



The Challenge of the

PENA COLORADA

Bill Stone

As Dr. John Zumrick, my wife Pat, and I flew home from the Huautla area in May 1982 we were feeling optimistic. We had just dived the 524-meter-long first sump in Cueva de la Peña Colorada and explored nearly a kilometer of large dry gallery leading north, towards Sótano de San Agustín. According to the computer plot we developed later, there was a 9-kilometer gulf between there and the closest known passages in the upper cave system. We knew that eventually we would have to set a camp beyond Sump II if the exploration from it became too remote. No one had ever attempted a camp of long duration beyond a sump before.

During the summer of 1982 we put

together the team for the spring 1984 return expedition. All expedition members took part in a series of three week-long training sessions. The Peacock Springs system of Suwannee County, Florida bore a remarkable similarity in size, depth, clarity, and silting conditions, and hence was chosen for the training site. Members of the team practiced techniques of precision buoyancy control, line laying, silt control, and stage-diving. All of the classroom work was administered by John Zumrick, a certified NSS cave diving instructor.

DIVE EQUIPMENT

In addition to the training opera-

tion, there was an ongoing program of research and development to produce light-weight, long-range diving apparatus for the expedition. The success of the mission was, in many ways, directly tied to the transportability of the scuba. The basic design employed composite filament-wound tanks, similar to the ones used for the dive at the bottom of San Agustín in 1981, but weighing a pound less and capable of handling pressures as high as 6000 psi. One of the greatest obstacles we faced was developing a versatile, yet standard expedition rig that could be used interchangeably among the various members of the team.

Sherwood Selpac Corporation and Acurex Aerotherm, companies that had been crucial in our use of high pressure systems in the past, again rallied behind the effort with surprising zeal. Selpac Southeast, Sierra Precision, and Rubatex contributed critical subsystems that made it all work. The result, test dived in November of 1983, was an odd-looking yet reliable piece of hardware. For the primary dive lights, we used a compact, variable-power head that I had developed over the past three years. It utilized a 30-watt quartz-halogen bulb and a separate canister of dry D-cell Nicad batteries that gave 3.5 hours operating time when fully charged. General Electric Corporation of Nela Park, Ohio and Gainesville, Florida provided forty-four of these units built to our specification.

THE WHEELS ROLL

By January of 1984, we had secured the backing of forty institutional, corporate, and private organizations. The Explorers Club of New York and the National Speleological Society granted official sponsorship status to the expedition, and Rolex USA came through with a generous grant. Seven tons of food and hardware had been amassed and were by now cluttering houses in various parts of the country. Given the size of our expedition truck and the

incredible cache of equipment in it, we anticipated severe problems entering México. So great was our concern that negotiations were initiated in the spring of 1983 with the Mexican government to secure federal permission to conduct the operation and insure our safe passage through the country.

Although the planned site for the expedition basecamp was in the municipality of Huautla, we would have to cross directly through another municipality--San Miguel Huautepec--and hire our porters and burros there for transport of the materiel down into the canyon. With Colonel David Rivera Breton of the 28th military battalion working on our behalf, presidente Alfonsín Alvarez Carrera extended us a friendly greeting and granted permission to operate in the municipality.

BASECAMP

Over the course of three days, 147 men and burros were required to move our equipment to the bottom of the canyon. An additional 36 men worked on clearing the dense jungle for the site of basecamp. Three days later basecamp was fully established. Two white 5-meter-by-9-meter custom-fabricated jungle tents housed the mess hall, equipment storage, and maintenance areas. Sets of pre-



Loading a burro for a trip down into the canyon. (Bill Stone)

fabricated tables, benches, and storage racks were assembled and the equipment and provisions were sorted and stacked. Sitting around the table that night at dinner was an unusually versatile group of individuals. Our team consisted of John Evans, Bob Jefferys, Rob Parker, Clark Pitcairn, Noel Sloan, Angel Soto, Gary Storricks, Pat Wiedeman, Sergio Zambrano, and myself, all experienced cave divers from the United States, México, and Britain. Additionally, Jay Arnold and Mark Tillman from California had signed on to produce a documentary film of the expedition. Not present that evening was John Zumrick, who was back in the U.S. finishing some tests for the Navy's Experimental Diving Unit, and who would not arrive until early March.

WORK BEGINS

With basecamp set up, we immediately began preparing the diving gear and pumping tanks. There was unspoken excitement. A group meeting was held, and it was agreed to put Gary and Clark, our best divers, in first, each with a set of doubles. All of the equipment had to be backpacked to the new canyon entrance, roughly a kilometer upstream from the compressor station. From there it was 600 meters



Rob Parker with the eight tank sled at -20 meters. (Bill Stone)

through large breakdown and mud-floored passage to Sump II.

On February 27, Clark and Gary kitted up at Sump II. As soon as Clark submerged, he could pick out the telltale reflection of a pool on the far side with his 30-watt primary light. The sump was only 14 meters long and 3 meters deep. Gary then returned to inform us of their find: a large trunk gallery took off on a northwest bearing. We gave them three hours to check it out. The rest of us then helped Jay shoot a scene entitled, "Explorers Carry Equipment to Sump II." No sooner had this been done when we heard whoops from the lake--the divers were back. They had explored some 200 meters of large diameter breakdown passage before being stopped at another sump.

SUMP III

The following day, we put seven divers through Sump II. We were on the far side of Sump II within half an hour. Clark, Pat, Noel, John Evans, and Bob surveyed from there to Sump III. Rob and I each carried a full single tank to Sump III and kitted up for an exploratory poke. The visibility was exceptional--30 meters easily--and we could see that Clark and Gary's borehole had simply continued on underwater. We leveled off at -20 meters and finned a long way. I began to feel we might have bit off too big a job for those single tanks. As we approached our one-third limit, the passage shot up a near-vertical shaft. At 190 meters penetration, we could make out a mirrored surface, and we popped up into a large lake chamber, perhaps 50 meters in diameter. The only way on appeared to be a 15-meter diameter hole in the roof, 20 meters above the lake. Rob free-climbed the pitch and took off. Thirty minutes later he returned, saying he had seen half a kilometer of 10-meter-diameter gallery and had stopped at a "whacking great chamber". Illuminating the chamber, he was unable to

discern any walls or ceiling. We returned to basecamp, intending to organize two survey parties for a long push.

WHACKING GREAT

The trip took place on March 1, after repeated supply runs through Sump II to stockpile tanks. Pat and I, the last team through Sump III, stacked our gear on a convenient flowstone bank and swam across the lagoon to the base of the 20-meter pitch. Shortly, we had a line up and were on our way. Rob, Pat, and I began surveying. Two hours later, we arrived at the Whacking Great Chamber. In the space of the next hour we barely scratched the room. The width was taped at 60 meters, but the length was pushing 200 meters. The ceiling was estimated at 40 meters. We had come into the room at the low end of a giant breakdown pile. It rose to a saddle in the middle of the room before it sloped back down into a canyon filled with big, water-scoured boulders. From a distance, it was easy to visualize the rainy season torrent boiling up from that canyon, flowing across the low saddle, and then dumping back down into the tunnel leading to Sump III.

Rob, Pat, and I pressed on with the survey down into the canyon ahead. We ran down 200 meters of 10-meter-square passage until the bedding began to dip down into the water. It looked like a sump. Fortunately, it had a meter of airspace, and we swam 60 meters to a sandy shore on the far side. The three of us looked at this big, flat, sandy area and at one another, and said almost simultaneously, "Camp I."

The passage then took on truly large proportions, 15 meters by 20 meters, and shot up a 20-degree slope. Rob extended his hands out toward the tunnel, as if he were presenting it to us, and exclaimed, "Now...this is what I came to México for!" In all, we surveyed 800 meters that day, stopping



Upper level formation passage above The Whacking Great Chamber. (Bill Stone)

at the base of a 20-meter shaft where the big horizontal tunnel went up on end at a vertical fold. Given the climb and the remoteness of the lead beyond Sumps II and III, we concluded that a camp would be necessary for any future effort.

CAMP I

Back in basecamp, we selected six of us to staff the camp. Freeze-dried food rations were then prepared for a ten-day push. Eight full tanks with regulators and backpacks were subsequently stocked at Sump III, along with some 800 pounds of peripheral equipment. To get dry gear such as sleeping bags through the sumps, we had developed machined PVC tubes with pressure end-plates and O-ring seals. Using these tubes, and a 5/16-inch PMI

handline through Sump III, Rob, Bob, Noel, John, Gary, and Clark moved into Camp I. The worst problems were the duffels of freeze-dried food, which required 135 pounds of lead bricks to get them to sink. All the containers compressed to one-third their volume as they reached maximum depth in Sump III. They were then so "negative" that 75 pounds of lead had to be jettisoned to get them off the floor. When coming out the far side, the packages re-inflated like little life vests, and the duffles would rocket up the shaft to the lagoon. By 10:30 p.m., March 5, the six of them had leveled out the site for Camp I on the sand pile we had discovered earlier.

BOREHOLE

The following morning, Rob scaled the 25-meter shaft at the limit of exploration and rigged a fixed line. They then embarked on one of the finest discovery trips yet logged beneath the Huautla Plateau. More than one and a half kilometers of gallery was seen that day, most averaging 10 meters by 20 meters in cross-section, and heading north. At the end, they had come across a 60-meter-diameter room--the Relief Chamber, named for the great vertical variation across its width. Two passages emanated from this room. One went west and sumped



The 60-meter swim through the Grand Lagoon before Camp I. (Bill Stone)

in an area of deep silt. The other went north to a 20-meter flowstone shaft. They descended this a day later, only to find that it too led into a deep blue pool--Sump IV.

Despite this disappointment, it was resolved on the spot to return to Sump III and pick up the two fullest tanks. Clark would then use these for a solo push on IV. Because of the lack of tanks this side of Sump III, Bob and Gary would return to the surface for a restock. That afternoon, Rob, Noel, and Bob finished a climb in the Whacking Great Chamber, where they discovered 200 meters of outstanding formation gallery, 10 meters by 15 meters. It contained numerous white, crystalline stalagmites towering 8 meters tall and measuring 3 meters across at their base. But it did not, as had been hoped, lead to another entrance.

SUMP IV

Late on the afternoon of the fourth day, Clark kitted up at the base of the flowstone shaft at Sump IV. This one had the cleanest entry and the greatest promise. The other sump, down in the silt mounds, had been labeled Sump IV-A. Clark's dive was a light-weight operation, relatively speaking, and was the forerunner for our modis operandi in more remote locations to come. Despite the inherent danger in diving solo, it sped up the operation and gave us the most productivity for a given amount of hauling. Special precautions were taken to allow the diver rapid access to the valving system and easy monitoring of its performance.

At 4:53 p.m. he disappeared into the blue tunnel. Noel and Rob could see the big light-beam flashing around for some time. The pool then went black, the ripples settled, and the surface became glass-smooth. They waited patiently. Two hours passed and Clark had still not returned. Noel turned to Rob and said, "Got any ideas on what to do if he does not

come back?" Rob rubbed his chin, and they stared at the sump some more.

SURFACE RECON

While the underground exploration was taking place, the surface crew began looking for new entrances. There was no lack of prospects. The canyon walls were peppered with black holes. Unfortunately, all of these were more than 200 meters off the floor, guarded by sheer, cactus-studded walls. The most spectacular hole easily measured 50 meters square. Sergio Zambrano and I came across an old Mazatec trail that led us out over the top of the big hole. John Zumrick, who had just arrived, and Pat set up an observation post on the Peña Colorada. With the aid of a pair of binoculars and a 3-watt FM transceiver, they homed us in on the target. At 5 p.m., in the failing light of dusk, I rappelled over the edge and began a 50-meter freefall descent into the mouth. The exposure was awesome, which made the discovery we were about to make all the more incredible.

I had scarcely undone my rack and radioed for Sergio to come down when I noticed something peculiar. There were two raised, circular stone platforms, perhaps 10 meters in diameter and nested one on top of the other. In the middle were two large, flat, rectangular slabs measuring 1 meter by 2 meters. At the head of each was a similar stone that was raised vertically.

We shortly went off down the big tunnel, setting a fast pace for 600 meters. The dimensions never varied--20 meters wide with a broad arched roof 10 meters overhead. It was bone dry, and there was a 2-centimeter layer of fine dust on the floor, absolutely undisturbed. The temperature began to rise sharply near the end, where the ceiling sloped down into the dirt. Just as we turned to head out, Sergio noticed three unmistakable carbon markings on the wall. We also discovered burnt wood particles from

some crude torches scattered along the floor. We were not the first explorers of this cave. No one else visited Cueva del Altar until over a month later, when Gary and Sergio returned to complete the survey. But the question remains--how had they, the ancient Mazatecs, done it?

SOLO SUCCESS

Back at Sump IV, a greenish light glimmered in the distance, and Clark surfaced to a barrage of questions. Sump IV was 55 meters long, reaching a maximum depth of only 10 meters. Beyond, there was a 100-meter-long airbell that ended at Sump V, and then things got complex. Sump V was a flooded phreatic maze at a depth of 12 meters. He had spent the majority of two hours underwater, poking in every



One of the many lakes beyond Sump VI enroute to Camp II.

branch, before he wound through the correct route. Near the end, he could make out a reflection of air-filled passage up through a narrow rift. He was 140 meters into the dive and was determined to know what was up there. A minute later his head was in the airbell, but he was also solidly wedged in the fissure. The safety line had wrapped around his fins in the struggle to back out. But he forced his way through to Chamber 6. Looking back, he could see a much wider bypass around the fissure. He re-laid the dive line through the larger route, then, in full dive gear, walked down 100 meters of passage. He came to a climb that he felt would require technical gear to scale. With this information he returned. It was an outstanding piece of exploration for one man.

Within two days the entire camp team was back at Sump IV. Since the next obstacle was a vertical shaft, it was decided to put the two best climbers, Rob and Bob, on the next push. They took along a dynamic rope and a climbing kit. Rob and Bob found a pleasant surprise waiting for them beyond Sump V. Having ditched all but their farmer-john suits and a daypack, they discovered Clark's wall to be free-climbable. For 200 meters they ascended a steeply inclined ten-meter diameter, scalloped tunnel. Then they began descending steeply for another 180 meters to another sump, Sump VI. An active stream led into a long lake, which they were able to swim some 60 meters to where another incoming shaft brought yet another active stream. Sump VI was clearly a downstream sump, and it looked deep. Rob volunteered to dive it if someone would come in to support him. But first, they decided to climb up the infeasible passage on the far side of the sump. To their surprise, it gradually opened up into another large, steeply ascending, scalloped tunnel. It was nearly identical to the one between Sumps V and VI, with the exception that there were now domes all

along the route that were dumping water into the system. Bob and Rob had scaled three pitches and run down 350 meters of large tunnel. What came next was totally unexpected--a 57-meter freefall shaft. They fortunately had a 70-meter static line along with them. Bob descended first. It was 12 meters in diameter and totally free. The rope landed in a sump, dark and deep.

SUMP VI

Three days later, Rob kitted up back at Sump VI. The dive was 70 meters long at 12 meters depth, and ended in a sand bank with an airbell overhead. There was a narrow passage going off, but the stream sank in the sand. Rob dropped the tanks and scooted up the fissure. It soon met a large canyon, and shortly he realized he'd looped around back to the beginning of the sump. Noel and Rob went back to recheck the place where the stream entered the sand. There was no possibility of following it. There were only two options left now: scaling the incoming domes beyond Sump VI or diving Sump VII.



Working on gear at the Sump IV depot during the second push on Sump VII. (Noel Sloan)

SUMP VII

On March 16, barely three days after the first camping team returned to the surface, John Zumrick, Pat, Bob, and I arrived back at Camp I for a push on Sump VII. Two days later Bob and I, assisted by John and Pat, set off for what was to be a 19-hour trip to Sump VII. I kitted up at the top of the 57-meter shaft and rappelled with the tanks, a dual front-mounted set, tethered below me. Bob assisted with kitting up in the water. In the course of two dives, I worked down through a breakdown complex to a depth of 40 meters. There the passage took off as a large, horizontal tunnel measuring 10 meters by 20 meters and crystal clear. Being solo and near my safe air limit, I called the dive at that point. I presumed that John, who was the better diver, would be up for the next push.

Back at Camp I, John expressed serious concern over attempting a deep penetration dive in VII without some unusual precautionary measures to protect the divers from a case of untreatable bends. These included: Camp II set at the top of the 57-meter shaft, now known as Sherwood Shaft, beyond Sumps IV, V, and VI; pure oxygen for decompression; a buddy; and intravenous steroids and other IV-drugs for on-site treatment of the bends, in the event that something went wrong. The divers would have to rest over an hour at the base of the shaft after decompressing on oxygen before beginning their ascent to Camp II, and would spend the night there "degassing" before heading for Camp I. The operation took place from March 24 to April 3. John Zumrick and Clark were to do the exploratory dive, with Rob and I being the designated survey/push team. We were equipped for a 40-hour bivouac beyond Sump VII. Four days into the cave, John and Clark did the dive. They reached a penetration of 125 meters beyond the end of my line at a depth of 49 meters. Clark said he was suffering

from narcosis, and he dropped the line spool in the process of tying it off. It plummeted to -55 meters and still remains there. They gave it the best we could hope for. The gallery still continues 10 meters by 20 meters in cross section, crystal clear, beckoning, and heading north.

ALTERNATIVES

John and Clark's effort had required 3000 pounds of equipment to accomplish. At that point, given the team and technology available to us, we made the tough decision to begin the de-rig. Four or five days were spent scaling up into high passages in hopes of bypassing Sump VII. Four domes were attempted, and all eventually became too tight or unclimbable. In all, we had spent twenty-three days working beyond Camp I. Camp II, set beyond four sumps, was occupied for six days. The surveyed length of the cave was 7.8 kilometers, and for all our effort we had closed 30 percent of the gap to the Sótano de San Agustín.

We spent the remainder of April scouting the Camarón and upcanyon areas, derigging the main cave, and searching for leads off 524-meter long Sump I. Two multishaft systems were explored near Camañon, Sótano del Cafetal (-110 meters) and Sótano de Don Felix Carrera (-260). Two notable caves were accessed via technical ascents up the walls of the canyon: Gourd Cave, which had extensive ancient Mazatec structures similar to those found in Cueva del Altar, and Vine Cave. The latter held great promise as the key that would lead us back into the mountain beyond Sump VII.

It was evident from the plunge pool at the base of the cliff that water had flowed from Vine Cave on a regular basis at some time in the past. Rob and I scaled the sheer 70-meter cliff to the entrance and saw some 350 meters of booming 10-meter by 15-meter gallery before coming unex-

pectedly to a sump. A day later Bob dived it with an inverted back-mounted rig and succeeded in reaching a continuation of the big gallery 120 meters away. Upon ditching his dive gear, he ran down another 350 meters of steeply descending passage before coming to yet another sump. It was big and clear, and there was a large active stream entering it. This sump went 200 meters and ended in a mud plug.

MORE LEADS

An unexplored stream-sink known as the Sumidero Santa Catarina, located in the broad valley below San Miguel, had been discovered in the spring of 1981, but had not yet been entered. What made it so tempting was



Looking out of Vine Cave towards the Peña Colorada. (Rob Parker)

that it was perched 500 meters above and 500 meters north of Sump VII. But Gary and John Evans were able to explore only 100 meters before it choked in an impassable fissure.

The Western Resurgence, another interesting lead left over from the 1982 reconnaissance mission, was explored on two solo dives by John Evans and myself to a penetration of 150 meters and a depth of 20 meters. Its course was predominantly due south, and it still continues as a 3-meter-by-3-meter tunnel with noticeable flow. However, this direction takes it into the mountain range across the Río Santo Domingo from Huautla. Thus it does not appear likely that it is a part of Sistema Huautla. We found another large spring on the north side of the river that also carried enough water to account for the system. Unfortunately, it became impassable 30 meters into the dive. The diving effort to re-explore Sump I in Peña Colorada resulted in the discovery of a considerable amount of additional underwater passage, as well as a connection to a new, third entrance. But the hopes that an offshoot branch might head west and intersect a hypothetical active stream channel never materialized.

THE CHALLENGE

So we were never able to find a bypass to Sump VII. Were the results of the effort worth two years of paperwork, a month of specialized training, and four months of tank hauling? To this I think most members of the team would answer "yes." Perhaps the most significant accomplishments of the expedition were not the distance reached and the number of sumps passed, but the advances made in psychology, logistics, and safety in the exploration of this last frontier of caving. More than six hundred cave dives were logged during the course of the expedition, with a perfect safety record. A better feel for the amount of diving done is given by the survey

Cueva de la Peña Colorada

Municipio de Huautla de Jimenez y Municipio de Mazatlan
Oaxaca, México

Sketches and tape Survey by the U.S. Deep Caving Team / The Huautla Project

May 1981

B Stone

F Stone

April 1982

B Stone

F Stone

Feb - May 1984

J Arnold

K Beschamp

R Evans

R Harber

R Miller

R Porter

F Quinn

F Quirk

N Sloan

B Stone

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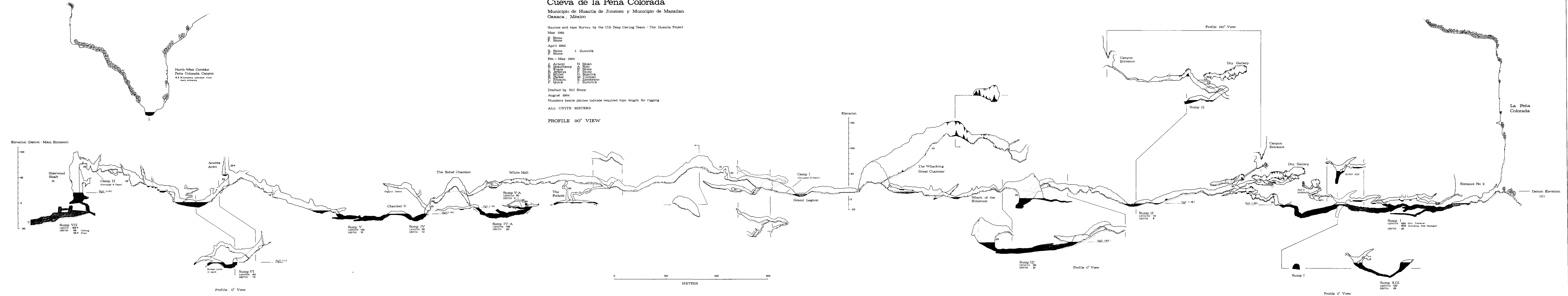
Drafted by Bill Stone

August 1984

Numbers beside pitches indicate required rope length for rigging

ALL UNITS METERS

PROFILE 90° VIEW



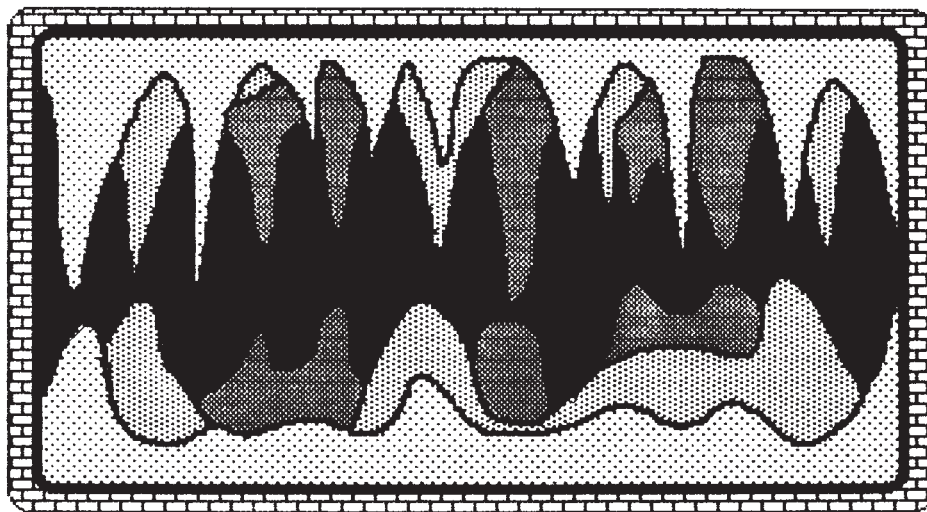
of the known caves of the Peña Colorada canyon: of the 9 kilometers charted by the expedition, 2.16, or 24 percent, were underwater. Given this percentage, is there any hope of traversing the center of the Huautla Plateau via the base level gallery? There are options, based on closed circuit scuba, open to development

that may allow us to do it, but the highly specialized long-range and redundant systems needed would probably take three to four years of concentrated effort to produce. This would, in theory, allow a small team of three to four divers to crack Sump VII, and the ones beyond, and eventually complete the dream of reaching the Sótano de San Agustín from below.

EXPEDICION PEÑA COLORADA 1984

Un grupo de 11 espeleólogos retornaró en febrero de 1984 al cañon Santo Domingo en el maciso calcáreo de Huautla. Con la meta de bucear la resurgencia de Peña Colorada y conectar así con el sótano de San Agustín, de tal manera que el grupo usó el más avanzado y sofisticado equipo de espeleobuceo. La cueva de la Peña Colorada fue explorada para 9100 metros, progresando esta vez 7830 metros en dirección de San Agustín. La exploración se desarrolla sobre nueve sifones, dando un total de 1350 metros de pasajes inundados. Debido a la longitud y duración de las exploraciones, dos lugares de acampar se establecieron. Todos los sifones encontrados han sido formados en el plegamiento del estrato calcáreo, y el estrato impermeable parece ser el responsable del resarrollo de dicho nivel acuifero.

El mayor obstáculo fue el sifón VII, pues se localiza al fondo de un tiro de 54 metros. La exploración terminó en un pasaje horizontal de 10 por 13 metros en diametro a una profundidad de 56 metros. Ocho cavernas más se exploraron con el fin de saltar el séptimo sifón. Destacandose entre ellas la Cueva del Altar y Vine Cave. En esta última se topografiaron un kilómetro, buceandose dos sifones. En los pasajes seniles de Cueva del Altar se encontraron un santuario antiguo fabricado en rocas en posición vertical. En el sección superior del maciso calcáreo se localizaron el sótano de Don Felix Carrera, consistiendo en varios tiros que terminen a 195 metros.



Barrettson