NSS News

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Misbehaving Sumps and Lost Tadpoles
A Tale of the US Deep Caving Team's 2009 J2 Expedition
Jon Lillestolen

The 2009 J2 expedition is the latest endeavor in the Aguacate Valley area of the Cheve Karst in Mexico's southern state of Oaxaca. A three year blitz of activity ending in 2006 yielded Mexico a new 1200m deep cave, only to be stopped by a shallow 200m long sump and not enough time or equipment to continue exploration that year. In the three years which followed, dreams abounded about kilometers of virgin borehole. Plans for this expedition were to continue to push the dry passage beyond the bottom of the cave at El Sifon de Los Piratas (Sump 2). The expedition developed new technology and brought with them the determination to meet the cave on its own terms to accomplish the goal of discovering what could be the deepest cave in the world.

History

During the 1970s and early 1980s, most American expedition cavers, who focused on world-class deep caving, spent their efforts on the caves of the Huautla plateau. Discovered in the 1960s, Sistema Huautla was a proving ground for cavers of the era. It was in this place and time that many American-style expedition caving techniques were born and established. With the connection of Li Nita to Sotano San Agustin the Huautla System broke the elusive 1000m depth mark, becoming the deepest cave in the Western Hemisphere and the first 1000m deep cave outside of Europe. (1) It remained the deepest Mexican cave until 2003, when it was surpassed by Sistema Cheve.

The discovery of Cueva Cheve in 1986 by Carol Vesely and Bill Farr led to the formation of a new Mexico deep caving effort, Proyecto Cheve. This discovery and subsequent exploration would ultimately shift focus from the Huautla Plateau southward across the Santo Domingo canyon to the Cheve area as Mexico's premier deep caving project. By 1993, cavers had pushed the Cheve system to world-class depths along with the world's deepest proven potential. Belief in a major trunk hidden deep in the mountain has kept cavers coming back year after year to fulfill the promise of deeper cave despite minimal depth gains since the early 1990s (4).

The Cheve karst lies within the Sierra Juárez, part of the greater Sierra Madre Oriental de Oaxaca, in the northern part of the state of Oaxaca. The highest elevation entrances in the Cheve karst are located near the town of Concepción Pápalo at approximately 2850m above sea level. This highest segment of Sistema Cheve includes Cueva Cheve, the main entrance, and Cueva Escondida, the highest known entrance to the Sistema, in addition to several other nice caves in the general area referred to as the Cheve upper karst. The upper karst swallows the surface drainage from the highlands and discharges it with all its infeeders into the Santo Domingo canyon 19 kilometers to the north. The resurgence karst including all the entrances near and in the Santo Domingo canyon have been explored since before the discovery of Cueva Cheve and include 12 kilometers of dry passages and more than a kilometer of submerged cave to date. Everything in between the upper and resurgence karsts is considered the "middle karst". This includes an area of over 60 square kilometers between the southern edge of the highland plateau and the village of Santa Ana Cuauhtémoc, twelve kilometers to the north. Surface water in the middle karst tends to disappear into stream gravel far from any obvious entrances, making it somewhat difficult to find caves. However, with approximately fifteen linear kilometers of unknown passage between the upper karst and resurgence karst explorations, the middle karst may hold the backdoor to the booming conduit hidden somewhere in the mountain.

In 2003, two major expeditions were undertaken in the Cheve karst. One would push the last of the leads in the bottom of Sistema Cheve and the other would push onward in the confined canyons of Cueva Charco. Before the expeditions, Cheve was the second deepest cave in the Western Hemisphere. Charco, the best lead in the middle karst, was hoped to continue towards a connection with the elusive subterranean conduit that connects Cheve with its resurgence. Unfortunately, both expeditions were stopped by serious obstacles. The limit of exploration in Charco is marked by a small sump at the end of a very long and miserable cave – essentially a 6 kilometer long crawl in water. Cheve currently ends in an impassible rock pile on the other side of two sumps (the current deepest point in a cave in the Western Hemisphere is located mid-way through Sump 2). To push even further would require months of preparation and significant risks just to return to the limit of exploration at either location (5).

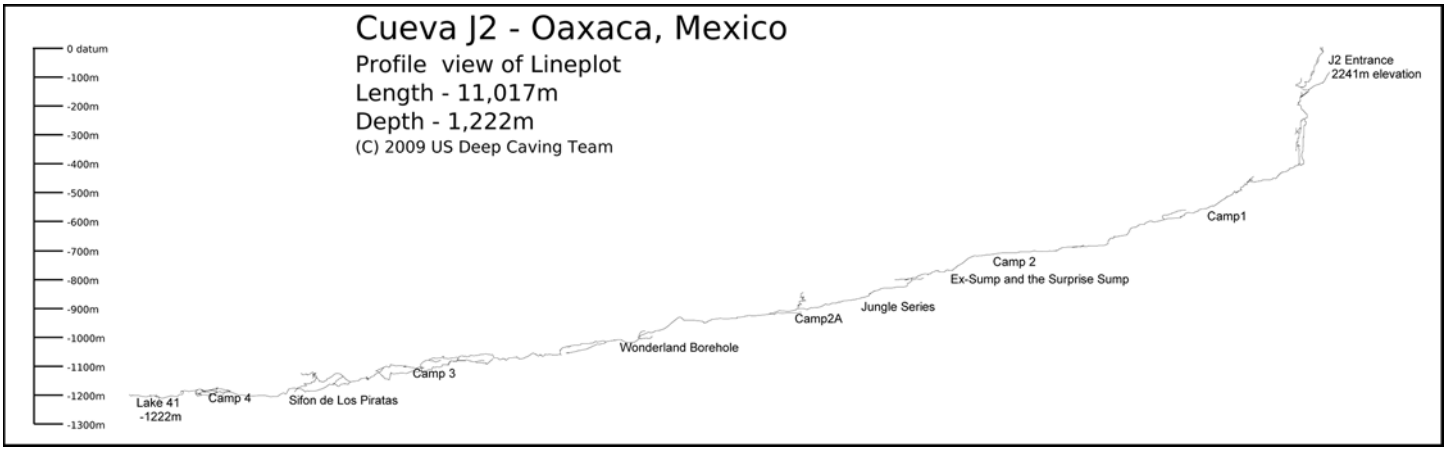
After Charco, Proyecto Cheve cavers went back to the proverbial drawing board to begin searching anew for areas to find new cave. The effort in 2004 focused on untapped areas in the middle Cheve Karst. It was this year that produced Mexico's newest deep cave, J2. After 10 weeks of effort by a multi-national team from 9 nations organized

Kasia Biernacka & Marcin Gala

Michael Denneborg helps reload the basecamp propane cylinder back onto a mule

Michael Pugliese

The kitchen in its full glory as dusk approaches



by the USDCT in a miserable, unending rain storm on the mountain, the team cataloged a long list of potential caves by grid-searching the area around what would become the J2 basecamp. Most never proved to be worth pushing, but J2 eventually swallowed every piece of unused rope that the expedition brought that year. A return the following year would leave J2 at -1101m and a gaping borehole that would beckon a third expedition in 2006. The 2006 expedition led to the discovery of the Sifon de Los Piratas (Sump 2). Sump 2 was found to be 200m long. It surfaced into dry60 meter diameter chamber that ended in Sump 3. The dive through the SLP established J2 at a depth of -1209m (3).

The Expedition Objectives

The 2009 expedition set off with the objective of diving the Sump 2 to the dry passage on the other side and exploring Sump 3. The dive team would consist of several experienced exploration divers and a handful of logistical divers that would transport equipment through the sump for deeper camps. Logistical divers would be experienced expedition cavers given a crash course in the overhead diving environment, giving them the ability to dive with redundant air supplies and follow a dive line through Sump 2. The plan was for logistical divers to swap leads with the exploration divers to put the best team at the leading edge. This would push the exploration forward at a reasonable pace and provide the safest way to map the cave.

Additional goals would include pushing "Last Bash" – a 30m deep fissure discovered in 2005 in the floor of the Aguacate canyon that blows enough air to be a decent-sized cave as well as concentrating on reconnaissance of areas slightly further from basecamp and into unknown territory in the El Ocotal Cloud Forest.

Preparing for the Expedition

To prepare for the diving push at the end of J2, a core team of experienced J2 cavers assembled at Bill Stone's compound in Austin, TX for a week in October of 2008 to train and plan for the expedition. Poseidon Diving Systems had graciously sponsored the expedition with eight of their soon-to-be released Mk-6 rebreathers as they had been designed to be capable of being carried into a cave such as J2. The compact size and range of the closed circuit rebreather would allow for more diving than with an equal amount of weight in open-circuit diving gear. This training would allow both the more experienced exploration divers and the logistical divers enough underwater experience to feel comfortable using the Mk-6 under highly controlled conditions in a cave. The training additionally allowed the divers, experienced and inexperienced, to become familiar with the redundant diving setup that would be used in the sumps of J2.

Over the course of the week in Texas, the team learned to work with each other more closely while learning the intricacies of diving with a closed-circuit diving system. The setting was a comfortable one, dive training started in the 8-foot deep test tank that Stone had built for his NASA projects. From there, we moved to a local caver's backyard pool, complete with hot-tub, 15-foot deep end, and a duck-under to a man-made cave complete with skylight. The week rounded out with dive trips to a SCUBA park on Lake Austin, which featured a plethora of dive obstacles including a metal profile of a shark that swallowed our dive line more than once.

With the week of intense diving and expedition planning complete, the team was working like a fine-tuned machine. Everyone left for their respective homes to continue dive training until it was time to leave for the expedition.

Southward Bound

As with most American-led caving expeditions to Mexico, the 2009 J2 Expedition started in Austin, Texas. Austin is a town with a sizable grotto that has no equal in it's support network for expedition cavers traveling south. With local Texans and the small gathering of J2 participants, heaps of expedition gear were loaded into the caravan of trucks for the long trip to Oaxaca.

The first wave of J2 cavers departed Austin with their caravan of trucks on March 12th. Three long days of travel across the rugged Mexican highways landed them in the small town of San Francisco Chapulapa ready to start negotiations with the local politicians for permission to visit and continue exploration in the area. Since the 2006 expedition, Chapulapa had elected a new presidente and had elected a new board of members for the bienes comunales. This presented some challenges because although we came bearing permission directly from the state of Oaxaca to be there, the locals were always eager to demonstrate their power (particularly so following the teacher strike in 2005). In an attempt to gain friends and convince the locals that we were there for our stated aims, we arranged to share a slide show on cave exploration along with some basic information on karst geology. The slide show was followed by a question and answer session to allow the locals to air any concerns.

Thanks to the assistance of several expedition members that were fluent in Spanish and had a thorough understanding of the culture, the locals, although not fully convinced, left the slide show with an improved impression of the cavers. The negotiations with the local politicians dragged on as they tended to be both stubborn and disorganized. While waiting for the presidente and the "comisariado" de bienes comunales (representing the two independent power structures in this little mountain town), the expedition set up camp in the field behind the house of our dear friend Faustino Navarete Rubio, who had been helping with J2 expeditions since the very beginning in 2004.

The Fun Begins

After a week of tedious discussions, negotiations and politics, permission was

Bill Stone

James "Jaime Hot Tub" Brown organizes dive gear at the *Sifon de Los Piratas* in preparation for establishing Camp 4 beyond the sump.

Kasia Biernacka & Marcin Gala

Marcin Gala and Matt Covington use the cave board to keep track of gear in the cave.

finally granted and the expedition proceeded. Gear, food and personal equipment was organized on Señor Faustino's field to be arranged into packs for the long trek up the mountain. Mule trains then hauled these packs up the mountain in order of importance. The process took several days as the locals had only a finite number of mules and the five-hour round trip limited them to two trips per day.

With gear steadily arriving, basecamp was assembled in short order. Massive tarps were set up first to cover the kitchen and expedition gear areas. Makeshift tables were built to keep dive equipment, Michie phones and the expedition log out of the dirt. The kitchen would have its own large table with two sets of double-burner propane stoves. The stove-top table was surrounded by hanging pots and pans and group food was strewn across the ground behind it. The bulk of the expedition food was neatly packed in large grocery bags on the ground behind the stoves with dates to indicate when each was to be available for use. The bags had to be labeled by week in this way to make sure that the food would last the entire expedition.

The camp fire ring from previous expeditions was once again surrounded with sitting logs to become a natural collector for cavers. Across the campfire ring from the kitchen was the climbing tree. This 30 meter tall tree served as the site of the rebelay course. Before long, the proctor of the rebelay couse completed rigging the challenging course for expeditioners to prove that they could competently travel through the complex ropework in the cave. J2 is no easy cave, and this test would assure that we were not allowing cavers to put themselves in danger through lack of skills or over-confidence.

The group area/kitchen was wedged between the edge of the ridge as it dropped off into the J2 valley and a large steep-walled sinkhole giving the appearance to the camp of being nestled around the rim of a volcano. Tents filled in around the remainder of the volcano crater, with the trail down to Señor Faustino's being on the side of the crater opposite the kitchen.

Once all the toil of setting up basecamp had settled, the focus started towards J2. A three year gap in expeditions to the area made it necessary to check the rigging that had been left in the cave. The cable ladders, used in the first hundred meters of the entrance section, were brought back to ease travel through the hardest and tightest section of the cave. Large sections of rope in the vertical shaft series at around -250m were replaced with

new 9mm rope, getting rid of the much abused ropes that had been left hanging since 2004. In addition to the ropes, the phone line that allowed easy communications between basecamp and the underground camps was checked and any badly worn sections replaced. The expedition had commissioned a dozen new Michie phones for 2009 along with a base station from David Larson who had kindly worked on a compressed schedule to ready these for the project. The expedition quickly reached Camp 1 at -555m, where supplies were restocked (we used standardized 35 liter food bags, good for about 8 person-days). The lead team, checked the condition of staged gear at Camp 1 from 2006 and spent the night before their quest onward.

SUMPED!

Waking up from Camp 1, the ex-sump and the former Camp 2, are only an easy two-hour trip deeper into the cave. Camp 2 is in a large chamber with a nice set of short rebelays taking you down the far side of a 20m high cascade. Near the bottom of the cascade is a flat spot, where a small tent can be set up to keep the spray off the camp's sleeping bags and cook gear. Going deeper in this chamber and down several more sets of short cascades, the room starts to taper down into a 1.5m wide canyon with a deep pool of water in the bottom of it. This steadily-narrowing canyon is what is referred to as the eEx-Sump . This ex-sump is the part of the cave that temporarily stopped exploration in 2005, when the water was 2 meters higher because of a breakdown dam on the downstream end of the canyon. What required dive-gear and the guts to pass an underwater body-tight squeeze in 2005, now requires a neck-deep bath in what remains of the sump-pool.

To pass the ex-sump now requires sliding down a short Tyrolean line that drops into the sump-pool. After a short swim with the aid of the Tyrolean line, the canyon tapers down into a body-tight squeeze that requires helmet removal to pass through. Fortunately, the squeeze is short and adrenaline helps with the exciting climb out of the 11 F water. Wind rips through the same canyon passage as it heads for the larger passages beyond and quickly cools anyone foolish enough to wait here for too long.

As the first team in 2009 passed the ex-sump, they prepared themselves to pass a wider, but deeper pool of water just beyond. A small hill of breakdown separates this pool from the ex-sump and as they reached the top of this hill, they were surprised to see that the pool was now reaching all the way to the ceiling where there had previously been at least two meters of airspace in 2005 and 2006. They had just discovered what would become known as the Surprise Sump. Expecting an easy trip to Camp 2A, the cavers were amazed that once again J2 would require a short sump dive to continue. Apparently the large pile of clean washed breakdown on the far side of the pool had shifted since 2006 holding back more of the water than in previous years.

With a delay in the plans to continue onward into the cave, the expedition reestablished the old Camp 2 in the large chamber before the ex-sump. Dive gear was prepared and Surprise Sump was dived to see if the feat performed at the ex-sump in 2005 could repeated on this new challenge. After diving the sump, it was determined that whatever was holding back the water could not easily be reached and the sump would have to drain at its own slow pace. Although it drained slowly, the sump did eventually lower to the point where, some 3 days later, brave crews could pass through with several centimeters of airspace.

During the two months of the 2006 expedition, Surprise Sump had never given any indication that it would rise during rain events and so it was never thought of as a threat. To prevent any further problems, a set of dive gear was staged on the far side in the event that heavy rains would require the cavers to dive to exit the cave.

Moving Equipment

With the problem of Surprise Sump temporarily solved (though disconcertingly not by our accord), teams pushed deeper in the cave, re-establishing camps 2A and 3 and repairing the phone line on the way to the Sifon de Los Piratas. As if there hadn't already been enough trouble with sumps and politics, an influenza mini-epidemicstarted to spread across the basecamp. It hit some of the cavers harder than others, making some unable to work for up to 3 weeks. Due to the combination of complications that came out of politics, the Surprise Sump and now the flu outbreak, the expedition was way behind schedule and still had a huge pile of dive gear destined for El Sifon de Los Piratas that had not left basecamp.

Finally, fresh cavers began to arrive in basecamp, and teams of cavers were able to begin moving bag after bag of dive gear into the cave. Several dedicated cavers offered to make surface runs, carrying bags into the cave to the bottom of the vertical shaft series and exiting in the same day, experiencing the worst that J2 had to offer twice in the same day.

The cave starts out in a beautiful heavily-vegetated steep sinkhole. It can be hard to see the sun from the entrance during most of the day due to the big depression and the tall trees that seem to flourish in the vicinity. Just above the main part of the entrance is a classic Mexican cave headwall of smooth limestone, only on a smaller scale than the big well-known Mexican caves. Just inside the entrance, the cave quickly descends into down-climb after down-climb into a body-tight meander canyon. Several of these down-climbs are permanently rigged with both cable ladders and ropes, because of their tight nature, it is easier to descend on rope and ascend on cable ladders where it can be very difficult to use ascenders. After about 200m of body-tight canyon, the cave opens up into its first small chamber. The relief of unrestricted passage only lasts a short while as cavers are then forced into a super tight pitch-head that required many days of rock-shaving to allow passage for everyone when the cave was first being explored in 2004.

Beyond that first rebelay pitch, the passage becomes more manageable and steeper as the cave begins dropping short pit after short pit. Finally, the water from the entrance series disappears into a small crack in the floor at the bottom of a nice cascade. From here a short rope traverse through a narrow canyon leads to the top of the vertical shaft series. One hundred and fifty meters of depth and a never-ending series of rebelays leaves teams at the bottom of the vertical shaft series which still has the bolt placed in the floor marking the end of the final survey of 2004, the year the cave was found.

This is where the surface crews deposited their bags before returning through the misery of the entrance series. The bags were later picked up by crews basing themselves out of Camp 1. From the shaft series it is a kilometer-long, mostly-horizontal trip to Camp 1 sloshing through the ever-growing stream, as J2 picks up new infeeders along the way.

From there, the Camp 1 teams carried bags into the next short stream section to leave their bags at the near-side of the ex-sump at the site of the old Camp 2, about 2 kilometers beyond Camp 1. They would then return to Camp 1 to sleep that night and would repeat the process as long as bags were being hauled in from the surface. Once enough bags were hauled into the staging area at Camp 2, a massive effort was put underway to move the approximately 20 bags (averaging 50 lb) through the Ex-Sump, Surprise Sump and Jungle Series to arrive at Camp 2A and into the dry borehole of the Wonderland at the -800 meter level.

Camp 4

With enough of the gear bags close to the sump, and food supplies dwindling for the large contingent operating out of Camp 3, the decision was made to prune the bottom-crew to only four. Two divers would remain and begin their move to a bivouac at the Sifon, while another two support cavers would move the remaining bags, rig the diving platform at the sump, and assist the divers with any needs they might have. After two long days of setting up hammocks, arranging the dive platform, rigging a taught-line-slack-line Tyrolean to access the platform at the sump, and building rebreathers, the divers were finally ready to get into the water. Thanks to the Mk-6 rebreathers, graciously provided by Poseidon Diving Systems, the divers were off on their mission to prepare the sump for a push beyond. Although rebreathers are arguably more complex and moody than open-circuit dive gear, they provided us with an opportunity to explore beyond the sump that was safer, but more importantly requiring far less equipment overall due to their

Kasia Biernacka & Marcin Gala

Bill Stone, Jose Morales, Jim Castelaz, and Matt Covington cooking in Camp 2

Kasia Biernacka & Marcin Gala

Matt Covington at the spacious and comfortable Camp 1

Bill Stone

Jon Lillestolen assists Jose Morales into the new Poseidon Mk6 rebreather at the *Sifon de Los Piratas* in preparation to dive the sump.

high efficiency in the use of the compressed gas that was brought down. We used standardized carbon-epoxy tanks this year – 2.9 liter oxygen tanks weighing only 2 lb and 4.7 liter side-mount compressed air bailout tanks.

To explore through the sump into what we were hoping would be large section of dry cave, it had been decided that the best guideline would be a 9mm caving rope. This would allow divers to pull themselves through the 200 meter long sump instead of finning which would ultimately save energy and our precious dive gas. The push divers rigged this guideline and a telephone line then carried the camp gear for Camp 4. They deposited it all on the far shore of the dry chamber, which had only been visited by a single diver (James Brown) in 2006. After a quick reconnaissance of the massive dry chamber on the far side of El Sifon de Los Piratas the divers (Jim Brown and Jose Morales) returned through the sump and back to the safety of Camp 3.

On their way out of the cave, the bottom-crew swapped places with a fresh set of divers (Matt Covington and Marcin Gala) that would establish Camp 4 and begin the exploration into the unknown territory beyond. The six cavers swapped stories and advice alike. On their way into one of the most remote reaches of the planet, jokes were lightly tossed around about what to do in case of illness or injury. Everyone involved knew that there was no reasonable rescue beyond the sump platform, not even the world's best cave rescue resources could manage to pull someone out of the bottom of J2 alive. It would be a toss-up whether it could be done from somewhere as high in the cave as Camp 2A.

The two lonely souls destined for Camp 4 pushed onward and in short time were phoning the surface from their new home. Because of their remoteness, the new bottom-crew phoned in twice daily to give progress reports on their exploration and to check in with family and friends. They surveyed from the far end of El Sifon de Los Piratas downward into the tunnel that runs past Sump 3, into a diminishing passage beyond Camp 4, and then diving into Lake 41, also referred to as Sump 4. Marcin Gala performed a 40 meter solo recon dive into Sump 4 that confirmed the sump continued on the same general trend as the rest of the cave as a lake with a slowly descending ceiling and the only dry passages shot northeast and away from the known trend of Sistema Cheve. These dry passages were short, narrow, miserable canyons that led nowhere.

In four days based out of Camp 4, the first push team had mapped about a 600 meters of passage eliminating all possibility of a dry continuation in this far section of the cave. A heroic effort, no doubt, but it would have to come to an unfortunate end because the team was out of both leads and supplies. While this crew planned their exit, the surface crew made plans for a second crew to make Camp 4 a home, but this time with a crew of seasoned cave divers.

Last Bash

J2 is an interesting cave and had a habit of consuming every last resource on the mountain, but there are many other great leads to pursue. Short ridgewalks from basecamp would consistently yield new caves and more surveyed passage.

One of the better leads to pursue outside of J2 in 2009 was the 30m deep "Last Bash" (LB) cave. Last Bash blows as much air as J2 in the entrance pitches and seems destined to connect as it lays directly on top of the line plot of J2. Steering a crew away from J2 to explore LB only required re-targeting rope earmarked for the main cave. Through the persistence of a handful of the J2 cavers, the expedition assembled three separate pushes on the cave, each discovering more new cave than the last. In the end of the pushes, only a half kilometer of passage separates the end of Last Bash at it's current depth of -500m and the most likely connection spot near Camp 2A. Another good solid push could possibly have linked the caves together, assuming that stream passage in LB continues along its current trend of easy walking passage.

Final Push

The spirit of the expedition diminished slightly with the news of a fourth sump blocking the long-sought connection to Sistema Cheve. All the dreams of running down kilometers of Papua-sized borehole trailing a 100m tape instantly vanished and the effort concentrated on sending more equipment to the sump for a second Camp 4 crew. Time was running out, and the team remaining in basecamp was getting smaller, as cavers started returning to real-life in droves to attend to family and career needs.

Fresh dive tanks and rebreather parts filtered into the cave as trash and personal gear were carried outwards. The sump-diver crew swam through the second sump with a week's worth of equipment to lay seige to the fourth sump, and try to salvage what was left of the dream of a 2009 Cheve connection.

Bill Stone

La Boca Del Bigoton in the borehole beyond Camp 2A

Michael Pugliese

Luis "Wicho" Gabriel Diaz traversing a handline in Last Bash

While the divers toiled away at the diving leads at the end of the cave, a team of aid climbers began working on high leads near Camp 3 in the hope of rediscovering the lost airflow. With lightweight lithium batteries, a small hammer drill and the ability to recharge batteries at the base of the climb, the Camp 3 team made short work of the high leads, while not giving support to the dive crew.

Meanwhile, the Camp 4 crew dove every possible underwater lead that they could find, pushing any going lead in either sumps 3 or 4. Despite a few gear failures, the team persisted and found a likely connection tunnel leading westward toward the Cheve trunk. Sump 3 was physically connected to the main dry passage just before Sump 4 via a 170 meter dive. Sump 4 was pushed on 4 sepearate dives to a penetration of 400 meters with the 12 meter wide x 8 meter tall tunnel rising and at a ceiling depth of less than 2 meters. Dwindling gas supplies and a lack of time before the advent of the rainy season, however, turned the team around as soon as they had found the likely path to success. The maximum depth of the cave (-1222 meters) is also the deepest point in Sump 4. With the surveys returned by the second dive team a total of 1400 meters of new tunnels were discovered and mapped in 2009, almost half of which were underwater.

Bill Stone

Jose Morales dives the new Poseidon Mk6 rebreather in the sump

Derig and Leaving Mexico

The sump-diver crew returned through the Sifon de Los Piratas for the last time to rejoin the rest of the deep team at Camp 3. Notes were compared and plans were made to start the long haul of gear out of the cave. Moving from Camp 3 back to Camp 2A, the crew spent a night and loaded up for the trek through the wettest part of the cave, including the exciting swim through the ex-sump. The team made good progress through the Jungles Series and then into the paleo tubes above the stream passage and into the sump-pool at the surprise sump. The rainy season had appeared to have arrived early on the surface as it had rained non-stop for about a week. Unaware of all the rain, the derigging cavers were surprised to find Surprise Sump once again filled to the ceiling with water. This time the water level was even higher than the first time it had happened this year.

The dive bottles that had originally been left at this sump for safety had long since been moved deeper into the cave to serve as bailout bottles for the push divers in Camp 4. The safety bottles were one of many pieces of gear that hadn't made the list of gear destined for the surface. The weather on the surface didn't appear to be getting any better, so with no other options, the team decided to return to Camp 3 and retrieve the dive gear from deeper in the cave.

Kasia Biernacka & Marcin Gala

Will Heltsley sketches in Last Bash

At this time seven crew were trapped below Surprise Sump. Using the tanks, two drysuit-equipped divers assisted three divers with no diving suits through the 20 meter sump. One member of the team was a non-diver and was unable to get through; thus one member of the team remained to keep a 2-person bivouck on the downstream side of Surprise Sump while the remainder of the team went on to Camp 1 to sort out an emergency recovery plan while hoping for the rain to temporarily abate. Two of the team going to Camp 1 continued on to the surface to bring in an EXO-26 full-face commercial diving helmet to assist the non-diver out. Fortunately, 36 hours after reaching Camp 1, and with constant phone contact with the bivouack crew, the sump opened with 10 cm of air space and the two were able to pass through. By this time the Camp 1 crew was already on the upstream side (coordinated by phone) to bring the remaining equipment bags up.

Following this final 19 day underground push, and with everyone on the surface at last, basecamp was slowly broken down and gear loaded onto the mules to be sent down the mountain.

Kasia Biernacka & Marcin Gala

Matt Covington traverses a pool in the wet canyons between the ex-sump and Camp 2A

Kasia Biernacka & Marcin Gala

Tony Dwyer, Tony Castro, Marcin Gala and Michael Denneborg prepare to leave basecamp for a short trip into J2.

Kasia Biernacka & Marcin Gala

Paulina Olinkiewicz climbs a pitch in the entrance series of Last Bash.

Through the gracious help of Señor Faustino and his family, the cavers made their way down the mountain along with all their gear. Trucks were loaded, everyone said their goodbyes and another successful expedition was completed to the El Ocotal cloud forest.

J2 2010 Expedition – Return to the Deep

Although the cave hadn't done exactly what had been hoped, plans were laid late in the expedition for a return to the J2 area in 2010. The Cheve Karst doesn't give up its secrets easily and although intensive sump diving expeditions could certainly do a lot more to crack the secrets that lie below, there is a growing crew of us that believe there is plenty to be explored in the Cheve area that does not involve difficult tank hauls followed by grim diving.

In 2010, the expedition objectives will involve entirely non-diving leads. The main goal will be to create Sistema J2 by connecting in "Last Bash." Although it was pushed somewhat on this expedition, the connection remains only a long day's push from tying the survey lines together assuming that the cave Gods are smiling upon us. From this entrance the lower reaches of J2, and the borehole beyond Camp 2A, will be easier to access and the few remaining leads in this section of the cave will get a good final look. Using the "Last Bash" entrance to the system will make it possible for us to use a basecamp lower on the mountain and much closer to a water source. Our friends in the village of El Ocotal have graciously offered the use of their ranch high in the Aguacate Canyon. This will put us within a half hour's casual hike of the entrance of Last Bash instead of the hour-long jungle bash down steep slopes from the traditional J2 basecamp.

The second objective will be to give a good final push to all the remaining side leads in the bottom of J2. Although the most promising leads have all been pushed, there remains several infeeders and other interesting leads that could be the way to discovering the route of the elusive gale-force airflow that is lost at the -700m level in J2.

The final objective is to ridgewalk the remote upper reaches of the Aguacate Canyon. The Aguacate canyon has been walked on several occasions, but with a basecamp established directly in the canyon it will be possible to focus a more intense effort to find the less obvious caves that could become Mexico's next 1000m deep cave or the secret to finding the massive Cheve Conduit that lies somewhere below.

Expedition Members and Sponsors:

Kasia Biernacka, Zusia Biernacka, James Brown, Petr Čáslavský, Jim Castelaz, Anthony Castro, Lucyna Cieslik, Elizabeth Covington, Matt Covington, Michael Denneborg, Marcin Derlatka, Luis Gabriel Díaz (Wicho), Yvonne Droms, Tony Dwyer, Marcin Gala, Nikki Green, Will Heltsley, Heather Levy, Jon Lillestolen, Mark Minton, José Morales, Nina Muller, David Ochel, Paulina Olinkiewicz, Michael Pugliese, Yuri Schwartz, Vickie Siegel, Marion Smith, Seth Spoelman, Bill Stone, John Swartz, Sergey Tkachenko,

Members of the expedition would like to thank the sponsors and many willing cavers who made this another successful USDCT expedition. First and foremost is Poseidon Diving Systems, which without their assistance with equipment and development of the Mk6 rebreather, this expedition could not have happened. Nalge Nunc Products, Direct Fastner Systems and CanCord Rope again made gracious donations to the USDCT. Stenlight again provided excellent lights, chargers and underwater batteries for the diving effort. Expedition Sponsors also include Analytical Industries, the Association for Mexican Cave Studies, Caves of Tabasco, Deep Outdoors, DSS Deep Sea Supply, Dive Rite, Google, Molecular Products, Niterider, Patagonia, PMI, Puerto Rico Technical Diving Center, Santi, Science Art and Magic, Sea Pearls, Stone Aerospace, Structural Composites, Thermo Valves, Underwater Kinetics, Whole Earth Provision Co., Windy Point Park, and XS Scuba. Special thanks go to Bill Stone, Jose Morales, James "Jaime Hottub" Brown, Mark Minton, Yvonne Droms, Luis "Wicho" Gabriel Diaz, Jose Antonio Soriano, Fofo Gonzales and the many others who spent countless hours organizing the expedition. We are also grateful for the continued assistance of Proteccion Civil Oaxaca, The Distrito de Cuicatlan, and the Municipio de Chapulapa over the past 20 years.

Bibliography

(1) Atkinson, Gerald (1980), "Sistema Huautla": *Association for Mexican Cave Studies (AMCS) Activities Newsletter*, v. 11, p.13-17

(2) Hose, Louise D. (1993), "Sistema Cheve – World's Deepest Karst Conduit System": *Association for Mexican Cave Studies (AMCS) Activities Newsletter*, v. 20, p.44-45

(3) Lillestolen, Jon and Warild, Al, "Three years in the El Ocotal Cloud Forest": *NSS News,* v.65,no. 6, p.4-10

(4) Pistole, Nancy (1994), *Proyecto Cheve 1986-1993*

(5) Stone, Bill, Droms, Yvonne & Pistole, Nancy (2005), "Cheve 2003": *Association for Mexican Cave Studies (AMCS) Activities Newsletter*, v. 28, p.109-118

J2: The Journey to Camp 4—Beyond the Sump

Matt Covington

On April 23, 2009, a dozen cavers sat in the cloud forest atop a remote mountain in Mexico, entranced by the constant crackling of the cave phone. At 4:07 pm Jose Morales and James Brown had entered the sump at the bottom of J2. It had taken a full month between the arrival of the team and the first dive, a month that was fraught with setbacks – political problems, destroyed rigging, a surprise sump, swine flu, and many heavy loads. Today, we finally had divers in the water, and we anxiously awaited news.

In 2006, J2 exploration was halted by the discovery of a sump at -1200 meters. We had enough time and gear for a single exploratory dive. James Brown dove into the sump and emerged from the water after a 150 meter-long dive that never reached more than 10 meters of depth. He climbed up a breakdown slope and into a large chamber. The route then descended down to another sump that seemed to be the main continuation. We knew at this point that any return would require a major diving expedition.

During the next three years, we took a rest from J2 while Bill Stone worked with Poseidon to develop a lighter, more compact, and more foolproof rebreather. He also began to assemble a team of cavers interested in working beyond the sump. Finding cave divers who are interested in negotiating a serious deep cave has long troubled dive efforts in deep caves. Bill's typical approach has been to train expedition cavers to dive.

For the 2009 J2 expedition, Bill assembled a dive team made up of two types of cavers. There were the exploration divers, who were experienced cave divers and also capable of negotiating the rest of the cave. The secondary dive team was composed of expedition cavers who had trained specifically for diving the rebreathers in J2. They were experienced in rigging and other skills needed for above-water exploration but had limited cave diving experience. The exploration divers would complete all underwater exploration and rig 9-mm static ropes through the sumps. The secondary divers would pull along on the static lines, hauling camp and rigging gear to push the cave beyond. The 9-mm ropes would greatly increase travel speed and safety for those 'commuting' through the sumps. James and Jose were the primary exploration dive team. If they were successful, then Marcin Gala, a Polish caver, and I were slated to follow with the first dry caving push on the far side of the sump. We were on edge.


Lake 41

Marcin Gala

At 10 pm Bill's voice brought the cave phone alive, "Basecamp, basecamp, this is the sump. Do you copy?"

"Yes, Bill. We copy. What is the news?" Marcin replied.

"James and Jose have returned from the sump. Let me give the phone to Jose to relay what they found."

Jose recounted the news. After emerging from the sump, Jose had climbed up to the high side of the large chamber and discovered a going dry passage. For two hours, he and James explored a maze of passages that seemed to bypass the next sump. It was clearly time to send in the next team to establish Camp 4 and continue exploration. Jose and James would spend the next day rigging the 9-mm rope and the phone line through the sump, and hauling some of the camp gear to the far side. Marcin and I were to enter the cave the next day.

The next morning we piled up the gear required for our trip. As the morning progressed, the pile grew. We wanted to have enough food and rigging gear for nearly a week of exploration on the far side, but it was clear that a heavy load was accumulating. Packs bursting at the seams, we set off to the cave. During the expedition, Marcin and I had ended up caving as a team on almost every trip. As a result, the two of us had grown close through long hours toiling together and talking about everything on the earth (and under the earth)—the sort of friendship that is often forged in expedition caving. As we paused at the entrance, we mused about the trip we were about to undertake. After all of the hard work and long wait we were primed for what might be one of the greatest adventures of our lives. This thrilled us, but we also couldn't ignore our heavy packs and the difficult trip that lay between us and the prize.

Eight hours later, we were at Camp 2a, tired, but not trashed. Our nearly week-long rest on the surface had paid off. News came via the cave phone that the 9-mm rope was in place, and the initial camp loads had been hauled through the sump. The next day, we met Bill, Jose, James, and Jon Lillestolen on their way out, between Camp 2a and Camp 3. We stopped for a long chat about the dive


Kasia Biernacka & Marcin Gala

Climbing through the skeleton rock near -1000m


Kasia Biernacka & Marcin Gala

Fretting over the pile of dive gear at Camp 2A

Marcin Gala

Matt Covington and his flooding mask on the return dive from Camp 4

logistics. Initially, we had planned on diving that day, but after a late start, and our long chat, we decided that it would be better to get a good night's rest at Camp 3 and dive on the following day. We arrived for an early evening at Camp 3. Need I say that it's hard to sleep the night before a sump dive at -1200 meters in one of the deepest known karst hydrological systems in the world? I have slept better.

Early the next morning we arose and headed to the sump. Upon arrival, Marcin rappelled to the dive platform and began readying the rigs for the dive. Once the rebreathers were ready, Marcin got into his dry suit and into the water, making room for me on the platform. I loaded my pack with gear and weights to counter its buoyancy. Then I struggled into the rebreather on the awkward platform. We needed three bags to fit all of the gear, so Marcin took two bags and one bailout tank, while I took one bag and the other two bailout tanks. By this time, Marcin had been in the water a while and was already becoming hypothermic. He clearly wanted to get going. I slid into the water, and we headed down. However, my bag was still too buoyant, and poorly balanced. It dangled upside down from its tether like a balloon on a string. Right as I signaled to Marcin that it was too buoyant, some of the lead fell out and it became even more buoyant. I slid back up the rope to the surface and repacked the bag. Marcin was not having a good time.

"Matt, *please* hurry. I'm very cold."

Marcin retrieved the weights. I repacked the bag, adding more weight and jettisoning a nalgene full of cashews that really didn't fit. We descended again, and after a moment to check everything, we started pulling ourselves along the line. Since Marcin was so cold, he rocketed out in front. I kept up for a few of minutes, but then began to fall behind. For the most part, the line ran quite close to the floor, which was largely composed of sharp and jagged horns of rock. Every minute or so I would feel a sharp tug backward and realize that my pack had snagged one of the horns. It became automatic to reach back and scoop it free with my hand. In many cave dives, dragging along the bottom like this would be the worst thing you could do. However, the only sediment on the floor was large-grained sand that quickly settled after being stirred up. Visibility was hardly affected by our passing.

About seven minutes into the dive, I was becoming out of breath from racing along the line. I paused for a moment to see if I could slow my breathing. After 10 or 15 seconds I started moving again at a slower pace, but I was still not catching my breath.

"Something doesn't feel right. Is something wrong with the rebreather?" I wondered.

In a moment of doubt and panic, I reached for my bailout gas, where I knew I could get good air. I tried to take a big breath only to feel the resistance build halfway through until I could draw no more air. Then I remembered. The valve was turned off to avoid loss of air in the case of slow leaks. I groped through the tangle of gear and rotated the valve, relieved to feel air flow. I paused again for a few seconds, to slow my breathing.

"Okay. I need to get out of here."

The rest of the dive was a continuous struggle between keeping a calm and measured pace and just wanting to get through, knowing that I was using up precious bailout gas. Luckily, two minutes later I saw the surface of the water, with Marcin's light refracting down from above. I was glad to have that over with.

The dive was only 10 minutes long. Not much, really, but long enough.

We discussed the dive for a few minutes. I didn't know whether I was having a genuine problem with the rig, or if it was just overexertion combined with psychological stress. I did know one thing though; the dive back would require a concerted effort at staying calm. We climbed out of the water and stashed the dive gear up in the boulders. Marcin was still cold. My dry suit had leaked like a sieve (I'm just too skinny for a standard size), and I found myself knee-deep in water inside, and also cooling down fast. We fired up the stove to make a hot drink.

Matt Covington

Elizabeth Covington on one of the ladder pitches in the entrance series

After hot tea and dry camp clothes, the world started to seem a bit better. After all, we were beyond the sump and about to explore one of the most remote places yet reached underground. Our first task was to find a good location for Camp 4. Following a quick recon, we found a flat sandy spot that Jose had mentioned, about 5 minutes away from the sump. Returning to the sump, we grabbed the camp gear, surveyed our way back to camp, and laid the phone line. We reached camp, with 170 meters of survey, and called it a night.

That night we wondered aloud what we might find the next day. I could feel the weight of the expedition on our shoulders. Many people had worked very hard for us to be here, and many had trained with us for the opportunity we now had. There were many others who could have been in my place. I had been at the right place at the right time,

Bill Stone

Vickie Siegel passing a pack through the Donde Homek Breakdown at -1000 m

and because of that, I was the one here. It was the ultimate privilege. As Marcin put it, "It now seems as if the whole expedition has been working just for us." We would make it count.

The next morning, we continued our survey down the passage from camp. After a short distance, we entered the maze that Jose had explored. A number of passages diverged to the right, but a few hours of surveying later, we could tell they were not headed the right direction. As our mapping progressed, we decided to push a good-looking lead to the left that led quickly to a free climb up to a ledge overlooking a large borehole. Finally, it seemed we had something.

We rigged a rope and rappelled to a ledge. From there we could traverse out into the borehole. The vast passage was floored with giant breakdown blocks. We picked our way along the boulders, surveying as we went. About an hour later, we stood staring at a flowstone ramp ascending ahead. We had only gone about 150 meters, but this already looked like the end. After a couple of attempts, I managed to climb up the ramp, using tiny edges in the flowstone for footholds. The slope eased, and I scampered to the top, only to confirm a total flowstone blockage. After rigging a double-rope rappel, I descended back to Marcin. We would have to try low. A short way back, we were able to climb down through the boulders to a lower level. However, this passage was immediately blocked by a lake. Enthusiasm waning, we returned to camp earlier than we had anticipated.

Marcin had a Palm pilot with Auriga, and each night we entered the survey data, in order to get an idea of where we had gone. We also phoned up the survey data to the surface, so that they could track our progress as well. That day we came in with 380 m of survey, but not quite the easy booty we had hoped for. While talking to base camp, we learned of the swine flu outbreak in Mexico. This explained the bad sickness that had gone through the expedition weeks before, but now we wondered whether the reinforcements that we were expecting in the next days would actually arrive. Would they be allowed to travel? Would they decide it was unwise to come to Mexico? Among those expected to arrive soon to basecamp were Will Heltsley and my wife, Elizabeth, who were travelling together from California, as well as Yuri Schwartz, Sergey Tkachenko, and David Ochel, all strong cavers whose help we could use. I had been looking forward to seeing Elizabeth when I got out of the cave, but now all that was uncertain. In honor of the news, we dubbed our new borehole passage the "Pigs Flew Passage."

Bill Stone

Left to right, Vickie Siegel, Jose Morales, Nikki Green, and James Brown during the final haul of dive gear to the sump

The next morning we arose and retrieved our drysuits from the sump, in order to check out "Lake 41," named after the survey station at its edge. We swam out into the lake and around the corner. Actually, it looked pretty good; we could see about 30 meters ahead. After a constriction the lake opened up into several small chambers, all heavily decorated. However, the lake ultimately sumped. Although the water was so deep we couldn't see the bottom, the ceiling below water was still covered in stalactites, suggesting that the passage was once air-filled. Somewhat dejected, we returned to camp to drop off our dry suits and have a hot drink. Marcin thought that the sump would be the way on and wondered whether there was any point in continuing survey in the maze. I maintained some shred of hope of finding a bypass, but mostly I was just enjoying the survey and dreading the return dive. A couple more days of pushing leads didn't sound that bad. For the rest of the day we mapped a passage that gradually became tight and muddy, dubbing it "What Tiggers do the Best." After 65 meters of small passage it hit a T-junction with larger passage. However, one direction quickly looped back to known cave, and the other terminated in grim leads headed up-cave.

Back at Camp 4, we learned that Elizabeth, Will, and Wicho Diaz had arrived in base camp. They had decided to brave the swine flu. "Someone wants to talk to you, Matt," they told me. It is strange indeed to talk with one's wife, whom one hasn't seen in a month, while camping beyond a sump three days into a cave. She had just finished her Ph.D. in California and was coming to Mexico to spend a couple of weeks relaxing

Marcin Gala

Marcin Gala and Matt Covington at Camp 4. Two lonely souls at one of the most remote reaches of our planet.

Marcin Gala

Surveying in the Undertaker

Marcin Gala

The intersection between the Pigs Flew Passage and the Grim Reaper Loop, near the water source for Camp 4

Marcin Gala

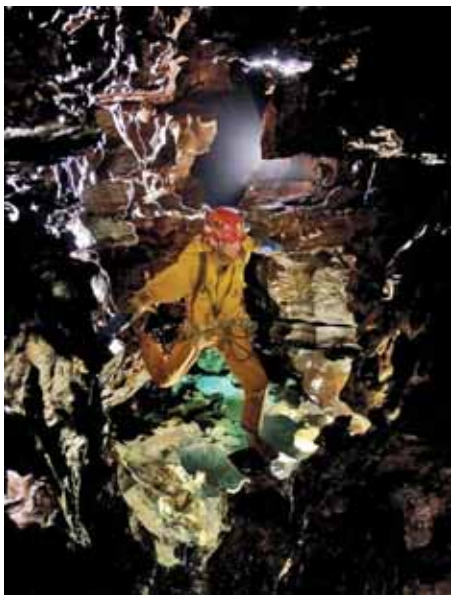
Looking out into the Pigs Flew Passage

and generally enjoying life. How else could one begin such a conversation than with, "Dr. Covington, I presume?"

The next day we were resigned to pushing more maze leads. First, we headed into a lead that we had seen the previous day near the Pigs Flew Passage. It quickly forked and led to two different lakes. On one side it continued and went into a sharp, mud-coated, small passage. Somehow we had gotten on a Monty Python kick. I was quoting every skit I could remember, while Marcin laughed. He had seen a lot of Monty Python in Polish, but was amused to hear the lines in their original language. Finally, he asked, "What is the name of death? The guy with the black coat and blade."

"Oh, we call him the Grim Reaper," I replied.

"That is what we should call this passage," Marcin exclaimed. Thus was born the "Grim Reaper Loop." The macabre theme continued, and later we surveyed "The Undertaker." We then spent a couple of hours combing the breakdown and walls in the Pigs Flew Passage but came up empty. Finally, Marcin photo documented the passages we had explored, and we called it a day. That day we surveyed 200 meters of passage, bringing the total new survey to 837 meters. After dinner, we talked with Bill on the phone. He asked whether we would consider a reconnaissance dive in Lake 41. Marcin perked up. That was what he really wanted to do. We carefully considered the amount of remaining gas and decided that there was enough bailout gas for Marcin to do a quick and shallow open circuit recon dive.



Kasia Biernacka & Marcin Gala

Matt climbing through the sharp rock near Camp 3

The next morning we hauled three bags of dive gear from the sump to Lake 41. We only had a gap reel, so we knew Marcin wouldn't be able to go far. He entered the water at 1 pm. I turned off my light and sat in the dark, pondering where I was and wondering what he was finding. No one else was in the cave but the two of us, and Marcin was now doing an exploration dive. Fifteen minutes later he returned,wanting more line. He could see an air surface just 10 meters ahead, but couldn't quite reach it. I ran back to camp and loaded a bunch of phone line onto the dive reel. He returned to the water at 2:45 pm. This time the wait was longer. Maybe he had found something. Forty-five minutes later he returned to tell his story. After a 25-meter dive he had emerged in another lake, thinking that he had cracked the sump. However, a 25-meter surface swim revealed that he was in a pocket blocked by flowstone. There were some high leads but nowhere to get out of the water. However, on the way in, he had seen some ripples on the sand dunes underwater, indicating strong flow. The way on was probably there, deeper underwater.

After hauling the dive gear back, we returned to Camp 4 to phone an inventory up to basecamp and pack up our personal gear. We were headed out, but after a few more days of rest, Bill and Jose would return to push the new sump. Marcin and I had learned some lessons from the previous dive. Upon arriving at the sump, I took plenty of time to fiddle with my gear, make sure I knew where everything was, and test that the rebreather was working correctly. I got in the water first, and Marcin followed a few minutes after. The relaxed preparation paid off, even though conditions during the dive were quite unpleasant. The team dive masks fit my narrow face poorly, and on this dive my mask leaked terribly. It completely filled about every 15 seconds. I resigned myself to do most of the dive blind, only clearing the mask when I needed to check my partial pressure of oxygen. Despite these difficulties, I managed to remain cool-headed this time, and soon I was ascending up the rope to the platform. A few minutes later, Marcin arrived. We dropped our bags on the platform and went back under so that Marcin could get some photos and video underwater. Surfacing again, and returning to Camp 3, we found our mood had significantly lightened. While at Camp 4, the return dive had hung over us like a dark pall in the back of our minds. Having returned through the sump, we were still three days from the surface... but we could smell it.

Next month

The J2 story continues with a gripping personal account by Jose Morales on the final push of Sump 4. Team members were pushed to heroic limits after being trapped by rising waters and running out of food. Read it next month in our February issue.

Kasia Biernacka & Marcin Gala

Matt Covington descends into the Jungle Series of J2.

Kasia Biernacka & Marcin Gala

Kasia Biernacka descends a pit in the entrance series of J2.

Bill Stone

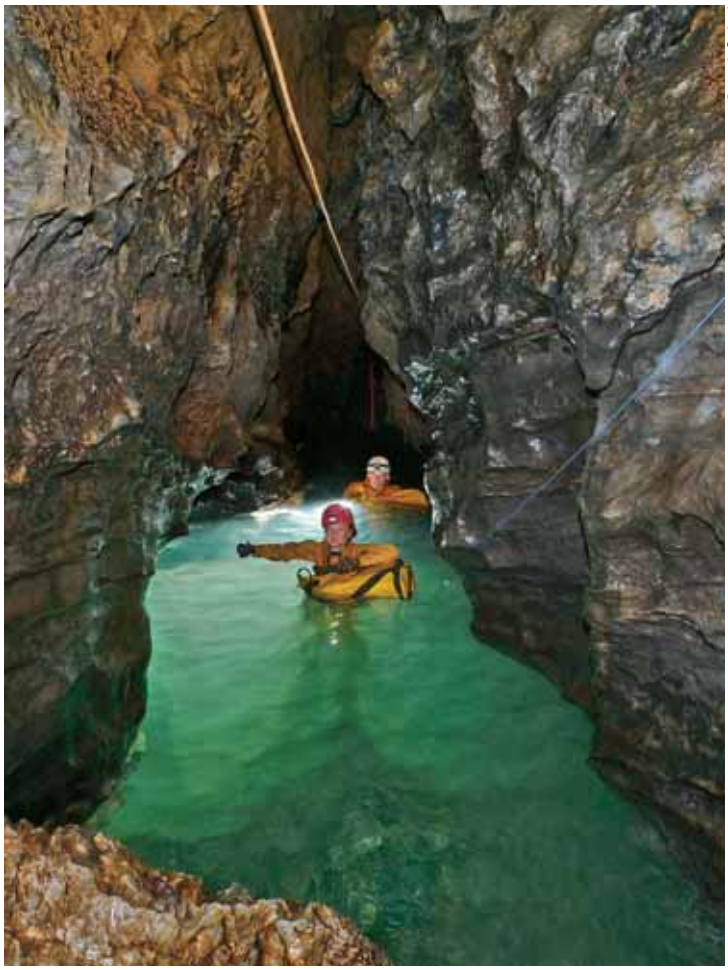
Nikki Green traverses a handline in the Wonderland Borehole, J2.

Kasia Biernacka & Marcin Gala

Paulina Olinkiewicz skirts a pool in the wet section between Camp 1 and Camp 2A.

Marcin Gala

Matt Covington climbs through the cascades of the Jungle Series



David Ochel

Vickie Siegel and Nikki Green swim in the frigid J2 waters at the start of the Jungle Series.

Kasia Biernacka & Marcin Gala

Left: John Swartz descends a pit high in the entrance series of J2

Left: Marcin Gala prepares to dive in Lake 41. Photo by Matt Covington

Right: Magda Aksman traverses one of the many Tyroleans just upstream of Camp 2A in J2

Kasia Biernacka & Marcin Gala

J2 2009: The Final Push

Jose Morales

[*Ed. note: This story continues coverage of the Mexico J2 expedition from the January issue*].

We left J2 base camp on April 28th, 2009 and began a long 4wd descent down the eastern flank of the Sierra Juarez. Bill Stone and I discussed the situation at the cave as we drove down through the maze of rugged dirt roads for the next 4 hours. We were on our way for an expedition food resupply to the big city of Tuxtepec in the eastern coastal lowlands of Mexico. Even though the scenery was stunning—the road precipitously skirted the 1600 m deep Santo Domingo gorge—there was a much more powerful thought process going on inside our heads: what was the status of the crew that was now headed to Camp 4 in J2? What had they discovered? How were they feeling? When would we get a chance to go back? Our crew of James Brown, Jon Lilestolen, Bill Stone and me had just exited the cave the previous day following a 14-1/2 day push to rig a 9mm rope and telephone line through the 200-meter-long Sump 2 at the -1209 m level of J2. We had achieved that, and, as well, transported most of the food and supplies needed to establish Camp 4 to the downstream side of the sump, thus preparing the cave for a significant assault on the most remote, deepest reaches. We had met the team headed in for the first push from Camp 4—Marcin Gala and Matt Covington—at the -1000m level and briefed them on the situation at Sump 2 for almost an hour. They headed down and we headed out. Those two would be alone in the cave from then onward, pushing the exploration limit. Even though we were supposed to be recovering from that long Sherpa trip—and we were enroute to a place full of good food—we were preoccupied with the cave. In our collective minds, we were missing out on the action. We decided to give the locals in Tuxtepec part of the U.S. Stimulus Plan by buying as many tacos as we had money for. The expression on their faces told us that they were happy as well, or maybe they couldn't believe how much a few gringos could eat! It is still debatable and unclear who ate the most.

Bill Stone

Jose reels in the dive line while surveying on the second passage of Sump 3. Although the cave is muddy in places, the sumps were clean with large breakdown and white, coarse sand on the floor. Average dimensions were 10 to 12 m wide by 6 to 8 m tall.

Back at base camp two days later I could not wait for news on the status of Marcin and Matt's exploration of the "Land between the Lakes," which lies between Sumps 2 and 3. Before putting our packs down, the inhabitants at camp told us that the push crew had racked up a significant dry cave survey total during our absence. The bad news was that they had also found what appeared to be another sump. Unbelievable! But nothing in this cave ever yields easily. We thought we had the key breakthrough on April 25th when James and I reconned the giant chamber at the head of Sump 3 and surprisingly found a gaping, air-filled tunnel heading northwest. Matt and Marcin had now mapped about 800 meters in that area, without gaining any depth. Somehow, we had landed in a fault zone that collected water and it was much more extensive than anyone had thought possible. It was the same fracture that expressed itself on the surface as the Cueva Charco valley. In fact, we were almost directly beneath the entrance of Cueva Palomora at the western limit of that valley—albeit some 1200 meters lower in elevation. The map showed J2 to be headed towards the San Miguel gorge, where the Charco valley spilled over into a 600 meter deep canyon. Our Holy Grail was to bust through into that air-filled, descending corridor. In base camp, sitting comfortably around the campfire in warm dry fleece, we hoped that this new, inconvenient Sump 4 would be short and easy. Naiveté is easy when you are comfortable.

Marcin and Matt continued to survey the tunnels in between the downstream side of Sump 2 and the upstream side of Sump 4. Their effort yielded no potential dry leads

and ended with a quick open-circuit reconnaissance of the beginning of Sump 4. On that dive Marcin was able to surface into an air bell about 25 meters into the sump along the righthand wall. But it was clearly not the way forward. On his way back he was able to see that there were other possibilities worth looking at which could potentially be the way forward. Puzzlingly, the only choices were heading west-southwest; Cheve system caves almost invariably trended north-northwest. After 5 days of survey Marcin and Matt started their long way back to the surface. We were able to track their progress upwards from the daily contacts on the Michie phone, which operated flawlessly all the way to Camp 4. Later, at basecamp, when I asked them how isolated it felt to be in Camp 4 for five days they responded that after they exited Sump 2 they could almost smell the entrance. They still had 3 days of travel ahead to reach daylight.

It was then May 5th and many changes were taking place with the team. We had originally planned to be where we were now some 3 weeks earlier, but the H1N1 flu had hit the crew hard and we operated at less than 30% power during much of the first month of the project. Now some of our strongest players—including Matt and Marcin and six others, were scheduled to leave the mountain. Ahead of us was serious cave diving exploration work. Of the eight that would remain on the mountain, only three were full cave divers. James had injured his knees on the last push, which left me and Stone to do the diving. Despite the small team and the impending rainy season, I couldn't be more excited. We prepared gear and food resupplies for what we felt would be a 10 day push. Amongst that was one carbon-epoxy 9 liter compressed air tank (at 6000 psi) and a spare oxygen bottle (2.7 liter at 3000 psi), also carbon-epoxy, to replace the gas supplies at the sump. Despite the equipment paring, we still had six 55 liter packs when we entered the cave, each in the neighborhood of 65 lbs.

It took us three days to reach the sump. With us was Yuri Schwartz and Sergey

David Ochel

Jose Morales serves as loadmaster at Camp 1, trying to compress the items going out into the fewest number of duffel bags. The expedition standard backpack was a 35-liter volume PVC pack made in Poland. Two of these shown here are 55-liters, which work well in open passage but frequently require unpacking in crawlways and squeezes.

Tkachenko, both from Siberia, Russia. Yuri is currently a full time post-doc resident in the U.S. working in microbiology and is a regular GVKS caver. Sergey was a co-founder of the Novosibirsk Diggers caving organization. Both are highly skilled expeditionary cavers and their support was crucial. In addition, Jon Lillestolen and Will Heltsley generously carried a load each to the sump before heading back to Camp 2A to check a few high level leads before leaving the mountain. On May 8th the four of us remaining reached Sump 2 at 2 pm and began a lengthy series of chores—changing out and re-calibrating an errant electronics module for one of the rebreathers; recharging the gas supplies for 8 tanks and, most tediously, packing two 55-liter duffels for underwater transport with our food, rigging, and diving supplies for Sump 4. Things went slowly and it was not until 2 am the next day that all systems were working and checked out, the big bags were neutrally weighted for transport underwater, and Bill and I were kitted up and in the water. Yuri and Sergey waved goodbye from the dive deck. They then began their long trip back to Camp 3 and we began our dive to Camp 4. They would spend the next week working on aid climbs near the sump in the hopes of discovering a dry bypass to the underwater maze.

Bill Stone

In-cave recharging of electrical gadgets. We used Mil-surplus lithium-SO4 primary batteries (the dark green blocks) to recharge helmet STEN lights, primary dive lights (black cylinder to the right, from NiteRider), Mk6 rebreather batteries (clear plastic cylinder), as well as Underwater Kinetics eQ-LED underwater lights. These two blocks provided all electrical power for the 7-1/2 days spent working from Camp 4 on the final push in 2009.

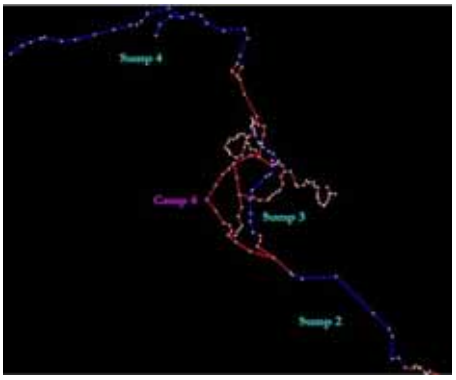
The dive proceeded flawlessly, despite our having been awake for almost 20 hours. It took around 20 minutes to get all the gear through to the downstream side of Sump 2. We had a lot of resources for what was going to be the push that was going to make it or break it for J2. We were determined to do anything within the limits of reasonable safety and the capabilities of our gear to find the way through.

We got to Camp 4 at almost 5 a.m. so we decided to sleep for a few hours and then use what remained of the day to transport the diving equipment from the beach on the downstream side of Sump 2 to the mouth of Sump 4. It looked like a pretty easy 500 meter stroll on the map back in base camp but it was not that comfortable in reality as the rebreathers had a lot of delicate parts on them that had to be protected during transport and we had to make the trip many times.

On the afternoon of May 9th we reconned the route to Lake 41 (the beginning of Sump 4) and found that we had to place a few bolts and a few more ropes to make it safe enough to transport the rebreathers—a damaged component out here would mean the end of our exploration efforts and a dangerous open-circuit exit to Camp 3. After the rigging improvements were completed we alternately carried the rebreathers one by one with the other guy acting as a guide when moving through breakdown to prevent any damage. Eventually we carried all the remaining dive gear to Sump 4, including the carbon-epoxy side-mount tanks containing our bailout gas as well as fins, masks, reels, lights, and drysuits. Once this task was completed, we went back to camp and started strategizing on how we were going to tackle the first dive. The preliminary plan was to scout the left wall looking for a way onward to the west, since Marcin said that his effort was concentrated on the more logical right wall (we had been expecting north-trending passage).

The next day right after breakfast we were on site kitting up for the dive. This is a tedious process that requires mental rehearsal and concentration to make sure that you don't forget or overlook anything. Cave diving is dangerous business so it is imperative to have a pilot-like attitude for pre-dive checks and execution. In this case it was not an issue since both of us were used to flying aircraft and had the same philosophy regarding discipline on a cave dive. Once in the water we started slowly making our way through the tunnel, tying off our guide line as we were figuring out the way forward. We previously decided that I was going to lead and that Bill was going to do the underwater survey on the way out. He always had this attitude of encouraging other people to do things out front while he picked up the less interesting tasks. Just as Marcin had warned us, about 30 meters into the dive the cave did something illogical and abruptly made a 90 degree turn underwater to the west, abandoning its usual northern course. The large hairpin-turn corner at the limit of Marcin's exploration gave the impression that the cave "wanted" to go forward (north) but for some reason it was not allowed and it turned west. Later on, on other dives, I continued to observe other large pockets or pseudo-tunnels like this one trying to go north but they all quickly ended in the same abrupt way.

We made the left turn and continued 8 meters vertically up a very large sand dune. There was a large air bell at the top of the dune and we surfaced there briefly. There were no obvious tunnels leading off from it,



unfortunately. The way on lay below, down the other side of the big dune. We stayed on the left side of the tunnel reaching a maximum depth of 20 meters at the bottom of the sand slope (this point later turned out to be the deepest point reached this year in J2 at -1222 meters). We continued the exploration for around 180 meters and eventually made another illogical turn to the south. We surfaced then in what looked to be the end of a very tight fissure infeeder tunnel. A small waterfall could be heard falling in the distance. The place was not pleasant. We surfaced in waist-deep mud. A quick recon showed there was nothing more we could do here. Somewhere we had missed the main underwater tunnel. Bill surveyed everything on our way back while I did what I could to search for alternative routes out of the underwater canyon. Back at Camp 4 the data revealed that the tunnel did in fact turn to the south at the end, with no physical chance of it being the continuation. We concluded that we must have missed it somewhere before this dead end point and would have to return.

The next morning we were back at Sump 4. As we were going through the pre-dive checklist we discovered that Bill's head-up display (HUD) had somehow leaked on the last dive. The rebreathers had seen amazing abuse in the 11 kilometers of transport to get here. Now the automated pre-dive code on the Mk6 was sensing the short and failing the test series. The problem was that as the main computer was seeing this problem it was not allowing the rest of the pre-dive systems check to be completed and would therefore not enable diving. Unlike the Mk5 predecessor, the Mk6 was designed primarily for the sport diving market and it was fully automated (it allowed no user intervention nor overrides). We had the mk6 along because of its very small size. But we now found its limitations. It was correctly indicating that something was broken, that service was required, and as designed it was preventing unsafe use. Our problem was that there was no way to service it here. There were emergency procedures that could be used to operate the rig without the electronics, but not on an exploratory dive. After discussing many different alternatives Bill graciously let me continue the exploration of Sump 4 by myself. We still had the issue of having to get back through 200 meters of underwater passages at Sump 2 as the first step to get out of this cave. We were going to have to employ a contingency plan to do this, but for now the important thing was to not use all the open circuit gas so we could have some for our way out from both the exploratory dives in Sump 4 as well as the return through Sump 2. All of these things conspired to reduce our well-planned push to requiring solo exploration diving.

Bill Stone

Jose preparing to depart on the downstream exploratory push on Sump 3. This shows the full diving rig from the rear. The rebreather is the small black cylinder in the center. The top tanks were 2.7 liter x 1.6 kg carbon-epoxy tanks containing air (left) and pure oxygen (right). The two bottom tanks were also carbon-epoxy (4.7 liter x 3.5 kg). By using a larger (9 liter) tank at much higher pressure (400 bar) we were able to re-load the air tanks beyond Sump 2 for each exploratory mission by trans-filling through the first stage regulator ports using a flexible high pressure hose.

I found absolutely nothing on my very detailed reconn of the right wall up to the top of the sand dune. Every time I turned back Bill would be patiently waiting on me and playing through strategies to enact if something was to go wrong while I was diving. This is a very uncomfortable position to be in and I'm very grateful of the way he did this and the so many other things and sacrifices he made over the coming days so I could keep diving.

We did a few more methodical dives in the hopes of discovering a continuation but found nothing. Our life support supplies were now starting to run low. We decided that I would make a last dive into Sump 4, concentrating on the right wall past the crest of the dune and going downhill. Later, as I was hovering over this crest I decided to lightly lay on top of it to get the million things hanging on me better organized before continuing downhill with my cave diving line. I barely put any weight on the sand when suddenly a 5 to 7 meter wide section of sand and mud started sliding violently downhill, making the kind of noise that you just don't easily forget. I quickly came back to a hover and stayed a good 5 to 10 minutes, analyzing the situation to figure out if it was safe enough to lay my line over this kind of terrain without running the risk of line traps or any other life-threatening situation. Barely any silt had come up from the bottom as a consequence of the slide and with no apparent current present, the silt was certainly staying static in the same place. So I decided to slowly continue over this area to a predetermined turnaround point that if reached without seeing a potential lead, would be the place to turn around, since going any further would mean getting more into the tunnel that eventually headed south into nothing. I reached this point right when I ran out of line.

I made one last tie off and moved laterally some 15 meters to the original line, placed by Bill and me on the initial dive. I tied my reel to it. Hovering in frustration, I realized that this was the end, no more leads, no more line, and no more gas. I turned around to face the exit but decided to pause for a second before leaving and think it through one more time. There was one stretch of wall, a bit further on towards the south, that I had not covered. I moved further into the cave in that direction, staying as far right from the fixed line as I could in order to give the last portion of the right wall a better look. At this point I was getting very cold—my drysuit was leaking—and was wondering if it made any sense to continue into an area that was too deep and in the wrong direction.

Suddenly I saw a shadow on the right wall. I tried to get a better look but I started to lose sight of the main line. I turned and headed back to safety taking care to not stir up any silt. Now on the main guide line I paused again in frustration, and unclipped my safety reel. It was the only dive line I had left. As I tied it off and began reeling into the new tunnel I was thinking what Lamar Hires, my cave diving instructor, would have to say about this: "*bad idea.*" I was as focused as someone could ever be as I was moving into the general direction were I thought I saw the tunnel. And soon, there it was, a tunnel that we completely missed on our initial dive, heading north. I made a left turn some 8 meters beyond the entrance and quickly ran out of line. It was not borehole, but it was interesting. I reeled back my safety line in case I needed it later, and quickly thereafter was making my way back along the main line to the exit when I found the empty reel that I had run over the dune on the way in. I decided to reel it in all the way in case we needed more line latter on. Little did I realize that doing so would almost be the end of me.

I was looking down, minding the reel

as I rolled in the line, when suddenly I went straight into a cloud of some of the worst visibility I have ever encountered on a sump dive. The kind of zero viz that gets you almost dizzy as the light mixes with the murky water and you lose physical references of things as you are swimming through the emptiness. So before I could ask myself what changed, the line in front of me started to make turns that I had not made when I placed it originally. A few minutes later the line suddenly went straight into a mud wall. Not good ! As I was feeling the mud obstacle in front of me I bumped my elbow against a rock on my right. As I pushed myself to the left, to get away from it, I bumped again but now with some sort of ceiling and with something else on the left wall, almost simultaneously. I had read about this kind of situation more than once—usually in accident reports—and I could not believe it was actually happening to me. I don't know how I got into that hole but it seemed that backing out a little was worth trying. The thing about it was that the side mount tanks were fish-hooking against the rocks to my sides and for some reason the banging of the electronics on the top was not making me feel that this was a good idea either. I was probably only stuck for about 2 minutes, but it felt like two hours. I had to calm down and remember that thank God I was using a rebreather and had about 4 hours of gas left to solve this problem. I decided that taking things off was going to be the last resort. I did not have much space anyways, so next step was going to be to dig the line and myself out of it.

Bill Stone asked me 6 months prior to this whether I thought regular cave diving line was OK for this project and I told him that there was room for improvement. So I went ahead and designed a custom, tough, abrasion-resistant 2mm cord with the help of the Cortland company from NY. They graciously sponsored the project with more than 2 kilometers of this line. A lot went into the creation of this line and it was paying off now as I was pulling the hell out of it from in-between rocks and mud. I continued to shuffle everything for around fifteen more minutes until I came out into crystal clear visibility. I was now able to realize that while I was gone there had been a second mud slide of much larger proportions that changed the face of the whole place. In doing so it grabbed my line and stuck it into a very nice line trap from hell.

After this incident we settled into doubt about Sump 4. It just did not have the feel of a going tunnel and it was clearly headed in the "wrong" direction. Perhaps all along we had been falsely led away from the true way on—Sump 3. Back in April, James Brown had entered Sump 3 for about 30 meters, and it was going large, with a crystal white sand floor, much like Sump 2. If anything, this place for sure had the current and should go the "right" way despite the fact that we thought we should have bypassed it by now. I picked up where James left off and continued placing new line for 175 meters. Then suddenly it ended in some sort of sand dune to the left and a small fissure to the right of it. After poking my head over the crest of this sand dune and seeing how steep it was, and taking into account that it looked like the bottom of the sand pile I had just fought my way out of the previous day, I chose to continue into the narrow fissure route. The thing about that one was that it was not big at all and it was making all sorts of sharp turns around big and questionable breakdown boulders. But there was no silt, the water was super clear, and I was feeling very curious about what was coming up. What appeared ahead was an air chamber with a wide open feel to it, albeit for an uncomfortably tight egress to shore. After getting all my gear off, making a complete systems check and leaving it in a stable place I started an exciting climb into the unknown, still in my drysuit. Two minutes later I was contemplating something that should have not existed in the "unknown," a flimsy-looking, pink thing that looked very much like flagging tape to me. It said MGMC for Marcin Gala and Matt Covington. Great! I came out of Sump 3 into the tunnel that leads into Lake 41, 30 meters prior to it at the bottom of a fissure that we did not see before. I left my gear there and walked back upstream to Sump 3 to meet Bill through the very familiar route that we used from Camp 4 to Sump 4. I could not resist getting close to Bill before loudly calling to him. The echoing voice coming from the upstream direction had the surprise effect I had been seeking. He quickly understood before I got to him what had happened and after a short discussion we went back to camp.

With Sump 3 now definitely explored and clearly carrying the river to the head of Sump 4 we concluded that our last chance was to go back to the tunnel that I found using my safety reel near the end of Sump 4. The thing was that we needed all the line that I just placed in Sump 3. That meant another dive and the consumption of precious diving resources. We had no choice, however. I was already using Bill's CO_2 canister. He had agreed to exchange his almost unused canister for my very used and almost depleted canister in order to allow exploration dives to continue. After making the long cold dive into Sump 3 to survey it and then to retrieve the line, we transported the equipment back to Lake 41 for the one final push.

Vickie Siegel

Bill Stone inspects the water level at Surprise Sump on May 20th. The bolted rock had previously been installed by Heather Levy and Seth Spoelman more than a month earlier when they were similarly trapped beyond the sump. The top of the rock is exactly the point at which air begins to flow through the sump. Here it is half a meter underwater.

We slept restlessly that night. Right after breakfast we were back to Lake 41 through the now super-familiar route. We both knew this was the last chance to find the missing way forward but at least if we did, we now had two exploration reels full of the special cave diving line to do it. We gave each other the Roman *Virtus et Honor* salute and I headed in. I left feeling it was so much harder for Bill to stay back, but if anyone could deal with it the right way, it was him.

Back underwater I picked up where I left off with my safety reel a few days back and continued placing line to the end of the tunnel. I suddenly reached another dead end! I turned around and paused again at the entrance of a small tunnel going south. I had passed it on the way into this chamber, yet dismissed it at the time. I now followed the illogical route south thinking that it had better make a U turn pretty soon. And for once, the cave did something right and made the "U" turn and started heading northwest through a much different tunnel—spreading out to 12 meters in width and 10 meters high with large breakdown on the floor. Everything was covered in white sand. This tunnel had small "V" shaped sand ripples in the bottom pointing the way forward—a sure sign of the lost flow and its direction. It was also very consistent in size and heading and I was making very quick progress through it. Eventually I ran out of my first spool of line which was not that nice since it was getting to be very far from the entrance. I tied on the second and last Dive Rite exploration

Bill Stone

Jose in the "Land between the Lakes" – the giant chamber between Sumps 2 and 3 in J2. The dry bypass of Sump 3 is up and over this breakdown pile some 200 meters distant.

reel and continued on. I felt so humbled and fortunate to be enjoying this incredible opportunity of truly navigating deeper into the unknown. I felt a deep sense of unison and peace with the cave that is hard to put in words.

I was now past the point where my sidemount bailout bottles had enough open-circuit gas to get me out of there. I did not go much longer until my second reel ran out in the middle of the tunnel, still underwater. I paused in frustration only momentarily before deciding to use my safety reel again. I was going to use everything that I had at my disposal, and that was it. As I was tying the reel I was asking myself whether I was surrendering my reason to my passions in bad honor to the Greeks. The tunnel was giving indications of getting shallower and after only 20 meters I saw the unmistakable mirrored surface of air overhead! I surfaced and quickly tied the line off to a rock that was inside the airbell. I stowed away the safety reel with barely enough line to perform an emergency line recovery procedure. I swam through the air chamber with some excitement. I had a lot of light—an array of 5 UK Super Q e-LED lights and one Sten Light—and everything was sharply lit. I could not wait to see what was coming up. I made a couple of turns and realized that this was a large air bell just prior to what I now believe will be the main air-filled continuation of the cave. The bottom was coming up now—max depth 1.5 meters on the roof—and the flow was speeding up. All the prior morphological observations in that final stretch of 12 meter wide by 8 meter tall tunnel point to this conclusion. Going forward those last few meters underwater, unfortunately, was not in the cards. I was out of line, dangerously low on all consumables, and still had a 2 hour long survey dive back to Bill. There was no doubt in my mind then about whether the cave went. Before heading back I enjoyed a few minutes looking around at one of earth's most remote places. I have literally lived by the saying that there are no atheists in the war trenches, so I gave a humble prayer to the almighty and decided to enjoy the trip back through the most awesome cave I have ever seen, read, or heard about. Three hundred and seventy meters later it was over and I was back at Lake 41.

I was very happy to see Bill and quickly told him everything. We had a good night's sleep and began readying for a very tough derig ahead, following 7-1/2 days at Camp 4. Because of all the vagaries of the way the expedition had unfolded we were short on people and knew it. The main preoccupation now, however, was that before Bill and I could get to Camp 3 we had to dive through Sump 2 with 200 pounds of very negatively buoyant equipment and a dysfunctional rebreather. Bill and I had spent a lot of time in Camp 4 discussing how this would proceed. Amazingly, we had also discussed it with basecamp via the Michie phone and Vickie Siegel had taken the discussion notes down the mountain and was able to reach one of the Mk6 code developers by satellite phone. Based on her relay of the advice they gave we thought there may be a way to jump start the automated control system by submerging the rig (it had an auto-start safety feature meant to protect divers who accidentally fell off a boat with the rig on their backs but not turned on). Several hours later the two of us were in the water at the beach at Sump 2. Bill went out a few meters into the sump to a depth that should have triggered the auto-start procedure but the fault persisted. He returned with a resolute look on his face and said, "pull the battery." That left him with a dead rig. The normal abort mode for the Mk6 was to go to the surface during a dive. Fine for a novice diver in open water but not so good with 200 meters of underwater tunnel ahead. Neither did the Mk6 have a backup PO_2 monitoring system (again, a simplification for lightweight sport diving). It did, however, have a manual oxygen addition switch that we added just before leaving Texas. That decision now proved to be crucial. One of the final abort scenarios we had discussed at Camp 4 was to run the rig in "semi-closed" operation. In this mode the user can take a breath from the automated air addition system and recycle it a number of times—usually somewhere between 10 to 15 breaths for a calm person. The reason it works is because the CO_2 is being pulled out by the scrubber canister and because a normal person only consumes about 5% of the oxygen in a breath during normal breathing. With the CO_2 kept low, there is no autonomic insistence by the body to change the air, so one can calmly breathe this mix as it goes ever more hypoxic. The trick is to decide when to dump the hypoxic mix and reload. Bill was able to extend this concept much further with a second trick: by breathing in only half of a lung of air and then filling the remainder, manually, with pure oxygen, it was possible to extend that single "breath" to nearly 10 minutes underwater. At the end of that interval he dumped the entire breath and executed the procedure again. He only had to do this procedure three times to get through the sump—thus effectively diving a 200 meter sump on three breaths. It was this type of efficiency that had allowed us not to dwell on the exit from the cave for the past 4 days. But it was not something you would prudently use for exploration. Because no one on the team had ever tried this procedure, however, we agreed that I would carry the full load of gear (both 55 liter bags) while he went ahead and focused on getting out, hopefully without having to resort to his sidemount bailout gas.

Meanwhile, I had to inflate everything that I had to the maximum, including my drysuit, in order to make a much shallower trench in the bottom as I crawled to the exit. Thankfully, we had had the foresight to rig that 9mm rope through the sump and it was now possible to make rapid headway by pulling along on the rope—definitely non-standard cave diving practice, but highly effective for carrying big loads through a sump. I could not stop thinking about Bill's situation and after 30 long minutes I saw him peacefully waiting for me underwater at the head of Sump 2. Even though we had discussed the procedure at length it was still hard to believe: he had exited the cave through a 200 meter sump, more than 1200 meters below the surface, on manual mode on a rebreather that was not designed to do that, with all the computers and screens off, with a leaking drysuit and, at the end, he took time to pull out a camera and film my arrival for the sponsors before we got out of the water. Later on at the diving platform he told me how much he enjoyed the whole thing.

The horrible de-rig was a much longer and heavy procession than anyone wanted. The good thing was that we had a great crew. At this point we had seven in the cave: Vickie Sigel had guided Nikki Green and David Ochel down to Camp 2A. They were making shuttle runs down to the -1000m level to retrieve the gear we were moving upwards. Yuri Schwartz and Sergey Tachenko from Russia had persisted for more than a week at Camp 3 eating nothing but powdered potatoes—their drill batteries had long since given out and they had spent the time haul-

ing equipment upwards. Bill and I completed the underground team following our return from Sump 4. James Brown manned base camp and the all-crucial Michie base phone to coordinate the asynchronous teams. And that was it: these were the last of the 46 person team to remain on the mountain on what surely had been a roller coaster of an expedition. We had a nice party when the entire team met at Camp 2A (-800 m). It was a cause for much merriment and one of the expedition's more memorable quotes: having been living on subsistence rations at Camp 3 for a week, Vickie had promised the meat-loving Russians that she would bring them an entire sausage to Camp 2A for them. But the timing had been bad and although they had brought the food to Camp 2A half of it was gone before Yuri and Sergey got there. With a hearty laugh Yuri then said, "*there have been **many** promises that have been broken on this expedition, but worst is that Sergei and I would have entire sausage to ourselves in Camp 2*." If anyone had a right to make the claim it was Yuri—he had spent considerable time training to go beyond Sump 2 and through happenstance (because he was not yet a full cave diver trained in exploration skills) had been unable to go. As a consolation, we kitted him up in my gear at Sump 2 after Bill and I surfaced on May 19th and he made two 50 meter penetrations down the 9mm line, just as we had rehearsed in controlled settings prior to the expedition. It was his first cave dive.

The following morning we began what we felt would be a routine exit from the cave. Everything proceeded well until we reached Surprise Sump. To our stunned dismay we discovered that a recent series of persistent showers on the surface had again flooded it shut, apparently just after the passage of Vickie's team descending to Camp 2A. After the initial frustration passed we went back through 500 meters of the highly technical Black Gorge section to Camp 2A (a 2 hour journey) and had another party to boost the collective morale of the group. The next day Bill and I were the first ones to get to Surprise Sump and found it to be even worse than the previous day. Now the situation required us to start making some tough choices. We asked our Russian crew to go all the way back to the head of Sump 2 and retrieve some of the scuba gear that was left there for the next expedition. This was a highly non-trivial request but our disciplined friends started to get ready right away and left with David, who graciously decided to join them, on their 19 hour mission. Bill and I established a bivouac at Surprise Sump, along with a Michie phone and a plan to coordinate immediately with the others if the sump opened. The basic problem at this stage was that there was literally no more food left anywhere downstream of Surprise Sump. We all knew the cascade of consequences that could follow under such circumstances this far and this deep with the psychological chances of not making it out. Had the rainy season arrived early this year? If so, then the sump was not going back down and we had to come up with a proactive way of dealing with it—hence the trip to the sump to retrieve dive gear. Bill and I painfully constructed a bivouac in the rock pile downstream of the sump and used our drysuits and coveralls as "sleeping" mats. The plan was that as soon as the Sump 2 crew made it to Camp 2A, Nikki and Vickie were going to take that gear and bring it up through the Black Gorge to Bill and me. We in turn would dive Surprise Sump and then quickly go to the surface and bring supplies down. The only inhabitant at base camp at this point was James Brown, who was recovering from injuries sustained on earlier trips. It was felt imprudent by all for him to attempt a solo descent. It was far more important that he continue the indispensable job of monitoring the weather as well as arranging for special equipment to be brought up the mountain from the vehicles if needed.

David Ochel

James Brown tests the EXO-26 commercial diving mask that would have been used for a sump rescue at Surprise Sump.

Bill and I had one small Power bar which we had to split for three days. We did get very hungry and as a consequence very cold as well. But we kept good spirits as we were waiting for the gear. Eventually the sump crew made it back to Camp 2A and handed over the gear bags to the next team that was going to bring it to us. Fifteen minutes after they left the camp and began their ascent up the Black Gorge they were forced to turn around because of stomach problems related to the lack of nutrition and general fatigue. This meant that we were going to have to wait almost a day for the Sump 2 crew to recover from their push trip so they could bring us the gear while the other team recovered enough for next day's inevitable mission of getting out of there.

Bill Stone

Jose arrives at the upstream side of Sump 2 on May 17th, bearing the two 55-liter x 50 kg gear bags coming back from Camp 4. The 9mm guide line is visible below the bags.

Finally we got the gear after an incredible effort from all of them and went quickly to work; they returned to Camp 2A to wait for our call. Bill went first and dived upstream for what proved to be 23 meters before surfacing. The route, unfortunately, was a little bit technical—it was not a straight shot to the other side as we had hoped. He took a look at the EX-Sump (beyond, towards the entrance) to confirm that it was passable without dive gear. Then he plugged in a Michie phone into the line and called me at the bivouac to give a report. It was very hard to hear him over the powerful background noise the water was making at his location but it became clear that the plan we had developed jointly to dive out with the entire team was doable. When he came back we decided that we did not have any indication that the situation was going to get any better. Further, it was not clear that we were going to have enough time to go out and back before the rainy season really got into full swing and the water rose even higher. As far as we could tell—and as Vickie had pointed out on more than one occasion—the rainy season appeared to have arrived very early this year. So we decided that everybody was going to have to dive their way out of this one. We did not have any time to waste, since every meter the sump came up, the dive got 10 meters longer. We called Camp 2A and told Vickie and Nikki to start making their way to Surprise Sump as soon as possible, with the mindset of making a short dive to get out. We told the rest to give the first team 2 hours and then to leave Camp 2A and head our way with the same mental preparation of

continued on page 20

J2 Cave 2009

(continued from page 9)

having to dive out. We only had two of our 4.7 liter sidemount bailout tanks with us so we were not going to get too many tries at this. Complicating the matter was that there were seven of us and only three XL drysuits. Four people would have to do this in nothing but their cave suits. Vickie and Nikki arrived at the sump and were quickly met with a detailed brief on what to do. I was going to wait for them on the other end and Bill was going to coach them on this side. They did not have any weights so they were going to have to crawl inverted on the ceiling to get to me. Once I got to the other side I saw Vickie's lights quickly moving my way and before I could submerge myself to guide her to me she was already out of the water. I felt so happy and proud of her for the outstanding job she did under such pressure. The plan had been for her to get gear to the other side of the long swim through the Ex-Sump and then wait to help Nikki out the waterfall at the upstream end. She did this and waited for almost half an hour before hypothermia onset forced her to set off for Camp 1 at a slow pace, solo. Back on the downstream side of the sump we were having problems. Nikki had not shown up.

I eventually dived back to the downstream side to find out what was taking so long. As I surfaced I saw the scene that I was hoping not too see: Nikki was hyperventilating in a corner, overwhelmed with the situation. She had attempted repeatedly to submerge but each time could not get a full breath from the dive regulator. After one glance at Bill, who was patiently trying to assist, it became clear she was not going to be able to make it through. The reality was that the situation was asking her to do something super hard in a weakened condition. She had never dived before, much less in this kind of environment. The 11 °C water temperature without an exposure suit was not helping the cause. The more critical problem was that she had already consumed too much gas in her attempts to go under and we still had 4 more people to get out on that same tank. Partially hypothermic now, she was not in a good position to make a decision as to whether to continue trying or to stay behind for an uncertain rescue. It was also clear to Bill and me that she would likely drown trying to go through. I had to make the choice for her. It was not an easy thing to do but I had to ask her to give me her tank so I could use it to help the rest. She immediately agreed and went back to the bivouac site as the others got ready for their turn.

Everyone else (all with some level of prior dive training) was able to go through with no major setbacks. David Ochel decided to stay back at very high personal risk to help her out through the waiting period. He did this knowing that the river could continue rising to the point of making a rescue impossible. This was good and bad: good because she had someone else to talk to as Bill and I were racing to the surface to get emergency gear and more gas, and bad because if something happened we could lose two team members at once. Of course we were going to do everything we could to prevent that.

The four of us that subsequently went through—Sergei, Yuri, Bill and myself—pretty much raced to Camp 1 and met Vickie there. She knew something bad had happened when she counted crew members and came up two short. She almost waited too long in the waterfall zone above the ex-Sump, hoping to see Nikki at some point. She had a long cold trip alone back to Camp 1 thinking of what happened to the rest of the people all along. She was still shivering when we got there and quickly understood the seriousness of the situation. We decided that Yuri and Sergei would go to the surface to retrieve dive rescue equipment. We had already phoned James and requested he descend the mountain to get a special EXO-26 commercial diving band mask that could be used to transport an unconscious person through a sump. That and a spare 9 liter carbon-epoxy tank would be enough to get the remaining two through Surprise Sump if we wasted no time. On the surface, James frenetically assembled gear and food bags to go back down. Thank God that we never lost the ability to communicate through the Michie phones—with them we kept a half hour phone contact line with the bivouac team as well as with the surface. Bill, Vickie and I stayed at Camp 1, recovering with the very little food that was left there so we could be ready to jump into action as soon as the Russians were back. As Yuri and Sergei were getting closer to the surface the trapped crew started reporting that the sump appeared to be slowly going down. A weighted rock and rope had been tied to a roof pendant there more than 5 weeks earlier by Heather Levy and Seth Spoelman for the purpose of tracking the sump level. Our hope was that it might go down enough so as to allow them to get through without the emergency dive gear—and thus relieve Yuri and Sergei of having to bring down the heavy package.

Somehow the miracle happened—there was a 1-day breach in the now continuous rain—and the sump opened with just 10 cm of air space at 10 am May 23rd. David called Camp 1 and let us know their plans. Bill and I suited up immediately and met them several hours later as they were coming through the ex-Sump. Once Nikki was clear, David had gone back (he was wearing the third dry suit, which fit him well) and shuffled the remaining duffels of equipment through. Once they were out of the sump we were all able to breathe a little easier and continued the heavy process of the de-rig but with a renewed sense of accomplishment and unison. Bill and I had been underground for 19 days when we reached the entrance. It was the longest contiguous period either of us had spent in a cave. J2 was now 1222 m deep and more than 11 kilometers long. More than 600 meters of underwater tunnel had been explored, of the 1.5 kilometers discovered by the expedition beyond Sump 2.

The expedition concluded without any further incidents. It had been a memorable trip at every level. A week later we all had a wonderful expedition homecoming party at Stone's ranch in Austin and gradually departed our separate ways over the coming weeks. Even at the party talk had already begun of how we would come together once again to push forward in this magnificent system. The 2009 J2 expedition was one of the ultimate examples of the importance of cohesive and smooth team work; the amount of equipment transported underground was daunting, yet the entire team dealt with it in

Bill Stone

an upbeat manner. I cannot wait to be part of it again.

I heard before the expedition that some people in the past had categorically declared J2 to be finished. Suspended in the underwater borehole at the end of Sump 4, with the ground and ceiling rising, ripple marks on the clean, white sand floor, and the San Miguel gorge—with its possibility of another 600 meters in depth—now only a short distance away, I knew otherwise. The cave goes strong, and it is without a doubt one of the most formidable exploration challenges on Earth.

David Ochel

The team reviews the outcome of the 2009 expedition when the new passages are plotted up on the regional map. Left to right: James Brown, Sergey Tkachenko, Nikki Green, Jose Morales, and Bill Stone.

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