

Lechuguilla Cave Newsletter

Issue 3, Winter 2007-2008



Introduction

Paul Burger

Welcome to the Winter, 2007-2008 edition of the Lechuguilla Newsletter. The purpose of this publication is to keep cavers informed about what is going on at the park, particularly Lechuguilla Cave. This year, the surveyed length of the cave went from 120.2 to 123.4 miles and surpassed the Hoeloch system as the world's fifth longest cave. A great deal of work was done to fix survey errors and improve sketches.

This issue, all of the articles were compiled from submitted trip reports. If you would like to contribute material to this newsletter, please send it to Paul Burger at Paul_Burger@nps.gov. Since this is an electronic-only publication (unless you print out your copy), there are no printing costs, so I also welcome color photos, maps, or whatever you may need to enhance your articles.

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Thanks to all of those who have volunteered this year. We appreciate the work all of you do inside and outside of the park to make these expeditions a success. We know it takes a great deal of work to compile leads, identify survey errors, and handle the logistics of running an expedition. All of the proposals were well-written and all of the expeditions produced great results.

Thanks to all of you again, and enjoy the issue.

Lechuguilla General News

Cave and Karst Management Plan

The new Carlsbad Caverns National Park Cave and Karst Management Plan has been approved and is now available.

All Lechuguilla Cavers need to be familiar with Appendix B: guidelines for Entering Lechuguilla Cave, Appendix C: Cave Survey Guidelines, and Appendix D: Inventory Guidelines. You can download a copy from the park at:

<http://www.nps.gov/cave/parkmgmt/planning.htm>

Lechuguilla Quadrangle Maps

The updated quadrangle maps are now available in digital form (PDF format) from the park. Hardcopies produced by LEARN have been printed, and can be obtained from Hazel Barton. For copies of CDs, please contact Stan Allison or Paul Burger.

Lechuguilla 360 CD

Four Chambers Studio in cooperation with the park has produced a CD with 360-degree views of some spectacular places in Lechuguilla. The

CD also includes some maps and textual descriptions of many of the features found in the cave. While it is too late to buy them as Christmas gifts, they make great birthday gifts for those friends and relatives who wonder why you keep crawling around under the New



Group Photo at the Entrance—Photo by Andy Armstrong

Southwest Expedition Report

March 24-31, 2007

Andy Armstrong

Area of the Cave: Deliverance Passage, High Hopes, Tower Place – Underground Atlanta, Lechys Lair, Voids

Expedition Leader: Andy Armstrong

Team: Participants on this expedition were: Andy Armstrong (AZ, sketcher and expedition leader), Peter Bosted (VA, sketcher), Darren Dowler (Australia), Brian Kendrick (NM, sketcher), John Lyles (NM), Paul Mozal (CO), and Larry Shaffer (SD, climber, sketcher). Five of these have been core members of Far West expeditions over the past few years and have worked together in the cave on many occasions. Four of the cavers were on last year's trip that included the discovery of Flatlands. This was Brian and Darren's first trip to the Southwest Branch.

Summary

This expedition was planned and led by Andy Armstrong. The trip was planned around several leads generated on the 2006 Armstrong trip and other leads uncovered in the park files during research. Climbs were a major focus of this expedition. Although we did not break into any significant new areas, many leads were checked and needed resurvey was accomplished. A major connection was made between Flatlands and Lechy's Lair, three lead climbs were completed, and one climb remains a work in progress. New footage was added to the cave length every day of the expedition, culminating in more than a half-mile of survey by week's end. On this expedition, Lechuguilla's surveyed length surpassed that of Holloch in Switzerland. Lechuguilla is now the fifth-longest known cave in the world.

Total Surveyed: 2816.4 feet

Total New Survey: 2167.2 feet

Tie-in Survey: 57.8 feet

Resurvey: 591.4 feet

Detailed Daily Reports

Saturday, March 24

The team entered Lechuguilla at 1300. All were carrying heavy loads due to climbing gear and 630 feet of rope divided among them. At Boulder Falls, they split into two teams.

Team 1

Andy Armstrong, John Lyles, and Paul Mozal proceeded steadily to Big Sky camp and arrived at 1700. Upon arriving, they found the siphon broken at the water source. After some creative engineering, the flow of water was restored.

Team 2

Peter Bosted, Darren Dowler, Brian Kendrick, and Larry Shaffer followed, taking photos along the route, and arrived in camp at 1800. Both teams left all ropes and climbing gear in Chandelier Ballroom.

Sunday, March 25

Team 1

Andy, Peter, and Larry left camp at 0805 headed for Flatlands. They stopped at the rock in Chandelier Ballroom and sorted climbing gear for the day. The objective was a lead in the wall of Anvil Cloud Dome approximately 80 feet off the floor. Arriving at Anvil Cloud Dome, the first order of business was to replace the faulty New England rope there. A “150 foot” rope was brought for this purpose. The rope just barely reached the floor with two wraps around the natural anchor. Anvil Cloud Dome is only 130 feet tall, so the new rope was shorter than advertised. This ended up being true of all the new ropes cut for this expedition. Two rope pads were placed at the Anvil Cloud rig. One is a PVC pad at the top rub, and the other is a wrap-around ballistic pad located five feet lower. The New England rope was cut at the butterfly which left a 120’ and a 30’ New England rope.

The team then traveled to FL34M, the end of Poo Holler, to retrieve the 90’ climbing rope that was left there in May 2006. It was replaced with the 120’ piece of New England. There is approximately 20’ of extra rope here that could be cut and used elsewhere. The 100’ rope at FL34J that was rigged in May 2006 was found



Mold on rope after 10 months exposure in Poo Holler—Photo by Andy Armstrong

to be covered with thick green mold after just ten months of exposure to Poo Holler conditions. It is another case of mold growing on the sizing of a newly manufactured rope.

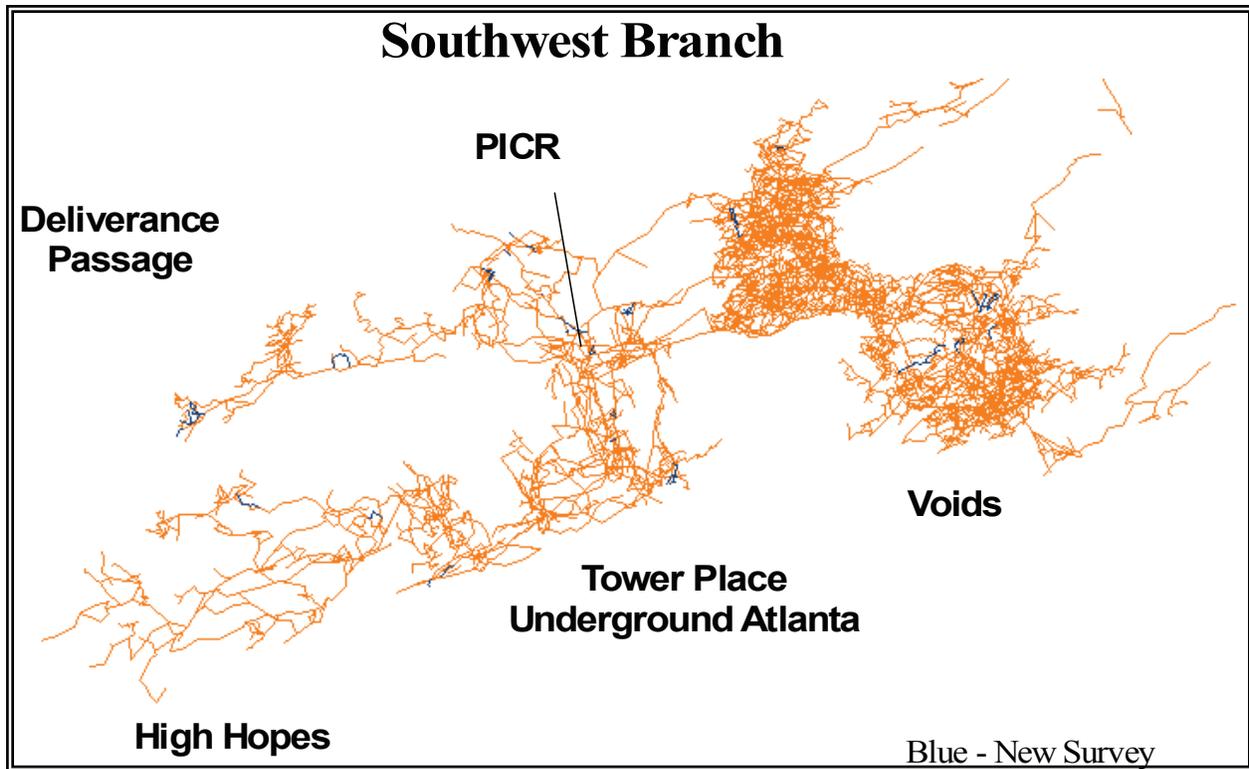
The team then traveled back to Anvil Cloud Dome to begin the climb. Larry rappelled and was able to pendulum over to the FL11 belay ledge to scout the climb. Andy joined him on the ledge. From there, the climb looked possible, but difficult. Then Larry had an idea to belay from above, at the main Anvil Cloud anchor. This idea won out, and both cavers ascended. A belay was set up at the anchor and Larry descended the static rope. Andy belayed from above. Larry was able to pendulum and lasso a knob on the far wall near the lead. He drilled two removable bolts to traverse to the lead. It was climbed using gear but it unfortunately connected back into the dome just below the anchor. During the climb, Peter took 3D photos of the bat skeletons and crinoid stems in the Anvil Room. The team reunited and the climb was surveyed from the top using FL22D-H. The climb was then cleaned and the climbing gear was sorted for the next climb at FL40. The team returned to camp at 2240.

59.4’ New.

Team 2

John, Darren, Brian, and Paul left camp at 0820 for Flatlands. Their mission was to survey side leads of Acid Rain and Powder River that did not require climbing gear. The first lead pushed was FL24J, a high angle fissure above Acid Rain. It was surveyed to a pinch after FL24K-M. They then fixed a blunder by surveying FL29 to FL30, an omitted shot from 2006. This shot is in Dew Point Drop and John was on rope for the shot.

They then surveyed FL45-50 in a lead in the floor of Powder River. This ended at a small window overlook into Prickly Ice Cube Room (PICR). A disto was used to measure down to the floor, 95 feet below. They hung a blue flag



from the window which can be seen from the trail in upper PICR.

The team climbed higher and connected with the 2006 FL34A-E survey knocking off another lead in the process. At FL34C, Paul climbed up into a fissure, and FL51-52 were surveyed to where it became too tight.

Returning to camp, the team rigged a traverse line in Dew Point Drop by pulling up the FL33 rope and rigging it to the other side. They used the same natural anchor as the rappel line at FL29. Both of these ropes remain to allow dropping the pit or crossing it to Powder River. The new traverse saves considerable time crossing Dew Point Drop. The team was in camp by 2200.

165.2' New
8.3' Tie

Monday, March 26

Team 1

Andy, Darren, Paul, and Larry left camp at 1000 for Powder River. The team hauled climbing gear from Anvil Cloud Dome to the climbing lead at FL40. Larry began climb with Paul on belay as Andy and Darren went to survey the remaining horizontal leads in Flatlands. FL23C-E was surveyed up a tight rock flour tube to an end. There was just enough room at the end for Darren to turn around.

The team of two then went to FL34H and surveyed down a sloping fissure to a large window overlooking Prickly Ice Cube Room. The aragonite tree in the entrance of the BIG survey was visible 55 feet away from this window. The lead at FL34I is a wide fissure covered in CR with no floor. This was determined to be too dangerous to survey.

Darren and Andy headed back to FL40. Larry ended the day 90 feet above the belay. The lead had gotten smaller but had airflow and gypsum rims and seemed to be promising. The team returned to camp at 2245.

165.7' New

Team 2

John, Peter, and Brian left camp at 1005 to check leads near the end of Deliverance Passage. They headed to FHC1-7 in the Flour Sifter area. This survey was marked on the quad as “sketch missing.” The team found that some of the inclinations were incorrect, and decided to resurvey the entire passage. Two leads were surveyed; FHC2A dead-ended, and FHC2B-D crossed over the room and tied in. A nearby inclined hole was surveyed using FHC8-10. A tight crawl was discovered on the edge of known cave and was surveyed with FH7FA-D. This ended in a small muddy chamber with a drain hole in the floor that did not go.

They then surveyed a loop through a large side chamber using FHB46B-H to connect FHB46 with FHB44. A side lead was noted at FHB46D that was too small to be entered. This lead had air movement and was seen to continue at least 10 feet.

In the Ainty Room, the team noted several holes in the floor that can not be readily explained. There was a “blow-out” of dirt below each hole, as if they were dug by an animal. Photographs were taken of the one near FHR11. Whether these holes were man-made or were a spring source for up-welling water was unknown. John states that he has not observed holes like this elsewhere in the cave. The Ainty and adjacent Flour Sifter are low points in the Deliverance arm of the cave.

John checked the lead at FHB51F marked “really tight” on the quad. It was impossibly tight and had no airflow. It should be considered too tight and removed from the quad as a lead.

They then started up to K2 to document the “hammer” lead noted by Fortini at FHE96. After the aptly named Mutiny Passage, a tight boneyard crawl, they reached the first rope down and up a pit called San Juan Hill. Not realizing they would need it, the team had left their vertical gear back at FHB47. Without the gear, they were unable to continue up K2. The team returned to camp and arrived at 2345.

267.7' New

178.1' Resurvey



The Friendly Confines of Big Sky Camp—Photo by Andy Armstrong

Tuesday, March 27

Team 1

Peter, Andy, Darren, and John left camp at 1045 for leads in High Hopes. Shangri-La was reached in about 2 hours. They followed the J survey across Conniption Pit to the JZ survey near Aqua Velvet Lake. The JZ survey drops down a free-climbable pit into Caramel Corn Underground. The original notes showed six tight leads in the area between JZ6 and JZ14. This team found the “leads” to be nothing more than alcoves. It was hard to see how any of these places would have been considered leads.

Finding stations JZ21A-C in the cave, and on the used station list, but not on the line plot,



Paul Mozal belaying on the K-22 Paper Jam —
Photo by Andy Armstrong

this short cut-around was resurveyed. Then a lead was located at JZ21 and surveyed with JZ21E-D to a connection with High Hopeless Dome. Caramel Corn Underground should be considered finished, as it has been scoured of all possible leads.

Back in the main J survey, the team noticed a section of big wide pancake passage that had not been surveyed. This was done using J43A-C. This survey tied in at JEE12 which is right at the level where the gypsum snow is dissolved below a former waterline. Above the line is gypsum snow, below is calcified, rafty boneyard. The lower surface of the gypsum is a flat tray right at the former waterline. This situation also exists in the “fissure-pool” near Lake Okeechobee, only a few hundred feet away in the Western Branch. The two passages are remarkably similar in character. According to the line plot, both places look to be at the same elevation, about 740 feet below the entrance.

The quad map was used to navigate to a point directly below Shangri-La, and Andy located a climb up. This “shortcut” turned out to take a lot of time because of route-finding and a steep gypsum climb involving significant exposure. Andy was able to belay Peter up this climb with a length of webbing. Besides being tired, the

rest of the trip back to camp was uneventful. The team arrived at Big Sky at 2345.

182.6' New 33.6' Resurvey

Team 2

Larry, Brian, and Paul left at 1100 to continue the climb at FL40 named “K-22 Paper Jam.” Larry re-racked for the climb up the powdery dome at the top of the previous day’s effort. Meanwhile, Paul and Brian surveyed up to Larry. The climb ended after 15 feet with no sign of further passage. The climb was surveyed and the rope pulled down after rappel.

The team then traveled to Hoodoo Hall to continue Hoodoo Dancers climb begun in 2002 by Allison, Steward, et al. Larry climbed the fixed rope and traversed the ledge system on the right to a large ledge. He then rigged a static rope off of a natural anchor. Larry descended and Paul climbed to ledge. Paul belayed Larry back across the traverse to clean climbing gear. No gear was left. The team intended to return the next morning, so the survey was left for then. The ledge contains large frostwork that was very hard to avoid. The team reached camp at 2330.

60.3' New

Wednesday, March 28

Team 1

Larry, Peter, and John left camp at 1055 for Hoodoo Hall. Larry re-rigged the climb while Peter and John attempted to repair a survey blunder in Hoodoo Hall. Peter and John ascended and three dead-end passages were surveyed. Peter belayed Larry across ceiling of dome to check a lead that was a no-go. It was surveyed and Larry traversed back across, cleaning all gear. Leads were surveyed using FHU10-17. The team descended and Larry derigged static rope. Larry did a pull-down rappel leaving a small piece of 1” webbing and a stainless steel screw link.

At 1800, the team went to Shelob's Lair to re-sketch FG34-38, noted as missing from Park files. Only FG35 could be located, so the line plot was used to rebuild station positions for re-sketch. The line plot that Andy had provided them was at 66' to the inch. The task might have been easier with a 50' to the inch plot. The recreated stations were not flagged. There is possibly one lead left in the final room, but extremely delicate gypsum beards and hair block the way. The area is probably best avoided. The re-sketch was finished at 1945. The team carried two 90' static ropes back to the Chandelier Ballroom and reached camp at 2150.

159.5' New

Team 2

Andy, Darren, Brian, and Paul left Big Sky at 1100 and went to the Voids hoping to pick up some new footage. The objectives were several leads left in 1998 by Rod Horrocks. While route-finding on the way to FQ23, Brian slipped in a sloping chimney and fell approximately six feet. He arrested his fall by grabbing a bedrock bridge with both hands and hung there swinging. If he had not found purchase on the bridge, he would have fallen another 15 feet.

After this close call, the team located FQ23 and began to survey. A tie-in to FNE8 was reached after FQ23A-E. Several of these shots may have been redundant, Andy will check with Stan and a line plot after the data is entered. FQ23E-L took the team through unsurveyed but scooped passage up into FNE17. FQ23M-V were through virgin crawls and climbs named "Grandpa's Pleasure Palace" until a tie-in was reached with FPX5. FQ23N-Z led through tight crawls and tied into FNE7. The team returned to camp at 2130.

323.7' New

18.8' Tie

Thursday, March 29

Team 1

John, Peter, Brian, and Larry left camp at 1045 and headed to Tower Place. The team changed into aquasocks and clean clothes at the bottom of the slope leading up to Tower Place. Dirty gear had to be brought across in bags for exploring the leads on the other side. At the top of the slope, a washbasin was encountered. This was used to clean aquasocks, knees, elbows, and hands. The team examined the known leads at the lower end of the room. A polyethylene sheet was placed on the flowstone floor at the transition from clean to dirty clothing. The lead marked on the quad as L4 was upslope of a pool on the northern side of the room. This lead was unattractive, in that it appeared to be in rock flour, over a slope leading down to the pool. To examine this lead would require a tarp under the incline, with the edges held tight and the lower side buried to prevent rock flour from falling into the pool. The lead would be nearly impossible to do without impacting the pool, so it was left undone. It might be appropriate to mark it as too delicate on the map.

L5 was 12' high on the south wall, further down slope in the room. It requires a method to thread a rope through an eye to safely pull up and get down from this overhung climb. A collapsible tent pole might work to "thread the needle" here.

Below this lead was another unmarked lead, a crawl that was surveyed using FLVV45-47 and tied into FLVT8. It became too tight, after a short crawl in rock flour that had a sharp bend. Upslope of this lead on the south wall was a separate flake of the wall that had flowstone behind it. Larry observed that it had a small dry pool basin that was better left alone due to nearby rock flour.

Finally, a lead out on the flowstone slope was found. This ducked under a lip into a small

alcove. A tarp was placed at the entrance so appropriate attire could be donned, and the team surveyed FLVV40-44 from FLVV11. It was decorated with chenille spar and flowstone. The native rock is breccia. At FLVV44, the crawl ended.

At 1800, the team departed for Lechy's Lair, via Chasm Drop. The Chasm Drop rope was replaced, as it was in terrible condition. The rope had a bad spot with a butterfly knot, was extremely gritty, and had a fuzzy, swollen sheath as noted by Andy's team in 2006, and Fortini's team in 2005. A new 70' piece of PMI 11mm was installed to the intermediate fissure level at FLWE4 without continuing down to Chicken Little as the original rope used to do. At a rope hanging near the Ant Lion Hall, the team worked on a blundered vertical loop which Peter had notes for. Several shots were retaken and several stations added to fix the blunder. Peter will determine if more work needs to be done to correct the problem.

The rope from KE4X-KE4Y is tied to the next rope leading up to KE15. A note at the silt pile says "grapple hook is set right at lip, has held body weight, did not complete climb," with an additional note, "this note applies to the rope above, not this rope (climb at KE16)." The team climbed up to KE15 at the attic level of Lechy's Lair in this area, to find another note that the grapple hook rope is rigged above KE16 to a high lead marked L8. It appears to be approximately 20 feet up, in a nearly vertical boneyard tube with a few holds. Bolts would probably be needed to safely continue this climb.

The quad map shows the lead climb incorrectly connected to the lower passage near KE6, when it is in reality connected above the intersection at KE16. The rigging here is bomber, with a large natural anchor at a column of bedrock.

The lead marked L10? HIGH was found to be no lead. The lead marked L9 was surveyed from

KE31 to a pinch using KE31A-B, in a gypsum tube. Additional scooped passage was noted in the tube leading to KE27, in a right branch that is not shown on the quad. This should be surveyed on a subsequent trip.

While at KE4X, Peter made voice contact with Andy's team on the other side of Ant Lion Hall. John's team returned to camp at 0015 Friday. The old Chasm Drop rope was left in Big Sky Camp to be cut up and used as handline or hauled out of the cave.

94.6' New 126' Resurvey

Team 2

Andy, Darren, and Paul left camp at 1100 for Tower Place. Once there, it was quickly determined by Larry on the other team that there was not enough work in Tower Place for two survey teams.

Andy's team left after a few photos. They then went to the Crystal Rain Passage above the Bridge Room on the other side of Underground Atlanta. The leads at FLW42-43 were determined to be six foot extensions along the joint in the passage bends. The end of both could be seen from the previous stations and so were not surveyed.



Impacts on white flowstone in Bridge Room —
Photo by Andy Armstrong

Back in the Bridge Room, the team photo-documented impact to white flowstone. Someone has been very careless here and tracked CR mud all over the flowstone.

The leads at FLW19 were surveyed. The first one generated FLW69-71 in promising passage that soon became too delicate. Any further travel into this lead would wreck the white flowstone with brown CR tracks. There were also small pools observed to be farther down the passage.

They then returned to FLW19 and surveyed FLW72-79. This was down a tight tube, then through tight crawls into a large chamber. This led upwards toward Bridge Room. The survey was ended before it became redundant with the lower-numbered FLW shots above.

Back at FLW76, FLW80-83 was surveyed west through virgin crawls to a low room. Here again, the team was stopped by pools. There were five small pools containing a couple of gallons of water each. While the team could have carefully crawled above the pools without getting wet, they were unclear whether this would be considered a pool crossing by the Park and so did not continue. FLW83 was shot as a virtual station across the pools but the team did not physically cross the water. Beyond the pools, the passage appeared to drop down a small pit and continue.

The team left Underground Atlanta at approximately 1945. On the way down the lower UA rope, a new rope pad was hung at the upper rub point.

The team then headed to Lechy's Lair to attempt a connection with Poo Holler in Flatlands. The possible connection was noticed by Andy while studying line plots before the expedition. Station K16 in Lechy's Lair was found to be nearly above FL34M, a big climbing lead at the end of Poo Holler. K16 was researched and found to be a pit lead left

over from 1989. The notes described it as a 20'-40' pit into a NW-SE trending passage. It seemed that the team could rappel into Poo Holler from there.

The team picked up a 90' rope at the Lechy's Lair turnoff in See Saw Canyon that had been left there for this purpose earlier in the day. When the team reached the Black Hole in Lechy's Lair, they made a voice/light connection with Peter from the other team in the KE survey. He was across the Ant Lion Pits from the Black Hole. Andy's team measured the rope at K5 for the rope log and proceeded to K15. Here they were stopped by an exposed climb-down until Andy located a rig point just at the lip.

The 90 foot rope was rigged here and Andy descended to K16. At K16, he found two pits. Andy continued down the rope through heavy CR until he recognized the Poo Holler ropes below. He then ascended and the team surveyed K16-FL34N-FL34M, connecting Flatlands with Lechy's Lair.

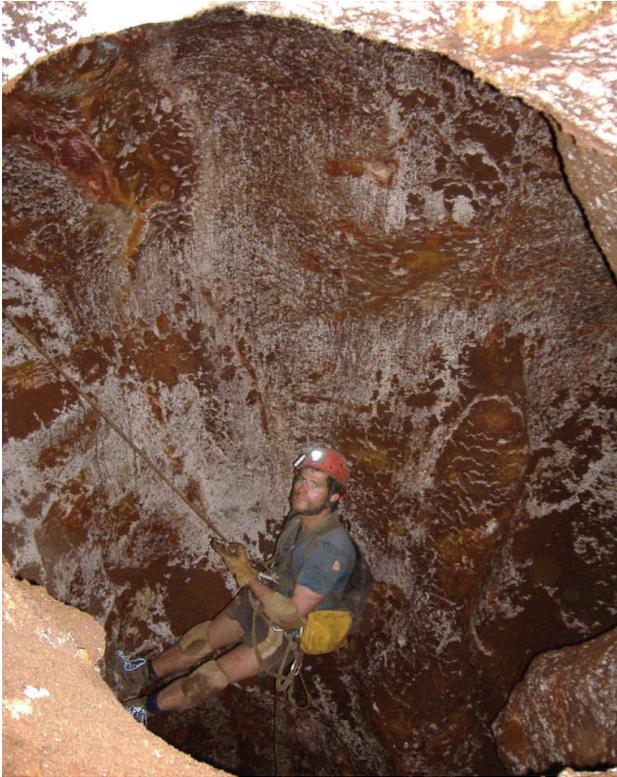
This creates one of the larger loops in the Southwest and creates another connection between SOUTH and FARSOUTH in the COMPASS data file. It is also interesting that the K16 lead had been known for 18 years. If anyone had rappelled this pit, they could have discovered the entirety of Flatlands from the top. The team returned to camp at 0030 Friday.

226.1' New

Friday, March 30

Team1

John, Darren, and Brian left camp at 1130 to pursue more leads in the Voids. Finding the lead at FQ36 was made difficult as the tie-in FQ26 was labeled FQ26! in the cave and the shot from FQ29-30 is incorrect. The inclination should be reversed from -27.5 to +27.5 degrees.



Paul Mozal rappelling Lechy's Lair/Poo Holler connection pit—Photo by Andy Armstrong

Once FQ36 was located, the lead was determined to be nothing but a connection to another survey close by. The team downclimbed FNNY3 to follow this survey over to FQ59. This was not a viable lead either.

The room beyond it is the same room in which Andrich, John, and Paul worked on the 2006 Armstrong expedition, down slope from the Sulfur Room. Brian located a tight virgin tube to survey FOB1-5, which dropped back to FQ36 again!

Searching around back in the large room, John located three holes in the floor near FQ70 to be surveyed. Two of these were in breakdown and one a vertical boneyard tube at least 20 feet deep. A balcony above has a climbing lead straight up. Paul attempted to solo this climb in 2006, but returned when it became too hairy. It appeared to end, but a more technical climb could prove otherwise.

After so many no-go leads in the FQ, the team went to two leads in the FNN that remained from last year's work in the area. Lead #1 at FNN27 led to a tight downgoing tube, surveyed as FNN36-44. At FNN39 only two of the team could squeeze past, so John continued setting stations ahead until reaching a hole which dropped out into the main room again, above FQ70. This was an unmarked lead, not seen by the 1998 team above their station. Brian went out of FNN and came around to complete the sketch from FNN39 to FNN44 to tie into FQ70, passing FQ73.

At lead#3, near FNN31, only three additional stations could be shot with FNN45-47 before becoming too tight. Searching around the FNN31 station, two additional unmarked leads were pushed, one heading NE to a constriction in rafts, surveyed as FNN48-53. The other went WSW and was significantly longer.

The survey continued with FNN54-65, where it emerged through a very tight boneyard into a room at FNTX6. This ended the FNN-RNN (pronounced FUN RUN) as this late night Friday escapade was named.

Additional unmarked leads were noted in this room, so lead tapes were applied. The route out of this was direct to the Sulfur Room, near the corner (FNTX2) where John had misplaced his gloves in 2006. This appears to be the best area to continue finding virgin passage, away from the remaining FQ survey leads that the team had originally intended to survey.

John knew a shortcut to the packs that were left back at FNN31. He proceeded through the "guillotine" passage, near FNN35 and retrieved the gear, just as the loose chockstones moved again. The team returned to camp from the Sulfur Room and arrived at 0100 Saturday.

**365.9' New
30.7' Tie**

Team 2

Andy, Peter, Paul, and Larry left camp at 1155 and traveled to Chandelier Ballroom. There they picked up climbing gear and a 90' rope. They then went to FJ15 in Chandelier Maze via Land of Awes.

To get Larry onto a overhanging ledge to begin climb, Andy threw the static rope over a knob on the ledge. In the process, a loop of rope grabbed a football-sized rock and flung it off the ledge. The rope and rock fell 10 feet to the ground and the impact cut the sheath down to the core. The bad spot was taken out with a butterfly knot. Then the rope was secured over the ledge without further incident.

Larry ascended and began the climb. Paul and Peter headed off into the Maze to do blunder checks. They found three blunders, replaced stations that had fallen and set a new station at FKJ7Z to replace the impossible one at FKJ7B.

Larry ascended the dome at FJ15 using some gear and multiple removable bolts, and three stainless permanent bolts. After nine hours on lead, Larry reached a ledge. Here he fixed an anchor and rigged the static line. At the top, a 12'x 20' lead continues upward in a fissure. It remains as the only significant lead generated by this expedition.

The climb was surveyed by the reunited team with FJB1-4. The team returned to Chandelier Ballroom, where climbing gear was divvied into equal portions for the trip out of the cave. Hoping that the climb is the obstacle that is guarding the exit to the Maze, it was named Minotaur. The team reached camp at 0045 Saturday.

**96.5' New
253.7' Resurvey**



Larry Shaffer climbing the Minotaur—Photo by Andy Armstrong

Saturday, March 31

Team 1

John, Peter, Paul, and Larry left camp at 1130 and reached the surface by 1515. Both teams picked up climbing gear at the Chandelier Ballroom and reached the airlock without incident.

Team 2

Andy, Darren, and Brian left camp at 1200 and reached the surface at 1600. By the time that Andy's team reached the airlock, the cave was breathing out forcefully. As the inner door was only held by bungee cords, it made for some interesting maneuvers when the outer door was opened.

Acknowledgements

I would like to thank the following people for helping to make this expedition a success:

The team; Peter Bosted, Darren Dowler, Brian Kendrick, John Lyles, Paul Mozal, and Larry Shaffer -- for lots of hard work in demanding situations throughout the week.

Peter Bosted – for supplying blunder lists that were helpful in locating resurvey tasks

Bonny Armstrong– for helping me to prepare this report.

The Cave Resource staff at Carlsbad Caverns National Park – including Dale Pate, Stan Allison, Paul Burger, and Tom Bemis – for providing leads, data, equipment, support, and permission to field this expedition.

Chandelier Graveyard

May 6 – 12, 2007

Hazel Barton

Area of Cave: Near (Deep Secrets and Three Amigos) and Far West (Western Borehole and Chandelier Graveyard)

Expedition Leaders: Hazel A. Barton and Vivian Loftin

Trip Participants: Hazel Barton, Andrea Croskrey, Jennifer Foote, Pat Kambesis, Johanna Kovarik, Chris Krejca, Jean Krejca, Vivian Loftin, Pat Seiser, Carol Vesely and Elizabeth Winkler

Total Volunteer Hours in Cave: 1641.75

Summary

The goal of this expedition was to work toward resurveying problem areas associated with the Chandelier Graveyard and Deep Secrets quads. As the quads become more complete, many of the outstanding leads are climbing leads, so a

dedicated climbing team was assembled to push these climbs. Once again we were able to make considerable progress toward completing these goals, including finishing a significant bolt climb within the Western Borehole above the EJJ survey. The survey totals for the expedition are as follows:

New survey: 2,286.75 feet

Resurvey: 3,638.60 feet

Total survey: 5,925.40 feet

The cartographer was beginning to think that only one or two more expeditions would be necessary to complete this quad; however, the complexity of the Escher Underground and EYEK mazes have reduced the chances of that. Within the Deep Seas quad, while only a few of the aims were completed, one of these was several thousand feet of the borehole from the bottom of the Great White Way to the Fortress of Chaos. Also the Deep Seas cartographer dedicated 3 days to a climb in the Chandelier Graveyard quad.

Expedition Overview

Once again we assembled a phenomenal team with significant talents in sketching, survey and show tunes. We were even treated to an underground Yoga session to limber up after the long haul into the cave. On the first day, the group broke up into three teams (one team of 3, two teams of 4), entered the cave and made it to camp without incident. Due to an early arrival, teams 1 and 2 were able to get a start on some of the minor aims close to camp.

The final team arrived in the evening due to the potential illness of one member earlier in the day. That person recovered and felt strong enough to enter the cave, making it to camp without any problems.

Throughout the course of the week, teams were sent to different destinations associated with the expedition goals. On the first day, the teams stayed relatively close to camp (ABCs Room,

Fortress of Chaos), with the climbing team working on leads near the EJJ survey.

On the second day a team went to push the Tiger's Den 'hot' lead, only to have it pinch out immediately. The team was then able to finish up the much needed EGH survey, which tied into the more complex EGD Maze. Hopefully this start will allow much of the maze to be tied together while the remainder of the expedition went to work on the Ph.D. Room area.

On Wednesday and for the remainder of the expedition, one team worked on the bolt-climb above the EJJ survey, which they successfully entered and found a 200 foot long canyon passage with no leads. Another team began work on the EYEK survey, which appears to have numerous leads heading off of it, while the other team continued to resurvey beyond the Fortress of Chaos toward the Great White Way.

On Thursday, one team returned to push leads below the Ph.D. Room, as identified by Stan Allison, finishing up this area and allowing completion of the quad, while the other spent the remainder of the week working on the Escher Underground Maze area, which is far more complicated than probably anyone has realized.

The final team spent Friday finishing the re-sketch from the Fortress of Chaos to the bottom of the Great White Way (requiring a tremendous amount of work). All teams exited the cave on Saturday without incident, other than managing to bunch up at the bottom of Boulder Falls to the point of one expedition member waiting 1 hour and 50 minutes to exit.

Detailed Daily Reports

Sunday, May 6th 2007

Team 1 – Vivian, Jean and Chris.

The team were the first in the cave and rigged the entrance drop, although they forgot to

write-up a sign-in sheet, which Team 3 were able to complete for everyone on entering the cave. The team did notice (as all other teams did) that the flagging from the entrance to the top of Boulder Falls is starting to show considerable signs of wear – to the point of directing cavers less familiar with the cave to the wrong passages. The team got to camp at about 1:30 PM and had some lunch while the other team arrived. Vivian took some time to show the second team where to begin surveying before leading Team 1 to assess three climbing leads.

The team began with a balcony at EY36. Jean was able to scramble up the initial ramp without assistance. Further up however it became a more exposed traverse, which the team decided needed to be rigged with protection.

The team then went on to assess the climbing lead above the EJJ survey (the roped traverse in the W/Borehole). The team decided that the climb was extremely overhung and was somewhat overwhelmed with it, even though it was one of the leads that had always appeared the most promising.

Most of the climb was coated in secondary deposits and while the rock underneath looked solid, it was possible that it was fractured in places. The dome lead only looked good from certain angles, so the team decided that this should probably be pushed last, if at all, during the expedition.

Finally the team went to check a lead at EC54, where there was a hole that required a bit of a climb to get to. Jean was able to climb over to the hole and quickly determined that it became a technical climb; however, she was also able to determine that the climb probably tied into known cave above and the decision was made to try and find the lead from above, rather than attempt the lead climb from below.

Jean did notice a bat skeleton in the lead that appeared to have been disturbed previously, suggesting the lead was not virgin. The team returned to camp by 6:45 PM.

Team 2 – Carol, Johanna, Jennifer and Andrea.

The team arrived early enough at camp to do some survey. The team began with a resurvey of ECG4 relatively close to camp, completing this survey and identifying three new side passages. The shortest of these passages contained a small raftcone-floored chamber. The second led to a fissure climb that opened up into a belly crawl. The belly crawl itself appeared to open up, but was much too tight for even the small bodied people on this team.

When they headed back along the main trail to ECG4, they were able to climb up and see the other side of this squeeze, solving the mystery of where it went.

The third lead they found spiraled down to a low, wide calcite-raft floored room. At the far end of the room the team was able to see the calcite-raft slope heading back up to camp. The team then headed home for the night.

Monday May 7th 2007

Team 1 – Vivian, Jean and Chris.

The team returned to the traverse near EY36 and headed up the ramp to begin the climb. The team set up a belay at the top of the ramp using cams to protect members as they crossed the narrow, gypsum covered traverse. Vivian went across first and found one set of footprints and a cairn, which was not visible from the room below, suggesting that someone had been there already, although the lead remained unsurveyed.

Vivian then tied off the belay rope to set up a traverse line, which Jean and Chris clipped into to come across so that the team could survey in the climb. After surveying about 50 feet of the traverse into a couple of domes that didn't go,

the team de-rigged the traverse and left it clean. After the first climb, the team headed back over to the climb at EC54.

As predicted, the team was able to find a bypass to the climb from above in the ECD survey. Nonetheless, as the team surveyed through the climb, Jean was able to free climb it just for fun. Ending the survey early, the team headed back to camp and made a survey of the camp sites as requested by the Park.

Team 2 – Carol, Johanna, Jennifer and Pat K.

The team headed out to the ABCs Room, where they surveyed a 16-foot-deep pit lead, which ended fairly quickly. The team then headed back to the survey near camp they had done the day before and finished up surveying these leads.

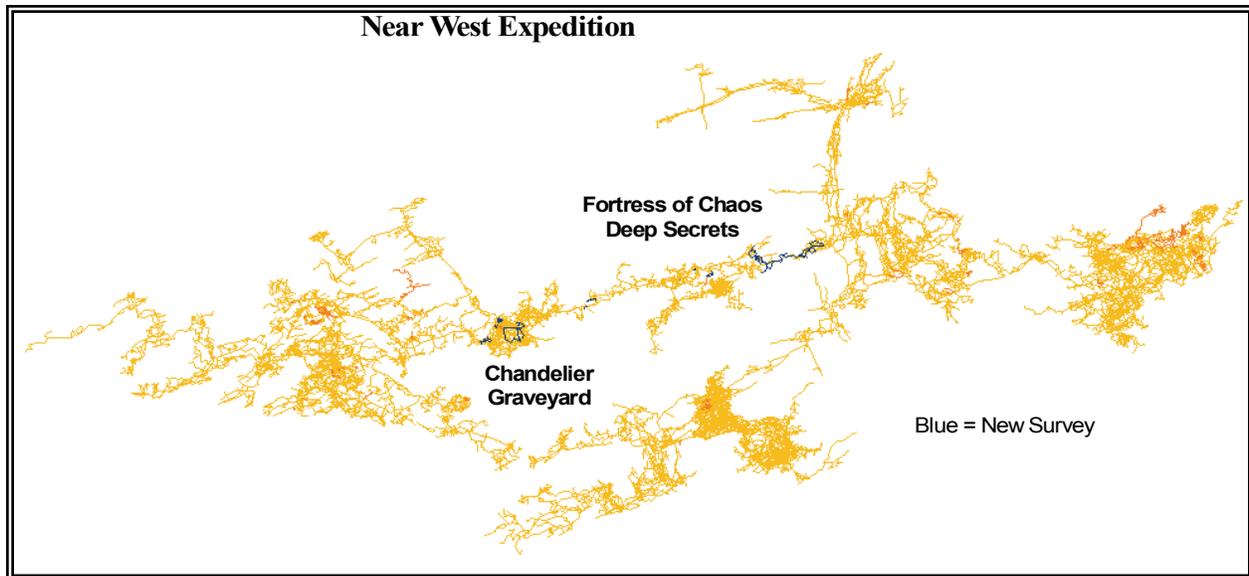
Team 3 – Hazel, Elizabeth, Pat S. and Andrea.

Given the late arrival to camp the night before, the team elected to work on some of Vivian quad tasks closer to camp, rather than heading out to the Chandelier Graveyard area.

The team began surveying the borehole from Fortress of Chaos heading toward the Great White Way. The team began the survey at ECL22, which was the limit of the 2005 Expedition. The original survey of this area did not take into account that the room was split into two levels by a breakdown pile and no record existed of the upper level, so we began surveying over the top.

Using this route, the team was able to tie into the ECA2 survey, which headed off down some steep pits. They then found another deep pit in the floor, which went about 70'. Andrea was able to head back down the survey, climb around and get down to a station in the bottom of this pit, ECL13, which was tied in.

A corrosion residue line was observed above ECLA2, which made a distinct band ~10' wide, a few mm deep and traversed the back wall of



the room.

In the middle of the Fortress of Chaos Room, Andrea found another pit, which she climbed down to an overhanging climb. The team was able to access the bottom of the climb from EC31 using a canyon that had been scooped, but not surveyed. The team surveyed the canyon and up the overhanging pit, connecting to EC3B and EC35C.

This canyon appears to be a continuation of a joint that the main route uses to traverse much of this part of the cave. The team did notice a lead in the ceiling at EC31 that looks good but appears to have been scooped as they continued the survey down the canyon to EC28. The leads here were delicate, requiring aquasocks and clean clothes, and headed out in many directions. The decision was made to finish for the day at this point.

Tuesday May 8th 2007

Team 1 – Hazel, Pat S., Vivian and Chris.

The team went to the much anticipated lead at EGHA2R in the Tiger’s Den. The team made it to the lead without any problems, despite wearing vertical gear and hauling ropes through the Tiger’s Teeth and rigged the rope using natural anchors. A rope pad was needed on the

sharp edge.

Vivian was the first down and the lack of noise as she descended indicated to the rest of the team that the long-awaited breakthrough had not been made; the lead ended just beyond what was observable from the top of the pit, in a room about 15` by 20`.

The walls of the room had been obscured from the top of the pit, making it impossible to determine its extent prior to dropping the pit. The bottom of the room contained numerous small pits and fissures, suggesting that this was an area where water entered the cave as some point in the past. Many of these small holes still blew air, suggesting that there was more cave below, but all the leads were too tight to continue.

The room itself was heavily coated with calcite and manganese, looking a lot like the King’s Solomon’s Mine area. The team surveyed the room and removed the rigging – no leads are left in that area.

The team retreated and decided to complete some of the remaining tasks in the Eiger Sanctum area, including checking the leads at EGD47 (which did not go) and EG4D (did go for a small distance and contains rillenkarn). We

then completed a re-sketch along the EGH survey, from EGH1-10. This area is part of the EGD Maze area and tied into both the EGD and EGO surveys on numerous occasions, which is not obvious in the original notes for this area.

All open leads noted on the original survey notes tied back into known survey and no leads were left.

Team 2 – Jean, Johanna and Carol.

This team headed to the Ph.D. Room to survey the pit leads off of the room and check the condition of the ropes along the EJ survey heading out the bottom of the room. Then the team pushed the pit lead identified at EYFY17. The lead was surveyed down through a tight climb and into a small gypsum-filled room. There was one small lead that was too tight, so after surveying the room, they retreated the back way they had entered.

Team 3 – Pat K., Jennifer, Andrea and Elizabeth.

The team headed to the Ph.D. Room to remap the main area and put down a main, double-flagged route to protect the corrosion residues in this area. The team began with a perimeter survey (the room is ~320' long and ~120' wide). The balcony had previously been mapped and the team concentrated on the main area.

A request had been made by Penny Boston to map the endellite in this room and the team did discover a significant amount, but much of it looked as though it had been tracked through the room on boots. While the team was not able to effectively map the locations of endellite in the room, they were able to record its distribution on the inventory sheets. The team completed the main room survey, noting that there were many holes below the breakdown that were not pushed and headed back to camp.
Wednesday May 9th 2007

Team 1 – Vivian, Jean and Chris.

This was the first day of a three day aid climb up to an alcove above the handline traverse/EJJ survey in the Western Borehole (Manifest Destiny Quad). The team flagged an area for a belay station and approach to the climb to minimize impact on the gypsum floor and during the day put in 8 removable bolts and managed to get about 25 feet off the floor.

The team also used Metolius cams, tri-cams, and hooks in addition to the removable bolts. During the climb, Jean took a fall when a newly placed nut pulled out, but was caught by excellent belaying (Chris) and a 1/4" removable bolt. Chris took a short fall at ground level while practicing with the removable bolts. All team members climbed and belayed during the day.

Team 2 – Carol, Pat S., Johanna and Andrea.

The team headed up to the Chandelier Graveyard and the omnipresent EYEK survey. The aim for the team was to head down the main route of the survey, mopping up leads as they went. At EYEK3, multiple leads headed off into boneyard, so the team split into two smaller teams to mop these up. Carol and Andrea surveyed a tight gypsum crawl that spiraled up past several other tight boneyard loops and a tight hole that probably overlooked the main passage. Several small boneyard leads were left.

Meanwhile, Johanna and Pat S. began working on a slightly larger boneyard lead that tied into EYEC14. Eventually the two teams rejoined and continued surveying down through a slightly larger boneyard lead, until they came out on a gypsum ledge overlooking the main room (EYE survey). The boneyard loop was tied into the survey through the main room, but it was impossible to climb down from the ledge, so the team back-tracked along their original route and headed back to camp.

Team 3 – Hazel, Pat K., Elizabeth and Jennifer.

The team began surveying from where the

previous team had stopped on Monday at EC28. The team mapped the NE side passage off of the main route (through the borehole). This is a boots off and clean clothes area, with significant popcorn, mammillaries and a nice pool. At the edge of the pool is an old Mallory science station (dated 1/11/94). The passage continued into a tight, mammillary-lined passage that ended.

We then returned to the main route and headed off another delicate, boots off, clean clothes lead to the SW. There were a number of pools in this area and Hazel noticed a number of 'floaties' within these pools that are reminiscent of those in the pink-dot pool. It appears that some of these floaties have formed on piece of hair floating in the pool at impact study site EC27A3 – perhaps left by the person carrying out the study.

We then headed down a steep, mammillary-lined slope (~60°) that required a handline. This area is delicate, with a lot of aragonite bushes, so it took a while to figure out how to tie the handline without impacting the area. We surveyed down the slope (~70 feet) to another mammillary-lined room that contained a pool. Jennifer noticed a number of purple dots in this area, which Hazel recognized as similar to those seen in Wind/Hicks Cave (which is about 10 miles outside of the Park, towards Carlsbad). There were a significant number of these dots and at some point someone needs to figure out what they are.

The team continued to work along the main route, mopping up side passages and alcoves. The whole area should be considered boots off and much of it requires clean clothes.

The team continued to work towards the Deep Secrets area, ending on the edge of a large rock that overlooks the main trail and the old drinking pool.

Thursday May 10th 2007

Team 1 – Vivian, Jean and Carol.

The team continued with day two of their three day climb. Jean and Vivian alternated on lead, first by ascending up to the highest piece and then placing several pieces higher, before descending. At the end of the day, Jean reached the lower lip of the objective hole and placed a 1/2" removable bolt. At this point it was apparent that the climb would need to continue to the upper hole as this lower tube was filled with breakdown. Again, 1/4" and 1/2" removable bolts, cams, friends and hooks were used throughout the climb. Carol did an excellent job of belaying throughout the day.

Team 2 – Hazel, Johanna and Pat S.

Originally this had been a four member team, but Elizabeth felt ill leaving camp in the morning and by the time she reached Lake Louise, decided that she wouldn't be up for a full day of survey. Elizabeth returned to camp and spent the day working on re-flagging and fixing the trail directly around camp – this was a vast improvement on the previous condition of the flagging in this area.

The remaining team headed to the Chandelier Graveyard and rather than using the main rope, headed up the EU ropes, resurveying as they went. The resurvey itself proved to be quite challenging, as the previous surveyors had either placed impossible to reach stations or made impossible shots. Using EY56, we located EYDB1 and EU1 (the Aruigia survey software on a palm pilot made this possible).

The pre-rigged ropes were used, all of which had questionable 'over-hand' knots and no back-up. At EYDB1 we realized that the original shot to EU1 was not a true +90° shot, so set an intermediate station at EU1A. EU2 could not be recovered, and we inadvertently created an awkward station, which made it difficult to survey the remainder of the room and made tie-ins difficult.

We continued up the EU survey and realized that many of the marked leads were already

surveyed or had been scooped. Many of the scooped leads tied back in to known survey, but had been marked as leads (lots of blue and white striped flagging dated 10/29/92).

In one scooped passage we began the EUG survey and came out at two windows overlooking the Western Borehole. We dropped some flagging out of this window and later recovered it just off the main Borehole trail, at EY56. Once we figured out where to look, it became obvious that there were a number of windows in the ceiling that had been obscured by gypsum.

We surveyed as far as EU6 (for a whole day of survey!), at the bottom of one of the rope climbs with a small lead yet to survey.

Team 3 – Pat K., Andrea, Chris and Jennifer.

The team returned to the Ph.D. Room area to mop up a couple of leads that Stan had identified when he was in the area re-rigging the Ph.D. Room climb. The aim for the day was to resurvey and push the boneyard and fissure leads at EY56. The team surveyed in the fissure and room just below the first re-belay to the Ph.D. Room and noticed a lot of loose rock in the area.

The team then continued surveying down to the third rope from the top and into a boneyard maze NW of the rope series. The maze contained small boneyard passages that either got too small or were interconnected. The passages were well decorated with nailhead calcite spar and aragonite, so the survey team did not push into many of these delicate leads. Nonetheless, there was good air in these passages and the team left the leads on the assumption that the air was coming from the Ph.D. Room.

Friday May 11th 2007

Team 1 – Vivian, Chris and Jean.

This was the third and final day of the aid-climb above the Borehole. Vivian ascended up the climbing rope to the 1/2" removable bolt set by Jean the previous day, Vivian then belayed from the top as Jean cleaned the lower parts of the climb, essentially re-climbing the entire thing in the process. Then Chris belayed as Vivian continued the climb up to the high hole, finally achieving the objective of a 5' x 7' diameter tube twisting upward and out of sight from the main Borehole trail.

From here it was clear that the passage did continue up through breakdown into blackness. Vivian set up a good anchor and attached a static rope allowing the others to ascend into the lead, All waited in order to explore the find together. The tube went up through breakdown and then popped up into the bottom of a room filled with loose spar and a nice nautiloid-type fossil. Unfortunately, despite about 200 feet of passage, no leads headed off this room, which was named the Roofus Room.

The team descended on a 70' rope rigged to a 7/8" removable bolt, two tri-cams and two slings. The rope hangs directly onto the main Borehole trail. No other hardware was left behind on the climb. The team also cleaned up the flagging for the belay and access route, then fluffed the trail, leaving little evidence of the climbing activities.

Team 2 – Hazel, Carol, Andrea and Jennifer.

This team returned to the EU rope series to continue the resurvey and clean-up of leads in the area from the previous day. After limited discussion and finding that the longest of the ropes in the area was also tied with an overhand knot, the team retied all the ropes through the EU series. Doing this shortened many of them, which were already rather short (it looked as though the team that rigged it was trying to save rope by cutting ALL excess rope off of the ends, leaving nasty fraying and requiring a lot of downclimbs).

The team continued to mop-up leads between EU5 and EU6, tying into the EUE (EUE8), EUD, EYDB and EUB surveys. This undoubtedly has generated a whole bunch of loops and loop errors, but will help the cartographer figure out the complexity of this area for mapping.

As we continued up the ropes, the team found another EUE8 station near EU7 (and labeled as EUE8' on the sketch) adding to the immense confusion of the Escher Underground Maze.

Again, many of the original EU stations created impossible shots, so we created a number of intermediate stations again, resulting in a lot of confusing data entry in the area – for example, EUB4 and EUD4 are very close together. The big rift identified in the original notes at EU10 is actually the ceiling of the EU7 room.

There actually may be a couple of interesting leads off of this ceiling, although it may be part of the EYEK complex and would be a technical climb to reach it.

If EYEK does not tie into the passage here, it would be worth taking a look at, given the amount of unknown passage up to the Ph.D. Room in this area. The most exciting discovery of the day were the corrosion residues above EU6, which appear to follow the flow of the calcite matrix. This will warrant it's own research trip!

Team 3 – Pat K., Pat S., Elizabeth and Johanna.

The team continued to resurvey the main route through the Borehole up to the bottom of the Great White Way, beginning at EC26K. The team started another survey (EC20A-D) to clean up a lead, which became too delicate with pristine flowstone. The team backed off from this route and found an alternate way up, connecting in to finish the survey of a balcony.

As they continued toward the Great White

Way, the team surveyed another balcony below the EC20A-D series and noticed a number of ceiling leads, which were assessed by the climbing team en route to camp on the first day.

Saturday May 12th 2007

Team 1 – Vivian, Jean and Chris.

Ever the team player, Vivian and crew remained at camp to map out the camping spots for Stan and give the other teams time to move past some of the obstacles en route to the entrance.

The survey/sketch of camp was completed and flagging was used to better define the boundaries of each sleeping spot. The team then combed the camp area to pick up hair and other detritus, before heading out to the entrance without incident.



Near East Expedition

June 2–9, 2007

Mark Andrich

Expedition Leaders:

Mark Andrich/Doug Warner

Team Members:

Mark Andrich, Expedition Co-leader, Sketcher
Doug Warner, Expedition Co-leader, Sketcher
Joe Sikorski, Lech Experienced, Sketcher
Mike Bennett, Lech experienced
Dan Lamping, New, Sketcher
Daryl Greaser, New

Summary

Once again six cavers descended on Carlsbad Caverns National Park to further explore the depths of Lechuguilla cave in early June 2007, continuing the goal of defining the complicated web of the lower Near East section of the cave.

We had several primary goals, including resurvey, resketch, lead checking, and blunder repair. Much of this work continues from our October 2006 expedition. In addition to research done from previous trip reports and sketches, we continue to incorporate tasks and leads from primary cartographer Rod Horrocks and blunder lists assembled by Peter Bosted.

Detailed Daily Reports

Prior to entering the cave on Saturday June 2, Doug, Mark and Dan arrived Thursday to take care of last minute administrative details in the Cave Resources Office on Friday. We copied sketches and surveys we did not already have, and double-checked line plots and routes with assistance from Stan Allison. On Saturday morning, the whole crew attended the required orientation presentation and assembled survey gear.

Saturday June 2

Team: Doug, Joe, and Daryl

Joe and Doug rigged the entrance drop. At the bottom of the entrance drop two small, live frogs were noted. We signed in to the air lock at 15:30. We then continued uneventfully to camp, arriving at 20:00, chose camp sites, returned to the water source for water, then back to camp to finish setting up camp sites and making dinner.

Team: Mark, Mike, and Dan

Mark, Mike, Dan hiked to the cave in clear, 90 degree weather, entered the airlock at 17:15 and proceeded to camp at an even pace. This was Mike's second trip to the Near East, and Dan's first time in the cave, so we went a little slower than usual in order to familiarize Dan with the Rift and the comfort of Apricot Pit. We arrived at the Rusticles camp without incident just before midnight, set up, ate and turned out the lights.

Sunday June 3

Team: Mark, Mike, and Dan

Survey Numbers Used: GP 6A, 7-12

Tie In Surveys: GP 5

Up about 11:30, Mark and Doug sorted through the notes to decide what order to begin work for the trip. Doug took Joe and Daryl to the GPA survey. Mark, Mike, and Dan left camp at 15:15 and went to the GTE survey off GP in the Volcano Rift.

We first checked passage above GP5 and found a possible lead that we ended up surveying with GP6-12. We later noticed in the data that there already is a GP6 as a single shot off GP 1 back in the Volcano Rift, so we changed the new GP6 to GP6A on 6/04 rather than re-label all of the new stations.

GP12 ended in tight crawl with no air, so we

headed back through camp to approach the GTE survey from beneath the Great Beyond room. Dan was feeling ill, so he remained in camp while Mark and Mike went for a water run, and then continued to GTE to check and assess the leads noted in our proposal.

We also went to the top of the Great Beyond room and along both walls checking for things we may have missed previously. We found nothing large enough to survey, though we noticed good air at the eastern terminus of the room, where GA19 is above the GTE19 A-O survey from 10/06, which also had good air. So far we have not been able to determine the local source or path of this air. We also confirmed there was no surveyed connection from the GTE survey, the “Great Beneath”, to any survey in the Great Beyond room, and put this task on our list. We then returned to camp at 00:30 to dinner and another fine night in the big friendly cave.

Total new survey 54.7
Total hours 27 ³/₄.

Team: Doug, Joe, and Daryl
Survey Numbers Used: GPAA1-10
Tie In Surveys: GPA3
Survey Numbers Used: GPBA1-4
Tie In Surveys: GPB8, GPB6

Doug left camp at 15:45 with Joe and Daryl. Joe was the sketcher for the day, Daryl read instruments and collected inventory, and Doug was lead tape. They started surveying the GPA lead at GPA3 using designation GPAA for stations 1-10. After tying GPAA10 back into GPA3 (and making a complete loop of 164.6 feet of new survey), we proceeded to the GPB blunder check from Peter Bosted’s list.

They found the errors in the way that was expected from the list, then moved on to new survey at GPB8 in a very delicate side passage. They used designation GPBA for stations 1-4, which we tied back in to the trail at GPB6.

They left one lead at GPBA4 due to the unsafe nature of an overhanging, loose aragonite popcorn climb with a 20-foot fall potential—the lead was obviously scooped by some previous expedition, similar to the rest of this area.

They left for camp for the night due to fatigue in spite of leads remaining and were back at camp at 1:05.

Monday June 4

Team: Doug, Joe, and Daryl
Survey Numbers Used: GPBA5-12
Tie In Surveys: GPB5

They woke at 11:00am and left camp at 13:15 to continue work left from the previous day. Doug, Joe, and Daryl and returned to the remaining leads in the GPBA area. They surveyed all day through large, very delicate passage that contained multiple overlay sections. They stopped at the end of the day with leads and passage remaining, but due to the complicated nature of the area, our sketcher was too fatigued and frustrated to continue (Joe: “I’m done and I’m going back to camp”. And he left). They returned to camp at 23:15 and decided to not return to the same area the next day to give Joe a break and prevent severe burn out.

Team: Mark, Mike, and Dan
Survey Used: GTEE1-8, GTE 12A-C
Tie In Surveys: GTE23, GTEA6; and GTE12, GAC3

Everyone awoke at about 11:30. They decided to keep the same teams since the Doug team has more to do from the survey on 6/03. Dan was feeling better, so they left camp at 13:15 to check listed leads in the GTE survey, the Great Beneath. They continued to push and check the north and east walls at this level, and checked leads at GTE11, 22, 24, and 28. None went in any significant way, or otherwise tied back

quickly to other GTE stations in the holes and loops in the breakdown, except for a low crawl between GTE22 and 23.

They surveyed this with GTEE1-8 tied to GTE23 and GTEA6, for 178.7 feet, of which 126.4 is new survey. Then they went back through GTE1 to GP5-6-7 to change -6 to -6A as noted in trip report of 06/03/07. Then back to GTE12 (and getting Dan and Mike completely turned around and confused in the process) to survey the connecting trail to the Great Beyond room above, using GTE12 A-B-C, and tied to GTE12 and GAC3. GAC is the north perimeter line of the room.

Dan sketched, his first experience sketching in Lechuguilla, and produced nice work. They returned to camp at 00:45.

Total Survey 178.7'
New Survey 126.4'
Tie-in survey 52.3'
Total hours 30.

Tuesday June 5

Team: Doug, Joe, and Mike

Survey Numbers Used: GV33-34, GV38-41, GVH1-6

The team woke at 11:30am. They decided on tasks that would take them to a different area of the cave for variety. They decided upon checking the tight lead on the GXB survey, blunders in the GVH survey, the GVX lead, and the GVA blunder.

They left camp at 14:35 and headed first to the GXB lead. Both Joe and Doug were small enough to make it to the room containing the original constriction encountered in the previous trip. Joe was able to push past the constriction but encountered another constriction he could not pass. Doug checked the constriction from a different angle and was able to pass and discovered an aragonite

decorated room. Joe shortly followed.

After noticing that this room continues, they returned through the three helmets off constrictions to find Mike waiting patiently. They discussed how to continue and decided to leave this lead for the day rather than leave Mike alone in the GXB passage for the duration of the survey. They continued to the GVH blunder sequence and found the correct stations and began surveying.

While surveying the GV40-41 sequence, Mark Andrich's team completed their nearby task and while on their way to their next task they discussed the GXB lead and how to pursue that lead. They decided that since Joe and Doug were comfortable with the passage and were the only ones on the expedition who could fit, they should do a two-person survey of the passage the following day.

After this consultation, Joe, Mike and Doug continued their blunder correction survey on the GVH line. After completing the full resurvey of all stations noted on the Peter Bosted blunder list (through very delicate passage), they returned to camp at midnight (00:00).

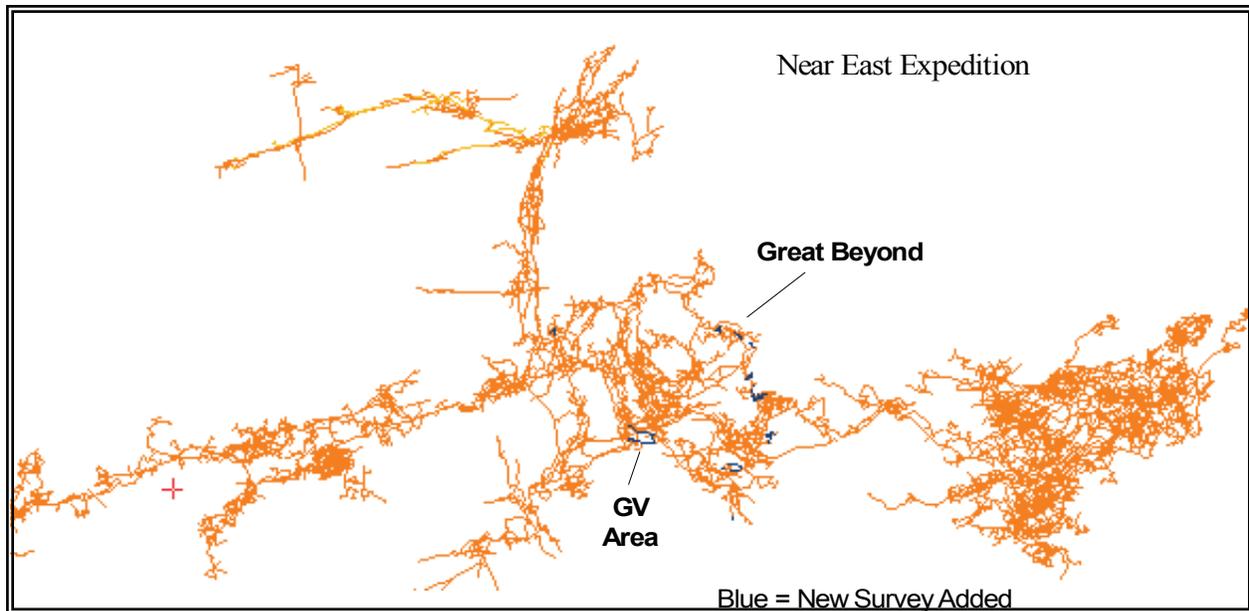
Team: Mark, Dan, and Daryl

Survey Numbers Used: GVE 19, GV 22-15

Tie In Surveys: GVE 17, GV23, GVCC 1, GVL 1, GVG!, GV14

Mike went with Doug and Joe to push the small hole at GXB. Mark, Dan, and Daryl had several smaller tasks, so left camp at 14:45 and headed to the Moby Dick room to photograph and further assess a lead noted by Mark in 2005 at GY 12 on the far corner of the room.

There was considerable air and substantial aragonite/popcorn deposits, but they were able to determine that they could not push this lead without significant breakage of these formations, and the lead looked too tight after



that. The airflow indicates possible continuing passage at the north edge of the cave in this area.

They traveled towards the GVE survey, passing by GXB off GX5 to see how Doug's team was doing. They stopped at the fissure above Stud Lake, at GV43B, to photograph and determine the feasibility of bolting a traverse across this area to apparent passage beyond. The rock looks pretty good for bolting, but any debris would probably fall into the western edge of the lake about 25 feet below.

They then went to the GVE survey nearby, and went to the pool noted between -17 and -18. They had previously gained permission from the Cave Resource Office to cross this pool with one caver, check the lead beyond, and if it goes, to bring the rest of the team and survey as far as they could in one day and then leave the rest for another trip.

Unfortunately only one caver was needed for this. Mark stripped to clean clothes, put on aqua socks, and stemmed across the pool to the far side. The lead turned to the west, went up a small slope, and pinched down with no noticeable airflow.

Dan took pictures of Mark crossing the pool and Mark took several of the lead. Mark and Dan took a shot, GVE17 to GVE19 to the far wall and Mark sketched in the passage. Mark crossed back over and the team exited the passage back to the East Bull Passage.

They ran into Doug's team again near GV41 and got the report of going passage in GXB. Both teams discussed how best to survey this passage given that Doug and Joe are the only ones able to fit through the numerous constrictions. All agreed that they should go back the next day as a 2-person team and Mike would join the other team.

Mark, Dan and Daryl then went towards the Blue Giants, checking holes and possible leads along the south wall along the way. They located the GV survey at GV22 where there was a blunder to fix. The azimuth from 22-23 was off by 9 degrees, GV21 and GVL1 share the same station, and the GVC survey is labeled as GVCC in the data, since there is another GVC survey nearby. The same holds true for the GVG! survey, which is labeled in the cave as GVG; there is another GVG nearby. Any work done in this area should take this into consideration.

They shot all the related ties, and proceeded

down the GV survey, until the team decided they had enough and returned to camp at 00:30. Total footage was in the GVE shot of 29.4 feet.

Wednesday June 6

Team: Mark, Mike, Dan, and Daryl

Survey Numbers Used: GV22-15

Tie In Surveys: GV23, 14, GVL7, GVB17, GVCC1

They left camp at 14:15 and first went to the bottom of Apricot Dome, where Mark had listed a rope to be replaced in the rope log. This is rope #4, and they replaced it with a new 50-foot-long rope to the same anchor. They were going to pull the old rope, but noticed a mildly hazardous downclimb (if coming from higher up) just above the now new rope. So they rigged the old one as an additional handline.

They then climbed higher to remove rope # 3, which is bypassed by an easy path flagged around the other side. Mike climbed to the top of Apricot Dome proper, rope #2, to check on the rigging, and pulled up the rope to check for bad spots. Finding all in good order, he rappelled back down and they went to the bottom and back to the main trail. Apricot Dome still has 4 ropes, the 175' (or so) at the top, the 81' rappel in the dome proper, the old handline to be replaced again as noted above, and the new 50' at the bottom.

The team went back to the GV22 area to continue blunder checking. Finding apparent blunders at GV15 to GVL7, an apparent reversal in the clinometer shot, and at GVB17 to GV15, azimuth off by 10 degrees. They had to re-establish a few of the stations, but they re-flagged the GV stations with the date of the corrections along side the original flagging (that they could find).

They returned to GV22 to re-shoot the 22-23 shot seems so crucial and was off by 9 degrees. Mark set a station light on 22 and Mike and

Daryl went up to 23 to shoot. As Mike was leaning over the boulder taking the shot and Daryl was standing next to Mike, two boulders next to GV23 broke loose and rolled down the slope towards Dan and Mark. Dan and Mark were able to jump to safe passage, but the smaller of the two boulders, about 300 lbs, rolled over Daryl's right foot and injured his toes. The larger boulder, about 700 lbs, slid down and crashed into the rock holding station GV 22, moving it 18 inches.

They immediately checked to see that everyone was safe. Mike had hung on to the GV23 boulder, which fortunately did not fall, Mark and Dan were just fine, and they took off Daryl's boot to tend to his wound, which turned out to be just a painful smashed toe, with nothing broken and no external bleeding.

Figuring that was enough excitement for one day they took several pictures of the boulders and the scene, and heavily flagged the GV23 boulder, not trusting it to hold a caver while shooting from the station. This entire sequence of GV21-22-23-24 will have to be re shot and GV23 will have to be relocated to make it safe, but the data obtained prior to the incident should be sufficient to determine the blunder in the GV survey.

They slowly returned to camp by 21:45, assisting Daryl with the hike. At camp Daryl elevated his foot and Dan remained with him, while Mark and Mike went up towards the GXB survey to check on Doug and Joe. They ran into them on the Crinkle Blister trail and all returned to camp by 23:45.

Team: Doug, Joe

Survey Numbers Used: GXB9-32

Tie In Surveys: GXB4

Joe and Doug left camp at 13:30 for the two person survey of the tight lead off of the GXB survey. They reached the area at 13:45 and began our survey at 14:10.

While surveying, at hanging station GXB16 a breeze was noted that was powerful enough to move the flagging. They surveyed through all constrictions and all leads, leaving only a very high, tight lead at station GXB31. The lead is at least 25 feet in the ceiling and is as tight as the other helmet-off constrictions heading NW in bedrock breakdown.

After climbing approximately 20 feet off the floor to check the lead, it did not look promising, but they never did find the source of the air. Upon completing the survey of 210.5 feet of new, virgin survey, they returned to camp.

On the way back they checked for an easy entrance into the GPBA survey to continue the next day's survey. After searching unsuccessfully (due to fatigue) they gave up and decided to find the connection the next day. As soon as they started back on the trail, they encountered Mark and Mike coming to find them and inform them about Daryl's unfortunate accident. After some discussion they eventually returned to camp, arriving at 23:45.

Total survey: 252.8 feet
Total hours 32

Thursday June 7

Team: Doug, Joe and Dan

Survey Numbers Used: GPBA13-19

Tie In Surveys: GZD19

The team left camp at 13:15 to finish the GPBA survey with Joe as sketcher and Dan running instruments and collecting inventory. They went back to the GPBA area, where Doug entered the survey via the delicate route used on previous days. Joe and Dan continued to the suspected connection area.

Joe and Dan were able to the last station via a less delicate route. They continued through the

survey to connect to GZD19 and surveyed a side passage for a total distance of 289.9 feet for the entire GPBA survey.

While mapping they noted two leads that were not surveyed. One was a fissure near GPBA11, left due to the delicate nature of the entrance. The second was a tight fissure near GPBA12 with some vertical component that was left due to team fatigue.

Dan was still unsettled after the events of the previous day and did not want to do anything that had any exposure, and Joe and I had enough tight lead surveying from the previous day. They left the survey area and returned to camp without doing any additional tasks, arriving at 18:45.

Team: Mark, Mike and Daryl

Survey Numbers Used: GZP29; GVA 1-2-8-15

Tie In Surveys: GZP28, EEZ1A, EE14; and GV24, GVB1

Mark, Mike and Daryl left camp at 14:15 and headed for the High Tide room at the bottom of Apricot Pit to tie in the hanging GZP survey. They decided to do the tie in and let the computer run the numbers before resurveying or blunder checking. They tied GZP28 to EEZ1A and EE14, using new station GZP29 .

They pushed along the walls of the High Tide room and located a flowstone-covered fissure above the EEZ survey, which has potential but no existing survey. They noticed that, as the GZP survey is a parallel fissure to Apricot Pit and there appears to be yet a third fissure below this. Both leads would require some bolting to access, so they left them for a future trip.

The rest of the High Tide room appears to not go, save for a hole under the "bivy" rock near the bottom of the rope. This is another passage into the Low Tide room.

They then headed back towards Nirvana, checked the entrance of the GOA survey off

G4B (GOA is marked GAO in the cave, labeled with ball point pen on blue/white lead tape).

They checked along the way and found possible leads near a fissure off G4A, in the un-named room between Low Tide and the Emperor near G9-11, and near the decorated areas at G18. The lead listed at GFX 15 will require aqua socks to access, but the other GFX leads will require access from the other end, which ties to the “rescue route” shortcut to the Blue Giants area.

They continued up the GF survey, back to GF 10, which is the start of the route to the GFX survey. Along the way they found a lead tape in a fissure near GF 6-7, which says a 40 foot rope is needed to access. There is also a climb down that has a flagged “key handhold” that could use perhaps a rope or webbing.

The team returned to the “scene of the crime” at GV22 to do the GVA blunder correction. Our first shot was GV24 to GV23, with just a rough shot (they did not want to use the actual station, but were about 1 foot away, due to the incident of 6/06) to confirm locale.

The distance from GV23 to 24 is off considerably from the data, from 13.6 in the computer to 31.2 as they measured today. They surveyed from GV24 to GVA1-2 then GVA2 to GVA8-15, and a tie to GVB1, finding no significant errors. They believe the GVA error is caused by this incorrect distance from GV 23-24. However as noted in the 6/06 trip report yesterday, the GV 22 and 23 stations have been compromised due to rockfall (but not enough to make a 20’ blunder!), and these stations will need to be redone. They have no idea yet how this may affect other surveys in the area, as the GV survey is key to several. They returned to camp at 00:45.

Total survey : 275.1 feet.

Friday June 8

Due to surface travel considerations and the fact that they were rolling forward on our daily caving time schedules, they decided to exit the cave on Friday to have a full day to attend to the paperwork prior to leaving the Park.

Team: Doug, Daryl and Dan

Everyone woke at 8:45, packed camp, and decided that Dan and Daryl would accompany Doug on the exit trip as the first team to leave camp. They left camp at 10:50, exiting the cave at 17:30 without incident. Daryl did notice that the redirect near the top of Apricot Pit may need to be adjusted because there is still some rope rub above the redirect when ascending. The suggestion is to slightly lengthen the webbing on the redirect.

Team: Mark, Joe and Mike

They measured the ropes left in camp. There is a 27’ in good condition pulled from a handline in 2006, a 55’ new in 2006, and a 63’ pulled from the previously noted 3rd drop in Apricot Dome, old but in good condition.

They left camp at 12:15 and proceeded towards Apricot Pit, stopping for a last bit of water, and began making our way up in good time. At the top rope, about 15:15, between the re-belay and the re-direct, Mike’s upper ascender slipped (he was using Texas) down to his lower ascender and his left knee smacked the wall. Mark quickly (as possible) climbed up to assist, was able to undo Mike’s pack and tether, gave Mike an additional handled ascender, and Mike was able to recover and climb slowly to the top.

Joe rappelled back down to haul up Mike’s pack. At the top, they checked Mike’s knee. It was sore and maybe it got a bit twisted, but he was able to carry his pack and walk slowly unassisted.

At 16:30 they slowly proceeded to Boulder Falls

where Mike donned his full ropewalker and was able to climb without assistance and hauling his own pack.

Joe went ahead and exited the airlock as Mike and Mark made their way, reaching the top of the airlock tube at 20:00. It was then they realized the outer door had not fully latched, and as the cave was breathing in strongly, the doors became jammed as Mike and Mark tried to enter the airlock.

They pounded on the door, trying to force the door open and away from the outer door, but the wind was too strong. Joe had reached the surface and knew Mike was going to be traveling slowly, so he did not suspect any problem.

With nothing else to do, Mark and Mike went to the bottom of the tube and crawled above it to get out of the wind to wait for Joe or for the wind to die down. They were getting colder, so decided to retrieve their packs that they had tethered to the top of the ladder. Mike again tried to force the door. He was able to wedge it a bit, enough to allow Mark to push his way out while holding the outer door shut, and finally latch it, eliminating the immediate problem. Just then Joe hollered down that he was on his way to help, but they waved him off and made him haul up our packs as penance. Mike and Mark exited the cave about 22:00.

While they were successful at finally exiting the airlock, this could have been more serious had Mike been seriously injured on Apricot Pit. While Joe perhaps should have stayed closer, it could just have well happened to the three of us. The point is this type of thing has happened to one degree or another since the airlock doors were installed.

[Note: this illustrates the importance of making sure the doors of the airlock are closed completely as described in the orientation]

They hiked out to the parking lot in breezy, mild, overcast, night air, and returned to the hut by 23:30.

Saturday June 9

On Saturday, after getting all of the paperwork taken care of, touring Carlsbad Caverns courtesy of the CRO, and having a REAL meal in town, everyone packed up ready to hit the road Sunday for their respective homes, happy once again to have the opportunity to enjoy the wonders of Lechuguilla.

Total volunteer hours for the trip 358 ½ in the cave plus several hours of surface prep and post-cave paperwork.

In addition to the resketching and blunder checking, the footages for the expedition are these...

Total New passage: 861.5'
Tie-in shots: 66.3'
Blunder footage checked: 867.0'
Total Surveyed: 1794.8'

Acknowledgements

All of the team members would like to thank the Cave Resource Office, especially Stan Allison, for all of their help in making this trip a success. The Near East continues to reveal new passage to those who do the homework and look carefully within the cave, and they had a great time going through our list of tasks to better define this particular area. They intend to return yet again.

The expedition leaders (Doug and Mark) would also like to express our appreciation to Rod Horrocks for his help in defining leads and tasks, Peter Bosted for blunder lists, the several surveyors and sketchers of past Near East efforts, and to all of the folks at Carlsbad Caverns National Park, seen and unseen, who make our visits there so enjoyable.

Thanks to my fellow cavers Joe, Dan, Mike, and

Daryl. All of them were up to the task, even when they got frustrated or weren't feeling well. It is because of them that they were able to successfully get all of our major goals accomplished.

I especially want to thank Daryl, even after being injured (!) for reminding us how much fun Lech can be for someone who has never been there (he and Dan spent a lot of time gaping in awe), and say how much I enjoyed helping Dan with his decade-long dream of exploring Lechuguilla Cave.

I personally became frustrated and discouraged for a time because they couldn't make the cave go when, and where, I thought it should. The efforts of my companions doing the sometimes dreary work of searching, and checking and fixing errors, as well as their continuing enthusiasm, reminded me that ALL of our work is necessary to solve the puzzles of Lechuguilla.

I look forward to working with them in the future. And as always, thanks again to Doug for all of his assistance in putting together this trip and this report, for putting up with me, and for making our trips in Lechuguilla more crazy and enjoyable every time they do this.



Coral Sea Expedition

July 2007
Ron Miller

Leaders: Ron Miller, Rich Sundquist
Team Members: Cathy Borer, Peter Bosted, Daniel Chailloux, Art Fortini, Steve Maynard, Bruce White

Summary

The focus of this expedition was to complete tasks in the Far East section of Lechuguilla Cave in support of quadrangle map completion. Our primary objective was to continue exploration and survey of known leads in the Coral Sea area, which they discovered in 2005. The Coral Sea is located off the eastern edge of the Outback.

Total survey: 4,554.6 feet
New survey : 4,216.3 feet
Excluded survey : 262.6 feet
Resurvey: 75.7 feet

Teams checked and surveyed several leads, most of which had been identified on our task list. Checked leads and outcomes are summarized below and detailed in Table 2.

In the Coral Sea area, they surveyed 3,998.9 feet of new passage—over three-quarters of a mile. One lead partway down the Milky Way pit yielded a half mile of new passage and two adjacent large rooms, the Wasp Nest and the Anglican Basement. Just beyond the Anglican Basement, they found a connection to known survey in the upper eastern Outback, which substantially shortened the travel time between camp and the Wasp Nest area.

The Coral Sea now comprises 1.7 miles of surveyed passage. Although the area is now known to be connected to the Outback at two points, its characteristics, including a high density and variety of calcite and aragonite formations, numerous occurrences of active flowstone and dripstone, and over 100 lakes and pools, continue to contrast sharply to the

dry, largely featureless Outback.

During this expedition, they continued to employ state-of-the-art conservation techniques, which have proven successful at minimizing impact associated with exploration of the intermixed “clean” (calcite-covered) and “dirty” (corrosion residue and decomposing rock) sections of the Coral Sea.

They contributed 1,586 volunteer hours to the National Park Service during this expedition. This total includes 1,426 hours in-cave or traveling between the cave and the research hut; 748 of the in-cave hours were out of camp. An additional 160 volunteer hours were spent on the surface in support of the incave activities (not including travel to and from the park).

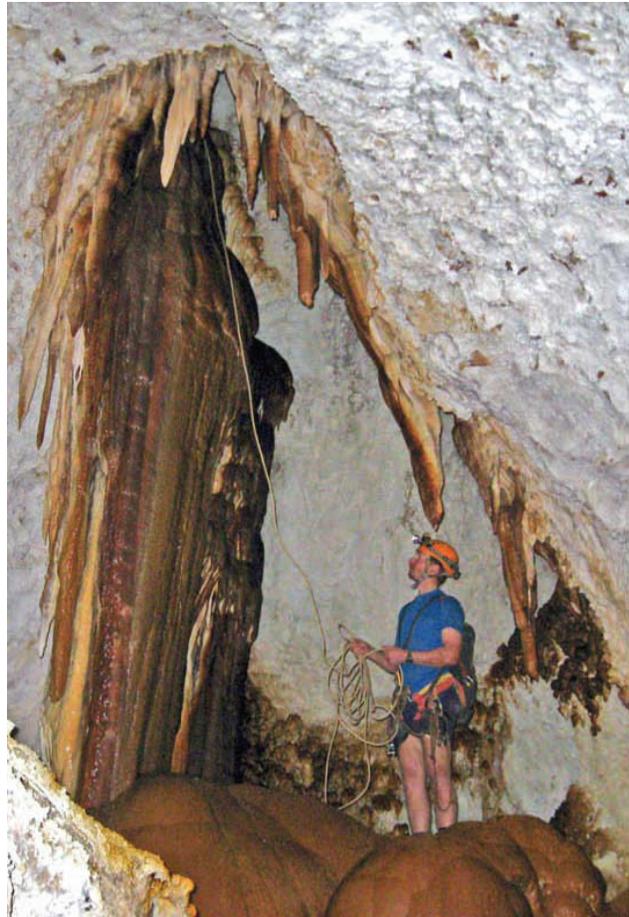
Entering the Cave

Having completed all the preliminaries on Friday, they were able to devote Saturday to getting everyone to camp by a reasonable hour. They entered the cave in three groups between 8:30 and 11:00 AM, staggering our entry times to avoid backups at the Aragonitemare climb. Two groups reached the Far East camp in eight to nine hours; the third took thirteen hours, but this included taking several 3D photos along the trade route.

The second team re-rigged a section the Aragonitemare climb, after finding significant core damage in the rope at a rub point (see Ropes and Rigging Notes). Arrival times in camp ranged from 6:00 to 9:30 PM.

Sunday, July 8

Peter, Daniel and Rich explored a lead near MOR1C, above Independence Hall. Working in full clean mode (aqua socks, clean clothes, cleaned skin, cleaned helmets and packs, and no gloves or kneepads), they continued the 2006 survey up a steep flowstone slope. An easy climb at the top led into a boneyard complex. They surveyed a loop in the boneyard, encountering another short section of maroon-



Ron Looking up Sastrugi Climb, Pitch 3, Above Wasp Nest (© 2007, Maynard)

colored flowstone, as well as the top of a previously identified climbing lead at MOW6. The team believes that they left no viable leads in this area.

Bruce and I surveyed leads above the New Guinea Room. The highest survey stations in this area lie within about 30 feet directly below the Boundary Waters area of the upper Far East; a connection here could shorten the travel time between camp and the Coral Sea from 3+ hours to about 15 minutes. A high lead near MOR35 led up to an alcove whose only exit was a tight, nasty crawl that they decided to leave as a lead. They also looked at, but did not enter, an existing high lead at MOR40, deeming it a bit too grim for the first day of the expedition. A lead at MOR32 tied back into known survey (MOR49) within two shots. A



Near East—Nirvana
(© 2007, Chailloux/Bosted)

promising lead at MOR25 also ended in two shots. They then surveyed a low flowstone lead at MOR17, leaving two very small leads.

Steve, Art and Cathy headed to the Milky Way pit, to check a promising lead part way down the far side. They climbed up into a fissure next to the pit, and rappelled down to what turned out to be two leads. The rappel required squeezing down through a very tight, popcorn-encrusted fissure, which caused some popcorn to break off and fall onto the flowstone-covered slope below. After fully surveying the first lead, they dropped down into an alcove at the next level, from which a promising fissure lead headed off to the southwest. They decided to save that lead for the following day, and left the 100-foot 9mm push rope fixed.

Monday, July 9

Steve, Art and Cathy continued the previous day's survey of the going lead on the far side of the Milky Way Pit. After fixing a loop closure problem that had resulted from high-angle shots made the previous day while on rope, they surveyed into the fissure passage. This passage eventually headed down and west, into a large room containing unusually well-developed rillenkarrén on many of the breakdown blocks that cover the floor. Some of

the rillenkarrén is coated with calcite; its resemblance to the internal structure of a wasp's nest was the basis for the room's name. The team only managed to define the northeast section of the Wasp Nest before having to begin the three-hour trip back to camp.

Peter, Daniel and Rich surveyed a lead near MOR12 in the New Guinea Room that led into a boneyard maze. In one direction, they were stopped by a three-foot by four-foot pool, with possible continuing passage beyond. Hoping to find a bypass, they went to the upper level and crawled in clean mode through a very small and sharp passage, using reversed knee pads as for protection from the sharp substrate. They then changed back to dirty clothes and entered a boneyard complex, where they discovered a 20-foot diameter room. The team left one 8.5-inch tall, eight-foot wide sloping flowstone lead that seems promising, but needs small cavers to push. They also took some 3D photos of Independence Hall and the New Guinea Room from established trails.

Bruce and I surveyed upper-level leads between Independence Hall and the New Guinea Room. They found a high bypass (now the flagged route) that avoids the problematic climb-down and step-across above Lake Aloha, which had proven extremely difficult to negotiate in clean mode without contacting the corrosion-residue-covered walls. Although the bypass adds another footwear change, it is substantially easier and better from a conservation standpoint. They then surveyed in full clean mode up a low-angle flowstone-covered fissure, which eventually led down to a terminal paleo-pool room that is almost completely covered in dark orange pool spar.

Tuesday, July 10

Steve, Cathy and Rich continued the previous day's survey of the Wasp Nest. They finished surveying the room, which turned out to be about 200 feet long and up to 90 feet wide, with



Calcite-Coated Rillenkarrren, Wasp Nest
(© 2007, Maynard)

ceiling heights of up to 100 feet at the southwest end. Two steep flowstone cascades grace the south wall of the room. The floor is entirely breakdown blocks, with numerous leads under the blocks. At the southwestern end of the room, a sheer drop of 30 feet overlooks the Anglican Basement, which they entered through a passage on the southeast side that enabled them to bypass the drop.

The Anglican Basement (which could be considered part of the same room as the Wasp Nest), is also of considerable size—170 feet long, 50 feet wide and 50 feet high—and contains a pool that is about 15 feet in diameter and one to two feet deep. At the southwestern end of the Anglican Basement, a small hole leads down into a low acid-basin room (the Annex) with dark iron staining and extensive

raft debris.

Expecting that the rope out of the fissure at the Milky Way pit was likely to become something of a trade route, Art and I replaced the 9mm push rope with an 11mm rope that they brought from Grand Guadalupe Junction. Although the 11mm rope is quite dirty with corrosion residue, they were able to rig it in such a manner that it does not rub against the walls of the pit, and coiled the extra rope at the bottom in the side fissure, roughly 30 feet above the floor of the pit.

Art and I then headed to the Wasp Nest to assist the survey team working in that area. They surveyed a promising side lead in the Anglican Basement that led past what turned out to be a low spot in the ceiling, at which point they unexpectedly found ourselves (after only three shots) back in the Outback, in the MNK survey. (Coincidentally, this section of MNK had been surveyed on the 2005 expedition on which they discovered the Coral Sea area, and Steve and Cathy were on both the 2005 MNK survey team as well as the 2007 Wasp Nest discovery team. The 2005 survey notes show a “C” grade lead in the area where they made the tie-in.)

I remembered that this section of the MNK



Coraloids in Independence Hall
(© 2007, Chailloux/Bosted)

survey was fairly close to the MNB survey, which is part of the Outback trade route to the Coral Sea, and thus might be a dramatically shorter route back to camp. I followed the discontinuous MNK survey Lechuguilla Cave about 10 stations to a tie-in with the MNB survey at MNB18. MNB18 is on the trade route to the Coral Sea, and is only 15 minutes from the junction with the MN survey trade route through the Outback.

The new route, which now is marked with orange “breadcrumb” flagging, shortens the travel time between the Wasp Nest and camp from 3 hours to 1 ½ hours, and eliminates all clothes changes along the route and all vertical work beyond the MN survey. This route is not a better travel route to the rest of the Coral Sea, however, because of the clothes changes and rope work that would be required to ascend the Milky Way pit and rappel down into Hall of the Dancing Bears.

Peter, Daniel and Bruce headed to Bryce Canyon to complete approved 3D photography and survey leads. They found that the end of the original MDA survey consisted of only a single line through an extensive pancake passage that contains many columns and some side passages. They surveyed this entire sloping maze, finding two more connections to the GDG survey in the process. They then checked the GDG survey carefully, but did not find any other leads.

Wednesday, July 11

Peter, Steve and Bruce surveyed a lead near MOG11, at the northern edge of the Wasp Nest. Beyond, they discovered and surveyed a low room (the Lovely Lowly Room) that had many interesting formations, including rillenkarren similar to that in Bryce Canyon, aragonite bushes, large hydromagnesite balloons, flowstone, and a six-inch long crinoid fossil encrusted with calcite. Peter found a somewhat obscure duck-under that led out of the room to flowstone passage. They climbed

up the flowstone into a 20-foot diameter room coated with white calcite crusts. In an alcove on one side of the room, they found a pool measuring four feet long, three feet wide, and four inches deep, with what appeared to be continuing boneyard passage beyond. They took a lower route out of the room into the boneyard complex, leaving four small leads. The team named the area the Ullular Gate, based partly on the many small pendants that chimed musically as they passed them.

Daniel and I also surveyed side leads out of the Wasp Nest. Although initially promising, all three leads that they surveyed either ended or returned to the room. Art, Cathy and Rich corrected a blunder that had occurred during the 2006 resurvey of MNL12 - 20, which is



Flowstone and Dipstone in Wasp Nest
(© 2007, Sundquist)

located in the Outback near the lead that led to the discovery of the Coral Sea. They discovered that the data page was missing a station, which caused the data to shift up by one station. They then headed to the top of the Milky Way pit, where they recovered the 9mm push rope and other climbing gear; this gear had been left by the Wasp Nest teams a day earlier, when they took the new MNK shortcut instead of returning via the Milky Way pit.

Thursday, July 12

Peter, Bruce and Cathy continued the survey of the Ullular Gate, beginning by restoring (using a sponge and plastic baggie) the flowstone that had been marked up inadvertently the previous day. They used aquasocks and established two changing areas on this trip. They surveyed up the flowstone slope from MOH14, only to be stymied by flowstone chokes in three directions.

Returning to the lower boneyard maze, they spent many hours surveying very sharp and tight leads that all became too tight. The last lead, at MOH22, opened up into a nice little canyon, but then it too came to an abrupt end. All known leads in this area have now been surveyed. The Ullular Gate area generally features flowstone alternating with calcite crusts and some hydromagnesite and corrosion residue pockets. Several small pools are also located in this generally damp area.

Art and I undertook what turned out to be a three-pitch climb (Sastrugi, 5.6 A1) out of the Wasp Nest, beginning at the MOG23 overlook above the Anglican Basement. I led the first pitch (bouldery start, then third class) up a popcorn-coated ridge to a large balcony, which is the junction of three lower flowstone



Bruce Viewing Rillenkarrren in Bryce Canyon
(© 2007, Chailloux/Bosted)

ascades—one just left of the first pitch that continues upward as the second pitch, one around the corner to the north, and one coming up from the Anglican Basement. Art led the second pitch (in clean mode) up the flowstone cascade on the left (5.3 A1). At the top of this pitch, they discovered the Orange Flow—a very pretty flowstone “river” containing numerous pools, as well as braided channels incised into the flowstone in a pattern resembling sastrugi (wind-carved snow ridges and grooves).

From the “upstream” end of the Orange Flow, I led the third pitch (5.6), also in full clean mode, up another flowstone-filled passage. This pitch led to a flowstone-filled room with four leads—three climbing leads on flowstone and one large side lead down a ramp and across a bridge above the climb. It was time to head back to camp, so they rappelled back to the Wasp Nest, down two clean 9mm 100-foot static ropes that they left fixed.

Daniel, Steve and Rich surveyed an upper-level lead at MOE4D, in the New Guinea Room. They climbed (without ropes) the M.C. Escher Dome, following a series of flowstone bridges that span the dome at intervals up its entire height. Once on the bridge at the top, they were treated to what Rich describes as “fearsome views down through the web of bridges all the way to the floor of the New Guinea Room,” over 50 feet below.

Daniel, who has by far the shortest legs of the team, found the climbing up the dome to be quite sporting. No doubt the French caver finds the MOI survey designation to be ironic; if asked about who might be interested in returning to this dome, Daniel’s answer would almost certainly be “Pas moi!”

Friday, July 13

Art, Steve and I carefully ascended (in full clean mode) the fixed 9 mm ropes on the Sastrugi climb, and surveyed the four leads out of the room at the top. All three of the flowstone

climbing leads ended in flowstone chokes. The fourth lead headed down a ramp, across a bridge over the third pitch, then up a nicely decorated slope. The slope on the MOGA survey has a floor of orange flowstone, which is studded with grapes and aragonite stalagmites; the walls and ceiling are richly decorated with popcorn buttons and aragonite snowballs.

At the top of the slope, however, the passage decreases substantially in size, and the character abruptly changes to “dirty” boneyard containing both corrosion residue and decomposed bedrock. They opted to leave this transition point as a lead.

Bruce, Rich and Cathy surveyed a lead in the breakdown floor of the Hall of Dancing Bears, at MOD11. They worked in full clean mode through an area containing aragonite, popcorn, flowstone, and several pools, and eventually tied back into known survey. On the way back to camp, they isolated (with a butterfly knot) a bad spot in the Ruby Chamber rope, which had abraded through to the core at a rub spot.

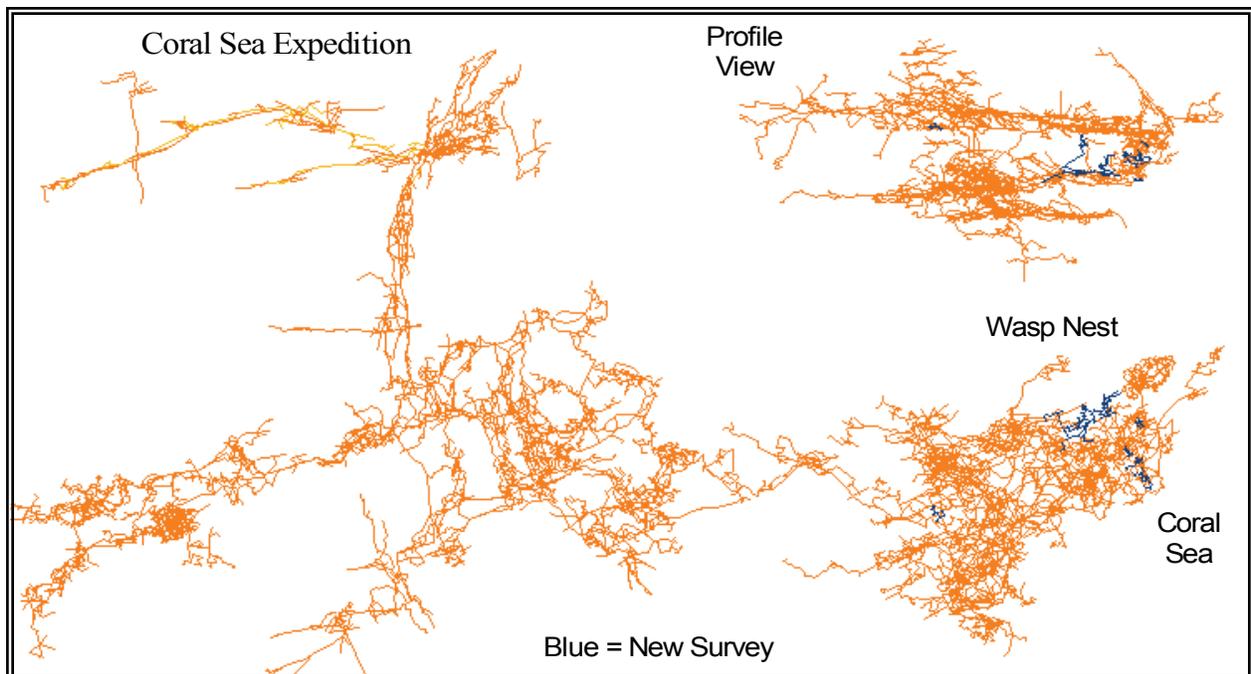
Peter and Daniel photo-documented the Boundary Waters area with 3D photography,



Ron and Art Surveying, MOGA Survey above Sas-trugi Climb.
© 2007, Maynard)

staying on the flagged trail for all of their photos. Their photos included large-passage shots, shelfstone shots, and also some macro shots of the aragonite bushes and hollow stalagmites along the path. They recorded the water level at the lake, finding it to be about 0.7 inches lower than the previous reading, in 2003. They then went to La Morada and removed the fixed 60-foot rope to use at the Aragonitemare.

Saturday, July 14



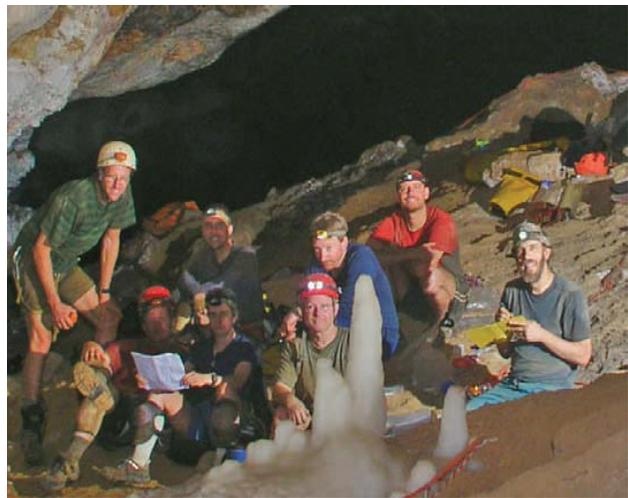


Shelfstone in Boundary Waters
(© 2007, Chailloux/Bosted)

After a hearty group rendition of La Marseillaise in honor of Bastille Day (which Daniel seemed to appreciate, or at least tolerate), they headed out in four groups, generally separated by about an hour. Peter and Daniel used the rope removed from La Morada to re-rig the problematic section of the Aragonitemare. Travel times from camp to the entrance ranged from 7 to 9 ½ hours.

Acknowledgements

I would like to thank several individuals for their assistance in making this expedition so successful. First and foremost, I was extremely fortunate to be able to work with a great group of cavers, who all donated more than a week of their time to participate in the expedition. They received invaluable assistance from the NPS Cave Resource Office staff, particularly Stan Allison. Photographs in this report were provided by Peter Bosted, Daniel Chailloux, Steve Maynard and Rich Sundquist.



From Left, Front Row— , Steve “Sally-Skippy-Deep Float” Maynard, Cathy “Zelda” Borer, and Daniel “Kermit” Chailloux. Back Row— Rich “Bruce” Sundquist, Art “Francois” Fortini, Ron “Robbie” Miller, Bruce “Scrotus—Ex-Poseur” White, and Peter “Uncle Vern” Bosted.

2007 Lechuguilla Science Summary

Paul Burger

Oligotrophy in Caves: The Biochemistry and Metabolic Activities That Support Microbial Community Survival in Nutrient Limited Environments

Investigator: Hazel Barton

Caves commonly form through the erosional processes of water. Once sufficiently enlarged to allow human access, these waters have long since departed, leaving the cave exposed to an oxygenated atmosphere. The entry of organic nutrients into the system is therefore a function of the geology and depth of the cave system, with significant input from the surface being limited to the entrance zone and areas of the cave fed by surface water whether dripping water or actual streams entering the system. The majority of caves therefore represent an essentially oxidized and nutrient limited environment, in which microscopic life subsists by scavenging primarily inorganic nutrients using an oligotrophic lifestyle.

Based on previous work carried out in cave systems, the investigators wish to use both Lechuguilla Cave and Carlsbad Caverns as model sulfur-base systems to continue these oligotrophy studies. To do so, they will use a combination of techniques, including model-organisms, cultivation, biochemistry and molecular phylogenetic techniques to question the following hypothesis:

Microbial communities are able to subsist in extremely oligotrophic environments, such as caves, by establishing a complex carbon-sharing network. Such networks provide highly efficient scavenging mechanisms, allowing a feedback nutrient supply system. Such a system permits increased diversity through augmented opportunities to utilize those scarce energy sources that are available, such as reduced metals in the bedrock and carbon halides in the atmosphere. Further, this diversity is not merely

a functional requirement for community subsistence, but can only occur in systems where UV damage does not limit the potential species richness of the community.

Activities

From August 10-12, 2007 Hazel Barton led a team to the Western branch of the cave to collect rock and water samples from the PhD Room (backreef), EYEX, EUD, and EU areas (forereef) of the Western Branch.



D. Levy recording water quality measurements from Lake Margaret, assisted by C. Andrews and K. Levy—Photo by Gosia Allison-Kosior

Chemical and Physical Limnology of Lechuguilla Cave Pools

Investigator: David Levy

Chemical characteristics of stratification in cave pools (meromixis) may provide insight into the geochemical origin and evolution of pool waters. The objective of this study was to test the hypothesis that certain pools in Lechuguilla Cave may be subject to permanent chemical stratification, analogous to a number of inland lakes throughout the world. Chemical stratification in Lechuguilla Cave pools could develop from inputs of relatively saline or fresh water to an existing pool from dripping water or subsurface flow. Factors favoring the permanent stratification of these pools are physical conditions, such as specific pool basin morphometry. Four cave pools of various

depth and distance below ground were chosen for study: (1) Lake Chandalar (-221 m), (2) Lake of the Blue Giants -277 m), (3) Lake Margaret (-319 m), and (4), Lake of the White Roses (-439 m). Depth profiles of temperature, pH, dissolved oxygen, and electrical conductivity were collected using a TROLL® 9500 multi-parameter instrument.

Activities

On 3 July 2007, a team of 4 led by D. Levy entered Lechuguilla Cave to characterize chemical profiles of pool waters in accordance with Scientific Research and Collection Permit No. CAVE-2007- SCI-0004. The team first traveled to Lake Margaret, stopping in the Chandelier Ballroom to cache climbing equipment for the August 2007 Cicero climbing expedition and to take group photos.

The team reached Lake Margaret at 1300 and used an In Situ, Inc. Troll 9500 device to collect water quality data on pH, electrical conductivity, dissolved oxygen, temperature, and oxidation-reduction potential as a function of depth. The team had a quick lunch and then



Levy recording water quality measurements from Lake Chandalar—Photo by Kristen Levy

traveled back to Lake Chandalar, arriving at 1440 to perform similar water testing. At both locations, the water column was found to be completely mixed, with no chemical



Preparing to deploy the Troll 9500 in Lake of the White Roses—Photo by Pat Cicero

stratification apparent.

Upon exiting the cave, sampling supplies were cached at E-F Junction for pick up two days later for a trip to the Lake of the White Roses. The team reached Lake Lechuguilla at 1830 and collected water samples for laboratory analysis. The team then exited the cave at 1915.

On 5 July 2007 a team of 4 led by D. Levy entered Lechuguilla Cave to characterize chemical profiles of pool waters at Lake of the White Roses (LOWR) and Lake of the Blue Giants (LOBG). The team entered the cave at 0815 and reached Rusticles Camp in around 3 hrs. We then left our extra food and bivy gear at Rusticles Camp, and traveled with little interruption until we stopped at Grand Guadalupe Junction to tank up on water.

From there, the team moved on to LOWR, reaching the deep point at 1600. Using the In Situ, Inc. Troll 9500 instrument, measurements of pH, dissolved oxygen, electrical conductivity, redox potential, and temperature were collected at the 1-, 3-, and 8-foot depths. Samples for chemical analysis were also collected from 1- and 8-feet.

It was generally found that the chemistry was constant down to 8-feet, with a temperature of 68.7 degrees C, pH of 7.35, electrical

conductivity of 479.7 umhos/cm, and dissolved oxygen of 7.3 mg/L. At 1730 the team completed sampling and departed LOWR, reaching Rusticles Camp just before 2200. The team awoke approximately 0730 the following morning and traveled with water sampling equipment to LOBG, where measurements were also taken in 2-ft intervals down to a depth of 17 feet. A slight degree of stratification was observed at LOBG, with a minor



Sampling at Lake of the Blue Giants—Photo by Pat Cicero

chemocline observed around 3 feet. The team then returned to Rusticles briefly to pack, and exited the cave, stopping at Lake Lechuguilla to collect water samples. All members exited the cave by 1600.

Collaborative Research: Identification of Microbial Signatures in Biogenic Cave Ferromanganese Deposits

Investigator: Diana E. Northup

The purpose of the study is to determine the role of iron- and manganese-oxidizing bacteria in the formation of ferromanganese deposits. The study hopes to determine the progression of mineral transformation in iron and manganese enrichment cultures inoculated with cave ferromanganese deposits and investigate whether similar transformations occur in rock varnish iron and manganese enrichment cultures. The study will characterize the microbial species involved in the production of these minerals in culture and determine whether previously characterized putative manganese-oxidizing genes are present in organisms found in iron and manganese enrichment cultures.

Information from the proposed investigations will elucidate how microbial life flourishes in this dark, low-nutrient environment, producing an abundance of ferromanganese deposits over geological time scales. Details of the processes and the identities of the players that help produce these ferromanganese deposits in caves and in rock varnish will be determined and will document additional novel organisms from these deposits. Results from the proposed research will provide insight into the geological alterations of iron and manganese by microorganisms and will help to resolve unknown aspects of these alterations.

Activities

On August 11, 2007 Elizabeth Rousseau collected backreef (Yates) samples from the PhD Room. Samples were also taken from forereef near station REY12 in the Western Branch. Samples were taken to analyze DNA, exoenzymes, cell counts, and for cultivation.

Dated cave pool shelfstones as indicators of climate change

Investigators: Joel Despain and Greg Stock

The purpose of the study is to date pool shelfstones in caves of the Guadalupe Mountains. Samples will be collected from dry

pools or pools with water levels substantially below the level of former pool highstands. Each cave pool has its own local groundwater point source, resulting in a range of pool levels. Yet, many pools in Lechuguilla and other Guadalupe Mountain caves are not presently at their highest levels, but have instead evaporated to some lower level.

The process by which pools drain is most likely related to both leakage and evaporation (e.g., Forbes, 2000), but departure from the steady-state highstand condition is almost certainly related to changes in the hydrologic input to the system.

For most caves, including those in the Guadalupe Mountains, this input directly relates to the amount of precipitation falling above the caves. In most cases, former pool highstands are marked by calcite shelfstone deposits or related subaqueous deposits (Hill and Forti, 2000). These former highstands record a local (in-cave) microclimate with greater effective moisture, either due to increased inflow resulting from increased precipitation above the cave, or reduced evaporation.

This research seeks to test whether the numerous pool high stands present in these caves were synchronous, and therefore reflective of larger scale climate shifts, or whether they were asynchronous, reflective of specific local changes in the overlying vadose hydrology.

Activities

The focus for 2007 on this project was the processing of samples obtained from Lechuguilla Cave in 2006. The calcite shelfstone samples were Uranium/Thorium dated by Victor Polyak, University of New Mexico. Here are results of Dr. Polyak's laboratory analysis:

Lost Pecos River: 15,032 +/- 647 yrs BP
(Before Present)

Pool Hall: 14,317 +/- 344 yrs BP
Orange Bowl: 19,648 +/- 603 yrs BP
Oasis Pool Room: 20,952 +/- 365 yrs BP

All of the ages come in at or near the end of the Last Glacial Maximum, considered to have ended about 18,000- 20,000 years ago. For interpreting the research results, this is good news, as it means that the cave lakes respond to regional climate changes, rather than random drip point migration and variation or pool seepage.

This tends to confirm the idea that the southwestern US was quite a bit wetter during the Last Glacial Maximum (LGM) because the Laurentide Ice Sheet in Canada established a dominant high pressure system that deflected the jet stream to lower latitudes. This idea has been around for a long time, but it's not been easy to isolate increases in precipitation from decreases in temperature.

Assuming that the near 100% relative humidity conditions presently seen in the cave existed during the LGM, we might be able to isolate the changes in precipitation only, which would be an important accomplishment. The dates also indicate that it has been a long time since the pools were last full, and given present climate trends, suggest that it may be a long time before they fill again.

Southwest Climbing Expedition

August 19-23, 2007

Pat Cicero

Expedition Leader: Pat Cicero

Team: Stan Allison, David Levy, Aaron Stockton

Summary

We eliminated numerous high leads (Trepidation Dome, FBB10; Triple S climb, FH13; un-named climb, FDG5; Dees Clime, FDG50), completed climber evaluations of two high leads in the Voids (FNTX2 and FQ64), and surveyed many leads in the Chandelier Maze area (Dees Plaze).

Total New Survey: 875.5ft

**Climbs Completed: Trepidation Dome,
Triple S Climb (Terminator Room), Dees
Clime (Dees Plaze)**

Detailed Trip Summaries

Day 1 (8/19/07) Sunday

We entered the cave at 11am and traveled in teams of two until the bottom of Boulder Falls. From Boulder Falls we traveled as a team until we reached Big Sky Camp at 3:30pm.

After a brief break to set up our camp sites and eat, we headed over to the Prickly Ice Cube Room. Our goal for the day was to try to get a static rope rigged on the "Bridge Too Far". 30 ft above our current high point in the Trepidation Dome.

Our bag of tricks for rigging a rope on the bedrock bridge included a slingshot, 50lb test spiderwire fishing line, 3/8 and 1/2 oz lead fishing sinkers, 120ft 2mm accessory cord, 120ft 3mm accessory cord, and duct tape. The strategy envisioned was to use the slingshot to shoot a weight attached to the fishing line over the bridge. Next the 2mm cord would be

attached and pulled over the bridge, followed by the 3mm cord. It was hoped that by using incrementally larger diameter ropes, we could pull a 9mm static rope over the bridge without breaking the pull cord.

Using the 2 or 3 mm cords directly with the fishing weight would not work due to the increased friction of these cords on the popcorn coated bridge surface. These cords would also require a larger weight to pull them down the other side of the bridge and that would be difficult to shoot with the slingshot. The best side to shoot the weight from appeared to be the far side of the ledge system, so Pat and Aaron were belayed over to that side and Pat made several attempts to get a weight over the bridge.

His first few attempts were bad due to aiming at the wrong target (there was a small circular hole that looked similar to the bridge hole seen on the other side of the dome). After a few more attempts it was discovered that the weight would not drop over the bridge since the fishing line would get tangled in the popcorn/aragonite that coated the walls above the bridge.

It was then determined that the other side of the ledge would be the best side to shoot from since it was easier to avoid tangling the fishing line in popcorn/aragonite coated walls.

After a couple more attempts the weight went through the opening above the bridge and the weight dropped down far enough for Stan to rappel down and retrieve it. We rigged the 2mm cord onto the fishing line using 3 girth hitches spaced out so that they kept the cord straight when pulled.

We worked the cord/fishing line combo back and forth over the bridge several times before the 2mm cord was pulled completely over the bridge. Next we attached the 3mm cord to the 2mm cord using the girth hitch knots as before.

Numerous attempts were made to pull the 3mm cord completely over the bridge but the knot section kept getting stuck near the top of the bridge.

We then determined that it might be best to attach the 9mm cord to the 2mm cord since you could whip the 9mm cord, due to its larger mass, and possibly get the knotted section past the rough spots on the bridge. We tried it numerous times, but both the 9mm and 2mm ropes got stuck on the bridge.

At this point it was getting late in the evening (9:45pm) and everyone was a bit tired and low on energy so we decided to leave the ropes stuck until we could come back the next morning. We made it back to camp after 10pm and went to bed after eating dinner.

Day 2 (8/20/07) Monday

We woke up at 7:30am and after eating breakfast and organizing our food for the day we left camp around 9:30am. The team headed back to the first ledge system in the Trepidation Dome so we could figure out how to get the 9mm and 2mm ropes unstuck from the rock bridge.

All attempts to pull gently on either rope failed to loosen the stuck ropes. At this point we knew we could use the slingshot with fishing line to rig the bridge again if necessary so Stan, positioned on the far side of the ledge, pulled very hard on the 2mm cord and the ropes became unstuck. We were very surprised that the 2mm cord did not break during this effort so it gave us more confidence to pull harder on the 2mm cord while someone else whipped the 9mm rope on the opposite side of the bridge.

The 9mm rope moved closer to the lip of the bridge many times but never seemed to clear the lip. At this point it was suggested that Stan not pull on the 2mm cord until after the 9mm rope was whipped so that the 9mm cord could



Patrick Cicero ascending static rope to the “Bridge Too Far” - Photo by Aaron Stockton

possibly move over the lip of the bridge. During one of the many attempts with this technique the 9mm rope cleared the lip of the bridge and Stan was able to pull it over the bridge.

Stan continued pulling the 2mm cord while Dave whipped the 9mm rope and soon Stan had the 9mm rope in his hands. The team was quite excited since now we had the ability to reach the “Bridge Too Far” without having to lead over 30ft of overhanging aid climbing.

Stan, Dave, and Pat all considered being the first to ascend the fixed 9mm rope up to the bridge, but Pat decided that he would be the guinea pig for this rope experiment.

The strategy employed was to climb the 9mm static rope up to the bottom of the bridge while being belayed on the 11mm dynamic climbing rope. Although, the belay rope would keep Pat from falling to the bottom of the Trepidation Dome, it would not keep him from falling ~60+ ft down, most likely hitting the wall directly below the first ledge system.



Patrick climbing up onto the bedrock bridge inside the Trepidation Dome—Photo by Aaron Stockton

While Stan belayed, Pat ascended the free hanging rope very gently. After climbing to the bottom of the bridge, Pat used a runner to tie off a large popcorn knob to serve as protection while moving up onto the bridge. He then used an aider connected to a higher piece of popcorn to step up onto the bridge.

Luckily, the bridge was very solid and the stance on top of the bridge was comfortable while he placed two 3/8" dia SS bolts to anchor the rope and to serve as the belay anchor for the climbing traverse from the bridge to the top of the dome.

Once the rope was anchored to the two bolts, Pat pulled up a small survey pack to serve as a rope pad on the bridge. Dave Levy ascended next to the bridge and after organizing his climbing gear he began an upward diagonal traverse to the top of the dome.

This Hookydigger Traverse was one of the most aesthetic leads on the whole Trepidation Dome climb. The exposure was huge as Dave started the climb ~110 ft above the floor of the Prickly Ice Cube Room.

Dave used a combination of free and aid climbing to move up this section. He only placed two RB's (5/16" dia), while using hooks, tricams, and natural anchors as his other pieces of protection.

After placing the last RB, Dave did a 5.7 mantle move up onto a ledge system that led to easy but runout free climbing.

Once up, Dave quickly looked for any continuing cave passage, but soon yelled down that the top of the dome was terminated. The climb that Dave completed was an upward diagonal traverse so it couldn't be cleaned on rappel or by ascending the rope. Pat cleaned this climb by following Dave's route with a belay from Dave.

The last RB was left in place to use as a rebelay for the static rope that Aaron and Stan would ascend to the top of the dome. While the climb was being cleaned, Aaron and Stan surveyed the Trepidation Dome from station FBB10C station up to new stations FBB10F and G.



Dave Levy climbing the Hookydigger Traverse to the top of the Trepidation Dome—Photo by Aaron Stockton

After everyone had reached the top of the dome and finished surveying, Stan rappelled over the side to remove the RB and place a Fixe SS double wedge bolt at the lip for a rebelay. Unfortunately, the RB was placed into the bottom of the hole without any room for movement. Stan tried for about 10 minutes to remove the RB, but it wouldn't budge.

We left the RB in place and Stan placed the 4" Fixe bolt for the rebelay. Everyone then worked their way through some very technical rigging to get back down the Trepidation Dome. At this point we were pretty hungry so we headed back to camp, arriving at 9pm.

After a good dinner we decided our efforts tomorrow would be focused on the high lead in the Terminator Room. The Trepidation Dome has now been climbed in its entirety and although it provided many very interesting technical challenges, it only provided 267ft of new cave passage, without any going leads. Still the team felt quite fortunate to be given the opportunity to climb such an imposing cave dome and would gladly do it again.

**Surveyed 97ft, Trepidation Dome, stations
FBB10F-G**

Climbed Hookydigger Traverse ~65ft 5.7, A.2

Day 3 (8/21/07) Tuesday

We woke again at 7:30am and after doing our morning rituals, we headed out to our next climb in the Terminator Room. Stan lead the team to the Terminator Room without any difficulty.

The last fixed rope rappel into the Terminator Room was very hard on the rappel devices due all the gypsum encrusted in the rope. The climb and ledge system looked very good so we were quite excited to do the climb, until Aaron found a strip of flagging tape with a note at the base of the wall. This note said something like "Difficult climb above has been done and does not go, Carol Vesely".

At that point we were perplexed since the lead had never been surveyed or removed from the lead list. We examined the wall carefully to look for signs that the wall had been climbed and looked for grooves on the rock where a rappel rope might have been pulled down.

We couldn't see any signs that the wall had been seen any human traffic. Even if the climb had been done before, we knew we needed to climb it again just to survey it. Stan used our 2mm cord and a medium weight rock to position the small cord over a large rock flake on the wall about 25ft above the floor. We then



Stan Allison ascending a rope fixed over the large flake on the Triple S climb (Terminator Room) - Photo by Aaron Stockton

used the cord to pull the 11mm dynamic rope up and over the flake.

The first position of the rope was not secure enough for someone to ascend, so Dave whipped the rope up and over a larger section of the flake, with a very good notch to secure the rope. Stan then ascended the rope for about 25ft until he was able to reach a semi-secure freeclimbing stance behind the large flake. At this point he used slings on two rock horns to create a couple of climbing protection points and clipped the rope into them.

With Pat belaying, Stan freeclimbed up the wall to a good position on the large ledge system. At this point he could see small footprints in

the rock flour so he knew that the climb had indeed been done before.

Upon further investigation he confirmed that the lead did not go. Stan and Aaron then surveyed the passage now known as the Triple S climb and obtained 61.6ft of un-surveyed cave (1 shot FH13A).

We packed up our gear and then headed back to the Chandelier Maze area to check out the next lead on our list, a 10ft climb at FDG5. When got to the Maze we saw there were a lot of unsurveyed cave passages in this area.

Due to the nature of the maze passages, Stan felt there would probably be an easier way to get to the top of the FDG5 climb without climbing up the slightly overhanging wall. After a quick check of several passages in the area, Stan found a passage that led to the top of the FDG5 climb, so we could now focus on surveying this route as well as other un-surveyed passages.

With Stan sketching, Dave and Aaron doing instruments, and Pat doing inventory, we surveyed 306.9ft of passage in "Dees Plaze" (stations FDG13-34). Most of this passage was covered in a thick layer of gypsum, and needles could be found in great abundance. It was kind of amazing that this area had not been previously surveyed. Our team pushed all the leads between FDG5 through FDG12 and left only the leads between FDG1 through FDG4.

We made it back to camp at 8:30pm and had a difficult time choosing from the wonderful selection of freezedried we had brought.

**Climbed ~45ft 5.6, A.0 Triple S climb,
Terminator Room (FH13)
Surveyed 61.6ft, Terminator Room,
station FH13A
Surveyed 306.9ft, Dees Plaze, stations
FDG13-34**



Stan Allison freeclimbing on the Triple S climb—
Photo by Aaron Stockton

Day 4 (8/22/07) Wednesday

We got up at 7:30am and did the morning ritual. It should be noted that the Jetboil stove really is one of the most efficient stoves sold. One minor flaw with the design is that it doesn't seem to be able to deal with the rigorous cave environment when packed. Dave found that the piezo electric starter had cracked insulation. This resulted in the electric current shorting to metal structures other than the one intended to start the stove. Luckily we had a butane lighter that we could use to ignite the stove.

At 9:30am we left camp and headed off to the Voids section of the cave to locate the last two remaining high leads that we had on our

proposal, a 10ft climb at FQ64 and climbable dome at FNTX2. This was the first time most of us had ever seen the Voids and it was really a striking contrast to the rest of the cave.

One of the first features you noticed was the inordinate amount of fractured bedrock debris all over the floors. This was our first clue that the climbs in this section of the cave might not be the best quality.

The second interesting feature of the Voids was the large quantity of sulfur deposits. We found the FNTX2 climb and at first glance it didn't look too bad, but you could see loose rock that would need to be cleaned as you climbed up it.

This area was very maze like too, so Stan headed off to find a non-climbing route to the opening at the top of the dome. He looked around for 20 minutes or more and thought he was close, but he never did find an alternate route to the top of the dome.

Meanwhile Dave and Pat examined the climb more closely so that they could formulate a strategy for ascending it. Our big clue that this climb was not a good idea was the large conical pile of loose bedrock debris at the base of the wall below the dome. The initial sections of the climb looked like reasonable freeclimbing, so Pat began bouldering the start of the climb.

During this he found that the exfoliating nature of the rock was not contained to just the surface. The rock was very much like an onion, in that you could clean off several inches of loose rock, only to find more layers of loose rock below the surface layer.

Stan came back and checked out the climb for himself and felt it looked loose but feasible. After Pat and Dave pointed out a large fractured foothold (250lb rock) attached to the bottom of the wall, Stan used a grapefruit sized rock to tap on the large foothold. We could see the large foothold rock moving with each tap of

the small rock. The vibrations from this tapping traveled up the dome and several smaller rocks rained down upon Stan.

After this rock fall, Stan concurred with Dave and Pat's opinion that the merits of reaching the passage seen above did not outweigh the high risk involved with climbing this small dome. With the maze like nature of this area it is most likely that this climb leads to some other previously surveyed passage.

When we examined the other climb at FQ64 we quickly came to the same conclusion. The climb at FQ64 looks easier from a freeclimbing perspective, but requires the climber to traverse onto a large bedrock bridge that is full of fractures. The big risk with this climb is riding the large rock bridge down to the ground with the possibility of other large rocks falling down



Stan Allison and Dave Levy surveying in Dees Plaze (Chandelier Maze area) - Photo by Aaron Stockton



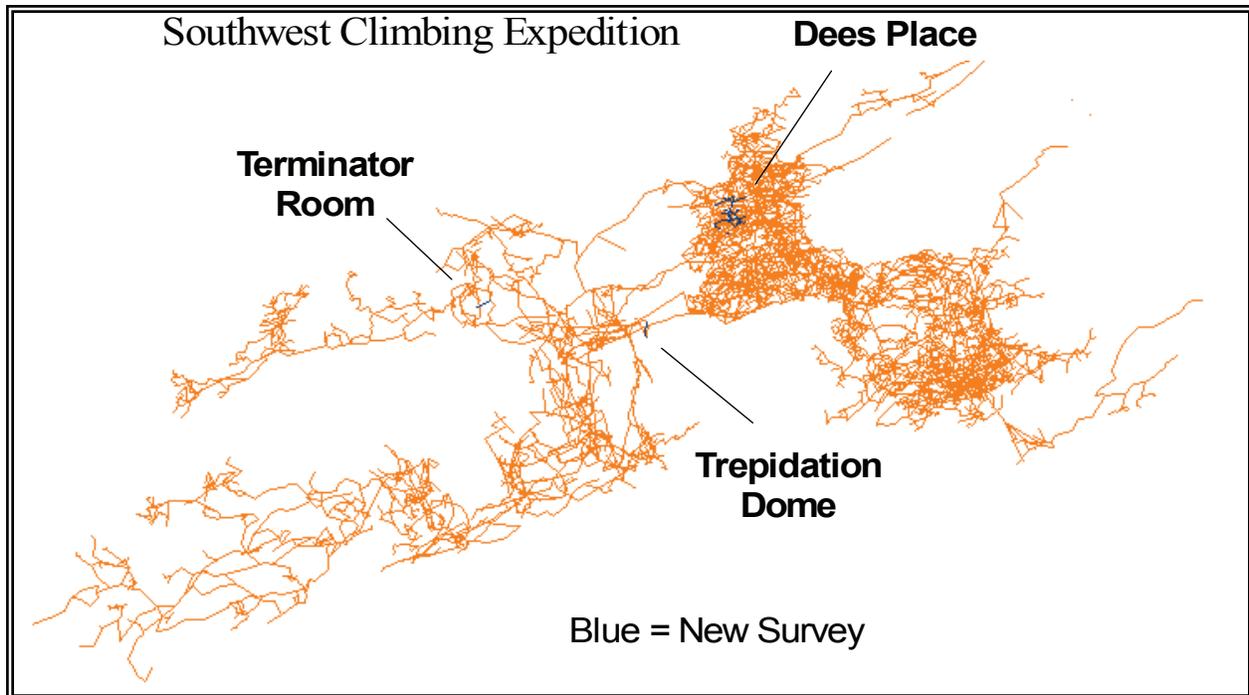
Dave Levy freeclimbing Dees Clime while Patrick Cicero belays—Photo by Aaron Stockton

onto the climber or the bridge itself rolling onto the climber when they both hit the ground.

All of us felt the risks involved with both of these climbs outweighed the slight chance of finding new passage above. As such we headed back to Dees Plaze to continue surveying many of the leads we left yesterday.

Once we were back surveying in Dees Plaze we found some really awesome sections that had incredible gypsum needles, including one needle that was 1.4ft long near FDG47. Above station FDG50 was a really fun looking gypsum climb that Dave led while Pat belayed. The climb (Dees Clime) led to previously surveyed passage (FKJ7Z), but it was still a good tie in.

After surveying the climb, we visited the Wizards Staff and Briney Pool areas so that



Dave could examine the potential research in this small but interesting pool. After Dave examined the pool area and theorized some potential research ideas, we headed back to camp (9pm). At this point in the expedition we had exhausted all our approved climbing leads except for the ongoing effort on the large dome at FJ15 by the Armstrong expedition (March 2007). They ran out of time on their expedition and didn't finish the climb, but we felt they had worked hard on the climb and left it for them finish off on a future expedition.

Since we didn't have anymore climbing leads to explore, we decided to cut our expedition short by 2 days and leave the cave on Thursday, instead of Saturday as planned. After a good dinner and a food swapmeet (everyone had two days of extra food to trade for something better), we went to bed.

**Climbed ~45ft 5.6, Dees Clime,
Dees Plaze (FDG50)
Surveyed 410.00ft, Dees Plaze
Stations FDG35-53**

Day 5 (8/23/07) Thursday

After eating breakfast we packed up our stinky gear and dumped our urine at the pee site. We loaded our packs, did a once over the camping area to make sure our impact was minimized, and headed out from Big Sky camp at 9:30am.

The Tinsel Town Maze was loads of fun with the heavy camp packs. We took a break at EF Junction and ate some more food to lighten our loads before continuing onward. Everyone was moving very efficiently.

On the way out, Dave and Pat saw a mouse at the first pool nearest the airlock. It seemed a bit spooked to see us with our bright headlamps and scampered off toward the entrance.

The last person reached the surface at 2pm so we made it out in 4.5 hours. The surface temperatures were a bit warm so we didn't hang out at the entrance longer than necessary.

North Rift

Steve Reames

October 7th, 2007

Team: Steve Reames, Paul Burger, Christa Schneider, Marty Morey

Steve took the entrance rope and carabiners to setup the rappel. He clipped into the first anchor and started climbing down to the second set of bolts near the lip. As he prepared to clip in, he heard a telltale sound of a rattlesnake. He stepped back and shouted “snake” to the others.

At that point no one had seen the snake – the sound seemed to be overhead. Steve stepped down again and the sound resumed. Directly below the bolts there is a small natural arch at the base of the gully. The rope pad that is usually placed at the lip is tied to that mini-arch. There is a small 8-inch diameter hole that goes back into the wall where the rattlesnake was living. It would be near impossible to dislodge it.

Years ago, the normal rappel route into the cave was on the North side of the pit, rather than the South side where it is now. But we did not have enough rope to rig it on that side. Instead, Steve rigged the rope a bit west (left side, looking downhill). The rig required two lengths of webbing to keep rope from falling into the snake gully and another to make a safety so you could safety rig your rappelling device. This took an extra 45 to 60 minutes to get the team into the cave.

From the Rift we traveled to the Traverse of Death. Rather than taking the traverse, we climbed down and followed the 1987 survey (for which we did not have good sketches). The route required a bit of climbing, but was not as bad as we had expected.

By 4pm we had resurveyed the old CE-survey

route, calling the new survey CEL. Near the end of the CEL-survey, everyone thought they had felt a little air. The source was not found, but surveying the that area seemed to be cooler than normal. There are no known leads in the area, so the source of the air is a mystery. We considered continuing and resurveying the CG-survey which continues from the end of the CE. But the way on was through a very tight vertical slot that both Marty and Paul agreed that they could probably squeeze in, but may not be able to climb out. The survey notes for the CG survey are useable, so we decided to call it a day.

The team successfully bypassed the snake on the way out (it was not seen). Last person out left at 10:45pm.

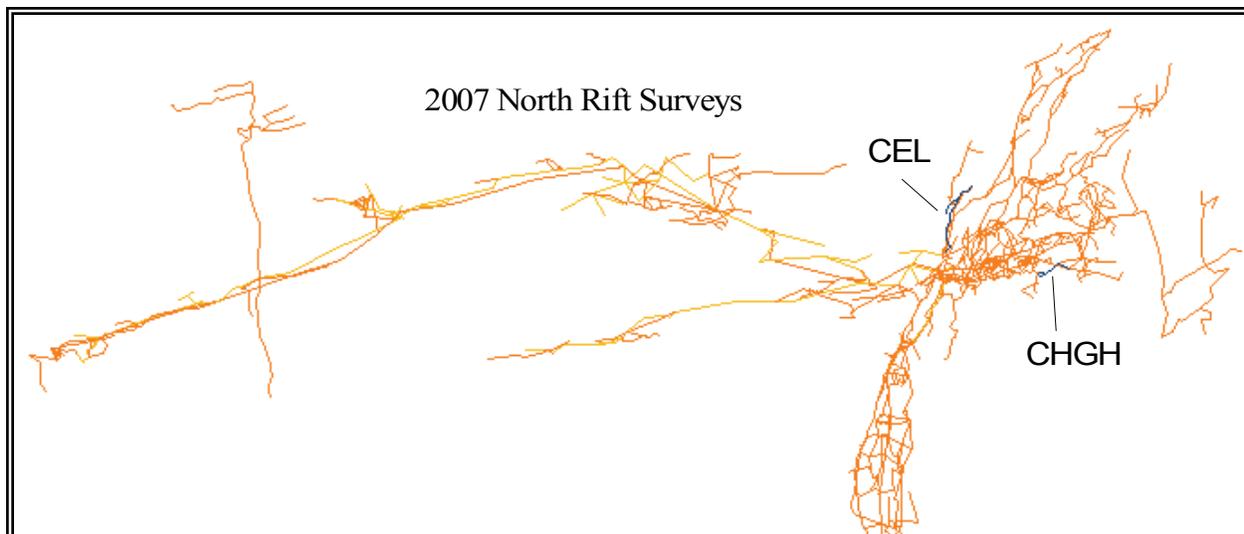
**Total new survey: 0.0 feet
Total re-survey: 266 feet (approx).**

November 4th, 2007

Team: Steve Reames, Jeff Goben, Barb Smith, Shawn Thomas

The team had three goals, all of which were achieved. The first was to finish a lead in Kryptonite Hall which is on level L+1. The CHGH survey netted approximately 60 feet of new survey in a tight crawlway. It took two shots to get to the lead; the extra distance was excluded, for a total of 9 new stations.

Next we followed-up with a lead that was left from the last trip, a possible climb at the end of the CEL survey (passage below the Traverse of Death). Shawn led a climb 40 feet to a possible lead. There was no lead – it was just a shadow. The last goal was to get good ceiling height measurements along the CF survey using a Disto A3 laser rangefinder. We started at the Traverse of Death and ended deep in the CF survey when the heights return to normal (about 4 feet). This will enable us to make a more accurate profile of the Rift.



Project Summary

At this point, the survey of the North Rift is officially complete. It is expected that in the process of creating the map, surveys may be found to be lacking, in which case a return trip or two may be required.

Thank you to everyone who have toiled for the last six years.

Total new survey: ~100 feet
Total new survey, less excluded lengths:
~60 feet

Far West Expedition

November 2 – November 8, 2007

John Lyles

On November 2 – 8, 2007, Peter Bosted and John Lyles co-lead a twelve-person survey expedition in the Far West (FW) branch. Besides Peter (from Virginia) and John (New Mexico), the team consisted of Mark “Elvis” Andrich from Missouri, Andy and Bonny Armstrong from Arizona/South Dakota, Daniel Chailloux and Michel Renda from France, Darren Dowler from Australia, Jen Foote. James Hunter and Tanja Pietrass from New Mexico, and Norm Thompson from Colorado. Ten of the twelve cavers have been

on previous expeditions in this cave. It was good to get Norm back into the cave, and to hear him and Peter talking about the ‘old days’ of exploration early-on with the Lecuguilla Cave Project. The cavers split either into three groups of four, or four teams of three to survey in various areas in the Far West. Teams surveyed under Rock’N’Rillen Room, under Jackpot in Spah Haabah, in the Wild Wild West, in Mental Breakdown Maze, in Adobe Room, in Menagerie and Royal Flush, in and near the Beard Room, in Friday Night Fever, and in the newly discovered Emerald City. Work in some areas was completed, yet we finished with more going leads and work for the future in other areas. It was a delight to work closer to camp than in past expeditions, while continuing to find virgin cave passage. 4682.8’ of new passage was surveyed. A total of 5196’ was actually surveyed, including new, blunder corrections, resurveys, and tie-in and redundant shots. The expedition added 0.89 miles to the overall length of Lechuguilla Cave, to make ~122.7 miles of passage length. 28 new loops were created, without significant blunders.

John brought marked-up line plots, photocopied old sketches, and made route-finding aids, which were useful for the expedition. Peter had marked-up quads and printouts from his blunder analysis program. Daniel brought a Palm Tungsten TX PDA

loaded with FW survey data and the Auriga software. These preparatory steps were all instrumental to the success of this expedition.

We planned to enter the cave earlier than our normal Saturday to Saturday expedition, in order for some of us to be able to attend the November Big Manhole dig on the 'exit' weekend. Due to lost luggage and connections from France to El Paso, Peter and the two Frenchmen were unable to enter the cave on Friday. The remaining 9 cavers entered from 3:30 to 4:00 PM, encountering a young rattlesnake near the lip of the second pit near the bottom of the entrance rope. The snake kept its distance, as did the cavers. They arrived at Deep Seas camp in the FW in time for dinner.

On the first day Norm led a team to Friday Night Fever, the newly surveyed upper boneyard to the northeast of the Leaning Tower. They went to two marked leads and surveyed 183.8 feet of new passage with 14 stations. This area was completed and the rope was pulled later in the week because it was needed to rereg the ABCs climb. Andy led a team to Rock'N'Rillen Room, which is up the Southern Climes ropes (287 ft) in the Southwinds section. They continued an ongoing project to survey all the boneyard under the breakdown floor of this high-up chamber in the backreef, in an area called Hahd Coah. Their work led to 172.4 feet of survey, and the Hahd Coah survey appears nearly completed. John led a trip to Menagerie and Art Gallery, in an area where he worked 10 years before on the discovery of another high-elevation backreef room named Sanctuary. His team surveyed 120.2 feet, with 87.3 ft. of this being new passage. There are only a few known leads remaining in the route from Jackpot to Sanctuary, so this area is nearly finished. Peter's team entered the cave after lunch and reached camp in time to try to repair a bad loop through the Red Seas route to the rear of camp, reshooting or resketching along the way. They

resurveyed 336.2 feet in 12 stations and returned to camp at 10:00 PM, within minutes of the other teams arrival time from their work out in the Far West. This simultaneous arrival in camp happened on numerous evenings, surprising everyone over our timing in such a massive cave. Previous expeditions with teams spread further out had cavers working with widely varying schedules compared to this expedition. We kept reasonably constant camp hours, caving in the daytime and sleeping at night, but as always, this became less absolute after a week in the big cave.

On the next day Peter led a team to Mental Breakdown, bringing Norm's team along for directions. Using Daniel's PDA with a full line plot of the FW, they were able to find the unflagged route from the Southern Climes turnoff area into the Mental Breakdown. The route goes under a huge breakdown slope. They proceeded to survey two undocumented routes between existing surveys, in an area of large breakdown blocks and many beautiful aragonite bushes. They went to a marked lead and surveyed into a low crawl full of unstable breakdown, and it connected back to known cave. Near the end of the survey, the display on Daniel's Disto stopped working, presumably because one of them had leaned on it against a rock and broke it. One down, but there was a spare in camp. They had surveyed 221.9' in 23 stations. Meanwhile, Norm's team surveyed leads and added 175.1' of new passage with 19 stations. Norm returned to the same area on another day and surveyed in 3 leads with 112.7 feet of new passage in 9 more stations.

John led a team to Spah Haabah, the new area that was discovered under the floor of Jackpot last year. This is northwest of the Leaning Tower in the Western Borehole. They began by entering via the route from Jackpot that they had discovered in 2006, and started with the closest lead. Virgin cave was surveyed into a tight fissure that intersected a larger fissure. Continuation required chimneying along a tight



Figure 1. Possible blastoid and sponge in Crinoid Casino—Photo by Andy Armstrong

fissure. They reached a traverse over a small pit, and found a downclimb to the bottom. Along this route they found another large breakdown hole leading into Jackpot adjacent to the previous entry point - this one being almost walking passage!

They continued surveying down the new pit to a wider chamber, eventually reaching a termination. A small window was negotiated and led down into the large Spah Haabah chamber near the beginning of 2006's IW survey. They had looped back around and made another (better) route between two surveys. They surveyed 252.8 feet.

Meanwhile Andy's team had also traveled to the Jackpot area. They worked on the other leads marked in the floor of Jackpot, most being nothing, and eventually got to the north end of Jackpot and located another marked lead. There was a note here that stated "Breakdown pushed 75' down, ends in breakdown choke – No leads 12/11/97". They took the note at its word and decided to just map the 75 feet that had been scooped.

While setting the first shot Bonny dropped the Disto down a breakdown hole. Were we starting to get Disto Fever? The team descended into the pile to look for the expensive instrument. Andy located a small hole to find it and squeezed down into a nice-sized virgin room and determined that there was cave to survey here. It was surveyed

through breakdown and boneyard for 337.2 feet, generating 16 leads. In the lower portion, there were nice crinoid fossils protruding from the walls. Since this area was beneath Jackpot, James named it the Crinoid Casino. The area was well decorated with spar and plentiful fossils and would be best described as breakyard. Figure 1 shows two excellent specimens.

Peter's team replaced the top rope just below the ABCs room on the main route to camp. This rope had developed a bad spot where it rubbed against the lip, and a butterfly knot had been tied earlier in the week. Now a new bad spot had formed - the rope was not going to remain usable in this situation. They cut the rope at the bad spots and used it to rig a traverse line at about waist level for the traverse across, that was previously unrigged.

In the past the top of ABCs required a step across the pit, a move Lech cavers have safely done for years. To improve safety rather than wait for bad luck, the former Friday Night Fever rope was used for the drop, rigging it from a large boulder directly above the drop to avoid rubbing on the upper part of the drop. They rigged a temporary deviation to protect the rope from rubbing against the ceiling further down.

---John led a team to Wild Wild West. It is past the Southwinds turnoff, and was discovered in 1994 along with nearby Southwinds and

Mother Lode. Going up into Far Planetarium, they turned and scrambled up to where they found three flags from ET survey stations, that had dropped down the airy Another Lode fissure survey last November. It was just above here, over a hundred feet.

Turning right they followed along the balcony edge of Planetarium. The route becomes difficult here as one must climb up into a steeply inclined slot in dirty rock flour. They continued chimneying beyond this through an equally ugly and wider exposed vertical fissure following orange flags, to the Outpost.

They surveyed one line under a known area and tied back in. The Peccary was surveyed and pinched in spar. A total of 131.8 feet of new passage was surveyed in Wild Wild West.

On the hike back to camp, the ABCs re-rigging project was underway at the eastern end of the Borehole, so everyone waited for the experts to test their rigging before finally trying out the new traverse line and rope down ABCs.

On Tuesday, Elvis and his team headed back into the breakdown below the Northwest edge of Jackpot. They surveyed a lead in a calcite-coated, small and sometimes tight passage, and continued on with several leads, eventually surveying 270.5 feet with 20 stations.

Meanwhile Peter led a team to the Northwest passage, past the first traverse, to the beginning of the second. They rigged a new 130' 11 mm rope to the bolt and lowered it down the pit. It was a beautiful white pit with gypsum snow.

First they fixed a blunder, finding that the inclination had been reversed, as suggested by his blunder finding program. After knocking off several leads in the Beard room, they surveyed a small loop through some pillars, called the Eye of the Needle. The total survey was 158.6 feet using 10 stations.



Figure 2. Namesake of Emerald Aisle—Photo by James Hunter

John and the Frenchmen went to work on leads near Spinning Room, NE of the Leaning Tower. John had specific directions from Ray Keeler to look for a lost “Fred Mitchell” lead from ~1991.

They checked for leads along the right wall of the passage, heading towards Spinning Room. They climbed up and began surveying a new station at a hanging pendant of rock, shot from below. A block of rock fell adjacent to the station as Michel was surveying. It was estimated to weigh 60-70 lbs and it pinned his head in the crawl. He was lucky to have only a bump on the head and a broken molar.

The passage ended where it had been previously scooped. The team then went to Spinning Room. A chamber above it had noticeable airflow, decorated with more needles and beards. Perplexed by this air movement, John then entered a crawl below the room to a smaller chamber with large flat plates (rafts). There he discovered a vein with dark green translucent minerals on gypsum in an alcove (fig. 2). This alcove was named Emerald Aisle.

While the team was photographing these, John crawled into a low squeeze above the alcove. A dark void was observed beyond a constriction, so he crawled ahead to have a better look. As he was entering the constriction, several plates



Figure 3. Emerald City borehole—Photo by Daniel Chailloux, Michel Renda, Peter Bosted

shifted and loose debris dropped on his back, prompting him to crawl forward without further hesitation. He looked around and realized that he was in a spacious passage. Knowing that big passages like this are not often found in Lechuguilla anymore, John looked around for footprints or surveys. There were none!

This crawl opened a new area they named Emerald City for numerous green deposits and mineralization. Figure 3 shows the passage shape. It continued with ever-widening dimensions, and fossils were noted, along with sizable beards, hairs, and gypsum needles. They surveyed 10 stations for 390.7 feet, marking 8

leads and leaving an inviting 30 x 30 foot passage going steeply upslope, for tomorrow. The three returned to camp after midnight, ecstatic over the new find.

While Emerald City was being explored Andy and his team continued working in Crinoid Casino, surveying more boneyard leads. One led to more boneyard and 11 more leads. On one survey Darren emerged into Jackpot again, between the trail flagging, through an obvious hole between blocks that had never been entered. This was a much easier entrance into the higher number stations in Crinoid Casino, so they named it the “High Roller Entrance” with signage promising “Loose Slots, Tight Leads”. They returned to another lead and surveyed down into sharp, glassy boneyard with nice fossils. They entered an extremely sharp area where the boneyard was described “like razor blades covered in sandpaper”. It was impossible to move without getting scraped and cut, but they continued through the Slice’N’Dice to its end, surveying 403.9 feet with 48 stations. They arrived at camp at about the same time as John’s team from Emerald City, so an excited discussion was whispered while the others slept. Both teams had made out well today.

The news of the Emerald City discovery travelled fast in the morning, and on Wednesday three teams of three would continue mapping the Emerald City trunk and associated leads.



Figure 4. Bottom and top of slope above EVJ18 in Emerald City—Photo by James Hunter



Figure 5. Twin domes above EVJ26 in Emerald City—Photo by James Hunter

John’s team picked up the survey in big passage at the base of a steep slope covered in small breakdown debris. Numerous blocks of gypsum had exposed layers showing with a bright yellow powder, possibly a silt layer. They waited

while James free-climbed the ~45 deg, dusty slope until he found a rigging point. He used a new 100’ PMI 11 mm rope tied off to a large 4.5’ diameter chockstone wedged in a trench in a gypsum glacier. 234.5 feet was surveyed including some interesting survey while on rope.

At the top of the slope (fig. 4), the easy passage ended at several climb leads. Directly above, the ceiling was approximately 75 feet high, and a bridge was seen between two large domes. Using the Disto, from the highest point on the slope, they measured a consistent 195 feet. In one area, John measured 239 feet, indicating a smaller diameter hole in top of the tallest dome. Gypsum could be seen at the 100-foot level above the slope, and the wall up to this was solid bedrock. This makes this dome one of the tallest single drops known in the Western branch. Figure 5 shows a telephoto view of “what’s up”.

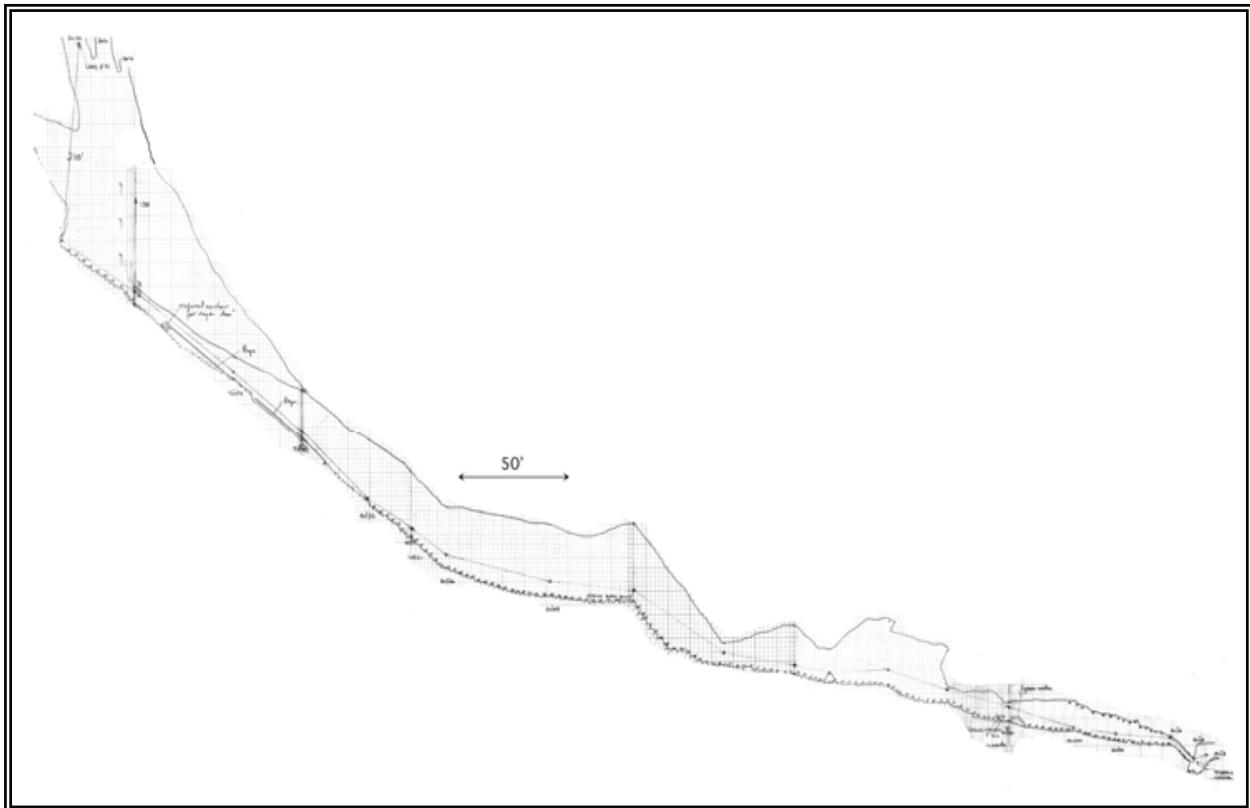


Figure 6. Extended profile of Emerald City, composite map from field sketches from Daniel and Norm

Figure 6 shows a composite profile view of Emerald City from EYJ8-26, as recorded by Norm and Daniel in their sketches. The entrance (Emerald Aisle) is on the lower right, and the high domes are on the upper left.

Elvis' team followed two other teams to the newly discovered Emerald City. They pursued three of the leads. The first was near a hanging pendant of rock that had a green coating underneath gypsum flowers. It was generally in line with the vein of 'emeralds' in Emerald Aisle.

The team surveyed up a steep tube, through a small hole/drop, and down a parallel tube back. As in the rest of the Emerald City, many needles and hairs were in the vicinity of this survey near the bottom.

They then went to a lead to the east of the main trunk, and surveyed three stations to a small terminal room - again with abundant flowers, hairs and needles. The team went in a direction opposite to this passage to the southwest, into a larger alcove. There was a ramp to the left of this line going above to a clean scalloped tube, 8' diameter, as a promising lead that was not pushed.

They went to the top of the Emerald City to look at potential leads noted by yesterday's team and to see the impressive 230' dome at the end of the main passage. They surveyed 285.8 feet with 12 stations today and reached camp at midnight after a leisurely trip back through the western borehole, wondering what else might be north of the wall between Leaning Tower and NW Passage - now that Emerald City was found out there.

Norm led the third team to Emerald City to work off leads. The first lead they tackled went through a tight low crawl and opened up into a large room, 30 x 60 feet, with a 30-foot ceiling and a large overhanging ledge leading up to apparent high lead or leads. It was not free

climbable. Lions Lair, as it was named, was surveyed to the end. They surveyed 227.6' of new passage in 15 stations.

Peter and the Armstrongs went to the breakyard maze under Jackpot (Crinoid Casino) and surveyed numerous loops, knocking off about 8 leads. They generated a few new leads, all very tight and grim, and saw many more fossils and spar. All together they surveyed 478.2' of new passage in 43 stations, and headed back to camp for a midnight dinner.

Figure 7 is a composite sketch put together by John from the field notes, showing the trunk of Emerald City with the Lions Lair addition. The scaling is not exact.

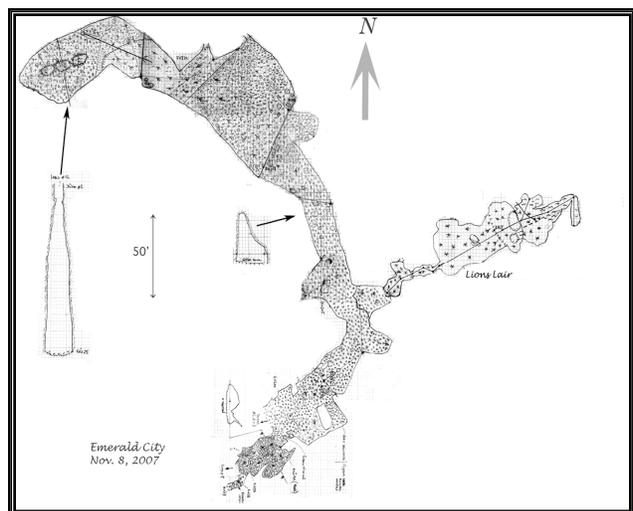


Figure 7. Composite plan view, from field sketches by Daniel and Norm

It was Thursday now, and Elvis and team went to the Northwest edge of the Jackpot room, this time to check and survey leads in Spah Haabah left from November of 2006. They eliminated numerous leads and worked their way back towards Mirage room on the discovery route of this (NOT) shortcut. When they got to IFB103, there was a spar constriction that Elvis could not get through. He sent Jen and Darren through to check on the leads, especially any going north into the unknown. They surveyed one non-go lead for

the data and Darren made a rough sketch to enable Elvis to plot the passage correctly, while he waited in a small room just on the other side of the constriction. This "Tube-o-Spar" extended this local area about 35' to the north.

They finished with 234.6' of new passage surveyed in 23 stations and slowly made their way back to Jackpot and to camp, arriving at 2:45 AM. This was the latest any team returned to camp on this expedition – unlike our previous expeditions.

Also John and team went to Emerald City to inspect climbs and survey remaining crawl leads. They went to lead #1 to survey below the wall. It opened into a nice chamber that was adjacent to a circular chamber piled high with loose silt. This pod had colorful thin layers - one layer being dark reddish/brown mud that was brittle and fractured. The golden and orange silt is at least 3 feet deep in this dead-end chamber. The ceiling has a small hole that is completely blocked with gypsum.

The team then went to the Lion's Lair. For about an hour, they attempted tossing the 8.5 mm rope over a prominent knob - only to find that it did not have a notch or other grippy feature to hold the rope. The lead looks good, but may require a bolt or two to cross an exposed portion of wall from the knob over to the ledge floor.

They surveyed upslope in the main passage of Emerald City in a lead that turned out to be a small dead-end chamber with one shot that John checked and plotted. The team surveyed 149.9' of new passage and reached camp about 1:45 AM.

Peter and the Frenchmen also went to Emerald City to survey other leads and to photodocument the area. They added some cross sections to the EVL sketch of the previous day.

They pushed a lead into a gypsum alcove. There was a very tight gradual slope at the bottom, which was pushed for 12' to set a station. They could not get through a low constriction. This lead was left for another expedition, where thin cavers would be able push it and survey as a team.

The total survey was 72.1 feet. The easy leads in Emerald City were complete, leaving climbs and a low crawl for future expeditions.

Norm's team didn't go to Emerald City on Thursday, and instead they surveyed the last remaining lead marked on the quad map at Adobe Room. The map said it went 30' and ended but was not surveyed, but reality was significantly different from this.

It was a boneyard maze area. The team surveyed 146.5 feet of new passage in small boneyard and left 4 unexplored new leads. They found an old Band-Aid indicating that this area was at least partially-scooped. There were large quantities of crinkle blisters throughout this survey - floor, walls, ceiling, so they named it "Crinkletown Maze."

On Friday, nine cavers woke up early, packed up and departed camp, reaching the entrance without problems, one wave of four cavers at 2:00 PM, with a second wave at five around 3:15-3:45 PM. The entrance was exhaling strongly.

The remaining team of Peter, Daniel and Michel had Park permission to photo-document Red Seas with stereo cameras. The team took 3D photographs for a few hours, then packed up and departed camp at 2:00 PM, arriving at the entrance at 5:30 pm. They took stereo photos of Michel climbing the rope to the entrance in dusk, then de-rigged the rope and hiked back to their car under a warm starlit night.

This Farwest expedition was very successful, in finding and surveying known leads, correcting some blunders, and in discovering new areas like Crinoid Casino at the end of a previously scooped and marked 75 foot crawl from 1997, and Emerald City, just beyond a tight constriction in an airy chamber surveyed in the early days.

Both discoveries, relatively close to camp, demonstrated to us that there is still a lot of potential for new passage to be discovered in Lechuguilla Cave. Simply stated, “Lech is not finished.” The breakyard under Jackpot may not have appealed to cavers in 1997, so it wasn’t pushed far.

Yet, in 2006, our last Far West expedition succeeded in finding and mapping a route all the way from the Mirage Room to the underbelly of Jackpot, establishing a large loop encompassing thousands of feet of cave.

Crinoid Casino added much more to this region, with discoveries of fantastic fossils as a bonus. Emerald City was found in a previously unexplored blank spot on the map between the NW-trending Jackpot route and the NW passage.

Figure 8 shows (in red) the surveys completed on our expedition. Similar blank spots on the map (such as the big one between western and southern branches) probably have extensive passages in them, although finding and entering them will continue to be a big challenge.

Footnote on Green Minerals

In Emerald City, the presence of large amounts of green mineralization is significant and deserves further study. Photographs have been shown to V. Polyak, P. Provincio, M. Queen, D. Davis, H. DuChene, M. Spilde and other experts. DuChene (pers. communication, 12/11/07) suggested that two greenish deposits

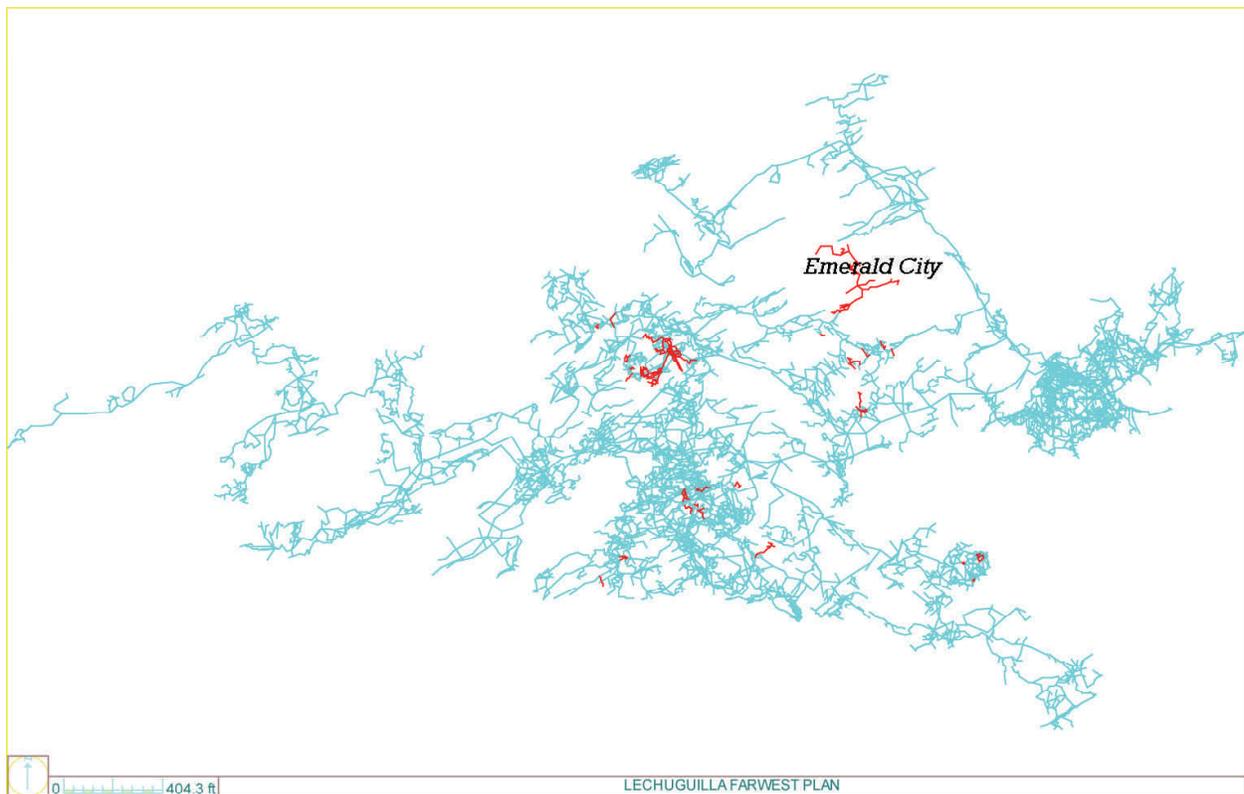


Figure 8. Plan view of Far West section of Lechuguilla Cave, from Compass

in the cave have been analyzed, one being a thick viscous liquid at Blanca Navidad that was fluorapatite. It is a calcium-phosphate compound, and it has been noted as a blue-green powder overlying gypsum blocks (green tinted) in Lechuguilla Cave (according to *Cave Minerals of the World*, 2nd Edition). It requires an organic source, however, which has not been identified in Lechuguilla Cave.

A second deposit was in the major vertical fissure at the upper end of Ghost Town. It was emerald green and appeared as “blebs” on white calcite. A sample was analyzed by Polyak and found to be not a mineral, but an amorphous chromium compound, a “mineraloid”. Other instances of green mineralization have been identified as barite, in Frostworks. Cephlapodunk has a green stal that may also be barite, although it has not been analyzed.



Green coating on pendant—Photo by Daniel Chailoux, Michel Renda, Peter Bosted