by 5:10 am and nectar begins flowing around sunrise. This, combined with field observations that birds are the first to arrive at the flowers, establishes that only day-active visitors are of importance. The structure of the flowers supports the hypothesis that N. sessilis is pollinated by birds,

however, there is some evidence that insects might be responsible for some pollination.

I had done a test in February to determine the relative importance of bird vs. insect pollination, and when I climbed the silk cotton tree in July, it was only to discover the test was inconclusive. It will have to be repeated next February.

In February I had discovered that my platform in the Monkey-pot tree, Lecythis ampla, had decayed to the point of no repair. This platform was my home in jungle trees for many trips to the tropics, so it was with some sadness that I decided to drop it to the jungle floor 110 feet below. Carlos Gomez, another Costa Rican biologist who assists me in the field, had climbed with me into the tree and he felt the same. Carlos had also regularly enjoyed the serenity and beauty of the platform's environs.

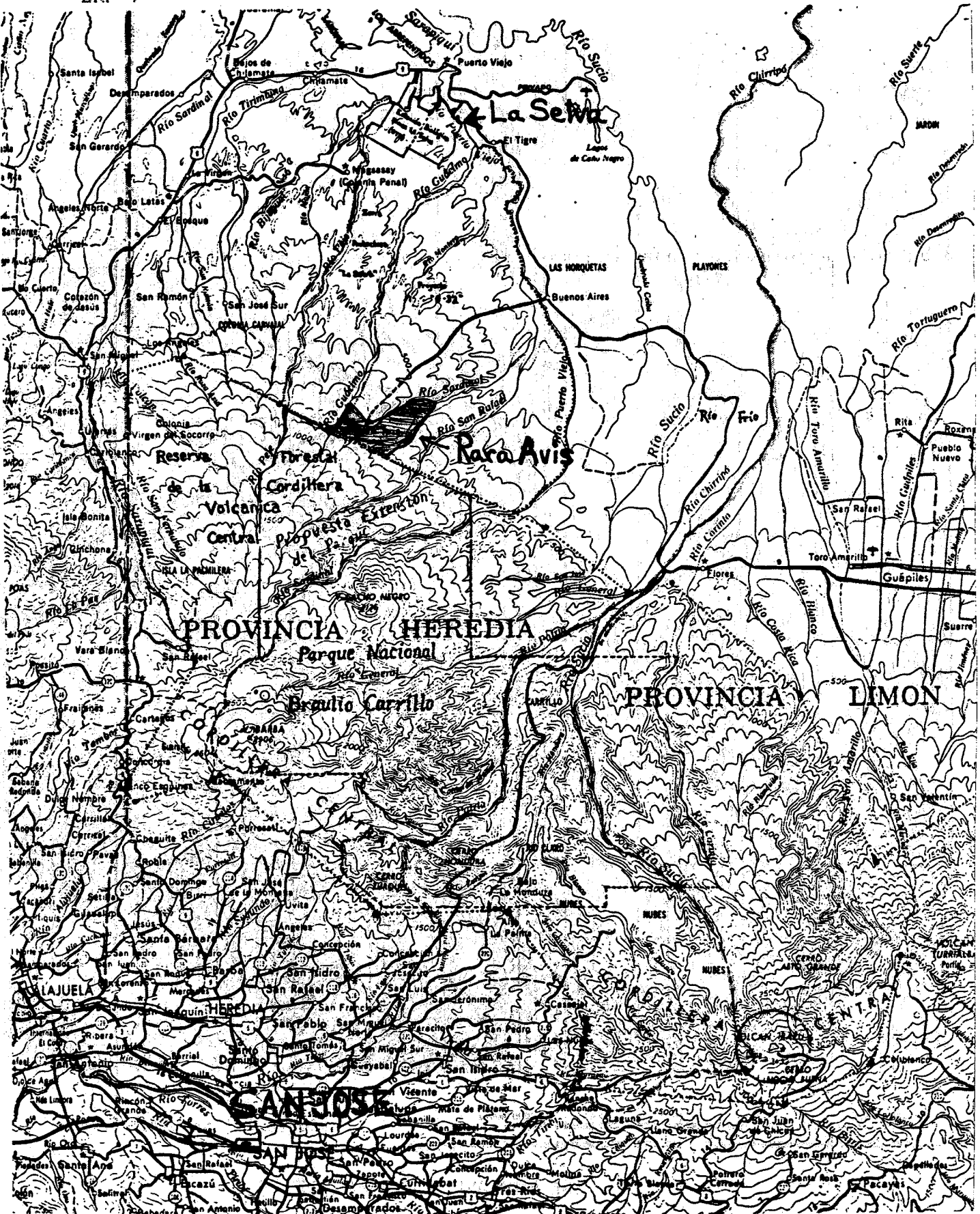
The event was all the more poignant because the future of canopy research at La Selva seemed bleak. The only other places at La Selva where one can view the canopy are at a platform and two catwalks. One of the catwalks is unsafe and will be removed, while the remaining structures have fallen into relative disuse. Tropical rain forest elements are constantly at work on canopy equipment, which must be regularly inspected if safety is to be maintained. Part of the reason for this situation is that La Selva has no one who can maintain the facilities and train people to climb. There is also a concern that the risks pose too serious a liability problem.

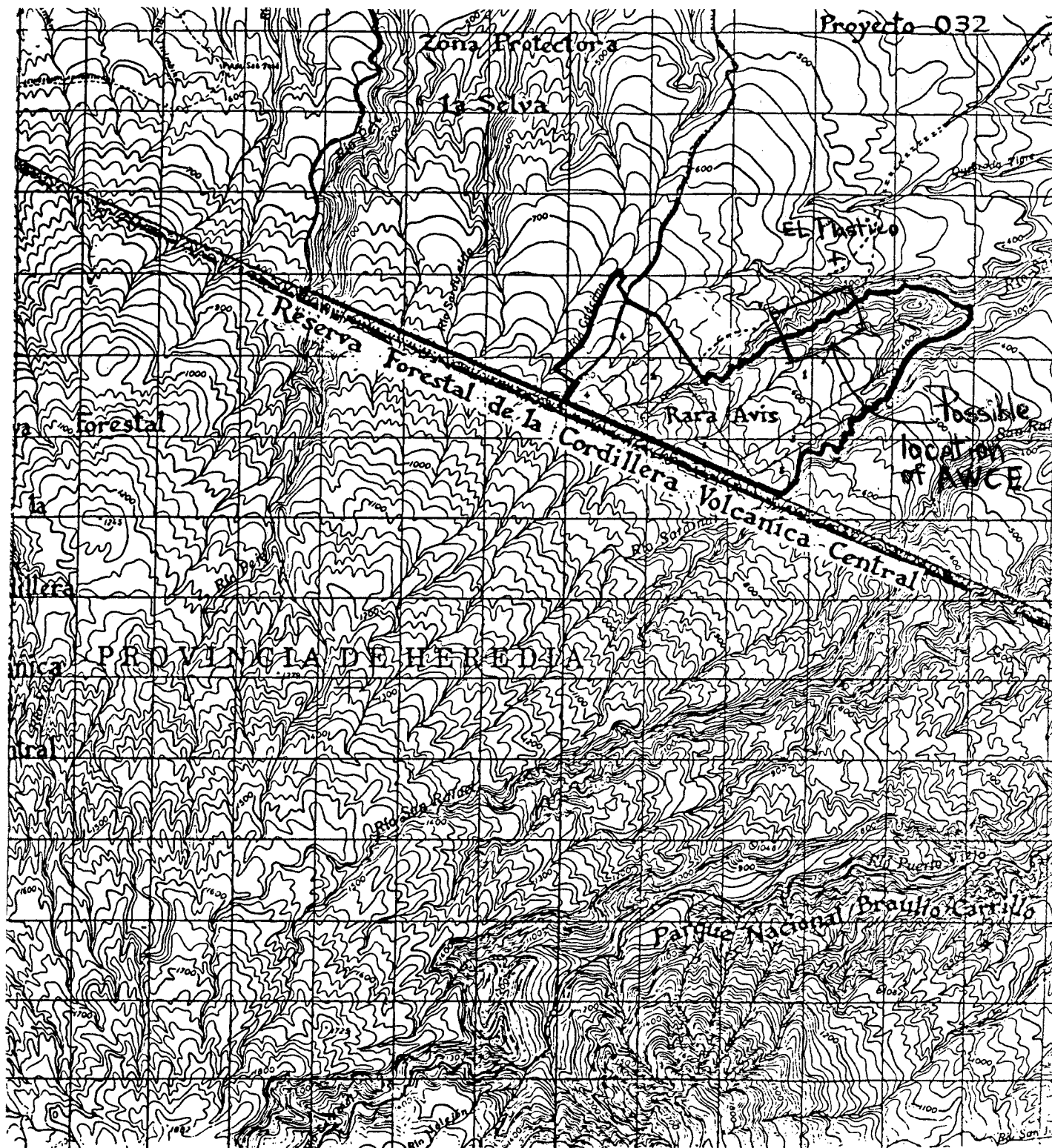
A puffbird had been watching us from a nearby limb. "Could it be," I wondered, "the same bird that years ago had entertained me when I had been on the platform?" Almost in answer the bird boldly flew up to my feet, wrestled with an insect, and then flew away, landing close-by on my aged web ropes. I felt a rush of emotion knowing this was my last trip up the monkey-pot tree.

We traveled next to Horquetas, a small settlement whose name on the map is Buenos Aires. The place is less than twenty-five kilometers from La Selva. Rara Avis, where I plan to build AWCE, lies at the end of an eight-mile-long road that begins at Horquetas (see map on page five.) The journey began auspiciously at a restaurant where we imbibed cold beer while waiting for a tractor to haul us and our equipment up the muddy hill. The January through March dry season was long over and rains had made the road impassable to all other vehicles.

Between Nick, Amos, Carlos, and myself, a large trailer was filled to capacity with equipment and supplies, and the load was precariously topped by a cargo of people, including hitchhikers. The first half of the ride was uneventful, except when we hit large bumps. The contents of the trailer were then thrown sideways, or in the air where they threatened to injure passengers.

Soon lowland pastures with their scattered remnants of virgin jungle gave way to more continuous forest where the old road ended and the new began. (In February Amos hired a bulldozer to clear a road all the way to Rara Avis.) This trip would be a premature test of the road's firmness; normally it takes at least a year for a mud road to become seasoned and firm. Steep hills became a test of the driver's skills because the tractor's bald





Contour intervals: 20 m

THE RARA AVIS SITE +AWCE

tires did not always grip the slick road surface. The front end often took the path of least resistance, and many times the vehicle threatened to slip off the road.

We began the trip not doubting that the tractor would carry us all the way to El Plastico, the farmhouse next to Rara Avis where we would be staying. But our optimism soon faded as conditions worsened, and we were forced to abandon the trailer along with some of its cargo. All essential cargo was packed in the tractor's bucket and on a cradle that had quickly been fashioned at the tractor's rear.

The advantage gained by dropping the trailer was soon lost to steepening, water-saturated hills. If the tires began sinking into mud, forward progress would be nearly halted. It was impossible for the tractor to climb out of the foot-and-a-half-deep ruts it was creating. The driver advanced by repeatedly backing downhill and assaulting the end of the rut, hoping to flatten it, but the clay merely parted like thick taffy. Amos watched this spectacle with an incredulous expression -- considerable, but not irreparable, damage was being done to the road.

My attention shifted between the driver and the antics of a drunk who had joined the ride up the mountain. When the tractor began sinking into the mud, the drunk tried to push the many-ton vehicle up the hill. That failing, he began throwing tree limbs into the tire ruts, which had absolutely no effect in stopping the tractor from sinking further into the mud. The drunk labored at the razor's edge -- he often came within a hair's breadth of being pulled under a tire and forced into the clay himself.

About two kilometers from El Plastico, the tractor finally sank to its belly in mud and would no longer move forward. We carried the gear the remaining distance on foot -- El Plastico was a very welcome relief.

The next day Nick, Carlos, and I hiked up the mountain to the waterfalls of Rara Avis where we would camp for two days. I had told Nick that the two waterfalls would make an excellent site for a catwalk that spanned the ravine and he wanted some photographs for GEO magazine.

Our camp site was a "ranchero", a roof on stilts situated on the side of a hill. When it rained, which was frequently, the water did not collect on our earth floor, but it did become slick and muddy.

I slept in an enclosed hammock strung between the legs of the roof. I left considerable slack in the support ropes, deciding that the structure would probably not take the strain of a well-adjusted hammock. The position my body took while in the hammock was the shape of a V.

Above me was a sleeping platform made of six-inch-diameter bamboo that had been split in half and nailed into a five-by-seven-foot table. That was Nick's bed, which he said was as comfortable as sleeping on a bed of drain pipes. His biggest complaint was that when he sat up, his head hit the roof. Even though Nick is an avid spelunker who admittedly should have been used to tight bunks, these close quarters were too confining for him. Carlos strung his open hammock between the other legs of the

ranchero and had no complaints about comfort. In truth, none of us had any reason to complain; the ranchero was superior to any shelter we would have built.

In the morning I strung a rope across the river. We had been warned by the carpenters who had helped us carry equipment to the waterfall that the river quickly rises and we could become stranded. The rope would allow us to forge the river if rains became torrential.

The cataracts were a couple of hundred yards away. We climbed down a steep mud and rock slope, often using roots or small tree trunks to stay balanced, and entered a lush canyon of exquisite beauty; a beauty that became breathtaking at the rocky stair-step cascades between the upper and lower falls. There, nature's roaring force was delicately contrasted by gentle mists, broad leaved plants, and two very large and shrill swifts that were nesting in the air space behind the lower falls. The canyon had an unconquered and timeless air; it was primitive and pristine.

Rara Avis is a mid-elevation forest that for historical reasons has remained relatively unstudied; most workers have concentrated their research on mountain cloud forests or lowland rain forests. Mid-elevation forests will prove equally as interesting as they no doubt house many new species not found anywhere else.

AWCE will be strung across the Rio Sardinal at one of the river canyon's narrower sections and the Hienz ground station, where canopy researchers would live, will be in the same vicinity (see map, page 6.)

During this trip it became clear that more than one canopy research site must be constructed in Costa Rica. For a few thousand dollars I would be able to build wooden platforms and rope webs, ropes that hang above the treetops and provide access to large volumes of forest in different forest types. There are several sites that warrant attention, including Carara and the Zona Protectora. Finding persons to man the platforms will not be difficult as I am in contact with a growing group of biologists who are anxious to research the jungle's roof.

Carara's animal wealth is truly impressive. This was reaffirmed a couple of days before I left Costa Rica, when I traveled back to the park with Carlos. We were considering Carara as a possible site for canopy research. On our walk we heard spider monkeys and saw white face monkeys, pale billed woodpeckers, coatis, crested guans, macaws, parrots, hummingbirds, and much more within the relatively short period of two hours.

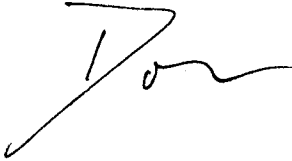
We found an ideal location for building a platform and a rope-web system in a small canyon. The large trees were Espavel, a type of jungle-cashew nut tree, and another species of tree with spiny bark. During the appropriate season, Espavel nuts are food for a wide assortment of canopy and terrestrial life.

The next phase of my project will take me to Los Angeles where I will help John Williams build AWCE and put it to test in the Santa Monica Mountains. When that is done, AWCE will be air freighted to Costa Rica, cleared through customs, and then

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transported to Rara Avis. Installation should take about three weeks.

Sincerely,

A handwritten signature in black ink, appearing to be 'Don' with a stylized 'D' and a trailing flourish.

Received in Hanover 8/11/86