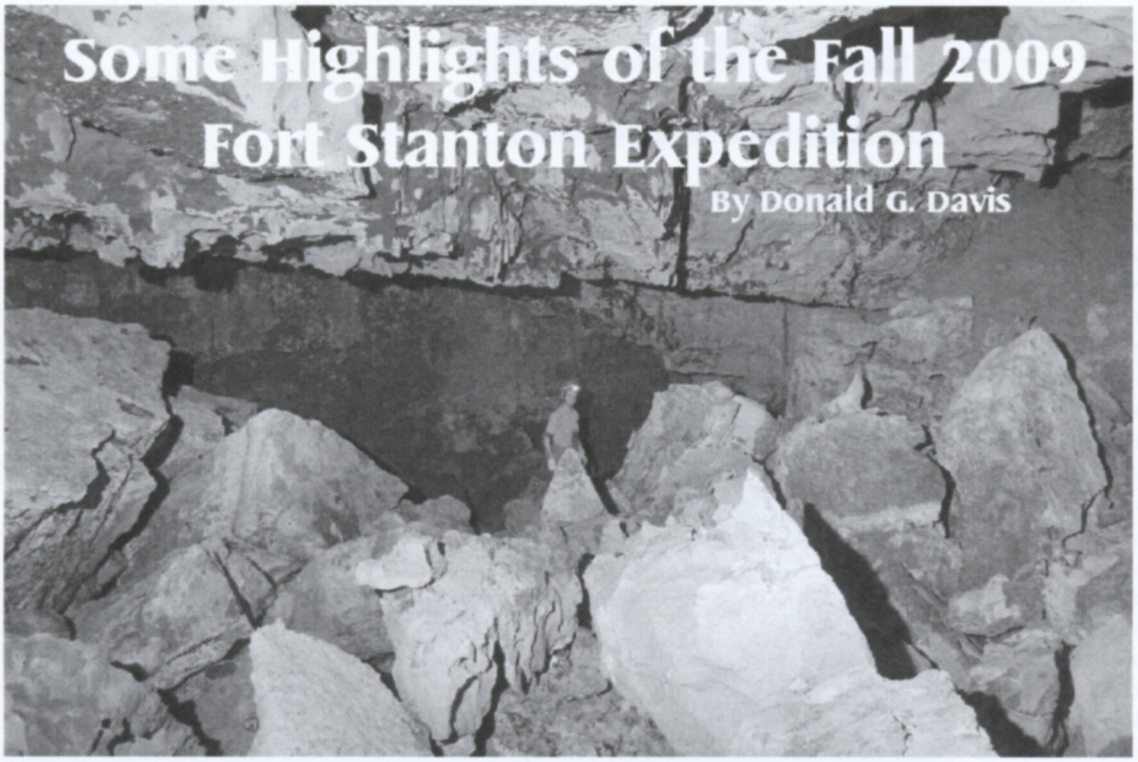
Some Highlights of the Fall 2009 Fort Stanton Expedition

By Donald G. Davis



The latest Fort Stanton Cave, New Mexico expedition, run by John Corcoran September 24-October 4, 2009, followed up some of the activities of the June/July expedition (see *Rocky Mountain Caving*, Summer 2009). Snowy River remained dry, but because Bureau of Land Management permission had still not been given, no attempt was made to resume exploring the 20- foot-wide by 30-foot-high borehole, last pushed in April, farther southwest from the Eggshell Trail segment of Snowy River South. The same was true of the divable terminal sump that blocks the downstream end of Snowy River North near the Rio Bonito valley. And most of the known side leads along Snowy River had been surveyed to ends during the spring and summer expeditions. However, the last-discovered of these leads—named Sandy River—continued into considerable new passage, ending in a very promising dig that will probably be easy to break through on the next visit. Fort Stanton Cave now has 14.73 miles of surveyed passage.

THE SANDY RIVER COMPLEX

On July 4, 2009, John Lyles had led a team that discovered a previously overlooked passage starting from station SRS129 at the base of the Two-Way Hill breakdown along the Snowy River South route. They had surveyed 15 shots (SRK survey) in an alternating series of breakdown squeezes and larger chambers, trending SSW and skirting the west margin of the Two-Way Hill breakdown zone.

He was eager to return there, and on September 26, he led another team that passed beyond the Two-Way Hill zone, leading into a large but short passage that ended in a funnel choked with sand. This route alternated between bedrock crawl tubes, breakdown slots, and larger chambers with much breakdown. Along the eastward side of the route, leads going into bedrock were noted at SRK16 and SRK40. It was hoped that these leads might be routes leading toward (or beyond) the Engel Hill breakdown in the Lincoln Caverns section of the original Fort Stanton Cave, about 1,000 feet to the west. The total length of the SRK surveys at that time stood at 822.6 feet.

I had not been on those trips, but on September 30, 2009, I participated, with Roger Harris and Patricia Seiser, in a third Lyles SRK 17-hour survey trip, with the goal of exploring the above two leads. Starting at SRK40, our survey passed through small virgin bedrock passage that curved back NNE to the west of the previous SRK line, and reconnected at SRK16, completing a side loop off the main SRK passage. This turned out not to have any obvious leads toward Lincoln Caverns, but it added an additional 333.2 feet, bringing the total for the three SRK surveys to 1,155.8 feet. (Of that, 44 feet are in a four-shot loop that is before the SRK line itself, under the base of the Two-Way Hill slope. Thus, SRK proper includes 1,111.8 feet of survey.)

Heretofore, no separately-sourced tributaries to Snowy River South have been found beyond the Mud Turtle passage. The SRK line may be such a tributary. It has passed the Two-Way Hill breakdown, Mud Lizard sump and Return to Snowy River room, and the present end is about 150 feet west of SRS150 in Snowy River. The lower sections, passing through breakdown in many areas, have deposits of sand, small gravel and mud. This passage appears to be the source of the sandy stream bed that runs through the Rock Lobster passage and joins the Snowy River channel at "Snowy River Springs" near SRS126. The SRK section is being called Sandy River.

The SRK40 > 63 side loop is smaller passage than the main SRK, and also had a relatively limited amount of breakdown, so that its survey level better represents the former stream elevation than the up-and-down survey from SRS129 to SRK38. This level plots about ten feet higher than the sub-parallel segment of Snowy River South closest to it. This side loop is not simply a single passage, but includes two or three braided passages that interlace between dividing pillars and walls, with frequent interconnections. The survey followed only one line through these, usually the easiest to traverse.

From SRK40 to about 50, the passage had extensive floor deposits of clean sand and small gravel, locally having flow marks and deltaic structures that indicated flow from south to north. It was impossible to traverse the route without some disruption of these, but we tried to preserve particularly interesting patterns by bridging across them. At station SRK50, the stream channel turned east into a small side crawl complex that probably goes over to the main SRK survey. The floor of the continuing passage rose slightly and

Photo:

Galería Cumpleaños in Fort Stanton Cave's Sandy River complex.

Photograph by John Lyles.

became soft, puffy material in which growth of small gypsum crystals had disrupted any original flow marks. It looked as if it had been much longer since water had flowed through this section than through SRS40 > 50.

At SRK55, we passed a solutional remnant of poorly-soluble rock resembling a four-inch-wide mushroom on an inch-thick stem, lying on its side. This contained a very well-preserved, curved fossil under an inch wide, glossy dark brown with fine striations visible. It was not entirely exposed, but was thought by Roger to be a brachiopod. Near it was a much smaller spiral fossil of similar color, apparently a gastropod.

After we had finished our survey by tying in SRK63 to SRK16, and determining that no obvious side leads went away from it in the westerly direction we had hoped for, we returned along the original SRK line to its south end at SRK38 to examine the source from which it seemed that the water in SRK had come. Most of SRK is irregular and complex, with many ups and downs and alternating slots and chambers. But from SRK35 to 38, it unites into a single passage 30 feet wide and 75 feet long (the Galería CumpleaZos, named for John Lyles's birthday), floored with large breakdown. At the south (upflow) end, the floor abruptly drops several yards down an angle-of-repose slope of ripple-marked sand that goes down to a vertical back wall of brecciated limestone.

It seemed that a powerful flow of water from beyond had pushed through a sump, keeping sand and gravel from settling in the bottom while energetic flow went on. When the flow stopped, the oversteepened downflow sand slope slumped back into the pit, choking the route and blocking it to our exploration. This looked to be a classic example of the feature known to cave diggers as a "sand boil," and having very good promise for extension by digging.

John Lyles tried test digging under the back wall by hand to arm's length. The hidden wall did cut back under, had small voids against the ceiling, and became more coarse and gritty downward. We regarded this as good signs that a relatively short dig, perhaps only a few feet, might break through to a major continuation of Sandy River beyond this blocked sump. Such a dig could easily be conducted by filling cave packs or duffels with sand using small shovels, and hauling these up the slope to be dumped among the breakdown blocks.

We have considered the possibility that Sandy River might be a loop cutting back to upstream Snowy River. The muddy SRG side lead, which ended in a fill choke, is in line with the present course of SRK and about 220 feet away. However, SRG plots about 10 feet lower than the projected course of SRK, and has only clay fill with no sand and gravel visible. Another more distant possibility, more than 2,300 feet SSW, is the pinch with airflow at the north end of the Up-Er Crust upper-level tube (SRH survey) that crosses Snowy River South at SRS218. However, that tube has no reported sand and gravel either, and is not as large a passage as terminal SRK.

In any case, if the upstream Snowy River passage had somehow served as source for SRK, that would seem to have been possible only when the floor level of SRS was at least ten feet higher than at present. But the sediment surface in the more recently active parts of SRK looks too young and fresh for this to seem likely. Indeed, SRK may still be intermittently active. In support of this is the presence of unconsolidated sand from SRK on the Snowy River calcite surface for several hundred feet downstream from the SRS/SRK junction at the base of Two-Way Hill.

Additional evidence suggesting a separate source for SRK is fragments of charcoal, up to 3/8 by 1/4 inch, in the sand dug from under the wall of the "sand boil" at SRK38. No charcoal has been recognized in Snowy River; the only other places in Fort Stanton Cave where charcoal has been reported in sediment are Snowflake Passage in the northernmost part of the original cave (by myself), and in the end of the Sombrero Room (by Lee Skinner).

Sand-choked upwelling source funnel of Sandy River.

Photograph by John Lyles.

Other interesting details: along the first few shots of SRK, thin whitish encrustation and knobs are visible on some walls in the direction of the Two-Way Hill breakdown. This closely resembles the thin calcite deposits in the Mud Lizard Sump, and may be the exit area for the calcite-crusted spillover that takes overflow from the Mud Lizard sump and disappears into the breakdown.

Some three-inch-long, inch-wide cylinders clustered on the ceiling of a separated bedding plane to the left of the first part of SRK, originally thought by John Lyles to be possible mud stalactites, appear on close examination to be silicified fossils protruding from the bedrock. They might be filled burrows.

RELIVING HISTORY: RETURN TO RUSSELL'S CRAWL

Russell's Crawl is a small tributary passage winding about 1,000 feet generally northward away from the Main Corridor toward the Bonito valley edge of the hills above Fort Stanton Cave. It runs parallel to the similar Hell of a Thousand Pinches, but about 15 to 20 feet higher than HoaTP. It was first explored in 1962 by Chuck Carrara, Bob Russel and Lee Skinner. (Even though there is only one "l" in Russel's name, "Russell's" was the discoverers' usual spelling from the beginning, according to recent e-mail from Chuck Carrara.) Not long afterward, in December of 1962, Vin Hoeman and I did a difficult multi-hour mud dig from the pinch of the

original crawl and broke into a short extension making a T-junction with the dig. Russell's Crawl was later surveyed, and I was under the impression that the survey had gone to the ends of Hoeman's Passage. But about a year ago, I learned from John Corcoran that Russell's had not been mapped as far as Hoeman's Passage. It seemed to be time to take care of this unfinished business.

Despite being within a few hundred feet of the entrance sink, Russell's Crawl is one of the least visited passages in Fort Stanton Cave. Trips had been reported in the *Southwestern Cavers* issues of January 1964, June 1965, August 1965, and September 1965. The most interesting was a six-day camping trip in August 1965. I reviewed all later issues through 1969, in which I found no further published reports on the passage. The existing record is somewhat confusing. The camp-trip article mentions surveying, but John Corcoran's survey-data files indicate that the R surveys used for the present map were made November 23, 1967 and October 18, 1969.

The side alcove leading into Russell's Crawl is usually overlooked by recreational visitors following the Main Corridor trail, and if they do look into it, they soon find that it is guarded by two very tight, claustophobic belly-crawl bends not far inside. Even before those squeezes are reached, the entry-zone chambers usually have had two-inch epsomite or mirabilite fluff growing from the floor sand. To protect this delicate growth (which was not noticed in the 1960s), Fort Stanton Cave Study Project cavers have abided by an informal closure that had been in effect for many years.

John Corcoran approved a trip October 3 by Roger Harris, myself, and Pete Lindsley to extend the survey beyond the old end point at station R46. We found that the only sulfate growth showing in the entry chambers was tiny needles in the sand, and proceeded beyond through the first tight squeezes, moving some sand out of the low points to make them more easily negotiated. We soon reached the Twin Rooms, a pair of chambers about 20 feet to the left of the stream channel, and well over walking height—larger than I remembered. In the second room we saw on a mud bank the first relic from the 1960s—a WWII army entrenching tool, corroded permanently into the closed position. This fits a reported "green garden spade," lost in that room by Gari Davis, in the June 1965 article (he offered a "small reward" for its return; why it was not removed by others who passed it soon afterward is not clear). An old carbide-lamp rubber gasket was nearby, and farther along the passage, the remnant of an abandoned Auto-Lite carbide-lamp felt holder. Most of the old survey stations were recoverable, having been marked with carbide-soot dots and numbers on the walls.

The central several hundred feet of the passage were mostly easy crouchway. It had deep sediment deposits consisting of about two feet of fine material underlain by a mixture of sand and coarse gravel forming vertical banks up to four feet high above the floor. This material had at some time been trenched as much as several feet deep by stream flow, with the gravel being remobilized and redistributed along the floor from north to south (in the direction from the Bonito valley toward the main corridor). This gravel is rounded to sub-rounded cobbles, apparently a variety of igneous and sedimentary rocks similar to the mix in the Rio Bonito's bed. Cobbles up to at least seven inches long were included—second in size in Fort Stanton Cave only to some of those in the mysterious cobble/boulder deposit in Helictite Hall and Sombrero Room (where, however, they are largely if not entirely limestone).

Roger Harris emerges from a low squeeze in Russell's Crawl.

Photograph by Pete Lindsley.

Evidence of both cave and surface life was plentiful. A dead millipede, at least one live millipede, and two diplurans were seen in the passage. We saw two half shells of pinyon nuts in different places along the passage. These looked rather fresh and were probably brought in by rodents. There was considerable evidence of rodent activity throughout Russell's Crawl, including abundant footprints and occasional tail drag marks in sandy floors. In addition to a live and a dead bat, there were many thin patches of bat guano (some moldy, some fresh-looking) beneath ceiling pockets, that indicate regular roosting of small numbers of bats along Russell's Crawl.

Just before station R41 there was an old dump, presumably from the 1965 camp trip, where a number of discarded items had been buried in silt near the right wall, but apparently re-exposed by rodent digging. Among the dumped items were a badly rusted quart Coleman fuel can (which I removed, but forgot by the south door of the field house) which matches one explicitly referred to in the September 1965 expedition report. Several rusted steel cans in the dump may be 1½-pound food cans also mentioned in that article's equipment list. Other items found, but not listed in the old article, include a broken brown-glass coffee (?) jar, an octagonal glass salt shaker, and a very rusted "church-key" beer-bottle opener. Russell's Crawl is perhaps the only location in Fort Stanton Cave where cavers' trash from that less-strict era can now be seen in this quantity.

Beyond R42 the passage dips down and gets so low that we had to remove hardhats. Trying to replicate the original survey (done with Brunton and tape) beyond R43, we soon found why the previous surveyors had not gotten beyond R46. Not only could I not set plastic marker tapes in the solid-rock ceiling as visible stations, I also could not position myself to sight with my Suunto Tandem instrument. I quickly concluded that I couldn't get any shots, and withdrew to R42 where there was room to sit up. Roger and Pete struggled with the problems somewhat longer, Roger scouting as far as the old R46 set at a cross-joint, but also gave up eventually. We failed in our goal of completing the survey into Hoeman's Passage, but made interesting observations in a section of Fort Stanton Cave that may have gone 40 years unentered. Roger and Pete took many photos.

I hope to return this year better prepared. Pins are needed to set markers in the floor mud. And the ideal instrument would be like

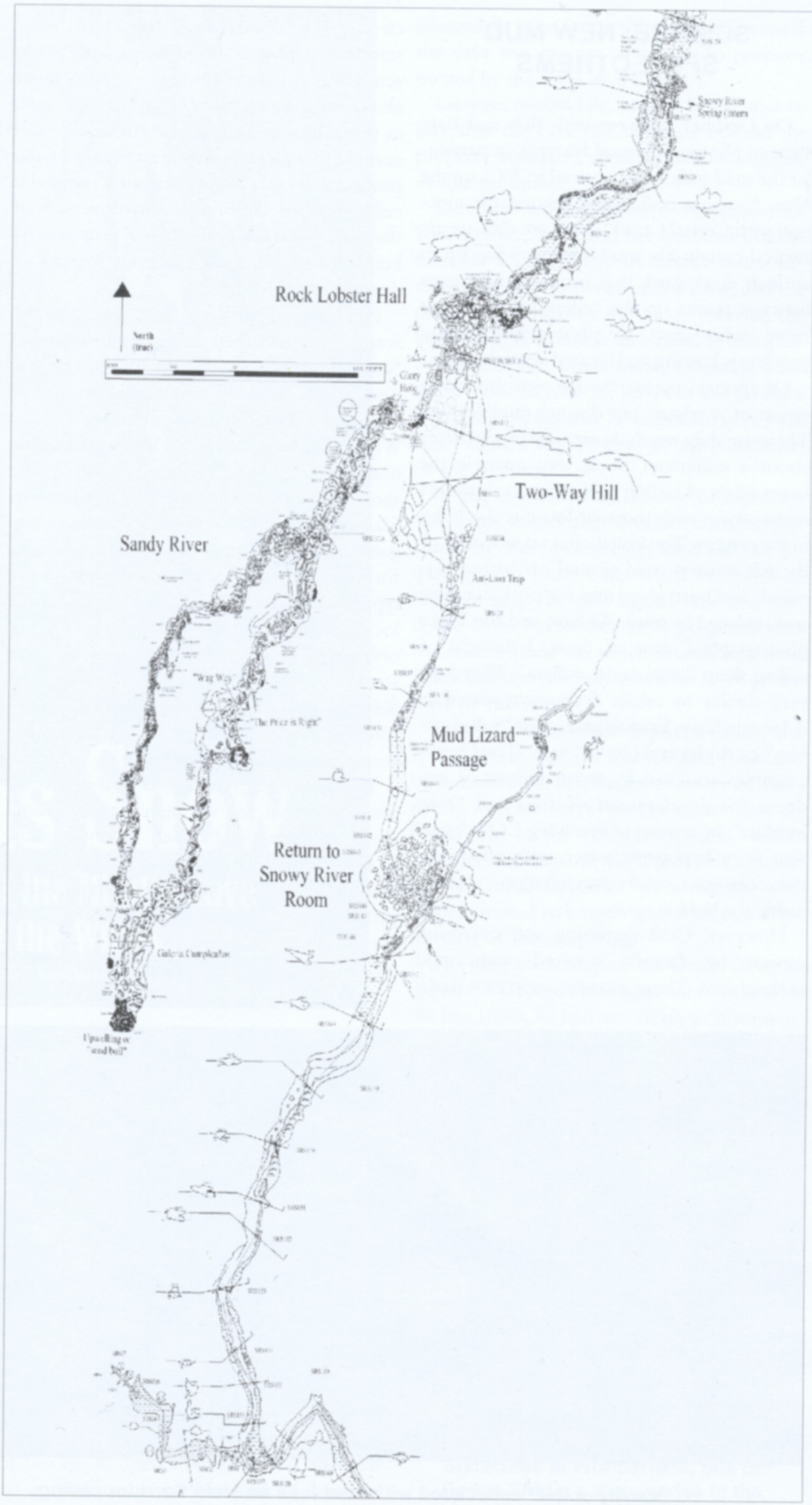
John Lyles's "Disto X" that he used in Sandy River: a hacked Disto A3 range meter that records electronically not only distance, but also azimuth and inclination. With that, one doesn't need to do contortions in a tight space to sight through an instrument; it is only necessary to see that the laser dot hits the target, after which the device can be turned as needed, and the readings copied off its display.

As remarked above, the evaporite floss that sometimes grows on the sand in the chambers near the start of Russell's Crawl was absent on this occasion (except for tiny glinting needles among the sand). However, I do not think it is necessary to close the passage to entry when evaporite fluff is present. It is clearly evanescent and intermittent, appearing and disappearing according to humidity conditions. Even if crushed by travel when it exists, it will quickly grow back during dry times, as it has in the past.

MORE HISTORY: ARCHAEOLOGY OF "CONRAD'S BOAT"

For at least 50 years, cavers have been passing fragments of rotting boards in a recess beneath the wall of the Main Corridor below Inscription Rock. These are in a cluster where deeper water starts when the passage stream runs, and are generally supposed to be remains of a boat reportedly built for Quartermaster Conrad of the Fort in 1872. However, no specific evidence to support this had been documented.

Carol Belski, assisted by Dave Belski, Paul Unger, and Steve Peerman, made an archaeological reconnaisance of these remains during this expedition. They laid out a grid, and recorded and photographed the wood fragments. Two heavily rusted nails, which may have been square (typical of pre-1900 nails), were found. The team also found nodules of apparent tar or pitch, which could have been bits of calking. Some pieces of unworked sticks were noted, which could have been used for poling the boat (more practical than oars or paddles in this narrow, shallow lake). None of this is definitive proof that these are the remains of a boat, or specifically Captain Conrad's boat. Nevertheless, all of the observed materials are consistent with parts of a pre-1900 boat, and as a group, they lend credibility to the story.



Sandy River complex, Snowy River South, Fort Stanton Cave.

Map by John Corcoran.

SCIENCE: NEW MUD SPELEOTHEMS

On October 2 I went with Bob and Esty Pape to photograph mud features, in particular the mud folia I first noticed in 2005 on the Main Corridor ceiling just beyond the junction with Crystal Crawl. These are thin, nearly vertical curtain-like mud fins extending up to an inch downward, that usually bridge gaps between points on the ceiling up to five or more inches apart. We photographed those previously known, and located several others.

Of special interest, though, was the recognition of a related but distinct mud feature. These are thin, nearly-horizontal mud shelves about a millimeter thick, that encircle the lower edges of ceiling pockets up to about 1½ inches wide, with more-or-less-circular holes in the centers. The visual effect is as if one of the felt washers used around car battery terminals had been glued into the pocket margin and replaced by mud. We saw, and the Papes photographed, four of these. I thought of calling them "mud cavity collars." They look very similar to calcite features reported in Adaouste Cave, France, and called "folia bubbles" by Audra et al (2009, Fig. 6). The French examples are cited by those authors as evidence for development of folia and "folia bubbles" by a process involving CO2 degassing from hypogenic water, with condensation-corrosion/calcite-precipitation cycling inside the bubble cavity.

However, CO2 degassing and corrosion cannot be factors involved with mud speleothems. These growths support a particle-accretion theory: mud folia form when standing mud-rich floodwater, with sticky scum on its surface, fluctuates up and down along overhanging surfaces, and mud accretes as thin, arcuate shells in the affected zone. I surmise that cavity collars are a variant of this process that takes place where air is trapped in ceiling pockets, limiting upward movement of the water surface and forcing accretion to build horizontal, shelf-like rings instead of downward-angled fins.

For comparison with these Fort Stanton features, I recruited expert photographer Norm Thompson to go on November 8 to photograph the mud folia found in 1982 in the Snider Extension of the Cave of the Winds system in Colorado. This chamber has many steeply-angled, curtain-style folia of the same kind and on the same scale as the Fort Stanton examples. However, it also has elongated, overlapping tiers of lower-angle folia, forming contoured shelves more like those typical of calcite folia. (Calcite folia in some localities also have bimodal shapes, with not only tiered shelves but larger, more isolated, steeply-angled folia resembling the Fort Stanton mud folia in some ways.) The contoured-shelf morphology has not yet been recognized in Fort Stanton folia.

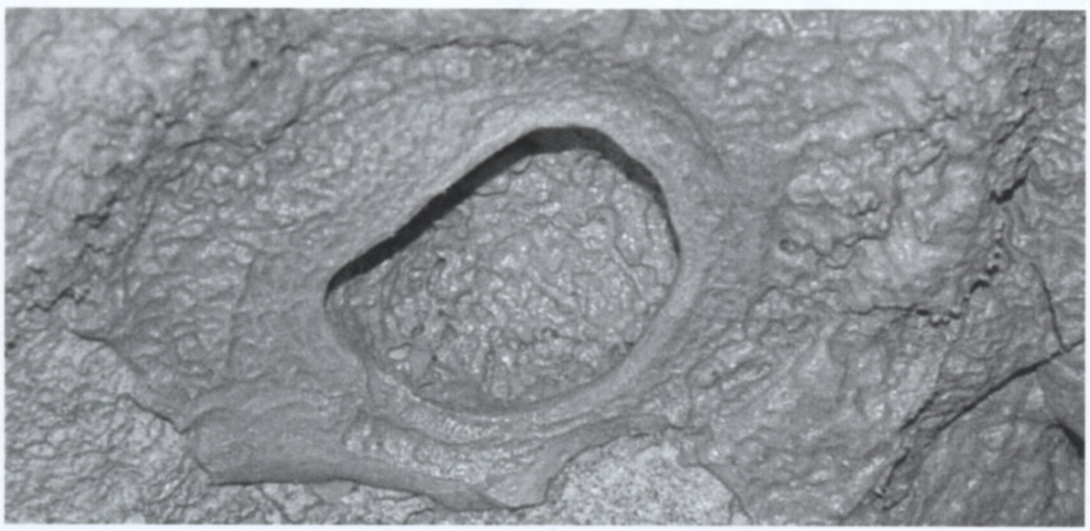
The most interesting aspect of this Cave of the Winds visit was the discovery of several previously-unnoticed mud cavity collars, identical in shape and scale with those in Fort Stanton Cave. This indicates related genetic processes for these mud features in both caves.

...AND MORE...

The above account is biased toward what most interested me, since reporting on everything that was done during that expedition would make this article dozens of pages long. The remaining item of most immediate interest to cavers was the carrying more than ½ mile into the cave of a ton of cement (in ten-pound packets) and its use to construct a concrete base for replacement of the temporary wooden lining of the Don Sawyer/Mud Turtle connection dig shaft, which is quickly rotting. The new shaft lining is to have a stainless-steel framework holding 2-foot x 4-foot high-density polyethylene panels that we hope will last indefinitely in the cave. The first two tiers of this construction were successfully installed after the fall expedition, in late October.

For a complete account, inquire of John_J_Corcoran_III@msn.com for a digital copy of his report to BLM (or to ask about joining the Project).

It remains unclear when BLM permission will be given to restart exploring the main trend of Snowy River South. Proposals are being considered to lessen the cracking, when walked on, of the 1,500-foot thin-floored Eggshell Trail segment. Probably the most practical is use of special pads to spread cavers' weight over a larger area—perhaps involving crawling that distance on hands and knees to further reduce load per square inch. In any case, the present end of survey is near the endurance limit for non-camping trips for all but the fittest cavers. BLM is considering drilling a supply shaft (or less likely, a man-sized one) into far-southwestern Snowy River to facilitate continued exploration.



"Cavity collar" associated with mud folia on Main Corridor ceiling near Crystal Crawl; opening about ½ inch wide.

Photograph by Bob Pape.

REFERENCE

Audra, P., Mocochain, L., Bigot, J., & Nobécourt, J., 2009, The association between bubble trails and folia: a morphological and sedimentary indicator of hypogenic speleogenesis by degassing, example from Adaouste Cave (Provence, France). *International Journal of Speleology*, V. 38, No. 2, p. 93-102. ■