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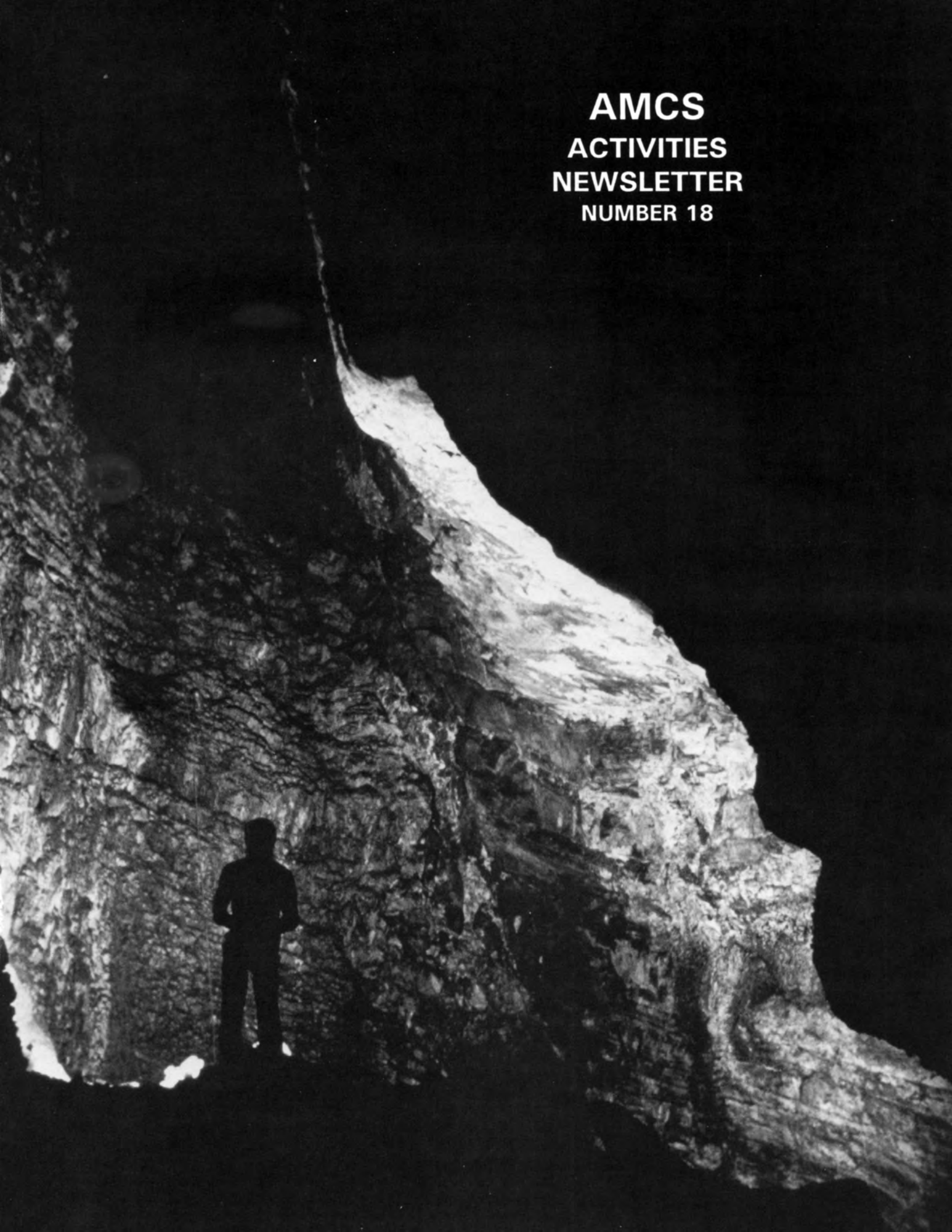

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NUMBER 18 **JANUARY 1991**

Publisher
Association for Mexican Cave Studies
with assistance from William Russell

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Front Cover
Rolf Adams at the Swim Gym,
Sistema Cuicateco, Oaxaca (Bill Stone)

Frontispiece
Bill Storage at the fifth drop in
Cueva de Agua Carlota, Oaxaca (Jim Smith)

Title Page
San Agustín, Sistema Huautla
Oaxaca (Jim Smith)

Back Cover
Brian Steele at second pitch in Nita Ka,
Oaxaca (Jim Smith)

Editorial

México remains on the forefront of world-class speleology offering opportunities to cavers, both local and international, whose common pursuit is the exploration, study and documentation of the country's many caving areas. This is reflected in the exploration and project reports submitted to this publication.

Caves that have systematically been worked over the years still yield new discoveries. Ongoing explorations in the Purificación area caves delineate the complexity and extensiveness of these systems. The secrets of the deep and extensive Sistema Huautla continue to be revealed through explorations coupled with scientific investigations. Renewed interest in known areas due to the availability of updated topographic maps or other new information, has inspired more than one trip to places that had been worked in the past as evidenced by recent excursions to Acatlán (Puebla) and Yerbabuena (Chiapas). And, even heavily visited areas still offer surprises. Explorations instigated by Mexican cavers in the San Francisco area (San Luis Potosí) resulted in the discovery of a significant new cave called Resumidero el Borbollón, noted for its 217 meter, in-cave pit. A major extension in Pozo de Montemayor (near Bustamante), makes it northern Mexico's first 500-meter deep cave.

Ventures to southern México's remote mountains have opened up some new, exciting areas. Sistema Cuicateco has the potential to be the world's deepest cave; it already claims the world's deepest dye trace. The remote and mysterious Cerro Rabón, another area of great depth potential, is being explored by a Swiss-American contingent of cavers. The Australians continue to tenaciously pursue deep caves in Chilchotla, Zongolica and near Huautla.

And, one must not overlook the major cave diving efforts in Quintana Roo where persistence in exploration and survey have resulted in the discovery and documentation of extensive underwater caverns.

Curiosity and subsequent explorations take us farther and deeper underground as we push the physical boundaries of the caves. The extremes of underground camping, technical rigging, and the logistics of cave diving are the tools necessary to push the limits of exploration. Consequently, these also press the limits of our endurance and make for a much leaner margin for error. As Bill Stone said (AMCS #6, 1977) "as the holes get tougher, then we had best get tough on safety".

Pat Kambesis

Association for Mexican Cave Studies

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Austin, Texas 78713

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MÉXICO
PLACES IN THIS ISSUE
MINAS VIEJAS
PURIFICACION
SAN LUIS POTOSI
TULUM
CHILCHOLTLA
CERRO RABON
YERBABUENA
SAN CRISTOBAL
MARGARITAS
ACATLAN
HUAUTLA
PAPALO

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MEXICO NEWS

CHIAPAS

In March 1990, Guy Meauxsoone and companions took on the exploration of the awesome river cave **Shumulá**, or **Yochibhá**, unaware that SMES cavers were planning their own assault for April. After the first two large cascades, the cave leveled out into a lake for the remaining nine hundred meters to the resurgence.

source: Ramón Espinasa

GUERRERO

In late December 1989, Australians Jim Blyde, Mark Wilson and Alan Warild spent four days looking at the Sierra Tigre (or Mojarona) near Chilpancingo. This 2200-meter-high ridge turned out to be dry and more dirt than rock. They found and marked with red paint, ten holes altogether. The best two were located about two hundred meters past two brown ponds beyond the last bend in the road before it heads off the ridge. **ST 7** was a nice shaft a hundred meters deep, and just beside it was **ST 8**, which went down five pitches to a dirt choke at -150 meters.

source: Alan Warild

SMES cavers mapped **Cueva de Agua Brava** near Cacahuamilpa in March 1990. After mapping 819 meters, they couldn't find a way on from the final chamber. A month later, in the same area, they found **Cueva del Coyote** near Mogote. Although only 248 meters long, the cave is unusual in that it is formed in Tertiary conglomerates. On September 1, 1990 they mapped **Michapa**, a 256-meter-long cave.

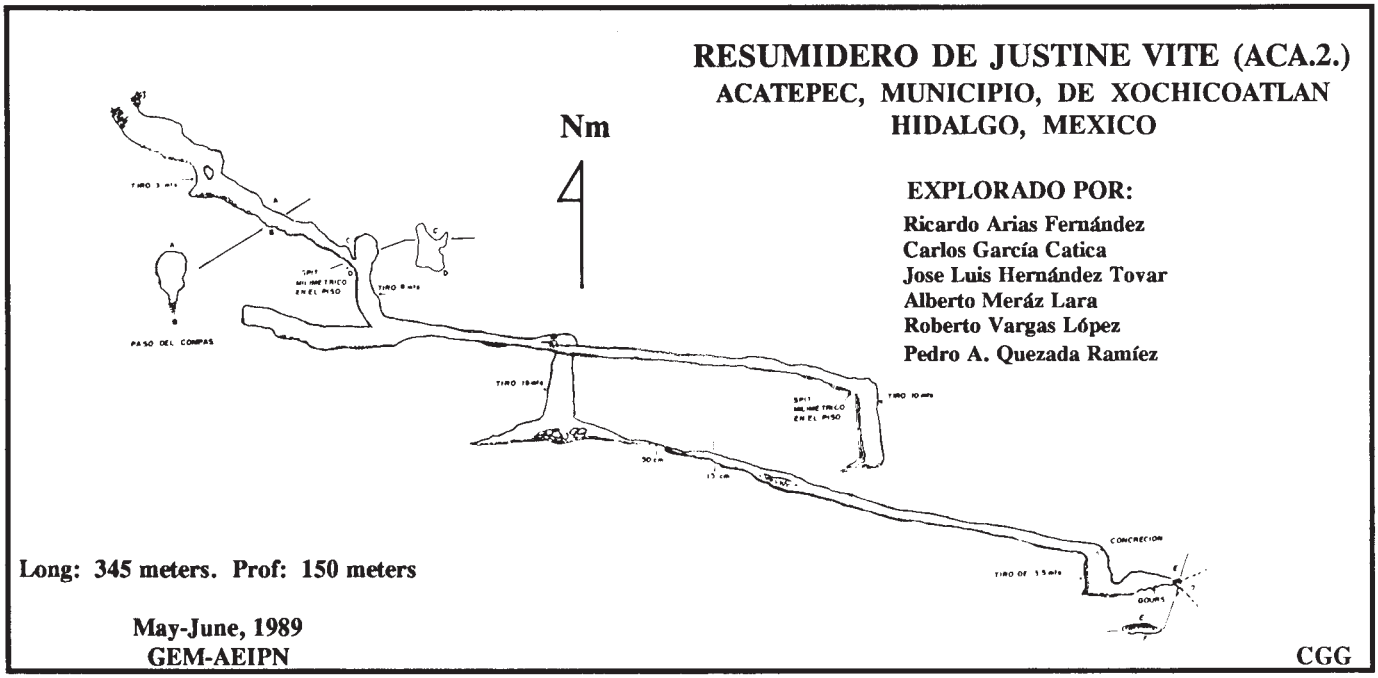
source: Ramón Espinasa

HIDALGO

In May of 1989, Cavers of the Asociación de Excursionismo del Instituto Politécnico Nacionál continued explorations in the Acatepec area, Municipio de Xochicoatlán. The deepest cave found thus far in the area is **Resumidero de Justine Vite** at 150 meters deep and 345 meters long. It is located eight hundred meters south of the village of Acatepec at an elevation of 1740 meters. The fenced, circular entrance receives local drainage, and slopes down a seven-meter ramp. The low passage leading off, drops down pits of three and ten meters to intersect a passsage about one hundred meters long. It terminates shortly in the uphill direction, and downhill goes to a ten-meter drop. This drop has a waterfall inlet, and pinches at the bottom. A small, side lead above the drop leads to a 15-meter pit over a breakdown chamber. A low, wet passage continues for a hundred meters to a five-meter drop into a room containing white gours. A continuation could be seen through a helictite-encrusted constriction, which would have to be damaged to continue.

Nearby, the AEIPN cavers explored **Cueva de Tezitla**, a vampire bat cave a hundred meters long. Near Mixtla, they descended **Sótano de El Puertecito**, an eight-meter-deep pit.

source: Ricardo Arias Fernández



compiled by Peter Sprouse

OAXACA

British cavers of the Black Holes Expedition explored a stream cave by Presa Miguel Alemán in 1988. **Agua de Mano** is three kilometers long, wet and well-decorated. Farther south, they investigated the Río Usila valley, accessible by light plane. The river cuts through a ridge at one point and portions of an underground river, totaling two kilometers in length, were explored. A large, dry, system four kilometers long called **Cueva Escalera** was found which contained numerous artifacts.

source: Bob North,
Caves and Caving,
No. 33, Spring 1989

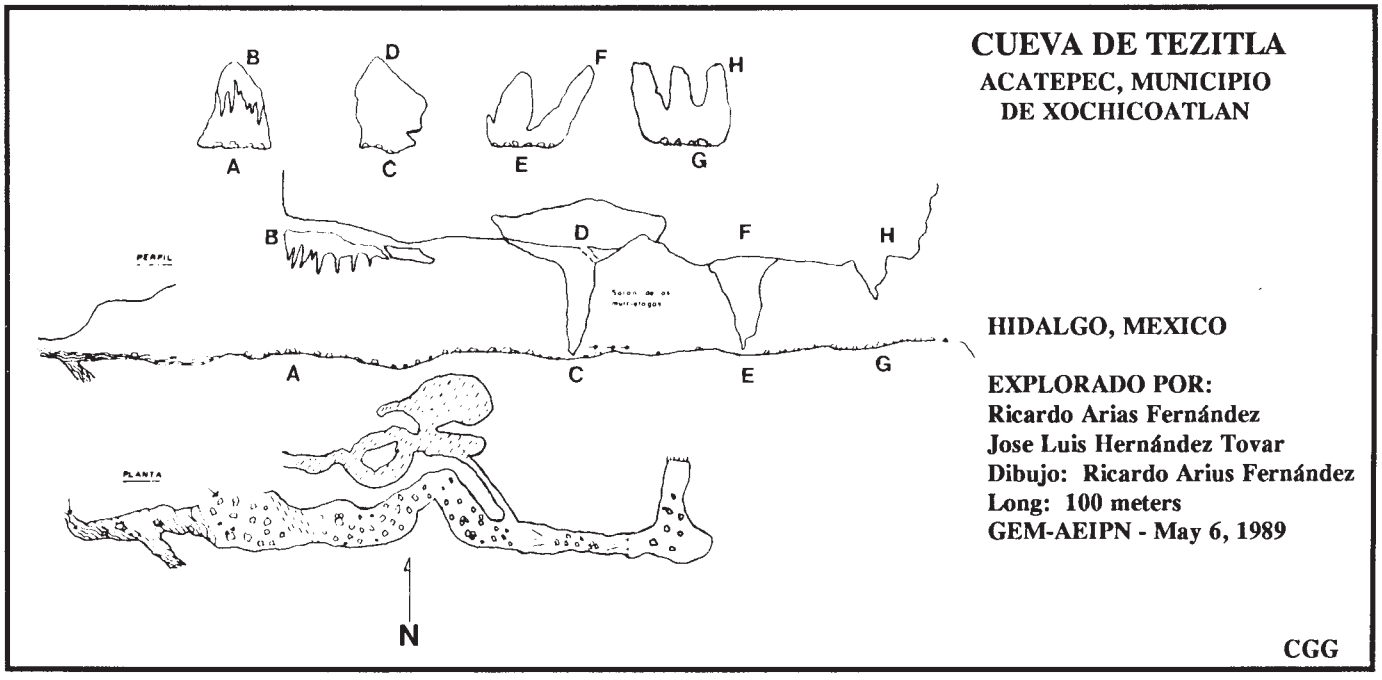
In December 1989, the Australian Santa Ana '90 Expedition checked caves around Santa Ana Ateixtlahuaca, five kilometers north of the road to Huautla. The most substantial cave found was **Xongo Dwi Ñi**, an impressive stream sink which had been explored for fifty meters to a blockage by a Canadian team in the 1960's. The Australians found it cleared, with both a wet and a dry route leading off from the entrance chamber, both which produced sporting, flood-prone caving. The "wet route" ended in a dirty sump, and the "dry route" went through some tight squeezes to a large chamber with a lake. This was the deepest point, at -443 meters, still about a thousand meters short of its presumed potential. An inlet off of this terminal chamber was followed upstream past detergent wrappers to a sump, presumably the downstream continuation of the wet route. Mapping in this cave produced 6500 meters of passage, with much remaining to do. Other caves found on the expedition were small, but some contained bone deposits and old water pots.

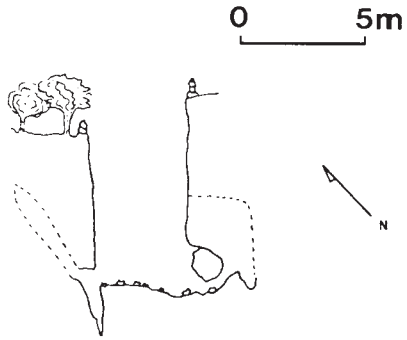
Proceeding on toward their project area at Zongolica, Oaxaca, the Australians stopped in El Eden to look at a cave in the middle of town which had been located two years before. **Cueva de El Eden** turned out to be a nasty hole running downdip along a shale bed to -276 meters. It was 948 meters long and contained giant spiders. The only other major cave found in the area was a large entrance by the new road near Santa Rosa. It was an easy walk down to a mud choke at -190 meters.

In February 1990, the Australians revisited Zongolica for "one last bash", finding instead, enough leads for two more expeditions. They only had time to explore two caves. **Nia Quien Nita (Dead Dog Cave)**, which had been explored in 1988 to -175 meters, was extended to -750 meters. It was mapped to 3100 meters in length with several big pitches, large streamways and unchecked leads. **X'oy Tixa (Man Hole)** was not as nice, but seemed likely to produce the area's first 1000-meter-deep system. However, it got progressively worse down -813 meters in only 1124 meters of traverse length, with one lead remaining for the next expedition.

source: Alan Warild

A pit near Chicahuaxtla, west of Oaxaca City, has apparently been used as a suicide hole for generations of Trique Indian women





SOTANO DEL PUERTECITO

COMMUNIDAD DE MIXTLA
Municipio de Xochicoatlan, Hidalgo, Mexico

Explorado por:

Ricardo Arias Fernández
José Luis Hernández Tovar

GEM-IPN 5-Mayo-1989

Prof: 10 meters
Long: 8.5 meters

CGG

distraught by family problems. In the past 25 years, eight women have allegedly cast themselves into the 16-meter-deep entrance pit to **Dúa Nún**, the most recent on December 23, 1989. Caving elements of the Cruz Roja Mexicana from D.F. pulled the latest body out, but the remains of the previous victims had never been recovered until a group of U.S., Mexican and Canadian cavers explored the cave in October 1989 and January 1990. They removed the bones and handed them over to the locals.

Beyond the first drop they found a loose slope leading to a second drop of nine meters. This was followed by a ten-meter drop to a muddy breakdown area filled with garbage, including suspicious red shreds of women's robes. Several difficult climbdowns through the breakdown led to the sheer, fourth drop of 38 meters. This landed in a large room containing a deep fissure. Here they picked up the survey on the second trip, with Raul Puente rappelling into the six-second fissure. Partway down the pitch, a rock peeled loose cutting open Raul's left forearm. With arm wrapped up, he made it out of the cave with some assistance, and was driven to a clinic in Oaxaca where he received twenty stitches.

Upon their return, the group was told by local officials that they had to leave. The locals were convinced that the cavers were removing gold from the cave. They got permission only to do a short trip to de-rig the cave. Hurriedly, they set about trying to bottom the cave. Greg McNamara descended the fissure which is broken by five major ledges into drops of 25, 30, 10, 36, and 15 meters. Below, the cave ended at a sump in a small, mud-covered room at around -251 meters.

source: Greg McNamara, *CIG Newsletter*, March 1990

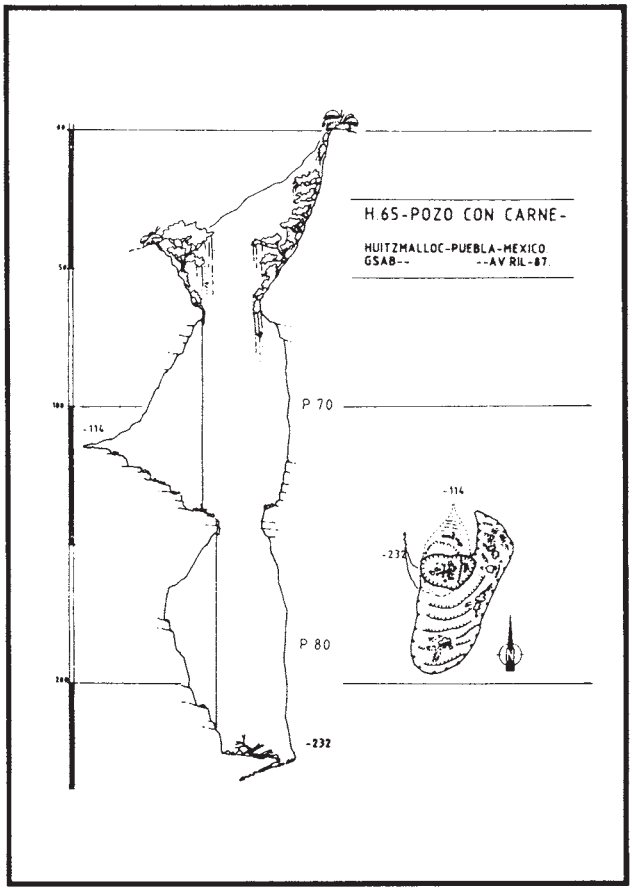
The 1990 Proyecto Pápalo expedition to **Sistema Cuicateco** succeeded in increasing both the length and depth of the system, as well as producing major finds at the resurgence level. Via the **Cueva Cheve** entrance, Camp III was set at 1100 meters depth and seven kilometers back into the cave at the breakdown which had stopped the 1989 effort. Several passages were pushed past this point. Some resulted in loops, while one went down to rejoin the main stream. This sumped at a new depth for the cave, 1340 meters below the highest point in the system. However, the cavers were unable to follow the wind, which is lost somewhere in the breakdown. Near the Cheve entrance, a climb in the Surprise Stream resulted in seven hundred meters of new passage that still goes.

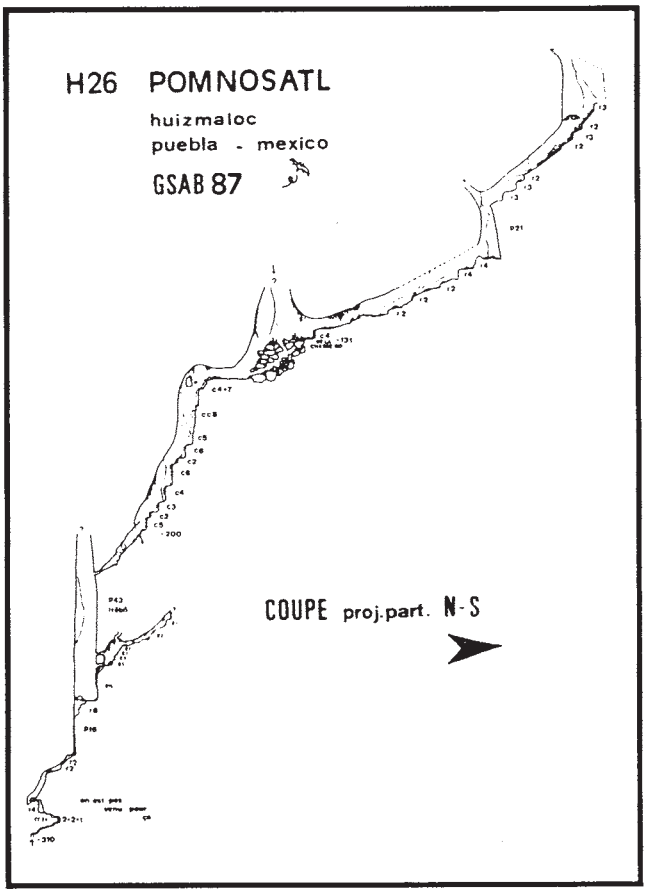
In the high karst above Cheve, **Cueva del Viento Frío** was pushed beyond the previous terminus to a depth of two hundred meters, resulting in a connection into the **Osto de Puente Natural** section of Sistema Cuicateco, which is now 20,415 meters long. The two entrances to **Cuates** were joined to the three **Escondido** entrances, forming a system a thousand meters long. A fissure passage at the bottom of a 115-meter pit in Cuates-Escondido is within twenty meters of connecting to an upstream lead off of Mondo Pit in Osto de Puente Natural. This connection would add 25 meters to the depth of Sistema Cuicateco.

Jim Smith conducted a successful dye trace from Cueva Cheve to the **Río Frío de Santa Ana** resurgence on the Río Santo Domingo. The dye took three days to reach the cavers at Camp III and, after eight days, cavers saw the dye color the Santa Ana resurgence. The dye travelled 17 kilometers horizontally and 2400 meters vertically, making it the deepest dye trace in the world.

Eleven cavers worked on the caves around the resurgence. Bill Stone had previously done a dive at that site, referring to it as the

Bat Junction in Cueva del Mano (Carol Vesely)





Western Resurgence. He had surfaced in a pool inside **Cueva del Mono**, which has now been connected to the largest of the resurgence area caves, **Cueva del Mano**. Cueva del Mano is situated just above the resurgence, and has been mapped to a length of 6630 meters and a depth of 110 meters. It has some large passageways and is well-decorated with helictites, anthodites and flowstone. The cave contains several sumps and progresses about a thousand meters into the mountain toward Sistema Cuicateco. A tiny, blowing crack was found in the White River Passage which is in close proximity to **Cueva de Buenavista**. This cave has three hundred meters of large formation passage. To the west of the resurgence, about five hundred meters was mapped in **Cueva Mariposa**, an overflow route for the spring water.

source: Carol Vesely

PUEBLA

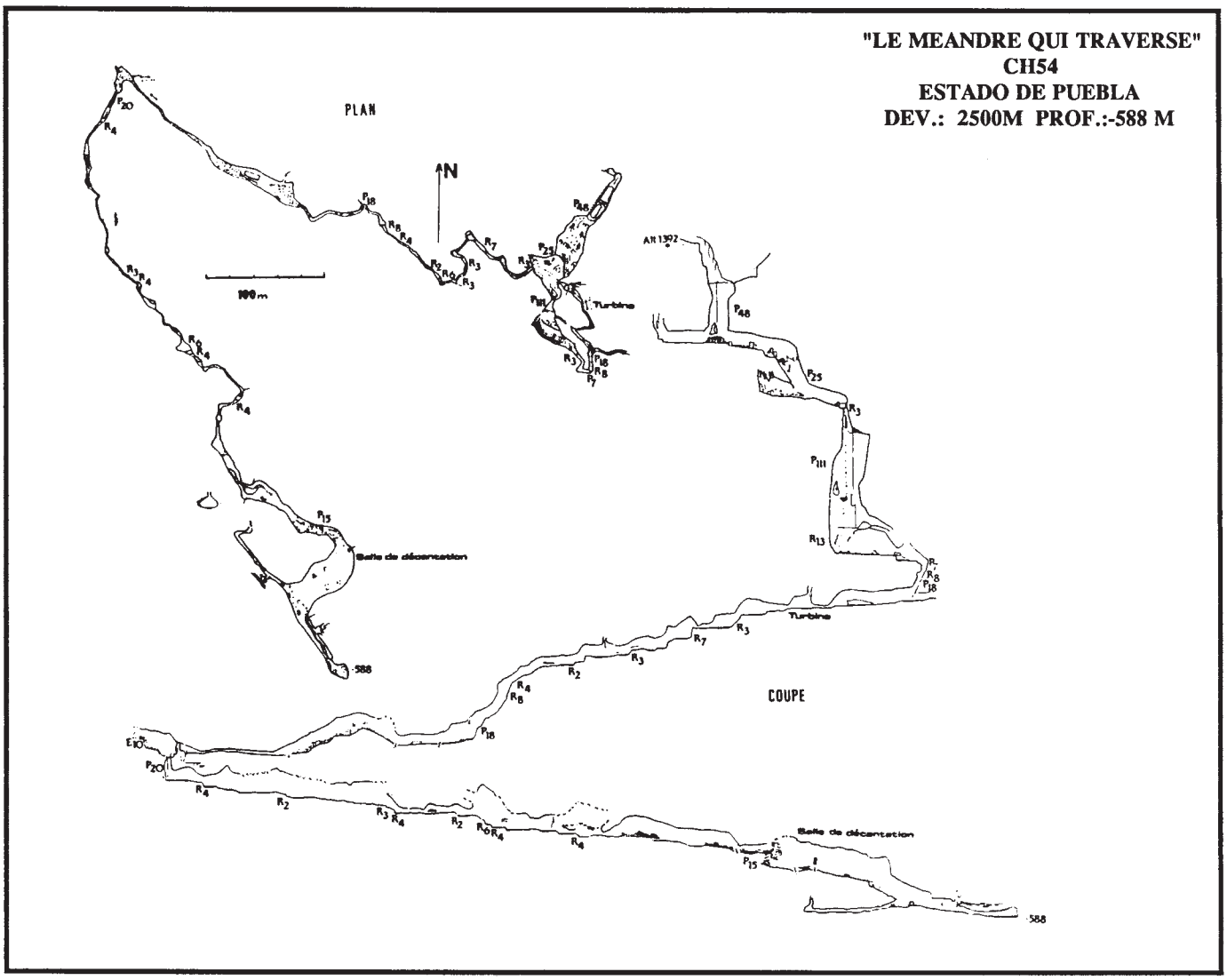
Six cavers of the Black Holes Expedition were shown the entrance to **Cueva Yohualapa** while investigating the Coyalapa valley in 1988. Two survey teams mapped 180 stations, prompting them to move their base camp from Comalapa, Veracruz. In their final week in México, they mapped eight kilometers in this cave before they had to leave. They were also shown other caves nearby which had strong airflow.

source: Bob North,
Caves and Caving,
No. 33, Spring 1989

Members of the GSAB 1987 Expedition to Mexico concentrated their efforts in areas within the states of Puebla and Veracruz. They explored and surveyed ten caves over four hundred meters long or two hundred meters deep and mapped 15.8 kilometers of passage. In addition, they mapped or located 56 other caves for a total of 18 kilometers during this expedition.

One of the caves discovered during the GSAB 1985 expedition was Aztotempa. They returned to that area in 1987 and found several caves nearby. **Aztutla** is located in a valley below Aztotempa. A good size river flows into the large entrance and down a thirty-meter pit to a room. Several hundred meters of passage eventually led to a sump at -177 meters. Total surveyed passage is 470 meters. The large entrance to **Pomnosatl,** another cave near Aztotemp, is obscured by thick vegetation. Hoping to make a connection to Aztotempa, expedition members made three trips and surveyed 560 meters of passage to a depth of -310 meters. However, a connection was not found.

Sistema 35 is situated three hundred meters from Aztotempa, on the other side of the doline. It was the largest cave explored in this area and is accessed through several entrances. The passage within attains dimensions of twenty by thirty meters and trends downdip to the four hundred meter level to an eighty-meter pit. GSAB members descended the pit and upon reaching the five-hundred-meter depth, discovered large stream passage. The upstream section quickly ended. Sumps at -746 and -753 meters terminated the downstream passage. Returning to the eighty-meter pit, the explorers found more passage which continued down-dip to -610 meters. Efforts were stopped at the top of a 15-meter pitch with no discernable air movement. A total of 4070 meters of passage was mapped, most of it ten to 15 meters wide and reaching a depth of -753 meters.



Another significant find was **"Le Meandre-qui-Traverse"** (Canyon Which Cuts Across.) This cave is developed on a fault which can be observed in the entrance doline. The route follows canyon passage down 35 meters to a 48-meter pitch. A stream flows along the axis of the fault taking a multi-drop route to reach a lower level. The cavers discovered a series of waterfalls and followed the very wet, vertical passage to a depth of -350 meters. The water flows into breakdown and the passage becomes larger. At a depth of four hundred meters, they found an L-shaped room and a small infeeder which issued a strong wind. The northwest trending passage leaving the room was not explored. They continued southeast to a narrow canyon which ended at a sump at -588 meters. The explorers ran out of time and were unable to finish mapping the remaining side passages: surveyed passage to date totals 2500 meters.

Locals told GSAB members of **Pozo Con Carne**, a 190-meter deep pit. One of them lost a mule to the pit at one time. The cavers bottomed the pit and discovered a large breakdown cone, covered with vegetation, leading to a low point at -232 meters. They also found the skeleton of a mule.

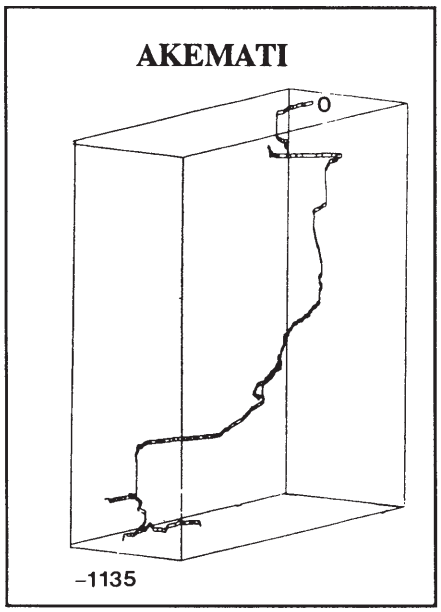
They returned to Pozo Verde, the deep entrance drop to **Sistema Ocotempa**. The original GSAB survey had shown it to be much deeper than the 221-meter and 81-meter pitches measured by Terry Raines. They rigged their original route and re-measured the pit. The results came to within forty centimeters of Raines' measurements.

source: Richard Grebeude
Regards 4, 1988

In 1989, GSAB conducted their eighth expedition to the Sierra Mazateca. Five cavers spent a month working the resurgence zone around Oztopulco, mapping over ten kilometers in various caves. **Atlixcalla** (formerly **Tamazcalco**), which had been mapped to 3200 meters length in 1985, was increased by 8500 meters to 11,700 meters. It is a temporal resurgence with river passages and several sumps. **Xantilco**, explored previously to -161 meters, was pushed to base level at -280 meters. Possible resurgences include **Topizalt** or more likely **OZ9**.

source: F. Saussus
Regards 5, 1989

GSAB continued a year later with Proyecto Tzontzecuiculi '90. A higher entrance to **Akemati** was found, called **Akemabis**, was



ZONE PRINCIPALE		
Nom	Profondeur en m	Développement en m
AKEMATI	- 1 135	3 750
SISTEMA DE OCOTEMPA	- 1 070	4 720
SISTEMA H31-H35	- 753	5 745
AZTOTEMPA	- 700	4 000
SISTEMA ATLALAQUIA	- 623	4 530
MEANDRE QUI TRAVERSE	- 588	2 500
SISTEMA H3-H4	- 430	1 300
POMNOSATL	- 310	560
SUMIDERO DE CAMPO NUEVO	- 309	824
SOTANO ATLALAQUIA	- 285	* 470
OC 8	- 264	300
CUAUBTEMPA	- 232	* 250
AZTUTLA	- 177	420
SOTANO DE LA MYGALE	- 161	212
OC 2	- 150	* 150
OC 4	- 150	* 150
HU 20	- 116	* 120
HU 2	- 102	* 115
OC 30	- 100	140
MONTITLA	- 71	1 020

* grand puits

RESURGENCE		
Nom	Profondeur en m	Développement en m
COYOLATL	+ 240	19 000
ATLIXICALLA	232 (- 140, + 92)	11 120
CUEVA XANTILCO	- 161	801
CUEVA DEL RIO TOPIZATL	50 (+ 33, - 17)	1 290
ZONE SUD-OUEST		
QUIPA XITLAMA	- 339	450
SOTANO DE RIO COYOMEAPAN	- 337	3 900
SUMIDERO DEL RIO XOCOTLAT	323 (+ 15, - 308)	1 500
AQUIDOUCI	- 235	650
CUEVA DE LAS RANAS	- 135	500
ZONE NORD		
SISTEMA ICTLATLELA	297 (+ 13, - 284)	1 835
SISTEMA HOLJUAZTLE	- 204	1 630
CORRALCO	- 180	550
AL 7	- 71	800
LA BORRACHON	- 40	600

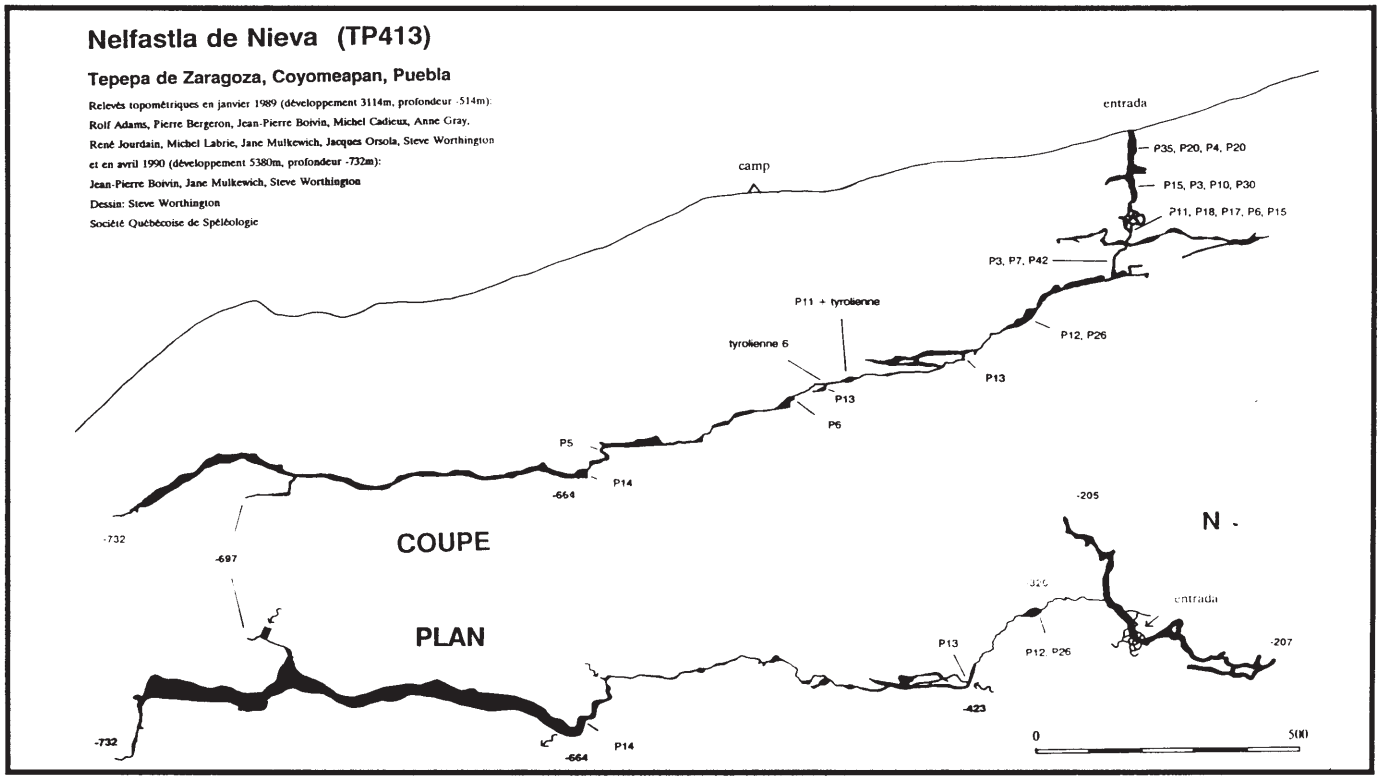
GSAB EXPLORATION IN THE SIERRA MAZATECA

explored to -1015 meters at the edge of a forty-meter drop. This cave is considered hazardous due to loose rocks and flood danger. Also explored was a tight and muddy cave to a depth of -582 meters.

source: Ramón Espinasa

Four Canadian cavers continued the exploration of **Nelfastla de Nieva** (formerly **Olfastle Niebla**) in the Sierra Negra in April 1990. The group included Marc Boutin, Jean-Pierre Boivin, Jane Mulkewich and Steve Worthington. They had difficulty gaining permission to explore from the authorities in Tlacotopec de Díaz.

In Nefastla de Nieva, the main streamway was pushed until it disappeared in breakdown at -664 meters. At this point a large horizontal passage took off. It pinched after eight hundred meters at a new depth of 732 meters. Another vertical cave, called **Nelfastlagótelt**, continued with a streamway to -281 meters, where it got too tight.



In both of these caves, the cavers had to wait out sudden floods caused by episodes of ten-centimeter rains on the surface. In the first incident in Nefastla de Nieva, Boivin and Worthington were coming up the streamway when the flow increased twenty-fold. They managed to get up two pitches before being stopped at a third. They slept overnight on a dry ledge, huddled in emergency blankets until the flood subsided the next morning. The second flood was in Nelfastlagótelt, where Mulkewich and Worthington were forced to wait by a waterfall for 11 hours.

source: Steve Worthington

QUINTANA ROO

Dive exploration continued in **Cenotes Dos Ojos** (see AMCS AN 16) in August 1989 after a 16-month hiatus. Porters were hired to ferry over 130 kilograms of gear to this remote, underwater cave system. Entering the West Ojo, Jim Coke and Lorie Conlin explored six hundred meters of west-trending passage. Two sumps were passed with unexplored dry passages going off in between. Exploration stopped in large, going passage when they ran out of dive line and surveyed out. This took three and a half hours and they reached a maximum depth of 11 meters.

The **Maya Blue** portion of **Sistema Naranjal** is still going great. Until recently, little had been done in the north and west portions of the cenote due to depth and remoteness. But in April 1990, a new passage was explored connecting the main line (A Line) to the F Line. Previously the remote F Line in northern Maya Blue required a long decompression stop. Now it is easy to reach and two boreholes are waiting to be explored.

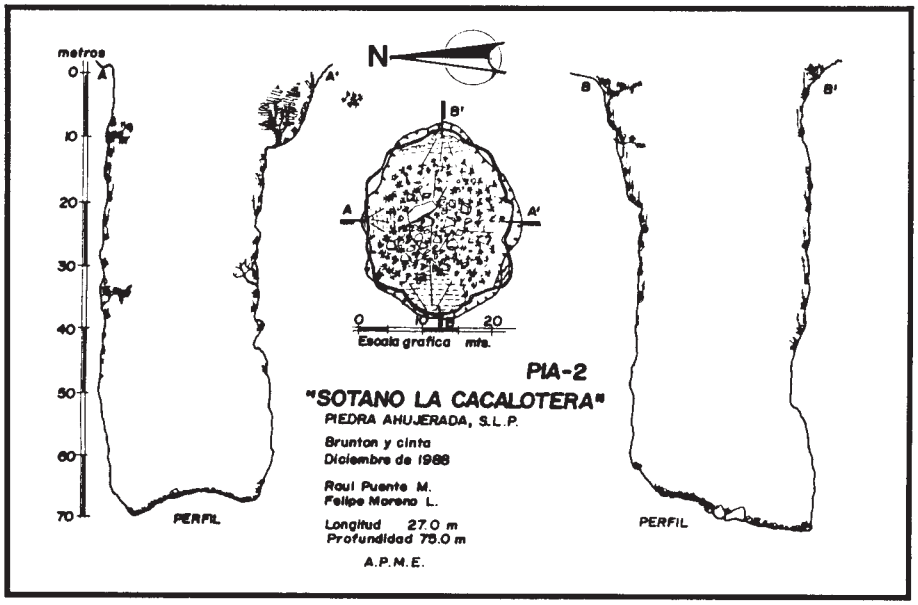
Cave divers Wes Skiles, Peter Butt, Kelly Brady and Tom Morris, have mapped over 3900 meters in **Cueva Burrodromo** and associated cenotes near Playa del Carmen. In their last expedition in spring 1989, one water-filled pit was found to have water layers of distinctly different chemical composition. A zone of strong hydrogen sulfide was passed which blocked all daylight. At a depth of thirty meters, the team broke into pure saltwater. This section had abundant cave fauna and continuing passage. The halocline prevented the mixing of the surface pool fauna and the saltwater fauna.

source: Jim Coke

Sótano de las Guacamayas (Peter Sprouse)

Nohoch Nah Chich is currently Mexico's longest underwater cave at 10,363 meters. Following their phenomenal 1988 progess in the upstream route, divers of the July 1989 Nohoch Expedition decided to surface and locate the "Dinnerhole" entrance (see AMCS AN 17) in order to lengthen scooter ranges. Mike Madden dove the 1100 meters to the Dinnerhole, climbed out, and blew on a bull's horn for an hour until the surface crew found him. The rancher's sons then spent a month cutting a horse trail to the new entrance and building a ladder and pulley hoist for lowering dive gear. Madden and Steve Gerrard did four scooter dives to push the upstream end to 2900 meters penetration. They motored to the end of the 1988 line on spare bottles, parked the scooters and donned their fresh, double 104 tank rigs. Pulling huge dive reels, they quickly entered a huge, beautiful dome room. Even after laying 2700 meters of new line, they could not find a main way on through the swiss-cheese maze. But the seventeen dome rooms they found were stunningly decorated.

Meanwhile, Bill Carlson and Tony Young worked on leads within reach of the Dinnerhole, using stage bottles. They found two significant passages which eventually petered out. On the downstream side of the Nohoch Cenote, these two divers pushed past the previous nine hundred-meter limit



for an additional six hundred meters. The passage still goes, and a pristine room with an exit to the surface was found.

source: Steve Gerrard,
Underwater Speleology,
November-December 1989

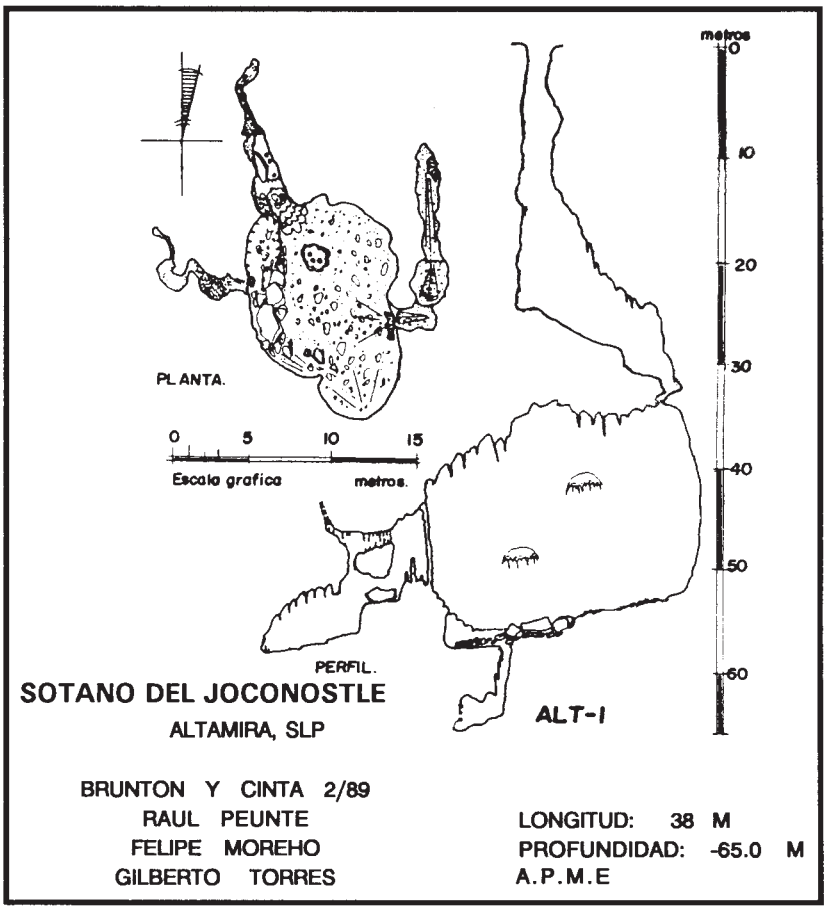
On June 19, 1988, two divers entered **Cueva Chacalal** in Chacalal Lagoon, near Akumal. They were not trained in cave diving, but intended to recover SCUBA gear left from a double diving fatality of May 3, 1987. Using improper diveline techniques, they were sixty meters in when the rear diver panicked and retreated to the entrance with the dive reel. Expert cave diver Jim Coke was summoned and the first diver's body was located. He had run out of air and evidently panicked, since his "fingers appeared to have clawed at the rock."

source: Steve Knutson, Mike Madden,
NSS News,
December 1989, Part II

SAN LUIS POTOSI

Cavers of the Asociación Potosina de Montañismo y Espeleología (APME) continued exploration in the Sierra de Alvarez east of the city of San Luis Potosí. They have explored fifty caves in this area including **Sótano La Cacalotera** and **Resumidero El Borbollón**. The latter has an entrance drop of 217 meters and reaches a total depth of 678 meters. Exploration was by an expedition which included cavers from Mexico, Canada and the United States. In the Altimira area they mapped **Sótano del Joconostle**. Caves surveyed near Las Rusias include **Sótano de Las Rusias** (-46 meters) and **Sótano de las Cuatesones** (-25 meters). Finds in the Valle de los Fantasmas area include **Sótano de las Llantas** (-76 meters), **Sótanito de la Lagartija** (-21 meters) and **Cuevas de los Eucaliptos Nos. 1 y 2.**

Farther east in the state, APME cavers Juan Cancino and Jesús Rodríguez discovered a new lava cave, called **Cueva de los Pastores**, located four kilometers south of Cárdenas. The cave consists of two interconnected levels. The upper level is about 2000 meters long, five to ten meters wide, and up to twenty meters high. The lower level goes for more than 2500 meters and is ten to thirty meters high. The two levels are connected in three places by collapses. The cave contains a large bat population. In many places the floor is covered with guano and the smell is quite strong. The APME began a survey of the cave in February 1990.



source: Raul Puente Martínez

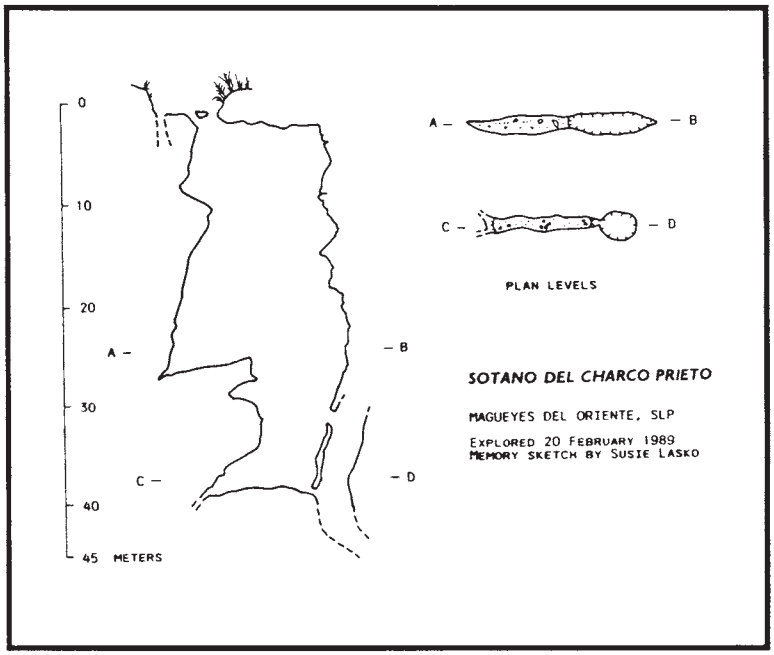
On February 20, 1989, a group of Austin cavers explored several caves south of Magueyes del Oriente, Municipio de Cuidad del Maíz. Allen Cobb, Susie Lasko, Barry Marks, Peter Sprouse and Cathy Winfrey were guided onto the Sierra Zarzamora, first exploring two small caves, then another which was said to have been used by bandidos a century before to dump their victims' bodies. Indeed, a human jawbone was found in the dirt floor of **Cueva de los Muertos**. Nearby, they descended **Sótano del Charco Prieto**, a fissure that dropped 26 meters to a ledge, then another 14 meters to a blowing constriction. Rocks bounced down another drop beyond.

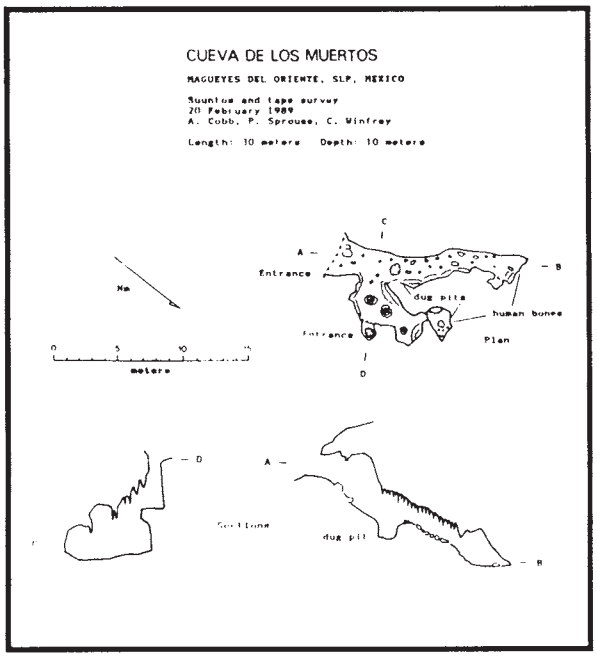
Near Xilitla, some of the same Texas cavers explored several caves in May and September 1989. Continuing work begun by West Texas cavers in **Sótano de Apetzco**, they went down the third drop of 15 meters to discover a large breakdown chamber, Xilitla Hall, at a depth of 130 meters. With help from SMES cavers from México, D.F., three more drops of 8, 45, and 15 meters were descended to a collapse at -245 meters. A large pit east of Tlamaya that had been seen on aerial photos, **Sótano de las Guacamayas**, was located and explored. It is about two hundred meters in diameter, with a high-side drop of a hundred meters and a low-side drop of twenty meters. Total depth is 150 meters. North of La Soledad, 34-meter-deep **Sótano de la Ladera** was mapped.

source: Peter Sprouse

A new survey of **Sótano del Tigre** was begun in December 1989 as part of Mexpeleo '89 activities. It had been mapped twenty years previously to a length of three kilometers, but a map was never made. About 1500 meters were surveyed in the new effort, with new side passages discovered as well.

source: Bill Farr,
The Texas Caver,
February 1990





A survey was also begun in the **Cueva del Aire-Cueva del Brujo System**, a complex cave near Huichihuayán. The entrance areas had been mapped in the 1950's by Federico Bonet and others, and the caves were connected in 1973. A group led by Carol Vesely first mapped the Aire portion, getting into the large sloping formation chamber that leads to Brujo. Although the survey is incomplete, over four hundred meters have been mapped thus far.

source: Carol Vesely,
The Texas Caver,
February 1990

A group of Canadian cavers explored a number of caves in the Xilitla area during and after Mexpeleo '89. Continuing the exploration of **Sótano de Tampemoche** (AMCS AN 16, p.13), they descended two drops to bottom the cave at -142 meters. East of Tlamaya they explored a number of new pits, including **Scorpion Pot**, 73 meters long and 26 meters deep, **Sótano CAN2**, a 25-meter-deep pit and **Sótanos del Cementerio No.1** (34 meters deep), **No. 2** (29 meters deep) and **No. 3** (18 meters deep). Southwest of Tlamaya, they explored **Sótano CAN3A** (29-meter pit) **Sótano CAN3B** (45-meter pit), and **Cueva CAN4**, to a choke at -55 meters.

source: Steve Grundy,
B.C. Caver,
January 1990

Two pits near Xilitla were mapped on December 31, 1989 by Joe Ivy and Ed Sevcik. **Sótano de San Antonio No. 1-1/2** was twenty meters deep and **Sótano del Possum Muerto** was 24 meters deep.

source: Joe Ivy

TAMAULIPAS

Proyecto Espeleológico Purificación cavers set a ten-day camp in **Cueva del Tecolote** in March 1990, increasing the cave's length 3136 meters to 20,796 meters. Based out of Camp I at a depth of two hundred meters, six cavers mapped various areas in the cave. Areas near camp produced minor clean-up surveys at Mumble-a-Bit Pit, Peter's Alpine Slide, Mickey Mouse Maze, Galactic Trash Compactor and the Spine Line. A large, mazey area off of Goofy's Borehole was discovered and named Gargoyle Gallery. This continues west as a series of lakes. Most of the mapping was done in the remote southwestern part of the cave, the Chihue Frihue. Left the previous year in the middle of a canal, it was followed another fifty meters to dry borehole. A major lead was soon found going north, the Forking Borehole, with the main way continuing southwest into a tall, complex borehole. Stopping at a short drop, attention turned to the Forking Borehole, where considerable passage was mapped in meandering, muddy trunks. An upper level was found which connected through to the Forking Borehole via numerous shafts.

PEP cavers also mapped a number of pits at Las Chinas in September and October 1989. Deepest was **Pozo de Las Chinas**, a 154-meter shaft with a total depth of 163 meters. Also mapped were **Pozo Sanguijuela** (P103 meters), **Pozo del Gran Esperanza** (P68 meters), **Pozo Galileo** (P50 meters), **Pozo del Mano Caliente** (P45 meters), **Pozo Trozo** (P50 meters) and **Pozo Yerbabuena** (P10 meters). Caves mapped included **Cueva Asa Meshi Mae** (-50 meters), **Cueva de la Calavera del Venado** (-28 meters) and **Cueva del Cabeza Tractor** (50 meters).

source: Peter Sprouse

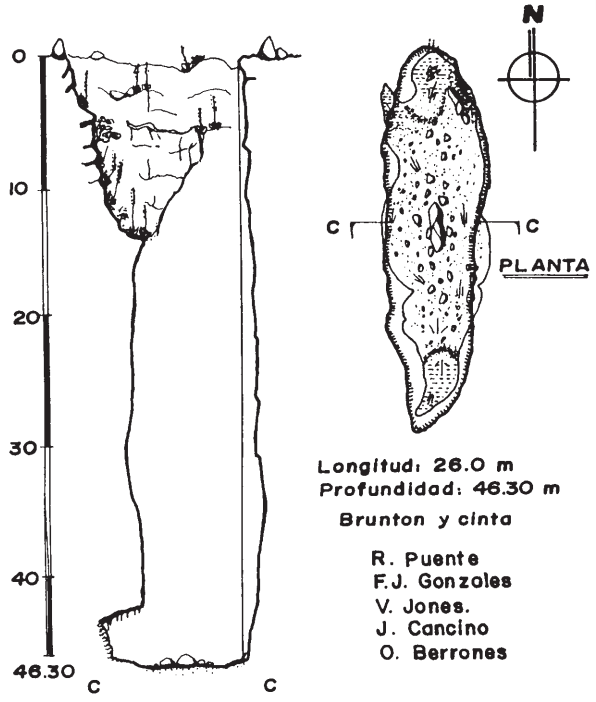
Cavers from Houston, Texas explored caves along the Río Guayalejo in late February 1985. Marcus Buck, Mike Connolly, John Fridye, Charles Fromén, Bill Rupley, Brian Smith and Harry Walker reached the large entrance visible on the north wall of the river canyon east of Jaumave. The steep, 750-meter climb above river level, culminated in a vertical, ten-meter pitch led by Marcus. They found the cave to be one large room, floored with dry guano dust. Dates written on the wall were Oct. 1, 1863 and 1960. Bottles placed under dripping formations provided meager water supplies for the group while they camped overnight in the cave. Local residents had no name for it, so they called it **Gruta del Polvo**.

Descending back into the canyon, they looked at a wet-weather resurgence on the south side of the river. Large rocks are

SOTANO DE LAS RUSIAS

LAS RUSIAS, MPIO ZARAGOZA, S.L.P.

Mayo de 1989.



Longitud: 26.0 m
Profundidad: 46.30 m

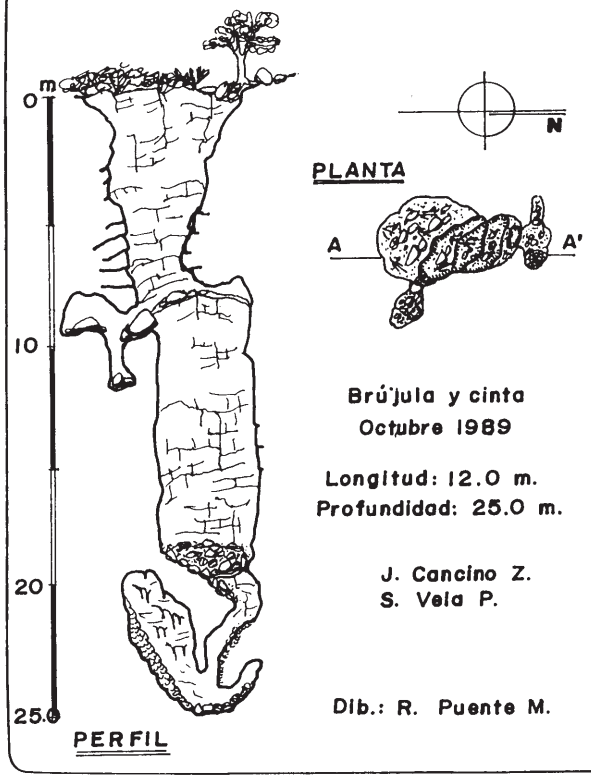
Brunton y cinta

R. Puente
F.J. Gonzoles
V. Jones.
J. Cancino
O. Berrones

Dib. R. Puente

SOTANO DE "LOS CUATESONES"

LAS RUSIAS, MPIO. ZARAGOZA, S.L.P.



Brújula y cinta
Octubre 1989

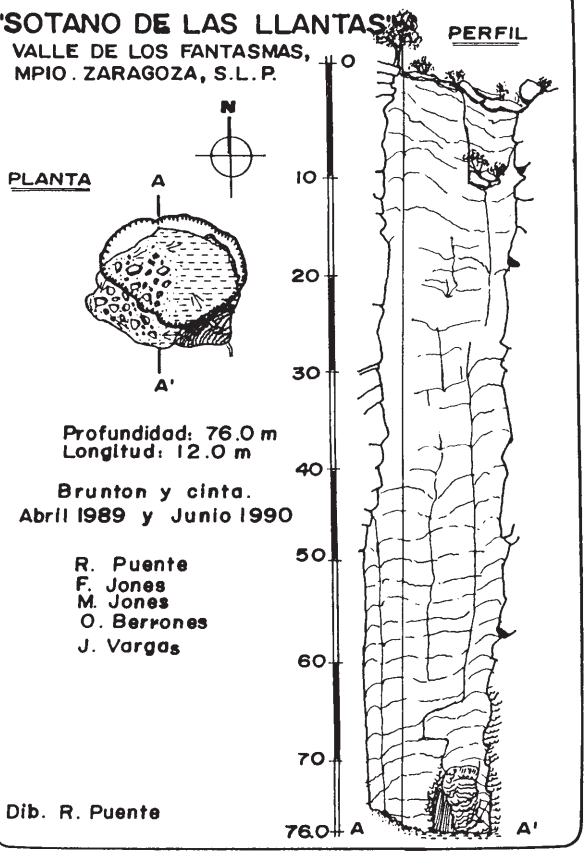
Longitud: 12.0 m.
Profundidad: 25.0 m.

J. Cancino Z.
S. Vela P.

Dib.: R. Puente M.

"SOTANO DE LAS LLANTAS"

VALLE DE LOS FANTASMAS,
MPIO. ZARAGOZA, S.L.P.



Profundidad: 76.0 m
Longitud: 12.0 m

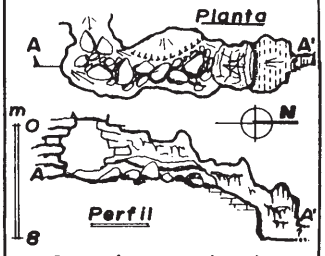
Brunton y cinta.
Abril 1989 y Junio 1990

R. Puente
F. Jones
M. Jones
O. Berrones
J. Vargas

Dib. R. Puente

CUEVA DE LOS EUCALIPTOS V. DE LOS FANTASMAS, (I)

MPIO. ZARAGOZA, S.L.P.

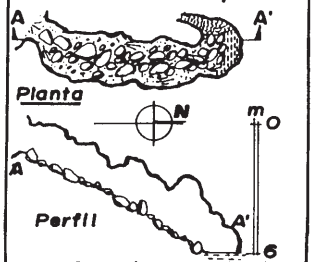


Croquis aproximado

R. Puente M. Junio 1990

CUEVA DE LOS EUCALIPTOS V. DE LOS FANTASMAS, (II)

MPIO. ZARAGOZA, S.L.P.

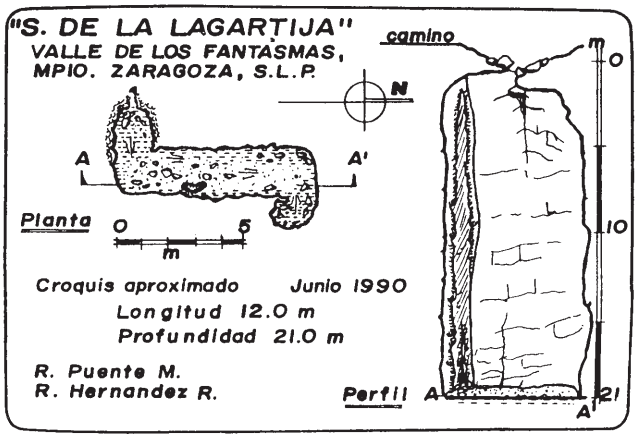


Croquis aproximado

R. Puente M. Junio 1990

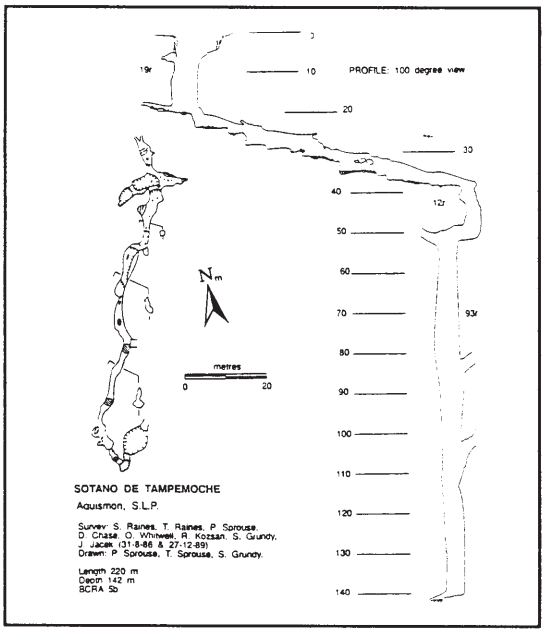
"S. DE LA LAGARTIJA"

VALLE DE LOS FANTASMAS,
MPIO. ZARAGOZA, S.L.P.



Croquis aproximado Junio 1990
Longitud 12.0 m
Profundidad 21.0 m

R. Puente M.
R. Hernandez R.



expelled by floodwaters, presumably from the Sierra de Guatemala which rises to the south. It would make a good dive prospect. Also visited was **Cueva del Tunel**, located in a side canyon southeast of Jaumave.

source: Charles Fromén

On January 18, 1989, a group of Austin cavers explored a multi-drop cave near Gómez Farías. Allen Cobb, Barry Marks, Susie Lasko, Peter Sprouse and Cathy Winfrey were shown the small entrance to **Sótano de Laksi**, located a few hundred meters east of **Sótano de Gómez Farías.** The initial, three-part, five-meter climbdown was soon followed by a 29-meter drop. This landed in a large gallery with three separate shafts dropping out of it. The first two, 11 and 18 meters deep respectively, each had short passages which pinched. The third shaft was 14 meters deep, quickly followed by a 12-meter pit to the bottom of the cave. Total depth is 62 meters.

Sótano de Gómez Farías was surveyed in 1975, but the map has not been published until this time.

source: Peter Sprouse

A group of Texas and Australian cavers investigated several sites in the northern Sierra de Guatemala in November 1989. The first objective was a large entrance which had been seen several times from aircraft near Montecristo, north of the **Nacimiento del Río Sabinas. Cueva de Montecristo** turned out to be a collapse sink with a large shelter cave on one side. This entrance is about a hundred meters wide and extends in thirty meters. Ladders had been erected by locals to reach beehives on the walls. The cavers were also told of another pit but were unable to visit it. Driving an overgrown road up the scarp to the west, they located a ten-meter pit which was free-climbed with a scaling pole. After driving back down the mountain and up again via Julilo, they had a look at the karst northeast of Joya de Salas. They found a three-meter-wide crack into which rocks bounced out of hearing range, but they lacked the rope to explore it.

source: William Russell

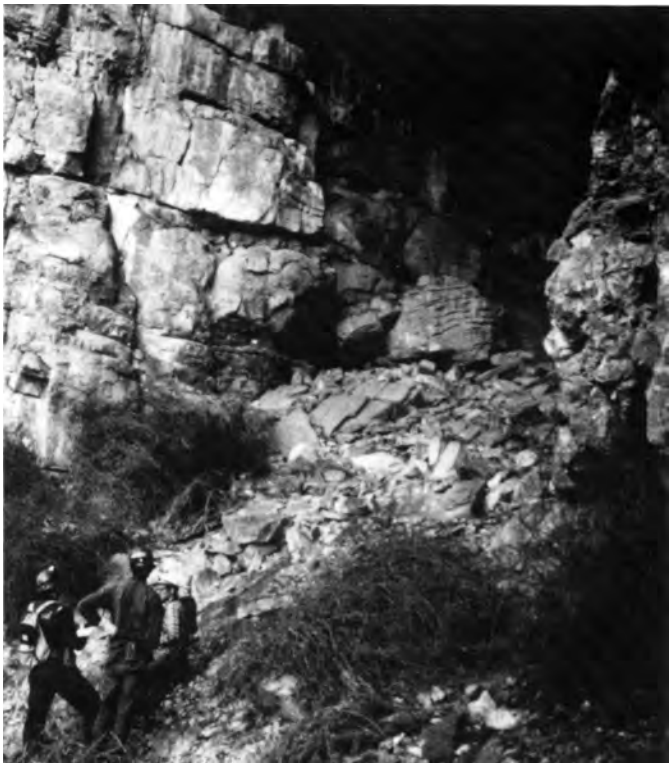
In May 1990, five cavers investigated the karst south of the village of San José, in the southern Sierra de Guatemala. Brent Bartlett, Dan Love, Charley Savvas, Glen Schneider and Mike Warton were shown several caves by the local residents. **Cueva de la Cima San José**, located on a hill a thousand meters from the village, had a 25-meter-high entrance opening into a huge chamber measuring three hundred meters long, one hundred meters wide and sixty meters high. It is full of large formations and has lakes along the right and left walls. At the rear of the chamber a flowstone slope descends to the right for one hundred meters to a mud sump.

A dolina to the south contained a log-jammed headwall into which drained three, small arroyos. A cold breeze encouraged them to dig an opening and, passing a second logjam, they discovered six hundred meters of horizontal passage and several other entrances. They named this cave **Cueva de los Maderos Perdidos**. Along the west side of the village the group explored a ten-meter-diameter, thirty-meter-deep shaft. **Hoya de la Ventana Malvada** had a window into a parallel shaft containing vampire bats.

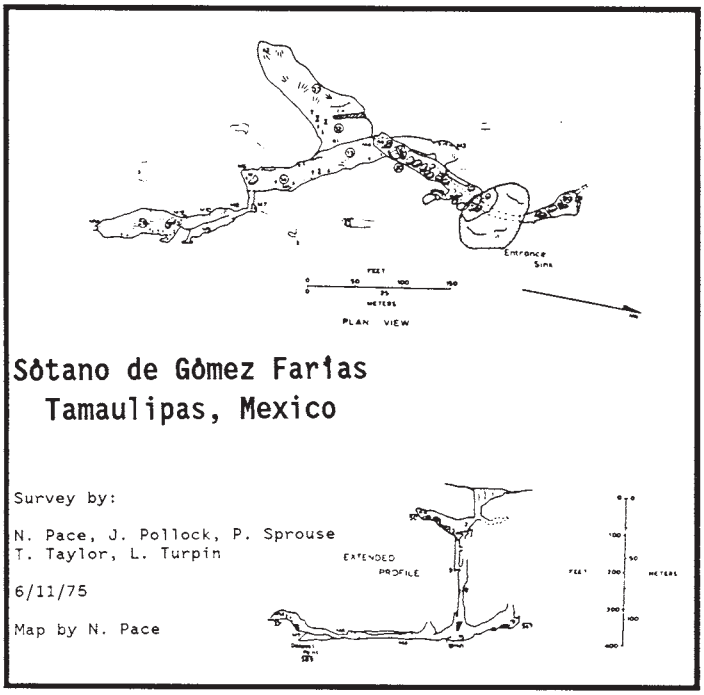
source: Mike Warton

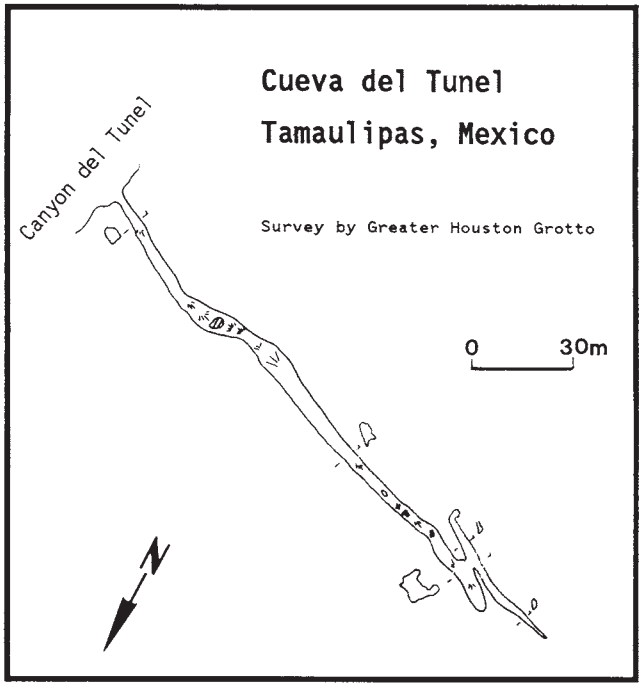
VERACRUZ

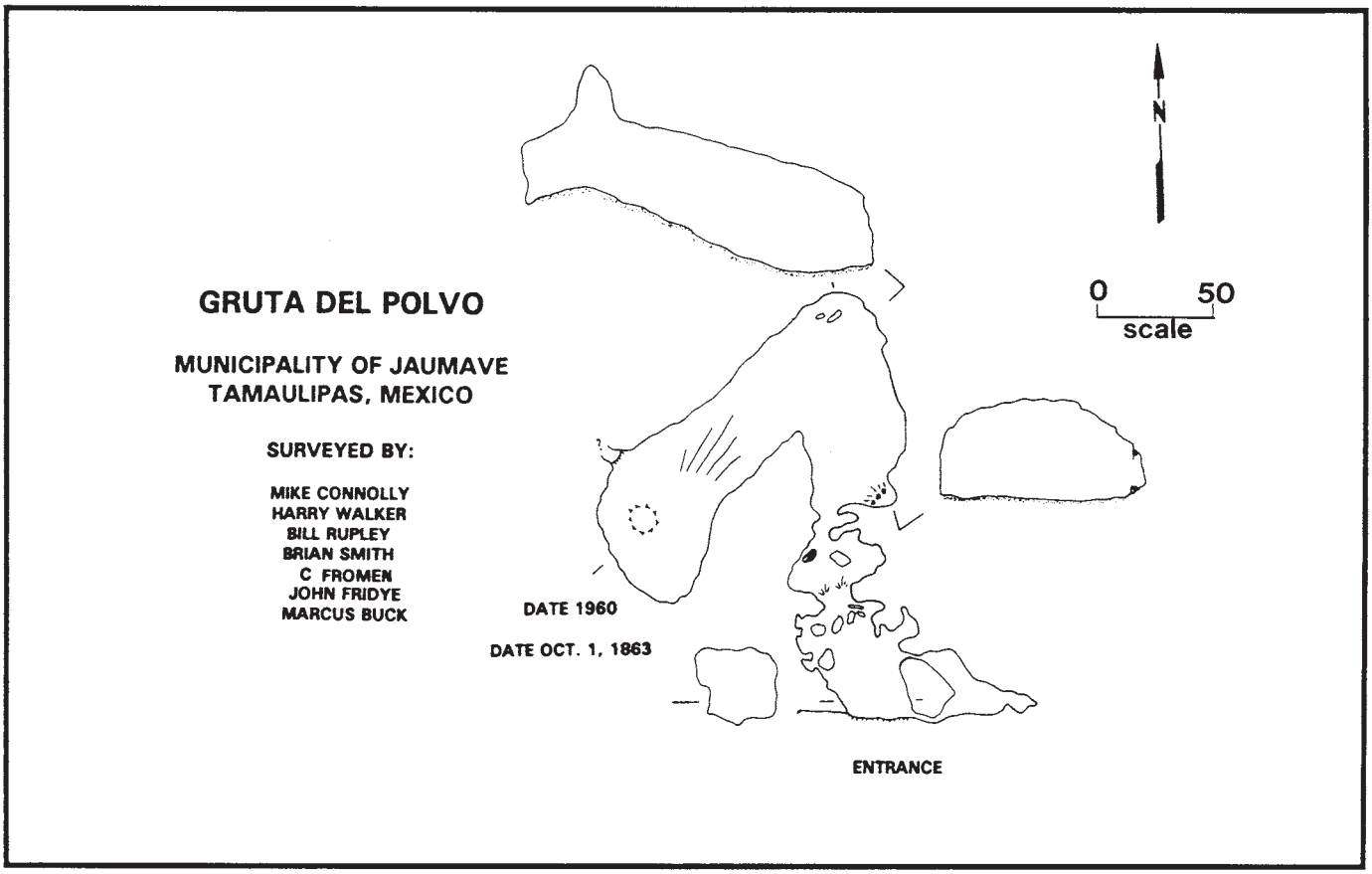
SMES cavers have concentrated their 1990 activities on **Sótano de El Berro**, a

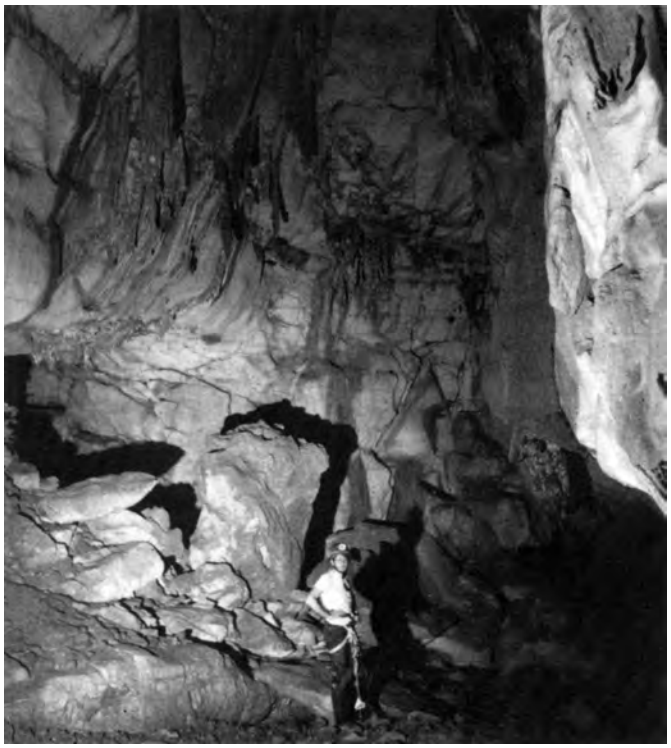


Houston cavers at entrance to Gruta del Polvo, Tamaulipas

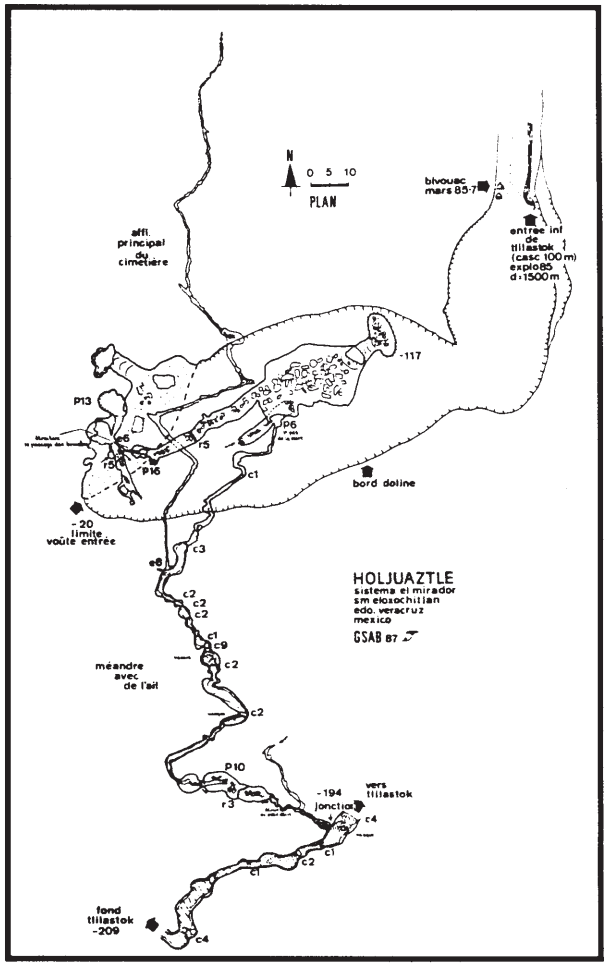

Sôtano de Gômez Farías
Tamaulipas, Mexico
Survey by:
N. Pace, J. Pollock, P. Sprouse
T. Taylor, L. Turpin
6/11/75
Map by N. Pace
PLAN VIEW
EXTENDED PROFILE
Entrance Sink


Cueva del Tunel
Tamaulipas, Mexico
Survey by Greater Houston Grotto
Canyon del Tunel
0 30m


GRUTA DEL POLVO
MUNICIPALITY OF JAUMAVE
TAMAULIPAS, MEXICO
SURVEYED BY:
MIKE CONNOLLY
HARRY WALKER
BILL RUPLEY
BRIAN SMITH
C FROMEN
JOHN FRIDYE
MARCUS BUCK
DATE 1960
DATE OCT. 1, 1863
ENTRANCE
N
0 50
scale



Allan Cobb in Sótano de Laksi, Gómez Farias, Tamaulipas (Peter Sprouse)



promising cave partway up Volcán Orizaba which captures snowmelt runoff as it hits limestone at the contact. In three, weekend trips in January, Ruth Diamant and Ramón Espinasa mapped to -409 meters. On April 14, the SMES cavers were joined by several novice capitaleños and three Britons. The cave split and the main route went down another pitch to a tight, nasty meander which fortunately, sumped a few hundred meters later at -515 meters. The Surprise Streamway was followed down three drops, the longest of which was 42 meters. They stopped for the day at the head of a fourth pitch into a big chamber at -570 meters and surfaced after a 17-hour trip.

On April 17, 1990, three cavers made the five and a half hour trip to the bottom. The next drop landed them in a round chamber and, over a breakdown ridge, they found the perfect site for a future camp. A long climb-down ensued, followed by a drop to another, tight meander. This was pushed for forty meters to the edge of a five-meter drop. Three days later a final, push team entered carrying only three ropes. Squeezing through the meander (the Squashed Walt Series), they descended two drops. At the bottom, they found three, good-looking leads: a crawl taking the water flow, a walking-size inlet and large passage to a deep pit at -656 meters. They threw in rocks that fell free for three and a half seconds, then rattled down a slope out of hearing range. Out of rope and time, they mapped and de-rigged out, planning to continue in 1991. Several large springs about nine hundred meters lower were vsited in August 1990, but they are situated on the far side of a major fault from Sótano de El Berro.

Elsewhere in Veracruz, the SMES cavers investigated a lava cave at Perote on July 7-8, 1990. **Cueva del Arco** at the crater of El Volcancillo is an impressive pit twenty meters wide and forty meters deep. A large passage could be seen taking off at the bottom of the second drop of 15 meters.

source: Ramón Espinasa

In addition to working in the Puebla area, the 1987 GSAB Expedition to Mexico also explored and mapped caves in Veracruz. From their base camp at El Mirador (next to San Miguel Eloxochitlan), expedition members explored **Holsjauztle**, located in a doline near camp. Spacious corridors led to a 15-meter pit, a crawl and more, big passage. A stream passage zigzagged to a boulder choke, but a few minutes of digging led to more, big cave. On a return trip, a connection was found to **Tlilastok** at a depth of 194 meters. The surveyed length of **Sistema Holsjauztle-Tlilastok** is 1.63 kilometers with a depth of -204 meters. Other caves in the area which were surveyed and explored included **Corralco** (550 meters long, 180 meters deep), **Tepetlampa**, (167 meters in length) and **Ictlatleļa** (1.88 kilometers in length, 297 meters deep). The other major cave explored in the area was **Sistema Atlalaquia**. This multi-drop cave has ten entrances. Exploration conducted from the three contiguous entrances to **CH40** led to a series of drops, the deepest being 135 meters. The cave ended in a sump at -570 meters. The other six entrances were explored and mapped and found to form a complicated gridwork of passage. Over 4500 meters of passage were mapped in Sistema Atlalaquia to a depth of 623 meters.

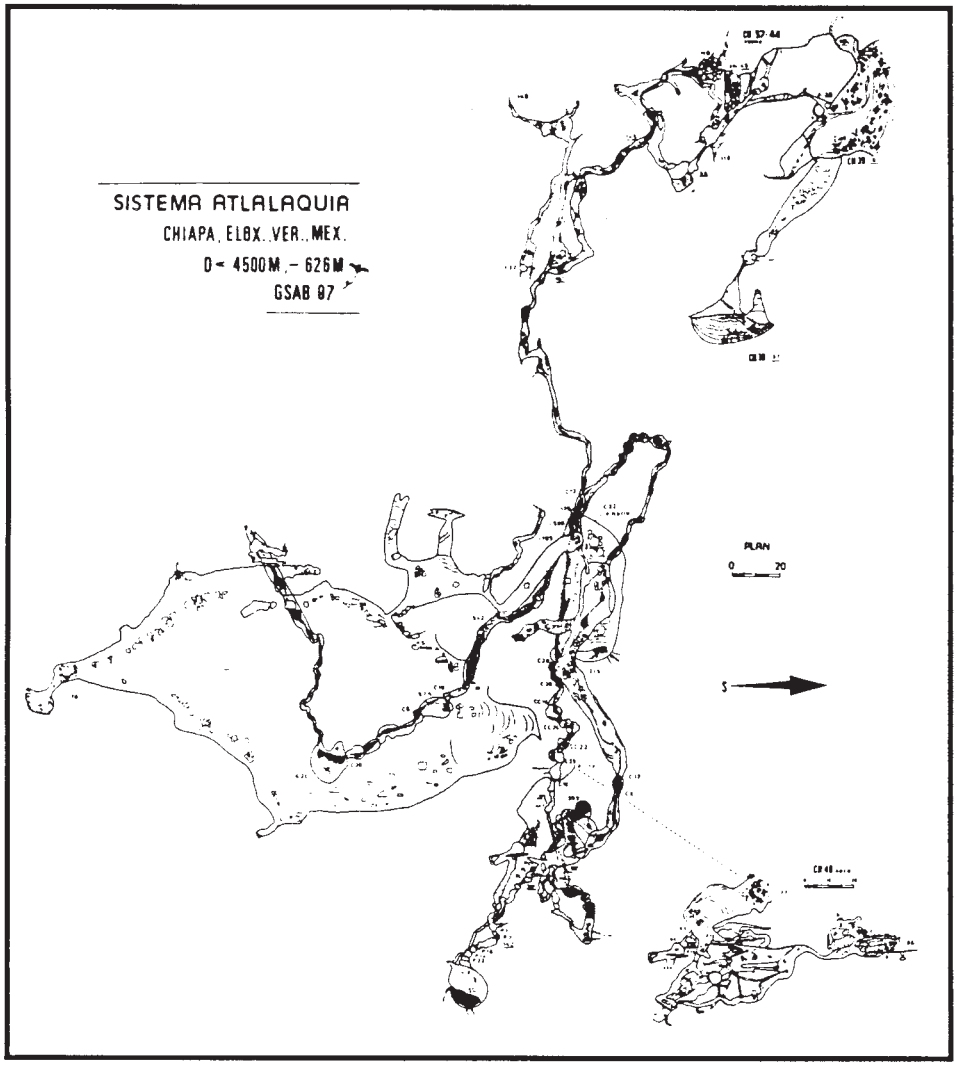
The GSAB group also explored **Sotáno d'Atlalaquia** at -285 meters deep and 470

meters long. This deep pit is formed in a vertical fracture and is located only 150 meters from the CH40 entrance to Atlalaquia. The bottom of the sotáno is blocked by massive breakdown.

source: Richard Grebeude,
Regards 4, 1988

In February 1988 British cavers of the Black Holes Expedition explored several hundred caves near Zongolica. In the Sierra Modelo, over two hundred shafts were explored, mostly between 25 and one hundred meters deep. The deepest pit was 227 meters deep, at Sierra Chica, followed by one at Colonia Modelo that measured 175 meters. A huge pit, dubbed the **Lost World**, measured one hundred by three hundred meters. It was not entered, but was estimated to have a drop varying from fifty to 150 meters depending on the rigging site. The jungle at the bottom looked "too terrifying" for their tastes. Nearby they found the deepest cave in the sierra, **Sótano de los Hermanos Peligrosos**, 390 meters deep and 531 meters long.

Some caves near base level in the Comalapa area were also explored. **Sumidero Xochiotepec** was explored down flowstone cascades in a canyon series and opened up into a large, phreatic tunnel. This cave was over two kilometers long and 126 meters deep. **Cueva Komosave** was seven hundred meters long and dropped into the previously known Río Tonto resurgence via a 45-meter pitch. Only a ten-minute walk from their base camp were **Cueva de Comalapa**, 7750 meters long, and **Cuevita Chica**, 2500 meters long. Also explored were **Nacimiento de Siete Aguas**, which contained crabs and catfish and **Cueva de Juan Sánchez**, previously mapped by U.S. cavers (see AMCS AN No. 4, p. 22).



Farther west, a number of caves were found near Soledad Atzompa. Two vertical caves, five hundred and two thousand meters long, were linked via a series of pitches. Also found was a two hundred-meter shaft.

source: Bob North,
Caves and Caving,
No. 33, Spring 1989

Deep and Long Caves of México

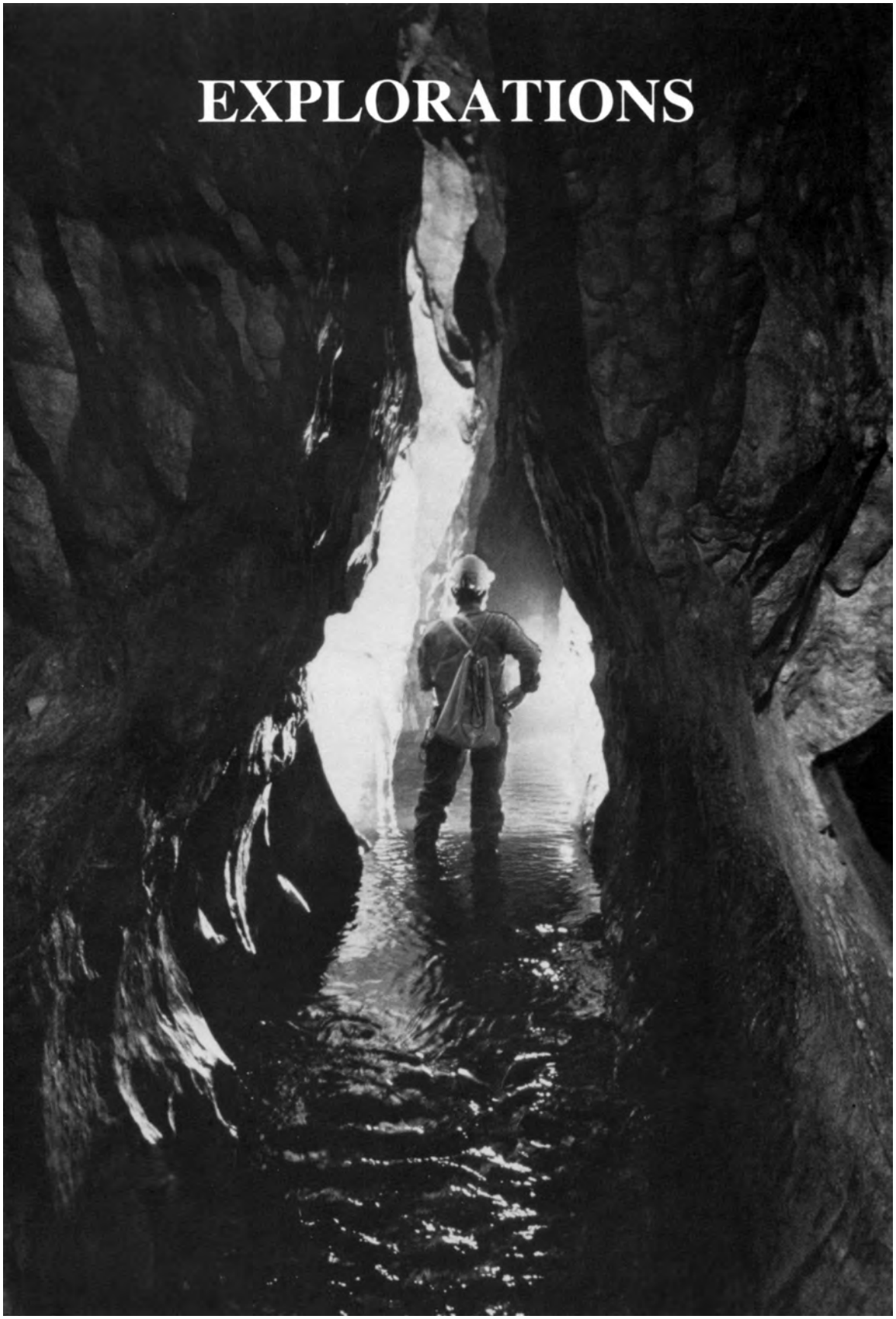
Compiled by Peter Sprouse

June 1990

(all lengths and depths in meters)

	Name	State	Depth
1.	Sistema Huautla	Oaxaca	1353
2.	Sistema Cuicateco	Oaxaca	1340
3.	Akemati	Puebla	1200
4.	Sistema Ocotempa	Puebla	1070
5.	Akemabis	Puebla	1015
6.	Kijahi Xontjoa	Oaxaca	973
7.	Sonconga	Oaxaca	943
8.	Guizani Ndia Guinjao	Oaxaca	940
9.	Sistema Purificación	Tamaulipas	904
10.	Nita Cho	Oaxaca	894
11.	Sótano de Agua de Carrizo	Oaxaca	843
12.	Sótano de Trinidad	San Luis Potosí	834
13.	X'oy Tixa	Oaxaca	813
14.	Olfastle Niebla	Puebla	780
15.	Nita Ka	Oaxaca	760
16.	Sistema H31-H32-H35	Puebla	753
17.	Nia Quien Nita	Oaxaca	750
18.	Sonyance	Oaxaca	745
19.	Nita Xonga	Oaxaca	740
20.	Yuá Nita	Oaxaca	704
21.	Aztotempa	Puebla	700
22.	Sótano de los Planos	Puebla	694
23.	Resumidero el Borbollón	San Luis Potosí	678
24.	Sótano de El Berro	Veracruz	656
25.	Sótano de Tilaco	Querétaro	649
26.	Nita Nashí	Oaxaca	641
27.	Sistema Atlalaquía	Veracruz	623
28.	Cueva de Diamante	Tamaulipas	621
29.	R'ja Man Kijao	Oaxaca	613
30.	Nita He	Oaxaca	594
31.	CH54 (Meadre-Qui-Traverse)	Puebla	588
32.	Sistema Cuetzalan	Puebla	587
33.	Sótano de las Coyotas	Guanajuato	581
34.	Sótano Arriba Suyo	San Luis Potosí	563
35.	Sistema de Angel (Ehecoklh)	Puebla	533
36.	Sótano del Río Iglesia	Oaxaca	531
37.	Sótano de Nogal	Querétaro	529
38.	Grutas de Rancho Nuevo	Chiapas	520
39.	Sótano de Ahuihuitzcapa	Veracruz	515
40.	Sótano de las Golondrinas	San Luis Potosí	512
41.	Hoya de las Conchas	Querétaro	508
42.	Sótano del Buque	Querétaro	506
43.	Cueva de Agua de Carlota	Oaxaca	504
44.	Pozo de Montemayor	Nuevo León	501
45.	Nita Chaki	Oaxaca	493
46.	Hoya de las Guaguas	San Luis Potosí	478
47.	Cueva de San Agustín	Oaxaca	461
48.	Sótano de El Barro (El Sótano)	Querétaro	455
49.	Hoya de San Miguel	Guerrero	455
50.	Sótano Itamo	Veracruz	454

	Name	State	Length
1.	Sistema Purificación	Tamaulipas	76110
2.	Sistema Huautla	Oaxaca	52653
3.	Sistema Cuetzalan	Puebla	22432
4.	Cueva del Tecolote	Tamaulipas	20796
5.	Sistema Cuicateco	Oaxaca	20415
6.	Coyalatl	Puebla	19000
7.	Atlixicalla	Puebla	11120
8.	Nohoch Nah Chich	Quintana Roo	10363
9.	Grutas de Rancho Nuevo(San Cris.)	Chiapas	10218
10.	Sistema Naranjal	Quitana Roo	8230
11.	Cueva Yohualapa	Puebla	8000
12.	Sumidero Santa Elena	Puebla	7884
13.	Cueva de la Peña Colorada	Oaxaca	7793
14.	Cueva de Comalapa	Veracruz	7750
15.	Atepolihuit de San Miguel	Puebla	7700
16.	Sótano del Arroyo	San Luis Potosí	7200
17.	Actun de Kaua	Yucatan	6700
18.	Cueva del Mano	Oaxaca	6630
19.	Sótano de las Calenturas	Tamaulipas	6581
20.	Xongo Dwi Ñi	Oaxaca	6500
21.	Sumidero de Jonotla	Puebla	6381
22.	Cueva del Abuelo	Chiapas	6000
23.	Olfastle Niebla	Puebla	6000
24.	Gruta del Río Chontalcoatlán	Guerrero	5827
25.	Sistema H31-H32-H35	Puebla	5745
26.	Gruta del Río San Jerónimo	Guerrero	5600
27.	Los Bordos	Chiapas	5211
28.	Cueva de Agua Blanca	Tabasco	5200
29.	Grutas de Juxtlahuaca	Guerrero	5098
30.	Cueva Quebrada	Quintana Roo	5000
31.	Veshtucoc	Chiapas	4930
32.	Sistema de Angel (Ehecoklh)	Puebla	4857
33.	Sistema Ocotempa	Puebla	4720
34.	Cueva del Nac. del Río San Ant.	Oaxaca	4570
35.	Sac Actun	Quintana Roo	4542
36.	Sistema Atlalaquia	Veracruz	4530
37.	Sótano de la Tinaja	San Luis Potosí	4502
38.	Sótano de Japones	San Luis Potosí	4500
39.	Sótano de Agua de Carrizo	Oaxaca	4477
40.	Sistema San Andres	Puebla	4471
41.	Cueva de Agua de Carlota	Oaxaca	4401
42.	Sótano del Río Iglesia	Oaxaca	4206
43.	Sistema Zoquiapan	Puebla	4107
44.	Sima del Borrego	Guerrero	4087
45.	Cueva Escalera	Oaxaca	4000
46.	Aztotempa	Puebla	4000
47.	Cueva Burrodromo	Quintana Roo	3962
48.	Sumidero San Bernardo	Puebla	3931
49.	Sótano del Río Coyomeapan	Puebla	3900
50.	Sumidero de Pecho Blanco No. 2	Chiapas	3790


EXPLORATIONS

ACATLÁN REVISITED

Terri Treacy

It had been 14 years since cavers visited the Acatlán, Oaxaca area. Though several significant caves had been surveyed in the area during the middle-to-late seventies, by 1989 the area had been forgotten. That is, until we saw the new topographic maps, showing huge sinks all along the tops of the ranges.

Acatlán sits in the middle of an elongated valley that is surrounded by a series of long, narrow, broken ranges. These are the front ranges of the Sierra Madre, just west of Tierra Blanca, with the highest point rising to an elevation of six hundred meters. Not surprisingly, most of the surveyed caves in the area are located near villages and most are fairly close to the valley floor.

Armed with a set of new maps, Jim Rodemaker and I arrived in Acatlán pleasantly surprised to find that Jim's friends in town had an entire house for our use, complete with hot water and a watch dog. After a great day exploring some of Presa de Aleman in our friend's boat, we set off on daily jaunts through sugarcane-filled valleys to the mountains in search of caves. It didn't take us long to determine that, without a guide, it would be hard to find any caves in the dense jungle-covered mountainsides.

Previous page:
Stream passage in Xongo Dwi'ñi,
Santa Ana Atiextlahuaca, Oaxaca
(Alan Warild)

One of our first objectives was to check a large dolina seen on the map at a place called Agua Escondida at four hundred meters elevation. At the bottom of the deep sink was a small settlement and an even smaller cave spring that served as the town water supply. A local told us that water flowed from the cave during heavy rains. We saw fish in the stream that looked similar to the fish found in some of the base level caves. This same fellow offered to take us to some bigger caves back down the road. Cueva de Piedra Verde and Cueva de Dos Piedras were large-room caves along the eastern edge of the range and we explored and sketched them.

The following day, while hiking in the next range to the west, we climbed down through some breakdown along the edge of a dolina and found ourselves in cave passage. At the top of a drop, the sound of flowing water could be heard. We would definitely be returning to survey Cueva de las Begonias.

OLD CAVES, NEW CAVES, EVERYWHERE YOU LOOK CAVES

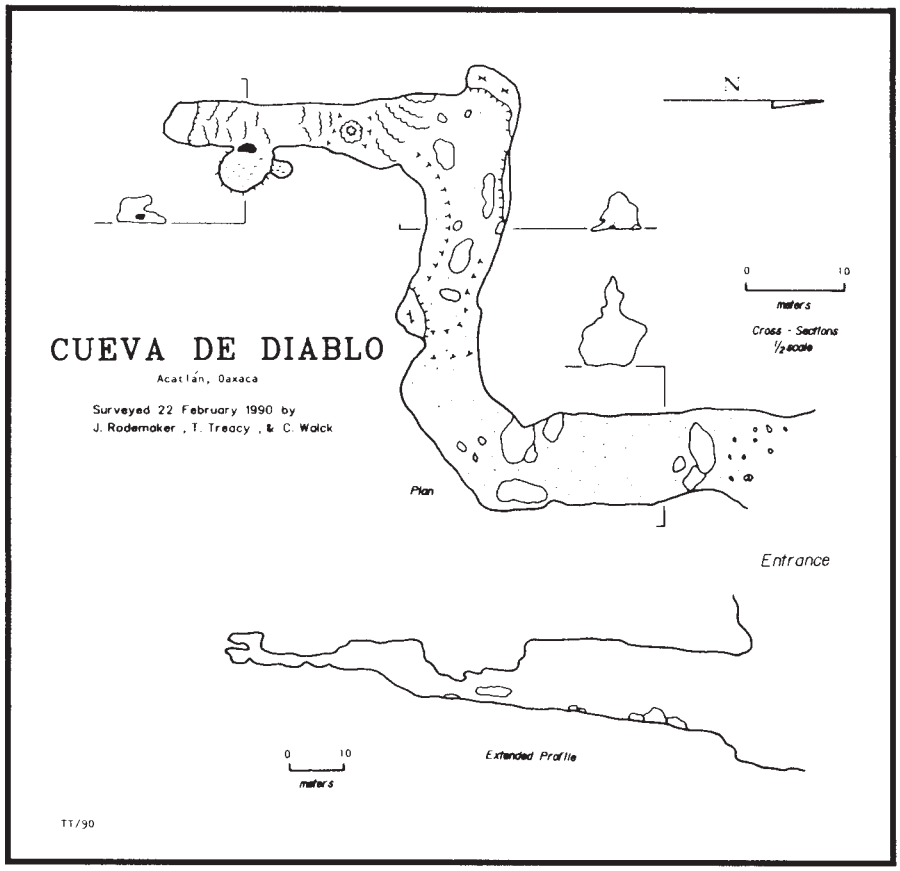
The next evening we drove to Veracruz to pick up the rest of the crew at the airport. The new arrivals were Preston Forsythe, Richard McGehee, David Scott and Cyndie Walck. The following day we were on the trail to Cueva de Sala Bonita. On the way, we dropped off Jim, Preston and Dave to explore the numerous caves along the base of the cliff. They estimated that they entered at least 25 small caves and did explore and sketch one, Cueva de Veintuino de Mayo.

Cyndie, Richard and I continued up to the Sala, an impressive sinkhole containing a classic, Mexican cave entrance measuring

fifty meters wide by twenty meters high. The entrance room narrowed to a beautiful, flowstone climbdown into a huge chamber.

Another unsurveyed cave from 14 years ago, was Cueva de Cayatano. Preston, Dave, and Richard set off to map it. After thrashing about in the hot cane fields for a few hours, Preston relocated Cayatano and they mapped 216 meters of walking-sized passage.

Meanwhile, Jim, Cyndie, and I returned to Cueva de las Begonias with ropes and survey gear. Cyndie was the first one down the fourth and final drop. She proclaimed it wasn't necessary for anyone else to come down because the cave pinched off at both ends. As she started back up the rope, one of Cyndie's pack buckles broke and we were highly entertained by her verbal antics as she fished the pack out of a deep pool. Back on the surface with plenty of time to kill, we explored a whole series of small, interconnecting caves located along the edge of the ridge. One can go for hundreds of meters and never be more than ten or twenty meters from an entrance. We found caves like this everywhere we went.

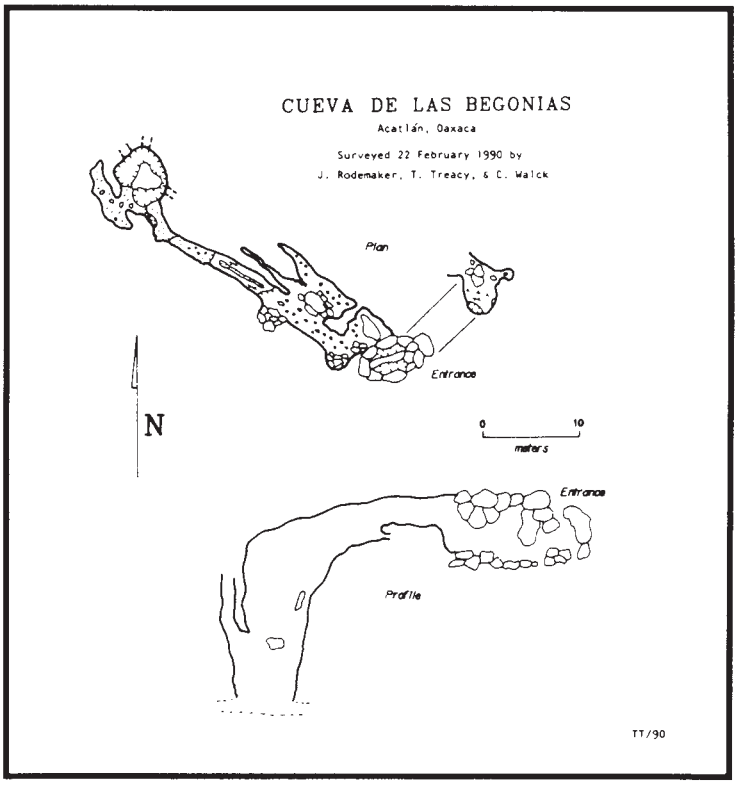


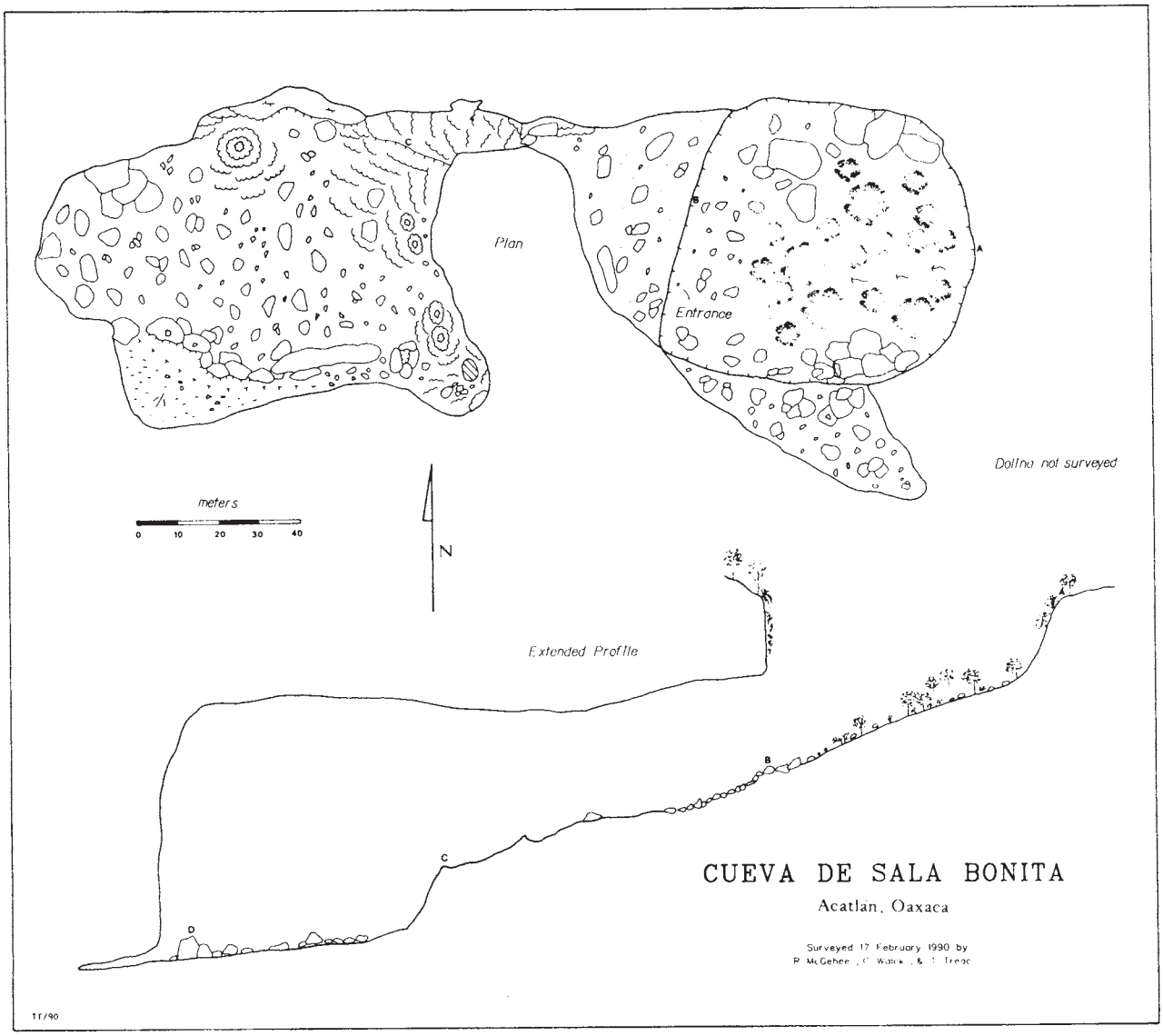
LOCAL HOSPITALITY

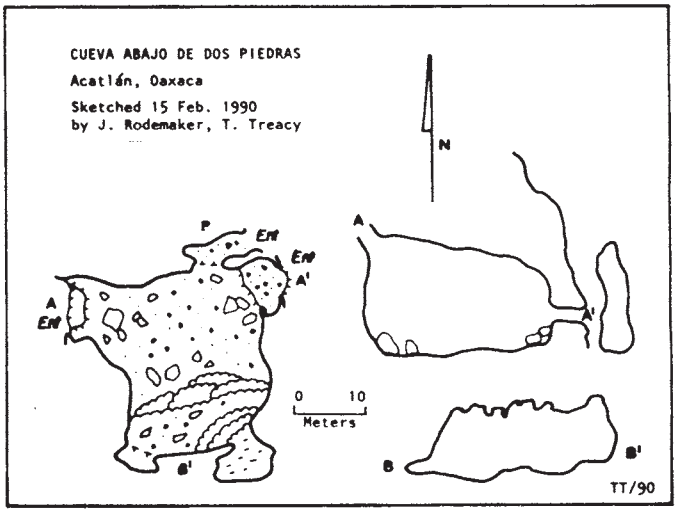
That evening we had been invited to our host's home for dinner, which was to be followed by a city-wide dance. Dave was fixed up for a dance with a local, young woman who took quite a fancy to him. Dave's fate was sealed. He was going to be teased the rest of the trip.

In return for the gracious hospitality, Jim, Cyndie and I took one of our friends to Cueva de Laguna Verde for a short sightseeing trip. Preston and Dave returned to Cayatano for another two hundred, or so, meters of mapping.

The next couple of days we talked to locals, arranged for guides and basically saw a lot of jungle and a few small caves. One cave worth mapping we called Cueva de Arroyo Enmedio. Located in an anticline in a cliff face, it consisted of parallel canyon passages. We left a constricted lead with airflow and a high lead up an unclimbable flowstone wall. Further along the cliff face, Cyndie and I were guided to four or five interconnecting caves which were too complex to map for the amount of time we had.




Plan
Entrance
Dolina not surveyed
meters
0 10 20 30 40
N
Extended Profile
A
B
C
D
CUEVA DE SALA BONITA
Acatlán, Oaxaca
Surveyed 17 February 1990 by
R. McGehee, C. Walck, & T. Treacy
TT/90


CUEVA ABAJO DE DOS PIEDRAS
Acatlán, Oaxaca
Sketched 15 Feb. 1990
by J. Rodemaker, T. Treacy
N
P
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Ent
A'
A
Ent
B'
0 10
Meters
A
A'
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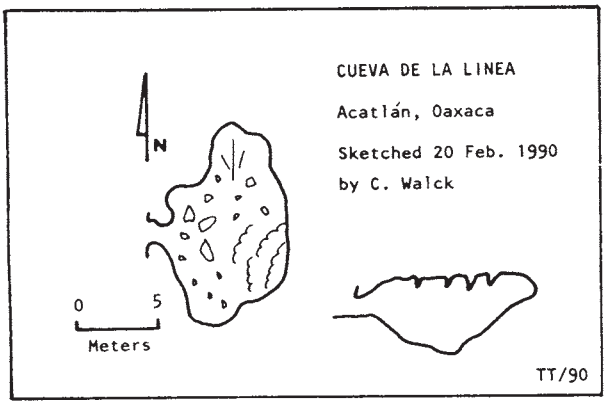
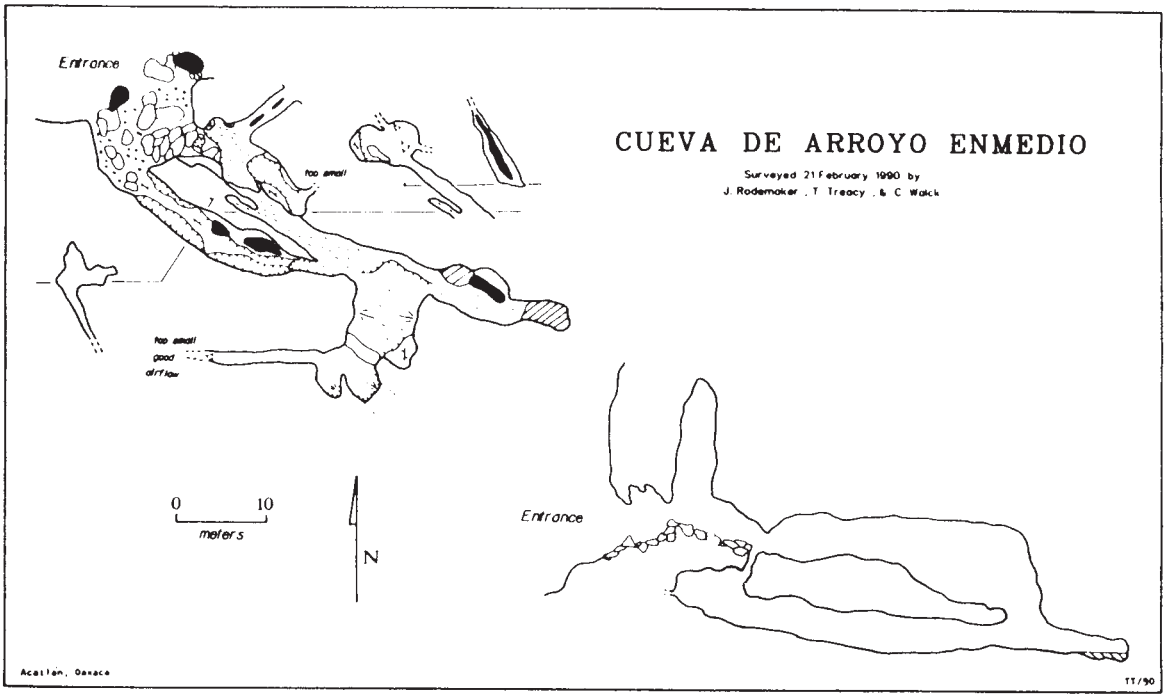
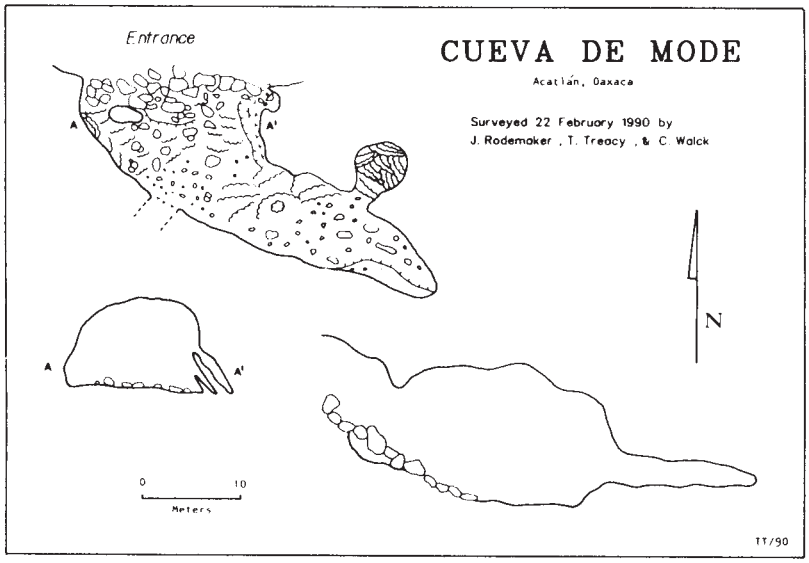
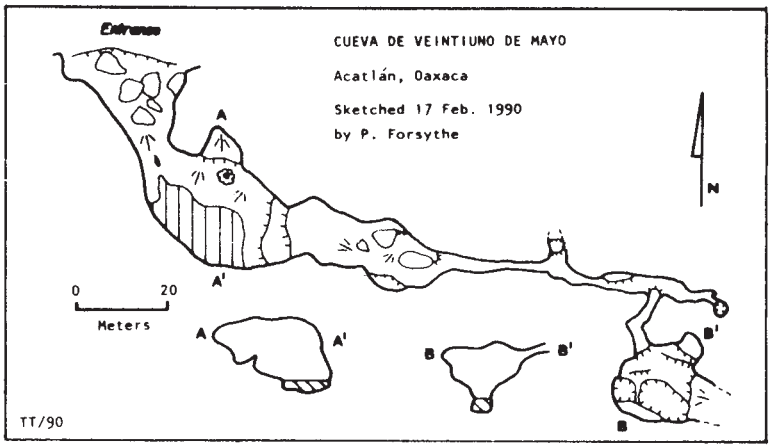
TT/90


CUEVA DE LA LINEA
Acatlán, Oaxaca
Sketched 20 Feb. 1990
by C. Walck
N
0 5
Meters
TT/90







The same guide who showed us Enmedio offered to show us Cueva del Diablo. He said you could walk in it for an hour. On the way to Diablo, he showed us Cueva de Mode. It was a great cave with a large entrance room and major, side passage that our guide said he traversed for a long way while hunting coatimundi. We quickly mapped Mode as we were anxious to get to the even bigger, cave he knew about.

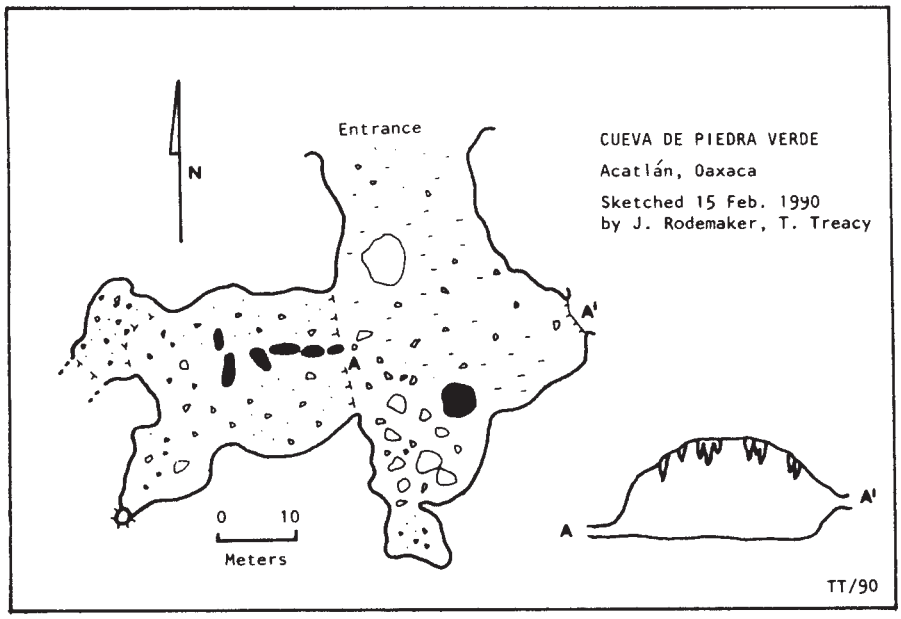
The entrance to Diablo was beautiful. From the huge boulders at the entrance we could see thirty meters of ten-meter-high by ten-meter-wide trunk before it made a bend out of sight. We decided to eat lunch and plan our mapping strategy. After much debate, we all agreed to explore to just beyond the entrance area. Then, one team would survey from our limit of exploration out to the entrance and the other team would survey ahead. We got to the end of the cave too quickly to proceed with that plan, so we simply surveyed the hundred, or so, meters back out. Although it wasn't what we were hoping for, it was nice and we did spend just about an hour in the cave.

WHEN TIME RUNS OUT, LEADS GET GOOD

It was our last day in the area and those of us who hadn't come down with the touristas were ready for a final day of caving.

Jim, Preston, Cyndie and I headed off to Cayatano to finish it and, if there was time, to visit Cueva de Culebra. However, our plans were abruptly changed when we discovered the road impassible due to the rain that had fallen all night. Realizing no one had ever checked the ridge that lay immediately before us, we set off hiking. We ran into people who took us to caves, told us about caves and, we found some on our own. One was an interesting, archeological cave with abstract pictographs covering all the walls. As we drove back we gave a ride to man who said that he would show us a big cave the next time we were in the area.

From all the broken pottery covering the floors of most of the caves in the area, along with several significant sites in a few of the caves, it is easy to deduce that these caves were once heavily used by an earlier Indian culture. The majority of the current population is not direct descendants of those that once used the caves. Most of the them have come from other areas over the past fifty years, or so, to work the sugar plantations. Consequently, many of the locals are not aware of alot of the caves. In fact, most seemed afraid of them. Our best guides turned out to be hunters who roamed the mountainsides and discovered entrances.



More trips, more guides and more hiking will undoubtedly yield many caves in the future.

ACATLÁN

Había sido 14 años desde que espeleólogos visitaron el área de Acatlán, Oaxaca. Aún cuando algúnas cuevas de significancia han sido topografiádas durante la mitad y finales de los setentas, para 1989 el área fué grandemente olvidada. Acatlán se sitúa en la cordillera frontal de la Sierra Madre al oeste de Tierra Blanca. La disponibilidad de nuevos mapas topográficos del área, mostró grandes dolinas a lo largo de las cimas de la sierra. Un pequeño grupo de espeléologos pasó algún tiempo buscando nuevas cuevas para explorar y topografiar en ésta área. Con la ayuda de los habitantes de los poblados, se localizaron varias cuevas interesantes. Muchas de esas fueron exploradas y topografiadas durante ésta expedición.

RESUMIDERO EL BORBOLLON

John Stembel

El Tiro Grande, the 217-meter pit in Resumidero El Borbollón (Maureen Handler)

During a 1988 Christmas trip to México, Maureen Handler, Gerald Moni, Cecile James, John Sullivan , Doug Abernathy , and Mark and Myrna Legault met up with Mexican cavers west of San Luis Potosí near Valle de los Fantasmas. They learned from the Mexicans of a some exciting new caves. One cave, Resumidero el Borbollón, contained a very deep, in-cave pit, possibly over three hundred meters and another, nearby pit was estimated to be sixty meters deep.

The American cavers visited the area and some group members even journeyed to the top of the big pit. Rocks tossed into the void fell for nine to ten seconds! Lacking a long enough rope and enough time to properly begin exploration, they talked with the Mexicans about a joint expedition to explore Borbollón in March. The Mexicans wanted help, especially with access to quality gear and rope, and to be a part of the exploration.

Maureen Handler and Carlos Javier Zermemo teamed up to co-lead the expedition. With a nine-second, in-cave pit, Maureen easily gathered a team of fifteen American cavers, a rope for the big pit and additional gear for exploration of a deep cave. Likewise, Carlos contacted Mexican cavers from his own club in San Luis Potosí, plus additional, strong cavers from Mexico City. He also secured permission from the landowner for a week-long camp near the entrance.

ARRIVAL

Over fifty cavers from the U.S., Mexico, and Canada, many of whom were not on Maureen's "official list", met Saturday, March 18, 1989 at the Hotel de Pasado de Potosí in San Luis Potosí. Maureen and Carlos had invited about twenty-five cavers, but word of mouth and visions of an in-cave, very deep pit had attracted many others. Maureen realized this was a larger-than-anticipated crowd and hoped that everyone could work together as an international team.

Introductions were conducted and a general briefing was held. It was learned that the Mexicans had previously done the big pit and most of the second drop. They had measured the big pit at 214 meters, along with a second drop of sixty meters. Borbollón was still going strong and deep.

Camp was set up off of an infrequently-travelled, gravel road near the cave. Maureen planned to have teams pushing the cave downward, while survey teams followed.

FIRST PUSH

Early Sunday afternoon, John Sullivan, Raul Puente Martínez, José Montiel Castro, and Joe Ivy entered the cave. This crew rigged the big pit with a rebelay three meters below and a meter offset from the main rig. Soon, the "first push team" of Alan Cressler, Marion O. Smith , Victor Granados, and Felipe Moreno Leos, caught up with them at the top of the multi-phase, second drop.

The teams merged and pushed the canyon passage down a series of drops and climbdowns. At the next pit, the international team shared cheese, cantaloupe and chocolate suckers while Alan set two more bolts. The Mexican half of the rig team, Raul and Jose, decided to leave while the remaining explorers tied three ropes together to reach the bottom.

Below this pit, the cave leveled off into a few hundred meters of beautiful, stream-carved canyon and some more climbdowns. Pits of nine and five meters were descended, then more walking passage with at least twenty meters of free climbs led to another pit. After this pit of 19 meters, the team stopped at a T-junction. The left route led to a 45-meter pit, and the right a shallower drop. Since they had less than forty meters of rope left, they decided to exit. The team estimated that they had explored to a depth of at least, five hundred meters.

SECOND PUSH AND MAPPING BEGINS

The second push team consisted of Neeld Messler, Chris Stine, John Stembel, and Asdrubal Mendizabal Zaldivar. They entered Borbollón the next afternoon, picking up 250 meters of rope at the top of the big pit. They reached the previous limit of exploration and rigged the longest rope in the pit on the right of the T-junction. The first drop was 12 meters to a wide ledge, where Asdrubal set a bolt, then it was 15 meters to the floor. Around the next corner were two more drops. The previous week of hard caving compelled Asdrubal to exit after these drops.

The team planned to pick up two bolts kits along the way, but Alan's was never located. A quick inventory of the available bolting gear revealed only one bolt left. Hopefully, natural anchors would be present. The passage continued downward as gently-sloping stream passage and easy climbdowns and wall protrusions and a wedged boulder provided the rigging .

At the bottom was the first crawling passage since the entrance series above the big pit. All nine push ropes and packs were dropped and the passage was investigated. Mud coated the walls indicating that a sump was expected soon. Seventy-five meters later another drop was encountered. Chris and Neeld retrieved all the ropes and packs as John set the last bolt.

The pit measured 12 meters, and after two corners and two climbdowns they found yet another drop. With no bolts and very little to rig to for this six-meter drop, John choose a large knob on the wall. The rig certainly would not break, yet the rope might easily slip off. Neeld inched over the drop carefully while the others watched and held the rope in place.

Forty meters further, they discovered a sump. Red-colored larvae of unknown extraction, strange blue fungus and an endless assortment of bactera inhabited the small lake. Nobody cared to enter the water. Anyway, it looked certain that the ceiling dipped to water-level four meters away. The crew left their seven push ropes at the T-junction.

Salon de las Grietas, the big room at the base of El Tiro Grande (Maureen Handler)

Also on Monday, Gerald Moni, Shari Lydy, Linda Palit and Adrian Sanchez Garduno entered the cave to survey from the bottom of the big pit down as far as they cared to go. They set 63 stations surveying down to a depth of approximately 440 meters. They stopped at a very, sheer and exposed, four-meter climbdown, three drops short of the T-junction.

SURVEY-PUSH-PHOTOGRAPH

After the second push team reported that the cave was bottomed and had ended at a sump, camp enthusiasm quieted down. However, there was still plenty to do. The left-hand, 45-meter pit at the T-junction was still undescended. There was plenty of cave unsurveyed. Also, the big pit had not been photographed.

John Sullivan, Sergio Santana, Mike Newsome and Victor planned to descend the 45-meter pit and push on from there. Near the end of the first survey, John developed a headache and had to exit. The others continued, picking up rope and bolts on the way. The 45 -meter pitch connected to the other route, bypassing two, short drops and a couple of climbs. They bottomed the cave, hauled extra rope towards the surface and exited the next evening.

Meanwhile, Joe, Raul, Felipe and Bob Cohen surveyed from the end of the first survey to the T-junction during a 25-hour trip. Terry Raines led a team comprised of Alejandro Pacheco Ramirez, Julie Jenkins, Josontiel, José Luis Soberones and Fernando Carrancoh. They surveyed from the entrance to the pit. After derigging the rebelay and padding the lip, Terry measured the pit at 217 meters using a laser theodolite and then tied into the other survey.

Another team consisting of Maureen, Mike Palethorpe, Bruce McLaren, Mike Taylor and Tim Farmer spent ten hours taking multi-flash pictures of the big pit and the expansive room below.

FINAL SURVEY AND DERIG

Alan, Marion, Terry and Ed Sevcik entered the cave Thursday morning planning to map to the bottom and then begin de-rigging. Ed decided to turn back after the big pit because of gear problems, while the others continued down. At the supposed sump, Marion was burning up and decided he needed to cool off. Dog-paddling around, Marion noticed a very small air space and could hear water splash down some sort of void on the other side. The largest area was wide enough for a nose and maybe three centimeters high. So the sump was not a sump, but a nasty, low air space. There was no noticeable wind, but very little wind could ever be felt in Borbollón.

Entering late Thursday afternoon, Neeld, Maureen and John Stembel were to meet the

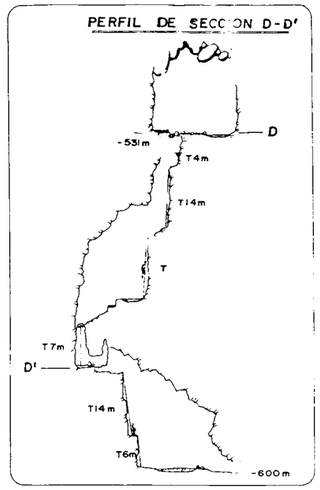
RESUMIDERO DE EL BORBOLLON

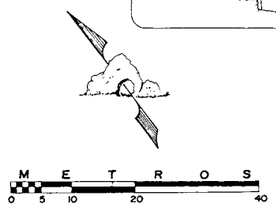
PIEDRA AGUJERADA, MPIO. ARMADILLO DE LOS INFANTE, S.L.P.

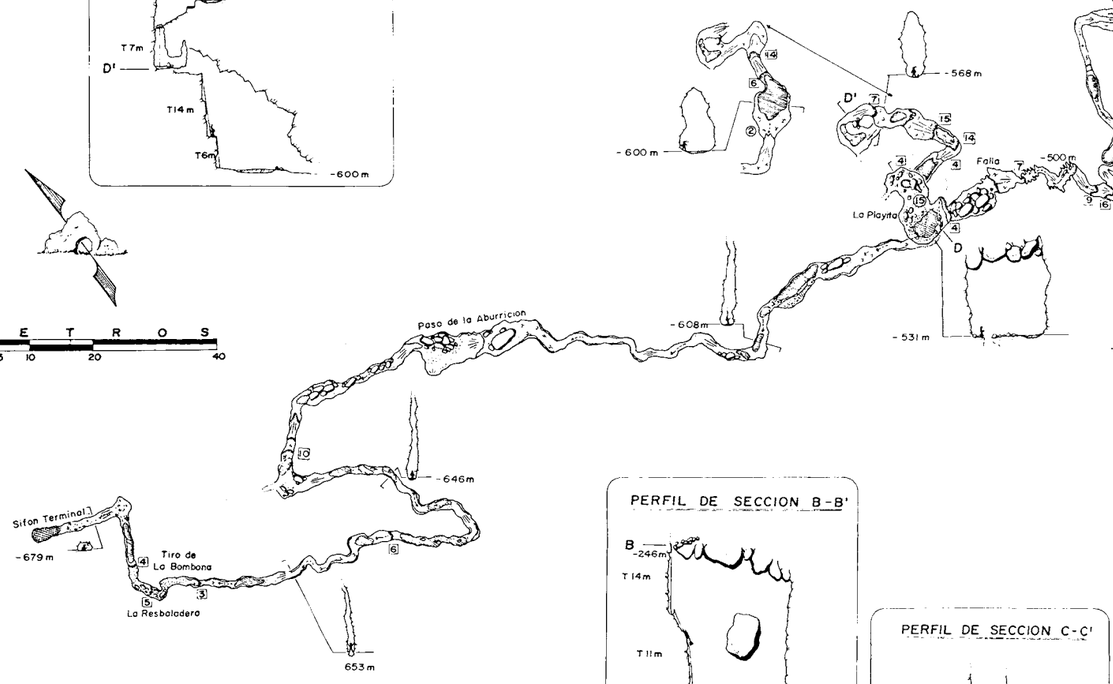
COORDENADAS: 22° 05' 57" N, 100° 36' 40" W
ELEVACION 2100 m.s.n.m.
LONGITUD TOPOGRAFIADA: 1346.46 m
PROFUNDIDAD TOPOGRAFIADA: - 679.32 m.

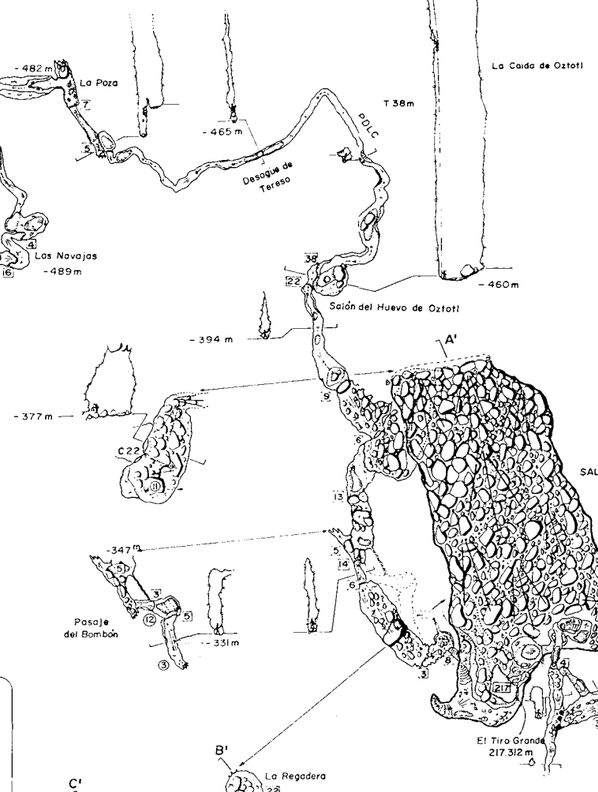
SUUNTOS, EDM Y CINTA.
ENERO 1989
MARZO 1989
NOVIEMBRE 1990
ENERO 1991

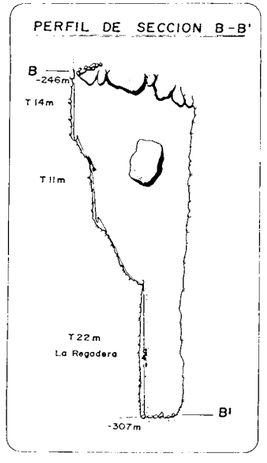
TOPOGRAFIADO POR
APME, DRACO Y TEQUITEPETL (MEXICO)
AMCS Y NSS GROTTOS (USA).

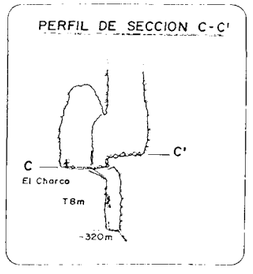


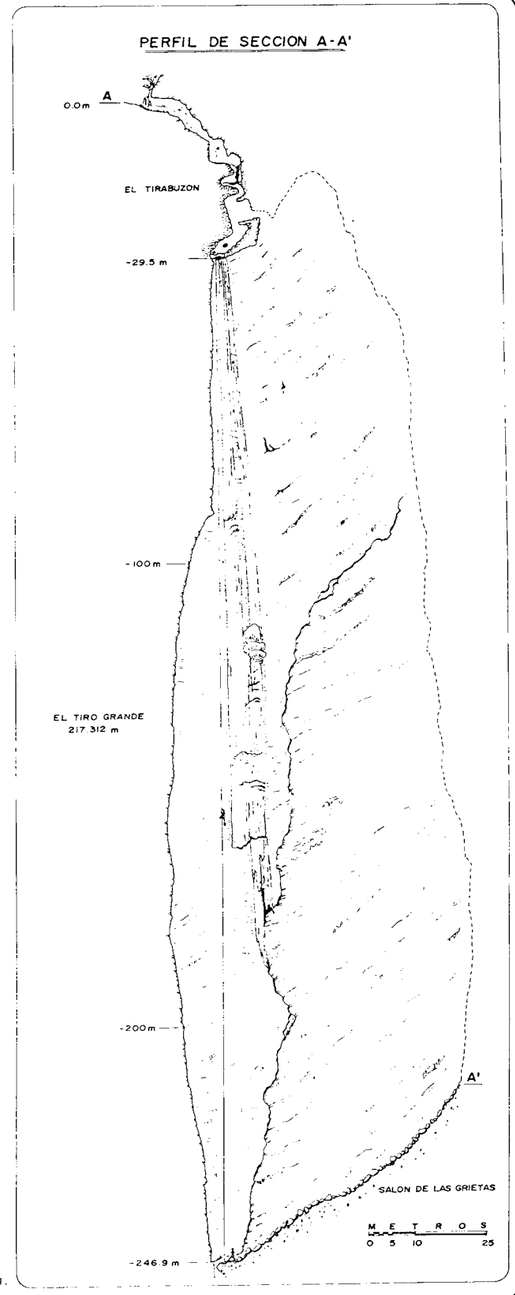












SIMBOLOGIA

Pasaje topografiado		Bloques de derrumbe	
Pasaje inferior		Estalactitas	
Pasaje superior		Estalagmitas	
Pared indefinida		Columnas	
Pendiente		Colada estalag.	
Pasaje con agua		Columna de roca	
Arena		Sifón	
Barro		Profundidad de tiro	15 ó T15m
Techo bajo		Profundidad bajo datum	-200m
Piso de roca solida		Datum	
Corriente intermitente		Altura de techo	③
Tiro vertical		Estacion marcada	C22

NOTA: SECCIONES TRANSVERSALES Y VISTAS DE PERFIL DIBUJADOS A MISMA ESCALA, EXCEPTO PERFIL DE SECCION A-A' (ESCALA INDICADA).

DIBUJADO POR: RAUL PUENTE M. 1991.

mapping team on their way out and help with the de-rig. Passing Terry, they continued down and met Alan and Marion near the T-junction. Neeld saddled seven, lengthy ropes and headed for the surface. Outside, he alerted the camp that the de-rig crews would be at the bottom of the pit soon and that help was needed to haul out the ropes.

A crew of thirty cavers spread out from the entrance to the top of the pit. Marion, Alan and John uncoiled all the ropes and snaked them end to end. Maureen and Alan climbed the pit, then Marion and John waited as the eight hundred meters of rope was hauled out. An old Modelo beer can affixed to the tail of the rope signaled the end. After six hours of hauling , everyone was out of the cave at sunrise Friday morning.

WRAP UP

Friday was spent sorting gear, making plans for a return trip and collecting addresses of new friends. Americans, Mexicans and Canadians had worked together to make the expedition a great success. Resumidero el Borbollón is currently 678 meters deep and 1324 meters long with a nasty, low air space waiting to be pushed.

Besides exploring the cave, Bruce Smith and other expedition members had spent many hours teaching vertical techniques to the Mexicans. Since quality gear is hard to come by in Mexico, many folks sold any extra gear they had, as well as some essential gear that the Americans could easily replace when they returned home.

Other participants: Miguel Angel Flores, Bertha Jiménez, Jesús García Marquez, Norma Hatch & Fernando Chavez, Angel Mendizabal, Anibal Mendizabal, Alfredo Varela, Eduardo Pena, Antonio Bautista, Ana Lara, Juan Cancino, Francisco Javier Jones, Silvia Yolando Vela Palos, Francisco Javier González, Miguel Angel Jones, Rogelio Shez, Claudio Espinosa Anguiano, Cesar Torres, Josilberto Torres Jimenez, Oscar Berrones Contereras, Bethany Jablonsky, Jim Hodsen, Gretchen Reinhardt and B. Daniel Stickney.

RESUMIDERO EL BORBOLLON

Durante Mayo de 1989, un grupo Americano-Mexicano-Canadiense exploráron y topografiáron la Cueva del Borbollón hasta una profundidad de 678 metros. El total de pasaje horizontal topografiádo fué de 1324 metros. Un grán tiro en la parte superior de la cueva fué medido siendo de 217 metros. El punto más alejado durante la exploración fué en una poza con un pequeño espacio de aire. Los cueveros reportaron haber escuchado agua corriendo en el otro lado a pesar de que no se observó movimiento de aire. Se planea volver para continuar con la exploración y topografía.

DISCOVERIES IN POZO DE MONTEMAYOR

Bill Steele

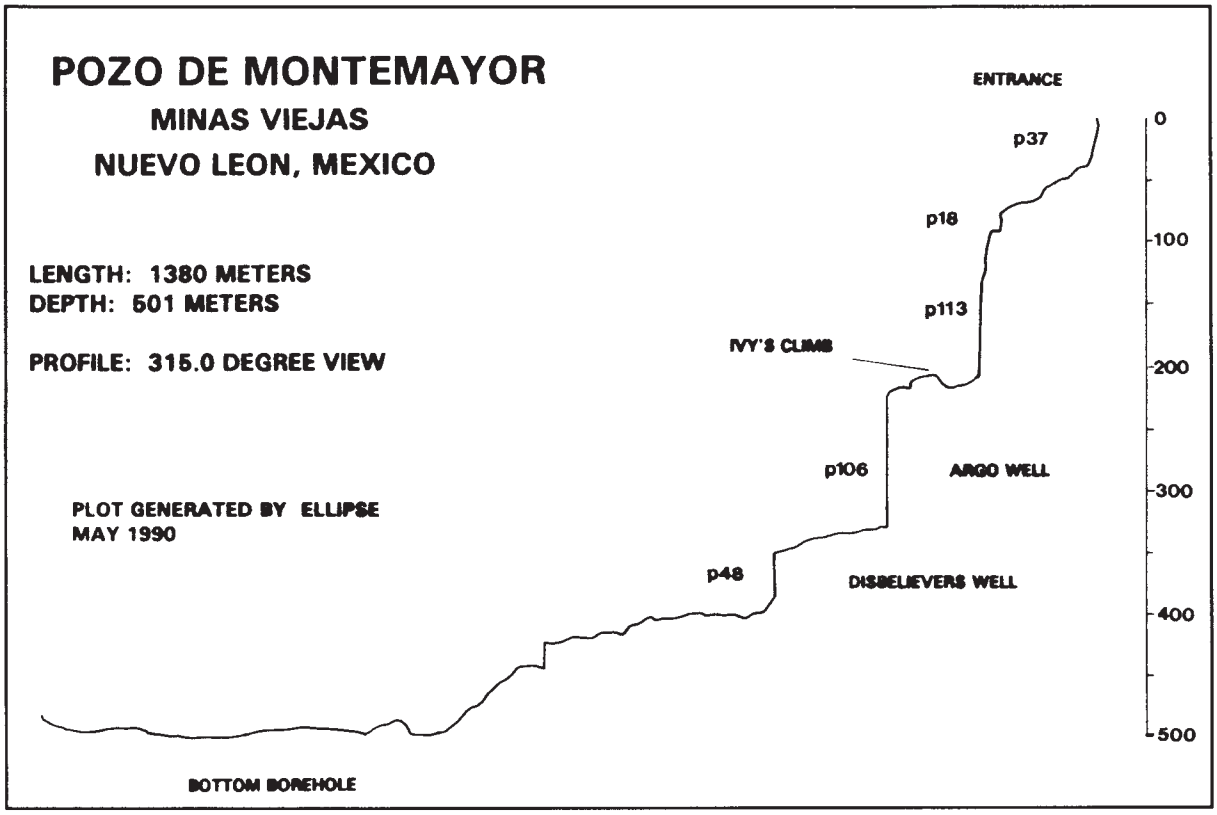
Passage below third drop in Montemayor (Andy Grubbs)

Minas Viejas, located in the mountain range east of Bustamante, was named after the cinnabar mining operations started over two hundred years ago by the Spanish. Mining was curtailed early in this century and all that remains is a complex of buildings, where over a thousand people had once lived. Today, a mere dozen or so people reside there. In addition to the mines, there are many caves in the area.

In the fall of 1980, a new cave was discovered on top of the mountain range east of Bustamante. Upon the insistence of the owner, Senior Pedro Elizaldi, Pozo de Montemayor was named after the first caver to descend the 35-meter entrance pit, Alan Montemayor.

From the entrance pit, five short drops led to the top of a monster. Dan Klinefelter and Bill Mayne were the first to descend this 115-meter, freefall pit. Over the ensuing years it was visited infrequently. In addition, other caves nearby were explored and proved to be interesting. However, the area was not considered to have potential for world-class, deep caves. Pozo de Montemayor was the deepest cave at Minas Viejas at 236 meters, half that depth coming in one shaft.

Due to scheduling conflicts with planned trips to the cave, I had not been able to make a trip to Montemayor. My home grotto, the Bexar Grotto, was big on the area, but most shied away from that last, deep drop. A handful of my friends who went to the cave, encouraged me to check it out. They reported steady airflow on the way to the big drop. What was needed to really check it out was a strong light to study the walls, someone experienced with swinging around on shaft walls and, probably, climbing aids.



RECONNAISSANCE

In early October of 1989, a trip was organized by Joe Ivy to thoroughly check out Montemayor. My son Brian, Don Morely and I volunteered to rig the cave and scan the walls of the last drop. We rigged the cave and made our way to the bottom. I had a Wheat Lamp and scanned the walls of the last drop as I made the first descent. Near the bottom, a thirty-meter-high canyon snaked away from the shaft. At the bottom there was no airflow. I followed thirty meters of passage away from the shaft and came to the known bottom of the cave. At -236 meters I arrived at the sump, observing mud covering the walls for ten meters up. But, approximately ten meters above the sump, there seemed to be a higher floor to the canyon I had been following. Even higher, about thirty meters, the ceiling continued.

I came back to the base of the drop to bottom-belay Morely. We only had two sets of gear and he would climb back up before Brian would come down. All went well and he and I went to scope the climb above the mud sump. We kicked steps into an existing mud bank and gained the top. I hammered the wall to check for good limestone and found mud overlying rotten rock. This was the place to begin the climb. The mud bank had given us three meters and sloped up to where the wall could be followed to the floor above the mud sump. I hammered a conical hole into the rotten rock which went twenty centimeters deep before coming to solid rock. The good stuff was great. It resonated with that mother earth, flat sound.

After this, I accompanied Don back to the base of the long drop to give him his first lesson in ascent. I rigged him with a Mitchell- jumar setup and gave him pointers as he struggled to leave the ground. As he climbed, I turned off my lamp and leaned against the wall to observe. The first ten meters took him several minutes. However, in a short time I heard a rhythmic click-clicking. He was now thirty meters up and had the hang of it.

Next, Brian came down and I took him to see the sump and the hopeful climb above it. I placed a bolt at the back of the conical-shaped hole in the wall; the climb was now set to be done.

The next day, Joe Ivy and a handful of others came in and zipped down to the climb. Joe decided that hammering into the wall to get to solid rock was a lot of trouble so he brought out a Ninja grappling hook. He got it to hold at the top of the climb and swung over the wall right above the mud sump. From there he was belayed from my bolt, inched a jumar up the rope to the grappling hook and cut steps in the mud to gain height. In four hours he reached the top.

A high canyon faced him. Fossil formations hinted at going cave. The airflow was here again. Joe and a few of the others followed the passage for fifty meters to another drop. They found some rocks to toss in and looked at each other in disbelief when the count of six seconds was reached. The rocks landed in water.

ANOTHER DEEP DROP

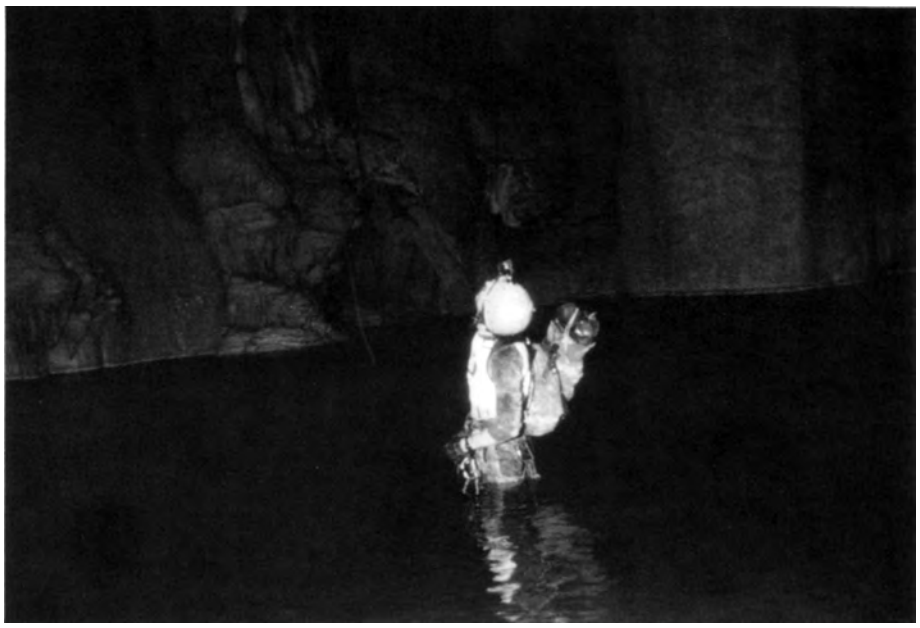
The return to push this new drop was planned for Thanksgiving and Montemayor was going to be jam-packed with the multitudes. A group of us decided to begin the four-day weekend with a descent into the

canyon off the edge near the mining community to explore a large horizontal cave spotted at the base. What was planned to be a long day stretched to become two. It took quite a while to follow the ridge around, go down through cactus and woods, step down dropoffs and reach the top of the set of cliffs above the entrance. By pre-arrangement we had folks from the caver camp come over to the edge every two hours and guide us with a walkie-talkie.

We rigged about 250 meters of rope and reached the floor of the canyon with none to spare. The entrance was large and inviting, but the cave ended in less than two hundred meters. We spent the night in the entrance, huddled around a bonfire, sleeping in thirty-minute stretches between waking up shivering. We named it Forced Bivouac Bear Cave. The bear part of the name came from the abundance of bear scat and torn up logs we had passed on the mountainside. It was Friday evening when we returned to camp. A belated Thanksgiving feast was in progress. The temperature had dropped and a strong wind gusted.

Argo Well was the name given to the new drop. It was approximately 125 meters deep and freefall to thigh-deep water. A short, five-meter drop followed, then a passage led to a fifty-meter drop. At the base of this drop it took awhile to locate the way on, but a very tight and sticky mud tube was found. Named the Rebirth Canal, it lead to a dry, meandering canyon then a forty-meter drop.

Most of the multitudes present at the Minas Viejas caver camp had seen what they wanted of Pozo de Montemayor. It was down to serious business. We were looking at a five-hundred-meter deep cave. At the base of this undescended forty-meter drop it would be close to that magic number, indicative of a world-class, deep cave.



Pool at the base of Argo Well (Andy Grubbs)

We decided on two teams; one to rig on ahead and survey back if it ended or if they ran out of rope, and a second to survey beginning at the forty-meter drop.

The forty-meter drop opened into a decorated room twenty meters wide and sloping down on flowstone and rimstone dams. This led to a trunk passage which jagged to the left through a forest of columns, stalagmites and draperies. In a forty-meter wide passage, reminiscent of Mammoth Cave, we tied in surveys with the others, and sat for a chat with Ivy, Linda Palit and Rolf Adams and Anne Gray from Australia. The passage dropped in height not far ahead. It was then a sumpy-looking crawlway to a mud fill.

On the way out, the long drops caused bottlenecks. Even though we climbed tandem there were long, cold waits. We emerged from the cave to the warm sunshine on Sunday morning. It had been a 23-hour trip.

Pozo de Montemayor calculated to be 501 meters deep. It still has leads off the canyon between the Rebirth Canal and the forty-meter drop before the muddy trunk passage. The two trips to the cave taken to date since the Thanksgiving 1989 trip have been to de-rig it and to take photos. Neither trip went through the Rebirth Canal. It remains to be seen what else is down there. Some of the other caves in the area seem all the more appealing. Pozo de Montemayor is now México's most northern, five-hundred-meter deep cave.

POZO DE MONTEMAYOR

Durante una excursión a Minas Viejas en Octubre de 1989, los cueveros descubriéron un nuevo conducto en el Pozo Montemayor. Una escalada técnica de 9 metros permitió el acceso a un pasaje el cual conduce a un tiro profundo. La falta de tiempo y cuerda pospuso el descenso de éste tiro hasta noviembre de 1989. En esa ocasión se decendió y topografió hasta una profundidad de 502 metros, haciendo esta, la cueva de 500 metros de profundidad más al norte de México.

1990 EXCURSION EN PUEBLO NUEVO SOLISTAHUACAN

PHASE I

DON COONS

Highway 195 winds its way through northern Chiapas connecting the Tuxtla/San Cristobal area with Villahermosa. The countryside is mainly limestone ridges with deep, intermediate valleys. Most of the area has been slashed and burned by the Indians, but areas of pine forest still remain. Near the high point of the highway, just north of Pueblo Nuevo Solistahuacán, the mountains rise to an altitude of over 2300 meters. Part of the ridge and western flank is owned by the Seventh Day Adventist Church and named Yerbabuena. It was founded three generations ago by an American family named Comstock and today has, as its central feature, a medical clinic and nursing school.

I was first introduced to the area by Gerald Moni and Marion Smith. They were on route back to the States after a raft trip on the Usumacinta River. Gerald had met Ruben Comstock at the previous National Speleological Society convention. With Ruben as guide, we were all keen on doing Sótano del Arroyo Grande, a deep pit that had been discovered in the area by the Draco Grotto. Ruben, the present generation Comstock, carries on the family tradition of hospitality in grand style. Mexican-born to an English-speaking father and a Spanish-speaking mother, Ruben speaks both tongues with his own flare. His first sixteen years were spent in México; he has since attended school and worked in the States. Ruben currently lives in Delaware for nine months, but returns to Yerbabuena for the winter. He carries on his grandfather's interest in caving and also in protecting the land from destructive agricultural practices. Together with his wife, Michelle, they hosted this year's excursion, which will be the first of many. With a "mi casa es tu casa" attitude and a cousin in every corner of the community, Ruben and Michelle pave the way for an unparalleled opportunity in Mexican caving.

View to the northeast toward the spring (Fred Grady)

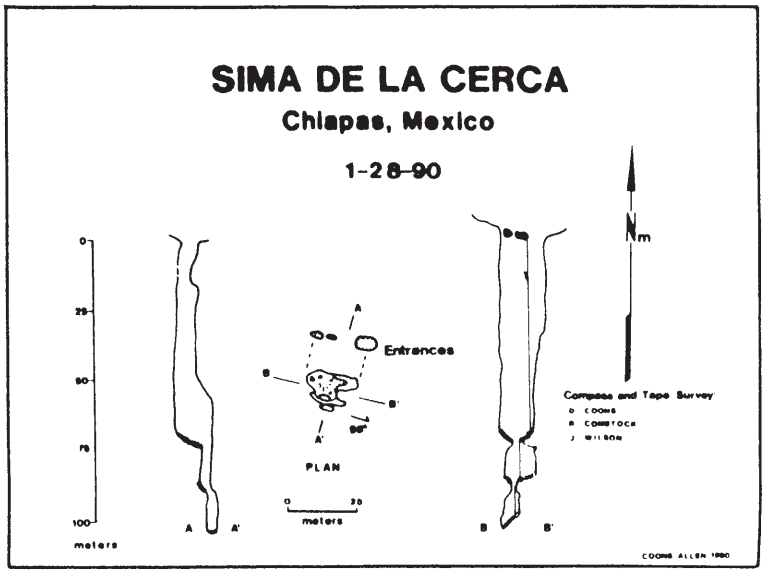
A three-day visit to the area in early January intrigued me greatly. Marion, Gerald, Ruben, Ron Simmons and I bottomed the thirty-meter diameter, muddy-floored, gunbarrel pit of Sótano del Arroyo Grande. Named for a nearby village, it is one of Mexico's deeper pits at -283 meters. On the following day, Ron, Sheri Engler, Kathy Haverly and I visited Cueva del Arroyo Grande, a large, horizontal borehole of dusty breakdown. Its entrance lies only forty meters higher in elevation than the pit, and one and a half kilometers away. How could two caves be so totally different, yet have developed in the same limestone, in such close proximity?

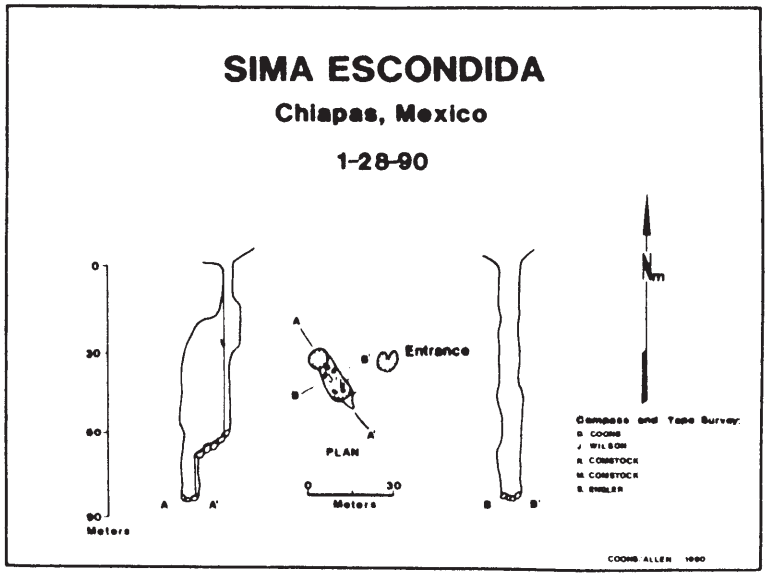
On January 16th, I returned to Yerbabuena to try and learn more. Two of Ruben's friends from the States, Jerry Wilson and Chuck Allen had arrived in the meantime, and with Sheri and Michelle we now totaled six. Although most were inexperienced in vertical and survey techniques, we learned a lot together. In the next three and a half weeks, along with those of Phase II, we catalogued, surveyed or began exploration of more than thirty caves.

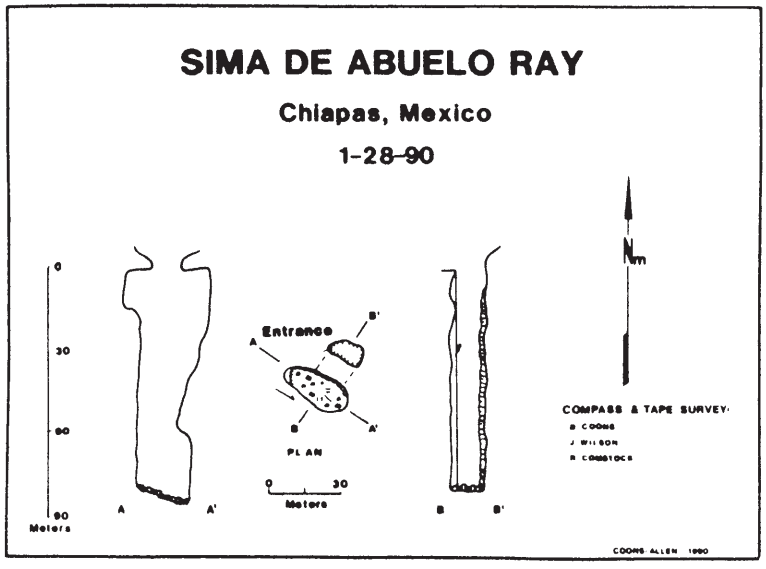
On the mountainside above the clinic, we mapped three pits on January 28th. Sima Escondida is a sixty-meter free pitch to a slope and a second 15-meter blind pit, Michelle's first pit. Sima de Abuelo Ray and Sima de la Cerca are on the trail. The first is a fine, eighty-meter free pitch to a talus floor. It was first descended some twenty years ago by Ruben's grandfather. He accomplished this feat, hand over hand on one line while being hauled up by a second line tied around his chest. Sima de la Cerca is close enough nearby that both pits can be rigged with a single line. Cerca was first bottomed in 1985 by the Draco Grotto at 106 meters in three pitches of 70, 20, and 16 meters, respectively.

Preliminary exploration in Sima Soconusco was begun on January 21st. A fine, free, 120-meter entrance pitch splits into two branches at the bottom. One is blind, but the other reaches a stream that sumps upstream. Downstream continues as one-meter-wide, four-meter-high canyon. We ran out of rope at this point, but it looked like an auspicious beginning to a fine cave. At least forty people had come to watch as we exited the cave that evening.

More than two kilometers upslope and 620 meters higher in elevation was Sima del Cedro and Sima Dos Puentes, less than 70







meters apart. All things considered, they were among the finest I had ever done. Both drop free down large, open faults past natural bridges to a depth of 175 meters and 172 meters, respectively. A second, fifty-meter pitch follows in both pits after a four-meter offset. Cedro ends in talus, but Dos Puentes continues down three more pitches to an end at -295 meters, passing three good leads. Our single, 330-meter rope was short, leaving a ten-meter down-climb to the bottom.

Cueva Queso Suizo was a nice, 470-meter long, mazey joint-controlled complex with five entrances surveyed on January 17th. Walking, canyon passages made it a friendly, comfortable cave. Everything drained down to a final boulder choke and sump that we believe flows into Cueva de Arroyo Grande, eighty meters lower.

At least a dozen other pits were located and ranged from thirty to a hundred meters in depth, but lack of time and additional rope prevented our entering everything we found.

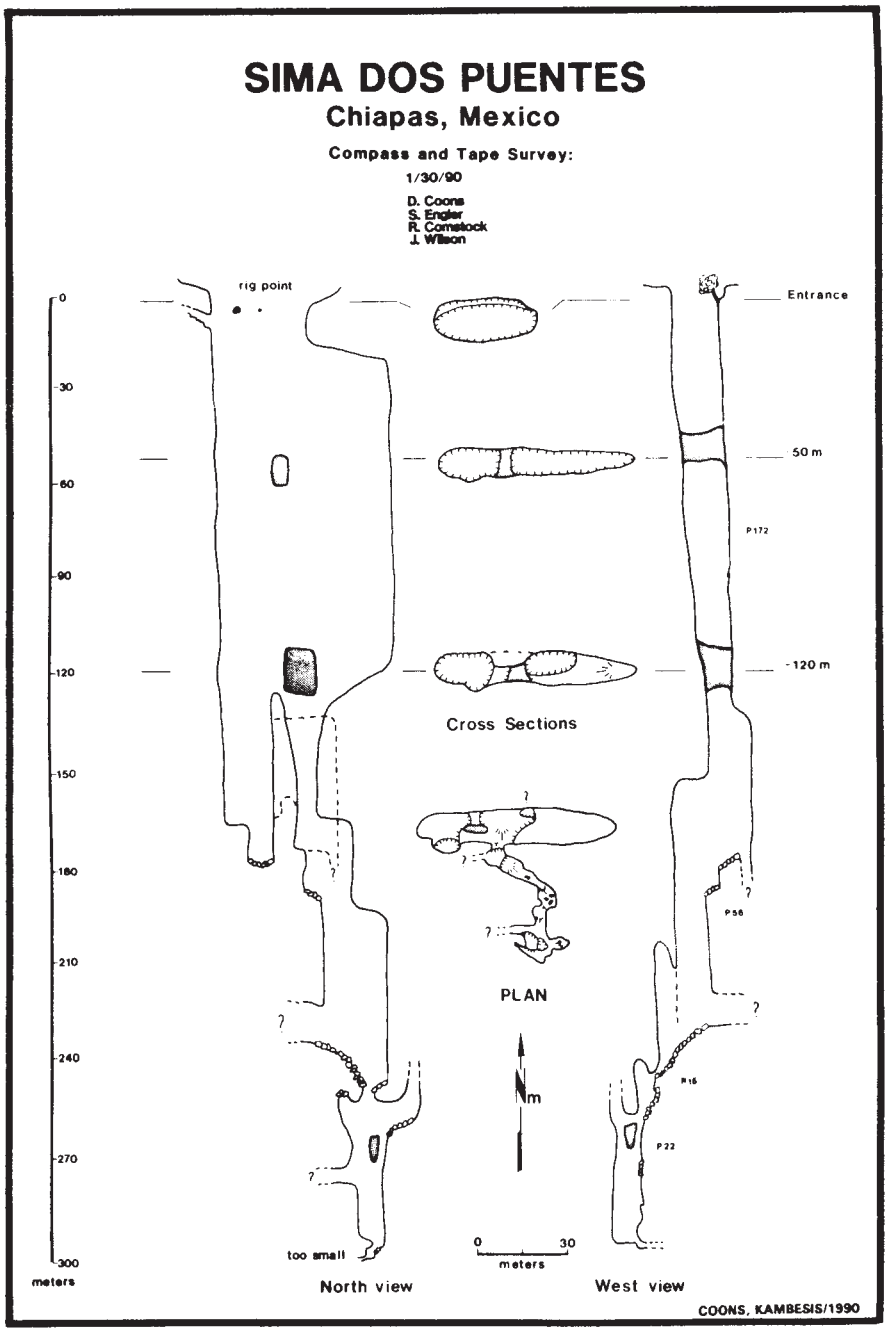
One of our most significant discoveries was what must be the master resurgence for the region. It is located at an elevation of 930 meters and flows from a boulder pile. With the mountain rising to above 2300 meters updip there is a vertical potential of over 1300 meters.

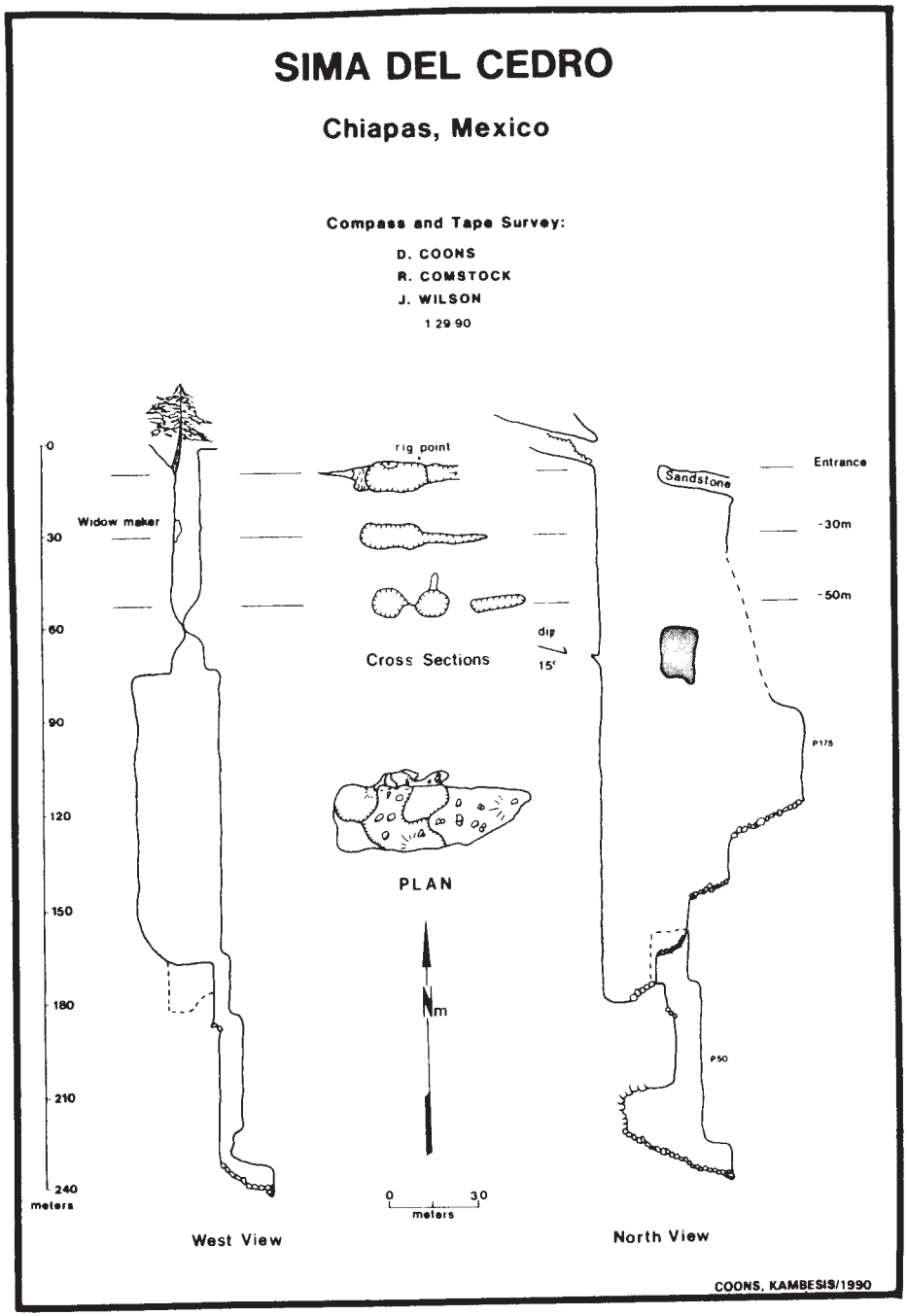
PHASE II

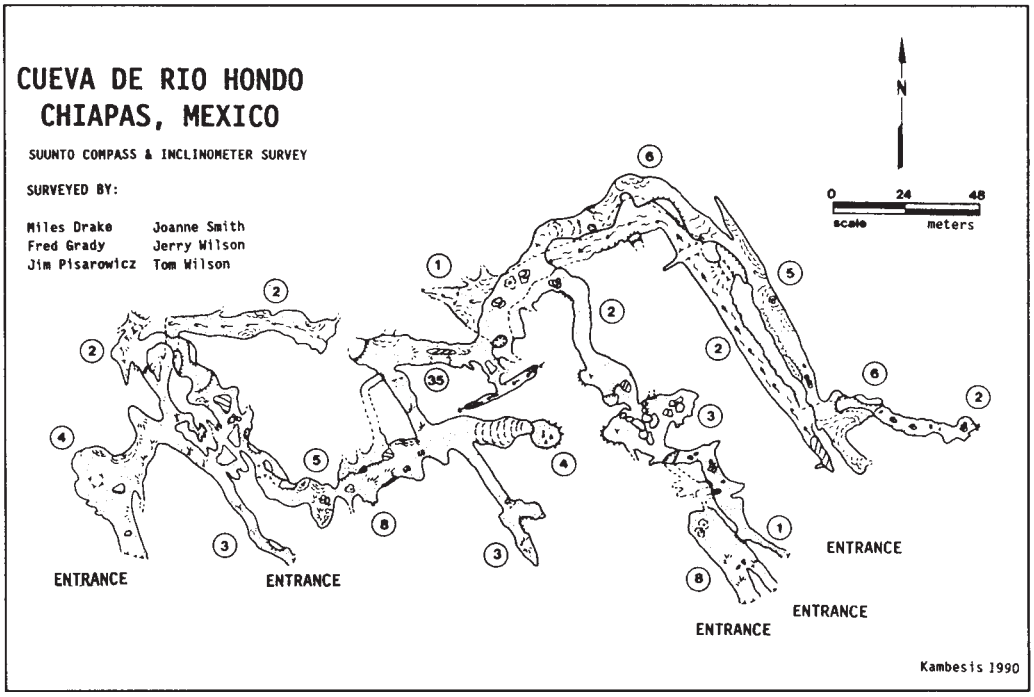
MILES DRAKE

As our transport crested the mountain on Mexican route 195 and began its descent, anticipation, aroused from map study and our guide's cave descriptions, broke like a cold sweat. Below, green, pine-filled canyons, interrupted by the occasional field and the village of Pueblo Nuevo Solistahuacán, gave a fine vista. The greenery and flowers were a great contrast to the gray mid-winter of Washington, D.C., only sixteen hours before. The road was built at a slight grade and descended 250 meters in nine kilometers, with the mountain to the northeast. The fact that the mountain "contained many caves on both sides" was the object of our keen interest.

The 1990 Chiapas Excursion was undertaken as a low-key surveying project in the Solistahuacán area. This was in response to a request from Ruben Comstock, our host. He was well-connected locally and would be able to diplomatically gain exploration permission prior to our arrival and possibly circumvent any political problems should


SIMA DOS PUENTES
Chiapas, Mexico
Compass and Tape Survey:
1/30/90
D. Coons
S. Engler
R. Comstock
J. Wilson
rig point
Entrance
50 m
-120 m
P172
Cross Sections
PLAN
P56
P15
P22
too small
North view
West view
0
30
meters
COONS, KAMBESIS/1990


SIMA DEL CEDRO
Chiapas, Mexico
Compass and Tape Survey:
D. COONS
R. COMSTOCK
J. WILSON
1 29 90
Widow maker
rig point
Cross Sections
dip
15°
PLAN
Sandstone
Entrance
-30m
-50m
P175
P50
West View
North View
0
30
meters
COONS, KAMBESIS/1990



they arise. His welcome included staging support at his part-time home, the Church's Reserva La Yerbabuena just north of Solistahuacán. This facility included a modern, concrete slab outbuilding with electricity and, nearby, running tap water and outhouses. Within three hundred meters was a Medical Clinic (the area hospital) and cafeteria. Our four-member team agreed that this opportunity would be hard to turn down. Unbeknownst to us, others thought so too. We were met at the Villahermosa airport by Ruben and Jim Pisarowicz and were told Don Coons and Sheri Engler had already begun surveying. Jim, Don and Sheri were in México awaiting the start of their own, separate projects. Don and Sheri, with the assistance of Rubin and his two friends, Chuck Allen and Jerry Wilson, had plumbed several deep pits (see Phase I).

GEOGRAPHY

The mountain ridge trends north-south and has several summits above 2300 meters. This mountain roughly divides two surface drainage basins; Río Durango, to the west (the Solistahuacán side) and Río Toro on the eastern side. What is very obvious from a glance at the topo is a two-square-kilometer sinkhole karst region on the western flank. To the east is a wedge-shaped valley lined on both sides by three, receding cliffs all converging to a narrow canyon, downdip to the northeast. The contours between opposing, four-kilometer cliff lines are strikingly perpendicular to the axis of the wedge. The entire wedge drainage represents more than twenty square kilometers and is mostly subterranean. Its form is so regular that it appears as if it had been strip-mined.

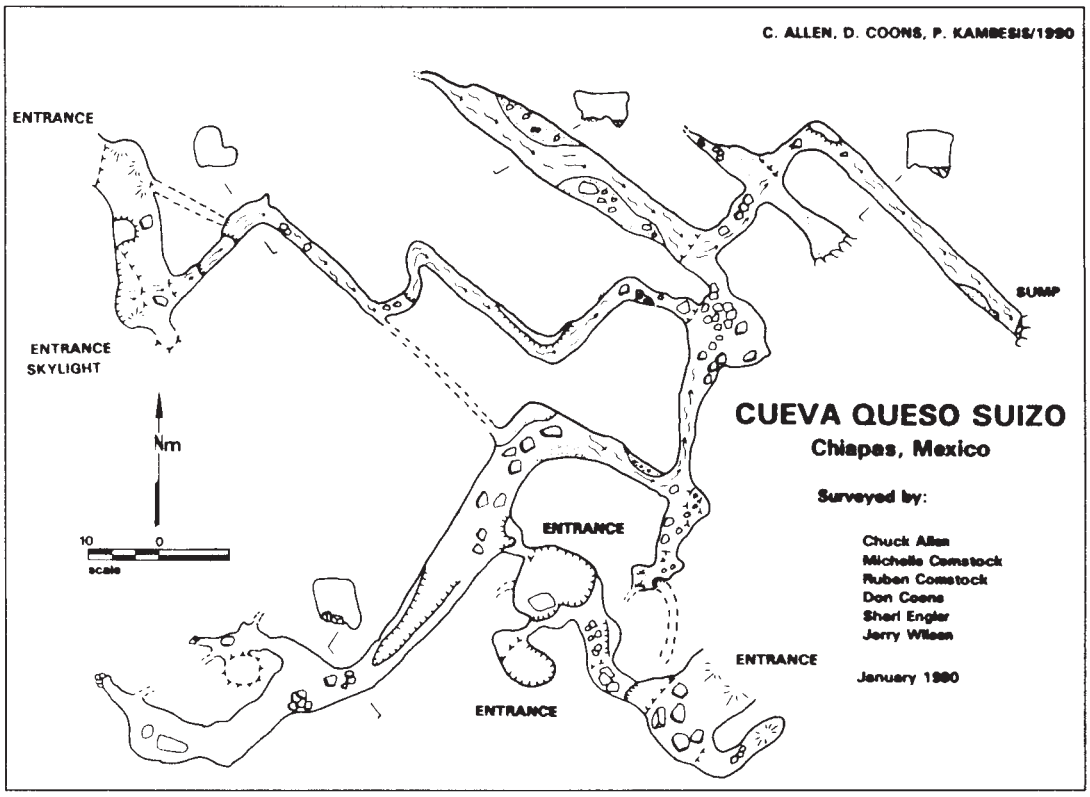
The wedge has been stripped of its forest vegetation. The ridgeline of the mountain acts as a barrier to the weather, allowing a sunny day on one side, while causing rain on the other. The pattern reverses s with the change in wind direction. The ridge receives the brunt of the rainfall and a cloud forest has developed. In February, the start of the dry season, we were not inconvenienced. Temperatures were pleasant, between fifty and eighty degrees Fahrenheit. This year, the dirt road from Solistahuacán over the ridge to the village of Arroyo Grande was passible, when dry, for two-wheel drive vehicles, which means we could get within one kilometer of many caves.

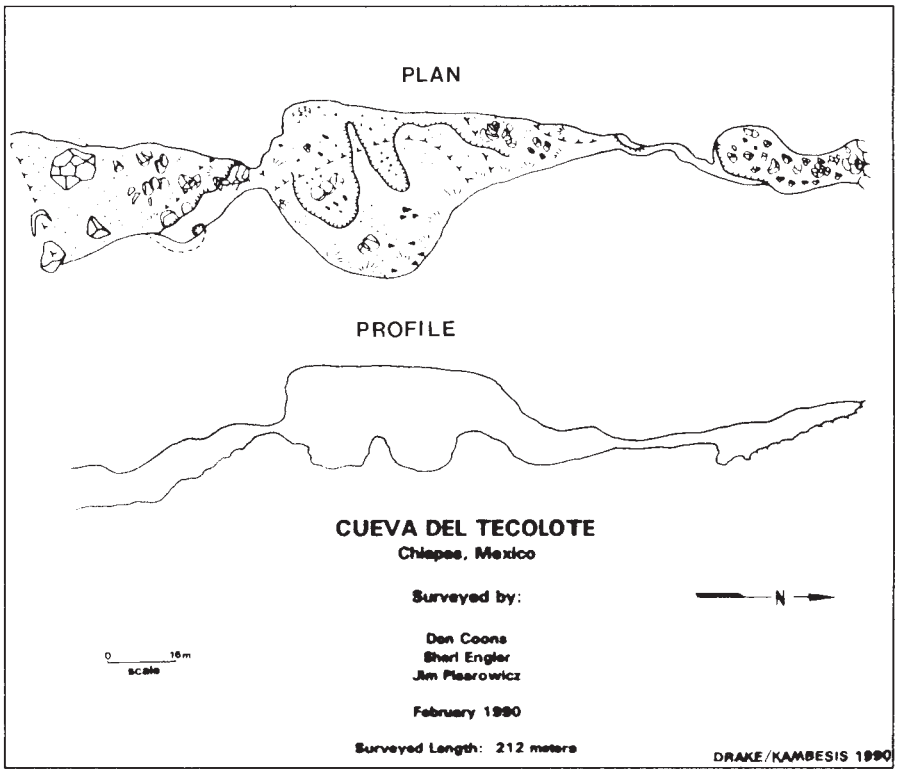
FOCUS

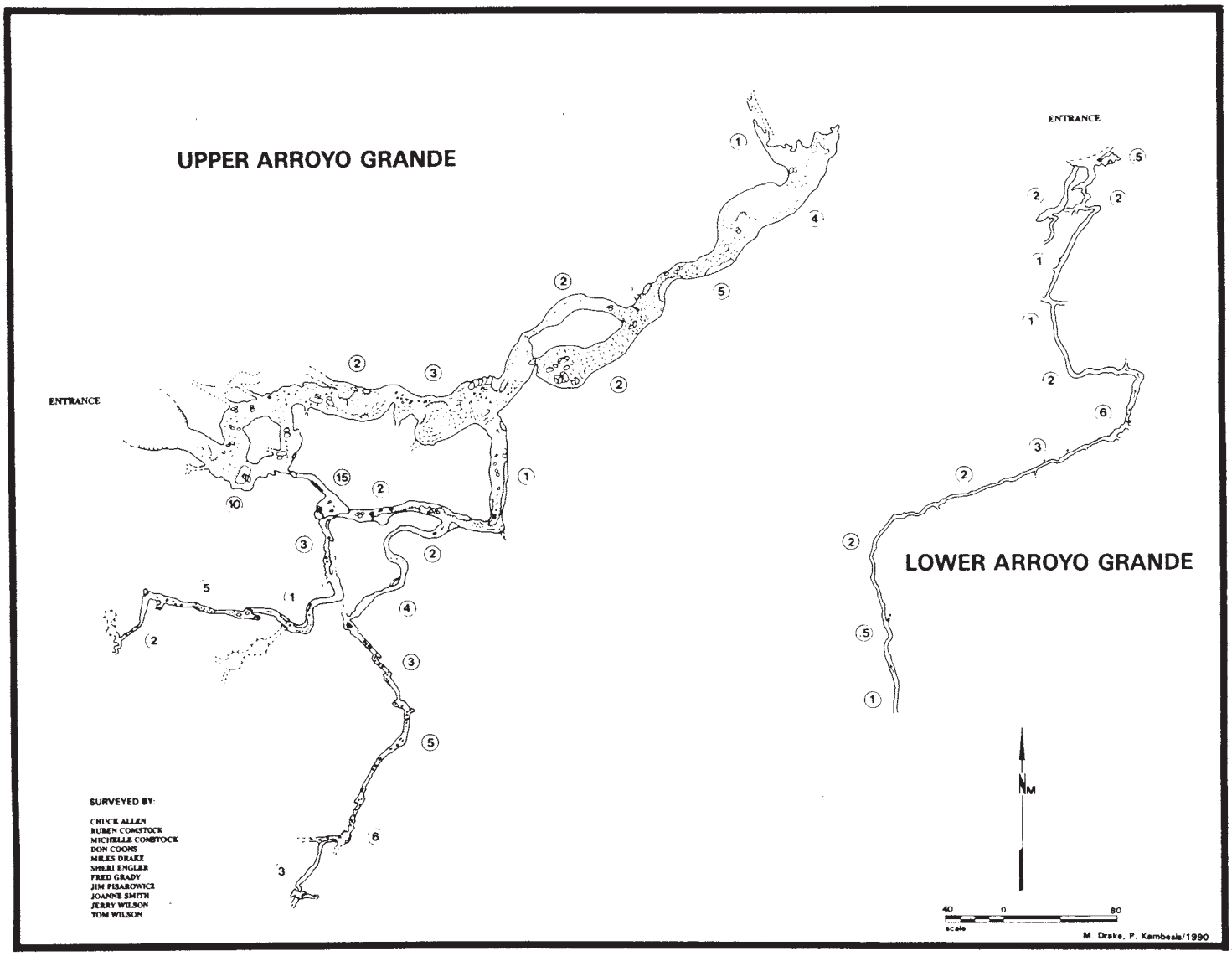
Known in the area was deadbottom Sótano del Arroyo Grande and a large, complex cave previously explored and surveyed by an Italian group from Rome in 1987 and named by us, Cueva del Arroyo Grande. The cave was so impressive, and yet so obviously a mere fragment of a large system, that we decided to resurvey it. The first entrance we visited lies north of the village. Off the bottom of a large sinkhole, the paleo-trunk passage beyond is seldom less than twenty meters wide, dry and lacks formations. The floor consists of small- to medium-sized breakdown slabs and occasional, choked funnels. After about a kilometer, a breakdown-choked dome blocks the passage. Dripping water and surface debris indicate a possible connection with a surface sink above.

Halfway to this point a large passage can be followed upstream for half a kilometer before it branches into much smaller passages. One high-level passage from the

Miles Drake in Río Hondo (Fred Grady)


C. ALLEN, D. COONS, P. KAMBESIS/1990
ENTRANCE
ENTRANCE
SKYLIGHT
SUMP
Nm
10 0
scale
ENTRANCE
ENTRANCE
ENTRANCE
CUEVA QUESO SUIZO
Chiapas, Mexico
Surveyed by:
Chuck Allen
Michelle Comstock
Ruben Comstock
Don Coons
Sheri Engler
Jerry Wilson
January 1990


PLAN
PROFILE
CUEVA DEL TECOLOTE
Chiapas, Mexico
Surveyed by:
N
Don Coons
Sheri Engler
Jim Pisarowicz
0 16m
scale
February 1990
Surveyed Length: 212 meters
DRAKE/KAMBESIS 1990



entrance connects to this passage via a twenty-meter pitch. There are some other interesting and unexplored passages above the stream passage that may go off elsewhere in the downstream direction. A climb up the south side of the stream passage leads to the Gypsum Passage which connects to the lower entrance. Ruben and Jerry Wilson did a through trip just to prove that the entrances indeed did connect. Approximately one kilometer remains to connect the surveys.

The approach to the lower entrance on the surface is more of a walk. The surface streambed can be followed down from the village to several large sinks, the first of which contains the impressive entrance of 212-meter-long Cueva del Tecolote. The other end of the sink has a small entrance and passage goes 101 meters to a 12 meter pitch. This large entrance has much more varied sizes of breakdown and several passages leading off. One was followed for more than a kilometer and many side leads were noted. A stream, encountered about halfway in, is not related to the stream in the upper cave. This end of Cueva del Arroyo Grande is more complex and much more decorated.

In all, ten survey trips were made to get the 3630 meters, roughly half of what the Italians were said to have accomplished.

CUEVA DE RIO HONDO

As a diversion, we surveyed an interesting cave just off of Route 195 that Ruben's grandparents had explored. The main entrance sits above a good-sized stream, and is an easy walk-in.

Within thirty meters, the passage joins a small cave stream that sinks under the wall. Upstream, the passage continues past several pagan shrines consisting of a central dead chicken, candle stubs, herbs and rum bottles. After the last shrine, a bellycrawl through a pool leads to a bit more cave before it gets too small to traverse. The main route goes up a short climb back toward the entrance. A pole was in place to make the climb easier. At the top of the climb is an old, phreatic maze-passage, only slightly offset from the lower stream passage. Off to the right is a short series of crawls leading to a small entrance and another climb-down to the stream. At the end of the maze-passage,

a cool breeze issues from a tight crawl. Ray Comstock, Ruben's grandfather, dug through this in the 1950's to discover the nicely-decorated passage beyond. The majority of the rest of the cave is joint-controlled passage with many formations. At several points, one can climb back down to traverse the stream level. The final upstream section gets too tight and the upper level chokes with breakdown. However, one climb-up through breakdown leads to a third level and two more entrances. Of particular interest were the vampire and fruit-eating bat roosts and the volcanic sand deposits dating, no doubt, from Chichinal's eruption in 1982. Four, short, survey trips netted 706 meters.

North of the village of Rincón Chanula lies a karst valley where we spent a day hiking, escorted by local Indian children who were helpful in finding the less-obvious entrances. Intending to do only surface reconnaissance, we left full caving gear behind.. It was just as well; seven entrances later it was obvious that we might make a week-long project of this one valley alone.

GEOLOGY

Don Coons

The following are geologic observations made during the course of the four-week expedition. The limestone mountains, probably of Oligocene age, rise over 2000 meters in a single, large, anticline. Its axis trends north-south with an eastern slope formed along a continuous northeast-trending monocline which dips 10-15 degrees. The western slope is much steeper and nearer the flex point of the anticline, with bedding dipping at sixty degrees. Although most of the mountain is limestone, a sandstone and shale unit up to fifty meters thick interupts it near the top. The exposure of this unit on the east flank forms a zone of cave and pit entrances in the limestone immediately below. A north-south band across the mountain between 1600 and 1800 meters elevation delineates the zone. Above the non-calcareous unit lies more internally-draining karst. No entrances are known there and the drainage resurges as small streams flowing across the sandstone and sinking again into much thicker limestone units below.

Earlier erosional downcutting in the area would have first breached the sandstone along the anticline above the present-day clinic. Water from the Río Durango on the west may have been pirated through fault cracks along the flexure line into the underlying limestone. These waters follow the bedding downdip to the east and flow completely under the mountain. They resurge again at its base where the sandstone is broken by much more rapid downcutting of the Río Toro as it drains to the coastal plain. Further erosion in the Río Durango has returned its water to the surface, flowing on an igneous bed. The western bank presumably flows underground to the large spring in the headwaters of the Río Toro to the east. Much more recent solution by water coming off the sandstone has drilled a number of deep shafts vertically to join this pirated water, draining the entire mountain.

In summary, caves in the area fall into two types. Either large, thirty-meter diameter dry, horizontal, boreholes or deep (60-280 meter) shafts. Although both are entered just below the sandstone contact, one type long predates the other in its genesis. The horizontal caves still capture small amounts of local drainage forming smaller, lower-level, active canyons. Several of the pits continue as multi-pitch caves with small streams. All of this water eventually joins to form the Arroyo Grande System resurging at the base of the mountain. Whether the cave can be integrated into one large system remains to be seen.

Michelle Comstock in Cueva del Arroyo Grande (Fred Grady)

Marion Smith calls the area a yo-yo's dream. Miles Drake declares "there is so much horizontal passage, the vertical types will never really be interested. Ruben Comstock says "I just want to attract as many cavers as possible to my corner of Mexico." Whatever your caving desires, Yerbabuena holds the answer.

ACKNOWLEDGEMENTS: We would like to thank the following people for their support: Doug Dotson for donating SMAPS, Bob Hoke for computer wizardry and Pat Kambesis for cartography.

PUEBLO NUEVO SOLISTAHUACAN

Un grupo de cueveros de Estados Unidos pasaron varias semanas de enero y Febrero de 1990, explorando cuevas cerca de Arroyo Grande, en el municipio de Pueblo Nuevo Solistahuacán. Topografiáron varios tiros profundos en el área. Una segunda fase de la expedición de dos semanas, inició a principios de febrero. Se inició una re-topografía de Cueva de Arroyo Grande. Además, el grupo topografió la Cueva del Río Hondo y localizaron siete entradas en un valle karstico al norte en el poblado de Rincón.

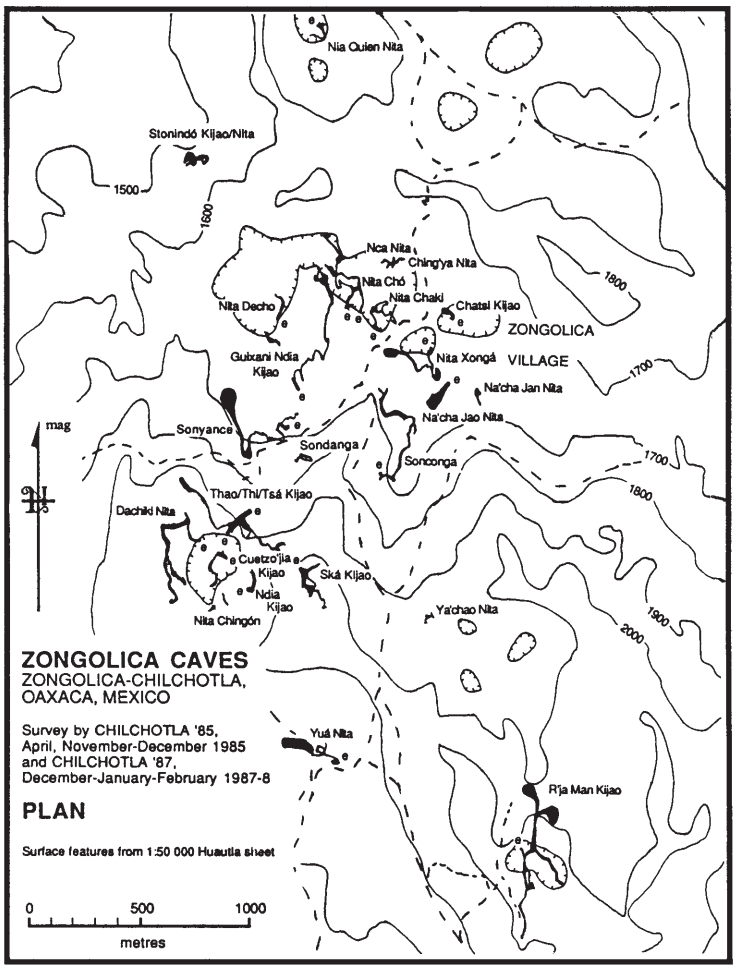
CHILCHOTLA 1987

Australian Expedition to México

Alan Warild

Ross Bann (Alan Warild)

Chilchotla '87 was the second Australian expedition to Zongolica, in the municipality of Santa María Chilchotla at the northern end of the Sierra Mazateca, Oaxaca. The aim was to continue exploration of the caves in and around the village of Zongolica in the hope of finding caves in excess of a thousand meters deep and, establishing a world depth record. The Zongolica area has a theoretical depth potential of 1900 meters, but a perched base level at 650 meters above sea level may mean it has only 1250 meters potential. Our expedition in 1985 had already proven the area to be a great place for deep caves: over four vertical kilometers in nine weeks of caving.



THE TRUE STORY

Life in the Sierra Mazateca is rarely dull. The Mazatec Indians live at a near-subsistence level, selling a few coffee beans and firewater known locally as caña to buy those little extras that they can't grow or make. When a bunch of strange people from Australia arrive (few of the Mazatecs understand where that is...a state of the USA perhaps), the reactions are varied.

At one stage, we were asked to check out a cave as a possible village water supply. While many villagers wanted us to look for water, the nearest resident to the cave thought otherwise. He screamed at us in a language we could not even begin to understand, but the machete he was waving made his intention clear. If that wasn't enough, the village school teacher wound up his PA system that night and broadcast across the hills accusations that we were stealing gold and artifacts from the caves. A few weeks later the story went around that we were capturing seals in the caves and carrying them off. Any story about what we were doing there seemed to be believable except the real one: that we were going into holes in the ground for fun.

An advance team of Stefan Eberhard, Mark Wilson and I set up camp and started exploration ahead of the main group, who arrived at the end of November 1987. The first cave to fall was Yua Nita - Suck Cave. Perhaps it was the strong in-draft, or maybe the nasty, tight stretches of passage between pitches. The name stuck. But in all truth, Yua looked good from the start. A ninety-meter shaft led to drop after drop, and there was no mistaking where this cave was going. At -689 meters it hit a large collapse chamber, a classic Zongolica "death of a cave" formation. Sure enough, there was no way out that we could find. Suck Cave had run out of slurp at -704 meters.

With two and a half months to go, one cave bombing out was no problem. Anyway, another had already taken precedence, R'ja Man Kijao, better known to us as Black Bull Cave, has an entrance at the 2044-meter elevation, making it one of the highest caves in the area. Any cave at such an altitude without a large cachment could not be expected to be good, and it wasn't. R'ja Man surely must be the classic of its kind; tight, nasty, dirty and unrelenting. At the bottom of every pitch was another slimy hole that popped out over yet another miserable pit. At a lower altitude it would have been left for future generations. On Stefan's fifth push trip, this time with Anne Gray (his companions rarely lasted more than one trip), a foul, mud wallow took him into large, clean passage. Not much farther on, they encountered a big stream entering as a waterfall and flowing on down the largest river passage yet seen at Zongolica. The horror of the entrance passages had paid off; all that remained was to follow the river to base level 1300 meters below. Around the corner the stream sank into the boulders of a large collapse chamber. Done again. Stefan was so deflated that he could hardly face another cave. Fortunately, the other eleven cavers in camp could and daily groups were heading out and poking into any hole that they could find. A few days of prospecting, but not finding gets anybody down. Cavers get irritable, depressed and desperate.

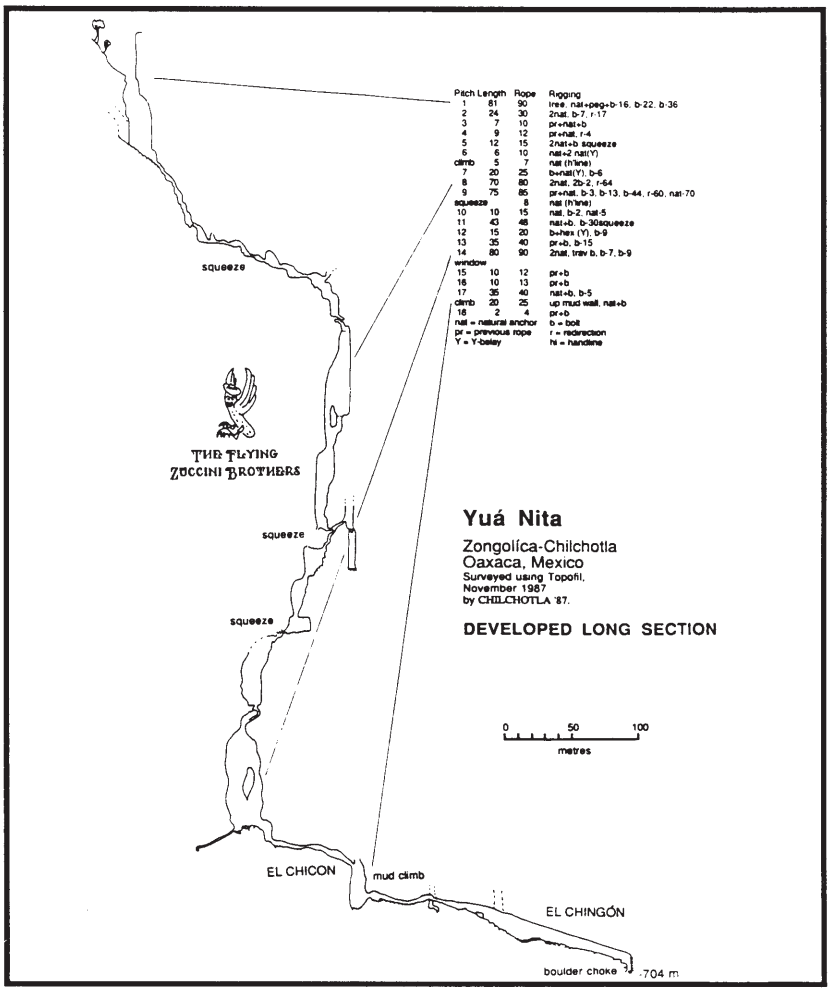
GUIXANI N'DIA KIJAO - REVISITED

Desperate can be the only word to describe re-rigging Guixani Ndia Kijao, deepest cave of the 1985 expedition. At the bottom, -940 meters down, was a lead seen only by me and, at the time, left as too horrible when there were other good caves going. By now we were desperate for an all-consuming cave to give some direction to our efforts. So began the re-rig of Guixani

and the inevitable jockeying for position. Who was going to be *the one* to pass the thousand-meter-depth mark? There are no friends when it comes to booty a kilometer down. Anne and Mark won the first push and got their booty. For hours they groveled through grit, dug sand, slithered in mud. They never did find the climb that I remembered, but they did stop at a strongly-drafting squeeze just above water level. Next day they emerged totally disillusioned. "If Warild doesn't rush straight back to a lead it isn't worth anything," they were saying. I never said it was going to be easy...or nice.

The bottom of Guixani is a particularly scary piece of cave. Between Anne and Mark's visit, and mine and Judy McNeall's, it had rained a little, perhaps a millimeter or so. At the bottom of Guixani the water level had risen thirty centimeters. The problem was that the squeeze to be pushed was only half a meter above water level.

With a little hammering the breakthrough came, but beyond some climbs the air dispersed through rocks into an even more desperate lead. Two days later it rained properly and the water level rose ten meters and stayed that way until well after we gave up and de-rigged the cave a month later.



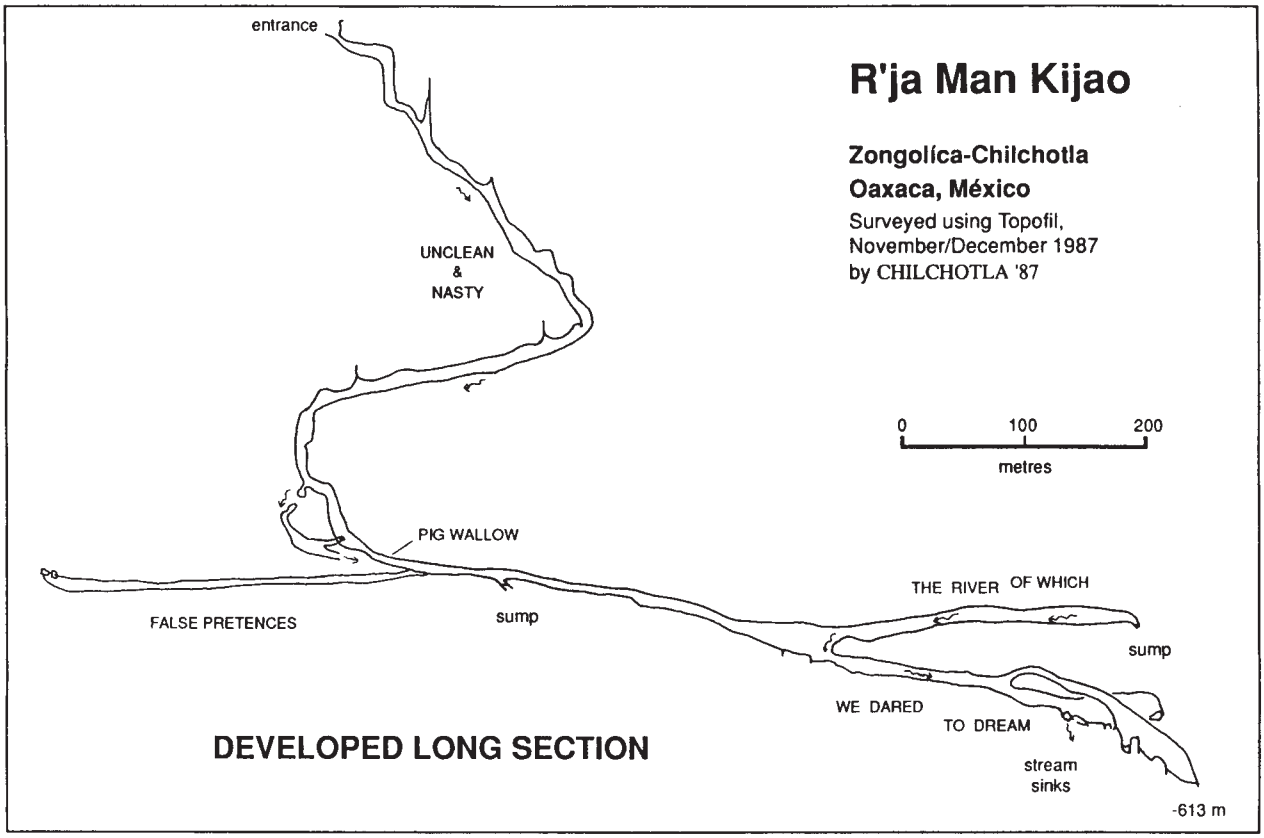
IN PURSUIT OF THE DEEP ONE

Just before Christmas, Ross Bannerman and Keir Vaughan-Taylor rechecked an entrance that had been found some days before, but not entered. Like all good cave prospectors, though, they were carrying torches. In their somewhat dim light they were able to follow the rain-swelled stream along a meander to the top of a gushing first pitch. Immediately there was an eager rush to help them explore the cave. That night the intrepid explorers hit the cerveza and decided to call the new cave "The Club" (members only). Unfortunately for them, the Mazatecs had found it several hundred years before and called it Sonconga. The expedition was back on the rails and the headlong rush to the bottom had begun. People who had previously been too sick or sore to move were suddenly filling their packs and getting down there as fast as they could. The mediocre quality of the upper cave and the mud of the four-hundred-meter level finally relented and we found ourselves dropping down through clean, black rock, almost dodging the stream as we went.

On one push trip, Anne, Mark, Rolf Adams and Ed Holliday got a first-hand demonstration of why the lower reaches of Sonconga were so clean. The rain began in the late afternoon, but the flood pulse didn't hit them until two am. Fortunately, Sonconga is warm (14 degrees Celsius), and open, and the rigging dry enough for the cave to remain passable. They emerged suitably impressed and very clean. They had also rigged down to -804 meters; the minus thousand-meter fever had well and truly set in.

Despite another day of rain, Stefan and Judy each stuffed a pack full of rope and headed in. The jokes stopped abruptly, when six hours later, Judy calmly walked into the house with blood all over her face. At -450 meters she had emerged from the mud into clean passage. Running past the waterfall, or because of mud on her boots, she had slipped and crashed headfirst into the only sharp rock available. The cut in her right eyebrow was serious, so after dumping their loads they had come out as fast as possible. With a surprising lack of fuss the cut was sewn up by Anne, a medical student, while Judy held a mirror and gave directions. As a veterinarian, she had sewn up more cats and dogs than Anne had sewn people. Several of the fainter-hearted club members couldn't cope with this and the room became deathly quiet as they crawled off into their sleeping bags to hide.

The limit of exploration was a decidedly wet pitch that showed all the signs of having been rigged by a half asleep caver in the middle of the night. We clipped past the anchors and descended gently. Five drops later was a collapse chamber covered in mud. Nine hundred meters down we encountered another apparent dead end. But, at the far side of the chamber, I stopped at a hole in the floor with the sound of water rising from it. Stefan swapped me a survey pad for the lead and on we went, down the drop, along a stream, a climb, another big room. By this time Stefan was far ahead, but as we surveyed down, Ross and I could hear, over the sound of rushing water, the charac-



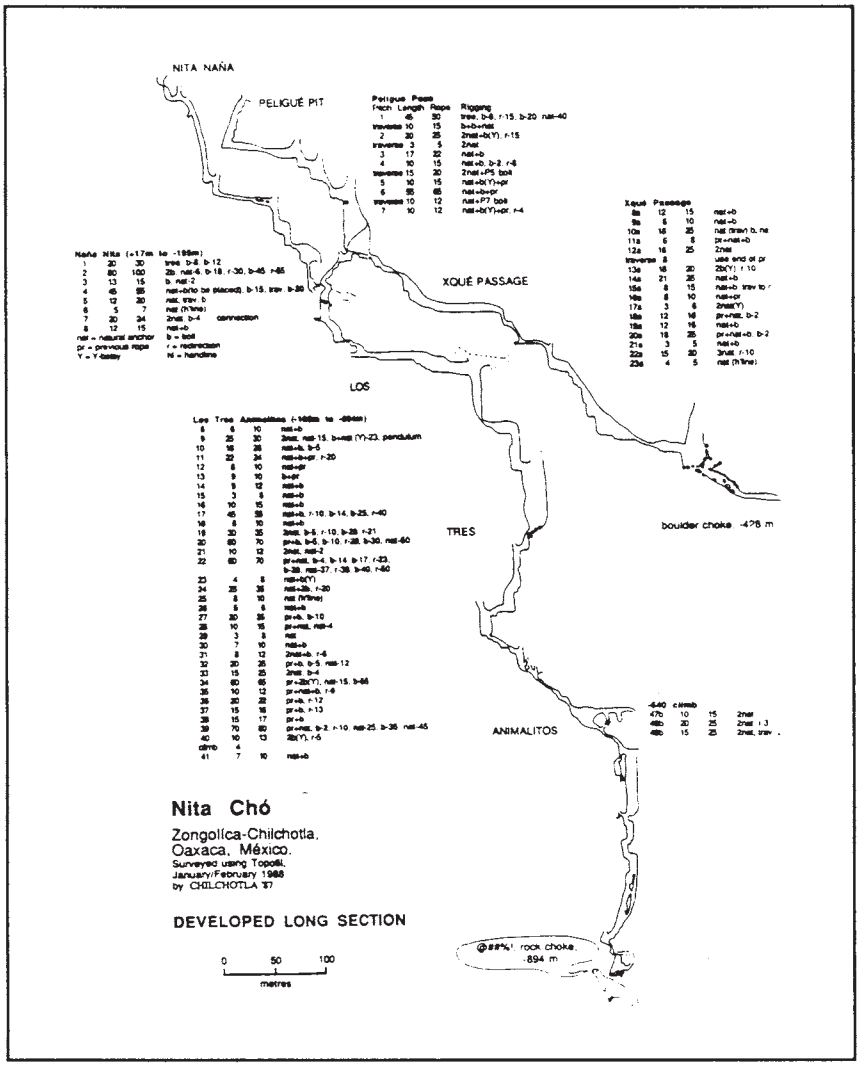
teristic chink-chink-chink of a bolt being drilled. Another big, dead chamber had an escape route out the bottom. We sat in its dry comfort to let Stefan get ahead again, but, before we knew it, he was coming back. We were almost too disgusted to take the survey down those last two pitches: -945 meters deep and stopped by a puddle.

The long drag up began. At one a.m. one's judgement is not what it should be. At -840 meters Stefan was in front, then me, with Ross half asleep at the bottom of the drop. Instead of delicately prusiking up the rope, I was powering up at full speed to avoid a total soaking, when the bolt burst out of the rock above me. I was dumped back onto a ledge under the waterfall as the rope pulled tight to Stefan who was almost at the top of the pitch. While I returned to a drier location, Stefan did a quick repair job on the rigging and resumed his climb out. As he was clipping past the double anchor at the top, there was a sudden flash of red coveralls as he dropped two meters and a clack as his jumar hit the rock beside me. Just above him swung the belay, a football-sized rock, still attached to the tie-off sling. Ever so carefully we teetered up the remains of the Space Cadet Pitch and got the hell out of there.

NITA CHO

For a week we had no great, going caves. It was also time for many people to leave, when Olegario, our landlord, showed me a hole he'd found while clearing the forest. Like all caves which go, it looked good. There was no shortage of cavers willing to

Pitch 2 of -150 meters in Stonindo Nita (Alan Warild)



help explore Nita Cho. The end of the first day's exploration saw me dangling at the knot in the end of a 45-meter rope.

Another real cave booming down, good stream, good airflow and only five of us left to explore it. Luxury! For a change no footprints up your back on the way to the lead. This time the lead was a twenty-meter drop nearly four meters down. Anne and Mark dropped down it to a very dead-looking rockpile, then retired in disgust to continue the survey. Several hours of groveling led to two hundred meters of passage and a choke. On the way out, a quick look at a lead at -160 meters confirmed that it went, so the ropes were left in a heap and out we went. As a diversion from this serious business of caving, I was handed a note one evening as I returned from Nita Cho. It contained a garbled message about our truck, (parked an hour's walk down the mountain) being attacked. Next morning, in the pouring rain, I went down to have a look. It seems that a passing group of soldiers decided that it was their duty to break into our truck and check it for contraband. The owners of the nearest house also felt it was their duty to protect the truck, which had been left in their care. The soldiers beat them up. The final outcome two days later was typical of Mexico. The soldiers were tactfully allowed to escape so as to spare the villagers any more harassment, and the foreigners, who all have bottomless wallets, got to pay the damages. Some days it makes you wish there were real caves in Australia.

Nita Cho had not gone away and in the next few trips, we saw more excellent passage which led us to a sump at -864 meters. Cho was left for drier weather while we checked other possible caves, none of which went far enough. Next trip down, the sump was gone. One last drop on our seven-millimeter bootlace rope landed me on a rock choke. The cave ended with no hope of continuation at exactly the same level as Guixani, only a hundred meters away. Cho was finished at a final depth of 894 meters. We had only four days to de-rig it, clean and pack the gear and leave before our truck's insurance ran out.

After all that, the score. Just what did seventeen cavers and three and one half months produce?

Cave	Length (in meters)	Depth (in meters)
Sonconga	1844	943
Nita Cho	1554	894
Yua Nita	1360	704
R'ja Man Kijao	1347	613
Ska Kijao	1095	380
Stonindo Kijao/ Nita	600	330
Dachiki Nita	1769	283
Cuetzo'jia Kijao	368	220
Na'cha Jao Nita	348	220
Ching'ya Nita	310	216
Na'cha Jan Nita	250	200
Nita Decho	450	200
Nia Quien Nita	312	160
Nita Chingon	150	150
Ya'chao Nita	150	150

TOTAL CAVE DEPTH: 5.46 km
TOAL CAVE LENTH: 13.57 km
GOLD: Minus A$2,500 per person
SEALS: 0

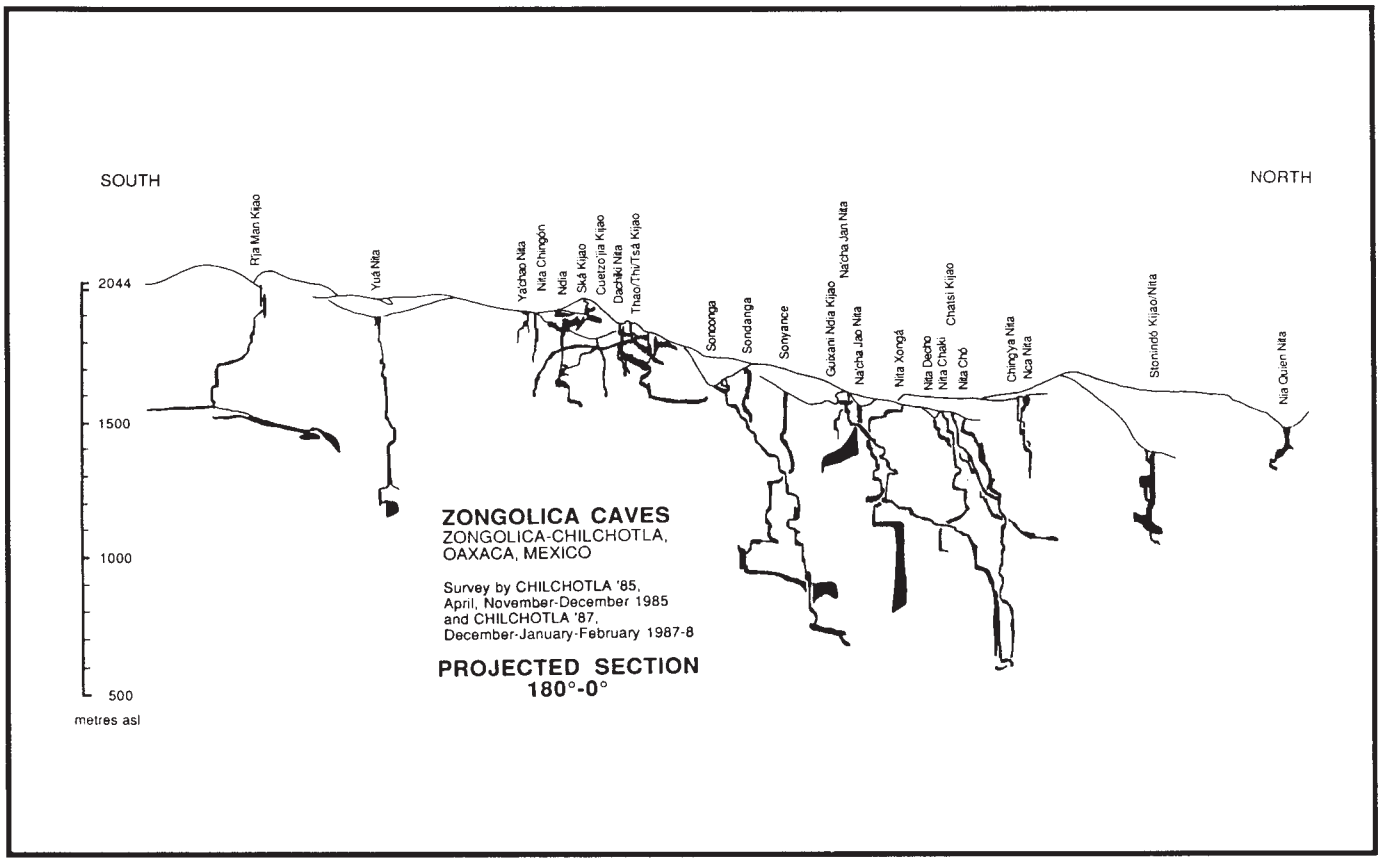
Zongolica's Caves

The area is typified by extremely vertical caves that tend not to connect to form systems. The typical Zongolica cave has a depth far in excess of its plan length. The usual trend, apart from down, is north to northwest, a good direction for maximum depth potential. The two caves that reach the lowest altitude, Guixani and Cho, both end at the same level and a hundred meters apart. Both also flood easily after rain, indicating a possible base level at six hundred meters elevation that may be difficult to pass.

Major Cave Descriptions

Sonconga (Hollow Place)
Length: 1844 meters, Depth: 943 meters

Sonconga begins as a walk-in entrance to a streamway that carries a good inflowing breeze. The first section has pitches alter-



nating with meanders, then the cave drops more steeply. Initially, the cave is relatively dry, with no remarkably good or bad features until minus four hundred meters. Here, the stream is lost for a while and the way down lies through some disgustingly muddy passage. The water abruptly returns and is followed through excellent, wet passage most of the way to the bottom. Three times, it is possible to escape out the bottom of large rockfall chambers, only to have the cave end in a sump as it picks up more water. The sump is 115 meters above the six-hundred-meter elevation level and, as the cave was explored during wet weather, the sump may disappear in milder conditions.

Nita Cho (Animal Cave)
Length: 1554 meters, Depth: 894 meters

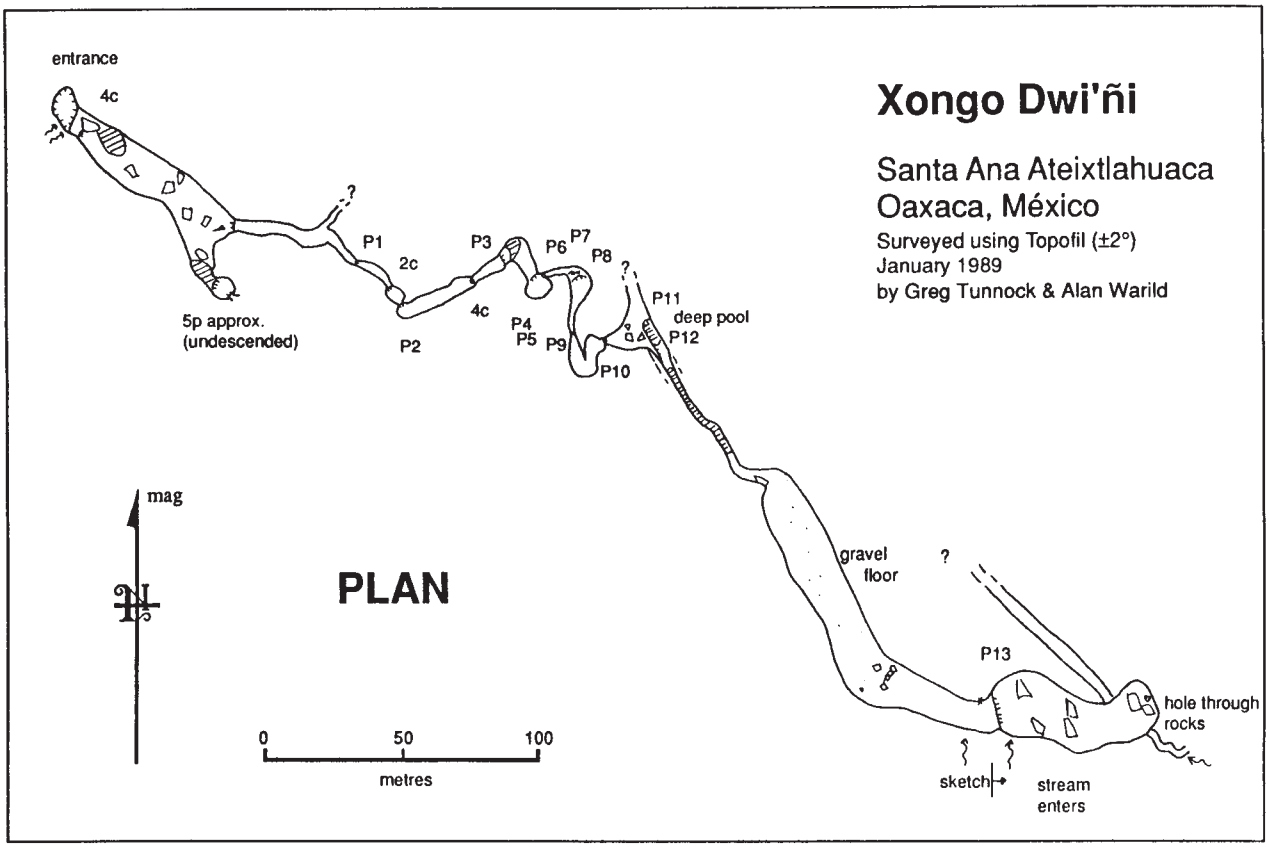
Cho begins with Pelique Pozo, an angled shaft that immediately picks up a stream at the bottom. The stream is followed to -160 meters, where it is lost down a hole. The obvious overflow route soon comes back to it and goes through a meander, after which it drops steeply down dry pitches to a boulder choke. The choke goes 150 miserable meters until it becomes impassible, but still carries strong air and water flows. At -160 meters, a short climb up leads to a separate, descending passage and stream, which also carries a strong in-breeze. This streamway is followed until it drops down a hole at a depth of seven hundred meters. An obvious over-route drops down two hundred meters of spiraling shafts to the bottom: a rock choke or, in wet weather, a sump. Nana Nita is a higher, smaller entrance above Pelique Pozo that connects into Cho at a depth of two hundred meters. Several leads still exist. At -640 meters the breeze is lost up a shaft and, at -250 meters, there are extensive, fossil passages. At -180 meters there is a separate stream and descending passage.

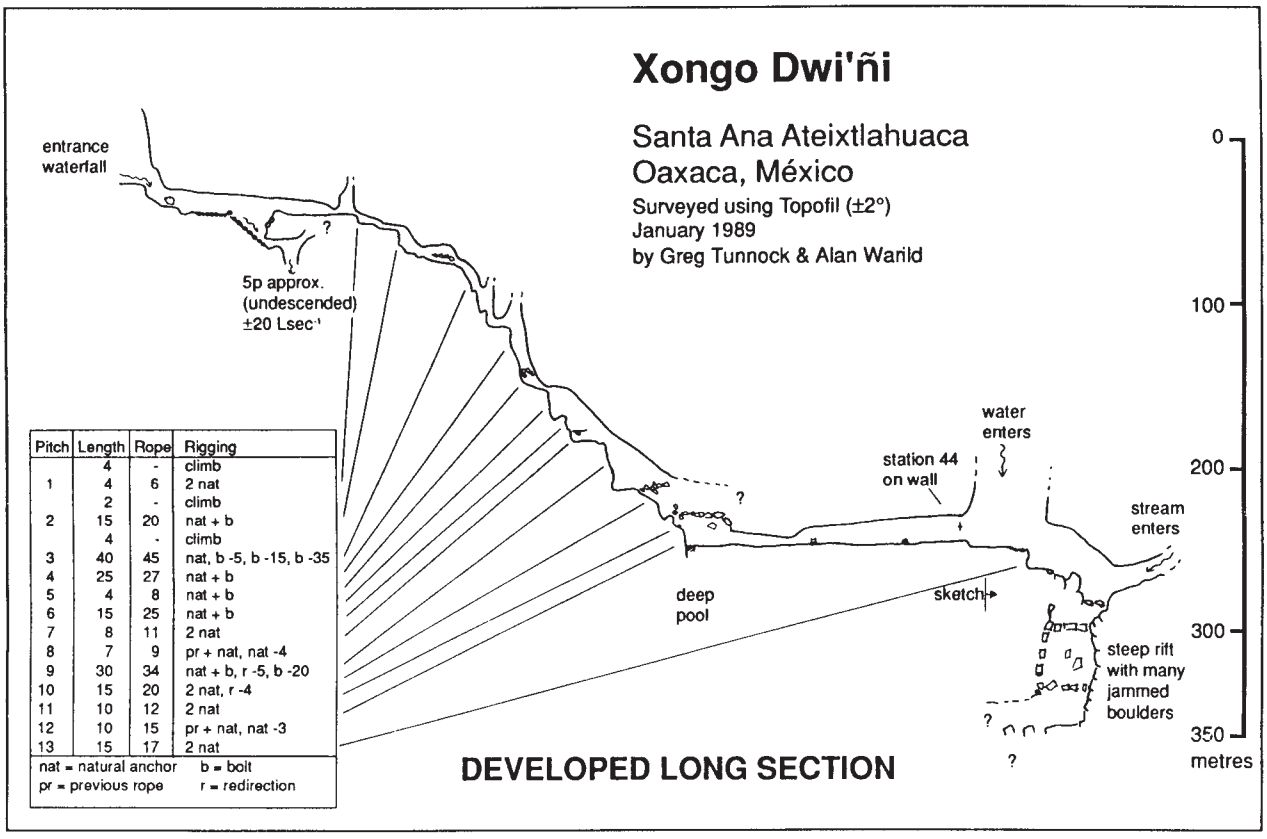
Yua Nita (Suck Cave)
Length: 1360 meters, Depth: 704 meters

Named due to the strong airflow and nature of the passage. Almost the entire cave is developed on a fault, such that the cave zig-zags back and forth in an east-west direction with almost no north-south development. The predominant direction is down, until the final chamber. The cave begins as a nintey-meter entrance pitch and is a series of drops interconnected by small, short passages and squeezes. Near the bottom it changes character to a meander, a pitch, then larger passage into a long, collapse chamber with no way out. The airflow at the bottom is very strong, but cannot be followed once in the big chambers. A shaft entering the final chamber may well be where the air goes, but climbing would be required to explore it.

R'ja Man Kijao (Black Bull Cave)
Length: 2347 meters, Depth: 613 meters

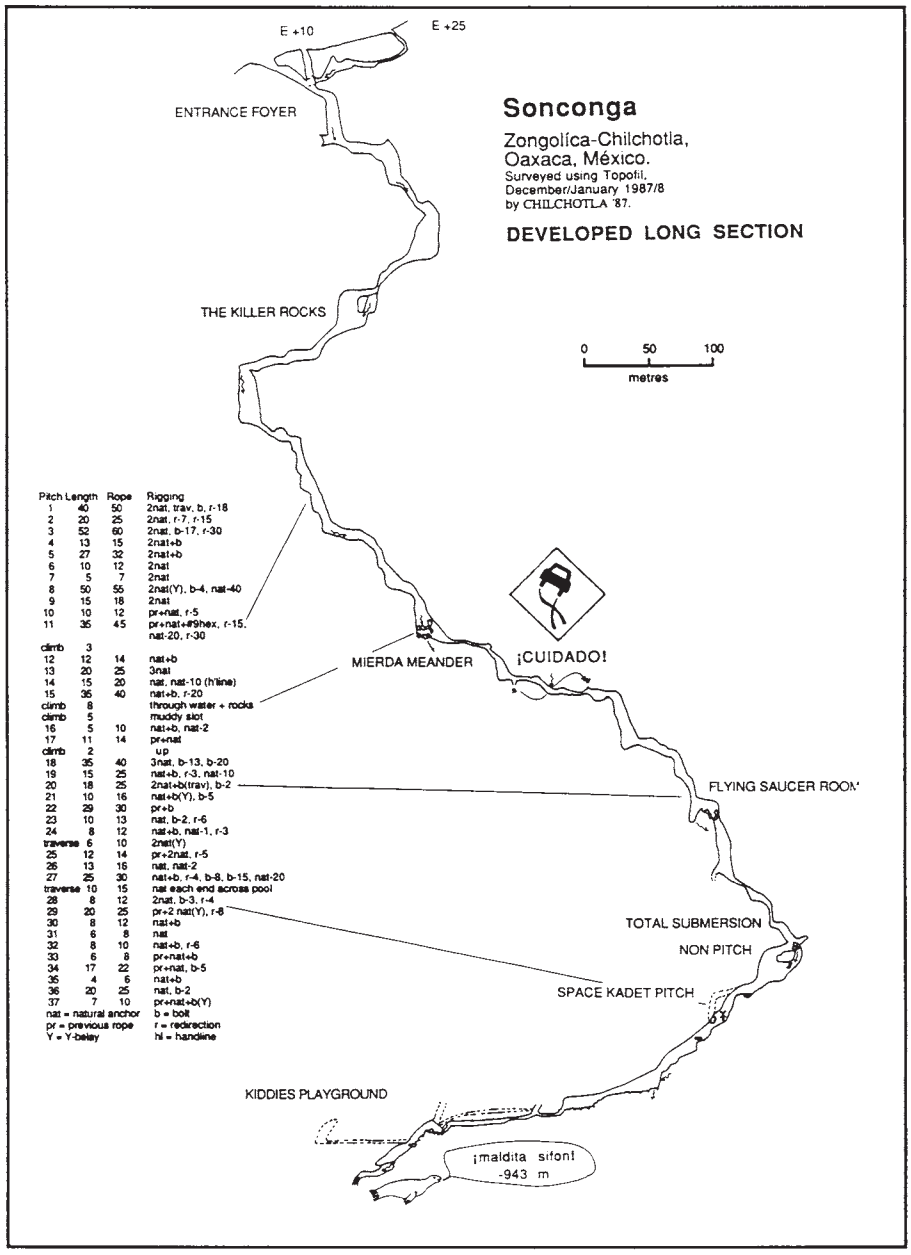
This was the highest elevation cave explored on the expedition. The first three hundred meters is characterized by tight, dirty fissure pitches, often with squeeze starts and nothing to recommend them. A clean, wet, fifty-meter pitch signals a change. It leads to a dry, rotten, fifty-meter pitch and a mud wal-





Pitch	Length	Rope	Rigging
	4	-	climb
1	4	6	2 nat
	2	-	climb
2	15	20	nat + b
	4	-	climb
3	40	45	nat, b -5, b -15, b -35
4	25	27	nat + b
5	4	8	nat + b
6	15	25	nat + b
7	8	11	2 nat
8	7	9	pr + nat, nat -4
9	30	34	nat + b, r -5, b -20
10	15	20	2 nat, r -4
11	10	12	2 nat
12	10	15	pr + nat, nat -3
13	15	17	2 nat

nat = natural anchor b = bolt
pr = previous rope r = redirection



low. So much for the change. When all appears lost, a rapidly improving flood overflow is reached which runs to a large streamway at a waterfall. This goes some two hundred meters to a terminal rockpile chamber. A bypass some meters back leads to a deeper, but even deader, chamber.

Ska Kijao (Seal Cave)

Length: 1095 meters, Depth: 380 meters

So, the locals thought we were catching seals in the caves....a big entrance at a respectable altitude leads to a large, breakdown passage and, after a rockpile, to a hundred-meter pitch series. A section of ancient, coral-lined passage drops to a small, gritty streamway which only gets worse before it chokes in rockpile without a single seal.

Stonindo Kijao/Nita (Over the Hill Cave)

Length: 600 meters, Depth: 330 meters

An impressive cave at a lower altitude. Stonindo Kijao has an abandoned, vadose, walk-in entrance, which leads to a series of big, dry, spectacular pitches into a large rockfall chamber at a depth of three hundred meters. Several streams converge here and a way out can be found through rockpile to a dirty streamway which gets no better before it ends in a muddy rockpile. Stonindo Nita has a spectacular pit entrance with a second pitch of 150 meters to a big chamber. From there, four small pitches lead back to the final chamber in Stonindo Kijao.

TRANSPORT

A total of two tons of food and equipment was freighted in, first, by post or personal baggage to the USA; then van to Chilchotla, and finally by burro/horse/mule/human, the last few kilometers up to Zongolica. Most of the food was bought at Tehuacan, the last major town, and only special items such as granola bars came from the USA. Buying a van is a major outlay, but offers mobility and also allows the equipment to pass easily into Mexico via a land border rather than fight its way through customs in Mexico City.

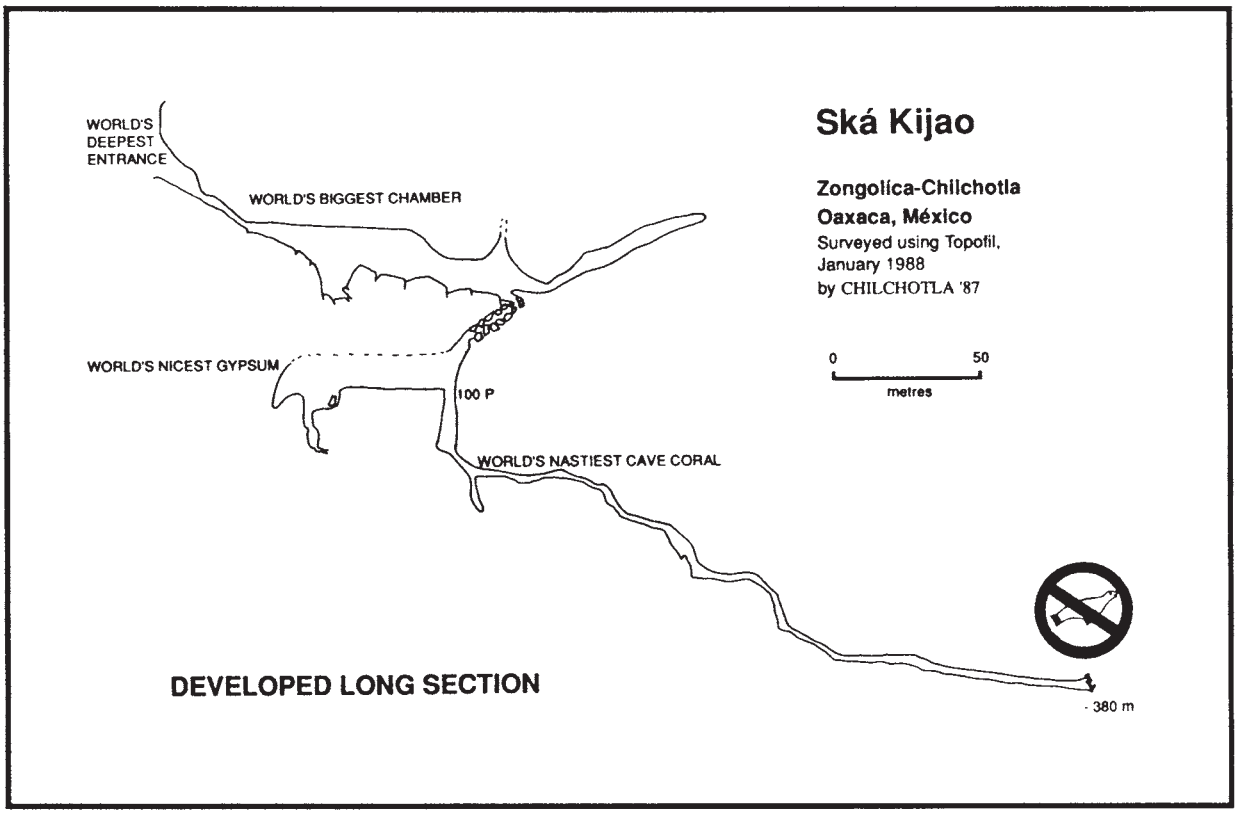
GEAR

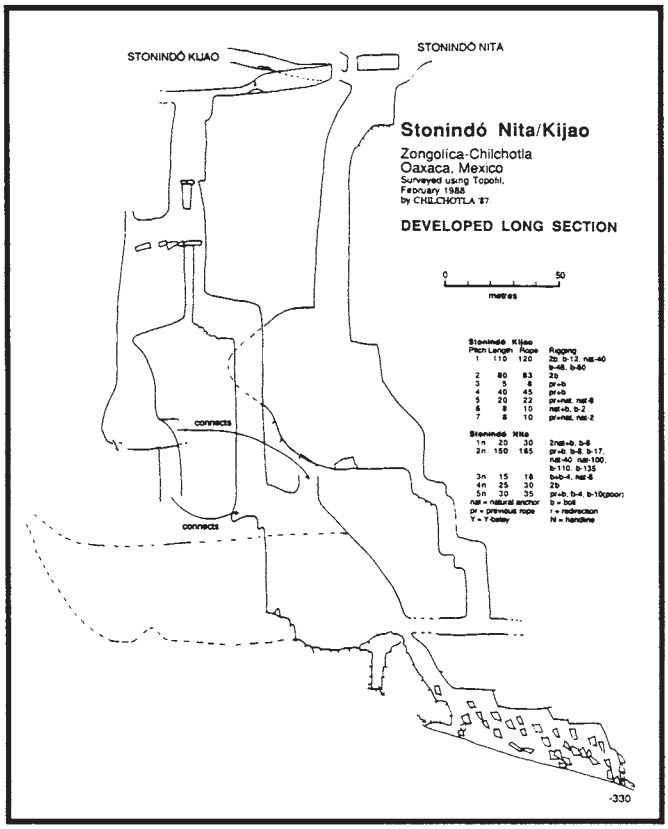
Three kilometers of rope were taken, mostly nine-millimeter, to be rigged Alpine style (although several people rigged subalpine and damaged ropes). Sixteen hundred meters of rope and one hundred meters of tape were bought at a wonderfully low price from BEAL Ropes and the rest was personal rope brought on the basis of a hundred meters per person although, for various reasons, many people brought other than what they were supposed to. Bolts and slings were the main rigging gear. Bolts were used extensively (sorry Terry). Five hundred were bought, of which about four hundred were used. Approximately eighty of the five hundred Spit brand anchors had flat teeth and were next to useless. Pegs were used about three times and the same for nuts.

Expedition members were: Stefan Eberhard, Mark Wilson, Alan Warild, Mark Bonwick, Julia James, Nick Melhuish, Judy McNeall, Anne Gray, Keir Vaughan-Taylor, Ross Bannerman, Rolf Adams, Phil Cole, Richard McNeall, David Martin, Sue Cade , Ed Holliday and Bob Runser.

ACKNOWLEDGEMENTS

Thanks must go to our sponsors, BEAL Ropes of France, who gave us an unbeatable


WORLD'S DEEPEST ENTRANCE
WORLD'S BIGGEST CHAMBER
WORLD'S NICEST GYPSUM
100 P
WORLD'S NASTIEST CAVE CORAL
Ská Kijao
Zongolica-Chilchotla
Oaxaca, México
Surveyed using Topofil,
January 1988
by CHILCHOTLA '87
0
50
metres
DEVELOPED LONG SECTION
- 380 m


STONINDÓ KIJAO
STONINDÓ NITA
Stonindó Nita/Kijao
Zongolica-Chilchotla
Oaxaca, Mexico
Surveyed using Topofil,
February 1988
by CHILCHOTLA '87
DEVELOPED LONG SECTION
0
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metres
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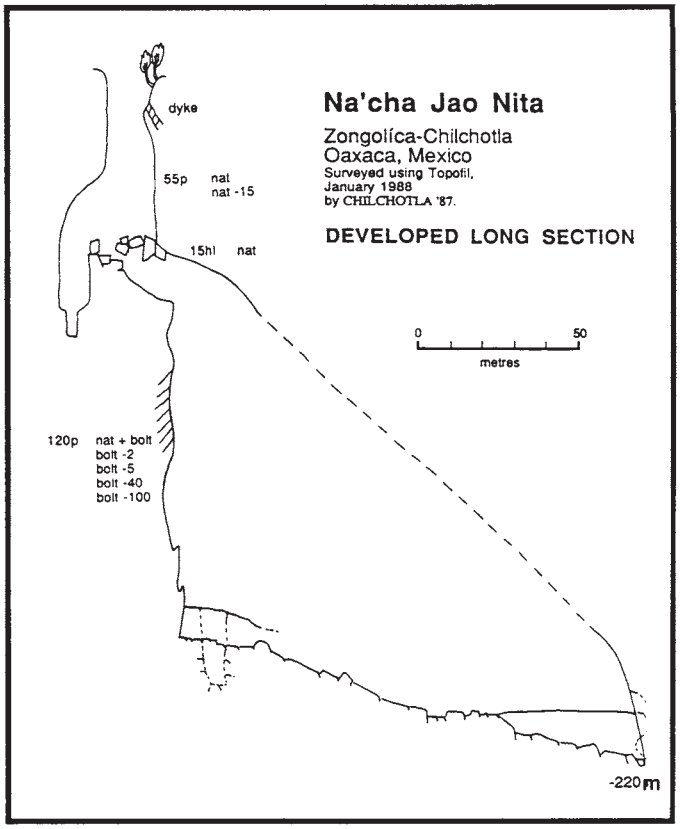
connects
-330


dyke
55p nat
nat -15
15hl nat
120p nat + bolt
bolt -2
bolt -5
bolt -40
bolt -100
Na'cha Jao Nita
Zongolica-Chilchotla
Oaxaca, Mexico
Surveyed using Topofil,
January 1988
by CHILCHOTLA '87.
DEVELOPED LONG SECTION
0
50
metres
-220 m

deal on their excellent, Antipodies rope and tape. Australian Geographic gave A$2000 cash, which went a long way toward paying for the rope and its transport.

Also, special thanks go to Diana Northrup, whose Albuquerque house we invaded, Kenneth Ingham and Ziggy for tolerating us in the above house, Fritzi Hardy for minding our truck and yelling at bank managers for us and Olegario and Porfirio de la Cruz who looked after us in Zongolica, as well as showing us more caves than we could check in a year.

CHILCHOTLA 87

El objetivo de la expedición australiana de 1987 a Zongolíca fué continuar con la exploración y topografía de cuevas en y alrededor del poblado de Zongolíca, con la esperanza de encontrar cuevas de más de 1000 metros de profundidad y establecer un record mundial de profundidad. El área de Zongolíca tiene un potencial teórico de 1900 metros de profundidad, pero una tabla de agua aislada a 650 metros sobre el nivel del mar, podría limitar el potencial de profundidad a 1450 metros. Aproximádamente 14 kilómetros de pasaje fueron descubiertos y mapeados en el área y 5.66 kilometros de cueva vertical.

Caves of the Chiapas Highlands of Southern Mexico

By Terry Whitaker
Abridged by Dave Hughes

INTRODUCTION

Chiapas is the southernmost state in México and abuts the western border of Guatemala. Elevations range from sea level at the Pacific coast to 2900 meters at Cerro Tzontehuiz. Rainfall is plentiful in all areas but December through February tend to produce the driest season. Chiapas encompasses approximately 74,00 square kilometers and posesses a rich variety of karst features. Of particular interest is the region of the Chiapas Highlands near San Cristobal (Figure 1).

The highest points around San Cristobal are tower karst at the scarp edges with large cliff-walled dolines on flatter ground. A few small areas of pinnacle karst occur above Carrizal. Lower down on the drier mountain slopes facing the Grijalva Valley, extensive areas of scrub-covered limestone pavement are present on strata which dip up to thirty degrees. This limestone displays a wide variety of karren grooves. Close to the intrusive Tertiary volcanic rocks, the impervious catchment or a cover of Terra Rossa (a red argillaceous deposit) results in a typical fluvio-karst with large river sinkholes or smaller mud-choked sinks. The underground flow of these rivers is chiefly dip-controlled giving a radial pattern of flow from the highlands near San Cristobal. The streams flowing into the huge, closed depression in which the town is situated, travel southwest to the Municipio of El Zapotal close to the village of San Lucas. The huge river sinks of Sumidero Tenejapa probably flow northwest toward Chenalho and from the Sumidero de Chenalho further northwest to the Río San Pablo. A large sink on the Río Rashanal at Yochib is believed to flow northward to the western branch of the Chacte River.

The eastern highlands contain cockpit country on a vast scale. Closed depressions are often two to three kilometers in diameter

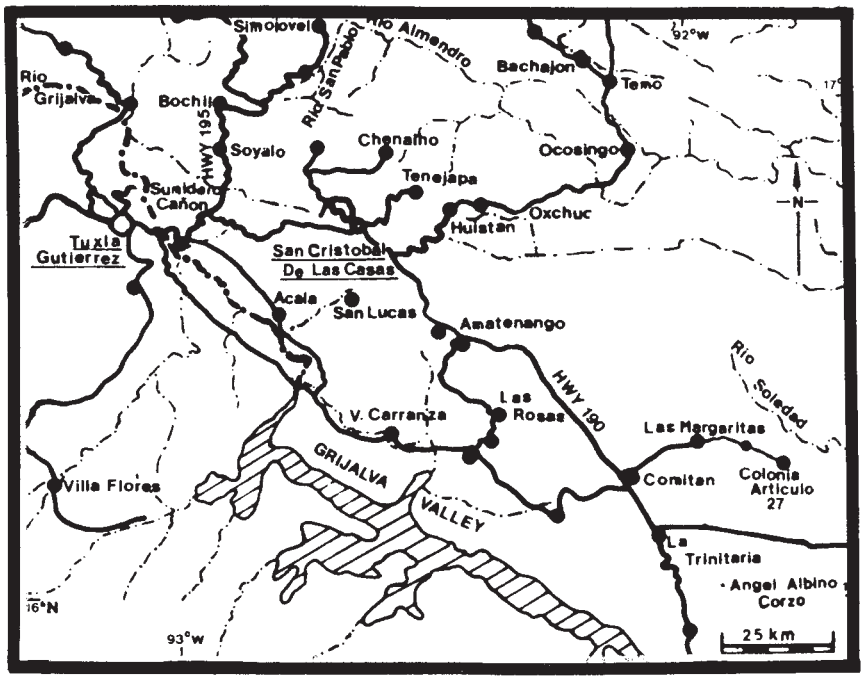


Figure 1. Region of the Chiapas Highlands near San Cristobal

and up to four-hundred-meter deep. Dense, tropical vegetation makes cave hunting very difficult. In some ares, huge vertical pits such as El Suspiro, El Pozoron, Chen-Ven-Sil-Mut and Chen Ulish have been explored short distances to boulder blockages or sumps. Several pits of this type also have been observed from the air in a region twenty kilometers northwest of Comitan. In most of the highlands, searches have led to the discovery of a scattering of dolines, several of which contain pits two hundred meters or more deep.

The 1982-83 British expedition to Chiapas continued the series of international forays visiting the area since 1970. From a speleological standpoint, the most productive of the earlier trips were those organized by Canadian cavers from McMaster University in Hamilton, Ontario. Their efforts led to the majority of the significant discoveries known up to 1982 .

The bulk of this British expedition was in Chiapas from December 1982 through January 1983. From a base camp near the Hotel Molino Alborado, on the Periferico Sur of San Cristobal, small groups set out and explored caves in four main areas. These included: 1.) The region of Colonia Artículo 27, south of Las Margaritas and about eighty road kilometers from San Cristobal; 2.) Close to San Cristobal at Zacualpa, Río Salida del Tunnel, El Corralito, El Arcotete, (Río Quinta) Rancho Nuevo and the Ranch of Liebrevitz O'Shaunessy of the Olla Porida Restaurant. These areas were accessible on foot from the campsite but involved walks of up to 12 kilometers; 3.) The areas of San Lucas in the municipio of El Zapotal, (15 kilometers by foot from San Cristobal,

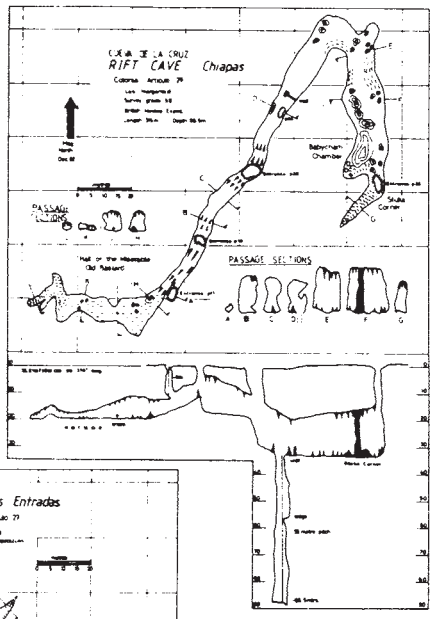
but eighty kilometers by road) and; 4.) Other areas such as the Tuxla-Pichucalco Road (Highway 195), the San Cristobal-Ocosingo road and Agel Albino Corzo in the Municipio of Trinitaria.

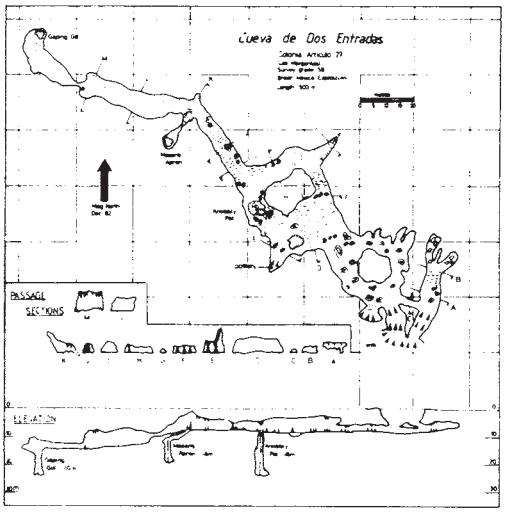
CAVING HIGHLIGHTS IN THE COLONIA ARTICULO 27 REGION

Exploration was carried out in the region near Colonia Artículo 27. Two major sinks were entered and both yielded several hundred meters of impressive, active passage ending in sumps. These are Sumidero Recuirdo, the flood sink of the Rio San Joaquin which, in the dry season, terminates in a lake called Laguna Recuerdo. The other is the Cueva de San Nicolás which is the sink of the stream flowing through Colonia Articulo 27 from the Ejido de Xahac resurgence. These two swallets, although not water traced, are presumed to unite and feed the impressive rising El Nacimiento de Buena Vista Pachan, having flowed northeast through the anticlinal ridge. At this resurgence, a large river emerges from beneath boulders at the foot of a seventy-meter cliff. The flow in early January of 1983 was estimated at about two cubic meters per second. A huge cave entrance immediately closes down to a clear, blue lake that should be a major target for any future expedition with diving capability.

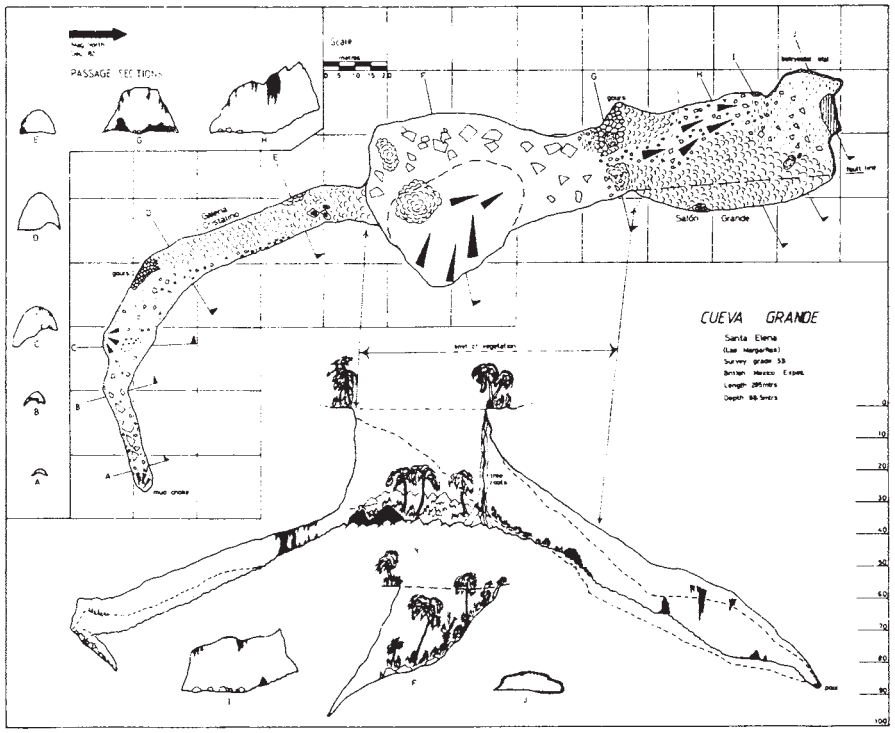
Closer to Colonia Artículo 27, a series of old, dry phreatic cave systems was explored. Seven separate caves are presumed to have been part of one system which is now fragmented by roof collapse and stalagmite blockages. Undoubtedly many more caves remain in this area, but digging will be necessary in most cases. All these segments are exceptionally well-decorated with flowstone formations. Most contain fragments of pottery which may have been used by the Mayas for ritual purposes.

A number of other caves were visited in the area and maps and descriptions for a selection of these follow.



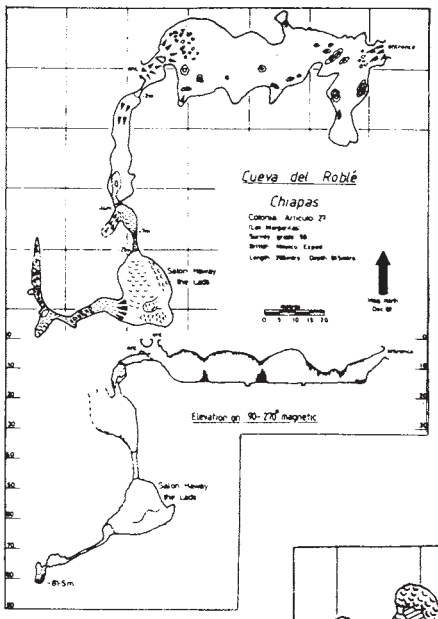


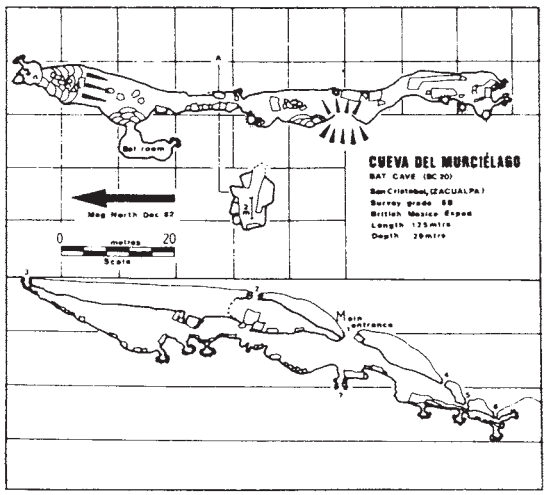
Cueva de la Cruz (Rift Cave), Las Margaritas, L315, D89. There are four possible entrances. Descent of entrance furthest south involves an 11-meter pitch to a large mud-floored chamber containing a large cross. To the north, a climb-up passes beneath another entrance and leads down a steep boulder slope under a further entrance. A blind pitch needs 55 meters of rope. Continuing north, one reaches another large and well-decorated chamber with a stone wall and the final entrance pitch. Landowners in Las Margaritas should be consulted to avoid trouble. Many small rodent bones are found at one entrance. Bats are found throughout.

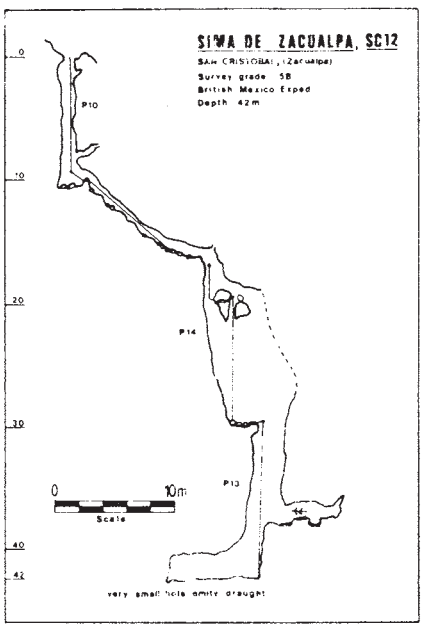


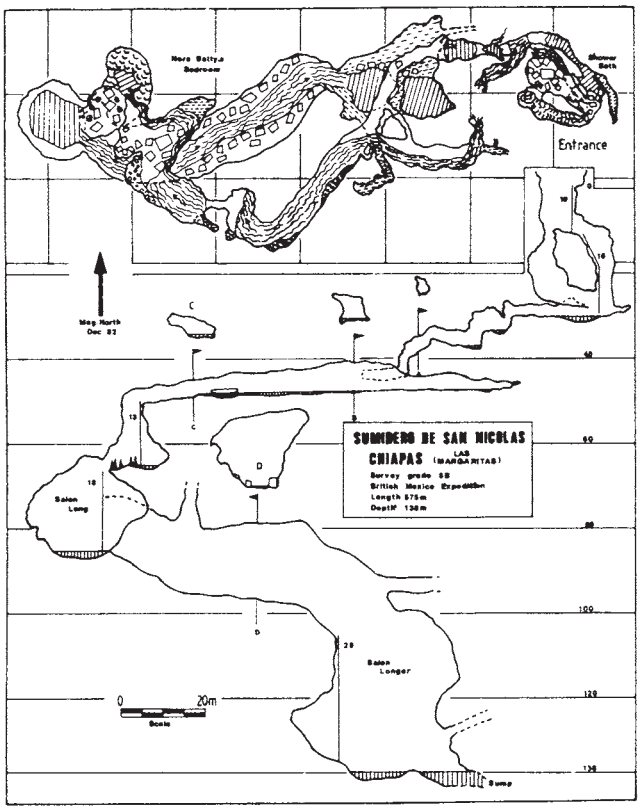
Cueva de Dos Entradas, Las Margaritas, L500, D25. Two obvious entrances lead to a lengthy series of chambers with walls almost entirely covered by calcite. Ends in a stalagmite blockage. Three blind pits of 8, 10 and 16 meters are located in the floor.

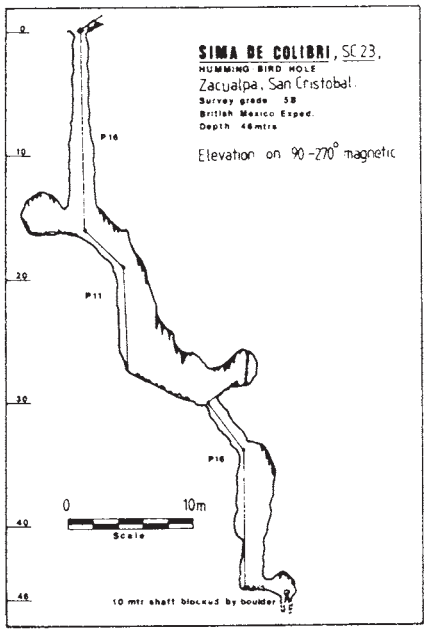
Cueva Grande, Las Margaritas, L295, D89. Entrance is a huge pit, shown on the topographical map. A forested entrance collapse is forty meters wide and deep. Tufa gours step down fifty meters to Salon Grande, an impressive, blind chamber with much decoration and a shallow pool. Another passage leads from the west end of the entrance to a four-meter climb and a glistening crystal rimstone slope forty meters long. From there, a mud-floored passage leads sixty meters to a breakdown area and a complete choke at a depth of eighty meters.









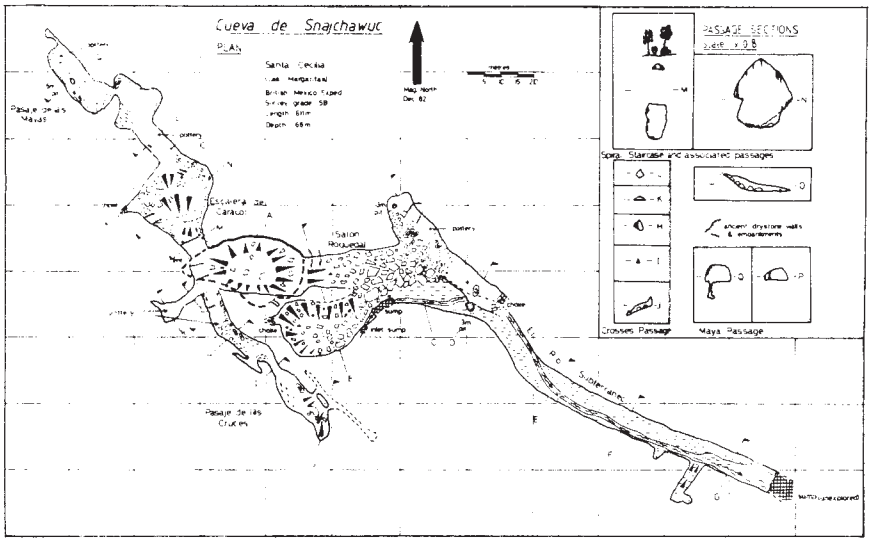


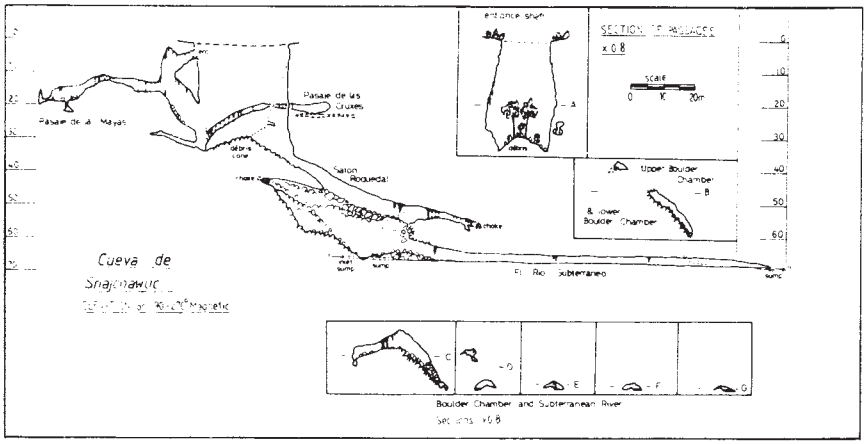
Sumidero Recurdo, Las Margaritas, L833, D92. Located about three kilometers northeast of Colonia Articulo 27. The most obvious flood sink of the Río San Joaquín. Carefully crawl through rocks and timber to a one meter diameter tube. After 18 meters, a six- meter climb leads to a steeply-inclined passage six to ten meters wide and five meters high. Pass two pools (the fish ponds) to an impressive flowstone cascade entering from the left. A steep muddy slope requiring rope, leads down to Salon Sulo. The stream can be followed down through canals to Salon Mike Farmer, and into Salon Stan Gee. A steep ramp leads to a sump. A high-level passage from Salon Mike Farmer, chokes after 120 meters. Near the entrance is a steep ramp not fully explored. The cave contains considerable animal life including small fish, white crabs, caddis flies and possibly pseudoscorpions.

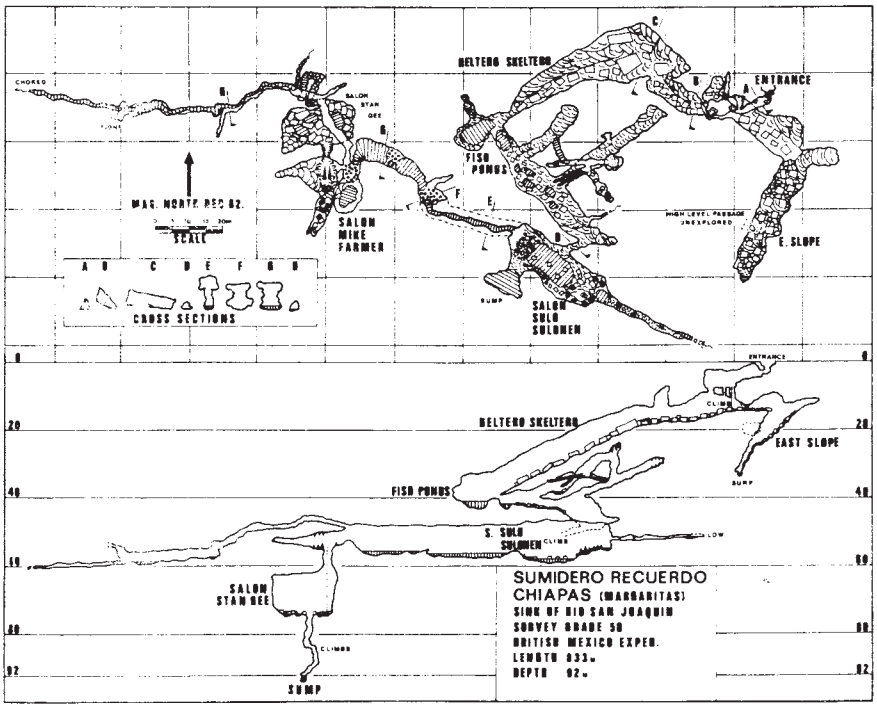
Cueva del Roble, Las Margaritas L265, D82. A steep entrance slope leads on the left to large interconnected chambers with another small entrance. To the right leads to pitches of 14, 7 and 21 meters into Salon Haway the Lads. This goes into a narrow, mud choked fissure.

Sumidero San Nicholas, Las Margaritas, L575, D138. Roomy entrance pitch of ten meters lands among trees and creepers. Stream sinks in boulders. The second pitch of 16 meters is dry over flowstone, landing in a three by four meter chamber. Across a pool, under a showerbath, leads into a rift and a deep pool. Two short swims follow to a sling-assisted three-meter drop into another swim. Traverse to left to avoid a sump. A 13-meter, wet pitch follows, landing in a fine, ten-meter diameter chamber. A dry pitch of 18 meters follows shortly. This lands in a chamber called Salon Long. A large passage five meters high and ten meters wide leads, after forty meters, to a final 29-meter pitch. A traverse down the right-hand wall gives a drier hang. The pitch lands in Salon Longer which contains a sump.

Cueva de Snajchawuk, Las Margaritas, L611, D68. Entrance is a thirty-meter shaft







which may be bypassed via an entrance to the east; this uses a ledge to descend. Four passages radiate off. Three close down rapidly. All contain dry, stone walls and cairns with wooden crosses and urns. The fourth passage descends a steep boulder slope into a large, well-decorated passage. Graffitti mentions "El Río Subterraneo." A climb-down over boulders leads to the river passage. This glutinously muddy, walking passage is a hundred meters long from sump to sump and obviously sumps in wet weather. The streamway contains many bats. The water is said to resurge at a well near Colonia Artículo 27, called El Ejido de Xahac.

CAVING HIGHLIGHTS IN THE AREA NEAR SAN CRISTOBAL

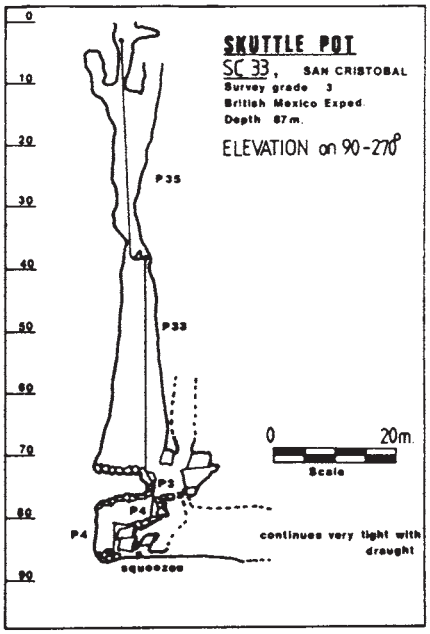
The town of San Cristobal de Las Casas has a population of approximately 35,000. It is situated in a huge, closed depression four kilometers by five kilometers at an altitude of 2100 meters in the Chiapas Highlands. It lies 85 kilometers east of Tuxla Gutierrez on the Pan American Highway (Highway 190). All the streams flowing into the depression unite and flow southeast of town where they used to vanish into a series of partially-blocked sinks. (Sumideros de San Cristobal). Major flooding of the town during the rainy seasons led to the driving of a drainage tunnel four plus kilometers long from the sinks area to be discharged near Carrizal (The Salida del Tunel). The highly-polluted stream has cut a new course (Río Salida del Tunel) five kilometers southward toward the Grijalva Valley, but sinks in several places on the plateau at a thousand meters elevation, not far from the small village of Laguna Grande on the path between San Cristobal and San Lucas. The water is next seen at the resurgence of Ojo de Agua, at San Lucas (El Zapotal) feeding directly from the Sumideros de San Cristobal. Investigation of these sinks yielded disappointingly small amounts of foul cave. The closed depression of San Cristobal has usually been considered to be polje. Early outflow from this drainage basin could explain the existence of the very large, well-decorated cave of Las Grutas de San Cristobal at Rancho Nuevo nine kilometers east of the town. The cave consists of one vast passage with breakdown areas. Two of these, Bosque de Piedra and Salon Kramsky are decorated by some of the finest, large calcite formations in the world. The passages generally run downdip and the only rigging required is for a 15 meter drop into

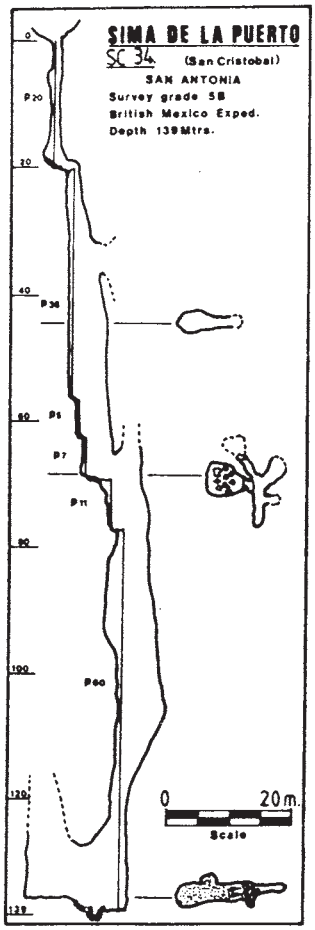
into the Salon Kramsky. Dip increases to the south and the cave descends more steeply reaching the sump level at -120 meters in a distance of two and one-half kilometers.

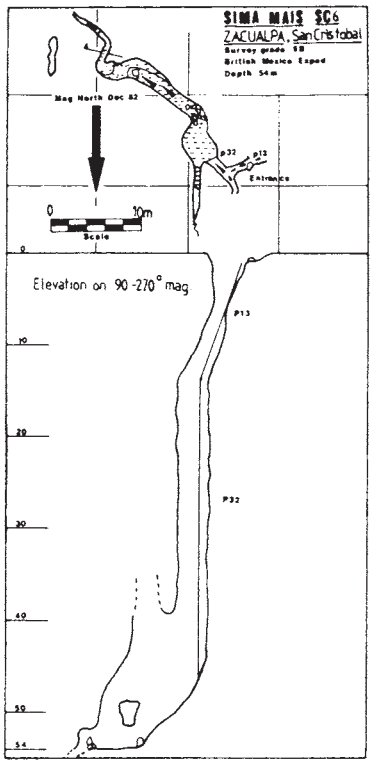
The depth potential of this system cannot be overstated. It begins at over 2200 meters altitude and flows toward Ojo de Agua at six hundred meters. The Expeditions's finding in this system was limited to the discovery of another, small sump upstream of the largest sump, the Caracol del Diablo. A large, muddy chamber was reached by two, short pitches under the righthand wall a hundred meters before the main passage sump. This chamber, Salon Winge, contains two boulder-strewn sumps.

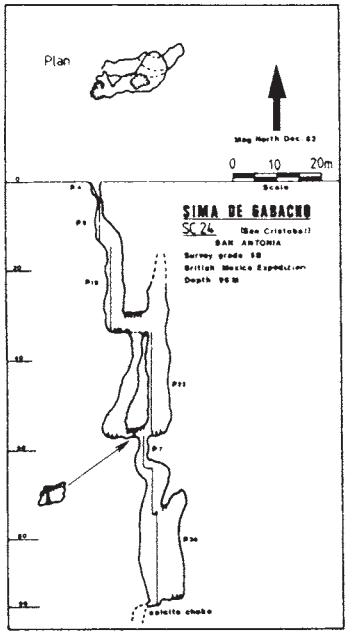
To the west of the town of San Cristobal is a narrow rim of pine- and oak-clad mountains reaching 2300 meters. Dirt roads wind over them from San Felipe, northwest of the town past Zacualpa and the Salida del Tunel to Carrizal. There is another from near the airfield west of the city going to Carrolito and San Antonia. Large dolines and rounded hills cover the highest land and dissected cave fragments abound. A few large, open shafts such as Spacemen's Pit, choke in massive boulder piles. In some areas, especially around the village of Zacualpa, small streams sink into muddy shafts in mature oak woods. In almost all cases, the initially-roomy shafts show little horizontal development, usually pinching out into muddy chokes.

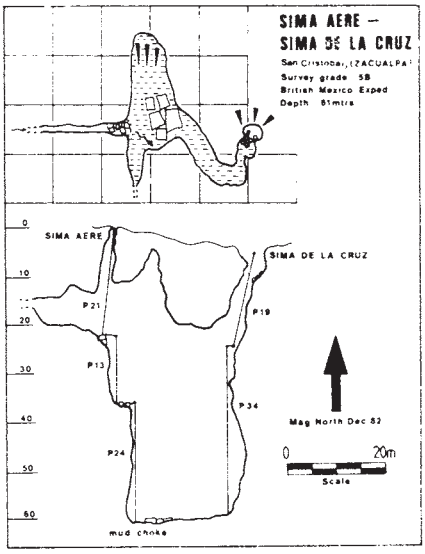
Cueva del Murcielago, SC20, San Cristobal, L125, D29. Horizontal cave with several entrances. Full of bats and guano.







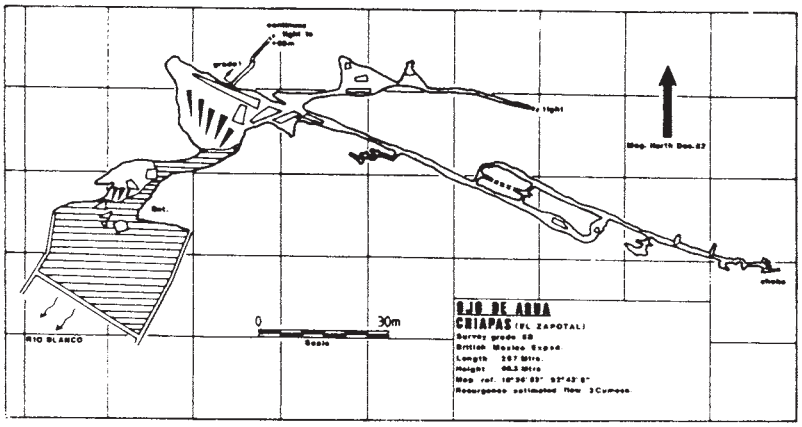


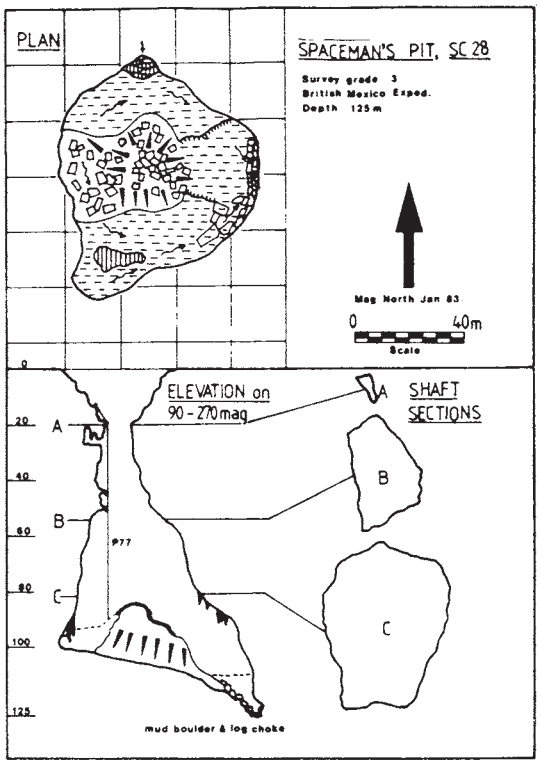


Sima Aere & Sima de la Cruz, SC11 & SC4, San Cristobal, L45, D61. Shaft SC11 of 58 meters leads into a low, mud-choked passage where another entrance (SC4) enters with pitches of 19 and 24 meters.

Sima de Colibri, SC23, San Cristobal, D46. Three pitches lead to a boulder and mud blockage, preventing access to a further, ten meter pitch. Well-decorated.

Sima de Zacualpa, SC12, San Cristobal, L30, D42. Entrance pitch of ten meters is followed by a rubble slope to a four-meter pitch jammed with boulders. Rebelay for a 13-meter pitch.





Sima del Puerto, SC34, San Cristobal, D139. A series of pitches in one rift. Pitches of 20, 4, 36, 7 and 5 meters lead to a large ledge and a last pitch of seventy meters. A tiny stream sinks in boulders and silt.

Sima de Gabacho. SC24, San Cristobal, D95. Pits of four and nine meters lead to a traverse onto a loose pitch of 19 meters. Traverse over a blind pit to a 22 meter pitch. A further pit of 37 meters can be rebelayed at -7 and -11 meters. This leads to a calcite blockage.

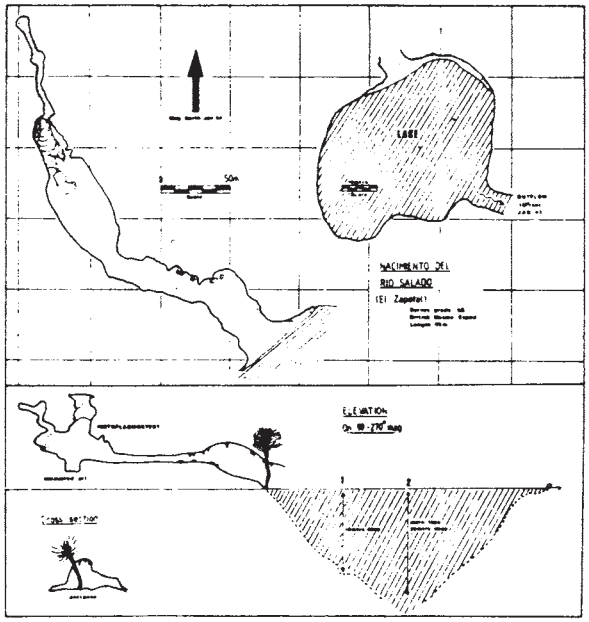
Skuttle Pot, SC33, San Cristobal, D89. Entrance is one meter diameter through boulders. Belay to a bolt two meters down; rope is needed at ten meters down. Rebelay after 35 meters. Next hang of 33 meters leads to a flat floor with three holes. One is too tight, but the largest leads through a squeeze over boulders and leads down 12 meters to a crawl on mud beneath a tight fissure. Two very narrow squeezes lead to a high rift. This rift, which contains crystal formations, becomes too tight after 15 meters. There is a slight breeze at the end.

Spaceman's Pit, SC28, San Cristobal, D125. Spectacular shaft concealed in a small woods. Pitch ends on rubble cone in a large chamber. Contains some large formations including a tiered, gour formation about ten meters high where a small stream enters. A climb down through mud and boulders at the lowest point chokes out.

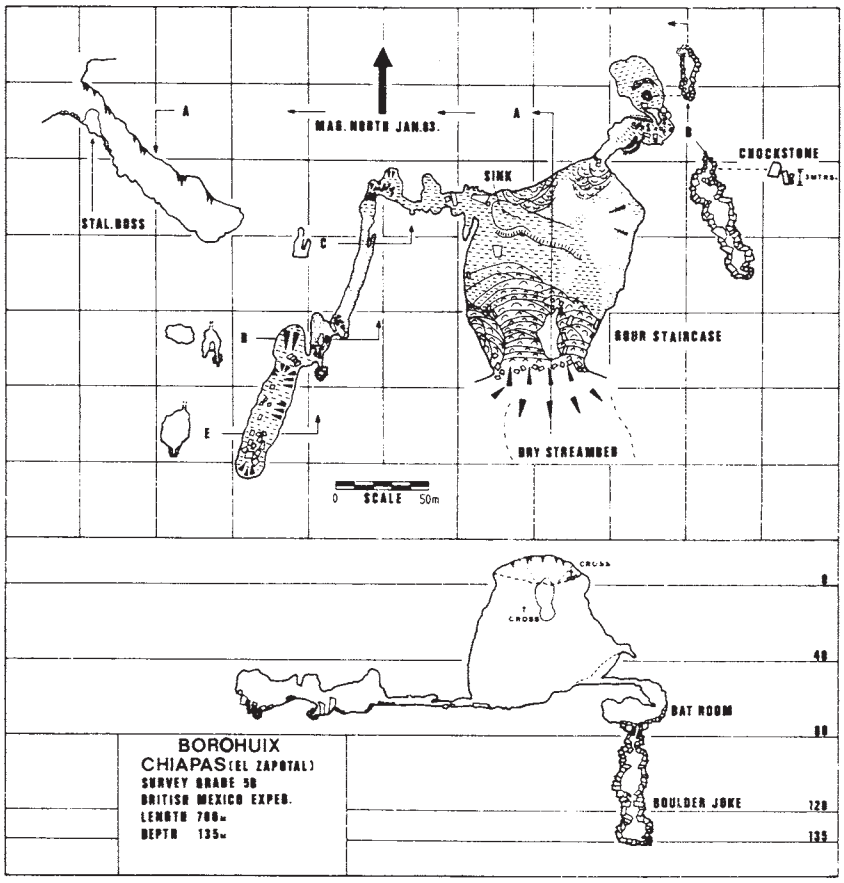
CAVING HIGHLIGHTS IN THE EL ZAPOTAL AREA

The limestone escarpment leading onto the Chiapas Highlands rises steeply from the low hills in the Central Valley of Chiapas. The limestone dips steeply toward the Río Grijalva and, at the foot of the slope, numerous resurgences supply streams flowing southwest to the Grijalva.

Near San Lucas, two of the largest streams, the Río Blanco and the Río Trapeche (the lower part of the Río Salado), unite to flow into the Río Frio. The Río Blanco rises from the boulder-strewn Ojo de Agua in the village of San Lucas and is the rising for the polluted San Cristobal water. In contrast, the Río Salado flows from an idyllic, blue, tree-lined vauclusian pool which is more than fifty meters deep. In the dry season, the water only flows about eighty meters before sinking in sand and gravel to re-emerge as the Río Trapeche. Northwest of San Lucas is another large rising which feeds the Río Frio. This may drain the area to the northwest of San Cristobal. The British team was unable to penetrate much further into the boulder choke than George Tracey's original exploration in the mid-1970's. Little cave is associated with any of these risings. Close to San Lucas is a huge, drained vauclusian rising, the spectacular Cueva Borohuitz which speculation ascribes to the same waters that formed the Grutas de San Cristobal.



Near the towns of Venustiano Carranza and las Rosas, are several other resurgences feeding the irrigation ditches of a large area of sugarcane plantations. The only stream investigated between Chiapilla and Venustiano Carranza rises from a bouldery-pool two hundred meters north of the road and has no prospect of cave passage. Unusual for this region, a major surface stream cascades



a hundred meters down a cliff originating from the area of Aguancatenango.

The only cave of any length was discovered a half kilometer northwest of San Lucas. This is an obvious flood rising called Veshtucoc (literally, the place where the water flows in the rainy season"). This was the Expedition's most important find, five kilometers of well-decorated, large and sporting stream cave over three hundred meters in vertical extent. It contains three, free-diveable sumps and ended at its upstream end in a huge breakdown chamber where the water emerges under boulders. In another branch a large, static sump awaits the attention of cave divers. In 1984, the Speleo-Nederland Expedition revisited the cave and pushed upstream for a further 1.3 kilometers to an inlet sump. Maps and descriptions of the major finds made during the British Expedition are included in this report.

Cueva Borohuix (Cave of Jaguar Mountain), El Zapotal, L700, D135. Arched entrance leads to steeply descending tiers of large, gour terraces. Main chamber is 55 meters below entrance and measures nearly a hundred meters in diameter. Two passages lead off. Right is a short crawl to a small chamber from where a nasty, sixty- meter descent through boulders is possible. Left consists of 240 meters of mainly horizontal passage. The cave is regarded by many local people to have mystical significance. A small shrine guards its entrance.

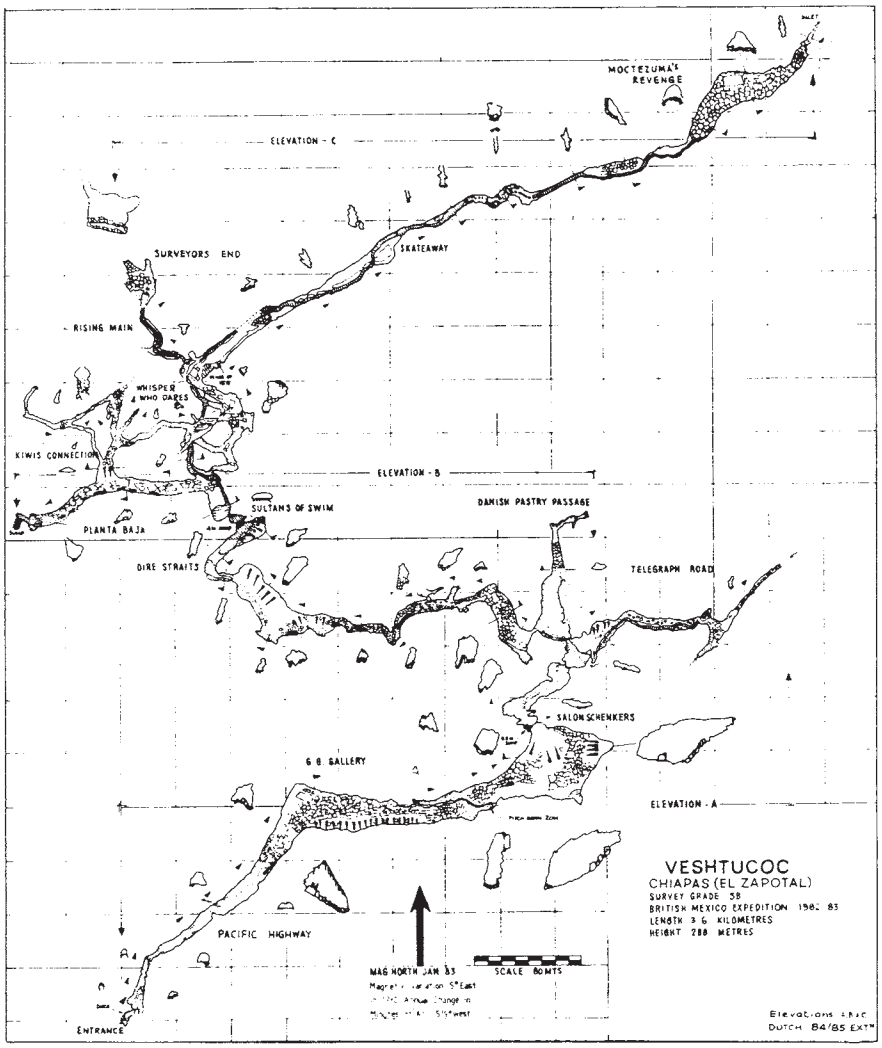
Ojo del Agua, El Zapotal, L297, D42. Located at the north end of the village of San Lucas where the Río Blanco rises. The water sinking at the Sumideros de San Cristobal and the water of the Río Salido del Tunnel resurge at a large, partly-dammed pool through a large pile of boulders. A wet crawl through boulders enters a small chamber which gives rise to a series of constricted rift passages, ending in narrow squeezes or at water. A roof fissure has been climbed for over forty meters then becomes too tight.

Nacimiento del Río Salado, El Zapotal, L66, D12. A large vauclusian rising in an idyllic setting gives rise to the Rio Salado which sinks in gravel 200 meters away. It re-emerges as the Río Trapeche. The only cave associated with the rising is a small, phreatic fragment reached by swimming. This cave contains many bats and is implicated as the origin of a histoplasmosis outbreak during the 1982-83 British Expedition. Entry is not recommended.

Veshtucoc, (The place where water emerges in the rainy season), El Zapotal, L4.9 km, D380. The entrance is situated at the head of a prominent area of light-colored rock slabs about two kilometers to the northwest and two hundred meters higher than San Lucas. Moderate climbing reaches a small vegetated cliff where a cross marks the entrance. A six-meter rope climb leads to water. A six-meter swim leads to a duck. Climb out of small pool into a passage which proceeds eight meters wide over and through gour pools. Take a twenty-meter swim to the sand-floored Pacific Highway. A stream is encountered emerging from boulders and vanishing down a tiny hole. This stream is constantly met in the rest of the cave. Blockage of the hole will completely sump the entrance duck. The passage continues ten meters wide through a stooping section to a boulder-strewn enlargement. Climb boulders on the right past alarmingly-tilted stalagmites, up to ten meters high. A pit is encountered back to a short length of streamway. Bolt on the right wall needs twenty meters of rope, but it is shorter and easier to use a rope tether around muddy boulders further along a broad ledge; a very muddy descent. Leave the stream and ascend over sand initially on the left, but traverse toward the right to rocks at the top of the slope. This passage enlargement is Salon Schenker. Descend to the stream at the end of the chamber where a very low airspace leads to a smaller, four-meter square passage. Leave the stream at an area of sandbanks and climb to a higher level, cross passage. Underneath is a small stream which provides an alternative, muddy squeeze. Right leads to a drafty aven, while left leads to a muddy chamber and on via a short section of streamway. Climbing out of a boulder pile leads to a gloomy area of jagged, black limestone. The stream is again met, but leave it to climb around and over boulders following a large roof tube and back to another short section of streamway. Leave the water again by climbing up the left wall on steep slabs to re-encounter it in a fine, sporting canyon up to three meters wide and twenty meters high, with waterfalls and pools. A short length of wading leads to a large, sump pool. There is

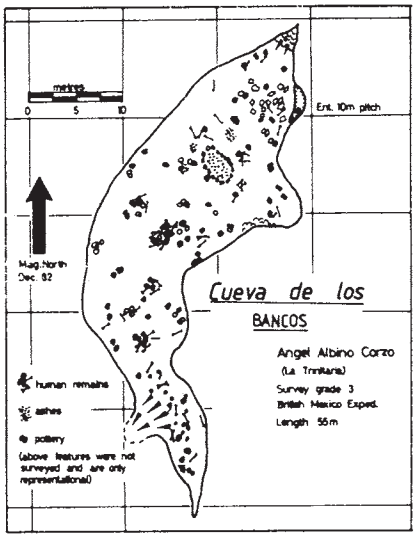
a serious free-diveable siphon four meters long and one meter wide. Do not dive toward the right wall. Swim into a chamber and crawl through an eye hole to another short swim to a gravel beach at a passage junction. Left leads to the muddy boulder-strewn, very large Planta Baja ending at a very large, deep, sump pool. Right follows a fine streamway. Leave the stream to climb to an obvious, higher chamber. A series of chambers leads to the well-decorated Salon Ben Dors which can also be reached in the streamway. An inclined pitch of twenty meters leads through a calcited-constriction back to the most exciting streamway in the cave. Waterfall climbs and a short technical sling climb, the Aztec Twostep, leads to the monstrous boulder collapse of Montezuma's Revenge. Here, a narrow inlet enters at room level, but the main water is lost under a huge mound of rock.

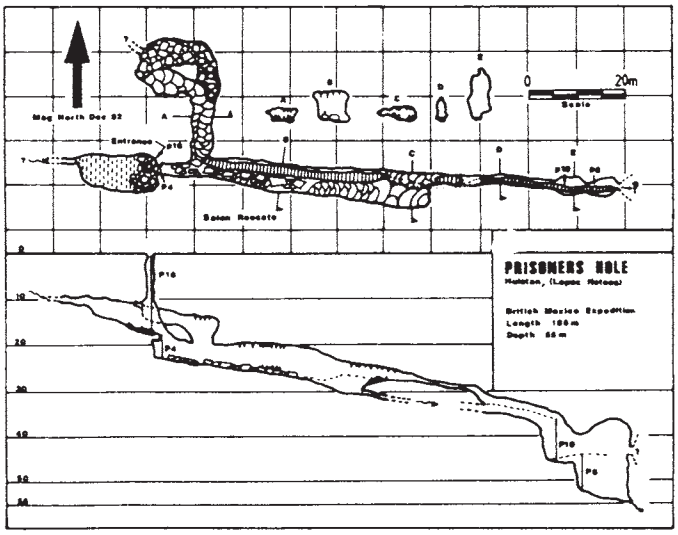
The area between Salon Ben Dors and Plana Baja is highly faulted with an intricate series of boulder chambers and rifts. A second inlet to Salon Ben Dors is Rising Main which proceeds northward to a high chamber, Surveyor's End. Bolting reached thirty meters to a constriction where the way on could be seen on the opposite (left) wall. The cave is a very exciting, but serious undertaking.



CAVING HIGHLIGHTS IN OTHER REGIONS OF CHIAPAS

During the course of the 1982-83 Expedition, explorations were carried out in sev-





eral other regions of Chiapas. The best caves found during these supplemental forays include Cueva de los Bancos and Prisoner's Hole.

Prisoner's Hole, OCR 4, Uistan, L185, D55. Entrance is a small hole under a tree into an 18-meter entrance shaft. This encounters a well-decorated passage containing a small stream. Upstream both ways become low. Downstream is a four-meter pitch. The passage becomes tall and narrow. Traverse to a ten-meter pitch. A further, short traverse leads to an eight-meter drop back to the stream. The fissure is too narrow to follow the water, but a way on is obvious at roof level. Traversing and bolting appears to be feasible from the head of the eight-meter pitch. Not fully explored.

Cueva de los Bancos, La Trinitaria, L60. A seven-meter entrance pit leads to a single chamber with funerary remains and about three hundred human skulls. This is an archaeological site with no possibility of extension. Consult INAH at Tuxla before visiting.

EPILOGUE

Original exploration, discovery and surveying continues in Chiapas. A particularly significant trip was staged by Dutch speleologists in 1984 and 1985 and their finds nicely supplement those made by the British Expedition of 1982-83.

Table 1 tabulates the long and deep caves of Chiapas up to 1986 and highlights the contributions of the British trip detailed in this report.

Longest caves in Chiapas up to 1986		Deepest caves in Chiapas up to 1986	
Name	**Length (in meters)**	**Name**	**Depth (in meters)**
Cueva de Veshtucoc*	4930	Cueva de Veshtucoc*	380
Sumidero Yochib	3316	Cueva del Choreodero	345
Cueva del Choreodero	3284	Grutas de San Cristobal	300 c.
Grutas de San Cristobal	3000 c.	Sumidero Yochib	213
Cueva Zapaluta (San Fransisco)	1750	Shaft near Yochib, Tenehapa	213
Sumidero de Tenajapa	1741 c.	Sumidero de Tenejapa	210
Sumidero Chicja	1431	Chen-Ven-Sil-Mut	139
Cochol	1361	Sima del Puerto*	139
Cuerro Hueco	1000	Sumidero San Nicholas*	138
Sumidero Chenalho	945	Cueva Borohuix*	135
Joya Chen	874	C'en Ulis	134
Sumidero Recuerdo*	833		
Cueva Borohuix*	700		
Cueva Snajchawuck*	611		
Sumider San Nicholas*	575		
Chen-Ven-Sil-Mut	522		
Cueva de Dos Entradas*	500		
Chenalho Resurgence	433		
Huistan Resurgence	430		
Sima de San Jose	360		
Sima de la Cruz*	315		
Sima des Tres Cruces	300 c.		
Salida de Cruz Pilal	300 c.		
Cueva del Rio Hondo	300		

*Found by the 1982-83 British Expedition

Table 1 - Long and deep caves of Chiapas up to 1986.

ACKNOWLEDGEMENT

Thanks are due to Dr. Terence M. Whitaker for permission to excerpt from his expedition report published in Cave Science - The Transactions of the British Cave Research Association, Volume 15, Number 2, August 1988.

CHIAPAS

Compilado por D. Hughes de un reporte por T.M. Whitaker 1982-83 Expedición Británica a Chiapas, México. La expedición británica de 82-83 continuó con la serie de irrupciones internacionales que han estado visitando el área desde 1970. El grueso de la expedición estuvo en Chiapas de diciembre de 1982 hasta enero de 1983. Desde un campamento base cerca del Hotel Molino Alborado, en el Periférico Sur de San Cristóbal, pequeños grupos salieron y exploraron cuatro áreas; la región de Colonia Artículo, cerca a San Cristóbal en Zacualpa, el área de San Lucas en el municipio de Zapotal y otras áreas tales como la carretera Tuxtla- Pichucalco, la carretera San Cristóbal-Ocozingo y Angel Albino Corzo en el municipio de Trinitaria. Muchas cuevas fuéron exploradas y topografiadas en esas áreas durante la expedición y mapas y descripciónes son incluidos en éste reporte.

Southwest Sacbé, Cenoté Naharon (C. C. Lockwood)

SISTEMA NARANJAL

JIM COKE

Ek's brief excursions to the sacred cenote brought many earthly rewards. The refreshing dip in the crystalline pool soothed his mind and body. Sharing fruits from aromatic citrus trees with brassy parrots was an added pleasure. However, the spirit of the d'znot's perpetual spring was enchanting to the young Mayan's soul. A special gift flowed from a large ,black void in the d'znot; a life sustaining gift. It was an offering that came from the abyss of the Chacs. Ek often dreamed of living next to their lair, to learn more of this special gift. Yet, to remain there was forbidden; the d'znot was a sacred locale to all mortals in the walled city of Tulum. But if the Chacs gave the water as a bequest to man, how could the gods steal it back through an opposite shaft in the cenote? The Chacs were truly mysterious in their ways.

Scholars propose that the Mayans centered their life and religious beliefs around the local geologic features which played an important role in their lives; native dry caves and cenotes, or karst windows. The latter provided an endless supply of water for the Mayan's needs, as long as the cenotes were accessible. The scarcity of surface water on the Yucatán Peninsula motivated the Mayans to explore many dry caves in search for "the gift of the Chacs". Their need for fresh water resulted in a religious expression that combined water gods and rain gods into a vivid cave mythology. We are still discovering Mayan artifacts near wet sections of newly-discovered, dry caves.

INTRODUCTION

During the past five years, we have turned our attention to caves that the Mayans were not able to explore; those that are concealed by a 10,000 year old water table. Our study of these underwater caves is just beginning to reveal how vast and fragile these freshwater conduits are. The Naharon-Maya Blue Cave system, Sistema Naranjal, is only one of many underwater caverns located near Tulum, in the State of Quintana Roo.

The Sistema Naranjal is situated on a low relief, coastal plain only four to five kilometers from the ocean. This close proximity to the ocean has subjected the caves to the effects of glacial and inter-glacial periods and resulted in the formation of a multiplicity of fresh and salt water levels. Transgressing and regressing ocean levels caused alternate flooding and partial flooding of the caves. These events produced highly-convoluted, vadose caves with a significant degree of speleothem development. This intimacy with the ocean has resulted in a fresh/salt water interface, or halocline. As the drainage lens of fresh water becomes thinner towards the discharge point at the ocean, the overlaying sweet water contacts a lower, static, salt water layer. The salt water layer is similar in composition to ocean water, though it lacks the correct salts and dissolved oxygen concentrations to be classified as a true sea water. The halocline also acts as a speleogenetic agent for the caves. It is not only affected by glacial epochs, but also fluctuates in depth with hydrostatic drainage head and with the daily tide. As the water level changes, it creates a mixing zone that results in a dissolution process that removes limestone rapidly.

Preliminary studies of this system began in 1985, with intense exploration of the upstream section of Cenote Naharon. Cenote Maya Blue was discovered a year later and set off an exploration frenzy. Underwater and land surveys indicated that Naharon and Maya Blue Caves shared a common drainage pattern and that the two cenotes were only nine hundred meters apart.

CENOTE NAHARON

Explorations in Cenote Naharon were initiated in the fall of 1985 by Johanna DeGroot, Hilaire Hiler and Jim Coke. Historically a popular swimming hole, the cenote's proximity to a modern road makes for an acceptable hike with the 55 kilos of equipment needed for a cursory underwater push. The first penetrations in this cave left us puzzled by a phenomenon never before found in this area. Studies in other caves had exposed us to light-colored limestones and crystal clear waters. Unexpectedly, Naharon contained black silts covering the walls, ceilings and floor. The drainage water also appeared to contain a suspended particulate. The numerous stalactites and stalagmites were coated with black silt deposits that clung tenaciously to the formations. Could the Naharon Cave be of this nature in its entirety? What was of great concern though, was the black, foreboding nature of the cave. The dark walls absorbed the light from our powerful primary lights and created a rather unfriendly atmosphere. As we continued, exploring five hundred meters of black cave, we hoped that there might be a change in the cave's character. During those penetrations, we descended gradually to the 18-meter level in depth, where an environmental change did occur.

Jim Coke in the Southwest Sacbé, Cenote Naharon (C.C. Lockwood)

We encountered a strong halocline that hampered our visibility. As the lead diver disturbed the interface, the mixing of the fresh and salt waters caused visual distortions for the subsequent divers. This added to the consternation level for the dive team, making route finding even more difficult. Consequently, exploration progress during the first year in Naharon was slow and only 2000 meters of cave was mapped. The interminable, black silt seemed to cover all parts of the new cave and the halocline complicated matters. In the following two years, penetrations beyond a thousand meters were executed using stage bottles and underwater scooters. Lengthy decompression schedules were common as we pushed further into this dusky hole. Where would this black unknown lead us?

The first connection to Maya Blue was also made in this period. Explorations through the downstream restrictions in Cenote Naharon helped us to tie in the upstream efforts from Maya Blue. The 1987 connection was very exciting, as it provided us with the first, major underwater system in Quintana Roo. With such a large cave to explore, Tom Young and I decided that an accurate survey was called for. Our persistence in the new survey of Naharon ultimately provided us with more answers about this fascinating cave.

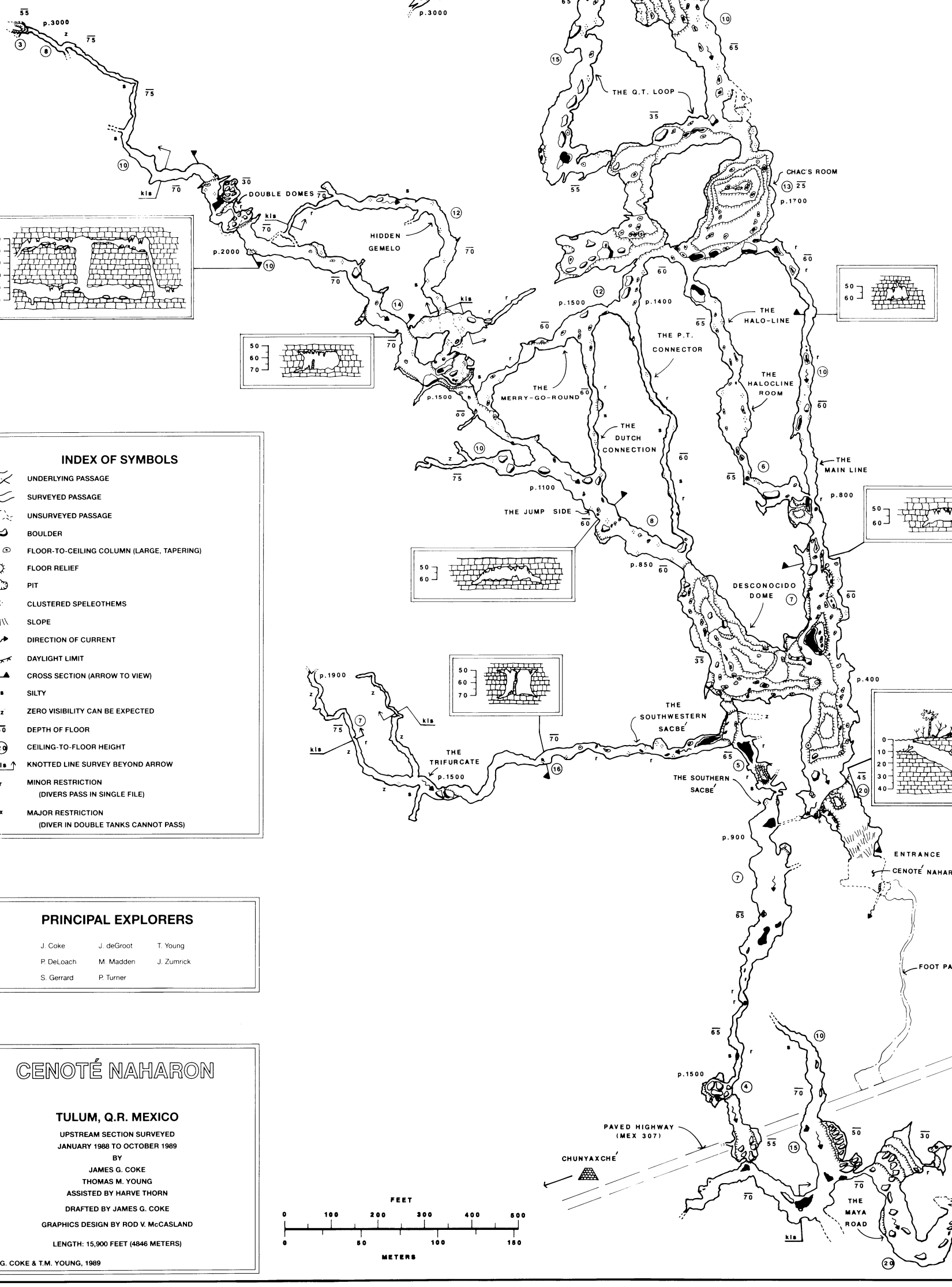
CENOTE MAYA BLUE

The first explorations of the Maya Blue Cenote were begun in the summer of 1986 by Denny Atkinson, Nancy and Tony DeRosa, Steve Gerrard, Hilaire Hiler and Mike Madden. Surveys indicated that the principal upstream section trended towards Cenote Naharon; thus, Maya Blue was tackled with white line fever. Maya Blue contained an unexpected treat for those cavers; the lime-

NOTES

In the present geological epoch, this limestone cave is completely underwater. It channels fresh water from a large inland Karst area through fault passages. Typical environmental conditions include black silt floors, walls and ceilings. A halocline is normally encountered at a depth of 60 feet (18 meters). Only trained individuals with proper equipment should enter this unique and fragile cave system.

A Suunto compass and fiberglass tape were used to confirm all azimuths and distances, except where noted as knotted line survey (KLS). A knotted line survey was incorporated beyond the KLS symbol appearing on the map plan. A precision depth gauge (±1 foot accuracy) was used to measure water depths. All distances have been corrected for the plan view. Penetration (i.e., p. 3000) from the entrance and the depth have been recorded in feet. Because of the vadose nature of the cave system, this survey depicts the major features of the cave passage.



INDEX OF SYMBOLS

- UNDERLYING PASSAGE
- SURVEYED PASSAGE
- UNSURVEYED PASSAGE
- BOULDER
- FLOOR-TO-CEILING COLUMN (LARGE, TAPERING)
- FLOOR RELIEF
- PIT
- CLUSTERED SPELEOTHEMS
- SLOPE
- DIRECTION OF CURRENT
- DAYLIGHT LIMIT
- CROSS SECTION (ARROW TO VIEW)
- s — SILTY
- z — ZERO VISIBILITY CAN BE EXPECTED
- 60 — DEPTH OF FLOOR
- (20) — CEILING-TO-FLOOR HEIGHT
- kls ↑ — KNOTTED LINE SURVEY BEYOND ARROW
- r — MINOR RESTRICTION (DIVERS PASS IN SINGLE FILE)
- x — MAJOR RESTRICTION (DIVER IN DOUBLE TANKS CANNOT PASS)

PRINCIPAL EXPLORERS

J. Coke, J. deGroot, T. Young, P. DeLoach, M. Madden, J. Zumrick, S. Gerrard, P. Turner

CENOTÉ NAHARON

TULUM, Q.R. MEXICO

UPSTREAM SECTION SURVEYED
JANUARY 1988 TO OCTOBER 1989
BY
JAMES G. COKE
THOMAS M. YOUNG
ASSISTED BY HARVE THORN

DRAFTED BY JAMES G. COKE

GRAPHICS DESIGN BY ROD V. McCASLAND

LENGTH: 15,900 FEET (4846 METERS)

©J.G. COKE & T.M. YOUNG, 1989

stone was tan in color. Only black stalactites bore mute testimony to the common ancestry of Maya Blue and Cenote Naharon. Maya's rooms and passages were enormous and side passages seemed to be everywhere. The white cave below the halocline was a lure to greater depths and innumerable leads. Our goal in exploring Maya was simple at the time: find the connecting passage to Naharon. It certainly could not be that difficult. As the Chacs would have it though, an enormous breakdown chamber was discovered seven hundred meters from the Maya upstream entrance. Only 350 land meters distance from Cenote Naharon, numerous side passages radiated from the Battle Ship Room at greater depths. The connection was not going to be easy.

Denny and Mike persevered in the exploration of the lower sections, finally discovering a key passage to the Naharon Cenote. The Chacs did it again, as this passage was only a small part of a greater puzzle. After many dives beyond nine hundred meters of penetration at depths of 24 meters, and hours of cold decompression, it was time for more help. The connection passage to the Naharon Cenote proved to be elusive. With help from Parker Turner and John Zumrick, John and I found an obscure, side passage on Mike's and Denny's lead, 925 meters into the cave.

The remains of a turtle and plastic trash in this section confirmed the imminent connection. Our lead set Mike and Johanna up for the next dive. They tied the knot to a line laid by Woody Jasper and Parker from the severely-restricted Naharon siphon cracks. The unselfish help of Juan José Tucat and Steve DeCarlo in establishing an air dump 650 meters into the cave made the dive much safer.

A swim through, from one cenote to the other, was not a viable possibility at this time. Although it was considered, the restricted Naharon siphon cracks presented a huge tactical problem, if not a gamble. What was really needed was a true underground connection between the two cenotes.

1989

The re-survey of Naharon resulted in 4000 meters of underwater passage. However, it was time to leave the tape at home and do a poke dive. Entering Desconocido Dome and exploring to the south, we found an inconspicuous tunnel where the flow siphoned. Four dives later we scooped over four hundred meters of cave in the Southwestern Sacbé, the Trifurcate. During the taped survey of this section, a small, silty tunnel was found to open into borehole passage leading due south. This was too good to be true. In one dive, Tom Young and Paul Heinerth explored over six hundred meters of cave, returning to the decompression stops with empty reels. They had run out of time in giant, going passage. Further survey dives to the Southern Sacbe revealed another side passage which accessed a large, dome room. We were extremely close to the Battle Ship Room in Maya. But where was the way to go in this vadose maze? In the last moments before air turn, a strong push dive saw Mike Madden, Tom Young and I finding an exploratory line that originated from the Maya Blue explorations. I couldn't believe it. Yet there it was, a route that I had hoped for, but the worst one to follow.

To my chagrin, the line did connect to larger passage, but only after one passed through thirty meters of silty bedding plane passage that was barely a meter high. I had followed Woody Jasper through this restricted lead three years ago searching for a Maya-Naharon connection. Stage bottles could be extremely troublesome in this area, to say the least. Ironically, this section was also the midpoint between the two cenotes with eight hundred meters to either exit, and air. I had to think about this one for a while before attempting a swim-through.

July 16, 1989 found Tom and I in the cool waters of Cenote Naharon, ready for the swim-through. Lorie Conlin, Richard Ribb, and Harve and Toni Thorn acted as our support team at the Maya Blue exit. Tom and I used three, independent tanks on DIN fittings, back-mounting two tanks with the third stage tank clipped beneath us. Each diver was stocked with 7571 liters of air, using the thirds rule for each cylinder. Our gas supplies were adequate for the trip and any problems that we might have in the cave. By entering the spring side of Naharon, the dive plan utilized the siphon flow after a short swim upstream. My familiarity with both caves suggested that the trip would take an hour if there were no complications. And, of course, there would be none.

Leading the pace in the first eight hundred meters gave me a chance to reflect on the four years of exploration and work that went into this system. Our perseverance in exploring the cave, the people who dedicated themselves to this study, and the survey that found this route - all those efforts were worthy of this final underground connection. As we approached the crux of the dive, I allowed Tom a moment to view the first part of the restrictions in their natural, silt-free condition. Being in the lead, I knew that my visibility would be good, and his poor. I was very concerned about route finding, with the real possibilities of encountering an old, buried guideline. Passing the hardest,

Cavern Naharon Cenote (Jim Coke)

ten-meter stretch, I looked back to wait for Tom. He appeared a few moments later shaking his head at me. To this day he won't tell me if that was a comment on the passage, or my technique.

The rest of the swim was a cake walk as we alternately switched between the three bottles, keeping each tank's volume equal. As we approached the final twenty meters before exiting the cave into Maya Blue Cenote, I looked at my watches to confirm a 67 minute bottom time at 21 meters in depth. We decompressed while small stones rained on us from the surface welcome committee. When we surfaced, to many helping hands, we felt an urge to walk the kilometer out to the Naharon entrance. Three hundred meters later, we took a ride and talked about the survey of Maya Blue.

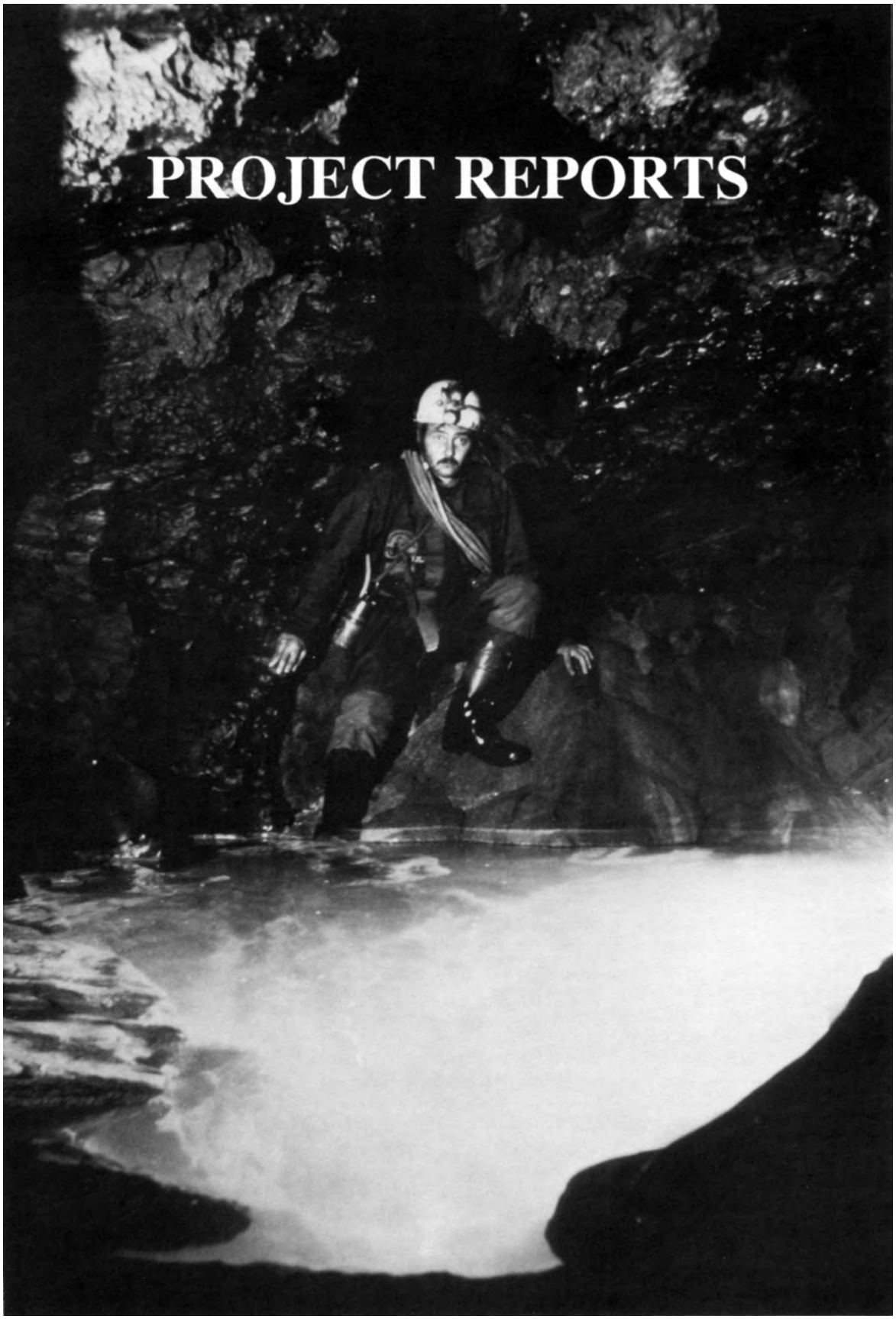
ACKNOWLEDGEMENTS

These studies would not have been possible without the generous support of Excursiones Akumal S.A., Dive-Rite Manufacturing, The National Association for Cave Diving and the Cave Diving Section of the National Speleological Society.

SISTEMA NARANJAL

La exploración del Sistema Naranjal, localizado en el estado de Quintana Roo, se inició en 1985 cuando los espéleobuzos entraron primeramente al Cenote Naharon. Un año después fué descubierto el Cenote Maya Azúl. Las topografías subacuáticas y superficiales mostraron que los cenotes se encuentran separados solamente por 900 metros. Esto motivó un esfuerzo para unir las dos cuevas en un sistema. En 1989 los espéleobuzos tuvieron éxito en conectar los dos cenotes.

Page 63 Ramon Espinasa in the Galactic Trash Compactor - Cueva del Tecolote, Tamaulipas (Dave Bunnell)


PROJECT REPORTS

PROYECTO ESPELEOLOGICO CERRO RABON

CERRO RABON 1989

Karlin Meyers

Entrance to Kijahe Xontjoa (Ernie Garza)

The cool, green plaza square of Tehuacan was the meeting spot for this year's Cerro Rabón expedition members. Some last minute shopping and final bus arrivals occupied most of the day before we headed to Huautla on March 7, 1989. Expedition participants were: Philippe Rouiller, Pierre-Yves Jeannin, Thomas Bitterli, Patrick Diriaz and Jean-Marc Jutzet of Switzerland, and Ernie Garza, Dana Yuricicit, Toni Williams, Jeb Steward, Todd Burt, Jim Brown, Beth and Karlin Meyers, Bruce Fouke, and Judy Ogden from the U.S. and Linda Gough from England. Permission was already procured through the mail earlier in the year by Blane Colton, and the officials in Tenango let us pass with no problems.

Already having learned hard lessons in burro rentals, we opted to send a small party ahead for pack animals from one owner. We would have Anselmo, our connection up top, send down some of his mules, thereby arranging for more dependable business.

On March 9th, we set up a base camp in the same location as in 1987. We built a community area for cooking, eating and for food and equipment storage. Large, roof tarps were installed to drain rainwater into two, fifty-gallon water basins that Ernie had made. Water is scarce on the Cerro Rabón and this year had been very dry. Our interior decorating talents produced luxuriant stone tables, kitchen counters and wooden benches. The big avocado tree that graced camp was rigged with a practice rebelay, hammocks and a shower.

Those who were returning to the area for the second or fourth time were very disappointed to see more large areas of forest cut down. Approximately five hectares have now been cut just south of the trail near basecamp. All of the trails into the woods begin in this area. Philippe and I spent nearly two hours locating our main trail in the devastation. Patrick, Thomas and Jeb immediately set out to a large cave entrance located in a newly-deforested doline just west of San Martín. This entrance had caught everyone's attention on the hike in. After dark, the three cavers returned from being lost. The big entrance was a shelter cave, but near it was a going cave.

With temperatures dropping to fifty degrees Farhenheit, we hoped for a thunderstorm to fill our water tanks. The next morning, with the rains having missed us, we were forced to do one of many water portages from a local cistern in town. Thomas, Philippe, Dana and I hiked the old trail which was still recognizable from last year. Our destination was the Xontjoa valley and the goal was to cut a new trail directly north to the main San Martín/Tenango trail. We

KIJAHE XONTJOA

San Martin Caballero

Oaxaca, Mexico

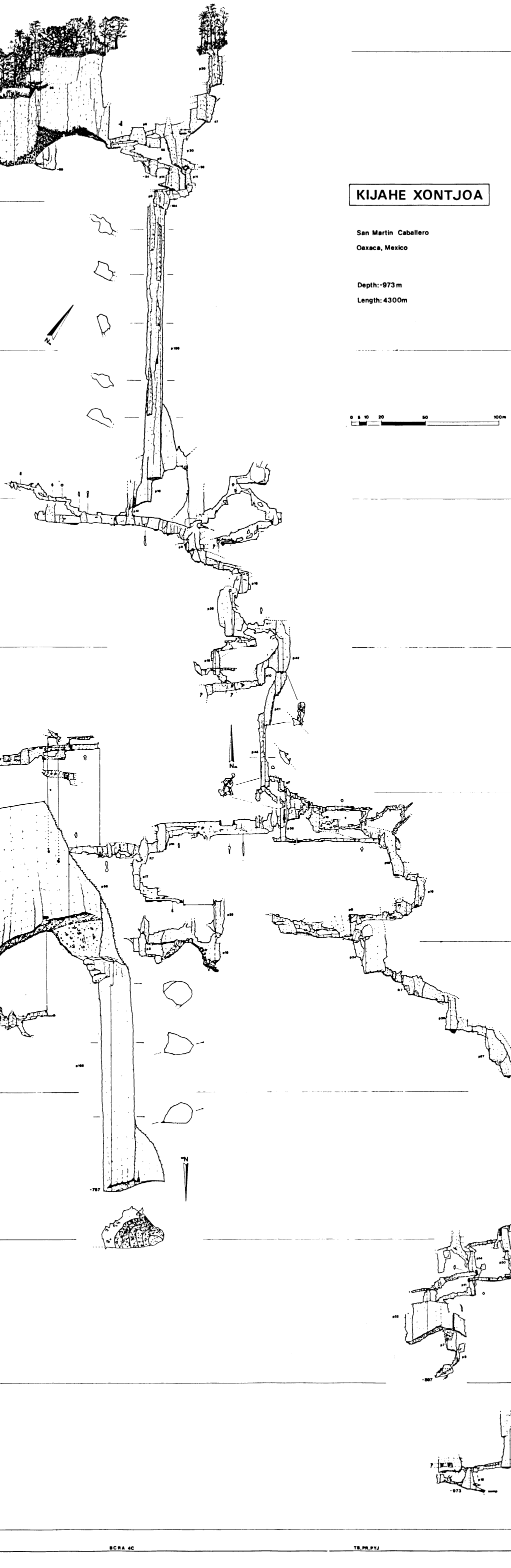
Depth: -973 m

Length: 4300m

0

-500

-1000



0 5 10 20 50 100m

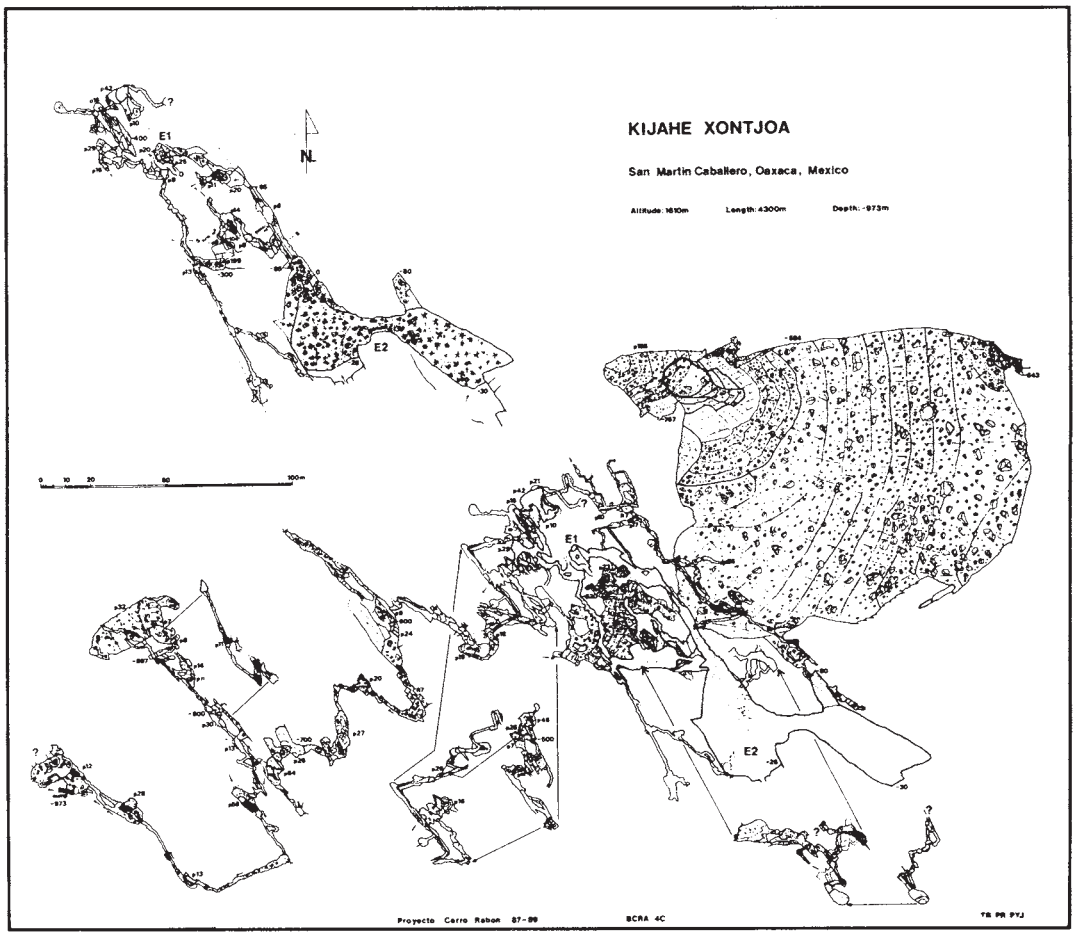
Proyecto Cerro Raben 87-88 BCRA 4C TB,PR,PYJ

Karlin Meyers at 60-meter pitch in Nita Ya Heke (P. Diriaz)

navigated the lush jungle for five and a half hours ending up in a clearing which could be seen on aerial photos. We located a trail that led us straight to the main trail. Time to hike to the main cave from basecamp would be about one and a half hours. This would eliminate the need to camp in the cave entrance after a big, push trip. The same day, Jeb, Judy and Todd set out to the western doline to check out the shelter cave which reportedly contained artifacts. They did indeed find, but did not disturb, many bones, shards and constructed graves indicating a very old burial site. Toni and Ernie had been unsuccessful in trying to find the old woodcutters trail which led to a large, open, bird pit.

KNOWN XONTJOA RIGGED - THE FIRST PUSH

The morning of March 11th was a cool 45 degrees Fahrenheit with still no rain. Today, our main cave, Kijahi Xontjoa, would be rigged to the known limit. Thomas, Philippe and I were equipped with a new, two-hundred-meter Wellington rope, half of which was kindly donated to us by Bob and Bob. The 188-meter pit was re-surveyed to be 199 meters. The error was probably due to the difficulty of measuring the pitch which had been rigged with eight-millimeter rope. This drop was rigged with two bolts located in a small room. The forty-centimeter slot gives little hint as to what lies below. Once beyond the slot, the rope hangs free in a superb shaft, touching the wall only at the bottom. The next two pitches of 16 and 12 meters lead into a stream



Rappelling into the big room
- Kijahe Xontjoa (Jean-Marc Jutzet)

passage. Thomas and I surveyed upstream about eighty meters to a small dome and infeeder while Philippe rigged the next two drops to the top of the 1987 survey. At this point, the water disappeared down a small drain which was not pushed. We descended a 29-meter pitch. The passage split at the bottom so we left this for the next trip. The cave was now rigged to -390 meters and showed good promise.

Jean-Marc, Thomas and Philippe went back in the next day and pushed the obvious large passage which split off at a slightly higher level. This passage soon led to the top of a dry, shaft series. These popcorn-covered pitches quickly pushed the depth to -525 meters and ended in a small, shallow sump. This, however, was not the end and just 15 meters up the last pitch was a large window leading to a meander. After nearly a hundred meters and several pits, the explorers stopped and headed out. The trail was, by now, clear enough to be navigated easily at night. Meanwhile, Jeb led a short trip into Spider Cave. A wrong turn led them into a tight, muddy section dubbed the Sewer.

THE VOID

The next morning Thomas, Patrick and I set off to push the Dry Series Extension. The previous group left seventy meters of rope and rigging gear for us at the last survey point; the top of yet another pitch. A drop of 17 meters, a few down-climbs and a very small, wet crawlway which Thomas pushed, led us to a 23-meter drop. This left us perched in a window overlooking a large room. A 16-meter rappel dropped us to the floor. A dead-air feeling dampened our sensations of going cave. However, the large, breakdown room required two hours to survey and this gave us hope that some big cave could still exist somewhere deep in the Cerro Rabon.

A bit disappointed, we climbed back to the top of the 17-meter pit. While Patrick and I re-packed gear and ropes, Thomas climbed up a few meters into another window. In less than ten minutes he returned and in his calm and gentle voice said, "It continues to a very big room." I thought he must have come out somewhere near the top of the last room we surveyed. However, he confidently restated, with a grin, "No. This is a *very big* room." Patrick and I quickly followed him along some fifty meters of passage which ended abruptly in a tall doorway that marked the portal to a black void. Our strong, electric lights saw nothing in any direction and our echoes sonared to us that this room was slightly larger than the last one. It was like a science fiction movie; standing in a doorway to space, the final frontier. Only, our frontier would require a sixty-meter rope to reach the floor. This was surely one of the most dramatic entries to a large room in the world. We returned to camp with news of going cave.

CAVE BEAR?

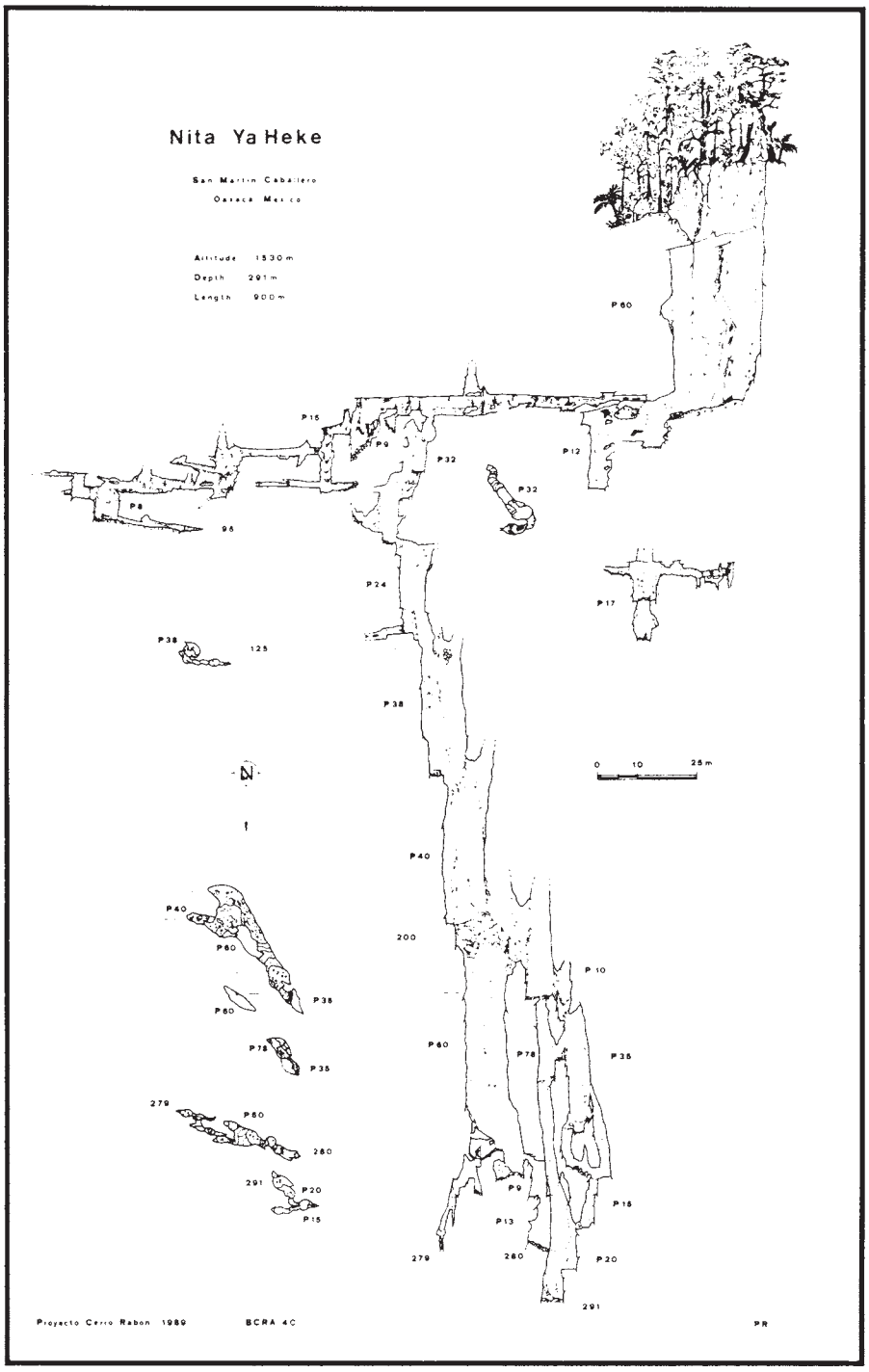
Our new trail to Xontjoa had passed a doline on the upper edge of the old clearing. It became Nita Arbol Muerte or in Mazatec, Nita Ya Heke, for the very large, dead tree that was used as the rigging point. Philippe and Jean-Marc first dropped the fine, sixty-meter entrance shaft which led to a tall, horizontal cleft trending north into the clearing. The cleft ended, but there were many holes in the right wall leading to large, fossil, stream passage. We traversed the stream for a few hundred meters until it finally ended. Near the terminus was a large, fully-articulated skeleton lying in a groove in the floor. How did an animal of this size get back here, through the squeezes that were barely large enough for us? Philippe retrieved some jawparts from this cow-sized animal which was later identified as an American Black Bear. The age is still unknown, but it proved to be a fascinating find. Returning down the passage, we located a shaft series and began to rig it before returning to camp.

During the same day, Ernie, Beth, Toni and Bruce found their way to the bird-pit south of Vincentes. The beautiful, eighty-meter sótano turned out to be blind. However, it adds another, nice, open-air pit to our plateau list. By now, Pierre-Yves Jeannin and Linda Gough had arrived rounding out our crew at 16.

THE VOID PUSHED

On March 15th, a large group, led by Philippe, set out to see the main cave. This included Linda, Todd, Jim, Dana, Jeb and Ernie. All made it down the 199-meter pitch. Philippe and Jim checked the far side of the big drop only to find another pit. They rigged and descended the thirty-meter pitch and did a climb back up nearly as high to an infeeder dome. From here, the passage continued down and soon opened into nice, stream passage. It was surveyed to another drop which was left for a later trip. This was now one of several good leads in the upper section of the cave. While the others headed out, Pierre-Yves and Jean Marc came in to meet up with Philippe to go to the big room. The jumping off spot turned out to be 56 meters above the talus-covered floor. The walls were so overhung that one ends up about twenty meters from the wall at the bottom. The room is a round chamber over six hundred meters in circumference; it is approximately 160 meters across with a ceiling height of one hundred meters, judging from our rocket flares. The talus forms a ridge to one side of the room and, on another side, the room slopes gently down with about forty meters of relief. The other side slopes steeply down a funnel of talus to a large, black abyss. Rocks easily tumbled down this slope and disappeared with thundering echoes masking any clue as to the true depth. The unstable slope was negotiated by rigging a rope on one of the walls of the room. Philippe descended into the blackness with a hundred meters of 3/8 inch PMI. Down the immense shaft he went, finally stopping at the end of the rope with the bottom nowhere in sight. He then ascended the drop and also back up the 56-meter pit to the junction room where more rope awaited.

While Philippe ran the ropes, the others surveyed the room. Philippe returned with eighty meters of rope and descended the shaft once more. One hundred fifty five



meters below the rig point, he touched bottom in a large chamber with no exit. From the floor of the shaft to the ceiling of the room was nearly three hundred meters of space! Appropriately, it was Philippe's birthday and so the shaft thus named. The three returned to camp the next morning, after a 24-hour trip. Also on the 16th, Ernie, Jeb and I made what was to be the last trip into Spider Cave. Our promising horizontal cave was just not to be. Less than one hundred meters down a tight meander from the 1987 survey, the passage ended in a breakdown junction with no airflow. It seems only vertical caves thrive in this region.

On Friday the 17th, Jim, Todd, Jeb and Judy set out to an area we had named the Lost City Valley. Prepared for an overnight, they would go as far as they could. The Lost City shows up on aerial photos as two, very long, linear sinks of unusual definition. They are located about two kilometers from the Xontjoa entrance, deep in the virgin forest. Patrick, Thomas and I set out to push Nita Ya Heke and Ernie and Linda went to photograph Bone Cave. Beth and Bruce were due to leave today.

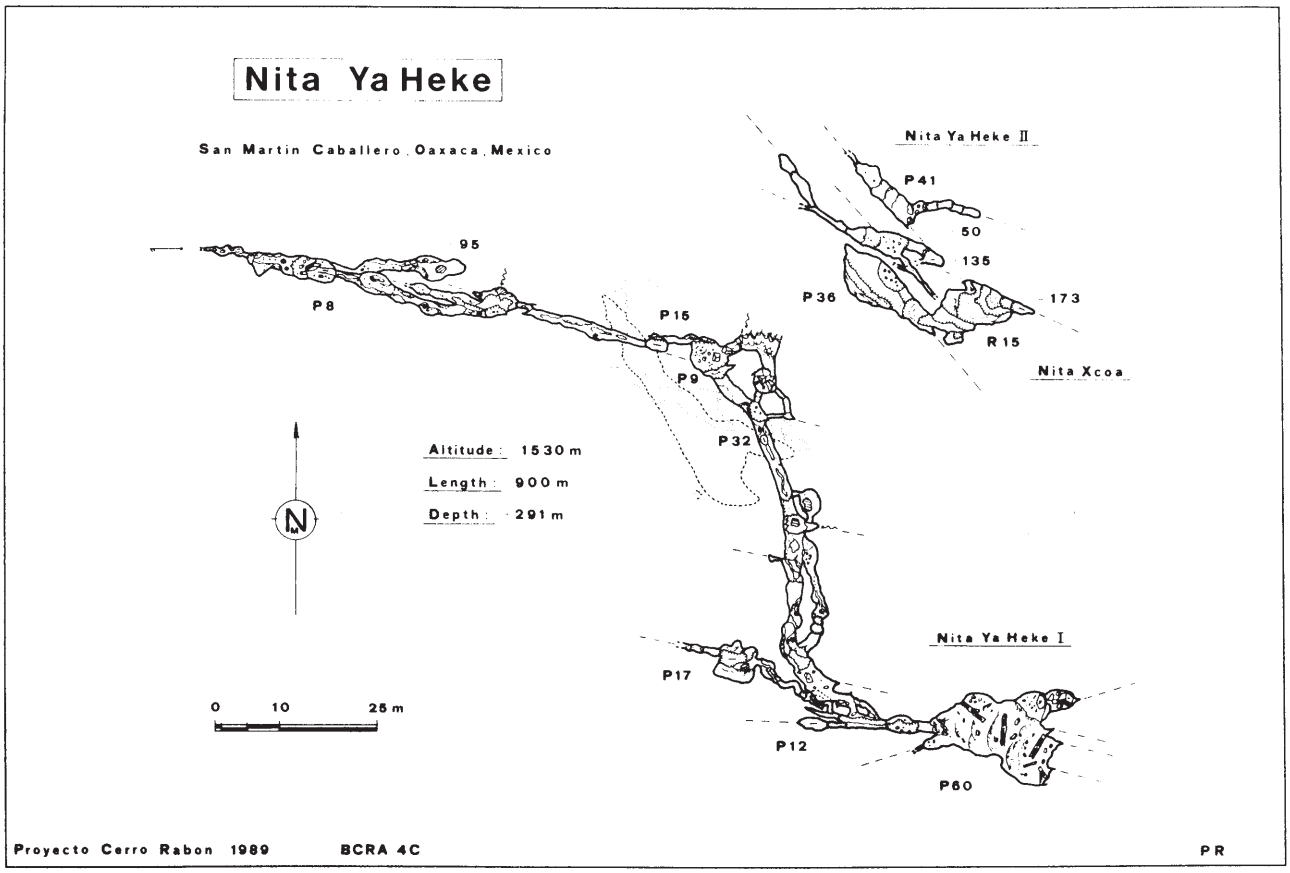
NITA YA HEKE

Nita Ya Heke continued as a multi-shaft series. Jean-Marc had previously rigged the first two drops of 32 and 24 meters, respectively. The rock of the 24-meter pitch was rotten and Thomas got quite a scare when one of the chock anchors popped out. This, and the next pitch of 38 meters, were rigged with eight-millimeter rope. We now had a good length of trusty PMI. At the bottom of the 38 -meter pitch we found ourselves looking through a huge gateway into a very large shaft. Patrick rigged while we surveyed. A forty meters landed us on a steep, talus slope where we were funneled down to the top of the another pitch. This pit was partially blocked by some large boulders. A dicey rig off one of these, allowed us to descend another fine shaft of sixty meters to some disappointingly-narrow leads. Out of rope, we did not feel inclined to push these, or the far shaft at the top of the sixty-meter pitch. Our survey reached -255 meters.

The following day, Philippe, Pierre-Yves and Jean-Marc returned to continue in Nita Ya Heke. The tight passages near the bottom soon terminated adding only twenty meters to the depth. The other shaft at the top of the sixty-meter pitch was descended with a ten-meter rope. A 78-meter pitch was encountered then, another broken shaft, which paralleled it, connected. Both ended in breakdown plugs at -291 meters. At the end of exploration, the cave was de-rigged.

Patrick, Thomas, Linda, Dana and I had entered Xontjoa. Patrick and Thomas went ahead to de-rig Philippe's Birthday Shaft and I led the others down to the big room. We all took photos and admired the chamber which must be very close to 3/4 million cubic meters in volume. We then departed, de-rigging to the minus five-hundred-meter level.

The next day, a clean-up survey was done by Philippe, Pierre-Yves, and Jean-Marc. We were all a bit disappointed that the big room had no continuation. However, once again, a window was discovered near



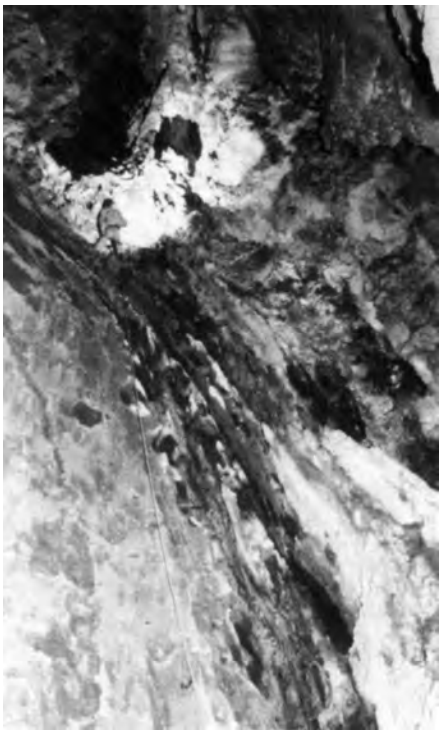
the bottom of the Dry Shaft Series. It was entered and the three spent the next 16 hours surveying a labyrinth section of cave which bypassed the 525-meter sump. Then, suddenly, a nice stream passage reappeared and began to plunge into the depths. An 18-meter drop was rigged and they took in a quick view of what lay ahead before returning to the surface after 24 hours of caving.

We were all excited because the passage was heading in the direction opposite of the big room. While all this was going on, Toni, Thomas and I went to the old clearing to begin checking the many other dolines. Thomas had meticulously drawn out a surface map which included 27 dolines.

The first, 15-meter doline, which was blind,was checked by sliding down a ten-meter wet, slimy tree. However, near its top edge was an offset and a promising entrance that became Nita Skua. But, we passed it for a more inviting hole nearby. This sótano had a large, one-meter wide tree stretched across the top which became an ideal rig point. Unfortunately, this, and the next doline, turned out to be blind. There would be plenty more to check in this area so we left the rope and headed back to camp to get ready for a push in Xontjoa. Patrick had returned at dinner time with a new entrance that he had located about one hour down the main trail. The next morning, he and Linda set out to check this new find and Philippe, Pierre-Yves, Thomas and I went into Xontjoa.

PUSH FIVE

We moved quickly to the last survey point in Xontjoa. With Philippe rigging and the rest surveying, we moved down more drops and climbs. The passage size increased and the rock bedding became more inclined. The passage clearly took high water at times and we admired the melon- sized cobbles in various, high-water pools. The next three pitches, totaling 120 meters, followed near-vertical bedding which bowed near to horizontal at the bottom of a 64-meter pitch, the last, and very wet, drop. The passage branched and shrunk in size as the cave pulled out of its nose dive. One route led us down numerous climbs and small passages to the top of a large room. The floor was probably thirty meters below and we had no more rope. We



Dry Shaft Series in Kihaje Xontjoa (Ernie Garza)

returned to camp. Patrick and Linda also returned, their cave bottoming out at ninty meters depth in a tight meander.

XONTJOA - PUSH SIX

On the 24th, the five Swiss left for the last push in Xontjoa. My foot disabled me, so I would miss out on this trip. The team would undoubtedly be moving fast. They took two hundred meters of eight-millimeter push rope to continue from the -840 meter level. The next morning, Ernie hiked to the Lost City while Anselmo came into camp and taught us how to make baskets from philodendron vines. The deep team had not returned at 11:00 a.m. so we guessed, optimistically, that they had gone much deeper.

At one p.m. they plodded into camp after a 28-hour trip. The large room at -840 meters was entered via a 32-meter pitch. The chamber measured forty meters across and had a series of pitches and climbs which ended in tight passage at -897 meters. The main split descended 13 meters to a crawlway, across a pool of water, and through a tight constriction and another shaft was encountered. Beyond, the cave is wet and would be uncomfortable during higher water. A 15-meter drop led to another drop of 56 meters. A stream passage followed the bedding with many plunge pools to climb around. The stream dives down two more drops (13 meters and 28 meters) to a sloped walking passage. A 12-meter drop leads to a sump at -973 meters, the deepest point of the cave.

At the top of the 12-meter pitch was, again, the omnipresent window that always leads to more cave. This accessed a large gallery with two, horizontal tunnels taking off into the blackness. These two passages, about four meters wide and three meters high, looked very promising. The leads moved alot of air and the cavers anticipated that a great deal of time would be necessary to throughly check them out. Perhaps, a junction with another, larger cave was possible. The cavers stopped exploration and headed out.

Everyone was elated with the new discovery and very curious as to what would lie down those tunnels. We broke camp and organized ourselves for the hike out, already eager to return in the spring of 1991.

CERRO RABON

La planicie de Cerro Rabón está situada a 300 km al SE de la Ciudad de México en la Sierra Mazateca. Formaciones karsticas están esparcidas y bien desarrolladas en esta área. Las cuevas hasta ahora descubiertas han mostrado mas características alpinas que las típicas para México. Generalmente, presentan una serie cpmpleja de tiros separados por meandros cortos. Frecuéntemente, las cuevas intersectan galerias fósiles las cuales representan etapas antiguas de desarrollo de las cavidades. La presente dirección de las corrientes de agua es todavía desconocida.Sin embargo, una gran resurgencia se encuentra directamente al sur, en la base de la planicie. Se han descubierto muchas cuevas pequeñas. Algúnas de las cuevas más grandes pueden alcanzar 200 a 300 metros de profundidad. La extención vertical del sistema principal es de -973 metros.

HUAUTLA PROJECT

NITA KA EXPEDITION 1988-89

James H. Smith

Crumbling Rock Canyon, Nita Ka (Jim Smith)

Huautla de Jimenez is located 240 kilometers south of Mexico City in the Sierra Madre Oriental del Sur in the northern end of the state of Oaxaca. The city of 10,000 inhabitants is the largest population center of the 100,000 Mazateca Indians scattered over the Sierras in small villages and towns. Huautla is world renowned for its world- class deep caves and psychoactive mushrooms. Since the mid-1970's, American cave explorers have fielded 18 expeditions to the highland karst to explore the complicated labyrinth of cave passages and vertical shafts beneath the surface. The deepest and most extensive cave is Sistema Huautla, the world's sixth deepest at a depth of 1352 meters. The cave contains 53 kilometers of surveyed passages explored through 17 entrances. Each of the entrances leads to a vertical shaft series and connecting passages. The drainage system contains six hundred shafts with a cumulative vertical extent of 17.75 kilometers. Other deep caves are located in the Huautla area and six caves deeper than five hundred meters have been explored. Sótano de Aqua de Carrizo is the deepest of those caves at -834 meters and was surveyed to a distance of six meters from Sistema Huautla. All of the caves are hydrologically related to the master drainage of Sistema Huautla.

The goals of the 1988-89 Nita Ka Expedition were to continue hydrologic investigation of the Sistema Huautla Karst Groundwater Basin, conclude exploration in Nita Ka, begin exploration of Frog Cave (Nita Ske), investigate the potential for caves in the Agua Munde area, and assist in a movie production of the caves of the Huautla region.

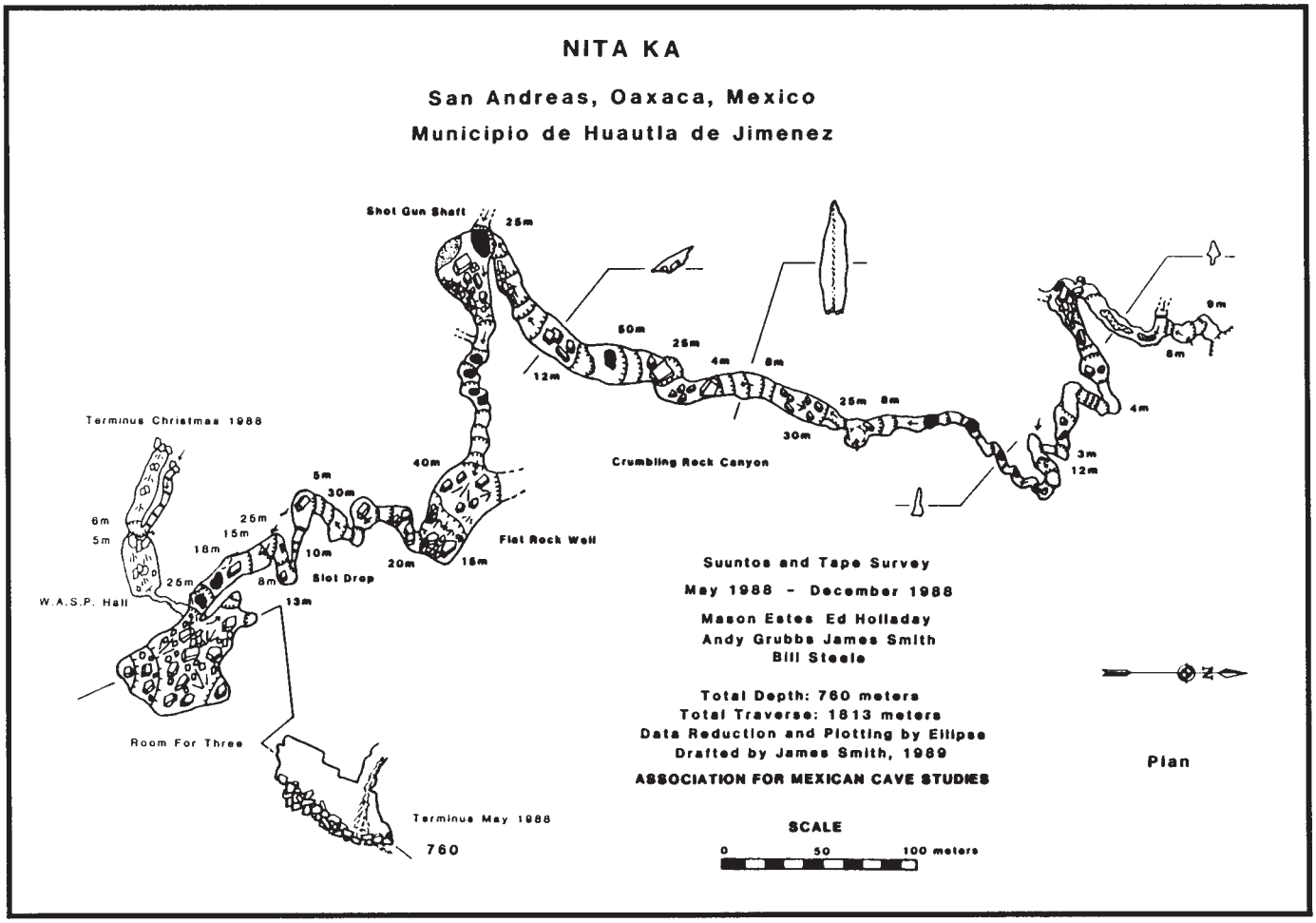
THE RIVER

From eight hundred meters above the Río Santo Domingo and a distance of five kilometers, we could see the majesty of the mighty river below; an awesome panorama consisting of a deep gorge lined with precipitous bands of white limestone cliffs five hundred meters high. I turned to Bill Steele and David Doyle and remarked that there was something different about the river. It was not the usual jade color, it was white.

Bill, David and I were on our way to the Sistema Huautla Resurgence to place charcoal dye receptors for a dye trace from Cueva de Agua Carlota to the resurgence of the karst groundwater basin to continue hydrologic research. We had arrived the day before, on December 20th, 1988, at the tail end of fifteen days of solid rain. The question remained, was it possible to reach the resurgences along the Rio?

We emerged from a large sugar cane field into dense scrub and followed the familiar path to a connecting field and into the fringing forest clinging to the last vestige of wilderness in the Peña Colorada Canyon. The canyon is named for an orange-stained four hundred-meter high headwall. At stream level, the canyon becomes cave-like with a width of 15 meters or less. Large vines hang from thirty-meter tall trees in the spotty canopy and between the shadows grow cacti and thorny plants in the transition zone between desert and cloud forest.

At river level in the Peña Colorada, we witnessed a much larger and more violent stream than from the previous year. Before



heading downstream, we climbed forty meters up to Cueva de Peña Colorada to tour the entrance area. I was amazed to see a lake twenty meters downslope in the entrance and evidence that water had recently flowed from the entrance into the canyon. The pool level was at least ten meters higher.

It is hypothesized that the phreatically-formed Cueva de Peña Colorada is the overflow for Sistema Huautla. I believe it was the original perennial spring and was hydrologically abandoned when the base level dropped. Bill Stone led an expedition in 1984 to dive in the cave and mapped seven kilometers of passages through six sumps, terminating exploration 150 meters into the seventh sump. The last sump was thought to have stream flow and to be the main drainage of the Sistema Huautla drainage basin.

After a hair-raising river traverse we were finally able to set charcoal dye receptors in the Huautla Resurgence. The resurgence was spewing water ten times the volume of what we had ever seen and I was skeptical of the survival of the dye receptors. We returned to shore via another wet and wild, adrenalin-pumping route and left the river by an ancient trail which links the Sierra Mazateca with the Sierra Juárez.

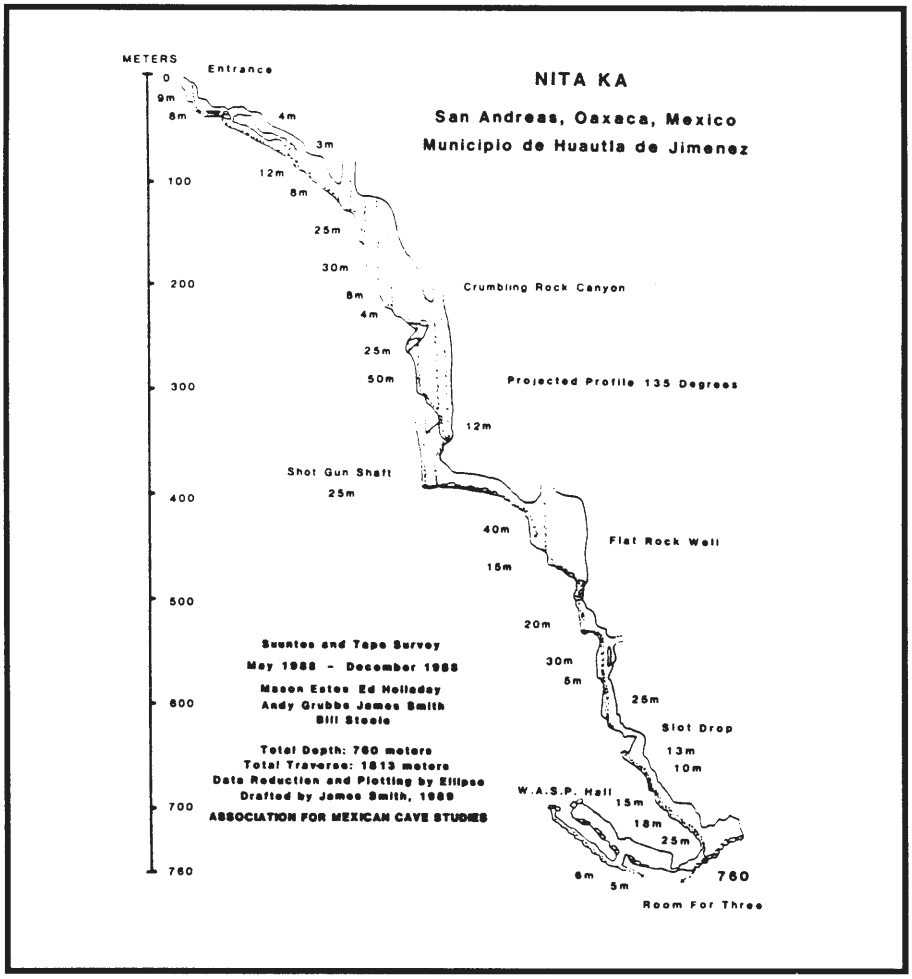
Four days later, Steele, Bill Storage, David Doyle, John Ganter, and I headed east towards Tenango to the community of Río Santiago. A large stream issues from a spring and flows through the community for over a kilometer before sinking into the karst. Even though Nacimiento de Río Santiago was an unlikely resurgence for Cueva de Agua Carlota, it is equally important to know which springs are negative. Later that day, 16 pounds of fluorescein dye were injected in the sinking stream of Cueva de Agua Carlota.

Two weeks later, the charcoal dye receptors were retrieved from the Sistema Huautla Resurgence and Río Santiago. The two charcoal dye receptors at the Sistema Huautla Resurgence were found dry and on a ledge. The water level in the resurgence cave had dropped six feet.

When the activated charcoal was treated, the results were negative. A water sample analyzed with a fluorometer was also negative. It is possible that the dye passed through the system after the dye receptors were high and dry, or the dye exited through a yet undiscovered resurgence. Dye injected in 1988 passed through the system for two months despite fluctuating water levels, attesting to the adsorption of the dye on clay particles in flooded phreatic passages. The dye trace is therefore inconclusive.

CAVE EXPLORATION

After the river adventure, cave exploration teams entered both Nita Ka (Fire Cave) and Frog Cave (Nita Ske) to begin exploring. These caves are located west of the one hundred-meter deep and four hundred-meter



long La Grieta dolina. La Grieta holds two of the 17 entrances into Sistema Huautla. The 758-meter deep shaft series of Nita Ka is situated in a thirty-meter deep dolina. Ka and Ske are 150 meters higher than La Grieta in less spectacular subdrainage basins in the community of San Andrés.

NITA KA

Nita Ka was first explored to a depth of 758 meters during the 1988 Sistema Huautla Expedition. The cave was one of the best discoveries of an unconnected vertical drainage route (unconnected to Sistema Huautla) since 1980 in the Huautla Region. Below 25 rope drops, in a large chamber known as The Room For Three, remained several leads which beckoned our return. It was our hope to connect into Sistema Huautla and add to the 17.75 kilometers of infeeding vertical drainage routes.

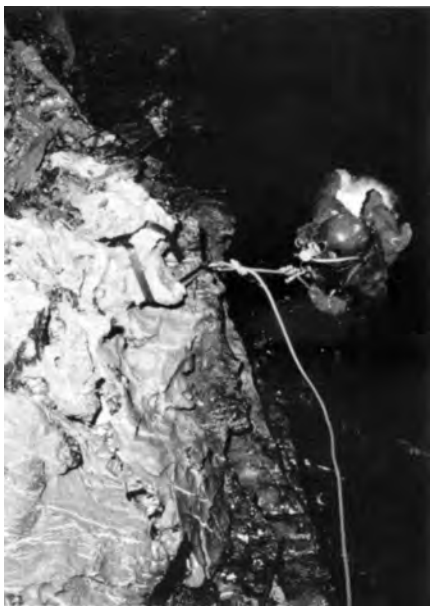
The first trip into Nita Ka was undertaken by Bill Steele and I for the purpose of rigging. A push team consisting of Bill Storage, John Ganter, David Doyle, Bill Steele and I entered the cave the day after Christmas to begin investigation of leads remaining from the previous expedition.

The upper cave is mostly horizontal, offering a series of dry, hands and knees crawls and narrow, jagged canyons punctuated by short shafts of no more than 12 meters. After descending the seventh shaft, the character of the cave changes to a sixty-meter tall, three-meter wide canyon called the Crumbling Rock Canyon. Aptly named, the canyon is a series of shafts interrupted by short segments of walking passage. The shaft series is quite hazardous because of loose walls consisting of mud, chert, and intensely folded thin bedded limestones. Some of the shafts bear names like The Shot Gun Shaft and Flat Rock Well, where the explorer is constantly pelted with rockfall. The Crumbling Rock Canyon has more than a dozen infeeding waterfalls which increase the size of the stream deep into the cave.

From the bottom of the Air Sump, the character of the cave changed again into smaller canyon and abundant breakdown. The rest of the team continued to depth, rigging ropes down to the Slot Drop at -620 meters. Thirty meters of tight canyon led to a chest-tight crack and an eight-meter drop. At the bottom of the shaft, a narrow continuation led to a five- meter drop and the beginning of a large, steeply sloping canyon. We descended two shafts and began rigging rope on freeclimbs where the water obscured hand and footholds.

With the additional rope in place, Ka now had 28 rigged drops down to The Room For Three. While Ganter and Storage made a quick circumnavigation of the chamber for leads, Bill and I headed down to what Ed Holladay had described as a one-foot high crawlway in breakdown at the lower end of the room. Bill checked an obvious crawlway to one side of the room which was actually a separation between a bedding plane and breakdown block. The crawl curved downward as it followed the fold of the rock and was extremely slippery. It became too tight and he fought to retreat from the steeply-inclined, headfirst position. We checked another crawl and hammered our way through the breakdown along the edge of the room, finding ten meters of cave passage and a separation betweenceiling and floor that was too tight to negotiate. I could see a half-meter high crawlway leading off and felt a strong draft on my face. No additional discoveries were made, so we exited the cave with plans to return to the windy crawlway.

On the 28th of December, Nita Ka was entered by Nancy Pistole, Matt Oliphant, Mason Estes, Lee Perry, Steele and I. The six of us traveled to the bottom of Nita Ka in three and a half hours. We brought with us specialized equipment to enlarge the tight access point into the crawl. Twenty meters of crawl led to borehole and the cry for rope and vertical gear. Steele exclaimed, that "WASP Hall" was the appropriate name for the twenty-meter diameter borehole. However, exploration yielded disappointment. We were unsuccessful in finding any down-trending leads in the breakdown. Instead, we explored a small, uptrending passage for three hundred meters to a breakdown choke in the ceiling. Steele, Mason and I surveyed back to the junction to find that Lee Perry had performed a gonzo freeclimb to a large, upper level. This was explored and surveyed to breakdown. The survey revealed that both passages ended at the



First Drop into Crumbling Rock Canyon at -200 meters (Jim Smith)

same choke. All leads were explored and Nita Ka was considered to be finished. We began de-rigging and pulled ropes up to the -620 meter level and hauled several more to the -420 meter level. In the following three days, Nita Ka was completely de-rigged with additional support from Doug and Carla Powell and Brian Steele.

NITA SKE (FROG CAVE)

While exploration was taking place in Nita Ka, Frog Cave was also being pushed. During the 1987 expedition, Alan Cressler and I found the entrances to Frog Cave and another nearby pit. The first attempt at exploration of Frog Cave began during the 1988 expedition when Andy Grubbs and I surveyed 150 meters and stopped at the top of the second drop. Only 15 meters away, a 15-meter deep pit was named Tarantula Cave by Keith Goggin. Exploration of Tarantula Cave was initiated by Keith, Ed Holladay and Stephan Eberhart. They explored down five drops in each of two routes trying to follow the water down narrow, body-tight fissures in the lower stream canyon. An upper level led to a fossil passage which was easier to traverse. Their progress was terminated at the top of a shaft and an incoming water route. A later attempt to explore this cave was thwarted by an angry landowner brandishing a machete and spewing foul language. The close proximity of the two caves indicated they may connect. In spite of permission from the government, landowner problems were a serious threat. In order to explore Tarantula Cave, a horizontal cave entrance was needed to prevent ropes from being chopped.

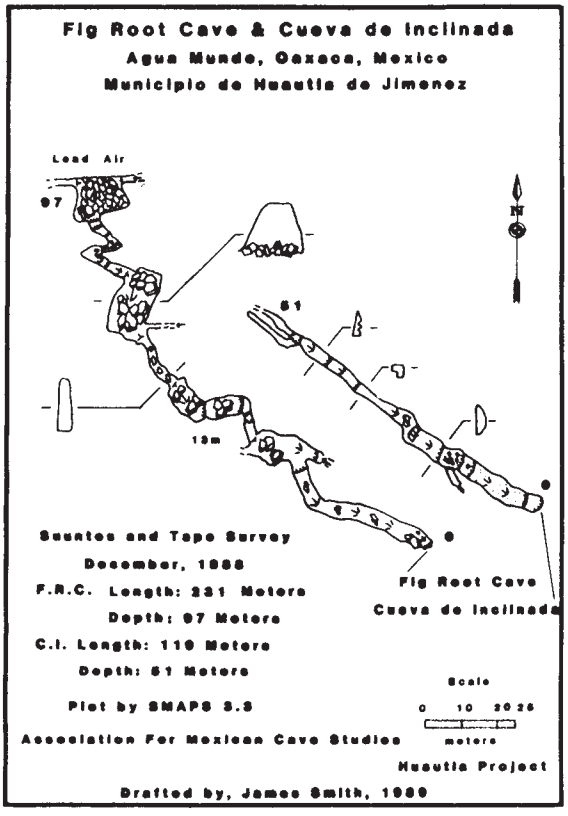
On December 23rd, the Frog Cave exploration team suited up in the heat of the day. They listened to the history of the cave they were to enter and about the trouble with locals living on the side of the hill overlooking the entrance of the cave. John Ganter and Bill Storage briskly hiked down into the dolina where the two cave entrances are located and ducked into Frog Cave. The two explorers hauled their burdens through narrow, jagged canyons and a tight, popcorn crack to the first drop. Their exploration kit consisted of two hundred meters of PMI rope, bolting gear and survey equipment. They enlarged the gnarly, tight spot and found their way to the end of the survey and the last rope. They descended the virgin, ten-meter shaft and dropped to a streamway and the beginning of the miserable, tight, lower route of Tarantula Cave. Then, connection...they had dropped into the junction between the lower streamway and a dry, upper route. They knew this was fact because of the abundant caver tracks. They avoided the lower, tight rift, though it still presents itself as a beckoning lead. It has been reported that a voice from that passage moans, "Nanta was wimp compared to what lies ahead, come and see." Enough to send cold shivers down one's back!

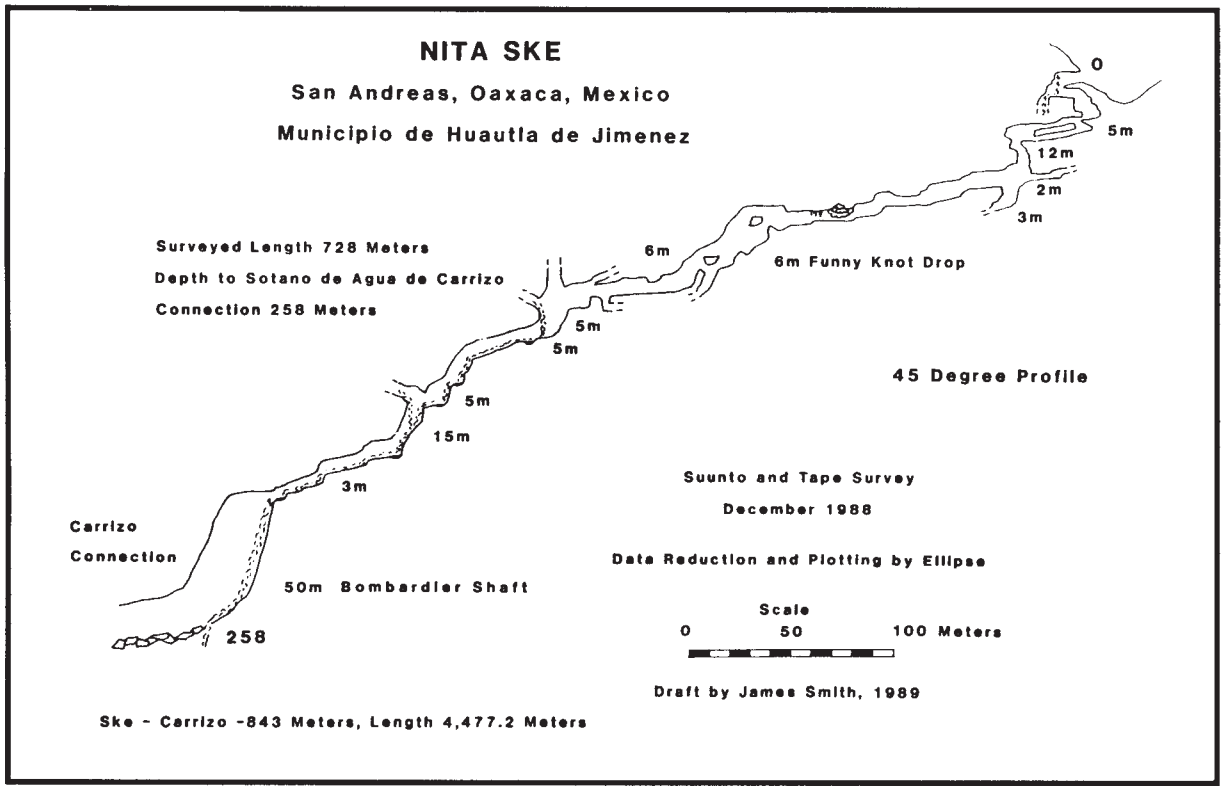
A handline and two more drops were rigged before the altitude and driving lag induced premature fatigue. They stashed the exploration equipment and surveyed toward the entrance of the cave. Without linking to the existing survey they left the cave after 11 hours to face a three and a half kilometer hike to the field house.

The next morning , Storage and Ganter asked the locals the name for "Frog" in Mazateca. "Ske" was the reply. Nita Ske met with approval.

On December 28th, Ganter, Storage and David Doyle entered Nita Ske and linked up the survey with 33 stations in two hundred meters of passage. At the edge of the drop, the last point of exploration, the crew could hear the streamway and could see a change in the character of the cave. Blackness loomed across the expanse of the canyon. A five-meter, wet chute led to another drop on tilted bedrock. The slick, black rock of the streamway led to the edge of a 15-meter shaft. Ganter set a bolt and descended the shaft. A three meter handline drop was rigged to the rampart of a deep shaft. Storage timed a rockfall at three seconds. The team mapped two hundred meters of passage over the course of 25 stations to link up with the last survey station. Nita Ske's survey was 450 meters long and 170 meters deep.

On January 2, 1989, Ganter and Storage renewed their effort in Nita Ske after Nita Ka was finally de-rigged. At the fifty-meter shaft, Ganter set a bolt and dropped to a water-blasted ledge ten meters lower. He could see the end of the rope swinging in the blackness and spray of the shaft. He tied two ropes together and crossed the knot in the drenching shower.



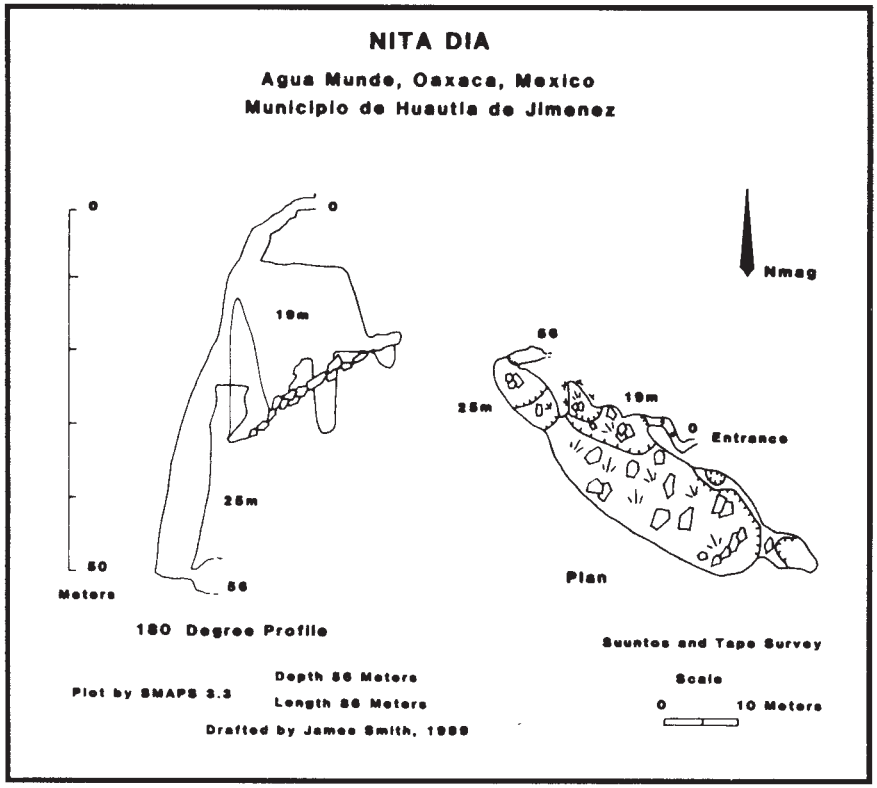


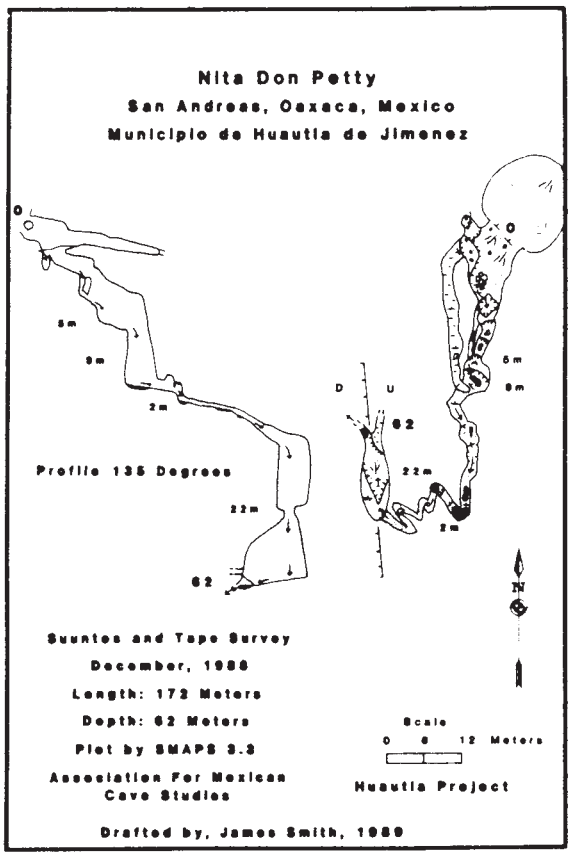
Loose rock detached from the walls, sending down deadly bombs. Ganter reached the end of the rope to find he was still above the floor. After untying the knot, he gained a toe hold and was able to freeclimb the sloping wall. He had entered a huge canyon. Out of harms way, he instructed Storage that the rope was short. The two explorers were astounded at the size of the passage they discovered. Shock and elation soon followed when Ganter spied station 89 on the wall. They had connected into the Rocky Horror of Sótano de Agua de Carrizo, one of the most dangerous areas in the Huautla caves. Renowned for its sandy funnel cone of shifting slabs at the angle of repose, its a wonder the death slope claimed no victims in the sixty-meter deep chasm. The survey plots in the field house indicated Nita Ske was headed toward Sótano de Agua de Carrizo, an 834-meter deep cave with 76 pitches and three separate series of vertical shafts. The two climbed the fifty-meter Bombadier Shaft and linked the final survey for a conncection after six stations. De-rigging to within 150 meters of the entrance, the crew exited the cave after 12 hours.

SURFACE RECONNAISSANCE

Between cave explorations, expedition members walked the ridge karst located two hundred meters higher than the field house in search of entrances. On December 27, two teams would search different areas, each following up on past reconnaissance. Bill Steele, his son Brian, Janet Steele and Bill Storage hiked several kilometers to La Providencia and checked a lead that had been seen years before. They named the cave Cueva de No Requerdo. I suppose it meant "cave that wasn't worth remembering". However, they are all worth doing at least once! It consisted of a 15-meter drop to a slope and a parallel pit of five meters with a mysterious wind but no leads.

The same day, John Ganter and I checked leads around Nita Ka, searching the brush for obscure holes. We found round soil pipes in the residually-weathered soil which ended in small drains in subsurface crevices. Some of the soil pipes were five meters deep and channeled both surface runoff as well as small springs issuing from bedded chert layers in the limestone. Soil pipes are not great finds from a cavers point of view, but to the karst scientist it is another phenomenon worth reporting. Near the soil pipes we found two caves. One we named Nita Don Petty after our expedition benefactor. The other was called Cueva de los Ojos or Cave of the Springs. It was explored to a five-meter drop and fifty meters of passage was pushed to a tight watercrawl with soil plastered to the ceiling. There was little air flow to inspire a return trip. Nita Don Petty had strong air flow giving the explorers hopes for a new discovery. Later that day, John and I hiked above and to the east of Nita Nido and Nita Ntau to hamlets of Nuevo Progresso and Agua Munde. The area immediately impressed me as it did when I saw it in 1987. A large solution valley is sectioned by a series of dolina walls separating the valley into three sizeable dolinas and numerous small sinkholes. Several springs and large clumps of cane marked perennially wet areas in the floor of the dolinas. Our question was, are there caves in the Munde dolinas? More importantly, nine hundred meters below us is the drafty Doo Da Dome section of La Grieta.





At Agua Munde, we descended the sides of one dolina. After a brief investigation we found that at least two of the dolinas were blind. On the flanks of the second one above a karst spring, we found a small sinkhole with a cave entrance. John did the honors while I watched the equipment. He descended a steep passage for fifty meters and returned with an encouraging report of strong air flow. Could we be this lucky? Happens all the time in Huautla.

Andy Grubbs, Tina Shirk, Matt Oliphant and Nancy Pistole entered Cueva de Inclinada, as John chose to name it. The team surveyed 118 meters of traverse and 52 meters of depth before the drafty cave became too tight. Another cave only thirty meters away was found next to a trail. Fig Root Cave was explored for one hundred meters to small passage and the top of a drop. This cave also has lots of air movement.

Nita Don Petty was not virgin. Bill Steele, Lee Perry and I explored the cave to find remnant equipment of some other party. We thought that it was most likely Australian, as they were active in the area in 1978. The cave passage became more difficult to traverse. Stoopway turned into a narrow canyon leading to a sloping, eight-meter drop formed in thin bedded limestone and chert. Immediately, a second drop of nine meters led to stoopway followed by fifty meters of low, wet crawl. The crawl was punctuated by climbs and ended at a twenty-meter shaft. The pit was the single most interesting feature of the cave. Twenty meters from the bottom of the pit, the cave passage is too tight to follow. There is enough wind blowing through the constriction to warrant a hard push with Instant Cave. We left our thirteen push ropes and hardware for the next crew to resume the push and surveyed out of the cave with 171 meters of traverse. The total depth of the cave is 62 meters. Doug, Mason and Brian later attempted to push the bottom leads but left in disgust.

Tina, Andy, Lee and Mason returned to survey in Fig Root Cave. They spent nine plus hours mapping 231 meters of cave passage to a depth of 97 meters. The cave ended in large breakdown collapse chambers but probably more due to an ebb in enthusiasm. The wind in Fig Root beckons!

Two other caves were also discovered. Nita Margarito, an eighty-meter shaft, was shown to cave explorers by farmers. It was descended first by John Ganter who reported no leads to explore. Nita Dia was a nice discovery for a small cave. It is located

below a trail and consists of a 19-meter freefall shaft 25 meters in diameter. A second drop of 28 meters led to a five-meter pit and the main passage ends in a narrow canyon with little wind. Nita Dia was surveyed to a depth of 56 meters and a length of 86 meters. A surface survey was run for over a kilometer to the new area. All new discoveries were tied into the 110 kilometers of overland surveys.

CONCLUSION

In all, the expedition surveyed 1.644 kilometers of new passage. A major connection to Sótano de Agua de Carrizo increased the depth of the cave to 843 meters and increased the length from 3.74 to 4.47 kilometers. Nita Ka's depth was increased to 760 meters and the length was increased from 1502 meters to 1813 meters.

Jay Arnold returned to Huautla for his third filming adventure. He documented the surface topography, dye traces and cave entrances. This expedition concludes his effort to film a documentary of the Huautla caves and their exploration.

The 1988-89 Nita Ka Expedition was a success in that leads were finished and some new ones noted. Nothing was found worth naming a return expedition after, but good potential remains deep in the Sistema Huautla. Nita He and Nita Nashi are two caves that may eventually link-up physically.

David Doyle at the entrance crawl in Nita Ka (Jim Smith)

SPONSORS

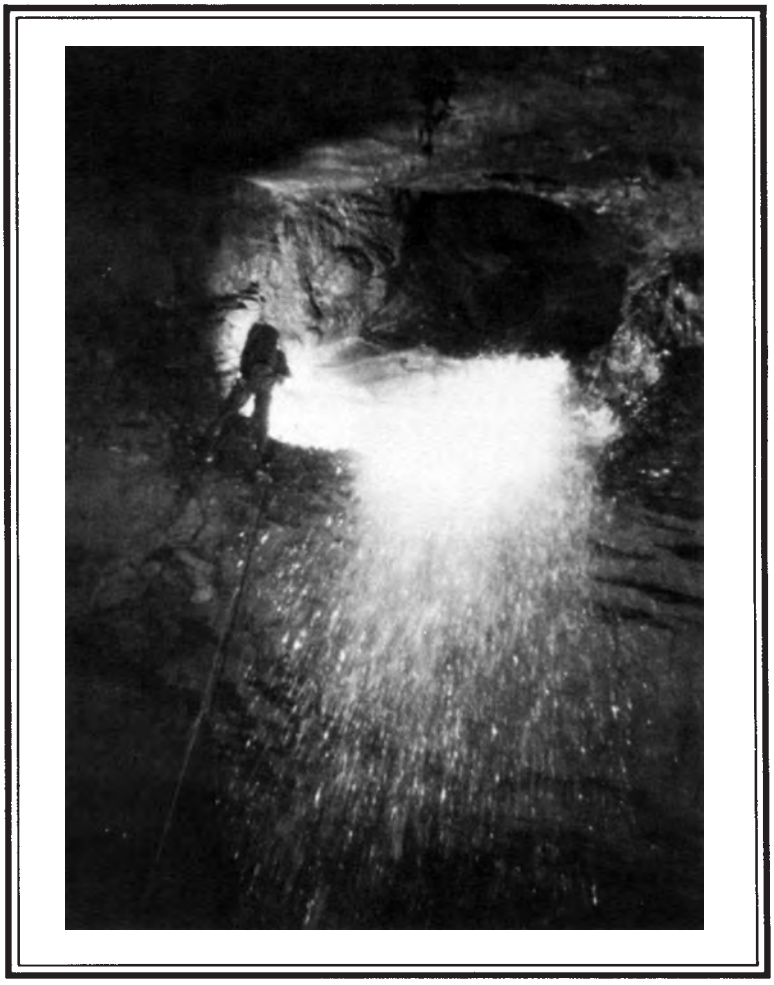
The 1988-89 Nita Ka Expedition thanks all of its sponsors for their generous financial donations and for equipment that helped to further exploration and scientific study. The Huautla Project would like to acknowledge Don Petty, Pigeon Mountain Industries, GTE Sylvania, Bob and Bob Enterprises, Lane Equipment Sales and the Dogwood City Grotto for their contributions.

NITA KA

Los objetivos de la Expedición Nita Ka 1988-89 fuéron los siguientes: continuar con la investigación hidrológica de la Cuenca Acuífera en el karst del Sistema Huautla, concluir la exploración en Nita Ka, iniciar la exploración de Cueva de la Rana, investigar el potencial para cuevas en el área de Agua Munde y ayudar en la producción de una película a color sobre las cuevas de la región de Huautla. De todo, la expedición topografió 1644 metros de pasajes nuevos. Un mayor conexión a Sótano de Agua de Carrizo aumentó la profundidad de ésta cueva a 843 metros y la longitúd de 3740 a 4470 metros. La profundidad de Nita Ka se incrementó a 760 metros y la longitúd fué aumentada de 1502 a 1813 metros. Se terminó de explorar varios pasajes y se descubriéron algúnos nuevos.

1990 CUEVA DE AGUA CARLOTA EXPEDITION

James H. Smith



Don Coons at the 25-meter deep shaft that drops into the South Borehole, Cueva de Agua Carlota (Jim Smith)

For more than twenty years, the secrets of Cueva de Agua Carlota lay hidden in the karst hills of La Providencia, Oaxaca, México, waiting to be revealed. The last entree into the cave had been by Canadian cavers in 1970. They surveyed 1,396 meters of passage before ending exploration at a sump at a depth of -152 meters. During the last 14 years, the secrets of the Sierra Mazateca's Sistema Huautla have been revealed through difficult exploration and scientific study. Major discoveries and ultimately, the key to the subsurface drainage, lay beyond the explorations of the original pioneers both Canadian and American. History is destined to repeat itself in Huautla. Because of this history, the Huautla Project's exploration goal was to re-enter Cueva de Agua Carlota for further investigation.

CUEVA DE AGUA CARLOTA

A yawning black hole below an overhanging limestone cliff marks the entrance of Cueva de Agua Carlota. The entrance is recessed in a karst hill and drains a broad, shallow sink. Flowing across the sink on top of a shale bed, is a perennial stream, lined with thirsty Carrizos (cane), which disappears into the heavily-vegetated entrance. Vines hang from the thirty-meter high, arching cave entrance to the ground. Among the vines are tree ferns and many varieties of lush tropical plants occupying a unique habitat in the shade of the recess. Two entrances are situated beneath the overhang. The higher entrance is accessed by a steep, loose, soil slope. The Jungle Entrance enters "The Great Room", passage that steeply descends over rubble to the edge of twilight, 130 meters from the entrance. This is the most scenic entrance in the caving area. The lower entrance is the stream route which follows a walking-size passage until it intersects The Great Room.

Our first trip into Cueva de Agua Carlota was through the higher entrance. Laura Campbell, Bill Storage and I entered the cave on February 6, 1990. Sounds of delight were followed by cautious warnings as footing went from precarious to out-of-control. As the slope failed, the integrity of plant holds also failed. Mud, vegetation, rocks and cavers cascaded down the steep slope and crashed into The Great Room. The sounds of excitement were drowned by the roar of cascading water.

We entered the cave with enough rope to meet the rigging requirements according to the Canadians' map. We were intrigued by the sizeable stream. One this magnitude must intersect the main Sistema Huautla hydrologic flow route, but where? Will it enter Sistema Huautla, or is it the key to the drainage between Sistema Huautla and Cueva de Peña Colorada? These questions posed intriguing exploration possibilities.

The stream rumbled around our feet and over a short cascade. The stream passage is developed along the strike of steeply-dipping shales and is slick as grease. A short distance beyond a pool, is the first drop (13

meters deep). I took several photos and we continued down the impressive eight-by-ten streamway. The stream descends steeply to the edge of a six-meter pitch. The remaining drops were purposely rigged through the water for action-packed photography and for fun. The streamway continued down slippery corridors filled with deep potholes and small cascades to the next drop, where it disappeared down a pitch of steeply-dipping shale. If this had been limestone it would probably have been free climbable. As it was, a large rooster tail of water exploded from a shale ledge. PMI rope was rigged from a large block of shale and the descent was through the middle of the fury. At the bottom, the passage narrowed to a canyon formed along steeply-inclined strata. One hundred thirty meters of scalloped streamway led to two more, sporting, wet drops separated by several deep pools. A side passage with notable air flow continued upstream and the footprints of the original explorers ended at a steep bank of paleosediment. Opportunity presented itself and we climbed up the bank into an eight-meter high, virgin passage. This led to a twenty-meter wide corridor with a thirty-meter high ceiling. One wall is shale that tilts steeply to the west. The stream was followed until the passage became too tight to traverse. At least 150 meters of virgin cave was netted on this tourist trip. Could this be an omen of good luck and a sign pointing to the Canadians lack of thoroughness? We hoped so!

We continued downstream, rappelling the last waterfall pitch. A long, wet section of beautiful, scalloped passage led to the edge of Hamilton Hall. We climbed up the huge boulder pile into an enormous chamber 240 meters long and forty meters wide with a fifty-meter high ceiling. This is truly one of the impressive chambers of the Huautla area. We decided to exit the cave early and left ropes to await our return.

DISCOVERY

February 8th, Bill, Laura and I returned to Cueva de Agua Carlota. It took less than an hour to reach Hamilton Hall despite the treacherous footing on slippery shale. We were still in tourist mode and didn't carry any ropes for exploration. We had an additional rope left over from the previous trip and used it to rig a short drop parallel to the exposed, free climbing route the Canadians used to reach the level below Hamilton Hall. We followed a sizable stream gallery and observed that the water disappeared into a swallet. Noticeable air movement sparked optimism that a way past the sump might exist. Beyond the swallet, we climbed up a mud slope into upper galleries looking for high passages that might yield the source of the air flow.

At the sump, Bill and Laura checked for a low air space passage while I looked high. Above the sumpt, I spotted a passage and free climbed up eight meters to investigate. The passage led to two drops. More importantly, there was strong airflow! The others climbed up to investigate the discovery and in unison we thanked the Canadians for leaving booty. Bill and I returned to the last drop and cut off the excess PMI rope to give us at least 15 meters to work with.

Matt Oliphant descending a shaft at -450 meters in Cueva de Agua Carlota (Jim Smith)

A natural rig allowed us to descend both drops to the other side of the sump. The passage led to a swim across a deep pool and a short drop. I thought we were going to be stopped for lack of rope, but a parallel tube offered a crawl bypass. I jumped into deep water and urged the others who were concerned about being able to get back up the short, overhung drop. They had not seen the bypass. We lost the stream at a sump at -152 meters and were following an overflow passage.

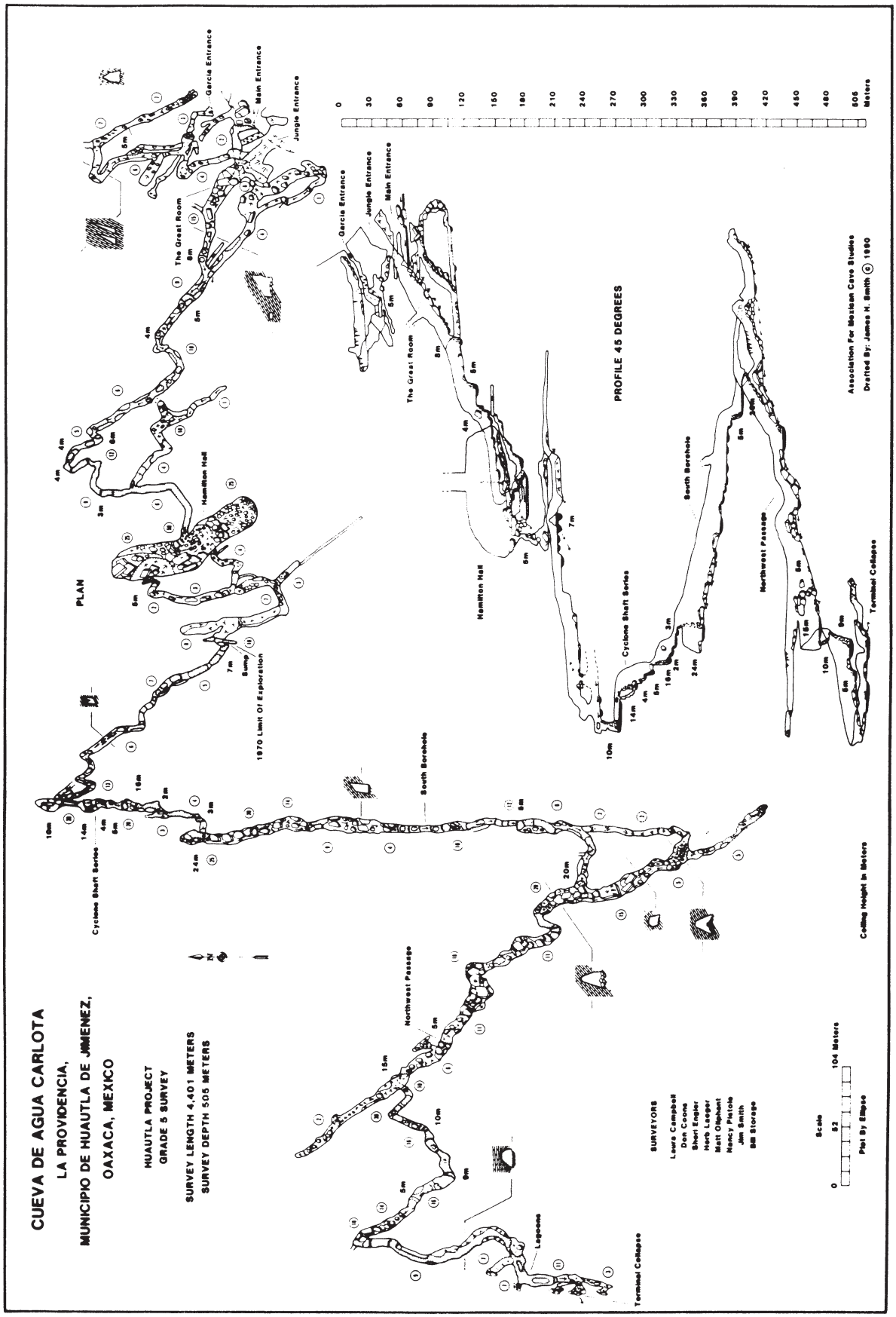
A six-meter climb led to a canyon with fluted limestone floor pendants and a second climb which accessed a multi-level canyon. Below, we could hear the stream rumble. The canyon floor opened up and we had to step across a 20-meter deep abyss to get to a spacious chamber with a breakdown floor. Laura and Bill waited while I free- climbed down twenty vertical meters over a series of ledges to the streamway. A few meters further, I was stopped by a very wet, 13-meter shaft. I returned to the crew and we surveyed to the beginning of the booty. We mapped 240 meters with less than twenty meters of vertical change. Now we had a cave to explore and it bid great promise!

B SURVEY

The next trip into Cueva de Agua Carlota took place on February 10th. This time Bill, Laura, and I carried four hundred meters of rope among the three of us. The sporting waterfall riggings of the upper cave offered difficulty with our loads and Bill dropped a 75-meter rope into a deep pool.

From the entrance, it took two hours to reach the end of survey. At the end of the A-Survey, I rigged a traverse line down the twenty-meter climb to protect this exposed, crumbly, pitch. Carrying heavy loads is awkward enough without risking your life on precarious free climbs. The volume of water in the 13-meter shaft required a drier rig point. A narrow, exposed ledge-traverse with good handholds minimized danger. On the opposite side of the pit, a short climb followed by a rappel, accessed the low, but drier, side of the pit...or so we thought. I descended first and encountered the furious blast of an explosive falls. I rappelled into deep water and had to tread water in blinding spray in order to de-rig from the rope. I swam through the curtain of water and found a continuation on the other side. Laura descended next through the furious spray screaming with delight. She suggested the wet pitch be named the Cyclone Shaft because of the turbulent nature of the waterfall.

While wading in the waist-deep water, we discovered that the stream split in two directions. We followed the main route to the edge of another wet shaft. Laura descended this first and disappeared through a torrent of water. We heard, "Off rope!" and felt the rope go slack. This drop was even wetter than the Cyclone Shaft because we were in the full force of the falls. In the waterfall, it was difficult to find the way down the rope due to ledges and the explosions from horizontal water blasts. We called this succession of drops the Cyclone Shaft Series.


CUEVA DE AGUA CARLOTA
LA PROVIDENCIA,
MUNICIPIO DE HUAUTLA DE JIMENEZ,
OAXACA, MEXICO
HUAUTLA PROJECT
GRADE 5 SURVEY
SURVEY LENGTH 4,401 METERS
SURVEY DEPTH 505 METERS
PLAN
PROFILE 45 DEGREES
Garcia Entrance
Jungle Entrance
Main Entrance
The Great Room
Hamilton Hall
1970 Limit Of Exploration
Cyclone Shaft Series
South Borehole
Northwest Passage
Terminal Collapse
Lagoons
SURVEYORS
Laura Campbell
Don Coons
Sheri Engler
Herb Laeger
Matt Oliphant
Nancy Pistole
Jim Smith
Bill Storage
Scale
Plot By Ellipse
Ceiling Height In Meters
Association For Mexican Cave Studies
Drafted By: James H. Smith © 1990

It became apparent that we were in a steeply descending, fault-controlled canyon and there would be a succession of drops. A series of wet pitches and climbs led to the discovery of a 25-meter diameter borehole. Blackness loomed downstream and we hurriedly explored several hundred meters of passage, watching it diminish in size to a narrow canyon. The passage trended due south toward the Río Santo Domingo Canyon where the Sistema Huautla Resurgence is located. In fact, the stream passage of the Southern Borehole parallels the Sistema Huautla drainage located west of this cave. The stream disappeared in breakdown and we stemmed across a canyon into a dry, upper level, but were forced back down via an awkward climb-down.

We regained the pothole-filled streamway and were stopped by a five-meter, waterfall drop. Rigging from slings off of natural projections, we descended the wet drop into a deep pool. A second waterfall entered the passage and the overall dimension increased to ten meters in diameter. We followed this for two hundred meters to a steeply-descending shale-floored passage. It became obvious that the 45-degree shale slope would require a rope.

After rigging, I rappelled first, to deal with rope hanging up on shale ledges. The passage turned westward in the down-dip direction and I could see into an arched borehole 25 meters in diameter to my right. This was very exciting and I yelled for the others to venture forth. We had been in the cave for nine hours and it was decided that this was a good place to start mapping out to the A-Survey. We started the B-Survey designation and set 54 stations in the course of seven hours. Total passage mapped on that trip was 680 meters.

BOREHOLE

The expedition complement had increased from a skeleton crew of three caves to nine total. On February 11, 1990, Don Coons and Sheri Engler arrived in Huautla. On the 13th of February, Matt Oliphant, Nancy Pistole, and Herb and Eve Laeger arrived from California, eager for caving.

On February 15, 1990, six of the nine expedition members entered Cueva de Agua Carlota to continue exploration. Underground, the caving crew reached Hamilton Hall in just under two hours. While attempting to get off rope on the six-meter drop out of Hamilton Hall, Sheri Engler injured her hip and returned to the surface with Don in accompaniment.

It took five hours to reach the B-Survey as some of our teammates had yet to acclimate to the 1500-meter elevation. We were loaded down with additional ropes, bolts and chockstones for rigging drops that awaited exploration. The team followed the 25 meter diameter, northwest-trending borebole below survey station B-1 across, and in between, large breakdown blocks along a twenty-degree slope. In the Northwest Passage, as it was called, we waded deep pools and found an obstructing breakdown pile from which we climbed up into a large chamber above the stream. Breakdown offered its own obstacles and slowed our progress. We reached the stream and then found a second collapse. Above us a small hole in a bridged ceiling collapse offered a potential bypass to the obstruction at stream level. Matt climbed up five meters on loose rock. A clatter of rock caused him to lunge for a more secure position at the top of the five-meter climb. He then rigged a rope for the rest of the team.

We traversed across the top of the breakdown to discover a deep shaft. After setting a bolt, Matt descended the drop and yelled up to us that it was about 15 meters deep. At stream level, water flowed from deep potholes through a wide canyon to a waterfall. Nancy rappelled first to find breakdown and pools in the canyon.

The next drop was a ten-meter waterfall descended first by Laura Campbell. It was more like a steep chute and is formed in the bend of the canyon. The next shaft was extremely wet and a deep pool at the bottom required a swim to reach dry land. This pit was rigged with a rebelay to avoid the waterfall and the sharp, rope-cutting lip.

The next pit was also in a bend of the canyon and offered a drop of four meters. We heard a whooping yell behind us which meant we had a visitor. It was Don who soloed into the cave after delivering Sheri to the surface. We gave him the honor of descending the four-meter pit.

The cave took on a new configuration, changing from a steeply-descending, dip-trending, vadose canyon to a phreatic, strike-oriented tube perched on a shale bed. We followed this corridor for 360 meters through increasingly muddy passage and deep lagoons. It looked very sumpy and the airflow was minimal. At the end of a deep pool, a small opening led to a breakdown terminus. The pile consisted of small, tightly-packed boulders which we perused for obvious holes with no luck. We would need to return for a closer look at a later date. We surveyed out of the cave, noting several side leads for the return trip. A total of 54 stations were set, netting 812 meters of traverse.

Laura Campbell in stream passage before Hamilton Hall - Cueva de Agua Carlota (Jim Smith)

OVERLAND SURVEY AND A NEW, HIGHER ENTRANCE

One of the most important aspects of the Huautla Project's cave survey data base is the complete integration of all cave entrances by overland survey. Cueva de Agua Carlota was surveyed to the base datum point at San Agustín. In all, Don, Sheri and Nancy surveyed 59 stations for a total distance of 2365 meters.

February 17th, Don, Herb, Bill and Matt were shown a higher entrance to Cueva de Agua Carlota by Cerco Martina Garcia and Jovita Martina whose family owns the dolina and all of the cave entrances. Cueva de Garcia is 32 meters higher than the main entrance. The crew connected to the main entrance of Cueva de Agua Carlota, increasing the overall depth. Of interest, is a chamber filled with pleistocene (?) deer bones with cave coral growing on the teeth. The explorers left several leads for the next survey trip.

RESURVEY

The Huautla Project's survey files did not include the Canadians' survey notes for

Cueva de Agua Carlota. On February 18th, two survey crews entered Cueva de Agua Carlota for the purpose of resurveying the passage explored by the Canadians.

Don, Sheri and Herb started at the A-Survey and mapped from the sump area to Hamilton Hall, and up the mainstream passage. They surveyed two drops and stopped at the first side passage discovered during the expedition. Matt and Nancy surveyed from the entrance into the cave and tied into the other crew's last survey station. The total effort yielded 1204 meters of resurvey.

CUEVA DE GARCIA

February 19th, Don and I began the survey of Cueva de García. At the entrance, I turned around to see Joveta, her brother and several friends who had followed us to the entrance, curious of our intentions. Don and I surveyed down the steeply-descending passage with the Mazatecs on our heels. Don loaned one of them his backup light and eventually the rugged passage filtered them out. We surveyed through a gallery of meter-long stalagmites to a sporting climb-down on slippery flowstone which sloped down eight meters to a passage junction. We followed this route, passing through a chamber with a sizable bat colony. Climbing to a lower level we were able to see the twilight of The Great Room in the Jungle Entrance of Cueva de Agua Carlota.

After linking the survey, we backtracked to the junction and carried rope and vertical gear to an undescended drop Don had discovered on the scoop trip. From the top of the five-meter drop we could see passage trending in two directions. We rappelled the popcorn-encrusted pit into spacious passage.

Don climbed down a slope while I checked for a couple hundred meters in the other direction. We began up the route I chose first and surveyed 250 meters to a terminal collapse chamber through comfortable walking passage . All total, we had surveyed 688 meters of passage in three hours.

THE BOTTOM OF CARLOTA

February 20th, Bill, Herb, Laura, Nancy, Don, Matt and I entered Cueva de Agua Carlota to push the bottom cave and survey side passages beyond the 1970 terminus of the cave. Our best lead was a borehole passage above the 15-meter drop that Matt had bolted. I moved a few rocks and found a bypass. We followed the gallery which gradually diminished in size until it ended in small breakdown after 124 meters. It trended northwest, away from the main stream canyon.

We then turned our attention to the bottom of the cave in an effort to bypass the breakdown. Every passage that intersected the north-south trend ended in breakdown. Bill discovered an inhumanly-small, vertical tube rising five, or more, meters that moved air. It was the only unobstructed passage we found. However, it would take very extensive mining to push it. Attempts to find a way through the breakdown at stream level were also futile.

A large, side passage with an infeeding stream was surveyed upstream by Don, Laura, Matt and I. We entered a breakdown chamber and skirted its treacherous slope of talus to a dry crawl-stoopway. It had a lot of air and we surveyed 330 meters up the passage until we connected atop the twenty-meter, wet, shale drop, closing a loop. We backtracked to the chamber where we lost the stream. A six-meter climb-down gained access to the stream. We followed a nicely-sculpted stream canyon for 95 meters until it ended in collapse. We exited the cave with 540 meters of surveyed passage.

FINAL SURVEY AND DE-RIG TRIP

Bill, Laura and I returned to Cueva de Agua Carlota on February 22 to finish de-rigging, photographing and to mop up some cave survey in the entrance area.

Below the first drop in the cave, we mapped a side passage for 155 meters. We were unable to finish the survey of an additional hundred meters of crawls and multi-level breakdown. In this portion of the cave, we found human skulls that had been flattened during early growth. This was a practice of Pre-Columbian indians, who used this disfigurement to distinguish aristocracy. A few pottery shards were found along with many scattered bones. The total survey of Cueva de Agua Carlota reached 4.4 kilometers and a depth of 504 meters.

ACKNOWLEDGEMENTS

The 1990 Cueva de Agua Carlota Expedition thanks the following sponsors for donations and grants which aided cave exploration and scientific study conducted during the expedition. The Explorers Club for awarding Flag #24, Nalgene Company, Pigeon Mountain Industries and Dr. Nicholas C. Crawford (thesis advisor) of the Center For Cave And Karst Studies, Western Kentucky University, Bowling Green, Kentucky.

CUEVA DE AGUA CARLOTA

En febrero de 1990, los espeleólogos del Proyecto Huautla visitaron la Cueva de Agua Carlota, una cueva de 1396 metros de longitúd cerca del Sistema Huautla. Una escalada de 8 metros en el fondo de la cueva sobrepasó el sifón terminal conduciendo a un pasaje amplio donde el arroyo se pierde entre los bloques de derrumbe. Desde ahí el Pasaje Noroeste conduce entre bloques y cursos de agua, eventualmente se hace horizontal y termina en una constricción sin aire. Una nueva entrada llamada Cueva de García fé encontrada y conectada a Agua Carlota, aumentando 32 metros de profundidad a la cueva. La topografía de Cueva de Agua Carlota ahora permaneca a 4401 metros de longitúd y 504 metros de profundidad.

HYDROGEOLOGY OF THE SIERRA JUAREZ OAXACA, MEXICO

James H. Smith

INTRODUCTION

Since 1988, karst hydrological and geological field studies have been conducted in the Western Hemisphere's most complex vertical drainage systems, located in the Sierra Juárez Geologic Subprovince in the state of Oaxaca, México. Twenty-five years of exploration and survey in the Sistema Huautla Karst Groundwater Basin have revealed a labyrinth of caves which are composed of more than one hundred kilometers of active conduits and shafts. Fifty-three kilometers of physically-connected shafts and conduits are known as the Sistema Huautla. The remaining forty-seven kilometers are believed to be hydrologically related and exist in the same karst groundwater basin.

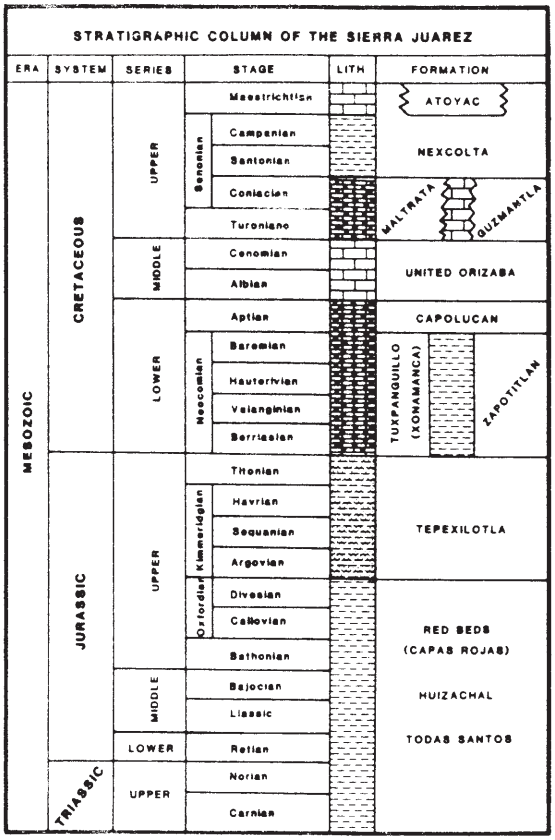
These field studies and ensuing research have involved defining the drainage basin, finding the resurgences for two karst groundwater basins, dye tracing of unconnected deep caves into Sistema Huautla, relating structural controls to groundwater flow, defining the stratigraphic horizons in which caves are found, and developing a regional model for speleogenesis. The main research emphasis has been on Sistema Huautla and using nearby Sistema Cuicateco as a comparison.

REGIONAL GEOLOGY

The Sierra Juárez Geologic Subprovince comprises the front range of the Sierra Madre Oriental del Sur from Orizaba to the Isthumus of Tehuantepec. The study areas include the Sierra Mazateca, location of the Sistema Huautla Karst Groundwater Basin, and the Sierra Juárez, situated south of the Rio Santo Domingo, which holds the Sistema Cuicateco Karst Groundwater Basin (Figure 1).

FIGURE 1

Stratigraphically, a continental cortex of Grenville age, Precambrian granulites and metamorphics (Fries et al., 1962) are exposed in the southern area of the subprovince, and are unconformably overlain by Triassic and Jurassic red beds and Cretaceous carbonates (Viniegra, 1965) of the Cordoba Platform (Gonzalez-Alvardo, 1976). Lower Mesozoic units are believed to have been deposited in the Huayacocotla aulacogen, a failed rift which formed at the initial opening of the Gulf of México during the Lower Ju-



Compiled from Viniegra, 1966 and Ramos, 1978.

FIGURE 2

rassic (Effing, 1980). The Cordoba Platform consists of thick sequences of carbonates containing rocks that exhibit reef, forereef and back-reef facies (Figure 2). On the west side of the Sierra Juárez Subprovince are Cretaceous metamorphics of the Cuicateco Complex. These consist of schists, gneiss, serpentines and metavolcanics (Charleston, 1980). The youngest rocks areTertiary in age and are found south of the Río Santo Domingo overlying Cretaceous rocks and in the Tertiary-age Veracruz Basin to the east.

STRUCTURAL GEOLOGY

The Sierra Juarez fold belt was formed in the Early Tertiary during the Laramide Orogeny. Subduction of the Pacific Plate under continental North America resulted in back-arc uplift. This caused gravity-sliding of strata overlying the Oaxaca Peninsula toward the northeast (Carfantan, 1981). The result is a thin-skinned style, overthrust fold belt with many minor imbrications. This complexly-folded region is a large, thrust sheet and the overall shortening and net movement of the range have not been determined. The Sierra Mazateca contains several major faults (Viniegra, 1966). The Cerro Rabón Fault is a sole fault that extends from the eastern portion of the range to the west 40 kilometers, where it is buried under allochthonous metamorphics of the Cuicateco Complex. It extends north for forty kilometers to Zongolica. The decollement strata are believed to be Jurassic flysch deposits.

The Huautla Fault, located on the west side of the Sistema Huautla Karst Groundwater Basin, is a high-angle, reverse fault in which Jurassic flysch and Lower Cretaceous limestones of the Tepextotla and Tuxpanguillo Formations (Echanove, 1963) have been thrusted over Upper Cretaceous limestones of the Maltrata Formation (Viniegra, 1965). This fault is not exposed south of the Río Santo Domingo, but has been traced to the north to Santa Rosa south of the volcanic peak of Orizaba (Viniegra, 1966). Beneath the Huautla Fault is an overturned syncline that extends north-to-south from west of Agua de Cerro to Río Santo Domingo.

The Cuicateco Overthrust consists of lower Cretaceous metamorphic and metavolcanic rocks of the Cuicatlan Complex. It extends on a north-south trend along the western edge of the Sierra Juárez (Charleston, 1980). This fault lies adjacent to the Sistema Cuicateco Karst Groundwater Basin.

The Huautla and Cuicateco karst groundwater basins are defined by their association with plunging, synclinal folds. The internal structure of Sistema Huautla Karst Groundwater basin differs from that of Sistema Cuicateco's in degree of folding.

Sistema Huautla Cave System is formed in an overturned syncline, bounded to the west and east by high-angle, reverse faults. The Huautla outcrop belt consists of Lower Cretaceous, thin-bedded rocks of the Tuxpanguillo-Capolucan Formation and Upper Cretaceous rocks of the Maltrata Formation. The core of the syncline is recrystallized, Middle Cretaceous limestones of the United Orizaba Formation of the Escamala Series (Viniegra, 1965). This structural style and degree of metamorphism has also been found to the north in folded strata adjacent to the Huautla Fault. The Sistema Cuicateco Karst Groundwater basin is also formed within a syncline which consists of less severley-folded, massive-bedded dolostones that are, most likely, part of the United Orizaba Formation. The diminished degree of folding may be attributed to changes in tangential-compressive forces owing to a hypothesized tear fault where the present day Río Santo Domingo flows (Viniegra, 1967) and to a thinning of decollement strata south of the river. The plunge of each fold is influenced by differential movements during Plio-Quaternary uplift and block faulting associated with the formation of the 8000-meter deep, Tertiary Veracruz Basin. In addition to basin development, construction of the Neovolcanic Plateau provides another mechanism affecting the rise of the Sierra Juárez. Uplift of the region continues.

KARST HYDROLOGY

Geologic field mapping has determined that the karst groundwater basins of Sistema Huautla and Cuicateco are narrow and elongate, corresponding to the configuration of the folds. Drainage within the aquifer to discharge point is controlled by the plunge of the fold.

Base level is controlled by structure and lithology. In the Sistema Huautla Karst Groundwater Basin, the structural control on base level is determined by the degree of plunge of the fold on top of impervious shales. At the Sistema Huautla Resurgence, the base level is controlled by the water table at river level and there is no evidence of an impervious shale.

Drainage patterns within the aquifer are determined by the strike and dip of strata, and orientation along faults. Sistema Huautla drainage has formed along the eastern limb of overturned strata to the west, and flows north-south along the strike and down the plunge to the south (Figure 3).

Sistema Cuicateco has formed on the western limb of a syncline which dips to the east. Conduit flow is to the east until it reaches the trough of the syncline and then it flows along a NW-SE strike and follows the plunge to the north (Figure 4).

HYDROLOGIC FIELD RESEARCH

To study groundwater flow direction, qualitative dye tracing was performed in the Sistema Huautla Karst Groundwater Basin in 1988. Stone (1984) located springs

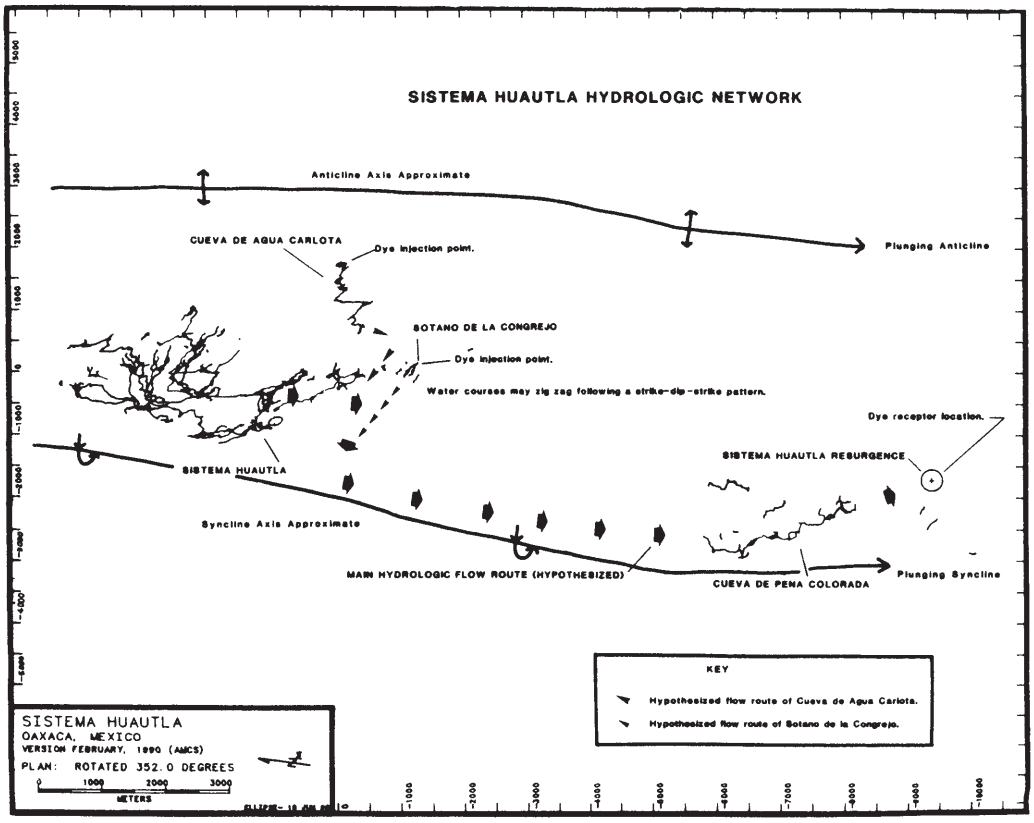


FIGURE 3

on both sides of the Río Santo Domingo. For Sistema Huautla, a single perennial, outflow on the north wall of the Río Santo Domingo (Sistema Huautla Resurgence) was established by a dye trace . The dendritic, vertical drainage system of Sistema Huautla was proven to have a vertical relief of 1770 meters. The linear drainage of the karst groundwater basin is approximatly 17 kilometers.

In 1990, a dye trace was conducted at Sistema Cuicateco's Cueva Cheve entrance to the Nacimiento de Río Frío de Santa Ana. The input is located at 2720 meters elevation and the resurgence is a single spring at three hundred meters. The 2420-meter-deep dye trace is currently the world's deepest. The proven vertical hydrologic extent is 2580 meters. The elongate drainage basin has a minimum linear drainage of 21 kilometers along the syncline.

Additional dye tracing in 1988 connected the vertical caves Nita He and Nita Nashi into confluences within Sistema Huautla a thousand meters below the dye injection point. Surface swallet input was also traced to a major confluence (Li Nita Waterfall Room) seven hundred meters below the injection point. Dye tracing in the largest swallet, Río Iglesia, proved that it does not flow into stream confluences within Sistema Huautla. Instead, the Río Iglesia flows into the hypothesized main hydrologic route which discharges from Sistema Huautla.

Cueva de Peña Colorada, a wet weather overflow, is hypothesized to have been the original spring during the formation of Sistema Huautla. As the mountain range uplifted, the hydrologic flow route formed conduits at a lower stratigraphic level and, consequently, a new spring. A dye trace proved that Peña Colorada entrance and Sump One are isolated from the main hydrologic route and therefore perched.

During 1990, the stream caves Cueva de Congrueo and Cueva de Agua Carlota were dye traced to the Sistema Huautla Resurgence. The dye from Carlota took almost a month to exit. It was observed in Cueva de Agua Carlota that dye was impounded by potholes and slowly released into cave streams. It is further hypothesized that dye was also impounded in deep sumps in phreatic loops under low flow conditions at a base level with low gradient (Figure 3).

The dye from Sistema Cuicateco exited after eight days, indicating a steady gradient along the base level with, perhaps, brief impoundments.

SPELEOGENESIS

In Sistema Cuicateco and Sistema Huautla Karst Groundwater Basins, surficial features indicate a fluvial overprinting related to the ancient Pápalo Drainge Basin. Helu, et al., (1977) described a thick sequence of Miocene conglomerates consisting of Jurassic clastics, Cretaceous limestones, cherts and metamorphic rocks derived from the Sierra Juárez. These sediments were transported into the Veracruz Basin by fluvial currents from an ancient Pápalo Drainage Basin. The Veracruz basin contains 5000 to 8000 meters of such sediments.

Remnants of Jurassic flysch and Cretaceous metamorphics overlie carbonates in the Sierra Mazateca and Sierra Juárez indicating overthrusting. While the extent of this overthrusting is not clear, it is hypothesized that much of the western Sierras were once covered by such allochthonous clastics and metamorphics. This thick sequence of noncarbonate material provided a protective caprock for the underlying limestones.

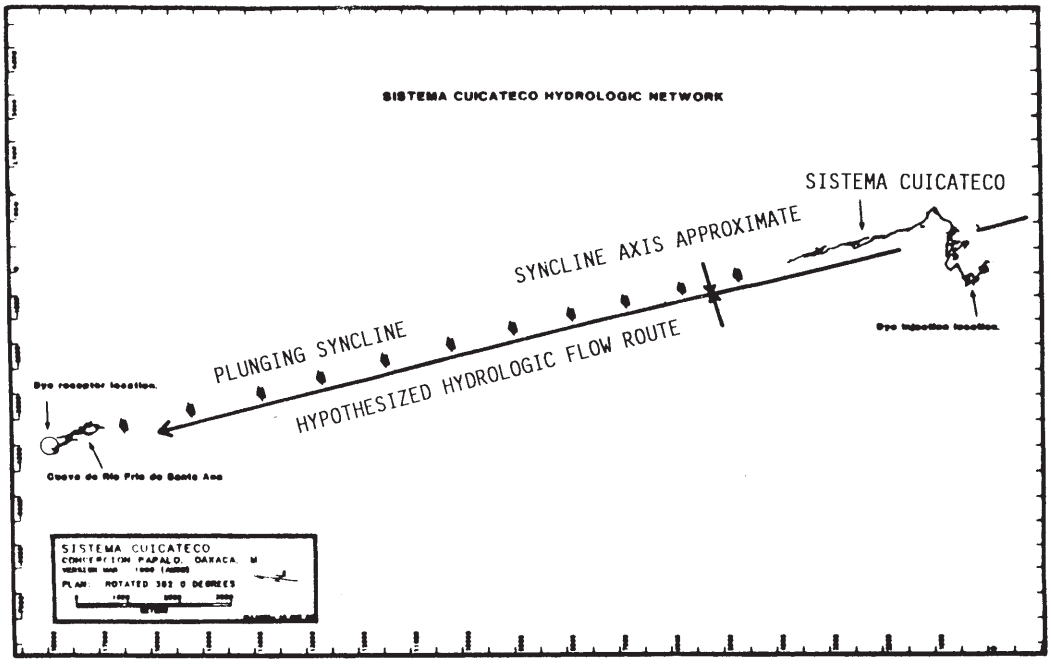


FIGURE 4

During the Laramide Orogeny and, more recently, during the Plio-Quaternary interval, constant uplift and erosion breached the caprock and exposed the underlying limestone. Surface streams began to invade the limestone forming a karst topography and cutting off the surficial tributary transport system into the ancient Pápalo Drainage Basin.

In the Huautla karst, cave entrances with extensive vadose conduit development are found on narrow ridges. This indicates that a much larger drainage basin was required to develop these conduits. Allogenic recharge waters are believed to have flowed from a clastic caprock aquifer that is no longer present, to paleoswallets that are survived by steeply-descending conduits in narrow ridgetops. Active, allogenic recharge occurs from allochthonous clastics southwest of the ridgetop caves along the San Agustín, Río Iglesia and San Miguel dolinas. The presence of these ridgetop conduits indicates that the conduits are older than the topography.

The phreatic morphology of passages in Sistema Cuicateco and Sistema Huautla near their present base levels, indicate that at the time the caprock was breached, the potentiometric surface was about one hundred meters higher than the active springs along the Río Santo Domingo. This surface curved up towards the recharge area following the axis of the syncline updip, implying that there was considerable relief between the breached carbonates and the true potentiometric surface. If uplift rates were approximatley one millimeter per year, the difference between the highest level of phreatic development and present development would require only about 100,000 years to form.

Prior to the development of a through-flow system, the anisotropic framework (cave-forming rock) was saturated and initially formed a phreatic system. As a juvenile, through-flow system developed, turbulent flow and corrosive waters enlarged existing fractures. Because the fractures were saturated and unable to handle the input of invading surface streams, the system remained phreatic.

Continued development of the through-flow system drained the saturated fractures. This resulted in the development of vadose shafts from allogenic waters and, ultimately, formed the vertical extent of the drainage system. Simultaneously, a true, phreatic system was developed and enlarged proximate to the potentiometric surface. This model is represented by both vadose and phreatic elements forming a multiphase cave system. The principal style of cavern formation is after the Draw Down Vadose Cave Model of Ford and Ewers (1978).

Within one hundred meters above the current base level, phreatic lift tubes are found in Cueva de Peña Colorada, located above the Sistema Huautla Resurgence. The same phenomenon occurs in the Black Borehole of Sistema Cuicateco. In both cases, development of shafts and steeply-inclined passages in a down-dip direction indicate vadose development while phreatic development occurs along strike down the plunge of the syncline, and proximate to the potentiometric surface. (Figure 4)

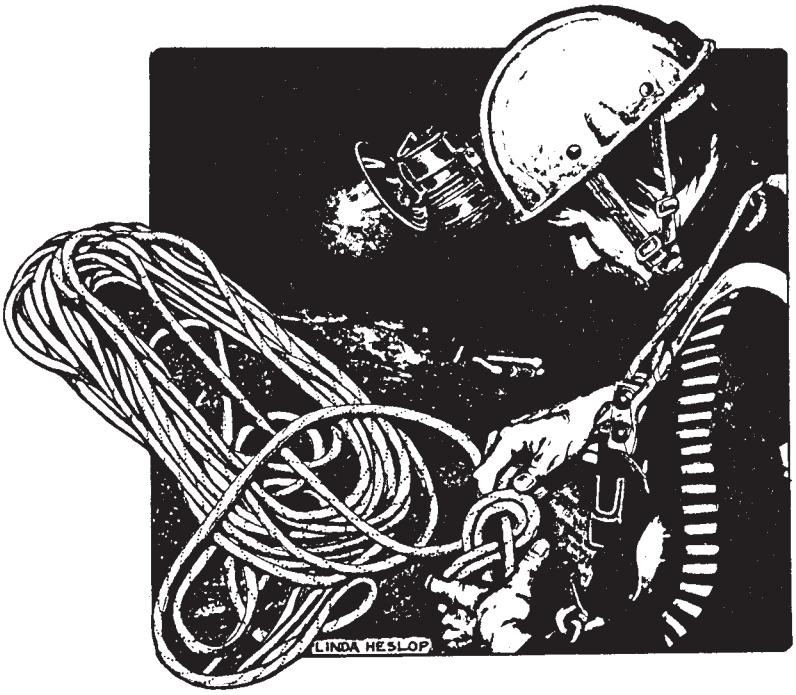
CONCLUSIONS

Research and the formulation of ideas concerning the geology, hydrology and speleogenesis of these vertical drainage systems are continuing. Based on the research to this point, the following conclusions are presented: Sistema Huautla and Sistema Cuicateco Karst Groundwater Basins are formed in, and controlled by elongate synclines; springs for the karst groundwater basins occur down the plunge of the synclines; hydrologic flow patterns are controlled by the structural geology; Sistema Huautla's Karst Groundwater Basin is formed stratigraphically within the Tuxpanguillo, United Orizaba and Maltrata Formations; Sistema Cuicateco's karst groundwater basin is formed, in part, within the United Orizaba Formation; and, both karst groundwater basins have single perennial springs as discharge points.

It is believed that the proposed speleogenetic mode, Draw Down Vadose Cave Model (Ford and Ewers, 1978), applies to the following situations: areas where thick sequences of allochthonous noncarbonates cover folded limestones and later were breached by fluvial systems during tectonic uplift; areas with sufficient vertical relief to form multiphase conduit development, i.e., extensive vertical relief between the potentiometric surface and input points to form vadose shaft drainage and simultaneous base

level phreatic development; areas where allogenic waters from a clastic or metamorphic caprock flow into a vadose cave system; and, areas with an anisotropic framework developed in a folded syncline. This may be applicable as a regional model for similar hydrogeologic conditions.

This research will culminate in a Master's thesis advised by Dr. Nicholas C. Crawford, director of the Center for Cave and Karst Studies, Western Kentucky University.



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HIDROGEOLOGIA DE LA SIERRA JUAREZ, OAXACA

Desde 1988, se han estado realizando estudios hidrológicos y geológicos en el sistema de drenaje vertical más complejo conocido en el hemisfério occidental, localizado en la subprovincia geológica de la Sierra Juárez en el estado de Oaxaca. Veintecinco años de exploración y topografía en la cuenca acuífera de Huautla han revelado un laberinto de cuevas, las cuales estan formadas por más de 100 kilómetros de conductos activos y tiros. Cincuenta y tres kilómetros de pozos y conductos físicamente conectados son conocidos como Sistema Huautla. Los restantes 47 kilómetros se considera están hidrologicamente relacionados y existen en la misma cuenca acuífera. El principal enfasis de la investigación ha sido en Sistema Huautla, empleando el cercano Sistema Cuicateco como un comparación.

PROYECTO PAPALO 1989

Carol Vesely

Waterfall drop in the East Gorge, Cueva Cheve (Bill Stone)

A series of underground camps at -850 meters enabled cavers to push Sistema Cuicateco to 16.3 kilometers in length with a vertical extent of 1243 meters. This makes it the second deepest cave in México and the eighth deepest cave in the world. In addition, 890-meter-deep Osto de Puente Natural was connected into the system adding a higher entrance.

INTRODUCTION

The Pápalo area is located in the Sierra Juárez in the state of Oaxaca, just south of and across the Río Santo Domingo from the famous Huautla caving area. There had been a total of four trips to the area prior to the 1989 Expedition. Sistema Cuicateco, the main cave in the Pápalo area, had been surveyed to 9.4 kilometers long and 1038 meters deep, the fourth deepest cave in Mexico and the twenty-sixth deepest in the world.

A ROUGH START

In mid-February, after three days and nights of driving from California, Bill Farr and I arrived in Oaxaca ahead of the rest of the team, to begin making preparations. We were surprised when the Presidente of Concepcion Pápalo denied us permission to remain in the area without approval from a "higher authority." In the past we had never had any problems. But as the size of our expeditions grew, the local people found it difficult to believe that we were there merely for fun and not to steal gold from the caves. We knew that Don Coons, who speaks better Spanish than either of us, had been backpacking in the area for two weeks. With the Presidente's permission, we located Don who was waiting for us at Llano Cheve.

Don and I headed to Oaxaca City to try to obtain permission. For three days we went from office to office explaining our plight. We tried archaeology, tourism, geology, geography, etc., and the reply was always the same: a puzzled look and ambiguous directions to yet another office. Then after three days, we finally got lucky. We met the Head of the Bureau of Mines, who spoke excellent English and understood our situation. He graciously provided us with a letter of permission and even sent one of his assistants along with us to talk directly with the Presidente. Thus, everything was all settled by the time the main group began to

Flowstone Canopy at -400 meters in Osto de Puente Natural (Andy Grubbs)

arrive at the end of February. Trip participants were Bob Benedict, Jeb Blakely, Peter Bosted, Don Coons, Bill Farr, Andy Grubbs, Louise Hose, Tim Jones, Steve Knutson, Mark Minton, Matt Oliphant, Nancy Pistole, Peter Quick, Bitsy Ray, John Schweyen, Ron Simmons, Pam and Jim Smith, Bill and Pat Stone, Carol Vesely, Todd Warren (all from the U.S.) and Rolf Adams (Australia).

To establish good relations with the locals, we arranged to give a slide show on the cave at the Papalo town square. Bill Stone did such a good job of narrating that the townsfolk insisted on a repeat performance for latecomers. In addition, we handed out fifty copies of a description of the project, written in Spanish, to the people attending.

Finally, it was time to begin exploration. In order to push the deepest part of the system, it was necessary to set an underground camp since trips from the surface were exceeding thirty hours. The beginning of Cueva Cheve (the main part of Sistema Cuicateco) consists of a series of dry pitches interspersed with large, breakdown-floored, borehole passage. At -450 meters is the longest drop in Cheve. Saknussemms Well, a magnificent, flowstone-lined, offset pit. Shortly after this, it is impossible to stay out of the water. The stream plunges down the Salmon Ladders and through the Turbines. The latter is a series of canyon passages with rapids and increasingly larger waterfalls. Beyond the Turbines, the cave nearly levels out in the walking passages of the Sumplands. After about a kilometer, two drops lead to the East Gorge, a large, sporadically decorated stream passage. An eight-meter rope climb out of the East Gorge leads to a flat, sandy area that was chosen as the site for Camp II. To reach camp it is necessary to traverse 3.7 kilometers of cave and descend to -830 meters in 33 rope drops.

After Don, Jim, Rolf and Bill Farr rigged the first thirty drops through the Turbines, the first camp crew of Peter Bosted, Don, Bill Farr, Steve, Peter Quick, Jim and I packed our duffles and headed in. Bill Stone lent support by carrying a load of group gear to the base of the Fuel Injector at the end of the Turbines. Fortunately, we didn't have to go through the Fuel Injector (the wettest, most radical drop in the cave) this year thanks to Don's finding a high bypass.

Along the way, disaster struck at eight-hundred-meters depth when Steve took a three-meter, head-over-heels fall with his duffle, injuring a couple of ribs. Steve's condition was stabilized and Jim bandaged his ribs. Bill Farr and I bivouacked with Steve near the accident site the first night. The following morning, Jim headed for the surface to alert the others. Meanwhile, the rest of the Camp II team helped move Steve and his gear to a second bivy site just above the Fuel Injector Drop. Despite the pain, Steve was able to move himself with assistance. Everyone was thankful that stretcher hauling was not necessary. Peter Bosted stayed with Steve the second night and the next morning the surface crew arrived. Steve made it through the wet drops of the Turbines and up 120-meter Saknussemms Well the next day. That night he stayed in Camp I at minus four hundred meters in the Giant's Staircase. Here, Dr. Noel Sloan, who had been summoned from the U.S., was able to reach Steve and assess his condition. The following day, everyone made it safely to the surface. Although he was unable to do anymore caving in Cuicateco, Steve recovered sufficiently to continue with his plan to lead a return expedition to Jul Mas Nim in Guatemala later in March.

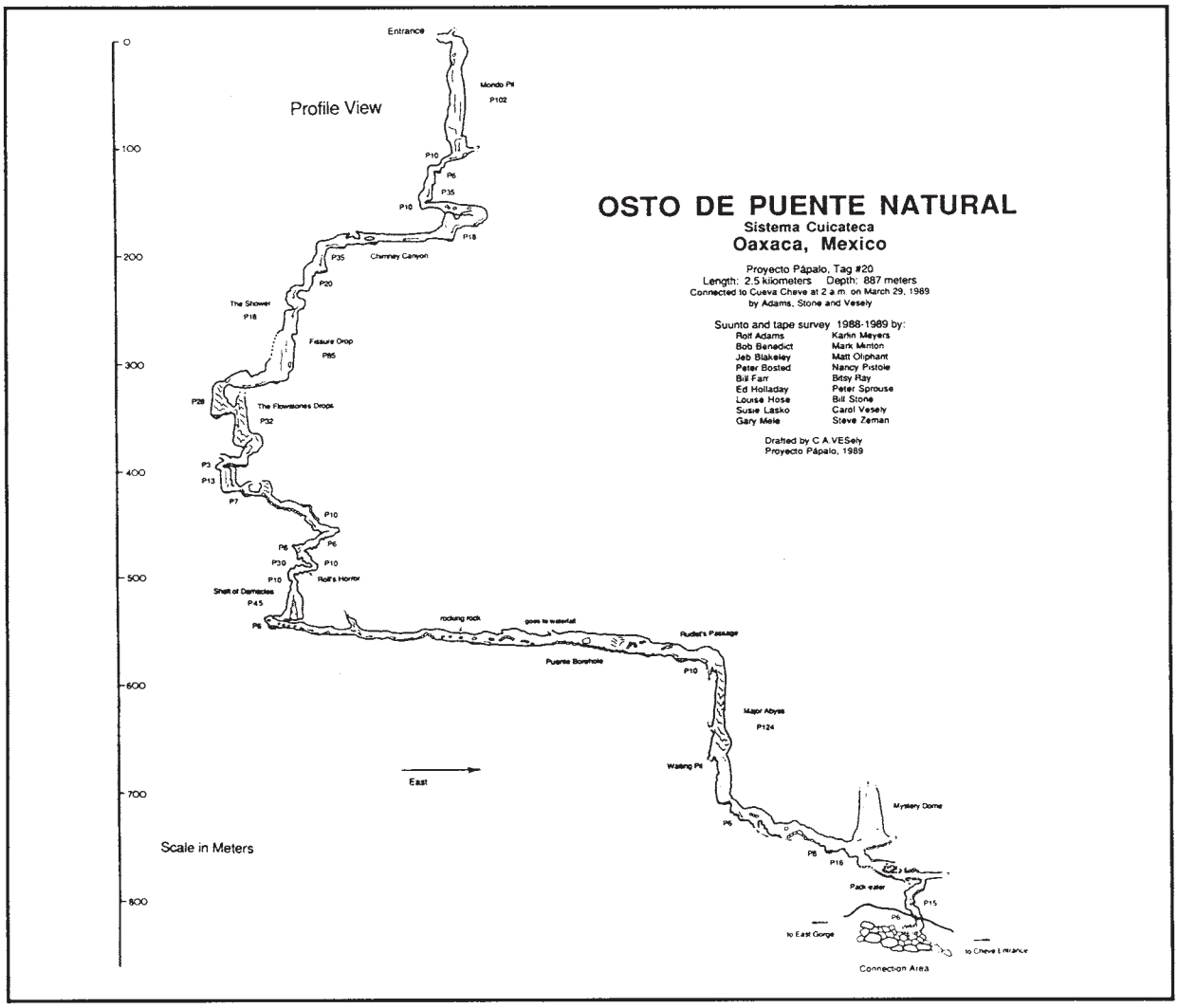
PUSHING DEEP

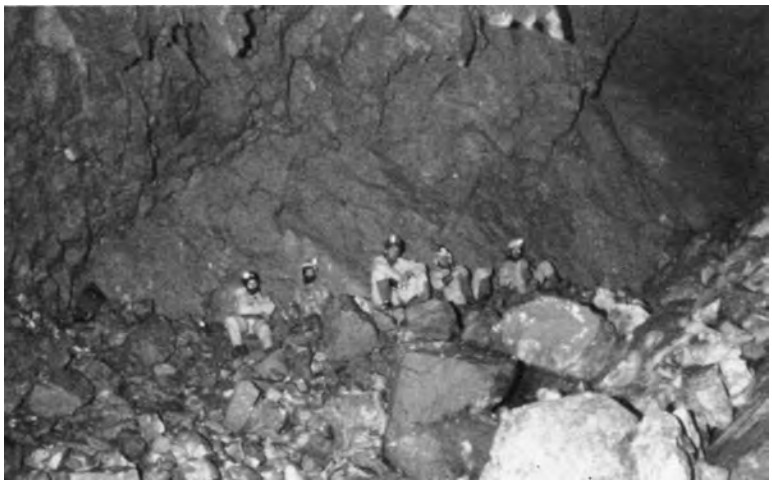
Back at Camp II after this unfortunate start, Don, Bill, Peter Quick and I surveyed some well-decorated side leads near camp. Two of the leads simply looped back into the main passage and the other two ended after less than a hundred meters. Cheve has very few major side passages.

The next day we set out for last year's endurance limit in the Swim Gym, located over a kilometer and seven drops from camp. To get there we scrambled over the massive, breakdown blocks in the Low Rider Turnpike, then gingerly rappelled past the loose chockstone in the Widowmaker Drop and landed in the wet and sporting Swim Gym. The Swim Gym is appropriately named, for one must climb down the cascades and cling to the walls to avoid being swept away by the raging rapids.

Since none of us had been on the final push trip of the previous expedition, we were not certain where the last survey had stopped. At one point we climbed out of the water and began following a canyon passage filled with huge breakdown blocks. We soon realized that we were in virgin territory. We pushed the canyon until there was no longer an obvious route through the breakdown and then surveyed out. We found a tie-in station where we had first climbed out of the water. From this station it was possible to follow the water down a narrow rift. We chimneyed down to a wide, low, walking passage floored with a series of pools. This route eventually led to a small sump. We were pleased that our survey to the sump had added 42 meters of depth to the cave.

The system had seven sumps, but in each case there is a dry, upper-level bypass. Backtracking to find where the air had gone,



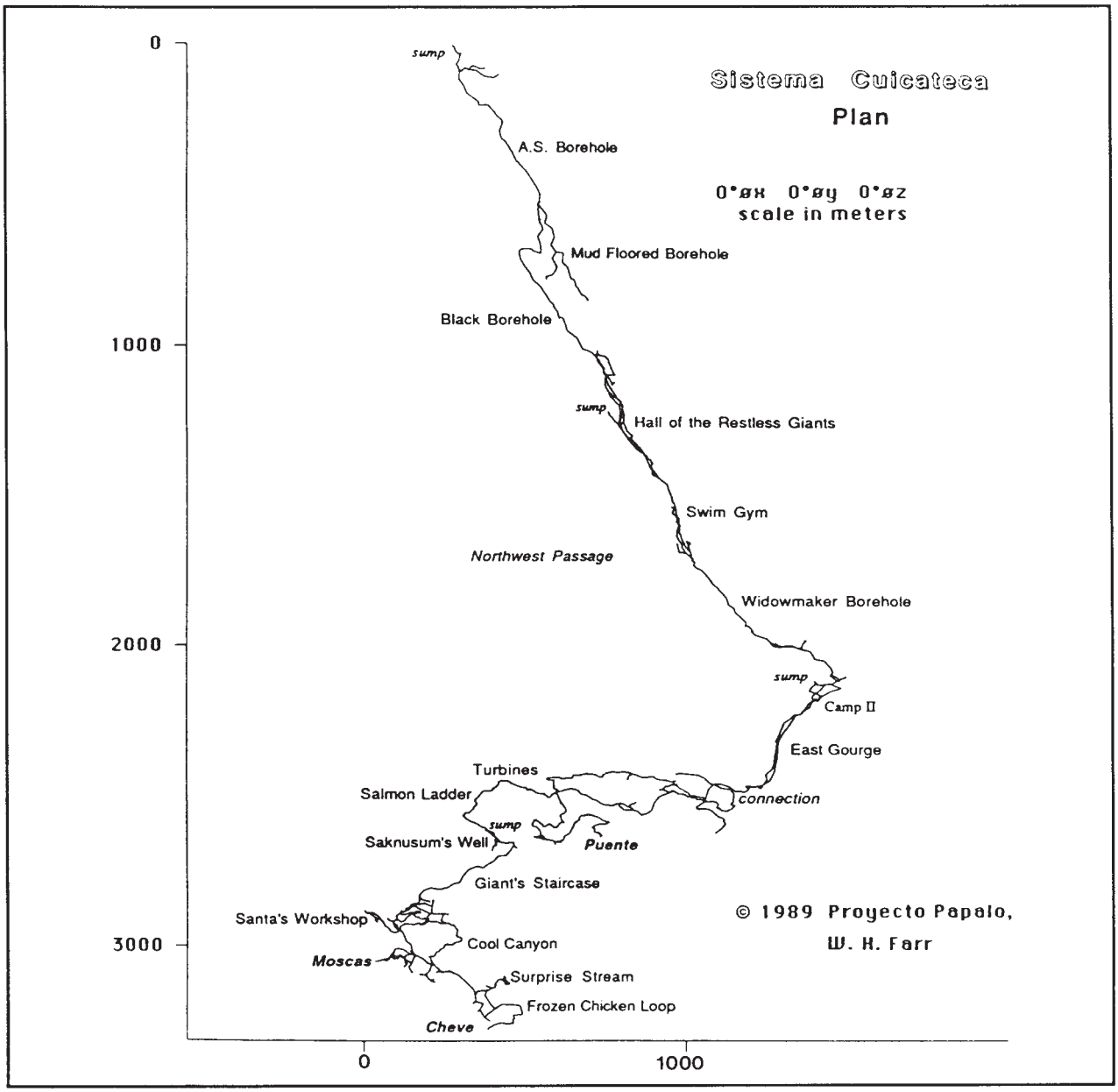


Crew at the terminal breakdown in the A.S. Borehole, Cueva Cheve (Bill Stone)

we began by pushing over the top of the Widowmaker Drop on the next trip. We located a large room and canyon passage directly over the Swim Gym. On the final trip of the camp, a more direct route out of the Swim Gym was discovered leading to The Hall of the Restless Giants, a large borehole filled with massive, cracked formations. The passage averaged 15 meters wide and high and continued for over half a kilometer. At the end was a terminal flowstone choke, but there were good leads left in the breakdown floor at an intermediate point. Team one exited the cave after nine days underground, adding 1.4 kilometers of survey to the length and 42 meters to the depth of the system.

OSTO DE PUENTE NATURAL

While part of the group was at the underground camp, others on the surface contin-

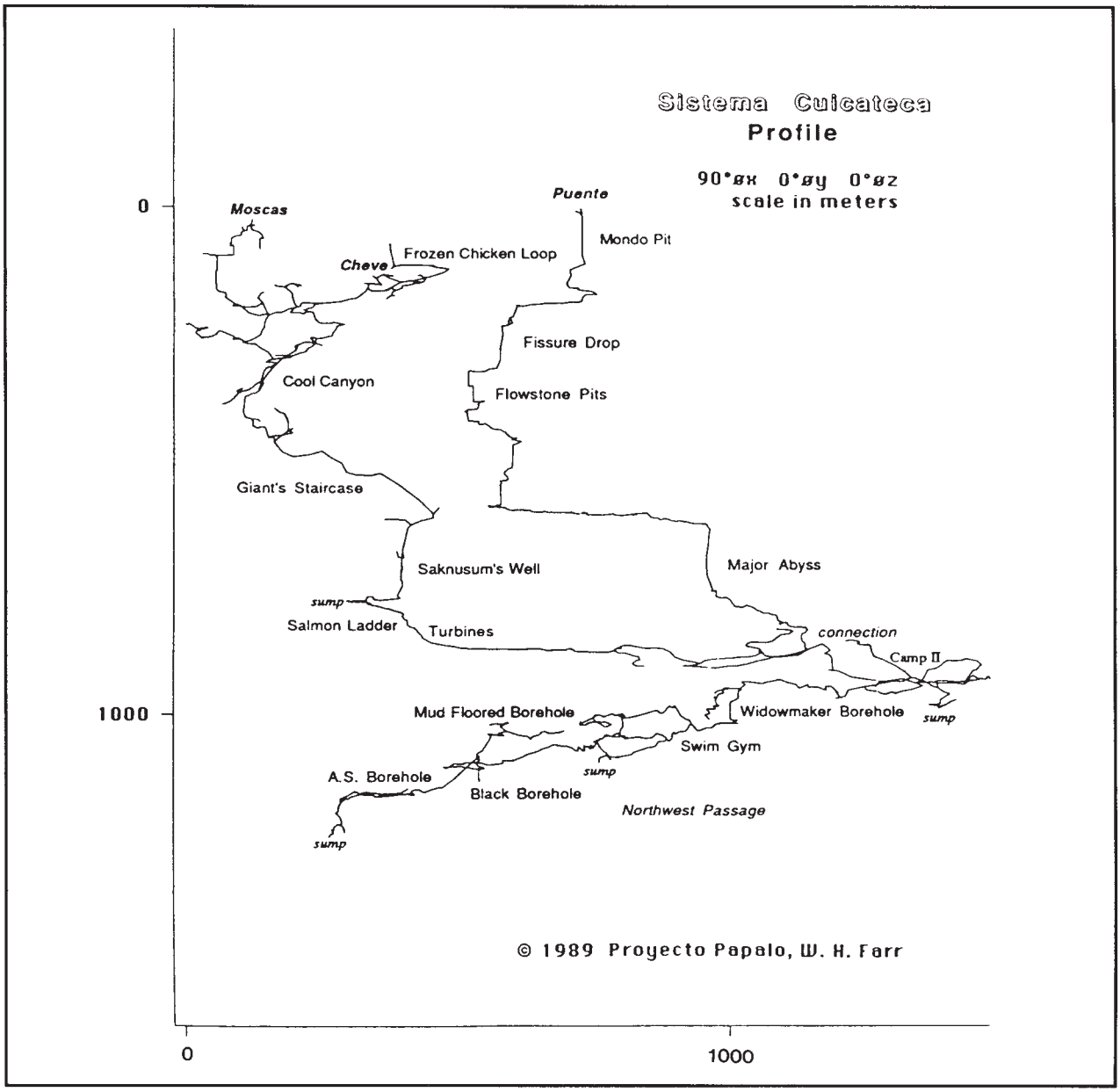


ued exploring Osto de Puente Natural, whose entrance is higher than any other in the system. At the beginning of the expedition, Puente was 422 meters deep, a kilometer long and showed every indication of connecting to Cueva Cheve. In general, Puente is a more difficult cave than Cheve. The passages are narrower, requiring frequent chimneying and the drops tend to be more awkward. It can be difficult to get motivated to push Puente with the more spacious passages in Cheve so near. Nevertheless, one of the goals of the expedition was to connect the two caves, since this would increase the depth of the system. Early in the expedition, a trip by Bob, Jeb and Bitsy pushed Puente to a tight, slowly-descending canyon. The passage was occasionally lined with flowstone and small pools dotted the floor. Despite the good airflow and going passage in Puente, after the first trip, interest was diverted to some new discoveries.

NEW CAVES

On a ridgewalking trip early in the expedition, Peter Bosted and I located the inconspicuous entrance to Viento Frío (Cold Wind Cave), which lies at the base of a grassy sink northeast of Puente. Peter and I surveyed down four short drops to the top of a very deep-looking fissure, where we ran out of rope. Later, Mark and I returned to descend this eighty-meter fissure drop and two more short drops to a total depth of two hundred meters. There are two infeeding passages into the cave so far and the passage size is generally more spacious than Puente. Exploration stopped after a stretch of canyon passage led to the top of an eight-meter drop.

Bill and Pat Stone, Mark Minton and Pam Smith spent several days looking for



new entrances in an area a few kilometers south and about six hundred meters lower than basecamp. They found several interesting caves. The best of these were Cueva Campana and Sumidero Aguacate. In both caves, the crew was stopped by a drop not far from the entrance. Though both caves had airflow, the group concluded that these were separate from the main system.

THE RESURGENCE AREA

During his two-week backpack trip prior to the expedition, Don had set dye receptors in the springs most likely to be resurgences for Sistema Cuicateco. One spring is located at four hundred meters elevation on the Río Seco below the town of Santa María Tlalixtac. The other spring, the Río Frío de Santa Ana, is on the Río Santo Domingo at three hundred meters elevation, fourteen hundred meters below the town of Santa Ana. Bill Stone dove this spring (which he called the Western Resurgence) during the Peña Colorada Expedition in 1984 and found a maze of going passages. The strong flow and cold temperature of the water in the Río Frío de Santa Ana led everyone to suspect that this was the resurgence for Cheve; only a positive dye trace would prove it. While Don and I were in Oaxaca City, Bill Farr dumped optical brightener into the Cheve stream. Three weeks later, Don, Mark and I went to the two most probable resurgences to retrieve dye receptors. Unfortunately, they all turned up negative. But, the trip was productive. We found and explored one cave near the spring on the Río Seco and located three blowing caves near the Río Frío de Santa Ana. The latter three caves seemed promising as our brief reconnaissance failed to find the end of any of them.

CHEVE CONTINUES

While we were at the spring, the second Camp II team, composed of Rolf, Bob, Jeb and Bill Stone headed in for four days. They pushed through the breakdown in the Hall of the Restless Giants and made their way through some very nasty passage to eventually discover the Black Borehole. This was, yet another, breakdown-floored passage, this time with very dark walls. Surveying eight hundred meters on their last trip, they ended at another breakdown choke that Stone described as the worst he had seen in years.

CUATES

Meanwhile, back on the surface, Andy and Bill Farr located another promising, new cave while ridgewalking near Puente. The twin entrances to Cuates are higher in elevation than Puente and have good airflow. Mark and I descended the twenty-meter pit just inside the larger entrance. This led to a breakdown room. After finding a way through the breakdown, we followed the air down three more pits of 28, 35 and 8 meters, to another area of breakdown, which we were not able to get through. We also explored an 18-meter pit in a dead-end room.

Toward the end of the expedition, Mark, Tim and I returned to push the pit inside the second Cuates entrance. Even after considerable "gardening", the top of this pit still contained many small, loose rocks. As Mark was sitting at the base of the drop in a "safe" spot behind a boulder, he was struck on the lip by a falling rock. We left the cave and Mark and I drove to Concepción Pápalo, where he received four stitches in his lip. There was a second pit visible beyond the first. This remains a good lead for next year.

THIRD DEEP CAMP

Undaunted by the reports of nasty breakdown at the end of the Black Borehole in Cheve, Don, Bill Farr, and Nancy went in to Camp II to check it out. After almost two hours of worming through the boulders, Bill moved a rock and squeezed "Through the Looking Glass" into the A.S. Borehole. Reaching up to forty meters high and forty meters wide, it is the largest passage discovered in the cave to date. Originally, the cavers had picked out another name for this impressive passage, but then they noticed the meter-high initials of A.S. which appeared as a natural inscription on the wall. Perhaps, Arne Saknussemm had been here on his Journey to the Center of the Earth.

Mark Minton at the larger of the two entrances to Cuates (Carol Vesely)

Joined the next "caving" day by Andy, Matt, John and Todd, the camp team split into two survey parties. They mapped both upstream and downstream in the A.S. Borehole to net 1.6 kilometers of passage in a day, all over a kilometer deep! Upstream, the A.S. Borehole lead to a tight, flowstone-lined crack that appeared to be the down-cave extension of the Black Borehole. Downstream, the A. S. Borehole ended in a massive breakdown pile with very strong airflow. A second trip to the end of the A.S. Borehole just to poke at the breakdown failed to reveal anyway through. However, all that air must go somewhere.

THE PUENTE-CHEVE CONNECTION

As the expedition neared the end, interest in Puente returned. A marathon trip by Rolf, Louise and Bill Stone pushed through some of the tightest canyon yet discovered in the system and they surveyed 117 stations in a horizontal stretch of passage at -560 meters. Several times the passage narrowed to the point where it was nearly impassable, prompting some to speculate that Puente might become too tight before ever reaching Cheve. Nevertheless, the three cavers were stopped not by a tight crack but by an impressive shaft, The Major Abyss.

There was time for one more trip to Puente before the end of the expedition. Bill Stone said it was 'connect or die". Carrying 250 meters of rope, Rolf, Bill Stone and I made a final assault on the cave. After rappelling the 118-meter Major Abyss, we followed the stream canyon down six more drops. With only seven meters of rope left, we finally connected to Cheve at a small infeeder on the east side of the big, breakdown-floored room just above the drop into the East Gorge. Rather than head back through Puente immediately, we decided to head deeper into Cheve to Camp II. Here, we met the others on the Camp II team who were just returning from their second stab at the terminal breakdown at the end of the A.S. Borehole. There was a combination of excitement and exhaustion as everyone shared their good news. As this was the last day of the underground camp, the Puente crew helped the others eat their remaining food. Then, all ten of us tried to cram into seven sleeping bags for a much-needed nap.

Everyone packed up and headed for the surface with Don, Rolf and Bill Stone surveying the new passage in Puente and the rest of us hauling camp duffles out of Cheve. Matt and Andy began stage-derigging on the way out from camp, with derigging completed the next day by Bill Farr and Tim.

After everyone else had left, Bill Farr and I hiked down to the Río Frío de Santa Ana to retrieve another dye receptor and

begin surveying the caves nearby. Unfortunately, this receptor also turned out negative. While we were there, we surveyed over five hundred meters in Cueva del Mano. With its flowstone-lined, warm, dry passage, Mano was quite a contrast to Cuicateco. The passages surveyed continued with good air flow, but we were out of time. There are many leads left in Mano and we haven't begun surveying the other two caves that we know about in the area. Even if this area turns out to be unrelated to Cheve, it still holds promise. Next year a larger push is planned.

POSTSCRIPT

Currently, the Sistema Cuicateco ends in an even more terminal-looking breakdown choke than the Looking Glass. Two trips have yet to find a way through, although air is screaming into it. The push farther will require establishing Camp III at the end of the A.S. Borehole. But, this is not the first nasty breakdown area we've reached and, with good air flow, we're confident the cave still goes.

In total, Osto de Puente Natural is 2.5 kilometers long, 887 meters deep and contains 23 rope drops. The connection between Puente and Cheve added 27 meters of depth to the system. To get to the present end of the system from the closest entrance (Cheve) requires 57 rope drops. Sistema Cuicateco is currently 16.3 kilometers long and 1243 meters deep, the second deepest in Mexico and the eighth deepest in the world.

SPONSORS

We wish to thank our 1989 sponsors for their generous donations: NDC Systems, Bob & Bob, Dogwood City Grotto, the Art of Climbing and the NSS Exploration Fund.

SISTEMA CUICATECO

Una serie de campamentos subterraneos a -850 metros, permitió a los cueveros explorar el Sistema Cuicateco a 16.3 kilómetros y 1243 metros de profundidad, combirtiéndolo en la segunda cueva más profunda de México y la octava en el mundo. Osto de Puente Natural, la entrada más alta conocida hasta ahora, fué conectada al sistema sumando 27 metros a la profundidad previa del sistema. En total, Osto de Puente Natural es 2.5 kilómetros de longitúú, 887 metros de profundidad y contiene 23 tiros que requieren cuerda. Para llegar al presente final del Sistema Cuicateco desde la entrada más cercana (Cheve) requiere descender 57 tiros con cuerda.

SPECULATIONS IN SPELEOLOGY
Sistema Cuicateco - The inside of a mountain

Don Coons & Patricia Kambesis

Southern Mexico's Río Santo Domingo slices the high mountains of the Cuicatlán region into two distinct ranges. Sierra Mazateca, the range to the north, contains world-class Sistema Huautla. The mountains to the south, the Sierra Juárez, hold a cave system of nascent fame, Sistema Cuicateco. The main entrance to Sistema Cuicateco is located in Llano Cheve, a conspicuous depression on the Cuicatlán topographic map. Two kilometers long and half as wide, the llano swallows the waters of three surface streams. Eighteen kilometers to the north and 2400 meters deeper, these waters resurge in the Canyon del Santo Domingo via the Río Frío de Santa Ana springs. Consequently, Llano Cheve is the gateway to what some believe is the deepest cave in the world.

Metamorphic rocks skirt the llano on its south and west sides. The northeast end holds the sweet spot, an impressive hundred-meter high headwall of limestone with a gaping black hole at its base. This is Cueva Cheve, the main entrance to Sistema Cuicateco. At higher elevations, the Cuicateco karst contains upper entrances that open into short stretches of horizontal passage separated by discrete shafts. These eventually connect to Cueva Cheve, giving the cave greater vertical extent and affording it the status of a system. The tectonic framework of the area, coupled with local lithologic and structural nuances, make for a formidable cave system; one that is physically challenging, psychologically intense and geologically unique.

Looking north down the Río Santo Domingo (Carol Vesely)

LITHOLOGIC OBSERVATIONS

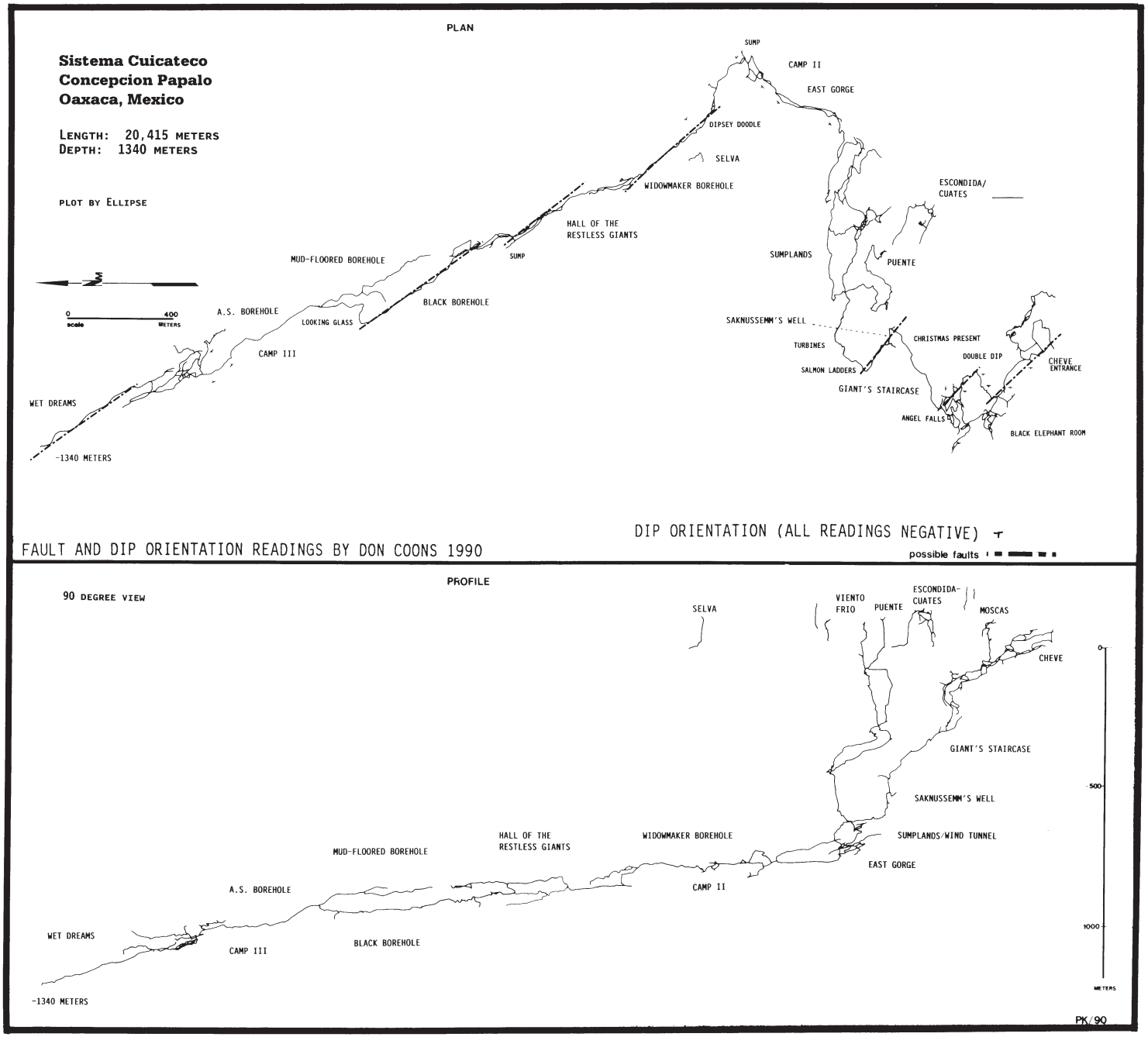
Sistema Cuicateco lies within a three-kilometer-wide swath of Lower Cretaceous-aged carbonates. This swath is sandwiched between metamorphic rocks for a linear extent of twenty kilometers. To the west, a melange of Cretaceous-age metavolcanic rocks (Hose, 1990) come in sharp contact with the Cretaceous carbonates. The eastern boundary of the swath is a three-hundred-meter escarpment which drops into an andesite-floored valley. To the south, near Llano Español, the carbonates pinch out between the metamorphic complex on the west and the andesite on the east. The Canyon del Santo Domingo terminates the system to the north. However, the carbonates continue unbroken northward across the river to the Sistema Huautla Resurgence located a half kilometer downstream of the Río Frío de Santa Ana resurgence.

The overall thickness of the carbonates is at least a thousand meters and beds dip west-southwest. Individual units vary in thickness from less than a half meter to three meters throughout the cave. Lithologically, the rocks range from dolomites in Llano Cheve, to dark-colored, recrystallized limestones through most of the cave (Smith, pers. comm), to a striking white marble in the Wet Dreams section, the deepest segment of survey in Sistema Cuicateco. Some areas, notably the East Gorge through Camp II to the Dipsy Doodle, are interbedded with thin shale units, less than a centimeter thick.

A prominent exposure in the cave is an andesitic porphyry dike located in the Christmas Present Chamber (Estes, Smith 1988). Visible as a massive fin projecting from the east wall, it tumbles boulders downward into the cave as far as the upper Giant's Staircase. Presumably this dike is related to the surface exposure just east of the area.

STRUCTURAL OBSERVATIONS

The upper reaches of Cueva Cheve, from the entrance to the Turbines, seem to be controlled by a series of faults that are separated by short stretches of strike-oriented passage. The Entrance Chamber, Basket Room and Black Elephant Room are aligned on a fault. A short segment of horizontal strike-oriented passage diverges from the bottom of the first pitch to the top of the Double Dip. A second fault dominates here and can be observed at the Christmas Present, Elephant Shaft and Angel Falls. Next, a massive, breakdown-floored ramp (Giant's Staircase), descends downdip for three hundred meters where it is abruptly terminated by yet another fault. The physical expression of this feature is an auspicious 150-meter-deep abyss named Saknussemms Well. The stream which flows under breakdown for most of the route reappears as a waterfall in this pitch and follows the trend of the fault into the Narrows. At this point, the passage takes an abrupt western departure from the faults and


PLAN
Sistema Cuicateco
Concepcion Papalo
Oaxaca, Mexico
LENGTH: 20,415 METERS
DEPTH: 1340 METERS
PLOT BY ELLIPSE
SUMP
CAMP II
EAST GORGE
DIPSEY DOODLE
SELVA
WIDOWMAKER BOREHOLE
ESCONDIDA/
CUATES
HALL OF THE
RESTLESS GIANTS
SUMP
MUD-FLOORED BOREHOLE
SUMPLANDS
PUENTE
BLACK BOREHOLE
A.S. BOREHOLE
LOOKING GLASS
SAKNUSSEMM'S WELL
CHRISTMAS PRESENT
TURBINES
DOUBLE DIP
CHEVE
ENTRANCE
SALMON LADDERS
CAMP III
GIANT'S STAIRCASE
WET DREAMS
ANGEL FALLS
BLACK ELEPHANT ROOM
-1340 METERS
0
scale
400
METERS
DIP ORIENTATION (ALL READINGS NEGATIVE)
possible faults
FAULT AND DIP ORIENTATION READINGS BY DON COONS 1990
PROFILE
90 DEGREE VIEW
SELVA
VIENTO
FRIO
PUENTE
ESCONDIDA-
CUATES
MOSCAS
CHEVE
GIANT'S STAIRCASE
SAKNUSSEMM'S WELL
SUMPLANDS/WIND TUNNEL
HALL OF THE
RESTLESS GIANTS
WIDOWMAKER BOREHOLE
MUD-FLOORED BOREHOLE
EAST GORGE
A.S. BOREHOLE
CAMP II
WET DREAMS
BLACK BOREHOLE
CAMP III
-1340 METERS
0
500
1000
METERS
PK/90

the stream picks up gradient as it cascades downdip through the Salmon Ladders and out into the Turbines.

Here, the nature of the cave changes dramatically. What had been a steeply descending series of vertical shafts and ramps, becomes horizontal streamway, shifting from a high, narrow canyon above the Turbines, to a wide elliptical tube through the Sumplands. A tributary just above the Wind Tunnel brings in a major infeeder, possibly draining as far south as Llano Español. The dimensions of the cave increase past the Puente connection and into the East Gorge where the character of the passage changes again to a high, bi-level canyon before plunging into a sump. The passage continues to trend east-southeast at first, then curves to the northeast. Dip and strike readings indicate a structural depression west of Camp II.

From Camp II to the known end of the system, the character of the cave changes significantly. Most of the passage is typified by massive breakdown-floored boreholes which follow the northwest strike of the structural trend. However, perturbations away from this main trend have been observed as a periodic series of eastward-trending "doglegs". Each is characterized by a complex of multi-level passages complicated by breakdown and sumps and may be a result of local faults, fissures, changes in lithology, or as a consequence of some aspect of the initial phreatic development of the lower reaches of the system. Three of these "doglegs" have been passed by explorers at the Widowmaker, the downstream end of the Hall of the Restless Giants, and the Looking Glass. The fourth is the present nemesis at the end of exploration where breakdown is more confusing and the current downward route ends in a sump at -1340 meters below the highest entrance, nine kilometers distance from the Cheve entrance, and 11 straight-line surface kilometers from the resurgence at the Río Frío de Santa Ana.

DESCRIPTION OF SURFACE AND SUBSURFACE DRAINAGE

Sistema Cuicateco drains a surface area of approximately eighty square kilometers, from elevations as high as 2970 meters above sea level. Waters flow across the impermeable metamorphics that make up the steep rock slopes and sink at or near the carbonate/metamorphic contact. The seven known entrances to the system occur on this contact. Gradients of these shaft-drain routes (Osto de Puente Natural, Viento Frío, Cuates, and Cueva Cheve from the entrance to the Turbines) approach 45 degrees. The water is funneled seven to nine hundred meters downward into the main drain of the system via a series of shafts and steep ramps.

Between Camp II and the current end of the cave, the hydrologic trend of the master drainage is to the northwest. The stream gradient is a gentle seven degrees and the water flows under breakdown for most of the route with the exception of the Swim Gym and Wet Dreams. The gradient in these two segments is considerably steeper and the water traverses are quite sporting.

Hydrogeologic conditions for the existence of the world's deepest cave are favorable in Sistema Cuicateco as proven by a successful fluorescein dye trace instigated by Jim Smith in the spring of 1990. Smith dispensed dye at the Cueva Cheve entrance of the system. Eight days later the waters of the Río Frío de Santa Ana ran green. This makes the Sistema Cuicateco dye trace the world's deepest with a vertical extent of 2440 meters and giving the system a proven hydrologic vertical extent of 2570 meters (Smith 1990).

THE RESURGENCE AREA

Eighteen kilometers north of the Cueva Cheve entrance, the Río Frío spring discharges through the lowest levels of a maze complex in Cueva del la Mano. Composed largely of a network of smaller passages which bear some evidence of faulting, the cave is complicated by flowstone and sumps. From east to west downdip, each passage is successively lower in elevation than the last reflecting the gradual lowering of base level due to the combination of uplift and consequent downcutting of the Río Santo Domingo. Though most of this subterranean network is hydrologically abandoned, it forms a distributary system that is still evident in at least three different risings along the present spring run.

SPECULATIONS

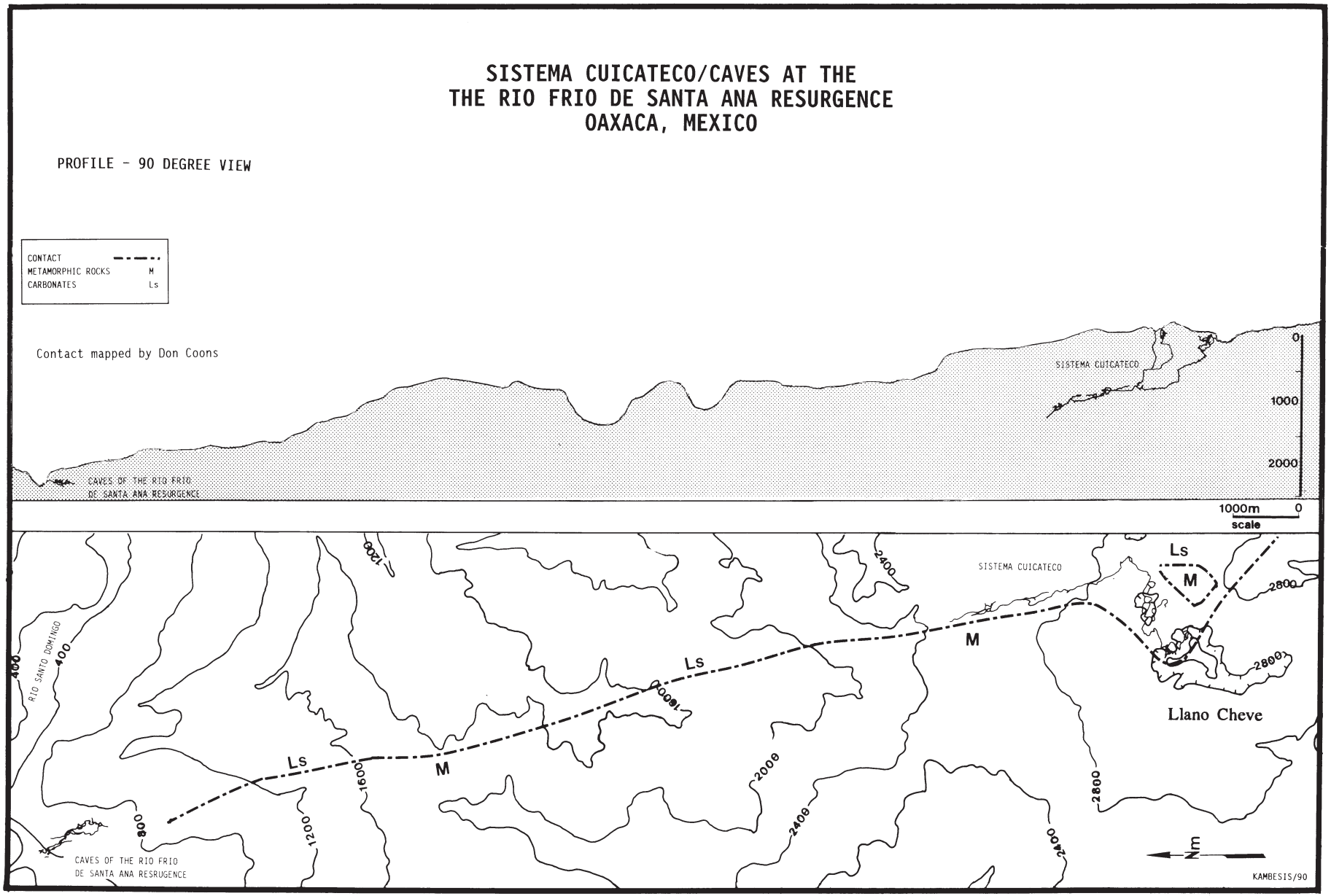
In order to understand the subtleties and complexities of Sistema Cuicateco and its speleogenesis, it is important to first consider the geologic context of the system on a regional basis. The Sierra Juárez is just one of a series of north-south trending mountain ranges that make up the Sierra Madre Oriental, the eastern structural "backbone" of México. The tectonic style of this region is that of a fold/thrust belt. By definition, stratigraphic units have been folded into a series of anticlines and synclines and tectonically transported along a detachment surface. The brittle nature of the rock has resulted in a succession of thrust faults which are closely associated with the folds. This structural style has undoubtedly influenced speleogenesis in the region.

Local hydrogeology (surface and subsurface) and subsequent cave development are a function of the folds and their orientations (Jennings 1971). Because the carbonates have been subjected to stresses resulting from overburden pressures and mountain building (orogeny), fissures (or joints) developed in the folded strata due to tangential stresses. These features tend to be localized in the troughs of the synclines and the upper arms of the anticlines (Jakucs, 1977). Thus, the joints that have formed at or near the axial planes of the anticlinal folds, along with associated local faults, probably play a major role in the vertical development of the system. The fissurization associated with the trough of the syncline may have influenced passage develpment along that trend. Regional deformation, extensive uplift, and erosion have led to the development of a high relief karst.

Over time, as waters drained into the fissure network of the limestone, shaft caverns developed, often to great depths, as is typical in other mountain karsts. Consquently, the high karst caves tend to be predominantly vertical. The upper entrances to Sistema Cuicateco and the upper portion of Cueva Cheve (down to -850 meters) consist of a series of shafts and dip-ramps which are separated by segments of strike-oriented passage. These features are the structural expressions of fissures, local faults and the dip of the bedding which serve to funnel the drainage deep within the carbonate corridor.

Beyond the East Gorge, there appears to be a structural manifestation that overrides the joints, faults and dip in channelling of the waters through the cave. Jennings (1971) observes that in folded structures, fold axes may deflect underground drainage away from the surface courses and notes that synclinal troughs, in particular, act in this way. Perhaps, in Sistema Cuicateco, the upper, vertically-oriented passages intersect the axial plane (or trough) of a faulted synclinal fold. The dominant control on the drainage route would become the plunge of the fold and fault trends associated with that fold.

SISTEMA CUICATECO/CAVES AT THE THE RIO FRIO DE SANTA ANA RESURGENCE OAXACA, MEXICO



Though these speculations are simplified, they do attempt to put the geologic observations within the context of the regional geology. Of further interest, with respect to speleogenesis, is the dual nature of the cave: the vertical shafts and dip ramps in the upper cave versus the the lower level boreholes. Do the deep, low-gradient boreholes of the East Gorge and beyond reflect karst evolution of a much earlier period; and did the vertically oriented network of passages in the upper karst, which are obviously related to current surface conditions, fortuitously intersect this much older trend? Or, is the development of the Upper Karst and the deep phreatic cave just multiple phases of the same speleogenetic conditions? Continued exploration, survey and geologic observations will help answer these questions.

SUMMARY

In general, the circumstances surrounding the formation of Sistema Cuicateco seem to be a function of the regional structural style, local structural features and their orientations, stratigraphy, and gradient.

Drainage flows across a large upland area of impervious metamorphic rocks. When the water encounters the contact between the metamorphic and sedimentary rocks, it sinks into a long narrow band of carbonates. Faults, fissures and the local dip of the bedding funnel the drainge deep witihin the carbonate corridor until it interesects a strong northern structural trend. The waters coalesce in this master drainage and flow at a low gradient until they resurge via springs into the Río Santo Domingo. This whole setting occupies an area as large as some counties, with a vertical extent deeper than the U.S.'s Grand Canyon.

The current survey traverse in Sistema Cuicateco, from the Cueva Cheve entrance, covers less than four kilometers straight-line distance on the surface heading north. The survey line in Cueva de la Mano covers one kilometer surface distance heading south; eleven kilometers separate the two. Explorers are not certain as to the potential length of a through-trip, or how many years of exploration it would take to find a route. However, of one thing they are very certain - Sistema Cuicateco is a superlative cave.

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GEOLOGIA DE SISTEMA CUICATECO

Una area extensiva de las terrias altas que esta composdad de piedras metamorphica esta localizada en la Sierra Juárez desur de México. Aguas superficia corren por ariba de las metamorphica impenetrable y se unden entre bandas estrecha de piedra caliza. Dieciocho kilometros para el norte y mas de 2400 metros abajo, estas aguas salen por la base de la montana dentro el Río Santo Domingo por un rio que se llama Río Frío de Santa Ana. Esto se ratificado por un vestigio de tinte conductado por Jim Smith en al ano 1990. El conducto bajo de tierra para este desague es el Sistema Cuicateco. Hasta, horo, veinte kilometros de passage se an trazado en un mapa a una profundidad de 1340 metros. Este report certidica observaciones hidrologica y geologica.

The Tachyon Tunnel forms a large, horseshoe shape above the Helenic Borehole in Infiernillo (Susie Lasko)

INFIERNILLO 1989

Peter Sprouse

Wrapping up a great decade, cavers of the Proyecto Espeleológico Purificación conducted a six-day camp in the Cueva de Infiernillo section of Sistema Purificación in November 1989. Exploration of numerous discoveries in the northern part of México's longest cave resulted in the survey of 3801 meters of new passage, making the system 76,110 meters in length.

The 1980s were a period of consistent growth for Sistema Purificación. By early 1980, not long after the Brinco-Infiernillo connection that established the system, 28 kilometers of passage had been mapped. That year Sumidero de Oyamel was connected into the system and, in 1981, pushes from Camp III in the middle of the system opened up the Southbound Borehole which promised to lead to a major, southern extension. In 1986 and 1987 two remote camps added 12 kilometers and extended the cave south to the Nuevo León state line. Then, in 1988, project cavers turned their attention back to Camp I near the Infiernillo entrance. Much of the nearly four kilometers mapped was in Arrakis, a new, eastern extension of the system. Add to that the November 1989 Camp I trip, and a total of 48 kilometers was mapped in Sistema Purificación in the 1980's by the PEP.

Pure white calcite flows down the middle of the Meager Borehole (Susie Lasko)

CAMP I

On November 17, 1989, thirteen cavers managed to squeeze into three Toyota trucks for the drive from Austin to the roadhead below Cueva de Infiernillo. Along on the expedition were Jerry Atkinson, Terry Bolger, Bill Farr, Jack Kehoe, Susie Lasko, Dale Pate, Dawn Reed, Scott Scheibner, Bill Stevens, Terri Treacy, Carol Vesely, Cyndie Walck and I.

Two days later we made our way up to the entrance, ascended the 35-meter cliff into the cave and settled into the familiar sands of Camp I. For the next five days, teams spread out to different parts of the cave. Four main areas were pushed: the new Tachyon Tunnel area,the Jersey Turnpike, the Confusion Tubes and Arrakis.

TACHYON TUNNEL

About one kilometer south of Camp I is the dense maze of the western Confusion Tubes. A dome climb in 1981 by Don Coons succeeded in opening up a major southern extension in this area, leading to the discovery of Ithilien, the Hellenic Borehole, and Babylon. Numerous leads remained in this promising area, so on the first survey day of the 1989 camp, three teams went to work there. Carol, Cyndie and Scott went to a stretch of passage between Ithilien and the Hellenic Borehole, where there was a selection of unexplored side leads. The first passage they mapped, Cyndie's Dildo Loop, produced nothing but an unusual name. Their next lead, the Polka Dot Passage, went better. After several hundred meters it tied back into Ithilien, then continued on until it got too small for their taste.

Meanwhile Susie, Jack, Bill Farr and I had moved a bit farther south to the Fissureland area, snooping out a new complex that earned the name Honeycomb Heaven. After sorting through about fifty meters of complexity, we decided on a good lead which developed into a firm northwest trend. Named the Puppy Glue Passage (for reasons now forgotten), we followed this lead for several hundred meters when, to our surprise, we heard voices. By chance we had reached a pit which dropped right into the Polka Dot Passage, just when Carol's team was mapping by. This closed a loop about one kilometer long. Less fortunate were Jerry, Terry and Bill Stevens, who had followed a steeply-descending lead near the Hellenic Borehole. This wet sleaze split up and got small, resulting in only 102 meters of survey.

It seemed apparent that up was a better way to go in this area than down, so when we took two teams back to the area on November 21st, that is what we did. Taking a good-looking lead off of the beginning of the Puppy Glue Passage, the two Bills and I mapped through a complex to a nice, west-trending, walking passage. This went a hundred meters to tee into a large, north-south trending passage. Assuming the presence of some sub-atomic particles, we named this new find the Tachyon Tunnel. We chose to go left, mapping a long succession of twenty-meter shots. A major lead trending south was passed, and the tunnel curved around east, then north. Finally, it lowered down to a pinch. Returning to the west, we mapped the other way off of the T-junction. This was followed for a hundred meters to a very low, breakdown zone.

With a good survey in the bag, we returned to the Honeycomb Heaven area, where we had started that day, to check on the other team of Susie, Terri and Jack. They were still mapping in that area after having made several good loops. So, we opted to go for another side lead which involved an interesting climb. This soon connected into the Tachyon Tunnel, where we encountered Susie's team who had also connected to it via the Decomposing Tube.

Everyone was having such a good time mapping that we decided to have a go at the major side lead that remained unchecked off of the Tachyon Tunnel. The Bills and I took the first survey while Susie's team leap-frogged ahead. The Meager Borehole was a pleasant, walking passage that trended southwest, going steadily updip. At one point, a brilliant, white, calcite flow meandered across

PROYECTO ESPELEOLOGICO PURIFICACION

Surveys 1973-1989
Length: 76110 meters
Depth: 904 meters
Plotted by Ellipse
Drafted by Peter Sprouse

Redrock Breakdown
Netherhal
Tachyon Tunnel
CUEVA DE INFIERNILLO
Jersey Turnpike
Arrakis
Dragon River
CUEVA DEL BRINCO
SUMIDERO DE OYAMEL
2300
2200
2000
1900
1800
1600
1200
Nm

Plan: rotated 250 degrees

Profile: 250 degree view

CUEVA DEL BRINCO
SUMIDERO DE OYAMEL
Dragon River
Redrock Breakdown
Netherhall
Tachyon Tunnel
Arrakis
CUEVA DE INFIERNILLO
0
500
904
METERS
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500

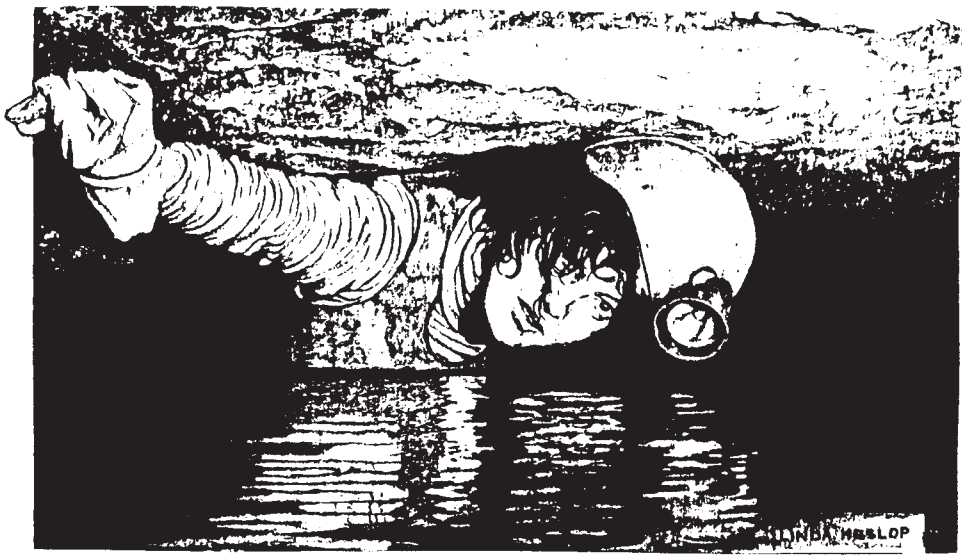
SISTEMA PURIFICACION

TAMAULIPAS, MEXICO

the floor. Finally, we called it quits, after 350 meters, when it seemed to be pinching out. This passage shows up well on the profile of the survey where it rises out of the mazes, seemingly on its own trend, climbing toward some unknown destination. Over 1800 meters was mapped in the greater Tachyon area over the course of the expedition and it will be a fruitful zone for years to come.

3-D MAZE

For years it has been known that a number of leads existed off of the long, linear Jersey Turnpike passage. Perhaps these could be pushed laterally to other parallel trunks. So, on November 20, Dale, Terri and Dawn set off to investigate. They started about five hundred meters along the Turnpike where the first of a set of loops bowed off of the main passage. Off the east side of that loop, they pushed several leads that looped back in, plus a side passage that climbed up high, which they named the Map Tube. Three days later they returned with Jerry, Scott, Carol and Terry to work this complex area with two teams. Dale's team mapped more loops, ultimately tying into the Grimbley Tubes, a small complex on the west side of the Turnpike. Carol's team went on down the Turnpike a short way to the next loop in the main passage. Starting in on more tube mazes, they mapped several hundred meters before also connecting into the Grimbley Tubes. The lowest levels in this whole area tended to be quite wet, indicating a more or less continuous canal at the lowest level. The net result of these three surveys was a tight, multi-level matrix of tubes that envelopes the Jersey Turnpike over a 150-meter-long section. This new complex has 943 meters of new survey. Numerous leads remain along the Turnpike and speculation now is that there may be a dense maze surrounding much of the length of the Turnpike. Another team consisting of Susie, Cyndie, Jack and Dawn pushed a canal lead south of Turkey Lake, a 150-meter-long swim five hundred meters farther south along the Jersey Turnpike. Turkey Soup, as they called it, started as a swim, then reconnected to the Turnpike after 213 meters of survey.



TUBES AND BREAKDOWN

Even in the original Confusion Tubes area close to Camp I there are still many, unexplored leads. Two teams set off to tie up some more of them on November 21st, Jerry, Terry, Dale, Cyndie, Scott, and Dawn mapped various, small tubes off of the Thru Tube, netting 202 meters of survey. Nothing earth-shattering was found, but more names added to the map were the Pygmy Borehole, the Stolen Tube, the Nameless Horror and the Donald G. Davis Appreciation Tube.

A long-shot project attempted during the week underground was a trip to the Redrock Breakdown, at the southern end of Sistema Purificación. The two Bills and I made the six-kilometer trip back to this blockage, stayed overnight, and made several attempts to get through. No way on could be found; not even a worthwhile place to blast.

ARRAKIS

Arrakis, a new section of the system discovered during the 1988 Camp I expedition, is a high, dry complex east of the main part of the cave. On the final day for surveying,, Carol, Susie and Jack set off to push more leads in this area. They first mapped a short loop off of the Pflugerville area, then took on an interesting canyon lead off to the right. This was the Noogy Borehole, taking off on a strong, southerly trend and eventually splitting into two levels. The lower, Cotton-Pickin' Passage, was a small tube mapped for one hundred meters over gypsum cotton and explored one hundred meters farther. The upper, Rattlesnake Trail, was more hospitable, and after another hundred meters of survey they halted, planning to continue on the next expedition.

Four kilometers of passage were mapped, a good time was had by all and some new companions were introduced to the cave. And yes, there are still leads near Camp I!

INFIERNILLO 1989

En noviembre de 1989 los cueveros del Proyecto Espeleológico Purificación realizaron un campamento de séis dias en la sección de Cueva del Infiernillo del Sistema Puricación. La exploración de numerosos descubrimientos en la parte norte de la cueva más larga de México, resultó en la topografía de 3801 metros de pasaje nuevo, haciendo el sistema 76,110 metros de longitúd.

Site of Camp I at the Dark Ages , Cueva del Tecolote (Ray Keeler)

TECOLOTE 1989

Dale Pate

Cueva del Tecolote is situated on the outskirts of the village of Los San Pedros, located twenty kilometers northwest of Ciudad Victoria, Tamaulipas, at an elevation of 1450 meters. An arroyo runs through town and along it you will see many old, truck tires and assorted castoff things. Follow it through the village and, on the east side, it abruptly ends at a high wall and a large hole that obviously takes large amounts of water at times. The cave entrance lies at the southeast end of a closed valley that drains several square kilometers.

On the east side of this valley, over a short ridge of limestone, lies the Gulf Coastal Plain at an elevation of three hundred meters. To the west and north tower the remnants of a Cretaceous reef complex as it rises to 2780 meters in elevation; a very prominent feature on the village skyline. Farther west, lies the Río Chihue encised in a very deep canyon, in places achieving over 1700 meters in depth. The river flows from north to south and then heads east, cutting a deep canyon through the frontal ranges of the Sierra Madre Oriental.

MARCH 1989

Late in the afternoon of March 11, 1989, four trucks of the Proyecto Espeleológico Purificación arrived in Los San Pedros. The objective for the trip was to set a ten-day camp in Cueva del Tecolote. Along for the fun were Manuel Aragón (México, D.F.), Djuna Bewley (California), Dave Bunnell (California), Ruth Diamant (México, D.F.), Ramón Espinasa (México, D.F.), John Fogarty (Texas), Ray Keeler (Arizona), Jack Kehoe (Maryland), Susie Lasko (Texas), Dale Pate (Texas), Scott Scheibner (Missouri), Peter Sprouse (Texas), Cyndie Walck (Missouri) and Jack "Solo" White (Illinois).

The previous expedition had taken place in November 1987 and had surveyed 2466 meters, bringing the total length of the cave to 13,550 meters. The expedition had advanced the cave in several places. On long trips from the surface, the Mickey Mouse Maze area, a complex area with several good leads left, was pushed to the west. Kennedy's Canyon was pushed to the north to a lake. Infinity Tunnel was discovered by following strong wind through breakdown at the end of the Serious Borehole. This passage was heading north and east and good leads remained for our return. The following day a team entered Tecolote to rig the numerous drops, scout out the campsite and to carry some gear to Camp I. Susie, Ray, Jack, Ruthie, Manuel, John and Peter took a nine-hour trip and accomplished these goals. Water levels along the route were quite low. There had been some concern that water levels would be very high due to Hurricane Gilbert which had dropped lots of water in the Tecolote drainage basin six months before. March is normally the dry season for this area.

March 13th was a rest-and-finish-packing day for the rigging team. Gabino Torres, a local resident who has been a friend to cavers for many years, took Dave, Djuna, Scott, Cyndie and Dale to Cueva del Brujo. The entrance was located on a ridge just south of Sótano de Trejo. The entrance is five meters high and ten meters wide and continued in this fashion for over a hundred meters before ending in a plug of formations and breakdown.

CAMP I

The next day all of the duffles were loaded and weighed (thanks to Solo's new scales). Solo's duffle (plus extra pack) won the heaviest contest weighing in at 32 kilos. Trucks were moved closer to the cave and the village for security, though Peter, who was very concerned about some ongoing forest fires in the area, parked his truck in the middle of an open field on top of a pile of

rocks. The night before, the sky had a reddish tinge to it and we thought it must be a fire. Everyone even piled into a couple of trucks and drove to the "edge of the world," a vantage point where we could look out to the east over the coastal plain. No fire could be seen.

With the trucks all secured, everyone headed into the cave and on to camp, some 1700 meters distance and two hundred meters lower. The rigging team had done a good job and there were no problems getting to camp, other than a few items that did not survive the long canals and immersion in water. John, Susie and Manuel arrived in camp only three hours after leaving the surface. The last one to arrive took six hours.

Camp I was in a large, walking passage called the Dark Ages which was discovered back in November 1984. Large silt mounds are found along the walls and the passage is, as the name implies, very dark. Various, personal camps stretched out along a hundred meters of this passage as everyone picked out their spots and emptied their duffles. This was to be home for the next ten days.

MINISERIES

March 15 was the first survey day and everyone was excited. This was what they were here for. Four teams headed out to explore the unknown. Two teams headed for the Infinity Tunnel and two good leads heading north. Susie's team, which included Jack and Ray, started down a left-hand lead, while Peter, Ramón, Ruthy and Manuel took the apparent main passage. They rigged a traverse line around a lake to help stay dry, and five stations later they came upon the Annoying Drop. Since they had no rope, they then went back and leapfrogged ahead of Susie's team in the Miniseries. Team totals for the day were 256 meters for Peter's team and 288 meters for Susie's and they left very few leads.

The other two teams had gone in the opposite direction. John, Dave and Djuna headed for Kennedy's Canyon, a westward lead at the end of the Fantasia Borehole. After taking numerous other passages, they arrived at their lead. Kennedy's Canyon ended in a swimming lead, but they mapped a side lead that also tied into what is probably the same lake. They netted 199 meters and, on the way back to camp, inadvertantly explored part of the Spine Line. John had only been to that part of the cave once before. The fourth team consisting of Dale, Cyndie, Scott, and Solo headed for a lead on the south side of the Mickey Mouse Maze named Dumbo Junction. The passage was large and turned upward into a small maze named Standing Room Only. The lowest level discovered was a walking passage dubbed Goofy's Borehole. Their survey total for the day was 339 meters. Total survey for the day was 1082 meters bringing the cave length to a field total of 14,632 meters.

Most of the cavers took the following day off and stayed near camp. Peter, Ramón, Ruthy and Susie went to the Major Abyss area to check leads. Below the Abyss area, they came to a pit that looked interesting, but having no rope they went to the Doll's Leg Junction, pushing a tube that got very wet. They mapped 120 meters for the day.

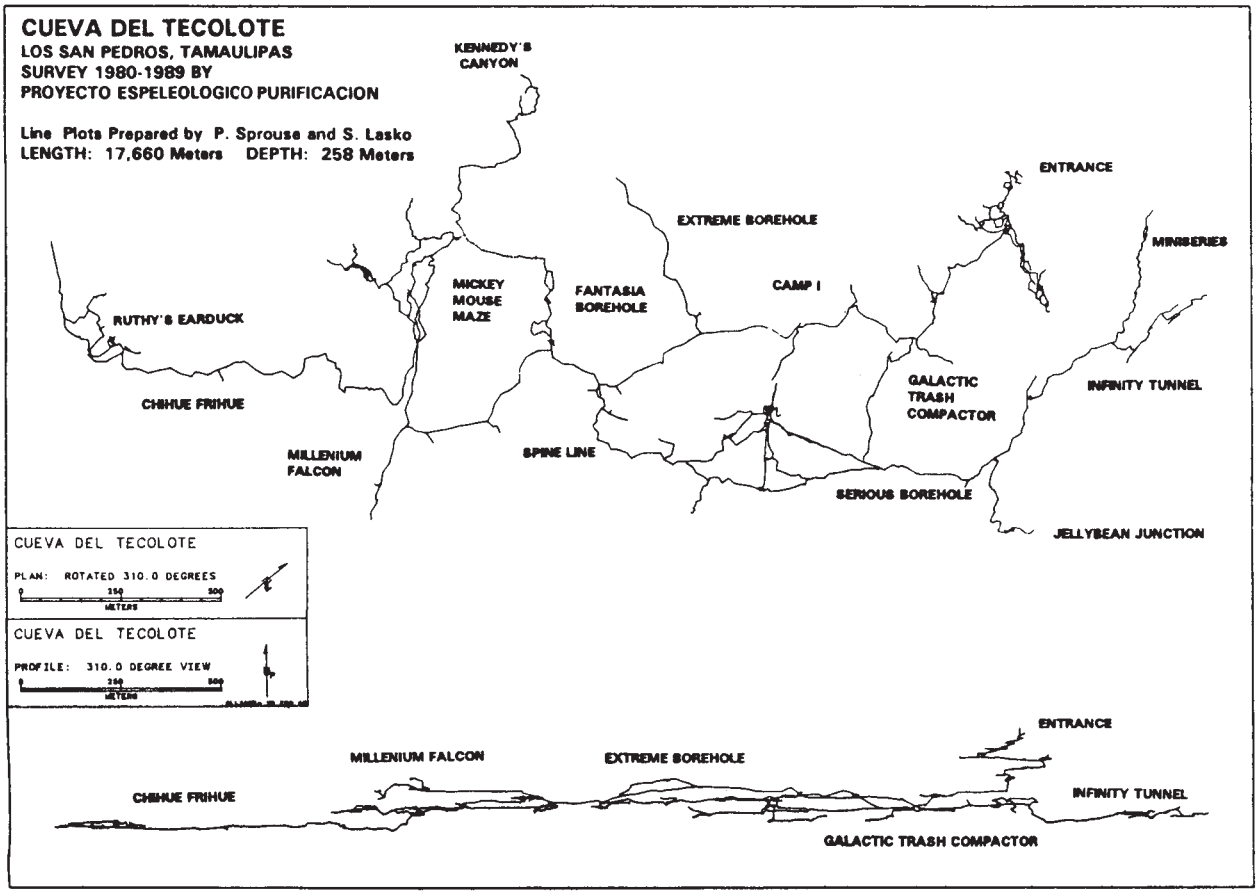
ACCIDENT

The next day, four teams once again headed out. John, Djuna, Ruthy and Manuel returned to the Annoying Drop at the end of Infinity Tunnel, where they mapped 163 meters before the passage pinched. Interestingly, they found fresh, green leaves in the passage. Ramon, Dave, and Peter went first to the end of the Extreme Borehole in an attempt to open up a tight squeeze at the very end. They set off a blast and left, letting the fumes clear. Proceeding down the Fantasia Borehole to the Fantasia Abyss, the team mapped 119 meters tying into Knives and Forks, a very sharp passage that had been mapped in 1987. As Peter was climbing back out of the Fantasia Abyss, a critical handhold broke and Peter fell six meters, recieving a broken left forearm, cracked lower left rib, and bruised tailbone. He had luckily missed the jagged projections that Fantasia Abyss is known for and hit the soft, silt floor. After a long breathing spell while Peter overcame some dizziness, his arm was supported in a webbing sling and he was aided back to camp and put in his sleeping bag. Ramón then headed to the Major Abyss area in search of Susie, Ray and Jack, who had gone to push the pit lead they had found the day before. They had mapped 156 meters to a clean, cobble-floored passage before Ramón found them. The team quickly returned to camp where Peter's wrist was splinted with a plastic trowel.

BREAKTHROUGH

The last team to arrive in camp from the day's activities had discovered big passages and numerous leads. Dale, Scott, Cyndie and Solo had taken wetsuits to Nonad Lake, a moderate-sized passage with deep water heading southeast. Nonad Lake was fairly short and; after one hundred meters the passage widened to twenty to thirty meters with lots of breakdown and a fairly low ceiling. After thirty meters, there was a loop and the passage continued thirty meters wide after this loop connected back in. The passage began to narrow down and became very muddy. After a short, sleazy climbdown,

Arroyo Chihue Pass (Dave Bunnell)



nice walking passage with shallow pools was encountered. It was eight to ten meters wide with a ceiling height of three to four meters. After 130 meters the passage had narrowed to four to five meters wide and ended at a balcony into a bigger passage. An interesting, muddy traverse got them into the larger passage and it took a few minutes to see what they had stumbled into. At the intersection, the passage was 15 meters wide with a ceiling height of six to seven meters. The floor of the passage was almost totally cemented cobbles. Thirty meters to the north lay a sump which appeared to generate lots of water at times. Back to the south, the passage continued off into darkness. The four surveyed 180 meters of large walking passage named the Chihue Frihue before calling it quits for the day. They had surveyed 706 meters for the day and discovered an important new section of the cave. Upon returning to camp, their enthusiam was dampened by the news of Peter's fall. It had been decided to get Peter out of the cave and to medical attention as soon as possible. The day's survey total had come to 1144 meters, bringing the field total for the cave to 15,896 meters.

After a night's sleep, six cavers began the trek out of the cave to get Peter to treatment. On March 18th. Susie, John and Peter headed out of the cave with Ray, Ramon and Jack along to help carry gear. There were no mishaps on the way out and Peter was able to exit under his own power. In fact, Jack complained that he still had a hard time keeping up with Peter. After resting and repacking the truck, Susie, Peter and John left the mountains and arrived in Brownsville and medical attention approximately 44 hours after his fall. Everyone who had stayed at camp on Saturday took a break from surveying and did a photo trip to the Rimstone Gallery. They also looked at the blast lead from the day before, but it hadn't opened up.

FREEWAY

On March 19th, while Ramon, Jack and Ray headed back into the cave, everyone remaining in camp returned to the Chihue Frihue and the great leads that had been left. This included Cyndie, Scott, Dale, Manuel, Solo and Ruthy. The first order of business was to survey to the sump to the north. This was named Irish Spring in honor of its discovery on St. Patrick's Day. Upon finishing this, the team then headed south and picked up the survey where it had left off. The passage averaged 12 meters wide and six meters high. After surveying several hundred meters they hit a weird intersection which was aptly named the Weird Place. Here, there were at least three ways to go, but it was hard to tell because the floor rose almost to the ceiling in places, making it difficult to tell what was actually happening. The team ended up surveying to the left, down a passage that appeared to end in

water. But Ruthy, who loved the water, did some checking and found a way on to more passage. There was only a short distance where one had to duck an ear in the water. This was Ruthy's Earduck.

On the other side, the ceiling was, at first, low and there were large, fragile, travertine dams. Soon, the ceiling rose and the pools became shallow. But fifty meters farther the passage became swimming once again. Cold was beginning to set in and a side passage that was dry was opted for, but it shortly connected back into the main water passage. The water was deep, blue and beautiful. The large, cirolanid isopods, *Speocirolana endeca*, were common in these deep lakes. Forty meters farther, a large, lead was noted on the right up a big, flowstone formation. Soon the team was able to get out of the water for a number of shots. A good-looking, dry lead on the left was passed and the main passage went back into the water. Solo swam fifty meters to a submerged gravel bar and reported deep water as far as he could see. The cold team headed the long distance back to camp. They had netted a day total of 540 meters, bringing the field total for the cave to 16,436 meters.

SURVEY CARRIES ON

Two shorter trips went out on March 20th to leads closer to camp. Jack, Ruthy, Ramon, Dave, and Djuna headed back towards the entrance to the Galactic Trash Compactor, a passage below the Salon del Puente that appears to take a lot of water. It had been pushed in November 1985 and no one had returned, mostly because of the large boreholes that had opened up in 1984. The team surveyed and photographed the beautiful flowstone and scoured passage for 184 meters to a sump. The second team of Ray, Solo and Manuel headed back to the lead Susie and her team had to abandon after learning of Peter's fall. They surveyed 175 meters in comfortable, walking passage with several good leads to return to, including one that was heading for the sump in the Galactic Trash Compactor, with good airflow. The day's survey total was 359 meters bringing the field total to 16,795 meters.

The next day saw three teams heading south. Dale, Cyndie and Scott returned to Standing Room Only, the small maze they had explored on their first trip out. They completed several loops and pushed a couple leads heading out of the area. The most productive was the Missouri Crawlway, which headed to the west. Several, good leads were left leading out of this area as the team surveyed 198 meters. The other two teams headed out to the Chihue Frihue and the many leads there. The team of Ramón, Ruthy, Djuna and Dave took a major lead from the Weird Place and surveyed several loops and left some good leads. One of their loops tied into the main passage and created a bypass to Ruthy's Earduck and a lot of swimming. This team surveyed 404 meters. The last team consisting of Jack, Solo, Ray and Manuel tackled the main passage which was deep-water swimming. The passage here had turned into a high canyon ranging from three to twelve meters wide and sometimes with a ceiling out of sight. After 176 meters the team became too cold to continue and turned back and began surveying a large upper lead discovered on the last trip to this area. After 78 meters they called it a day, regrouped and began the long trip back to camp. The day's total for all three teams was 856 meters, making the final, computed length of the cave 17,651 meters.

The next couple of days were spent recuperating, carrying gear out and derigging the cave. It had been a long, successful camp marred only by Peter's fall. The team had surveyed 4101 meters and left many, many leads. The expedition members would like to thank Bob & Bob for the donation of much-needed rope and would especially like to thank the many friends we have made in the logging village of Los San Pedros.

TECOLOTE 1989

La Cueva del Tecolote se localiza en las inmediaciones del poblado de Los San Pedros, 20 kilómetros al noroeste de Ciudad Victoria, Tamaulipas. En marzo de 1989, los cueveros del Proyecto Espeleológico Purificación estableciéron un campamento de 10 días en la cueva, para continuar con la topografía y exploración. Durante ese tiempo mas de 4101 metros de pasaje fuéron descubiertos y mapeados, llevando la longitúd de la cueva a 17.65 kilómetros.

EQUIPMENT AND TECHNIQUES

AN OPTIMUM SLEEPING BAG SYSTEM

Bill Steele

For over 15 years, camping in deep caves in Mexico has routinely been done. The sleeping bags used have been insulated with synthetic fill. Down fill will not work in the high humidity and damp conditions of the cave environment because it looses its insulating quality.

Many years of underground camping have passed with cavers packing their sleeping bags the same way. To protect the bags from water, in many cases swimming on the journey to remote campsites, they have been packed in trash sacks. The preparation procedure has been to place a stout trash sack inside a stuff sack, stuff the sleeping bag inside it, suck the air out of the trash sack, tie an overhand knot in the sack, then put the stuff sack into two more trash sacks each with the air sucked out and an overhand knot tied. The purpose in sucking out the air is so the bulk is lessened and the likelihood of puncturing is reduced. The sleeping bag inside the three trash sacks is then placed in another stuff sack so that the plastic is protected.

I have come up with a better system. Over the years, cavers coming to Huautla prepared for underground camping have arrived with some amazingly light and compact sleeping bags. Kelty makes one, Campmor another, and others are out there. I bought the Campmor Slumberjack Solite Hiker-Biker. Its fill is Quallofil, it weighs two pounds seven ounces, is rated to 40 degrees Farenheit, and it is advertised to have a stuffed size of 6 by 15 inches. The cost is $60.00. In addition, I purchased a wide-mouth, one gallon Nalgene bottle. The sleeping bag can be stuffed inside the water-tight polybottle. No muss, no fuss. It takes strong fingers, and a technique of placing the bottom of the bottle against the sternum for the last bit to get stuffed, but it goes in, and concerns about a wet sleeping bag on the way to some god-forsaken campsite, are diminished.

Excellent insulating pads to be used with the Solite bag are the Therm-A-Rest Ultra Lite 3/4 pad or the Ultra Lite Long. The 3/4 pad weighs 17 ounces and rolls to 4 by 11-1/2 inches. The Long weighs 28 ounces and rolls to 6 by 11-1/2 inches. These are available through Campmor.

For a ground cloth the most often used is a standard rescue blanket (not a pocket-sized Emergency Rescue blanket) or a shower curtain. Some cavers have gone to a Gore-tex bivouac bag and place pad and sleeping bag inside for additional warmth, dryness, and to cut the wind.

I camped deep in Cueva Cheve with my Solite, a cave that is 47 degrees Fahrenheit.

Rolf Adams and Bob Benedict at Camp II in Cueva Cheve (Bill Stone)

I did so without a foam pad, figuring I would sleep on my wetsuit. Howver, the additional 17 ounces and 4 by 11-1/2 inches of space is not something to dodge. I never will again.

RETURN TO GOLONDRINAS

Bill Cuddington

Bill Cuddington is widely recognized as the "father" of single rope techniques which revolutionized vertical caving. In the 1950's and early 1960's, Bill frequently participated in the discovery and exploration of many deep caves in the southeastern United States. Soon after T.R. Evans found Sótano de las Golondrinas, he teamed up with Bill Cuddington and others to make the first descent on April 2, 1967. Cuddington claims that T.R. actually offered him the chance to go down first. Bill recognized that the other cavers and himself wouldn't have been there at all if it hadn't been for Evans. Consequently, T.R. made the historic rappel of this superb pit. More than two decades later, Bill Cuddington continues to advocate and perfect single rope techniques. In the course of this crusade, he has made a number of return visits to Sótano de las Golondrinas. - Ed.

Nineteen years had elapsed between my first visit to Golondrinas in 1967 (the trip that bottomed the cave), and my next one. Though many trips were planned, they never materialized. In 1986, my wife Miriam and I went to México to tour the great pits. On this trip, we did Sótano San Antonio and Hoya de Guaguas. Golondrinas was next on our list and when we arrived on the site, we saw that a group from Colorado had already rigged it. Consequently, we used the original 1967 rigging spot as I had done on the very first

descent here with T. R. Evans. I rappelled a new PMI rope and was followed by Miriam and Roger Ling. This was Miriam's first view of the pit and she was enthralled by the beautiful birds. For the ascent I used a three Gibbs-roller system. Miriam clipped onto the rope when I was 800 feet up. My foot Gibbs was still in the testing stage and with the extra weight, it distorted. The only way I could get it to catch was to turn my left foot sideways, which shortened my step. I reached the top with a disappointingly slow time of 31 minutes, 28 seconds.

The next time I did Golondrinas was during Christmas of 1987. Miriam and I were joined by Greg and Shelia Andrews, Victor Bradford, Mary Howerton and Barry Ferguson. This trip I planned to go for a fast climbing time using a super Gibbs rig. I rappelled in on Greg's new PMI followed by he and Mary. When the stopwatch timers on top were ready, I started a solo climb. Prior to the trip, I made sure to maintain my fitness schedule and it paid off. My Gibbs rig worked perfectly and my climbing time was 24 minutes 39 seconds. When we returned home (Huntsville, Alabama), Victor Bradford did some research and found that I had broken Tom Baine's documented record of 25 minutes, 15 seconds.

In 1988 we returned to Golondrinas accompanied by Peter Gibbs, Charles Gibbs, Christopher Gibbs (all of Gibbs ascender fame), Daryl and Debbie Dunkel and Victor Bradford. Our support team consisted of Lavonne and Kari Gibbs and Roxanne Metz.

Health problems suddenly hit Miriam and I. She had to have minor ear surgery after which she developed a bad cold. She didn't recover from this until after the trip. I had trained harder than ever for the 1100 foot climb and reached an "on-the-edge" situation. I sufferred the effects of a virus and lost 6 pounds. However, we decided to go anyway. After all, what would Christmas be like without Golondrinas?

On December 21, 1988, we arrived at the pit. Two porters were hired to carry the 1220 feet of PMI rope. Once at the pit, we rigged the drop and I rappelled in, followed by Victor, Christopher, Peter, Daryl and Debbie. Lavonne, Kari and Roxanne were manning the radio and giving treats to our small spectators. Miriam planned to film the event and everyone acted as stopwatch timers.

I was allowed to make a solo climb since I was not 100% fit and needed everything going for me. This time, I warmed up thoroughly by running for eight minutes on a section of the soft floor. It could be that I became the first man to run a mile at the bottom of Golondrinas.

After a radio-countdown, I began the climb using the super-Gibbs rig again. My time to the top was 23 minutes, one second. I was elated, thinking I could not make good time because of the virus. Everyone else did the magnificent ascent in respectable times.

Before heading back to the States, we did Hoya de Guaguas . The trip home was without mishap and we are all dreaming of another trip to the "deep ones" in México! (The current record for ascending Golondrinas is held by Berta Kirchman with a time of 20 minutes 56 seconds set in 1989).

BOOK REVIEWS

Expé Sous Sierra, Mars Avril 87, Sierra de Zongolica, Mexique. Report de l'Expédtion de l'Union Belge de Spéléologie. 1989. 66 pages, comb-bound. Reviewed by Bill Mixon.

This is the report of a Belgian expedition to the Sierra Zongolica in Veracruz. Over one hundred caves in the area were explored and are described in the publication, which includes over thirty cave maps. There are also nice area maps for the regions explored, based on topographic maps and showing the locations of the cave entrances. The resurgence cave for the Río Tonto was surveyed for over a kilometer, and three other caves also exceeded that length. Five of the caves include pits over one hundred meters deep.

The cave descriptions and maps make up most of the report. There is also a chapter on the geology and hydrology of the area, and it includes information on water-chemistry studies and water-tracing they did. There are some brief comments on biospeleology. The report has only brief summaries in English and Spanish, but any caver will be able to understand the maps and much of the information in the cave descriptions without knowing French. Available from the AMCS, Box 7672, Austin, Texas 78713.

Le Spedizioni Speleologiche Malpaso '86 e Rancho Nuevo '87 in Chiapas (Messico), Notiziario del Circolo Speleologico Romano, Nuova Serie, No. 2, 1987, 176 p. Reviewed by Mark Minton.

Like its predecessor, this handsome volume covers two Italian caving expeditions to Chiapas in its eleven chapters. There is a list of personnel, objectives, and itinerary followed by a narrative account of the expeditions, covering surface, as well as underground, activities. A brief synopsis is given of discoveries beyond the previously- known end of **Gruta de San Cristobal (Rancho Nuevo)**. The geology and speleogenesis of the areas are also described. Chapter five contains the meat of the work: descriptions and maps of the caves explored, with special attention given to Grutas de Rancho Nuevo. Next, is a report on biospeleology, including a cave-by-cave list of fauna. There is also a more in-depth report on crayfish from **Cueva de los Camarones.** The radio communication setup used in the field, is described. Also, a chapter covers medical aspects, including dietary needs for tropical caving. The location and exploration of the remote **Ojos del Tigre** system is covered. The final chapter concerns the expedition logo.

Several important caves were explored during these expeditions. Most significant was a major extension of Grutas de Rancho Nuevo (also called Grutas de San Cristobal), making it the longest (10,218 meters) and deepest (520 meters) in Chiapas. A very large map of this cave is included in a special insert at the end of the book. A sump dive connection between **Mostro** and **2 Sumidero de Pecho Blanco** brought that system to 4435 meters in length (depth unchanged at 253 meters). **Sistema de los Ojos del Tigres** is 1840 meters long and 177 meters deep. It contains three, large pit entrances (eighty to a hundred meters deep) in the jungle, presenting a formidable logistical challenge. **Cueva del Achin** is 1585 meters long, with a vertical range of only three meters. A new, deep pit, **Sótano de la Luz** drops 140 meters into a single, large chamber.

There are many excellent photographs, including some of extremely large passages and impressive, black-hole entrances. There are also maps of all the caves, no matter how small. (One is only five meters long and deep.) Although written in Italian, the book contains a wealth of information on Chiapas, most of which can be appreciated without knowledge of the language. This publication is available through the AMCS, Box 7672, Austin, Texas 78713.

Excursionismo Politicnico No. 1, Autumn 1989, 19 pgs. Edited by Carlos Rodrez Rubio. Available from AEIPN, Apartado Postal 75-84, Col. Lindavista, 07300 Mexico, D.F. Reviewed by Peter Sprouse.

This is (apparently) the first newsletter of the Asociación de Excursionismo of the Instituto Politécnico Nacionál. While mostly concerned with mountain climbing, this issue does contain an account of a trip to **Hoya de la Luz** on the Xilitla Plateau.

Ecursionismo Politico No. 2, Winter 1989, 31 pages. Reviewed by Peter Sprouse.

This issue contains two articles on caves. The first concerns **Sótano de los Monos,** San Luis Potosí and contains renditions by Ricardo Arias of numerous cave paintings in the entrance area. Also included is an overview of **Sótano de las Golondrinas** with an interesting account of old Huastecan legends concerning the pit.

Sous Terre, newsletter of the Societe Quebecoise de Spelelogie, (July 1988, December 1989.) Reviewed by Bill Mixon.

These two issues summarize the group's expeditions to the Sierra Negra, Puebla, Mexico. The twenty-page, July 1988 issue covers work done in December 1987 and January 1988, including the exploration and mapping of **Sótano de los Planos,** 694 meters deep, and **Sótano de Alhuastle,** at 410 meters deep, including a 328-meter pit inside. The 24-page, December 1989 issue covers the "phase 2" expedition in January 1988 and features **Sistema de Angel** at a depth of 533 meters and 4,857 meters long, and **Olfastle Niebla,** explored, so far, to a depth of 518 meters. Both issues have color covers and numerous photos and maps inside. The text is in French, with English and Spanish abstracts.

The earlier issue is CAN$4.00 postpaid to Canada and the U.S.$6.00 "overseas". I'm not sure where that leaves Mexico. The second issue has a cover price of CAN$5.00. Write the SQS at 4545 av. Pierre-de-Coubertin, C.P. 1000, Succursale M., Montreal, Quebec H1V 3R2 Canada. Both issues are available also, for US$4.50 each, postpaid, from the AMCS, Box 7672, Austin, Texas 78713.

Sierra de El Abra Cave Map Folio December 1989, 10 sheets. By Neal Morris. Association for Mexican Cave Studies, P.O. Box 7672, Austin, Texas 78713, $6.50 postpaid. Reviewed by Peter Sprouse.

This collection of cave maps was originally prepared in 1974 for a publication on the caves of the Sierra de El Abra, San Luis

Potosí that never materialized. They have finally been released by the AMCS as a stand-alone map folio. The maps, by Neal Morris, are mostly large-format and are very finely-drafted. The cave maps include deep pits such as **Sótano de la Cuesta** and also stream caves like **Sistema de Montecillos.**

Tepeyollotli No. 4, September 1989, 58 pages. Edited by Ramón Espinasa. Available from AMCS or from Sociedad Mexicana de Exploraciones Subterráneas, Fuente de la Península #19, Tecamachalco 53950, Edo. de México, México. Reviewed by Peter Sprouse.

As with previous issues, this latest SMES edition is packed with cave reports and maps (some 49 maps, actually). In Puebla, efforts of the SMES cavers in Tapoztotl and of the GSAB Belgians at Zoquitlán are detailed. In Guerrero, SMES activities included **Cueva de Agustín Lorenzo, Resumidero de Izote, Cueva de las Pozas Azules** and numerous caves in the Chilacachapa area near Aclalá. An inventory of caves in the San Francisco, San Luis Potosí area is given, with cave maps. A biology article describes new species of thysanura and polychaeta from Guerrero caves.

This issue has a more international flavor to it, with articles by U.S. and Belgian cavers and with a SMES account of the 1989 PEP expedition to **Cueva del Tecolote.**

All told, this latest Tepeyollotli contains a lot of solid caving, and while the photocopy reproduction still leaves much to be desired, this one does sport the first cover with a photograph on it.

Draco No. 5, March 1989, 38 pages. Edited by José Montíel Castro. Available from AMCS or from Draco, Manuel F. Soto no. 131, Col. Const. de la Rep., C.P. 07460 México D.F., México. Reviewed by Peter Sprouse.

This fifth issue of Draco has its emphasis on the exploration of Resumidero El Borbollón, San Luis Potosí from the initial exploration by the APME cavers from San Luis Potosí to expeditions including Draco and AMCS contingents. In the state of Puebla, maps are included of **Sumidero Oztoquito** and **Sistema Santa Lucia.** The latter is a resurvey of a cave in the Cuetzalan area.

From Guerrero, **Cueva del Diablo,** a new part of **Sumidero la Joya** are detailed. Also included in this issue are various technique and organizational discussions.

Draco No. 6, December 1989, 43 pages. Edited by José Montíel Castro. Availability as per above. Reviewed by Peter Sprouse.

This issue of Draco contains descriptions of **Sumidero el Oztoque,** a 105-meter-deep cave in Puebla and of two small archeological caves in Guerrero. Other articles include one on the meanings and variations of the Nahuatl word "oztotl" and a review of archeological regulations in México.

Of particular interest, is a new section called the Registro de Cuevas Mexicanas, apparently intended to be a regular feature in future issues. It is a database-type list of caves from around the nation, utilizing a standard, short form with categories such as name, state, locality, coordinates, access, length, depth, drops, map status, author and source. The majority of the entries are third-hand, rather than from the author's experiences and lack basic information (such as length and depth) for which the form provides. One wonders why these caves were included (as opposed to caves which the Draco group had direct experience) when very little information was available to them. Even more noticeable is the lack of a specific reference in most cases, which it seems would be the most critical item needed for a researcher seeking information on a cave. This latest attempt at a cave database for Mexico, like others, seems poorly designed and over-reaching.

Tsaval No. 1, March 1989, 40 pages. Edited by Raul Puente. Available from Asociación Potosina de Montañismo y Espeleología Calle Plata no. 666, Col. Morales, San Luis Potosí 78180, México. Reviewed by Peter Sprouse.

This is the first newsletter from APME, a confederation of four caving groups in the city of San Luis Potosí. They are fortunate to have a major, deep caving area only a thirty-minute drive from home, so it's only natural that the caves of the San Francisco area (Sierra de Alvarez) dominate the first issue. Exploration of **Sumidero El Borbollón** is most prominent, but quite a few other caves from the area are described, including cave maps.

Caves of México Compiled by Terry Raines. Association for Mexican Cave Studies, 1989, about 250 pages, hardbound. $20 postpaid from the author at Box 7037, Austin, Texas 78712. Reviewed by Bill Mixon.

Despite its somewhat pretentious title and expensive production, this is really just a prototype of what a computer database on the caves of México might look like. Terry has designed a database with fields for things like name, state, nearest city, nearest named place, map coordinates, cave length and depth, and narrative descriptions of the location and the cave. There is not really as much in the book as the number of pages would suggest, since large type and a very open format were used to print out the data on a laser printer. The fact that most of the blanks are not filled in makes the format appear even airier. Only a small fraction of the easily-available data on Mexican caves is included in this edition. Nevertheless, it is an interesting effort and it will provide ideas for others attempting computerized, cave databases. The software has not been entirely tamed. The caves are alphabetized within states, but in a pretty useless way. It can be a pain to find a cave if you don't know whether its name starts out "Cueva de" or "Cueva del." Heaven help you if you don't know whether it is a cueva or a sótano, especially since the program has put the sótanos after the sumideros. The hardbound edition does, however, have a nice index that is alphabetized by useful words such as Golondrinas and Guaguas.

The book is a fair example of a cave database. Unfortunately, it is also an excellent example of why cavers often look upon cave files and their compilers with suspicion. Over 85 percent of the caves in San Luis Potosí and 75 percent of the caves in Queretaro are copied virtually word-for-word, without permission or credit, from a draft of an unpublished bulletin on the caves of the Xilitla area by Peter Sprouse and Terri Treacy. This material adds up to half the pages in the book and way over half of the decent cave descriptions. The uninitiated might wonder why Peter is not even mentioned in the acknowledgements. A useful database on the caves of México, especially if it is to include material not generally available in any other form, will have to be compiled by someone who is aware of the courtesy due his fellow cavers and the proprieties of handling other people's data; someone who is respected and trusted by the great majority of cavers working in México.

Cimas Y Simas de México, by Gerardo Ruiz, Reviewed by Alejandro Villagómez Muñiz.

At first glance, I was very pleased to see a publication of such good quality written by a Mexican author about the mountains and caves of México. There are excellent photographs throughout, it is well-printed and the text is interesting and very poetic.

Ruiz writes very modestly, which I found unusual. He always makes a point of naming those who were along on the trip and giving due credit to all who participated in initial exploration and first descents.

The book is divided into two sections: Cimas (Summits) and Simas or Sótanos (Sinkholes). In the first part, Ruiz describes the history and beauty of the four most important volcanos in the country. In one chapter, Ruiz makes a fair attempt at poetry, revealing the more sentimental side of the scientist. In the second, and more extensive, part he offers us a general description of most of the Mexican caving scene from the traditional subterranean rivers of Chontalcoatlan and San Jeronimo, to Sistema Huautla. Ruiz also mentions his visits to other areas such as **Cuetzalan, Sótano del Barro, Sótano de las Golondrinas, Grutas de Juxtlahuaca** and also an ice cave that can be found on the volcano Popocatepetl.

Since Ruiz is a biologist, it is not surprising to find an informative chapter on the flora and fauna of the mountains and another on the subterranean life that is found.

I would recommend this book to those who want to get an overall picture of Mexico's mountains and caves. Perhaps in the future, Ruiz will devote the time to write more in-depth about specific caving and mountaineering areas.

Subterraneo Issues 3-6, Nov. 88-May 90. Edited by John Pint. Available from AMCS or from: Espeleoclub Zotz, Apto. 103, CP 45010 CD Granja, Jalisco, México. Subscription is $10 per year. Reviewed by Mack Pitchford.

My first introduction to organized Mexican cavers was seeing "CONDOR CAVING CLUB" spray painted all over the formations in Palmito. Needless to say, my impression of such groups was that they were trying to boldly spray paint where no man had spray painted before.

Well, thanks to issues 3-6 of *Subterraneo*, my impression has been changed. *Subterraneo* is the newsletter of the Guadalajara-based Espeleoclub ZOTZ, edited by John J. Pint and illustrated by Jesús Moreno. Through all four issues, the newsletter maintains a consistently humorous approach to caving in Mexico without being frivolous.

Most articles are presented in both Spanish and English and appear to be separately written, not just rote translations of each another. The English portions are well-written, entertaining and informative. The artwork is good, too. Jesús Moreno is a prolific cave cartoonist. He does the covers, margin art and illustrates the articles. He has a good eye for humorous art. If *Subterraneo* is the only place his work is published, Moreno is squandering his talent. *Subterraneo* is published three times a year, but only one issue for 1990 has come out so far.

Proyecto Cerro Rabón, México, 1985-1989, T. Bitterli, P. Y. Jeannin, K. Meyer, Ph. Rouiller, 1990. 58 pages. Published by Speleo Projects, Basel, Switzerland. Reviewed by Patricia Kambesis.

This publication summarizes the results of systematic explorations that have taken place over the past six years in the remote Cerro Rabón in Oaxaca, México. A comprehensive abstract is provided in English, German, French and Spanish. The main text is given in German and/or English.

The report is a compilation of all important information on the area to date (1990) and includes summaries of the geology of the area, a short section on speleogenesis, biology (summarized in text and compiled in chart form) and paleontology (the latter two given in German only). There is also a section (in English) that recounts the initial two reconnaissance trips and reports on the the 1987 and 1989 expeditions to the area. The detailed cave descriptions, area maps, and list of caves explored and surveyed, are provided in German. Included is a superb set of 32 maps.

There is great cave potential in the Cerro Rabón. If this report is any indication of the work that the joint Swiss-American team plans to do in the area, then it stands as an exemplary effort for all major cave projects in México. Available from AMCS, Box 7672, Austin, Texas 78713, $15.00 postpaid.

OBITUARY

PHILIPPE ROUILLER

Philippe Rouiller, one of Europe's top cavers, died on May 27, 1990 while traversing a narrow canyon in the Swiss Alps. His family, longtime girlfriend Ursi Sommer, and many friends will greatly miss him and his boundless enthusiasm for life.

Philippe grew up in Basel, Switzerland where he started caving in his early teens. His legendary caving prowess was quickly revealed. He soon became very active in the many caving regions in Switzerland. The Jura Mountains became his weekend backyard training ground for both caving and climbing.

Philippe was a solid 5.10 climber. He participated in many, long push trips in the famous and never-ending Holloch System. The K2, named after its Himalayan equivalent, and the long, complex Sieben-Hengste-Hogant System were, however, targets for most of his caving activity. His fearless free and SCUBA diving talents became essential in many breakthroughs, including linking the Faustloch with the main system through a long, muddy sump, thus making the SiebenHengste the first cave both over 1000 meters deep and over a hundred kilometers long.

He was also the key diver to penetrate the -565 sump in Barenshacht, a long, deep and cold cave tantalizingly close to the SiebenHengste. The tight breakdown sump, in 4-degree Celsius water had already claimed one experienced diver. The breakthrough, made with two other divers, led to over six kilometers of large passage which still goes.

Philippe, apart from being probably the most active caver in Switzerland, was a prolific and excellent cartographer. He was the Swiss correspondent for the International Commission on Long and Deep Caves and also served as the editor for STALAGTITE, Switzerlands premier caving publication.

Philippe was known to many U.S. cavers from the joint expeditions they shared. These included the two-month-long, 1982 Papua New Guinea Expedition. He and Ursi led the exploration of Leiwaro Kundu, the longest and and dangerous push trips. He was also a driving force on the 1987 and 1989 Cerro Rabón, México Expeditions, tirelessly pushing the deep Kijahe Xontjoa and the many other caves in the region. He also participated on the August 1988 Lechuguilla Expedition. A stretch of the Western Borehole has been named Rouillers Way, in his honor.

Urs Widmer and Philippe Rouiller (right) in Lechuguilla Cave, 1988.

For those who had the privilege to cave with Philippe, they would certainly agree he was an extrordinary individual. He always glowed with unlimited enthusiasm and energy. His confidence flowed into those who adventured with him, making them feel that they could accomplish anything. His motto was "This is no problem!". Philippe was known for moving through a cave, as a 5.12 climber moves over rock, with the grace of a perfected ability. Where other cavers would get muddy all over, Philippe was content to soil only the bottom of his boots. Even with his talents and speed, he gave his encouragement and concern to anyone who needed help, no matter what level of ability, whether it was going up a mountain or on a long hard, cave trip.

Philippe liked to live his adventures to their fullest; accepting all the risks as if they were an important ingredient for a thorough adventure. His remarkable abilities had allowed him to escape a long list of close calls. The canyon trip was a sporting trip consisting of a long series of waterfalls in a vertically-walled canyon. Philippe, who was leading, disappeared from the end of a rope in one of these falls for reasons that are unknown. His two close friends, who were with him, suspected a fatal accident when they failed to find him at the bottom of the waterfall or waiting before the top of the next unrigged falls. They awaited a rescue and the following day Phillipe's body was found.

A memorial service was held on June 5, 1990 in Basel. Philippe worked for many years as a pharmacist in his father's apothecary. The many people who had frequented the apothecary will also miss Phillipe's warmth and deep concern.

For myself, I will sorely miss his radiant personality and caving/climbing comradery. His inspiringly strong spirit will always be with me and I am grateful for the time we shared.

Karlin Meyers

DIRECTORY OF MEXICAN CAVING GROUPS

Compiled by Peter Sprouse

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