2018 Sistema Cheve Expedition: Executive Summary

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Prolog:

At the end of the 2017 Cheve expedition an extraordinary discovery was made two kilometers east of the main entrance to Cueva Cheve. The new cave was initially named “CL6” by the recon team. Further discussions with residents in the municipality revealed that the place had a proper geographical name, so the new cave became “Cueva de la Peña Negra” – Cave of the Black Cliff. The initial explorations encountered extremely narrow, constricted passages, with hundred-meter-long fissures less than 20 cm wide and body-tight crawlways. But the final exploration push in 2017 had been stopped due to lack of rope at a 25 meter drop in a stupendous tunnel measuring 40 meters wide by 40 meters tall. It carried a strong wind – even in that large tunnel – so the portent was that there was much more cave to be discovered beyond that drop. When we left in early May of 2017 Cueva de la Peña Negra had 3.4 kilometers of surveyed passage and reached a depth of 426 meters. It’s location on the topographic map placed it in a zone where no previous exploration had been conducted in the Sierra Juarez and it’s numerous branches suggested that it might completely bypass Cueva Cheve and head deeper into the mountain. Interest in knowing where it went was high among the team members. So the only question at that point was how quickly we could organize a return.

Not quite ten months later the advance team left Austin on February 25, 2018. Ultimately, forty people from six countries participated. The final derig crew returned to Austin on April 30, 2018. In between that ten week gap a lot happened. While the Peña Negra demanded our primary attention, a significant mystery also remained near the bottom of Cueva Cheve. A labyrinthine maze leading east from the stream canyon just below Camp 3 was discovered in April of 2017. It carried and incredibly strong wind and held the promise of perhaps leading to a bypass of the underwater tunnels at the present end of the cave. As a result, two major cave systems were explored in 2018.

As with the 2017 expedition we had a lot of people on the mountain working multiple simultaneous objectives. In fact, 2018 proved to be significantly more complex as we had up to 6 underground camps stocked during the expedition (with sleeping kits, cookware, fuel, and telephones). Often three or four of these were in use at the same time. Each camp that was occupied had at least one exploration/survey team and sometimes two with each team comprising 2 to 4 people. To make sense of this we had to construct a chart at basecamp on a white board showing where all team members were located on any given day. I have reproduced that chart here (see the Camp Location figure). The immediate sense one gets in looking at this chart is that team members were bouncing about inside the mountain for substantial periods of time (for a grand total of 512 logged person-days at underground camps in 2018). For most people this represented somewhere between 40 to 50% of their time on the expedition; for some it was much more (the high being 83%). The upshot, however, was that people were moving about frequently underground, changing cave systems, and checking into camps as if they were hotels. Reservations were needed – otherwise they might show up only to discover that all sleeping bags were in use … a very awkward and uncomfortable situation for everyone involved, especially if two different teams converged at the same time following a long day of transit. And so basecamp, via the phone system, acted as the Expedia.Com for Cheve

travel. One consequence of this subterranean migratory behavior is that it is difficult to tell a simple story about what happened on the expedition. It was the antithesis of the linear, siege-driven time line that would, for example, follow a single person to the summit of Everest or K2. What follows below can be considered a sort of Canterbury Tales … a collected series of vignettes that interweave in time and space with overlapping characters to highlight key incidents and follow the various exploration fronts – all of which were generally directed towards finding new tunnels that would bypass the northern end of Cueva Cheve. This summary also provides an overview context for the other articles being written by various team members.

Calories:

I started my 2018 expedition log in a snow storm sitting in a small regional airport in Toledo, Ohio on February 23, wondering if any planes would leave that day and whether I would manage to connect up with the trucks that would be leaving Austin in two days for Cheve. The previous night I had given a lecture to some 400 students and professional engineers at the university there. The banquet had been impressive and I felt no need for breakfast that morning. This made me think of the frenzied work that had gone on over the previous six weeks relating to expedition food, specifically specialized underground camp food. I had been fortunate in that numerous Austin cavers had come out to the ranch the past three weekends (and some weekday nights) to help compress and pack food and equipment. Most of this food had been bulk–purchased by Vickie Siegel, Sean Lewis, and me in one marathon Saturday on January 24 in the conference room – with a projector showing the calculated quantities we needed and web sources for those ingredients while one of us placed orders for up to 100 kg or more per item. Sean had done extensive nutritional studies over the previous months. He had then single–handedly taken on the task of revising the custom underground camp dried food mix constituents and proportions that we had been tinkering with for years. The idea was to boost fat calories, protein, and nutrients to give everyone superior long-term athletic performance while not losing substantial weight during the expedition – still a pervasive issue even in 2018.

We purchased an extraordinary amount of dried and freeze-dried bulk food in that one day (sufficient for more than 600 person days underground), leaving only a few odd items like durable hard cheese and jerky which were difficult to locate in Mexico on our final list. The boxes began arriving over the next three weeks. The garage was by then also full with some 40 haul sacks, carefully packed with rope, telephone wire, sleeping bags (compressed into 6 liter Darren drums), Thermarest pads, cook kits, tables , chairs, generators, extension cords, and the mission control shelter. There was still a mountain of things to pack. But, as always, it somehow compressed and fit into four trucks being driven by Bev Shade, Vickie Siegel, Jon Lillestolen, Sean Lewis, Lee White and me. Three days later we met Mike and Donna Frazier, Gerardo Morrill, and Wicho Diaz in Cuicatlán, Oaxaca or “Cuica” as the locals like to shorten it. Wicho, Gerardo, and I had a brief meeting with the Comisariado of Concepción Pápalo, Pedro Vigil Neri, and we were then cleared to begin setting up basecamp.

In 2017 we had camped in Llano Cheve, but it was clear that the majority of the work in 2018 would take place at the Peña Negra so we decided to set basecamp just outside the entrance in a recent growth forest of 10m tall Ocote pines. This would have worked out simply except for the 120 meter vertical drop from the nearest 4x4 vehicle access a kilometer away. March 2nd and 3rd found us marching up and down this hill interminably like a procession of ants backpacking all the equipment down to camp. And then, just when everyone was well spent from hauling, the fog moved in from the east. It was then we discovered that Llano Peña Negra weather was quite different from Llano Cheve: orographic lift allowed the coastal cloud banks to slide up the adjacent valleys and into basecamp with no obstacles in the way; Llano Cheve was at the bottom of a 300 meter deep sinkhole guarded by a high eastern rim that stopped the

lapping clouds, for the most part. That evening heavy cold drizzle began to fall before we had a chance to set up most personal tents and the main kitchen and mission control centers. It would remain like this, with about 50% rainy days, for the next two months. We delivered a lecture in Concepcion Papalo the evening of March 4th to a crowd of around 300. This year Vickie, and Marcin Gala who had just arrived, set up a rope treadmill to demonstrate vertical skills and allowed the local villagers to try their hand at ascending with a FROG rig. It was popular after the first contestant – a surprisingly confident 7 year old girl – showed everyone how it was done.

The First Push: Peña Negra 2018:

For the next four days the entire team, with 16 now on site, rigged Cueva de la Peña Negra to the Lost in Space chamber (-300m level), transported supplies for an initial underground camp at the present limit of the Infinite Borehole at the deepest point in the cave, and ran a phone line to that camp. Perhaps the most significant incident during this time was the initial trip by Marcin Gala and Jon Lillestolen through the “Juniper Tube” restriction. They had discovered that the 40 meter long oval–shaped bedrock crawlway, known from late April of 2017, was now, earlier in the year, half full of water. They had managed to get through it with only one eye above water. On the other side, soaked, cold, and depressed at the thought of this being the route through which everyone and everything going into the cave would have to pass, they began searching the “Lunch Room” chamber, just beyond the crawlway, for possible alternative routes. Six meters up the south wall of the chamber Marcin spotted a narrow fissure. They free climbed into this and discovered a small, but dry tunnel leading south. To their joyous amazement it connected 60 meters later with a 10 meter diameter chamber at the base of the previous rope drop, and above the start of the Juniper Tube.

On March 9th Lillestolen, Frazier, Morril, and White established *Camp Kyle* at the -437m level. There was something of a joke involved here. With both Cheve and Peña Negra being rigged in 2018 we knew there was going to be a problem identifying which underground camp a person was talking from on the phone system. Cheve already had three underground camps: C1 (-400m), C2 (-805m), and C3 (-1,100m). Mike Frazier had thought about this and had acquired a number of small plastic cartoon action figures from the animated television series “South Park”. Thus, the first camp in Peña Negra became “Camp Kyle” (-437m). Two other camps in Peña Negra would eventually be established: “Camp Cartman” (-647m) to continue deeper explorations; and “Camp Stan” (-311m) to investigate several extensive tunnels branching off from the Lost in Space chamber (see the Plan map for locations). All six of these camps were eventually linked by single wire earth-conducting Michie phones. Standard procedure was for each of these camps to call in to basecamp at 9am each day to coordinate activities, share new data, and to make equipment, food, and personnel changeout requests. Two days later (March 11) Shade, Lewis, Kasia Biernacka, Tomek Fiodorowicz, and Mary Hicks joined the others at Kyle and it was then, with two teams working in open, continuing, unexplored cave, that the new survey data began to arrive – continued for the next month on average – at a rate of half a kilometer per day in passage frequently measuring 40x40 meters in cross section. No one had seen anything like this on a deep caving expedition in recent history.

Not long after this a call was received at basecamp from Lillestolen regarding their progress in the deep continuation of the Infinite Borehole. As he related it to Marcin Gala – who was serving as basecamp coordinator – they had run into “highly technical” passage. We eventually came to understand that they had used 65 rock bolt sets in a single day along with several hundred meters of rope to rig the route. What had been gigantic walking passage turned into gigantic passage with house–sized rectangular blocks wedged between vertical canyon walls. In many cases there was no floor to walk on: the holes between those blocks dropped 30 or more meters to the sound of a stream rumbling below. In place of easy walking was now a web of traverses,

rappels, and climbs. Often the passage would terminate against a giant stack of these boulders and one could see, 30 or more meters up, large passage at the ceiling of the enormous tunnel. Gerardo Morril had performed some spectacular climbs to surmount these obstacles and there were now a series of free–hanging 30 meter plus pitches that led up to the roof, only to cross a giant boulder to be faced with an equal rappel down the other side. This cycle repeated itself numerous times, devouring rope and rigging hardware. Within two weeks of our arrival on the mountain the survey data indicated that the main (Infinite Borehole) passage was heading resolutely northwest, towards what appeared to be an imminent connection with Cueva Cheve somewhere between Saknussemm's Well and Camp 2 at the 800 meter level of Cheve.

A Change of Course:

Marcin Gala, Corey Hackley, and Nathan Roser arrived at Camp Kyle on March 15 and replaced Lillestolen's team. The following day they descended 76 meters vertically and explored half a kilometer of continuing large tunnel beyond a 60 meter shaft where the previous group had stopped. The pit was the deepest yet discovered in Peña Negra and it had a significant waterfall dropping into it. When there was a downpour on the surface – frequent this year – it turned into a torrential, cold shower for anyone on rope. Gala's team came to within 300 meters of Cheve before the giant tunnel they were in, which had been heading predominantly northwest, abruptly took a 120 degree swing to the east. The following day (March 17) Gala, Lewis, Roser, Bristol, and Hackley discovered another half kilometer of enormous tunnels (at one point reaching measured dimensions of 50m wide and 80 m tall) heading east, punctuated by a series of huge hollow cones, some more than 70m across and 50m deep, that appeared to be drawing material down and to the north, towards Cheve. They were like giant antlion funnels. Later calculations showed that the base of the second of these funnels was within 50 meters above known tunnel in Cheve. Before this discovery, however, the cave had appeared to descend into a dead end in a silt floored canyon. Hackley had retreated back up the slope and began investigating a narrow, popcorn encrusted fissure leading up and north. He followed this unlikely tunnel some 60m before it suddenly opened into what appeared to be the continuation of the main, huge tunnel, still heading east. However, the side track into the silt–floored canyon had not been without merit. They subsequently reported that this was the only flat spot they had seen in 3–1/2 hours of continuous travel and that it would serve well as an advance camp – soon to be known as "Camp Cartman".

Two days later Lillestolen, Adrian Miguel Nieto, Morgan Smith, Nick Vieira, and Gerardo Morrill established Camp Cartman and prepared for a five day push. On March 21 Vieira rigged down into a complex series of tunnels below the second giant antlion funnel with Miguel-Nieto sketching and Morrill and Lillestolen running DISTOX laser instruments for the survey. The supply lines had been stretched thin to Camp Cartman and they were running out of bolts, but the vertical pitches kept coming. Vieira had to use slings and re-directs in places where rebelays would normally have been set, but their rope supply held out. It was 9pm that night when the basecamp phone crackled to life with Camp Cartman on the line. Vickie Siegel had been running the phones that night and people were scattered about camp making dinner and hot drinks to combat the cold that had settled in. My log book records what happened next:

> *I was busy reheating some cocoa when Vickie called out "Bill, come over – they've connected to Cheve". Jon was on the line reporting that they had connected at several places but the first was at survey station CC13. Jon then said, "Bill knows where this is – it's his station"* [1]*. Marcin Gala had predicted this possibility the previous day and indeed that is where they dropped in today. The only person disappointed tonight was Corey Hackley, who insisted that they should have remained in the high borehole he had*

seen and possibly bypassed Cheve to the east. Despite this, there was an immediate celebration in basecamp that went on well past midnight.

The connection with Cheve was exciting – the discovery of a connection between major cave systems is always a rare event. But underneath the celebration there was some disappointment. A connection meant that a huge new cave had just been absorbed into "Sistema" Cheve. Some wondered aloud whether this was fair, as the Peña Negra, in general, had far larger tunnels than those in Cheve. Why not Sistema Peña Negra? But that would be contrary to long precedent. Worse, however, we had been counting on the Peña Negra to in fact miss Cueva Cheve… to go around it to the east.

Over the following several days Tomek Fiedorowicz and Lee White joined those at Camp Cartman, as did Witek Hoffman, Kasia Biernacka, and Sonia Dudziak. Together they extended the large borehole above the antlion funnels several hundred meters further east before a collapse in the tunnel stopped progress. A side passage leading to the south opened into more than a kilometer of ascending galleries – which they name "The Silk Road" – that paralleled the descending Infinite Borehole but displaced 600 meters to the east. But the efforts to find an eastern bypass to Cheve appeared to have stalled.

At the end of March there was a mass exodus from Camp Cartman. But by that time other things had been happening, most notably Cueva Cheve had now been rigged all the way to Camp 2. The rigging of lower Cheve (beyond Camp 2) was still in progress when it was realized at Cartman that a through-trip was now possible. And so on March 28 Vieira, Hoffman, Dudziak, and Fiedorowicz chose to exit via Cheve, thus completing the first through trip from Peña Negra to Cheve, a traverse of more than 6 kilometers underground.

Into the Calles de Papalo:

While kilometers of borehole were being discovered in the Peña Negra rigging teams slowly began entering Cueva Cheve. Kristen Anderson, Adrian Miguel Nieto, Adam Byrd, and Morgan Smith reached Camp 1 (-400m) on March 15th. Byrd, Anderson, and Elliot Stahl returned for a 2-day push below Camp 1 on March 18th and continued rigging down to the beginning of the Turbines (-700m), below Saknussessm's Well. There was then a week-long hiatus before Derek Bristol, Lee White, Adam Byrd and I returned, planning to stay in the cave long enough to complete the rigging to Camp 3 (-1100m). Our foursome quickly diminished to 3 when the safety latch for White's descender failed during the descent of Angel Falls (-300m). Since there were no ropes beyond there for a while he continued along with us to Saknussemm's Well ("SAK") then returned to Camp 1 where he called in his problem to basecamp and sat it out there alone until a replacement descender could be brought in the next day.

I went down SAK first, inspecting the previous team's rigging. It was all new Cancord 9mm rope. I admit that new rope makes me feel more secure in a place like this. I have never gotten over the visceral feeling of looking down a 155 meter drop in a cave. And SAK was loud (from the waterfall), overhung, misty, and technical. There were 14 rebelays that demanded focus. At the bottom I checked the phone line at our traditional equipment depot and was surprised to find it worked (it had not been used in almost a year and flood waters raged through this section of the

1 In March of 1988 Bill Steele, Matt Oliphant, Bill Farr and I had discovered a large, dry, flowstone-floored passage above the East Gorge in Cheve. This tunnel begins near Camp 2 in Cheve and extends west to within 80m of the top of the 23m Drop, a well-known landmark in the cave. Lillestolen's team had rappelled into the apex of this tunnel about 300m southwest of Camp 2. It was a tall, 10m wide canyon with flowstone covered walls. It was not possible to see in 1988 that there existed a small side tunnel at the top of that canyon. It was this route that Lillestolen's team discovered from above.

cave in summer time). Marcin Gala was running phones in basecamp and his response had the cool business-like tone of an air traffic controller. Rather than saying “hey, the phone line works to SAK, cool! “, he said “I can see by your [slow] progress that you will not make Camp 2 in time for the 9pm call in so please plan to call tomorrow at 9am.” With just Adam, Derek and me now we had staggering packs and it felt dangerous doing all the awkward climbs in the Salmon Ladders. The going was slow. At one point on an awkward committing rappel I suddenly realized there was only one old hand driven, rusting bolt holding the rope. The hanger was stainless but it was obvious the bolt beneath it was corroding. I studied it for a minute then told the other two we needed to put in a backup bolt. Out came the TE30 drill. It drilled the hole in under 10 seconds, perhaps 200 times faster than whomever had set that rusting hand driven bolt in 1986. Thus began our work for the day: we had to replace a number of tyrolean traverse lines that had been storm lashed. Several hours went by in the wind driven spray of the waterfalls and I was by then quite cold and had both my suit hood up and balaclava on. The next tension traverse had a core shot rope and the section beyond was held up by nothing more than 50% of the core strands. We were most definitely not reaching Camp 2 today! By then it was past midnight and we were all getting stuporous. Fortunately we had planned ahead and everyone had their own camp kit with them so when 1:30 am rolled around on March 26 we found a sand bar beside the river (the first in hours of travel) and bivouacked there for the night.

The following day Corey Hackley, Elliot Stahl, and Lee White caught up with us and the six of us established Camp 2 and called in to basecamp. Marcin was again on the line, but this time relaying information from Camp Cartman: they were out of rope and planning to head back to the Peña Negra entrance. The phone line in the cave was a “party line” – anyone who picked up the phone could hear everyone on the line. Cartman was listening in and when they realized that Cheve was now rigged, and with a connection established, the route out via Cheve was actually now significantly shorter than going out the Peña Negra. They informed basecamp they would be leaving via Cheve to make the first through trip. This would then leave Cartman empty. The following morning Corey and Adam took half the rope at Camp 2 and moved to Camp Cartman while Derek, Lee and I continued rigging in Cheve towards Camp 3.

It was less than a day later, on March 29, that Hackley and Byrd ferreted out a way through the collapse at the east end of Peña Negra. It involved what Hackley described as a “nasty, muddy squeeze” that they had to remove rocks from in order to make it sufficiently large to pass. But it was short and on the other side was the continuation of the giant borehole. The tunnel had simply been blocked by a large collapse. While still 50m wide for large sections the new tunnel was also different from the jumbled breakdown floor of the main cave to that point. Large stretches of the entire tunnel floor were covered in smooth flowstone. Initially, from the summit of the collapse pile where they entered, the tunnel sloped downward, then leveled out. By the end of March Hackley and Byrd had extended Peña Negra a half kilometer further east, putting the end of this new tunnel – named “*Calles de Papalo*” in honor of the village – more than 300m east of the main fault in Cheve. This was “no man’s land” and an area we had been hoping to reach for decades. Sinkholes on the surface, and the general spacing of geologic faults in the Sierra Juarez, all indicated that there should be another large cave system about one kilometer east of the main Cheve fault. But the rapid discoveries ceased when the ceiling collapsed again. This time the bypass was not so obvious. Hackley later wrote:

> *“We dug about 6m through small breakdown heavily cemented with flowstone. Progress was extremely hard-won… the flowstone caused the material to behave as a single mass. When we started digging, we were following weak wisps of air. By the time we were finished, we were mistaking the sound of air moving through the breakdown for a massive waterfall ahead. This tells me that the dig has probably passed through most of*

the obstruction. Given its location, the character of the trunk leading up to it, and the air [it is most interesting]."

Although several teams returned to this area in 2018 no further progress was made at the end of the Calles de Papalo. However, a curious discovery was made near the point where the squeeze initially opened up into Calles de Papalo. The crawlway had intersected the giant Papalo tunnel mid-way down a flowstone covered slope. The main route descended down that slope, but in the opposite direction (west) it ascended for 70 meters before reaching the top of the tunnel. Above this point there was a spectacular 40m diameter dome that ascended into blackness. Hackley described their discovery:

"It is a minimum of 100 meters high, and about 40m wide near the base, narrowing toward the top. Adam and I named it the "Big Gaz" dome... we thought it was a brilliant name, but it seemed to fall a little flat when we announced it. Curiously, there was no water falling down the dome at all – not even a drip. It appeared to be almost exclusively phreatic in origin, and is associated with the massive fault that isolates Calles De Papalo from the main Peña Negra trunk. We saw air coming into the Calles de Papalo passage, vigorously, both from the breakthrough point by which we entered and the terminal dig. The dome is too large to discern airflow, but the air that is coming into the area has to either exit into Cheve somehow, or go up into the dome. So far, we have a collection of air inlets but no outlets. It is a very interesting [place]."

It was not realized until late in the expedition that these enormous tunnels beyond Camp Cartman were all at a level inside the mountain approximately 230 meters above the active stream passage in Cueva Cheve. The implication was that the Peña Negra caves were formed first, in a higher strata of rock than most of Cheve, and that there must therefore exist a much larger amount of passage that we had not seen – paralleling, higher, and to the east of, the main Cheve fault. There was one more surprise in store from this area in 2018. On April 5th Hoffman, Vieira, and Morrill surveyed another half kilometer of unusual black-colored, smaller fissure tunnel leading west from the first of the huge antlion funnels. To their stunned surprise they walked into a junction with the Cheve Sumplands tunnel (the main route to Camp 2) not 50m from the place where our rigging team had bivouacked just 10 days earlier. It was astonishing to believe that everyone had walked by that tunnel for 31 years and had not seen it. The result of this discovery was that there was now a much faster way to Camp Cartman via the Cheve entrance. It had previously taken most team members two days to reach Cartman via the Peña Negra entrance.

<u>To the Upstream Infinite Borehole</u>:

Just beyond Camp Kyle in Peña Negra the main tunnel took a hard left turn and hit a junction, measuring 60m across. This had been the limit of exploration in 2017. To the right, and north, was the continuation of the Infinite Borehole described above. To the left was a narrower canyon – still 10m across – from which a rappel led to a sizable stream. It was surmised, and later confirmed by survey, that this was not the same stream that passed by Camp Kyle. And it led both upstream and downstream. There was further conjecture that the downstream direction would surely connect with the other stream and perhaps might be passable underneath the giant boulders that now made up the floor of the Infinite Borehole. But the upstream tunnel was certainly going somewhere else. On March 11th Bev Shade, Kasia Biernacka, Sean Lewis, and Mary Hicks began exploration and survey of the upstream tunnel. Over the next five weeks they were joined by Lee White, Mike Frazier, Gerardo Morrill, Tomek Fiedorowicz, Matt Covington, Jordan Toles, Yazmin Barragan, and Nathan Roser at various times. More than two kilometers of tunnels, all trending upstream, were discovered, ending in the "Shadow Tower" chamber, an

unstable breakdown-floored canyon. The last push in mid-April left with possible continuations on both ends. This final chamber was essentially at the same level as the top of the Total Perspective Vortex (the main route to Camp Kyle) but with the tunnel displaced 220m to the southwest. Curiously, the Shadow Tower room is located directly under the Peña Negra headwall but 333m below it. This suggests that there is nothing preventing further cave development beneath the Llano Peña Negra, despite the surface of the llano having an impermeable rock layer that channels surface streams into large arroyos that sink into the ground when they meet the limestone headwall. For further information on this area read the article by Bev Shade.

The Boomerang Borehole:

Early evening of March 16 Vickie Siegel and I arrived at Camp Kyle. There was no one there. The sleeping bag situation was in disarray and some bags had been left sitting on top off space blankets with no covering – soaking up water. I counted 11 bags in camp including two that had been un-opened in their original 4 liter Nalgene transport bottles. All of the sleeping spots that had been prepared were taken so we set to work leveling out two more places. There was no lack of sand at Kyle – there was a 40m wide hill of it, sitting at the angle of repose, on the west side of camp – and I carried six 25 liter packs of it to the camp site, dumping it and later flattening it to a serviceable site. About this time Bev Shade and Nathan Roser showed up, having spent the day surveying a flowstone-floored canyon leading off of the massive Lost in Space chamber. The team that had discovered it in 2017 had barely time to run around it quickly and note unexplored passages leading off … of which there were many. I had half expected to run into someone during our inbound journey but we hiked through the chamber without seeing or hearing anything.

There was an awkward 30 minutes or so where it seemed that Bev and Nathan were not interested in talking to us. I've seen this before when you show up at a remote place where people have been working hard as a small, tight team for days or weeks. We were the interlopers. But eventually she opened up and discussed what they had done, showing us the maps they had produced over the last week. She had been sketching with a mechanical pencil on 8-1/2 x 11 inch waterproof sheets that Derek Bristol had printed out, rather than going all-digital. Although only one team in 2017 had been using DISTOX laser instruments tied via Bluetooth to a tablet-based survey/drafting program more were now going this technology in 2018. It was a year of technology transition. For a lot of us who grew up with pencil sketching maps in caves it was a big deal to make the change since there were drawbacks to the all-digital approach… such as less precision with a stylus versus a fine point pencil, and losing a memory card or losing a survey due to power loss. Several weeks later Bev and Vickie would spend a long day resurveying a section of the Infinite Borehole where an entire day's digital data had been lost in such a manner. But in time those problems will be solved and people will one day wonder how it was possible to survey with only pencil and paper.

For months prior to the 2018 expedition I had been studying the Peña Negra map data. The Lost in Space chamber contained a number of tunnels leading off. The most intriguing was labeled "LOKCM"… the first initials of the names of the survey party in late April 2017. The important part was that this particular tunnel was leading well away from the main cave in an easterly direction – out into the blank section of the map where we wanted to go. Derek Bristol had been out this tunnel a few days earlier and had discovered a narrow fissure that seemed to lead out over a deep canyon, as evidenced by the persistent echoes following their yells. They had no rope so the lead remained uninvestigated until Vickie, Nathan and I headed out there on March 17th. We were unable to find Derek's fissure but ended up rigging a rope down an alternate route into the canyon anyways. The entire place was flowstone covered with a number

of small waterfalls in just the right places so that you were sure to get a damp right from the start. The passage immediately opened up into a 10m wide formation-decorated corridor that, 100m later, spilled over into a deep canyon that seemed to have both upstream and downstream extensions. But by this time we were out of rope.

Two days later we returned with considerable rope and managed to use most of it rigging traverses in the upstream canyon. A series of climbs up flowstone ramps and more rappels followed. The last rappel dropped us into a small travertine covered crawlway. Vickie led onward, finding the route. She soon yelled back that we were out into open territory. Ahead a 15m wide, 10m tall tunnel led on. There was a stepped oval shaped dome in the roof that was surprisingly multicolored, like the eye of Jupiter. Hence, the new discovery became the “Jupiter Tube”. The floor was an undulating surface of 2 cm-thick black colored plates that let off brittle squeaks and cracking noises as we marched along. The sharpness of the edges suggested that the collapse that created the floor was recent, but that can be deceiving in caves.

Ultimately, more than a kilometer of new tunnels were discovered beyond the Eye of Jupiter, some reaching cross sections of 15 x 15 meters. Initially the passage headed due south for 400m, then suddenly turned east. Wicho Diaz, Jordan Toles, Vickie Siegel and I explored this until we ran out of rope on April 1, 300m further east. On April 5th Siegel, Toles, Bev Shade, Yazmin Barragan and I returned and were surprised to find the tunnel taking a sharp turn to the north where, several hundred meters further, we were stopped at a collapse of the tunnel, apparently caused by an incoming waterfall. The multiple changes in direction, heading first south then east, then ultimately back north again, gave rise to the name “Boomerang Borehole”. We conjectured that the passage had wrapped around an anticline with the south bound and north bound segments being essentially in the same rock strata but on opposite sides of the fold; the central east-heading segment was jagged and torn, which would support the idea that it was cutting across the anticline bedding and different strata contributed to the rough terrain. Completing the strange picture was the presence of three independent domes near the area of the change of passage direction – each in excess of 60m tall, potentially leading to an upper level that may bypass the collapse at the end of the tunnel. For further information on this area read the article by Vickie Siegel.

The Mad Hatter:

On March 29th Derek Bristol, Lee White and I left Camp 3 in Cheve, having completed the rigging of the cave, and began ascending towards the entrance. No sooner had we reached Camp 2 when Yuri Schwartz and Nathan Roser arrived from the surface. Also there were Corey Hackley and Adam Byrd who had been exploring in Peña Negra but staying in Camp 2. Our Camp 3 team had originally been intending to exit via Cueva Cheve the next day but help was needed at Camp Kyle, Camp Cartman had now been vacated, and Yuri needed a third person for their team for safety at Camp 3. The plan that evolved had Lee joining Yuri and Nathan the following morning and returning to Camp 3 to begin work on the windy crawlway that had been discovered at the end of the 2017 expedition; Derek and I headed out Peña Negra via the original connection route along with Hackley and Byrd. The latter two branched off when we reached the second antlion funnel in Peña Negra and went on to discover the Calles de Papalo tunnel, as described earlier. I stayed at Camp Kyle to help with explorations of the Jupiter Tube while Derek completed the first through trip from Cheve to Peña Negra.

At Camp 3 Swartz and crew settled in for three days of work in an attempt to remove rocks wedged in the windy crawlway, which Yuri had now given the name “Gone with the Wind”. They progressed 20m down an inclined tube before running low on supplies – our rigging team had not taken in any food or fuel during our brief visit so all they had with them were the limited

resources that they could carry that far in a backpack. They exited the cave on April 4. However, following just a single day on the surface, Yuri and Gerardo Morrill headed back into the cave on April 6, arriving at Camp 3 late on the 7th, following a night at Camp 2. On April 8th they reached the bottom of the sloping tube and began ascending, making another 5m of progress. Meanwhile Sean Lewis, Lauren Satterfield, and Adam Byrd had entered Cheve on April 8th and reached Camp 3 the night of April 9th. They then set in for five intense days of the complete antithesis of exploration in Peña Negra. Instead of 40 meter diameter tunnel they were lucky to see 1 meter diameter. Mostly it was less. Following 5 more meters of body-tight bedrock crawling the cave suddenly changed. It was as if they had entered a vast subterranean void, except that the void was filled with giant marbles. Progress through the gaps in the "marbles" (large breakdown blocks) was slow, steady … and frustrating. Others were mapping kilometers of borehole on this same mountain!

On April 15th reinforcements in the form of Jon Lillestolen, Oscar Berrones, and myself arrived at Camp 3. Yuri and Gerardo had exited the cave on the 12th, so we now had a 6 person end game team at Camp 3 to play out what options we could before having to begin the derig on April 22nd. Sean Lewis was at camp, solo, when we arrived. After four 10+ hour trips he had burned out and needed a day off. I could sense despair on his face. Adam and Lauren had gone off again to the marble jar … now known as the *Mad Hatter Breakdown*… and returned late in the evening having made only incremental progress. Thus far a total of 12 pushes had been made to the Mad Hatter area and the survey tally was just over 200 meters, averaging a total of 16m per day. The allusion was that anyone still working on this problem (vice in the big tunnels in the Peña Negra) had to be mad. The following morning I got to personally see what they were up against, and instantly understood Sean's emotions of the previous evening.

The *Gone with the Wind* section at the beginning was only about 30m long but it was body tight and the initial 20 meters descended on a 30 degree angle to a junction with a small trickle stream way. To be clear this "room" was barely wide enough to turn your body around in. It just seemed bigger compared to the body-tight tube on the way down. There you can turn around and head up another body size tube in bedrock. They had certainly not wasted any more effort than the minimum necessary to just get through. Another 10m of squeezing upward through this and there was a bedrock wall on the left and truck size boulders on the right. For the briefest of moments we were in passage 2 meters wide and 5 meters tall. We were past *Gone with the Wind*. The *Mad Hatter* lay ahead. Then it was up, up, up through breakdown squeezes until we reached station ZDE63 – the furthest point reached by Lauren and Adam. For the next 8 hours Jon, Oscar, and I laboriously surveyed between boulders while in the not far distance the others could be heard attempting to tease out the route. The place was not stable. No human had ever been here which meant that the matrix above – an apparently limitless expanse of "marbles" in this giant marble pile – could come loose if the others accidentally removed the wrong boulder in an effort to follow the elusive wind. There were periodic crashes of rocks falling as the others intentionally moved small rocks out of the way. Loose, unstable rocks abounded. Some would kill you if they fell at an inopportune time while you were climbing or squeezing past them. Of all the objective dangers that exist in unexplored cave, this is the one that bothers me most.

The wind that normally rips through here – making it an unpleasant, hypothermic place, as we had learned in 2017 – was now quiet, perhaps related to the protracted storms on the surface. Paradoxically, we needed the wind to show us the way on. Sean and crew were investigating every void but generally the trend was that we were going upward and slowly eastward. The real question was: how big was this breakdown pile and how could we get out of it ? The wind was our only guide. A hundred meters above us lay Harbinger Hall, explored in the 1990's. But it was a dead end chamber with no air flow and no way onward. So where was the wind going? We know we have to go east (Cheve is 5 km west of the resurgence springs) and so far the only

way you can go east in this cave is to intersect a shear fracture in the rock strata that goes from Northwest to east/southeast. We had seen it elsewhere in Cheve (the sharp turn in the Infinite Borehole before Camp Cartman being a good example) and it was a known geologic feature in Huautla as well. So, it appeared that the main tunnel just beyond Camp 3 had done exactly that – suddenly turned east. But within 100m the huge tunnel was stopped at this giant pile of collapsed boulders (topped by Harbinger Hall). That leaves open the question: does the main cave continue east of the big collapse? If so, then the *Mad Hatter* is just skirting around the north side of the giant collapse cone and we need to go further east. How far up do we need to be to find the fossil borehole ? This is what we talked about around the stove each morning and evening.

We made one more desperate 12 hour attempt on the Mad Hatter on April 17th. We did add 100 meters of survey, totaling 305 meters of gain in 14 days of work. Sean discovered what appears to be a descending section of the breakdown pile leading north. But there was no breakthrough, only limited progress and no definitive clues as to which way to go. So the Mad Hatter won this round. Memory of unpleasant experience, fortunately, fades with time. Further study of the 3D computer map will certainly convince someone to return here, for the air is going somewhere and it is still 15 kilometers straight line distance to the resurgence springs. For further information on this area read the article by Sean Lewis.

Above the ASB:

The Arne Saknussem Borehole (or “ASB”), the final section of cave leading to Camp 3 in Cheve, was discovered in 1989. For the following 29 years teams of explorers, weighed down by heavy backpacks of equipment, food, rope, and occasionally diving gear, had lumbered down this one kilometer stretch of very large canyon passage – averaging 10 to 20m wide and up to 55m tall. All considered it to be a monolithic rectangular tunnel with no side passages. There is an iconic spot in the tunnel, much photographed, where a huge boulder hangs suspended between the canyon walls. Directly under it, on the west wall, are what clearly appear to be the letters “A” and “S”, in white calcite on otherwise dark tan colored rock. The temptation to assign the words “Arne” and “Saknussem” to those letters was obvious. But that was as far as it went – it was a single tunnel.

But the new discoveries in the Peña Negra had changed our thinking. Somewhere, as much as 230 meters above the current active Cheve streamway and to the east, there is an ancient, older cave. And as the Peña Negra connections to Cheve in 2018 had demonstrated, junction tunnels exist between these two vertically separated caves. The morning of April 16th six of us were sitting around the stove at Camp 3. It was apparent that enthusiasm was waning for returning to the Mad Hatter and a day off was declared in camp. It was then that Sean Lewis mentioned having seen *something* at the roof of the tunnel near the “A.S.” signature rock. Around 3pm four of us set off to see the lead (Jon, Oscar, Sean, and me) and indeed, with all our brightest lights illuminating the roof, there appeared to be a tunnel up there. In fact there was a blackness on the west side of the canyon also, both at roof level. Oscar brought a DISTOX and we measured 55m to the roof.

Two days later, still groggy from the final, unsuccessful push on the Mad Hatter, we spent most of the morning assembling aid climbing gear from bits and pieces of other equipment. There were two complete sets of state-of-the-art climbing gear in the Peña Negra, but that was far away from us. So we made quick draws from webbing; pooled our non-locking carabiners; and fashioned adjustable daisies from used 9mm dynamic rope and two Petzl Microtraxion pulleys instead of the Yates adjustable daisies we normally used. With some searching Adam came across three old etriers at Camp 3. Luckily, we also found a 35m length of 10.2mm PMI dynamic

rope and an ATC for belaying that had been left at Camp 3 following the 2017 expedition. The rest of the equipment – drill, hammer, wrench, bolts – we had from our general rigging equipment and it appeared we had sufficient bolts and drill batteries to do it. Armed with this make shift climbing kit we set off to tackle a 55m overhung wall.

We climbed in two person shifts. We still had Sean's TE30 drill, which was not optimal for what we were attempting to do (it was heavy) but, on the other hand, it drilled bolt holes in 10 seconds flat, which is hard to argue with. The rock at the beginning was smooth, solid and the climbing angle was less than 90 degrees vertical which made the going easier. This changed dramatically at the end of the day, however. Oscar led the first pitch of 15m with Adam belaying. Those two then took a break and Lauren led the next 15m pitch with me belaying from a small ledge where Oscar had stopped. At the conclusion of each pitch we rigged a static 9mm rope. Adam then went up around 10pm with Lauren belaying for the 3rd and 4th pitches. It was then that the rock started becoming broken up and the ceiling overhung. By 1am they were still 15m below and 20m away from whatever was up there – even from that height we could not see exactly what was there due to the overhang. It was still possible that all this work would lead to nothing but a dead end pocket.

The following afternoon (April 19th) with Lauren belaying while hanging from the anchors and standing on very small ledges, Adam finished the climb. It was a tedious route in overhung bad rock, but by 10pm he was at the top. It had taken us only a day and a quarter to reach it. A similar climb in 1980 (the Mil Metro Dome in Huautla's Li Nita cave) had taken well over two weeks of effort using hand set bolts. The improved technology meant that the idea of climbing 230 meters to reach an older level of cave was not some impossible fantasy.

The morning of April 20th found Jon, Adam, and me standing on top with survey gear. It was then obvious that we had a real tunnel – headed due east. It was hard not to be excited. The tunnel jogged north temporarily, then back east, then north, then east again before finally breaking out into a 20m wide tunnel some 200m east of the ASB. The floor was covered with very small broken rocks that sloped from west to east. A huge, colorful slickenside formed the east wall. There was one restriction some 150m further on then it opened again for another 100m before it closed down at a collapse. It felt like we had surely missed something so we slowly retreated 500m to the ropes, looking along the east wall for something going east. Jon found a narrow fissure going down to a vertical drop that carried wind – blowing out.

"I am sure you can fit", Witek Hoffman said confidently in his Polish-accented English. His voice carried up from somewhere in the fissure. I, on the other hand, was fairly certain that I would not "fit". It was April 21st, and it was the last exploration trip of the expedition. The previous afternoon Witek and Sonia Dudziak had made a special trip to Camp 3 bringing food, which we had finally run out of that morning – we had been rationing it for the previous two days. That same day Sean, Lauren, and Oscar had headed out and Adam, who had been working for 14 days straight, decided to stay in camp and begin cleanup of Camp 3. And so Witek, Sonia, Jon and I had returned to Jon's east-trending fissure in the new passage at the top of the 55m climb – which had now received the name "*I Fault in your General Direction*" (another play on a Monte Python skit), from the presence of the slickenside that had suddenly changed our east-heading large tunnel to one back on the main northwest compass direction that seems to control Cheve cave formation.

So there the four of us were at Jon's fissure. Witek emerged saying he was halfway down Jon's pit and that it continued but that ropes were needed. He then proceeded to rig 2 ropes and a traverse line. While Witek remained confident, Jon was concerned that the fissure might be too tight for me. I should have taken that advice and given them the survey gear at that point. They

were covered in mud and I had not brought my suit (I was just in Capilene fleece and nylon shorts). When the time came to survey the first pit everything went well, but then I saw the fissure traverse and paused. All of those ahead of me were much smaller individuals. Against better judgement [note to future self !] I forced my way into the traverse. There were no footholds and the walls were slick…. nothing but greasy mud on smooth walls with no edges anywhere. The tendency was to slip down into the crack, and get stuck there. So even with the traverse rope it was still a struggle to stay high enough in the fissure to move at all. There was an obvious bulge in the wall just before the vertical rappel rope at the end of the traverse. I pressed through it, even though my harness buckle caught several times. It was a downward sloping fissure and gravity helped. When I got to the rope I snapped an ascender safety onto the line and rigged my descender. Then I looked back up, wondering how the hell I was going to get out. But the tunnel below was larger so I went down to do the survey. We ended up perhaps 40m east of the main tunnel before our promising lead ended. After a third pit it had turned northwest and gone down a tight fissure to a mud filled room – end of the line. So we began our retreat around 8pm, with survey data in hand. We had done our job. All went well until I got to the fissure above the second rope. They sent me up first – perhaps for amusement, but then again if I got stuck in there, none of them were getting out either. I tried four times and got jammed enough to convince me I was not getting through. Gravity was not on my side this time and the bulge presented a serious problem. I had no choice regarding having my vertical gear on since I had just ascended on rope into the fissure. The harness D ring was the main issue – there was no forcing it through. I climbed back down and discussed this with the others. This was a somewhat desperate situation, but no one was panicking yet. We still had a drill and a hammer. Jon went up and set to work on the rock bulge. Between the drill holes and the hammer he managed to remove some of the lower part of the bulge. Luckily that proved to be just enough for me to get through. We regrouped in the big tunnel, joking about our erstwhile predicament. Actually, it had been my quandary – they all could have left me there. We stayed up chatting till 11:30pm in camp. Next time we come to a tight fissure like that I will let those who fit go do their thing.

Epilog:

I began this story with exploration teams confidently advancing down seemingly endless gigantic corridors, mapping kilometers in the process, and ended with tales of desperation. Expedition caving involves both, perhaps luckily not in equal measures. The difference between the two largely reduces to one word: perseverance. We had been granted the exceedingly good fortune of having been presented with a stunning, open, enormous unexplored tunnel to begin the expedition in 2018. And in due course we explored and mapped the easy stuff, of which there was plenty. But in the end the discovery of the next breakthrough into new gigantic corridors always stands on the efforts of those willing to dedicate 10 or 20 or 30 pushes into a breakdown maze, a body-tight crawl, or to climb an exceedingly high dome in order to find the elusive pathway into the big stuff. It is the essence of cave exploration.

On April 22nd we began derigging the two caves. Basecamp was packed up and most everyone was back at their work by May 1. It had been an extraordinary expedition. The rigging of two major vertical cave systems had consumed nearly 8,000 meters of rope. A total of six underground camps were set (3 in each cave) in 2018 and it was not uncommon to have only 3 to 5 people in basecamp and the remainder of the team spread across 3 or more underground camps. All of the camps were linked to basecamp with a single wire Michie phone system so that efforts could be coordinated daily. The result of this was that an extraordinary amount of cave was discovered and mapped in 2018. A total of 13.5 kilometers of new cave – the vast majority of which was borehole measuring 40 x 40 meters or larger – was added to the system, most of that in Peña Negra. The depth of Peña Negra reached 798 meters before not one but

four widely separated connections were made to Cueva Cheve. The first connection was made near Camp 2 in Cheve just above the East Gorge in a dry flowstone floored gallery first explored in 1988. With the connections the length of Sistema Cheve increased to 45,949 meters. The profile of the connected cave system now reveals clearly that the upper portion of Cheve, known for over 30 years now, is just a side passage to the Peña Negra. The lower section of Cheve also saw intense exploration effort, with 1.1 kilometers of new cave discovered this year but no new depth. The 55m climb in the ASB, however, suggests that a complete re-investigation of the main tunnels in Cheve are in order to reach a continuation of the main trunk tunnel in the Peña Negra. That is where we will direct our efforts in 2019. While Sistema Cheve is currently in 14th position with regard to the deep caves of the world, the possibility still exists through determined exploration that it could one day be proven to be the world's deepest cave.

Expedition Sponsors:

None of the above exploration described above would have been possible without the latest technology and exploration and mapping tools. We would like to thank the following companies for their generous support of equipment and supplies for the 2018 expedition: Cancord (static rope); ClimbTech (bolt hangers); DFS/USA (rock bolts); Nalgene (plastic bottles for food and sleeping bag transport); PMI (dynamic climbing rope and rigging sling); STEN Light (primary headlamps); U.S. Rigging (eslabones maillon rapide para amarre); and Watershed (dry bags for transport of electronics, drills, batteries, and instruments).