Cascade Caver

Newsletter of the Cascade Grotto of the National Speleological Society

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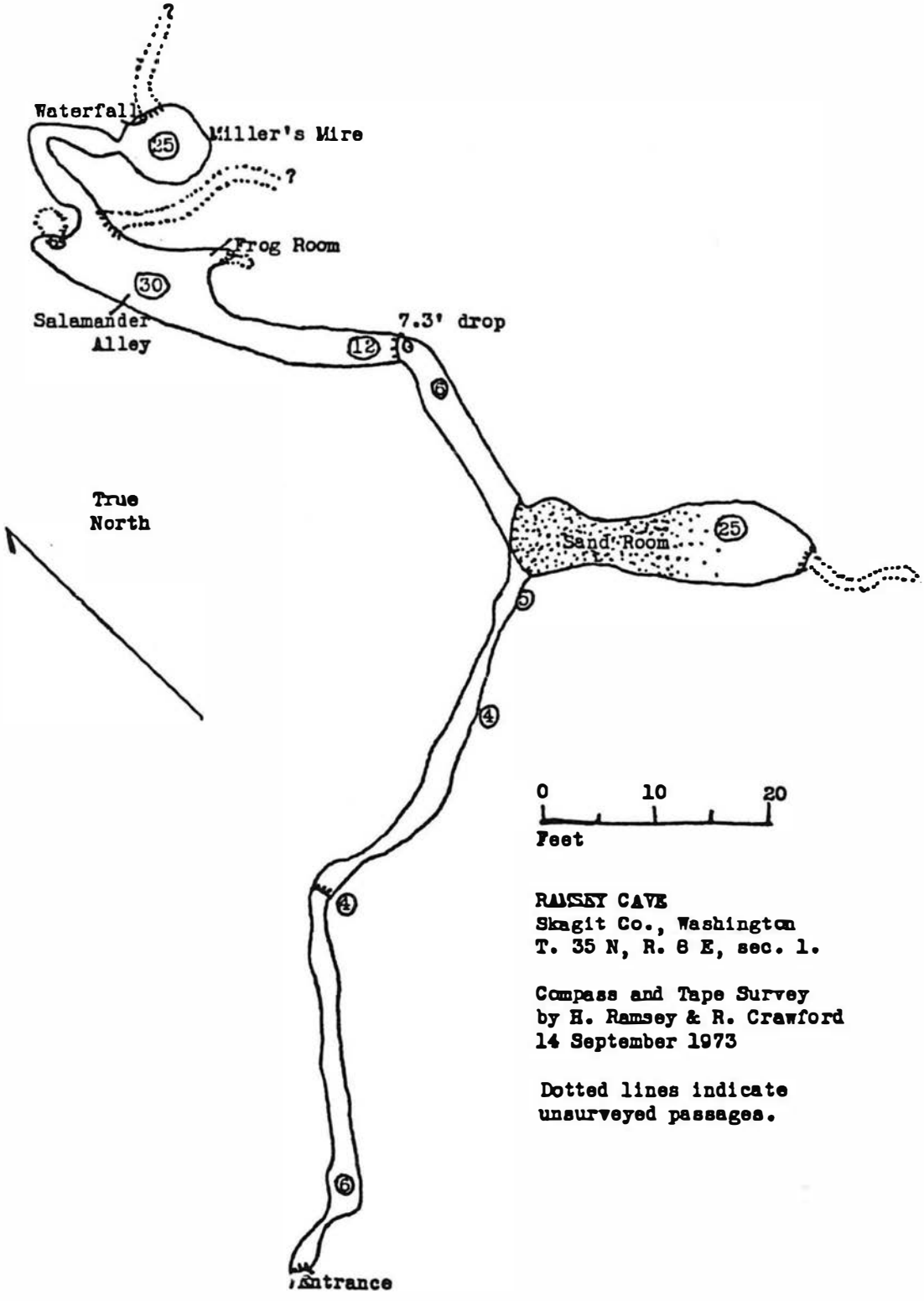

Cascade Grotto

Regular grotto Meetings are held monthly at 7:00 PM on the third Friday of each month at the University of Washington, room 6 in the basement of Johnson Hall. Business meetings are held on odd numbered months immediately following the regular grotto meetings.

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Dues which include a subscription to the Cascade Caver are $10.00 per year. Additional members in the same house hold are $2.00. Subscriptions only are also $10.00.

All materials to be published and exchange publications should be sent to the Editor.

Subscription requests and renewals should be sent to the grotto Treasurer.

In This Issue

On the cover: Ramsey Cave, Sept. 14, 1973, survey by H. Ramsay and Rod Crawford. The Salamander Alley, which use to have a 30 foot ceiling is now 3 to 4 feet ceiling height .

CASCADE GROTTO 1995 TRIP CALENDAR

DATE EVENT LEADER CLUB

NOV. 18 Vertical Practice Karl Steinke CG
Our regular meeting well be held at the Vertical Club in Bellevue, Climbing artificial climbing walls. Cost is $5.00. Karl needs a head count.
(206)271-1260

Dec. 17 Christmas Party The Bennetts PSG
Bill and Christine are hosting the joint Puget Sound, Cascade Grotto Christmas party. A turkey is being provided, please call them regarding your pot luck contrubution.
(206)255-1466

Feb. 4-5 St. Helens ski-in Jim Harp CG
A cross country ski trip to Little Red River Cave, could also visit Beaver Cave if time allows. Jim and Libby Neiland have graciously offered to let us crash at their place on Sat night. Bring your favorite wine for the spaghetti feed.
(206) 745-1010

Feb. 25 Cave Ridge Wendel Pound PSG A trip up to Cascade Cave. If conditions are ideal this could prove easier than in the summer. Slidding all the way down.
(206) 863-1649

May 28-30 Regional Cave Meet Jim Harp OG The WVG is our host with the most at Lava Beds Nat. Monument N. Calif. (206) 745-1010

July 17-21 NSS Convention Blacksburg Virginia
Jeff Wheeler and Dawn Kiss. These former locals are going to show us the caves of the Blacksburg VA area.
(206) 925-1748

Aug. 2-5 1996 NSS convention Salida Colorado
Skip Withrow (303) 693-0997

It should be noted that while some trips die for a lack of interest, many more successful trips happen on the spur of the moment without being announced in the Caver. Please contact the trip coordinator regarding any trips being planned or with a request regarding a trip that you would like to see happen. Members and family of any recognized caving organization are encouraged to join us on our field trips. Non-affiliated participants areby invitation only. For additional information call:

Jim Harp - Cascade Grotto trip coordinator
Home (206) 745-1010
Work (206) 388-3585
Work 1-800-562-4367 ext. 3585 or 3436

The toll free number works only from limited areas in Washington State.

Last month (Oct 1994) the cover photo was a reprint of the May 1966 Cascade Caver. Larry McTigue asked if any knew the cave or the photographer of the photograph. Thanks Dr. Halliday for the response. This Photo was taken Sept. 15, 1956 by Dr. Halliday after the first decent of Hell Hole Cave, Cave Ridge. Note the rope ladder!

Rock Climbing in the Deschutes
From the BOG Minutes

A meeting was held in Bend, Oregon, at the Deschutes National Forest office there. In attendance were federal land administrators form the BLM and Forest Service, members of the Gem Sate, Oregon, Jefferson and Willamette Valley Grottos and about 25 rock climbers. Many naves you would have recognized, Jim Nieland of the Forest Service, Steve Knutson of the cavers and Scott Franklin of the climbers.

The meeting was divided onto two periods, informational and discussion. The information period was first when five federal representatives talked about cave anthropology/ history, biology, Federal Cave Resources Protection Act and the current administration of caves. It was pointed out that some caves are already by default "significant" and that 99% of known caves in the Forest Services land near Bend are expected to be classified as significant. It was also pointed out four caves have "threatened" species of bats and several caves are prehistoric human sites.

The problem is that a fringe group of climbers has decided to set "permanent" sport climbing routes in several central Oregon lava tubes. These routes are almost exclusively bolted routes in the entrances of the affected caves and typically reach the apex of the ceiling. In addition to the obvious bolts and hangers in the caves, chalk, trampled vegetation, digging and rearrangement of rocks on the entrance floors, there have been videos and photographs of the climbing. This material has been distributed for commercial interests.

The affected caves are Hidden Forest Cave, 137 bolts; Pictograph Cave, 49 bolts; Charcoal Cave #1, 29 bolts; Derrick Cave, 11 bolts; Skeleton Cave, chalk only. The bolt survey was conducted by Larry King of Portland. In Larry's survey, he also recorded approximately 60 quick draw/ double carabiner setups and 100 single carabiners in the caves; These items were removed by the climbers prior to the meeting in Bend. One climber was so bold as to relate to Larry that his survey had come up a few dozen bolts short! Prior to this latest activity, none of these caves had a single bolt set in them.

It is the climbers position that "traversing" the cave includes the ceiling and that their "sport" is a legitimate and proper use of cave resources. It was the cavers position that no bolt can be placed in a federally managed cave without the permission of the land manager and climbers actions "knowingly disturbs, defaces, mars, alters, removes or harms any significant cave" in clear violation of the Federal Cave Resources Protection Act. It is the goal of the climber to have the Forest Service establish sport climbing caves. This is a major test of the law.

Those wishing to express their views and concerns on this issue may write to:

George Chesley, District Ranger
Fort Rock Ranger District
1230 NE 3rd, Suite A-262
Bend, Oregon 97701

and

Bob Alward
BLM State Office
1300 NE 44th
Box 2965
Portland, Oregon 97208

Survex Cave Survey Software

After the karst management meeting and VICEG meeting Peter Norris, from Vancouver B.C., brought out his notebook computer and displayed two caves they had surveyed on Vancouver Island.

The survey program was a software program from England called Survex. The software is in a zip file and is free-ware.

There are several features other than being free that make the program one you will want to get if you have a computer. SURVEX is entered in the form of text files. You can use any text editor you like for this. The data format is very flexible; you can enter data in any order you like, the ordering tape, compass, clino (for example) is specifiable so you can enter straight out of the survey notes. The display of the line plot can be rotated at different speeds, size increased or decreased, and viewed as a plan or profile. The most impressive feature is the rotation of the plot. The rotation is clean without the jitters common with computer animation. There are print drivers for Epson 8, 9 & 24 pin compatible, HP PCL, Postscript and HPGL printers and plotters.

At the present time the screen plots are only in one color.

If you would like a copy of the program, call Dick Garnick 206-671-1066 and I will help you get a copy by modem or get a disk to you.

USGS Mapping Center

Dick Garnick

On a recent trip to Denver Colorado, I spent a afternoon at the US Geological Service located at the Denver Federal Center. After spending some time and money at the map sales, I asked one of the clerks about obtaining DEM (digital elevation model) information. I was sent over to the USGS Bldg. 25. As I entered the building I found the directory and began my search for the information and sales office. I didn't find the office I was looking for quite as easy as the directory indicated. Later I found that offices had changed but the directory had not been updated. This turned out to be a bonus in my favor. As I wandered the halls looking for the information and sales, I passed open doors full of computers with graphics, people in discussion about their projects, colorful geologic maps hanging in the halls, and an exhibit of surveying equipment. WOW, what a rush! I finally asked where the sales desk was. Well I was only one floor off. After gathering information and looking at their displays of maps and aerial photos I asked if there was some way to get a tour of the mapping center. Lin Neifert ,a staff rtographer kindly came and toured me through a area where they were revising the topographical map south of Olympia WA. They showed me their computer with a new air photo overlaid with the current topo map. They could zoom in to areas of a few meters and trace over new roads, buildings, and other changes since the last version of the topo map was published. They could then print the updated version for a full visual check before it was sent off to be printed and released for sale. I was then shown a portion of the GIS (Geographical Information System) office. WOW, the BIG scanners, printers, and graphic work stations were most impressive. They called up a program and showed me a box of visual information of a contaminated area in California. This rendering was rotated around a 3D axis in the smoothest, quickest, highest resolution I have ever seen. If you are ever in Denver CO or Reston VA, I would suggest you visit the USGS. As a collector of maps this was a day to remember.

Outside Magazine "A Deadly Obsession"

"Bill Stone In The Abyss", "His life's obsession has been to get to the bottom of the worlds deepest cave. Two team members have already died. How much further is he prepared to go." This is a most interesting article about Stones 18 year quest to reach the bottom of Huautla Cave in Mexico, a must read!

Spelunker Club, BLM Working to Protect Caves

By Michele Labounty

Grants Pass Daily Courier
September 9, 1994

WILDERVILLE OR. — There was no turning back, nowhere to go but ahead, feet first, into the darkness.

Lying on their backs, they wiggled 25 feet through a rocky and narrow tunnel more suited to small animals than people.

At the end, the US Bureau of Land Management officials and amateur spelunkers, glimpsed a world evoking memories of Huck Finn.

"Imagine if you were the first person in this room. You would be awed," said Bill Fitzpatrick of the Southern Oregon Grotto, a local chapter of the National Speleological Society.

Folds of limestone cascade like draperies from the 35 foot ceiling. A massive column, born when a stalactite from the ceiling and a stalagmite from the cave floor merged, casts dark shadows from multiple flashlights.

Mud hides some of the formation's natural beauty, but imaginations give everyone an idea of what must have looked like before vandals, survivalist and others marred No Name Cave.

Bill McGahey, a veteran spelunker from Rogue River, feels at peace in the blackness, broken by splashes of light from the lamp on his hardhat.

"I love the feeling of discovery and exploration," he said. "You never know what you will find until you've to the bitter end of that nasty hole."

McGahey and Fitzpatrick, both 48 and the 20 or so other members of the Southern Oregon Grotto hope to turn No Name's appearance around and preserve other caves in southwest Oregon.

Here, in the belly of Round Top Mountain, Fitzpatrick and BLM Medford District Manager Dave Jones signed an agreement to help ensure limestone caves will survive: saved not just for explorers, but for Townsend's big-eared bats, which are on the brink of protection by the Endangered Species Act.

The BLM obtained No Name Cave, nearly $100,000 and 750 acres in a land exchange with John Brazier of Brazier Forest Industries of Seattle. Brazier receives 40 acres of BLM trees he hopes to cut in the Illinois Valley.

Jones and the BLM turned to the grotto for help because the federal agency is strapped for money and people knowledgeable about caves. And protecting these caverns, formed I drip a time over millennia, is mandated by

the Federal Caves Resources Protection Act of 1998.

"It really helps us to stretch our resources to protect and maintain these resources for the public," said Jones on his first visit into the cave with 850 feet of mapped passages.

About a dozen caves have been found so far in Josephine and Jackson counties. With the grotto's volunteers, caves will be monitored for vandalism, inventoried, mapped and cleaned up.

These explorers will search for other caves in the limestone band that cuts through part of southern Oregon.

To protect Townsend's bats a gate allowing bats to enter but not people will protect No Name's entrance this fall. Spelunkers will be able to pick up a gate key from the BLM.

Preserving caves will be a labor of love for the grotto. Listen how Fitzpatrick feels when he's inside a cave. Life's stresses vanish like the daylight.

"It gives me a sense of awe and wonderment, peace and solitude and communing with nature. It's much like why people walk in the forest, climb a mountain and float the river," he said.

Jones and Fitzpatrick signed the pact while sitting on what appeared to be a solid floor, but was really a roof to a cavern below that people have used like a Dumpster.

Hundreds of pounds of garbage, from candles to beer cans, have been hauled out by grotto volunteers.

Junk remains inside this cool cave, which would be much wetter without drought's grip.

Broken glass from beer and wine bottles crunched under the boots of explorers.

Spelunkers walk gently in the dark world they revere. Their motto: "Take nothing but pictures, leave nothing but footprints and kill nothing but time."

Fitzpatrick hopes the BLM will try to obtain the nearby Marble Mountain Cave in a land exchange with another property owner. The BLM is considering the possibility, said Gretchen Lloyd, head of the BLM's Grants Pass resource area.

The Civilian Conservation Corps carved steps in the Marble Mountain Cave in the 1930s when there was talk of opening it for public tours.

The Steps and heavy planks remain, giving explorers sights of some stalactites that have escaped vandals, and tiny pools so clear they seem like mirrors.

Ed. Note - Speaking with Michele, she admitted this was her first caving trip. She probably will not become a caver, small passages were not her thrill.

There is some question as to the Southern Oregon Grotto. Any one know about the grotto?

AN INTRODUCTION TO OREGON CAVES

By Jim Harp

Located amongst the beautifully forested Siskiyou Mountains of southern Oregon, near the cities of Grants Pass and Cave Junction, is Oregon Cave National Monument. Oregon Cave is managed under joint stewardship of the National Park Service (NPS) with research management specialist John Roth as Superintendent and Oregon Cave Company (OCC) the concessionaire. OCC, a private organization, built and now leases back a number of unique rustic structures including a gift shop, employee residences and a very impressive six story log lodge or chalet with restaurant and guest rooms. OCC also leases the tour rights to the cave.

Credit for discovering the cave is given to Elijah Davidson and his dog, who are said to have chased a wounded bear into the cave back in 1874. The story continues that the pair (or trio if Mr. Bear followed!) promptly got lost and exited via a stream passage using matches as a light source. Named Elijah's Cave by early visitors, who upon recognizing the unique natural beauty quickly spread the word, attracting the curious from far and wide.

The marble halls soon rang with sounds of church picnics, pseudo-scientific explorations and drunken cavern parties. Visitors were encouraged to bring a bag for packing out souvenir cave decorations and also a pencil for recording names and dates on wall or ceiling. One noted professor from Oregon State University proclaimed that the formations would renew themselves annually, much the same as the icicles of winter! It seems apparent that the mold for some modern caving attitudes had already been cast and not much is new underground.

Eventually the Cave, along with 160 acres of surrounding timberland, was acquired by Walter Burch and Homer Harkness, a pair of miners and would-be entrepreneurs who opened up the cave for tourism in 1885. Unfortunately, the partners hard work and advertising failed to bring in sufficient visitors or profit to justify their labors and in 1894 the cave was acquired by the Oregon Caves Improvement Company of California. It did not take the new managers long to realize that drastic modifications would be necessary to allow their customers to be shown through to the highly decorated rooms beyond the entrance. A long-lasting pattern of destruction was soon initiated when laborers were employed to enlarge passages and build trails through to Paradise Lost and the Ghost Room areas. Flowstone and other formations along the route were covered up or removed and deposited along with unwanted debris into void or side passages considered expendable. This did allow

visitors easy access to previously restricted areas, but their success was short lived and in spite of their big dreams and hard work, the Company was unable to raise sufficient capital necessary for construct of the road needed to transport visitors to the cave and was forced to abandon their ambitious project.

From 1896 until 1909 the cave went relatively unnoticed until a group of western alpinists and conservationists succeeded in bringing the cave's natural wonders to the attention of those in Washington DC. In 1909 President William Taft signed the order adopting Oregon Cave as a National Monument.

The federal government's program for development and use of the new public showplace could have been taken right out of a book written by the Oregon Caves Improvement Company. Destruction of formations and filling in of passages persisted much the same as with the former management. Over the years blasting opened up many areas along the tour route including a 500 foot access tunnel to the outside. A road was finally constructed, tourist accommodations erected and the crowning glory, electricity and lights installed along the tour loop.

A visitor of the 1990's promenades the tourist trail along passageways which are sometimes artificial enlarged by contractors while viewing formations snapped off by early souvenir hunters or enthusiastic excavators.

The tour guide points out a profusion of names and dates scribbled on the marble by early visitors, graffiti proclaimed to be of historical significance, destined to remain a permanent fixture. The path is illuminated by an electrician's nightmare, exposed cables running in various directions to light fixtures, which tend to shine in one's eyes as often as on the cave surfaces.

The genealogy of Oregon Cave reads much the same as most other tourist caves around the world. All seem bound by a similar chain of events. Misunderstood and abused by early visitors, then developed and exploited by well-intentioned admirers, anxious to open and reveal Pandora's box of underground geological delights.

Those people who have entered and changed our underground environments simply follow basic instincts common to most mortals. To possess and control that which is precious and beautiful, often with little thought of future impact or consequences.

Present day manager's of our subterranean worlds find themselves possessed with a host of challenges. Responsible cave management is in it's plebeian years with the book of restoration and conservation being written as work proceeds. Our new cave custodians find they must tread cautiously to avoid adding new sins to those of the past.

References: J. Roth, C. Larson, W Halliday.

Underground Surveying with Cave Radio and a GPS

By Bruce Nagata

The idea of a "cave radio" has been around for sometime now as a possible surveying device and, if used in combination with a GPS unit, it might have place in the survey of caves. (The editor will give a very brief description of a cave radio, but please pardon any mis-statements about the workings of the cave radio.)

A cave radio is composed of two highly directional antennas which would be mounted on a tripod device. A radio signal would be broadcast from the radio inside the cave the surface antenna is then moved to the spot directly over the first unit using the signal strength as a guide. The distance between the two units would also be calculated based on the signal strength received by the outside unit. The following article is an example of how this technology could be combined with a GPS unit for cave survey.

Survey Techniques

A team using a cave radio to survey would consist of two parties, one above the ground and one inside the cave. Both parties have cave radios and the surface party would also have a GPS unit. The underground party would set a station at a significant point in the cave. At the station the cave radio would be setup. The underground party would then use the cave radio to signal the surface party that it is ready. The surface party then uses its cave radio to determine the surface location directly above the underground party. The GPS unit is then used to determine the latitude and longitude of the station. The depth is determined from the cave radio. (The surface elevation would also have to be determined from the GPS or otherwise) From this data you would get an X, Y, Z coordinate point for the underground location. A survey would be done by collecting several of these points and plotting them as a cave map. This survey method is fundamentally different than the traditional tape, compass and clinometer method in that X, Y, Z points are each measured electronically rather than being calculated from successive distance and direction measurements.

Functions of the Cave Radio

1. Finding the location on the surface directly above the underground station.

2. Finding the distance between the surface station and the underground station.

3. Providing 2 way communication between the surface and the underground party.

Potential Problems and Limitations

The GPS has a finite resolution and this will limit the precision of the survey. (Also GPS units do not produce highly accurate altitudes due to several factors. Also one has to deal with compensating for the intentional signal drift

introduced by Uncle at each station. Also cave radios have a finite range which will limit how deep of a cave can be surveyed. The antenna for the cave radio is bulky and may not fit into some caves even in a folding fonnat.

This technique might have uses in fairly shallow caves, (a few lava tubes come to mind) and it is an interesting thought to ponder.

Cave Radio In Dynamited Cave

Paul Ostby

The Annex

"We should build a cave radio," said Bruce. We were sitting on the debris slope in Dynamited Cave's Annex. Dynamited Cave is a lava tube cave near Mt. Adams, in Washington. About 30,000 years ago lava apparently flowed over and into a deep fracture in the underlying rock. The result was an unusual lava tube cave with at least five passage levels and numerous vertical pitches, including a 55-foot blind pit. Even die-hard vertical cavers enjoy trips through Dynamited Cave.

This was June 1993 and Bruce Nagata, Steve Fogdall and I had been in Dynamited Cave for several hours. After spending some time in the lower passages we had ascended on the far side of the chock stone to see if we could get into the upper passages of the cave. Steve had lead the nasty 25-foot climb after the chock stone, as well as the somewhat easier climb that followed. This had put us in a huge room which Bruce had dubbed the "Aircraft Hanger," but which is officially named the "Annex".

At the far end of the Annex is a monstrous pile of dirt and weathered rock reaching up to the ceiling and blocking access to any further passage. After spending several hours walking over the jagged lava, even a neophyte caver knows that these smooth weathered rocks are out of place. Weathered rock belongs to the outside world.

In times past there had been a large skylight here. Over the millennia the debris had washed in from the surface above. Eventually this dirt and rock formed a huge mound which reached to the ceiling and blocked all passage upward and around the sides.

Scrambling up this shifting pile of debris it seemed certain that the surface was just a few feet above, almost within reach. We sat high up the slope, out heads near the ceiling, wondering just how far away the surface really was. Bruce said, "We should build a cave radio."

A cave radio is just the thing for this sort of situation. By using a special type of "radio" transmitter we could transmit a short distance through rock. If we also had a special type of receiver on the surface we could pinpoint the spot on the surface directly above the transmitter, and we could even determine the transmitter depth fairly accurately, possibly to within a few feet.

The alternative would be to survey the cave passage, plot out the data and determine the exact elevation of the debris slope with respect to the cave entrance. Then we could do a surface survey to find the spot directly above the debris slope and determine its exact elevation with respect to the cave entrance. By comparing these two elevations we could determine the depth from the surface to the top of the mound. If we were careful we could keep our errors to within about one percent. But with 3000 feet of cave passage and 1000 feet of surface survey, this meant we could expect errors of about 40 feet.

If we really wanted to know how close we were to the surface then we would need a cave radio. The problem was that I had never had much luck building analog electronic circuits. Many times I had tried building simple radios and they never worked. Never.

"We should build a cave radio." Bruce was right, but it was with some trepidation that I agreed to help build a cave radio. In fact, it was more than a year before we built our radio and returned to Dynamited cave.

The Radio

Bruce had collected numerous articles about cave radios, and I looked over everything he had. In several cases we had complete schematics and descriptions of how to build the radios. But in each case the schematics called for special electronic parts which I could not find in any stores or mail-order houses. Eventually I decided to try a circuit of my own design. I chose to build a beacon-type radio using a frequency of 3,276.8 Hertz. This type of cave radio is simple and is useful for radiolocation and for determining depth, but it cannot be used for speech. At best we could only send Morse code.

Most cave radios do not actually use radio transmitters, and our cave radio is no exception. It uses low frequency magnetic induction rather than electromagnetic waves. This is an important distinction for the person designing the radio, but fortunately the person using the radio doesn't need to know anything about electronics. All the user needs to know is what to listen for, how to point the receiving antenna, and how to read the angle that the antenna is pointed at.

Building the transmitter was easy. I was able to use an entirely digital circuit, none of that dreaded analog stuff. To

keep the circuit simple and flexible I used a small, cheap microcomputer chip to do most of the work. The transmitter can be keyed by hand to send Morse code. Or left to itself it will keep sending a beep-beep-beep signal.

The transmitting and receiving antennas were also easy for me because I didn't have to make them. Bruce made them. Each antenna is actually a coil of wire. Each coil is 18.5 inches in diameter and consists of about 420 turns of 28 gauge magnet wire. That's four-tenths of a mile of wire about the diameter of a human hair. This type of wire loves to kink and break, and in just one moment of carelessness the coil can unravel to the point where it has to be thrown away. Winding these large coils to the correct size while accurately counting the turns can be a brutal job. Boy was I happy when Bruce offered to make them!

With great ingenuity Bruce built a jig for winding the coils. The wire was wrapped around an 18-inch coil form. This form was mounted on a turntable bearing so that Bruce could easily spin the coil form to wind the wire. The heavy spool of wire was mounted on a nearby axle so that the wire would be pulled off with the right amount of tension. A small piece of strap metal on the side of the coil form triggered a thumb counter each time it went around, so that the exact number of turns were counted automatically. With this jig Bruce was able to quickly wind the two antenna coils.

With the transmitter and the two antenna coils finished, only the receiver remained to be built. Eventually I came up with a receiver design which was fairly simple and used parts that I had on hand. Best of all, the thing actually worked. That is, it worked fine on my workbench.

I took the cave radio to a schoolyard near my house for an open-air test. The results were somewhat disappointing. When my wife Katrina "hid" the transmitter by standing it up against a wall of the school, I was unable to accurately pinpoint the transmitter by just using the receiver. Furthermore, the radio transmitted less than 140 feet before that signal was lost in the background noise. And this was in the open air. There was no telling how much the range would be reduced when going through solid rock.

I figured that the locating problems were probably just due to metal in the school building distorting the magnetic field. The bigger problem was that the range was so short. Even though we expected that the Annex was close to the surface, I would still need to be within about 100 feet of ground zero (the surface directly above the transmitter) before I would hear anything. I could just see myself, out in the woods criss-crossing the ground above where I thought the Annex would be, trying to pick up some sign of the transmitter below. If the rock cut down the signal too much, I might never hear it at all.

Field Test

On October 1, 1994 we returned to Dynamited Cave with the cave radio. Steve Fogdall had arranged a cleanup trip, and this seemed like a good opportunity to try out the radio. We headed out to Dynamited Cave with high hopes, but without any good evidence that the cave radio would work.

Katrina and I decided to handle the receiver on the surface, while Bruce Nagata, Steve Fogdall, and Kwang Lee would carry the transmitter through the cave to the debris slope in the Annex.

While we waited for the cave crew to get ready, Katrina and I tried some experiments. Katrina took the transmitter about 70 feet inside the entrance while I climbed out of the sinkhole to check out the receiver. When I thought I was directly above the transmitter I turned on the receiver. Even with the volume all the way up I couldn't hear a thing. Damn; the battery must be dead. I put in a spare battery but still nothing. Not even noise.

I climbed back down to the cave entrance and checked with Katrina. She was still trying to level the transmitter coil and hadn't yet turned the transmitter on. I waited at the entrance until she switched the transmitter on. I was thrilled to hear the beep-beep-beep on the receiver even before Katrina told me the transmitter was on. The battery wasn't dead at all. I suddenly realized that the reason all the background noise was gone was because there was no nearby school, no nearby power lines, no cars going by on the street, none of the myriad of nearby electrical appliances that cause so much low-frequency noise in populated areas. Out here in the woods all was quiet except for the beep-beep-beep of the cave radio.

Excited now, I scrambled back up to the top of the sinkhole. The transmitter range should be much greater than I had expected because the signal would not be drowned out by noise. As long as the transmitter worked well through rock we would be in business. At the top I once again switched on the receiver and heard the signal loud and clear.

Thoroughly happy, I tried to pinpoint ground zero - the point directly above the transmitter. It was about 20 feet away from where I had estimated it should be. Several careful compass sightings inside and outside the cave convinced me that the radio was right. Finally, the depth measurement using the radio came up with a transmitter depth of about 70 feet. This agreed well with both Katrina's and my visual estimate of the depth. It also agreed with the map. We were in business.

The Cave

My original plan had been for the underground crew to

carry the transmitter to the Annex and set it up there. The cave crew would then leave the transmitter running for an hour or more, maybe even overnight. Meanwhile the surface crew would survey out to a point where they thought they were directly above the Annex. The surface crew would then wait until they thought the cave crew should have reached their station. The surface crew would then begin a search pattern trying to locate ground zero. With luck the surface crew would be close enough to hear the transmitter as soon as the cave crew started it up. Otherwise the surface team would have to execute a wide search pattern hoping to pick up the signal.

Katrina now suggested a different strategy. The cave crew would leave the transmitter running while they carried it through the cave. The surface crew would try to track them every step of the way. At each vertical pitch one member of the underground team would transmit a location report while waiting for the others to negotiate the pitch. Since none of us knew Morse code we came up with our own set of signals. At each stop the cave team would tell us their current location, the next location they intended to head to, the compass direction they were heading, and the approximate ceiling height.

I was afraid that we on the surface would lose the signal if the cave passage went too deep. However the possibility of maintaining an accurate fix on the transmitter location at all times was just too good to pass up. In the worst case we might lose them and have to fall back to my original plan.

Actually this plan made it somewhat more difficult on the cave crew. They would have to carry the transmitter as level as they could over the breakdown piles. As long as the transmitter was fairly level the surface crew could get an accurate position fix. If the transmitter was not level then the surface crew would go racing off in the direction that the transmitter was tilted.

Katrina's plan worked great! Bruce, Kwang, and Steve made their way through the cave while Katrina and I followed their progress on the surface. When the cave team slowed down we knew they were going over breakdown. When the cave team sped up we knew they had reached level passage again. When they stopped moving for a minute, I guessed they were probably at the first 15-foot drop even before they transmitted the signal to tell us so.

At times Katrina and I walked at a leisurely pace across an open field while the underground team scrambled over breakdown. At other times we were pushing our way as fast as we could through bushes, trying to keep up, while our underground friends walked quickly along a level section of the lava tube. But when the cave team reached the 40-foot drop to the Ballroom - the deepest part of their trip - we were still on top of them.

I knew that it would take a little time for the cave team to descend into the Ballroom and ascend on the other side. What I didn't anticipate was that the cave team would take close to hour here. There were a lot of cavers in Dynamited that weekend and there was quite a traffic jam at the 40-foot drop. Fortunately some of the other cavers let Bruce and Steve go ahead of them.

While we waited on the surface, Katrina and I took measurements to determine the depth. We found that the transmitter was about 101 feet below, plus or minus six feet or so. Then we ate a quick lunch, thinking our friends below would start moving again at any moment. Then I went off in various directions to see how far away I could go and still pick up the signal - about 200 feet. Then we speculated on why the transmitter was not moving. Then we rummaged through our packs to see if we had any more goodies to eat. Finally we just sat on a stump and waited.

After about an hour the signal abruptly stopped. I wasn't very worried because I knew that the underground team would probably disconnect the transmitter for the descent and ascent. However I started getting worried when I still didn't hear the signal after fifteen minutes. Did the transmitter get broken? Did the receiver stop working? Did the cave crew forget to re-connect the transmitter before moving on to the next vertical pitch? If so would we be able to pick up the signal when they did re-connect the transmitter?

More anxious waiting. We tried moving off in the direction that we thought was down-tube, just to see if we could pick up the signal. Nothing.

Finally, I heard the beep-beep-beep start up again. Our compatriots below had re-connected the transmitter. The signal was weak but clear, and it came from some distance down-tube. We rushed off to trace where the signal came from. Just as we arrived on the spot, I heard Bruce tap out the location signal: beeeeeep, beep-beep-beep-beep. They had arrived at the nasty 25-foot climb.

Fortunately Steve had left a rope here on the previous trip so that the hairy free-climb could be avoided. Even with the rope in place, this was a dangerous ascent with lots of loose rock at the top. I listened carefully to the receiver, praying I wouldn't hear the SOS signal telling me that someone had been hurt. Instead I heard only silence. They had once again switched off the transmitter for the climb.

After a few minutes the silence was broken, not by the familiar beep-beep-beep, but by Jim Harp's voice in the distance calling my name. I was unwilling to leave the spot where I hoped soon to hear the transmitter, so Katrina went off to collect Jim and show him where we were. Soon Katrina reappeared with Jim, Mike Wagner, and Kwang Lee. Kwang had left the underground team at the Ballroom in the hopes that having one less person would help them get

through the traffic jam faster.

The cave crew had only the transmitter and we had no way to tell them that we were still tracking them. For all they knew we might have lost them shortly after they entered the cave. It was gratifying to see Kwang's surprise that we were still tracking the transmitter.

While we were talking, I heard the transmitter start up again in the distance. Bruce and Steve had moved on to the final 20-foot pitch and switched the transmitter back on. As we moved to catch up I heard Bruce sending the signals to tell us where they were and where they were headed. A comment from Mike told me how strange this looked to the others; one guy carrying some odd gear, with an earphone stuck in his ear, listening to something no one else could hear, tracking some unseen quarry.

We caught up once more, but in a short time Bruce and Steve were on their way again. We moved off one last time, following the progress of our friends underground on the last leg of their journey to the Annex.

As I followed Steve and Bruce I was filled with the thrill of success. I listened happily as their progress slowed, knowing that they had reached the debris pile and were making their way up it. In this state of euphoria I walked down into a sinkhole knowing this must be the one. Soon their progress stopped and we waited several minutes while Steve and Bruce carefully adjusted the transmitting coil to be as level as they could get it. Our measurements told us that the Annex was deeper than we had thought. But this did not dampen my happy spirits at all.

The sinkhole above the Annex is about 50 feet across at the rim, and perhaps 20 feet deep. It is filled with dirt and has many trees growing in it. The spot where Steve and Bruce stopped is about 20 feet from the middle of the sink and about five feet up from the lowest point. The calculated depth of the transmitter was 32 feet plus or minus about 3 feet. Steve and Bruce report that the transmitter was about 2 feet below the ceiling, giving a final result of about 30 feet from the top of the Annex to the surface.

The thrill of this successful conclusion to our project seemed to be contagious. No one seemed anxious to leave the sinkhole. Mike commented that he had carried cave radios within caves before, but this was the first time he had been with the surface crew. Jim Harp amused us by grabbing a large stick and hitting a nearby tree several times. He said maybe the cavers below could hear it. I voiced some doubts about this. Boy was I surprised a few hours later when Bruce and Steve reported that they did hear it!

Conclusion

The success of this project has inspired me to think of ways to improve the range with a better quality receiver. I am also thinking of ways to build a two-way voice radio. And now that we have a working cave radio more projects come to mind. We can use it on cave ridge to see whether Hellhole and Cascade really do overlap. Stookey Ranch cave near Bend has an upper passage that ends in dirt and may be near the surface. In Windy Creek cave some of the passages loop back. The cave radio could tell us how close these passages come to other parts of the cave.

Our cave radio worked better than I had ever dreamed it would. No matter where or how we use it in the future, I don't think anything will match the sheer joy I felt with the success of this first project.

Meanwhile, Down Under

Bruce Nagata

We carried the cave radio into the cave, stopping briefly to test it, just inside the entrance, while still within vocal range of the surface party. After verifying that they were receiving our signal, we continued in.

At first we would stop every 500 feet or so and send a standard transmission that indicated our location, heading, where we were going and the ceiling height. When we reached the 40 foot pit, we encountered people ahead of us. They graciously let us go ahead of them, so I turned the radio off, put it on my back and we rappelled the 40 foot pit and ascended the chock stone.

We continued to the base of the first 20 foot climb before I remembered to turn the radio on and send another transmission. On the second 20 foot climb, while hauling the pack containing the radio, the tiny circuit for the radio fell off and landed in the breakdown. We didn't notice this, but the caver behind us miraculously saw it and brought it up.

We continued to the back of the cave with the radio on, and sent a transmission from the top of the rubble pile there. We thought the odds were low that we were still being tracked on the surface, but low and behold, we heard a tapping sound coming through the rock ceiling. We sent 6 beeps and then heard 6 taps coming from above. Success!

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