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## The Magazine

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## Caves.com

Exploring the "hard" side of  
Cave Digging, Cave  
Exploration and emerging  
techniques and equipment.

### Editor Contact Information

Mark Passerby  
[mark@caves.com](mailto:mark@caves.com)

Aaron Bird  
[aaron@caves.com](mailto:aaron@caves.com)

Rachel Bosch  
[rachel@caves.com](mailto:rachel@caves.com)

Mailing Address:  
P.O. Box 80693  
Lansing, MI 48908  
517-896-4376

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or have trained with qualified and  
knowledgeable individuals.

## The NEW 8 is here....



New 8 LED insert for  
Petzl Duo



Petzl Duo Headlamp

The Modu'LED 8 is a new unit from  
Petzl that consists of a reflector with  
8 LED's, which is fitted in place of the  
original 6 V mini bulb in the DUO.  
The LED gives a whiter more even  
light and uses considerably less ener-  
gy than a normal bulb. In addition  
the LED 8 has three light power set-  
tings, selectable by rapid switching of  
the power switch.

- optimum setting(10 meters):  
powerful lighting...long duration
- maximum setting(20meters):  
very powerful lighting with less  
duration
- economic setting(3 meters):  
less powerful lighting with very  
long duration
- Survival function: When the  
batteries are almost totally dis-  
charged, unit switches automat-  
ically to survival lighting setting.

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Available online from  
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### H.I.D. Lighting Systems for high lead searching



H.I.D.(High Intensity Discharge tech-  
nology) will likely become a standard  
exploration device for many high lead  
searching trips. The amount of light  
output for the weight and size of the  
units can't be matched by any other  
category of light. To see the light in  
use visit a high end bike shop some of  
which have these lights on display and  
commonly have demo racks. Also see <http://www.niterider.com>

Look for an in depth article in our next issue.

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## Features

### **4 Cavediggers Success**

Digging Success.... a global survey of diggers and their projects.

### **12 Microgravity's Use in the Detection of Near Surface Voids** by Morris Hall

### **16 A Little Digging Goes a Long Ways** by Yvonne Droms

### **24 Interview with Jay Kennedy** By Aaron Bird

### **32 Danger! Don't Feed the Micro-Rack**

By Scott McCrea

### **34 Three Dimensional Merging of Cave Surveys and Topographical Maps** by Garry Petrie

## Departments

**10 Expedition Digging and Exploration Equipment**

**11 Carroll Cave Update**

**14 Breakthrough and Cave News**

**20 Cordless Drills for Micro Shaving**

**22 The Petzl Pantin**

**23 Bacteria Battles Fungi in Pinch of Cave Soil**

**23 Protect Your Investment**

**31 Cool Links**

Muddpuppy on rope in Norseman Wells, AL.  
Photo by Terry Ragon

Cover: Photo by Peter Gedei from Slovenia

## Cavediggers Success

Nothing has intrigued us more than seaming together the information gathering functions of the internet, and its worldwide reach with the traditional and focused area of print media. The following section is the first of many experiments in caving that hopefully will reveal information, news, and relevant contacts that might not have otherwise been known. We want to thank the many of you who have participated in this survey, magazine, and online discussions, and hope you enjoy this new addition to our publication.

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### The following questions were posted online.

- 1) What is the most successful dig you have been involved in?
  - 2) How many feet/miles were found?
  - 3) Was the dig an extension of a known cave or a previously unknown cave?
- 

#### Name: John Walter

State/Area you cave: Virginia USA

Most successful Cave Dig?: We worked on this cave in Fredrick Co., Va. The cave is 1000 feet long from entrance to end, with 600 feet of side passages. We found one passage not on the map. We dug with an army entrenching tool for about 3 hours, which gave us 6 total. There were only two of us. It gave us an additional 73.5 feet of cave. On another trip into the cave we discovered two more passages not on the map. As we crawled down the passage, I noticed no slide, foot, or hand prints. I believe we were the first to be in the passages. We've gotten to a point where we have to do some digging. That trip is planned for Jan. 03. What we did crawl through up to where we have to dig, is about 75 feet.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: 148 feet

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#### Name: Jim Wasson

State/Area you cave: Ocala, Florida USA

Most successful Cave Dig?: Currently our six man team is in the process of digging out a side passage at an undisclosed location. We have been on this dig for over 13 weekends with about 820 man hours into it. We have some great air movement and are on track following it. Possibly not the best thing to use, but a can of dry smoke works great to see even the lightest of air movement. It's the stuff they test smoke detectors with. After the "back scratcher" passage restriction, we have entered a room that it 22' long, 12 feet wide and about 17 feet tall. We use a laser measuring device from Home Depot to get our quick measurements. This room has some great decorations. We are going back next week after a weekend off for some much needed rest.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: 983 feet to date

Continued on Page 5



**Name: Robert Scott**

State/Area you cave: Yorkshire (is there anywhere else?)

Most successful Cave Dig?: How do you measure success? Sorry, but for me it's not how much the team has discovered but how the team has worked together. Each club has its diggers who may float in and out of each project, but it's the teamwork that coheres the group into something special. One person may lead a project, but be not very good at the broader "people skills" - still you turn up all the same but you don't feel very attached. On the next project someone else leads and, with a bit of shoving and advice, involves others in the project asking for their help (and muscle!). There's no "us & them", nothing is assumed, the project is open and light-hearted, but as always still hard physical work. Apologies for pontificating but I believe that the success of a digging team is measured in its shared enjoyment rather than feet discovered. Think on, when you're nearing death, will you remember how many feet you've excavated or the good times that you've had? I have a feeling that this homo sapiens thing that I live in doesn't measure life in feet.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: 24 feet

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**Name: Steve Baldwin**

State/Area you cave: Black Hills of South Dakota USA

Most successful Cave Dig?: Back in the late 80's, we had a small plugged passage at the far extent of Jewel Cave on the western end that blew lots and lots of air. We were able to dislodge a loose rock about the size of a bowling ball and move it off to the side in a nearly vertical passage, maybe a foot and a half in diameter, 15 feet long, and twisting from horizontal to vertical and back twice in that distance. The rock was about half way. At the top of the last vertical part, the passage flattened to less than 9 inches and went off horizontal at a 90 degree bend from vertical for another 10 feet, then bent straight up through a tight slot that needed hammered a bit larger. That opened up into a short chimney to a duck walk passage for about 40 feet that ended in a couple of very small slots that blew a large volume of air. Three 14-hour trips later, we had this one enlarged by hammering bedrock to expose a crawlway some 10 feet long, 2 feet wide, and 8 to 10 inches high. This led to several hundred feet of crawlway, then to very large passages going everywhere. I believe that we mapped somewhere in the range of 5 miles of passage out there. It's a six hour trip one way to the end of that stuff and a lot of going leads in that area. Only very small cavers conditioned for "Jewel caving" will ever get into that area.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: approx 5 miles

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**Name: Bruce Zerr**

State/Area you cave: Tennessee USA

Most successful Cave Dig?: Sand Cave - in the Black Hills of South Dakota. This cave hides going passages in unbelievable, hidden places that no one would reasonably dream are the way on. It's deception and disguise - used to the max. I felt air coming from in front of me in a known dead-end passage. I asked the caver in front where the air was coming from. He replied, "There was no air, none." So I crawled underneath the little natural bridge and found four feet of virgin passage - and a sand plugged, 2"-high slot blowing air along the right wall. This led to a series of short sand digs and one hammer-bash before increasing the length of the cave by 50%. We got about 500' of virgin cave, plus found the largest room in the cave.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: 500'

Continued on Page 6

## Name: Terry Byland

State/Area you cave: Scott Hollow, West Virginia US

Most successful Cave Dig?: 3 micro blasts and we broke into 2 miles of massive trunk in Scott Hollow that still has leads we're working. 15-20 minutes of work.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: around 2 miles



*Cruisin in new cave after  
a successful dig.*

Photos by Ed McCarthy

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## Name: Alvin Gosnell

State/Area you cave: TAG Region US

Most successful Cave Dig?: Howards Waterfall Dig in Boy Scout area.

This hole was discovered by accident. An area of false wall, covered in mud, caved in when a friend leaned against it. His arm sank out of sight. When we looked in the hole we could tell it went somewhere. We enlarged it using a small axe with a hammer head on one end. It was a virgin passage that started out as a tight tube then opened 15 feet later to a stream passage that went about another 45 feet. Estimated time to enlarge hole was about an hour.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: 60 feet

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## Name: Brian Wheeler

State/Area you cave: South East UK

Most successful Cave Dig?: Crowborough Caves. Although closed to the public, in the late '60s a group of us tried to re-open the main chamber.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: aprox. 50 ft

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**\*\*Posted by Chris in the CaveDiggers discussion group:** "I use Evazote sleeping pads for the foam. They come in various thicknesses. These are the yellow sleeping pads. Don't use the blue stuff... it comes at a fraction of the price for a reason. My original knee pads are some 4-years old now, have protected me on hundreds of trips and they are as good as new (and if you've ever caved in Quebec, you'd know that the knees get used quite a lot). Blue foam will die after a handful of trips."

Continued on Page 7

## Name: Bill Walker

State/Area you cave: Florida

Most successful Cave Dig?: Werner Cave

Earlier this year we found a huge collapse in the bottom of a quarry. We located a 1' high rocky crawl at the bottom of the sink. Major air and bat guano led us on to dig the crawl out. One hour and 250' later we were into large walking passage and huge rooms. Not surveyed yet, but we've seen about a mile of passage. Most significant cave discovered in Florida in the past 20 years.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: ~ 1 mile

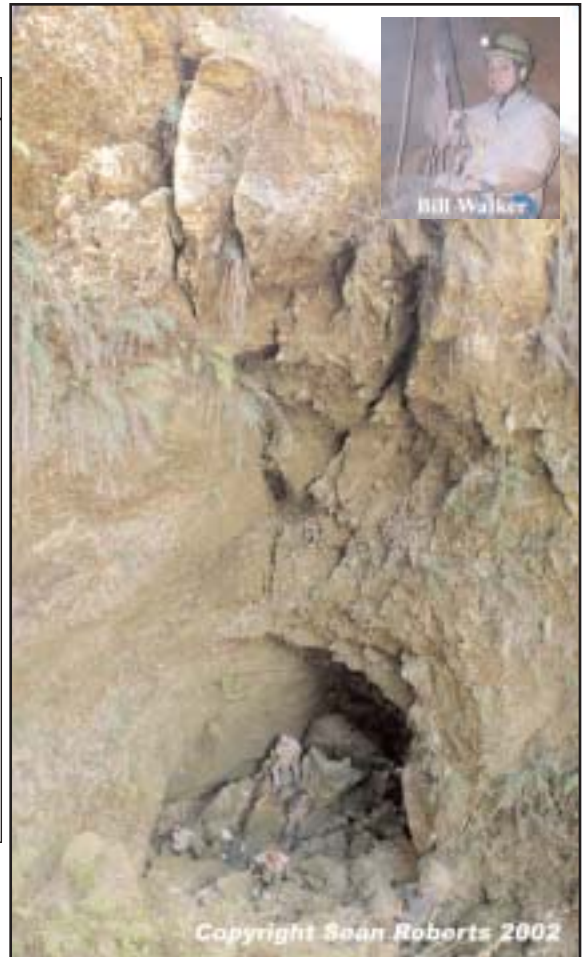


### Werner Cave

This cave was newly discovered by digging in Florida. With over a mile of new cave, it is one of Florida's most significant "new" cave finds in over 20 years.



The FSS (Florida Speological Society) is actively digging and exploring new caves in Florida. You can find them on the web at: <http://www.caves.com/fss>



## Name: Claude Koch

State/Area you cave: Washington State USA

Most successful Cave Dig?: Eliminator Cave. The upper entrance was dirt plugged. The passage just inside the upper entrance of the cave was also blocked by dirt. The lower entrance of the cave was blocked by rocks just inside the entrance. It took a few hours to open up the upper entrance. Both in-cave digs only took a few minutes. We used a crowbar and a sturdy 3 foot shovel for the upper entrance. Hands and feet were used for the two in-cave crawl digs.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: 1388 feet



Left to right: Blair Petrie, Edd Keudell, and Claude Koch

Continued on Page 8

## Name: Andy Foster

State/Area you cave: United Kingdom/Peak District

Most successful Cave Dig?: Discovery and exploration of Hangover Hole, stoney Middleton. Dug over about 20 digs, using some blasting to break up rocks. Here is a link: <http://www.keyhole.org.uk/hangover.htm> The system is very small, but is notable for some fine fossils and small gypsum flowers. It carries a big draught, but the obvious way on would be a huge project, and beyond the club's resources.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: About 250 meters (820 feet)

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**\*\*Great idea for knee pads posted by Don on the CaveDiggers discussion group.** "I use a set of Lost Creek coveralls with mouse pads in the knee pad "pocket". This idea was given to me by the owner of Lost Creek and it works very good. The foam is not bulky and it doesn't soak up water."

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## Name: Sergio Medeiros

State/Area you cave: Sicó Massif - Portugal

Most successful Cave Dig?: Gruta do Algarinho (2550 meters)  
Explosives and other digging method (4 hours of work) We've discovered an unknown cave that belongs to the "Várzea-Dueça Sistem", Penela-Portugal. (3rd longest cave system in Portugal +/-7Km)

Extend Known or New: Extended a Known Cave

Miles/Feet Found: 2550 meters (8,366 feet)

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## Name: Dave Haun

State/Area you cave: Kentucky, Indiana USA

Most successful Cave Dig?: Bryants (Indiana); 1 hour digging dirt-filled passage, 12 feet long, 30 inches wide, 20 inches high. This was an overflow passage, main passage was 8 feet wide but only 6 inches high. Saw a bat fly out of a hole in the overflow passage and started digging. Dig was at the end of a 100-foot belly crawl.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: +1.5miles

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## Name: Hal Love

State/Area you cave: Tennessee USA

Most successful Cave Dig?: 1995, Bill Walter and I found a hole in the ceiling of a crawlway in then 2-mile long Fox Hole Cave. The 6 inch by 2 inch hole moved lots of air. Returned with Joel Buckner and a drill the following week-end. Drilled two holes and popped it once. After knocking down several cubic feet of gravel, popped out into large passage. Total length of time for dig, approximately two hours. Man hours, about 4.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: 4 miles

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Continued on Page 9



## Name: Aaron Bird

State/Area you cave: West Virginia USA

Most successful Cave Dig?: We needed only one shot to open a constriction at the entrance of Helix Cave. Unfortunately the cave beyond the entrance was not very appealing. Essentially it was a down cutting stream passage that eventually turned into a canyon. Very few places in the cave allowed easy movement, and the short sections of walking passage that were found were all named for events that occurred when we found them. For example, Jettison Run was a nice smooth bedrock tube that was just big enough to run through, albeit while being slightly bent over. Greg's Flaming Highway was named when one of the sketchers was holding the survey book up over his head to see the passage and it inadvertently caught fire from his Petzl carbide ceiling burner.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: 4900 ft



## Name: Bob Kirk

State/Area you cave: West Virginia USA

Most successful Cave Dig?: Caves.com Cave  
About 10 tons of rock and dirt removal. Blasting in a few spots to widen the entrance. More digging and debris removal in one crawl passage. Total estimated man hours 760. Lots of air, one or two possible leads remain that require digging.

Extend Known or New: Cave was previously unknown

Miles/Feet Found: 500 ft



## Name: Thomas Shifflett

State/Area you cave: Virginia USA

Most successful Cave Dig?: I've been successful with several multi-mile projects. The most successful has been the Chestnut Ridge Cave System - a 14-mile long, 722-vertical-feet deep cave in Virginia. The breakthrough consisted of pushing the known end of Chestnut Ridge Blowing Cave, at the time less than a thousand feet of passage. Methods used were chemical, because micro-blasting had not yet been invented as we now know it. Really can't remember the man hours involved. It did take several attempts and hammering and chiseling through five continuous constrictions to finally get through.

Extend Known or New: Extended a Known Cave

Miles/Feet Found: 14 miles



Dig Wagon, left photo, made from a cake pan and wagon wheels hauls dirt from the 120 foot long dig, right photo, in Scott Hollow WV. Photos submitted by Terry Byland



## Expedition Digging and Exploration Equipment

### Gravity Charcoal Water Filter

by Terry Byland

For the last two years in Scott Hollow, we have been doing monthly trips working on expanding the cave system. The area we are working in is two miles from the entrance so we camp there for the weekend.

Right away I realized we had a water problem. The camps had anywhere from two people to twelve on a weekend trip. We were hauling it in from the creek and boiling it or putting iodine tablets in it. Some people carried in their own bottled water but that was heavy.

I talked to a friend of mine who works for the city water plant. What an eye opener that was. There are tons of parasites and bacteria that live in our streams today.

After explaining my situation he recommended a Gravity Charcoal ceramic water filter system. These filters are made of ceramic with charcoal on the inside. They can filter down to .2 microns. The charcoal purifies anything that fits through that.

Basically you have two five gallon buckets on top of each other with filters in the top bucket and a nozzle on the bottom bucket. You dump your dirty creek water in the top bucket and it soaks through the filter at the rate of 1 gallon an hour and drips into the bottom bucket.

These filters will filter out pathogenic bugs like ryptosporidium, Giardia lamblia and dangerous bacteria such as E. coli and Salmonella typhi. It will take care of sediments, chlorine, pesticides, nasty taste, bad odor, turbidities, worm eggs and spores.

The filters can be cleaned with a brush or a scoring pad, which they provide. The life of a filter is six months to a year or 150,000 gallons depending on use and water. The Gravity Charcoal filter systems cost \$150.00 to \$300.00 and the two replacement filters cost \$50.00 to \$100.00. In our situation that is pretty cheap. I found three web sites that sell these filter systems.



[www.caribocry.com](http://www.caribocry.com)  
[www.911water.com](http://www.911water.com)  
[www.sportsmanguide.com](http://www.sportsmanguide.com)

If you feel creative you can buy two 5 gallon buckets and a set of replacement filters and assemble it yourself. I used the filters to bolt the top bucket to the lid of the bottom bucket. Then I put a nozzle in the bottom bucket. Just be careful of the seals so the bad water doesn't leak into the good water.

So if you're camping in a cave or in the back woods this will provide a safe and easy alternative way to meet your water needs.

### Servus Hazmat Boots

by Mark Passerby

I decided recently to find a wellie style boot to try out, and after searching the web and a dizzying array of styles. I chose the Servus HZT Hazmat Knee Boot. I believe with shipping it came to somewhere around \$45 and took a good 4 weeks to arrive. It was worth the wait.

These boots are tough, comfortable, and form fitting with steel toes and a nice gripping sturdy sole. They have replaced my leather laced boots and seem to be virtually indestructible.



To order, I recommend Response Equipment Company on the web at: [www.r-e-c.com/prod\\_boots\\_gloves.html](http://www.r-e-c.com/prod_boots_gloves.html) or you can call them toll free at: 1-888-732-3838

### Customized Kokatat Test Caving Drysuit



The Kokatat test suit is being custom sewn by the company, and will be tested by Caves.com over the coming months. For starters the suit is totally waterproof, extremely breathable, and durable. It is our hope that by testing and sending feedback to Kokatat that they will be able to further advance the "breathable" suit into a serious expedition cave suit that will fit the task at hand for many cave situations in varying climates and conditions. Results of tests will be published in an upcoming edition of this magazine.

## Carroll Cave Update

By Rick Hines

The breakthrough came July 28, 2002, more than six and a half years after the first dig but less than a year after the first blast on this dig. Since the breakthrough, the scope of the Carroll Cave Conservancy's activity has expanded. Before July 28 we were focused on one goal, getting in. Now parallel efforts are moving forward on several fronts. We have groups working on:

- 1) An entrance building and ladder
- 2) Surveying,
- 3) Geology
- 4) History
- 5) Biology
- 6) Rescue preplanning
- 7) Conservation and restoration
- 8) Membership and Access Policies

A brief summary of each area of activity follows.

### 1) Entrance Building and Ladder

Excavation of the debris cone has formed a mesa with sufficient headroom for cavers to exit the shaft. Concrete will be poured below the shaft for the ladder base and an anchor for a steel cable that will be part of a ladder safety cable ascender system. Two stainless steel access ports have been built. The ports will be cast into a ground level concrete pad that will form the floor of a 16 foot diameter by 16 foot tall entrance building (a salvaged silo). The stainless steel ports will lead to an 8 foot diameter by 8 foot tall basement room at the top of the 110 foot shaft leading to the T- Junction in Carroll Cave.

Six 20-foot heavy duty aluminum ladders have been purchased. The shaft has been chipped and expanded to a 32-inch minimum diameter.

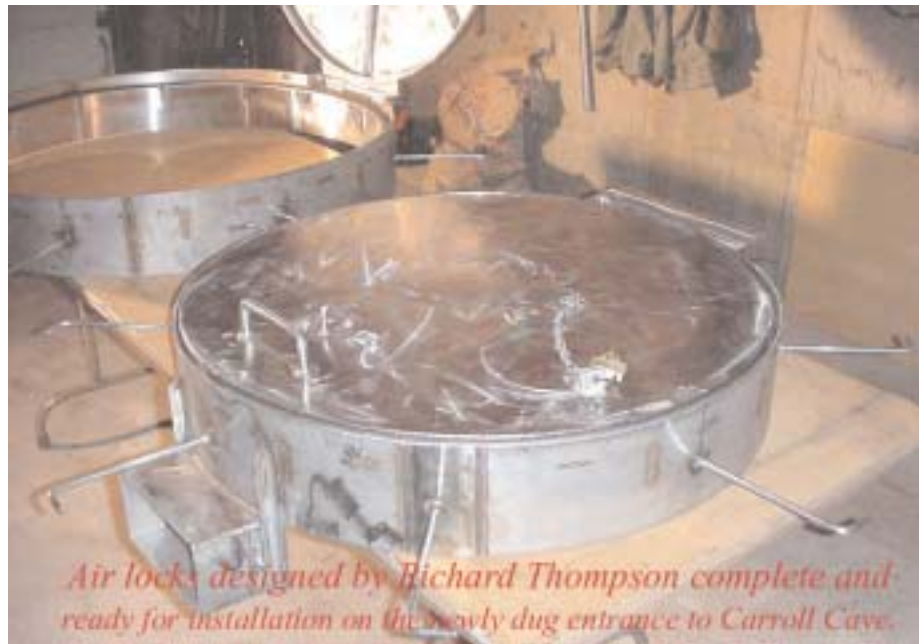
### 2) Surveying

The Survey committee has purchased equipment, including a miniature transit and has started surveying out from the new entrance. They plan to redo the original 12

miles of trunk passage and add the new surveys of over 100 side passages that are currently known but not mapped. The Survey teams have already discovered virgin passage and I am confident that many discoveries remain to be made.

### 3) Geology

We have analyzed thin-sections of rocks taken from the shaft at various levels and analyzed water samples taken from the shaft, Thunder River and Carroll River. We have measured radon levels and are starting on dye tracing from area sinks. We are working with the landowners to inventory all sinks in the area. We are hopeful that the geology effort will help guide our exploration.



### 4) History

Our historian is interviewing people involved with the early history of Carroll Cave (previously known as Traw Cave) and starting to collect and organize the written history. One of the landowners has offered to allow us to use an old schoolhouse for a bunkhouse. We have secured a donation to help with building a new roof. We hope to get started with the restoration in the spring.

### 5) Biology

We have recently accepted a biolo-

gist to head this committee and look forward to this effort growing. We know we have a large population of cavefish and several species of bats to study and protect.

### 6) Rescue preplanning

Our members have worked with the NCRC and the local fire department to sponsor a cave rescue orientation. We are continuing to work with the local first-responders and are working on rescue preplanning.

### 7) Conservation and restoration

We are working to recruit a qualified person to head our conservation committee. Our first trip to power spray wash muddied formation is planned for January.

### 8) Membership and Access Policies

We are still revising our membership and access policies and hope to have new versions ready for review at our Semiannual Members Meeting, January 12, 2003.

If you have an interest or expertise in one of the above areas, we would like to hear from you. To help the Carroll Cave Conservancy with your time or donation please contact Rick Hines, 913-897-4258 or email [rickhines@aol.com](mailto:rickhines@aol.com)



## Microgravity's Use in the Detection of Near-Surface Voids (Theory and Practice)

By Morris Hall

Gravity is the physical attractive force of one mass to another mass and is described by Newton's law of Gravitational Attraction where:

$$F = \gamma(m_1 \cdot m_2) / r^2$$

**F is the gravitational attraction (force)**

**$\gamma$  is the gravitational constant**

**$6.67 \times 10^{-8}$**

**$m_1$  is the mass of reference mass one**

**$m_2$  is the mass of reference mass two**

**$r^2$  is the square of the distance**

**between the objects.**

Newton's law basically states that the gravitational attraction, i.e. the force, between two objects is directly proportional to the mass of the objects and inversely proportional to the square of the distance between those objects. As objects increase in mass, gravitational forces increase. As objects get closer together, gravitational forces increase. Every object in the universe has a gravitation attraction to every other object in the universe. As an example of the gravitational force that can be exerted between two objects, Dobrin used the example of two billiard balls weighing in at 225 grams each, which were separated by 7.5cm. The gravitational attraction of these two objects is then calculated as:

$F$  (force in dynes) =  $6.67 \times 10^{-8}$   
 $(225)(225) / ((7.5 \cdot 7.5)) = 6 \times 10^{-5}$   
dynes : a very weak force.

In exploration for voids, only the vertical component of gravity is measured so that we are interested in "a" (acceleration) or:

$a = F/m_2$ , since  $F = m_2 a$ ; therefore  $a = m_1 / (r^2)$  where  $a$  is the acceleration of a mass  $m_2$  due to the attraction of mass  $m_1$  at distance  $r$ .

Since mass and density are related (Density = mass/volume), then the vertical acceleration component of gravity is related to the density of the objects causing the gravitational

acceleration and the distances between them.

In the cgs system, the dimension of acceleration is centimeters per second per second (cm/s<sup>2</sup>). Geophysicists refer to this unit of measure as the gal, in honor of Galileo. The gravitational acceleration at the Earth's surface varies, but is usually around 980 cm/(s<sup>2</sup>) or 980 gals.

In the exploration for oil and gas structures, buried river valley aquifers, and ore bodies, conventional gravimeters are used to detect the lateral changes in density of the Earth that are usually measured in milligals or 1/1,000 of a gal. Caves, voids, and archeological investigations require more sensitive instrumentation. Subtle near surface changes in density are measured with a microgravimeter that is capable of measuring differences of 1/1,000,000 of a gal or a microgal.

*So how can we take advantage of these fundamental physical gravitational principals in our hunt for caves and voids?*

One of the greatest naturally occurring variations in lateral density of the Earth is going from solid limestone at 2.7 g/cm<sup>3</sup> to an air filled cave at .01g/cm<sup>3</sup>. It is this density difference of 2.69g/cm<sup>3</sup> between a cave and surrounding rock that a gravimeter may detect.

In order to create the theoretical gravity at a point on the Earth's surface, a number of corrections need to be applied to the measured gravity.

### Latitude Correction

Because the Earth is flattened at the poles, gravitational acceleration increases in both directions from the equator. To create the theoretical sphere, the latitude correction is subtracted from the measured gravity to make this correction.

### Free Air Correction

Since gravity decreases with increasing elevation, the elevation correction is added to the measured gravity since the gravity measurement is made relative to sea level.

### Bouguer Correction

Since the theoretical Earth is a sphere at sea level, if a measurement is made above sea level, excess gravity caused by the material between the elevation of the measurement and sea-level exists and must be subtracted from the reading. The density of the material between the station and sea level must be estimated to make this correction.

### Solar and Lunar Corrections (Tidal Corrections)

Gravimeters are so sensitive that they can detect the gravitational changes related to the changing distances of the Earth related to the sun and moon as they move in space. These celestial corrections can be added or subtracted to the measured gravity, depending on the season, month, day and time of day. The moon and sun have an orderly and predictable gravitational influence on the Earth. The moon has a gravitational effect on the Earth over twice that of the sun because of its proximity.

### Terrain Correction

If the gravity survey is conducted in an area where there is considerable variation in the lateral elevation away from the survey, terrain corrections are applied to correct the station gravity for the effects of the nearby hills or valleys.

After all the above corrections have been applied to the measured gravity, the gravity is termed the Bouguer gravity: gravity measurements that are dependent on changes of density within the Earth. This Bouguer gravity can be thought of as the

Continued on Page 13

gravity that has been measured at a point in time and position on the Earth's surface that can be directly compared with gravity measurements from any other point on the Earth's surface that have undergone similar correction. This value is the summed gravitational effect between the gravimeter and the center of the Earth. In practice, this gravity reading is usually thought to contain influences of near surface lateral changes in density and deeper-seated lateral changes in density. Usually the Bouguer gravity data undergoes a final filtering process to help differentiate the shallow lateral changes in density from the deeper ones. Once the deeper-seated effects are removed from the Bouguer gravity, the near surface gravitational effects remain where are termed residual gravity. It is the residual gravity that we are interested in: it can contain "anomalies" which may be associated with caves.

### Errors in Gravity Surveys

Errors in gravity surveys are related to making the corrections to individual gravity readings as previously discussed and errors in the instrument itself: human error in reading the instrument and drift of readings related to the non-elastic response of the spring used to measure the gravitational attractions on the mass contained inside the gravimeter.

Following then are typical sources of error in a gravity survey and their approximate magnitude of error:

Latitude Correction  $\pm 20'$  Latitude =  $\pm 5$  microgals (at 45 degree attitude)

Bouguer and Free Air Correction Combined  $\pm .1\text{foot} = \pm 6$  microgals (using 2.7 g/cc Bouguer density)  
Tidal Corrections (including instrumental drift)  $\pm 5$  microgals  
Terrain Corrections  $\pm 20$  microgals (typical)

Instrument Reading Error  $\pm 1$  microgal

The total maximum error in any one gravity reading is therefore the sum of all errors or  $\pm 37$  microgals.

However since there is only a small probability that all errors would be additive, a better estimate of the error associated with any one survey reading would be represented by the standard deviation of the above errors or  $\pm 7$  microgals.

It is important to understand that any anomaly associated with a cave would therefore need to be significantly greater than this standard deviation of error, or the anomaly would be indistinguishable from these sources of error. The typical minimum anomaly would need to be about three times the standard deviation of error or 21 microgals.

### Special Field Survey Considerations

It is possible to minimize the above errors in the field.

(1) Measure profiles in the east-west direction. Therefore no latitude correction.

(2) Use commercial grade GPS in estimation of elevations: accurate to  $\pm 1$  cm or  $\pm 2$  microgal

(3) Repeat readings (reoccupy stations) to average errors in tidal corrections and instrument reading errors: improvement from  $\pm 6$  microgals to  $\pm 3$  microgals

(4) Use digital topos to make terrain corrections: improvement of  $\pm 10$  microgals to  $\pm 10$  microgals

With extraordinary effort, gravity surveys can have a maximum sum of errors of  $\pm 15$  microgals, with a standard deviation of  $\pm 4$  microgals. Therefore the minimum anomaly above error could be as low as 12 microgals.

### Gravity Interpretation

It is important to be able to compare the residual gravity anomaly with theoretical models that describe the possible geology that could cause such an anomaly. The theoretical model that I like to use for a cave is that of a horizontal cylinder which yields a minimum residual gravity expression over the cave. For example, a cave at 80' in depth, with a height of 40' located in dolomite of

2.76 g/cm<sup>3</sup> (air filled) has a residual gravity anomaly directly over the cave of -136 microgals. This "model" of a cave can then be compared with the actual residual gravity (both in magnitude and shape of the anomaly) in order to predict the likelihood of a cave being present as well as the depth to the cave and the likely dimensions of the passage.

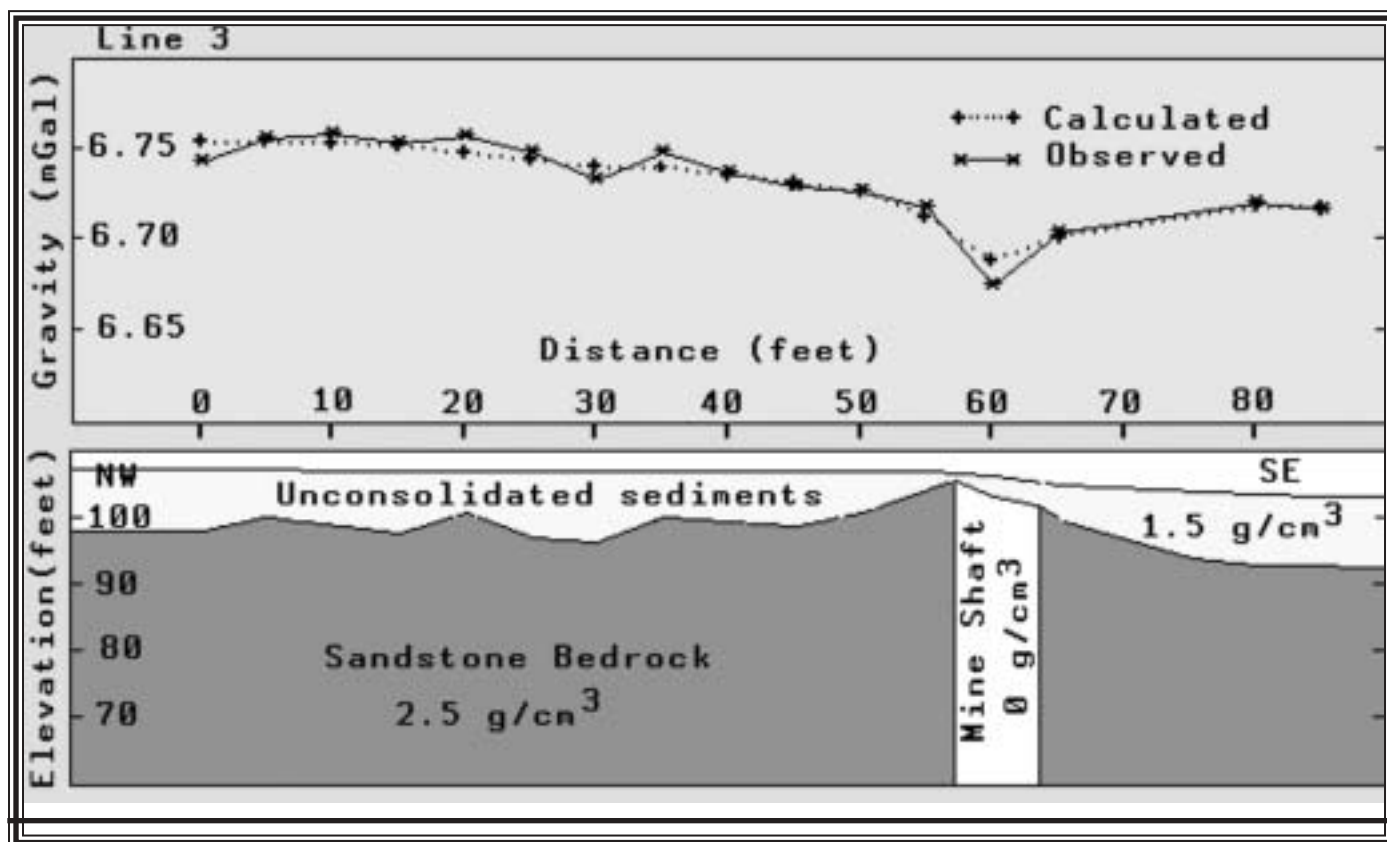
### Practical Stuff

The exploration for caves using microgravimetry has been going on since the 1940's. The problem in using the technique is the non-uniqueness of any interpretation derived from the recording and processing of the gravity data. In most surveys, many anomalies are found that often do not relate to caves. The reason is that unless the cave is large, filled with air, and near the surface, it will be indistinguishable from background noise as previously discussed. In my opinion, the microgravimeter has its greatest application in tracking the lateral extent of a cave that has been discovered and the lateral extent of the cave is unknown. Repeating a gravity survey lowers the risk of a false anomaly if the same magnitude and shape of the residual gravity is similar to the original survey. The use of other geophysical methods to confirm the microgravity's findings is recommended.

Dobrin, Milton B., Introduction to Geophysical Prospecting, 1976

**Editor's Note:** Various microgravity studies have been done recently in the Greenbrier Valley, WV by Jeff Bray. Some of his data was and is being used in new and existing cave discoveries. Our next issue will feature some of those stories.

## Sample plot of Microgravity Survey over a Mine Shaft



### Cave News

#### Digging Connects Caves to Make Greenbrier Counties 11th Longest System!

The Boar Hole - Portal System

On December 15, 2002 an ongoing dig in the northern section of the 4.5 mile long Boar Hole in Greenbrier County, West Virginia broke into known passage of the 6.1 mile cave called The Portal. The dig was accomplished by normal techniques and good old fashioned hard work. Members of the West Virginia Association for Cave Studies (WVACS) were involved with the dig and the breakthrough crew was composed of Pam Tegelman, Tom Malabad, Larry Fisher, and Vonny Droms. The Boar Hole is owned by WVACS member Carroll Bassett and The Portal is owned by WVACS

members Dave and Sandy Cowan. The resulting connection gives Greenbrier County it's 11th cave system over 10 miles in length. There are 1228 known caves within the county. Submitted by Bill Balfour  
**NOTE:** See Yvonne Droms article with more details on this breakthrough in this issue.

#### Digging Opens Persinger Entrance to Benedicts Cave i.e. Mudslide Newsletter

The Persinger entrance to Benedicts Cave in Greenbrier County, WV was recently acquired by the WVCC (West Virginia Cave Conservancy) and in November 2002 efforts were successful in reopening the plugged entrance and making caver access now possible. This puts roughly 24 miles of cave that was previously closed or not easily accessible now open to further exploration and study.

#### Big Efforts Yield Big Rewards! The Reopening of Maxwellton Sinks Cave

After months of work and efforts by dozens of cavers, a new entrance to Maxwellton Sinks has been opened. The approximately 10 mile long cave had previously been closed by a massive flood in the early 70's. Much work still remains to be done to further stabilize the dig site, but the new entrance assures cavers access to continue mapping and checking the many unchecked leads. The process of locating the dig site involved the use of microgravity studies, well drilling and big excavating equipment and is quite a story. The next issue of Caves.com will cover the story.

Find the magnetic declination of any point on earth by going to <http://www.ngdc.noaa.gov/cgi-bin/seg/gmag/fldsnt1.pl> and remember to put those dates on your cave survey so future generations can get an accurate plot.



# Caves.com Yahoo Discussion Groups

Caves.com maintains several groups hosted by Yahoo. The website addresses and interest areas are listed below. Everyone is welcome to join and participate.

**Cave Digging**— <http://groups.yahoo.com/group/cavediggers/>

**Vertical Caving**— <http://groups.yahoo.com/group/cavescomverticalcaving/>

**Surveying**— <http://groups.yahoo.com/group/cavescomcavesurveying/>

**Cave Rescue**— <http://groups.yahoo.com/group/cavescomcaverescue/>

**Geology/Hydrology**— <http://groups.yahoo.com/group/cavescomcavegeohydro/>

**Biology**— <http://groups.yahoo.com/group/cavescomcavebiology/>

**Cave Diving**— <http://groups.yahoo.com/group/cavescomcavediving/>

**Bat Conservation**— <http://groups.yahoo.com/group/cavescombatconservation/>

## Meet Terry Ragon---Caves.com Survey Discussion Group Moderator

My name is Terry Ragon and I am the current moderator for the Caves.com survey discussion group. I would encourage anyone with an interest in mapping to join our group since the more members we have, the more information we can share amongst the group. We currently have 34 members in our discussion group which continues to grow each month. Go to

<http://groups.yahoo.com/group/cavescomsurveying/> to join.



I'm a member of the Birmingham Grotto (although I currently live in Huntsville, AL) and have been caving in the TAG area for the past 14

years. I became interested in surveying about 3 years ago and since then have spent most of my caving days mapping recent finds in North Alabama. Although mostly small, I've managed to publish 29 maps in the past 2 years, 3 of which have even been awarded ribbons at the NSS Cartographic Salon. Unfortunately, Engineering School has seriously cut down on my time for drawing maps the past 6 months.

Earlier this year, friends from the Birmingham and Dogwood City Grottos helped me complete the re-survey of a well-known cave owned by the Southeastern Cave Conservancy, Inc.---Horseshull Cave. Horseshull was originally mapped by Bill Torode in 1971 to a length of 2946'. However there have been strong rumors in recent years that a "missing passage" was left off of Bill's map. The possibility of re-mapping the cave was mentioned to me, and soon a plan was set into motion.

The project started on November 3, 2001 as I was joined by my two most reliable survey partners to



date: Chrissy Frotten and Scott Fee. We spent five hours mapping from Entrance 1 to one of the coldest section of the cave, netting a total of 1168' of survey before stopping at a 12' virgin pit. Although we would've loved to carry our survey into the unknown, the pit was far too tight for even Chrissy to enter, and the management plan would prevent us from modifying the passage without permission anyway.

Two weeks later I returned with Scott Fee and Julie Henderson to continue the survey. We began in the main trunk then worked our way into the breakdown area of the cave until stopped by time constraints. All together we had set 24 stations and added 696' to the total survey. As we hiked back to the vehicles, Scott

Continued on Page 20

## A little digging goes a long way...

by Yvonne Droms

We arrived at the dig site after almost two hours of searching for the correct way through a mean, nasty pile of breakdown. We set to the task of digging immediately, knowing we had only a limited amount of time to spend in the cave. I took the first shift and slithered into the tunnel, a digging shovel in one hand, my Mag light in the other, and a Tikka strapped around my forehead. It seemed plenty spacious at first but the ceiling soon started dropping down. It was not long before I was barely able to turn my head from side to side. Luckily, the air was good and a breeze blew by my face, giving me a sense of space and keeping me from feeling claustrophobic.

I progressed about 80 feet, following a body-sized channel that had been dug out in previous months by Larry Fisher and Gordon Cole. They had spent many hours here, digging their way towards they knew not what. Now it was my turn to continue their work, my turn to push on into the unknown. I elbowed my way forward, encouraged by the good air and the tantalizing slice of space visible in front of me, stretching into the darkness. When the ceiling started squeezing down on my shoulders, I stopped and got ready to dig. Ahead of me and to the sides, I could see for a long way: a flat ceiling and a flat floor, separated by about six inches of space. Every now and then, there were some slightly deeper depressions, and I aimed for those, of course.

Behind me, Larry Fisher, Pam Tegelman, and Tom Malabad were waiting out their turn to dig in this remote section of the Boar Hole, a 4.3-mile cave located in northern Greenbrier County, West Virginia. I had lost voice contact with them, and so I now concentrated on my task. The soil was pretty soft and not gooey or clayey at all, so it was not very hard to scrape it away. But

doing so was very awkward, because I could not move much, nor could I move the two-foot-long shovel around effectively. The best way was to shove it ahead of me, upside down, and to press forward to make it dig in, pry it sideways to loosen a chunk of soil, then use my arms and hands to push that dirt aside. In this way, I was creating myself a body-sized channel with raised walls of dirt on the sides.

It was tight and awkward, but the digging went fast, and in some places I was able to push my body through instead of having to dig, thereby gaining a few easy feet. I progressed by almost 30 feet in this way in about a half hour. At that point, Tom came up behind me to take a turn. I relinquished my spot, albeit not very willingly. I backed out towards him until we

"there were places where it was so tight that we were scraping our backs on the ceiling while pushing ourselves forward."

found a place where we could squeeze by each other. I watched Tom enlarge my channel a bit so he would fit more comfortably. After I got cold, I contorted myself enough to be able to turn around, and so I headed back to Larry and Pam. I found them warming themselves by the heat of a candle, huddled under a tarp.

Tom dug and dug while we chatted in the heat tent. We were getting ready to change the guard when suddenly we heard Tom's voice in the distance. He was yelling to us that he had broken through! Walking passage, then big canyon! How exciting! We threw our tarp aside and jumped up. Larry and I were ready to go check it out, but Pam reminded us of the time. We needed to head back. I was foaming at the



Yvonne Droms climbs out the cable ladder in the culvert of the Boar Hole right after the digging team made the connection with The Portal. Photo by Tom Malabad

mouth, but we had no survey gear with us, so it made sense to come back the next day to survey the dig and then continue on.

So Tom came back and enthusiastically shared with us what he had found on the other side of the constriction: wide open passage, dunes, sinks, a deep canyon, and the sound of a stream. We gathered up our gear and left the cave in a very good mood indeed. Back at the WVACS fieldstation, we spent an exciting evening speculating about what we had found. More Boar Hole or another cave? We knew there was a large cave nearby, The Portal. Wouldn't it be great if we had broken into that?

The following day, December 15, 2002, we were in cave at 11 a.m. and at the entrance to the dig about one hour later. Being lead tape, I started into the tight tube, this time with my helmet on and pushing my pack ahead of me since we wanted to continue the exploration beyond the dig after surveying through it. In one hand I had the survey tape, and in the other a roll of flagging tape to

Continued on Page 17



## Continued from Page 16

set the stations, and it all felt suddenly very claustrophobic. I took my helmet off and that made me feel a bit better, but now I had to push it along in front of me together with my pack and the survey gear, not an easy task in that tight tube. I progressed by about 25 feet and tried to set a station for Larry to read behind me. It was really difficult to work in there!

Larry took the readings for that station and so I progressed forward, awkwardly, to set the next one. By the time Larry arrived at my previous one, I started hearing some discussion behind me. This was not going to work. This was crazy! After some more conversation that I could not understand, Tom suggested that we survey through the dig without being encumbered by all our gear.

That suited me fine. I pushed my pack and helmet aside as soon as I found a spot large enough for it, and also removed my gloves and elbow pads. I felt suddenly a lot better after getting rid of all that stuff that was blocking the view in front of me and making me feel trapped. Pam came into the dig, and she and I did a surprisingly fast job of surveying the 140 feet or so of super tight passage. It couldn't be easy for Pam to read instruments with her chin on the floor and the top of her head against the ceiling! But nothing like a good incentive to make you hurry up a bit and get out of there!

It felt wonderful to break out of the dig on the other side, because there were places where it was so tight that we were scraping our backs on the ceiling while pushing ourselves forward. Tom obviously had been using the same technique as I: dig deeper occasionally to have a refuge to go back to, a place to feel OK, then dig just enough to get through in other places... In any case, it felt wonderful when I emerged into a space tall enough for me to sit. I announced the good news to Pam behind me, knowing she'd be thrilled to know it was almost over. Tom was

sketching behind us. How he managed to do that in a passage only ten inches tall, I have no idea...

Once out into walking passage, Tom noticed a side lead to the left. He headed into it to check it out. We soon heard some more excited yells! He had found footsteps and a couple of survey stations. We had broken into another cave!

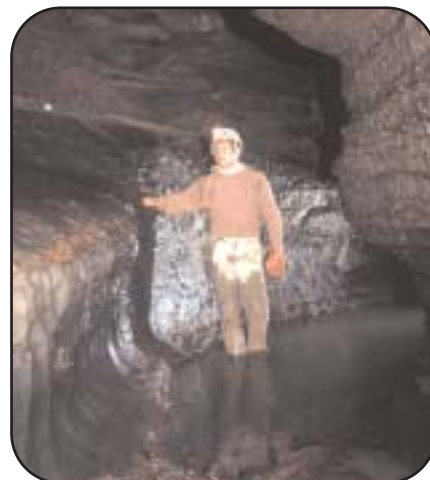
It had to be The Portal, a 6.1-mile cave. But we were not certain. We were hoping we had not broken into a part of the Boar Hole not shown on the most recent map... We chatted excitedly while tying our survey into one of the existing AT survey stations. Pam kept saying it was not The Portal, just so that we wouldn't jinx our luck! We plunged back through the dig and started back out of the cave as soon as possible so we could consult the maps stored either with Carroll Bassett, the owner of that entrance of the Boar Hole, or with Dave Cowan, the owner of The Portal. Wouldn't they be pleased to know that they were now suddenly underground neighbors?

Our gang of excited cavers trooped out of the vertical culvert into the snow-covered woods and slithered down the steep embankment towards Carroll's house. He was not home! We changed and drove up to his shop and found him there. Carroll did not think there was an AT survey in the Boar Hole, so we were getting more and more certain we had hit The Portal. We called up Dave Cowan, who immediately came over, but we could not find an AT survey on his less detailed map of The Portal. Finally we called Bill Balfour, the keeper of all the recent records for that cave. After a few agonizing minutes, Bill confirmed there was an AT survey in a remote part of The Portal! We had done it...

It was a historic moment. Boar Hole (4+ miles) plus The Portal (6+ miles)... A new 10-mile cave system in Greenbrier County was magically born. A little digging did go a long way!

## Some Boarhole Photos

by Ed McCarthy



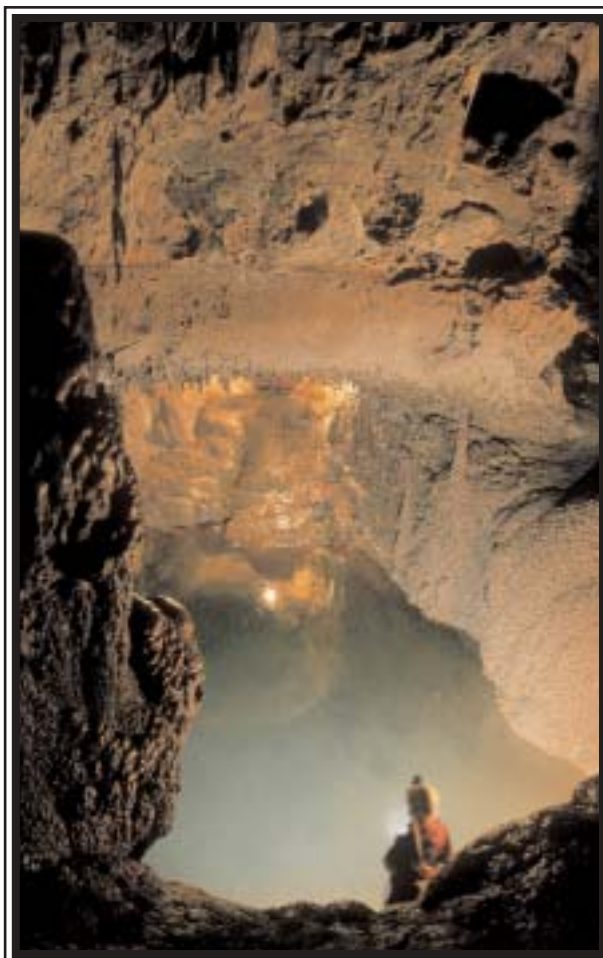
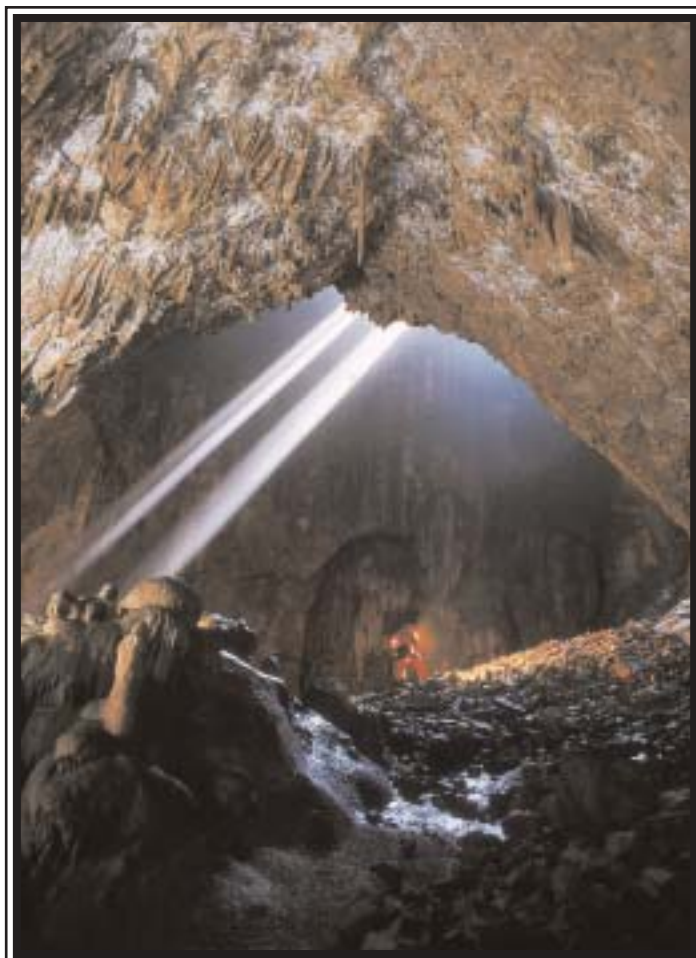


# Cave Photography by Peter Gedei

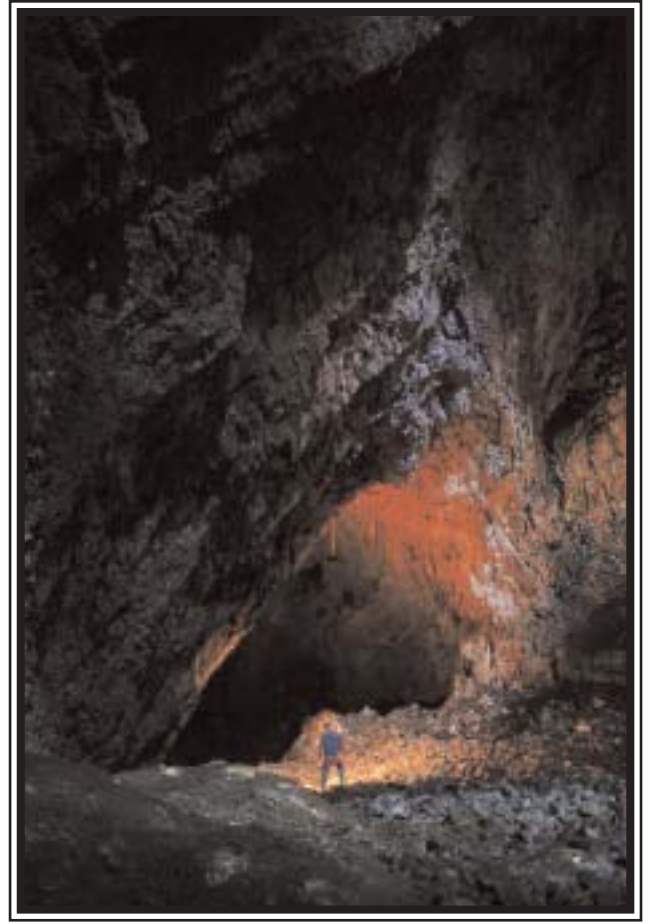
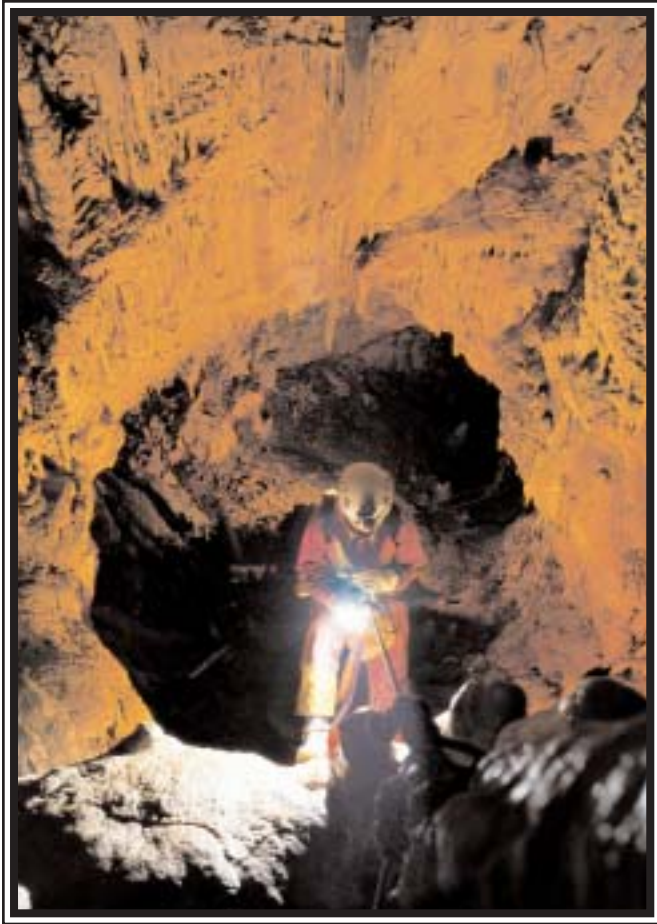
When you see the cave photography, you only see the beauty. What you don't see, is the hard work, everyone involved has to put in. These pictures were made with a lot of assistance from my friends-cavers, who - with their love and devotion towards speleology and wonders of the underworld - helped to conjure this miraculous world to the non-cavers. I have never used any filters, double expositions or any kind of tricks while taking pictures. There are also no digital manipulations with the shots. They were all scanned on drum scanners, and later on made smaller and corrected, until they resembled the original as much as possible.

I would like to thank all the members of Speleo club Zeleznicar, who have assisted and helped in making of these photographs.

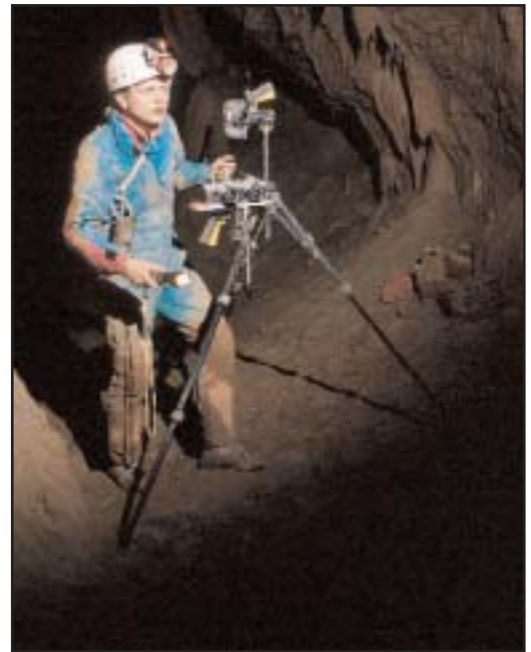
Peter is from Slovenia. Centerfold and cover photos were taken in caves located in his home country.







All the shots were taken with Olympus OM-2sp and OM-4T cameras, Zuiko 28/2, Zuiko 21/2, Vivitar 19/3,5 and Vivitar 28/2,8 lenses, Metz 45CT-4, Vivitar 283 flashes and Osram Vacublitz M3 bulbs. All photographs were taken with Fujichrome Color Reversal films.



## Continued from Page 15

also cleared the trail of blackberry thorns quite a bit with his machetè.

Our next trip into Horseskull was held on December 1, and I was lucky to have enough volunteers for two survey teams. Mudpuppy joined Chrissy and I as we started "mopping up" side leads left from the previous trips. We set 40 stations in four different sections of the cave, and Chrissy even scored about 100' of virgin passage by pushing a very small, sandy crawl. Mudpuppy was able to climb up a narrow canyon to help us complete one of the loops near the entrance.

The second team that day consisted of Andy Porter with Tony and Christine Voudy. They started in the large breakdown mid-section and slid into the very muddy portion that forms the "end" of Horseskull. After 4.5 hours, they added 754' to the survey bringing the total to 3202' (0.61 mile). Andy free-climbed up a nasty 20' exposed section in the hopes of adding a bit more to the survey, but actually Bill had been there before and mapped it, too!

By the end of the survey, we had discovered there was no "missing passage" to be found! And later after speaking with Bill Torode, I discovered that he had heard the same rumors, and had re-mapped the cave. Now we are BOTH certain there is no "missing passage" at all! :

Horseskull Cave consists of predominantly walking-sized passages formed in the Monteagle Limestone of Jackson County, Alabama. The cave is made of essentially one main level with several climbdowns leading to a lower level choked with breakdown. These lower levels fill fairly quickly after a heavy rain, and form pools of water in the main passage. Several large piles of guano can be found near the "middle" portion of the cave, although a sparse bat population inhabits the space now. Entrance 1 is a 6' diameter pit that drops 29' along the rocky wall. The second entrance is a steep mud

slope leading to a climbdown (total depth of 30') which may require a handline for safe passage.

The cave was turned in to the Alabama Cave Survey by Leonard J. Munson of the Chattanooga Grotto around 1961. However, the cave was known to local farmers for many years before its "discovery" by cavers. The signatures of several can be found on the walls throughout the cave and date back to the early 1830's. Marion O. Smith visited the cave on two separate occasions (in 1973 and 1982) and documented a number of signatures belonging to Union soldiers; and although the cave appears to have seen a high amount of traffic in 1861 and 1862, there is no evidence of saltpeter mining to be found.

In 1997 The Southeastern Cave Conservancy, Inc was able to purchase Horseskull in an owner-financed deal. The cave was owned by a family who wanted to see it (and the surrounding land) protected forever. So thanks to the efforts of 'JV' Van Swearingen and Mark Wolinsky, forty acres of land surrounding Horseskull Cave were added to the SCCi Cave and Karst Preserve.

Presently, the cave remains under the care of the SCCi, and is open to visitation without permit. The management plan asks that cavers limit the size of their groups to 12 or fewer, and please note the parking spot for the cave is on the side of the paved road opposite from the cave (marked with yellow SCCi Preserve Boundary signs).

### Sources:

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- Munson, Leonard J. c.1961. Catalogue of Alabama Caves and Caverns, Entry #613.
- Porter, Andy. 2001. Personal communication.
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Smith, Marion O. 1984. "Union Soldiers and Other Names in Horseskull Cave, Alabama". Birmingham Grotto Newsletter, January 1984, pp. 4-9.

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Torode, Bill. 1971. Map of Horseskull Cave.

Wolinsky, Mark. February 18, 2002. Email communication

See Terry's Horseskull Cave map on page 21. Map won a Blue Ribbon at this years(2002) NSS Cartographic Salon(Apprentice Category).

## Cordless Drills for Micro Shaving

### Bosch 24V Annihilator



### Hilti 24V TE5A



### Hilti 36V TE6A



Hilti drills can commonly be found on [www.ebay.com](http://www.ebay.com), whereas the Bosch can be purchased new from sites such as [www.utterguys.com](http://www.utterguys.com)



# Horseshull Cave

Jackson County, Alabama

Grade 5 Survey Nov 2001-Jan 2002

Scott Fee Andy Porter

Chris Frotten Terry Ragom

Julie Henderson Christine Voudy

Mudpuppy Tony Voudy

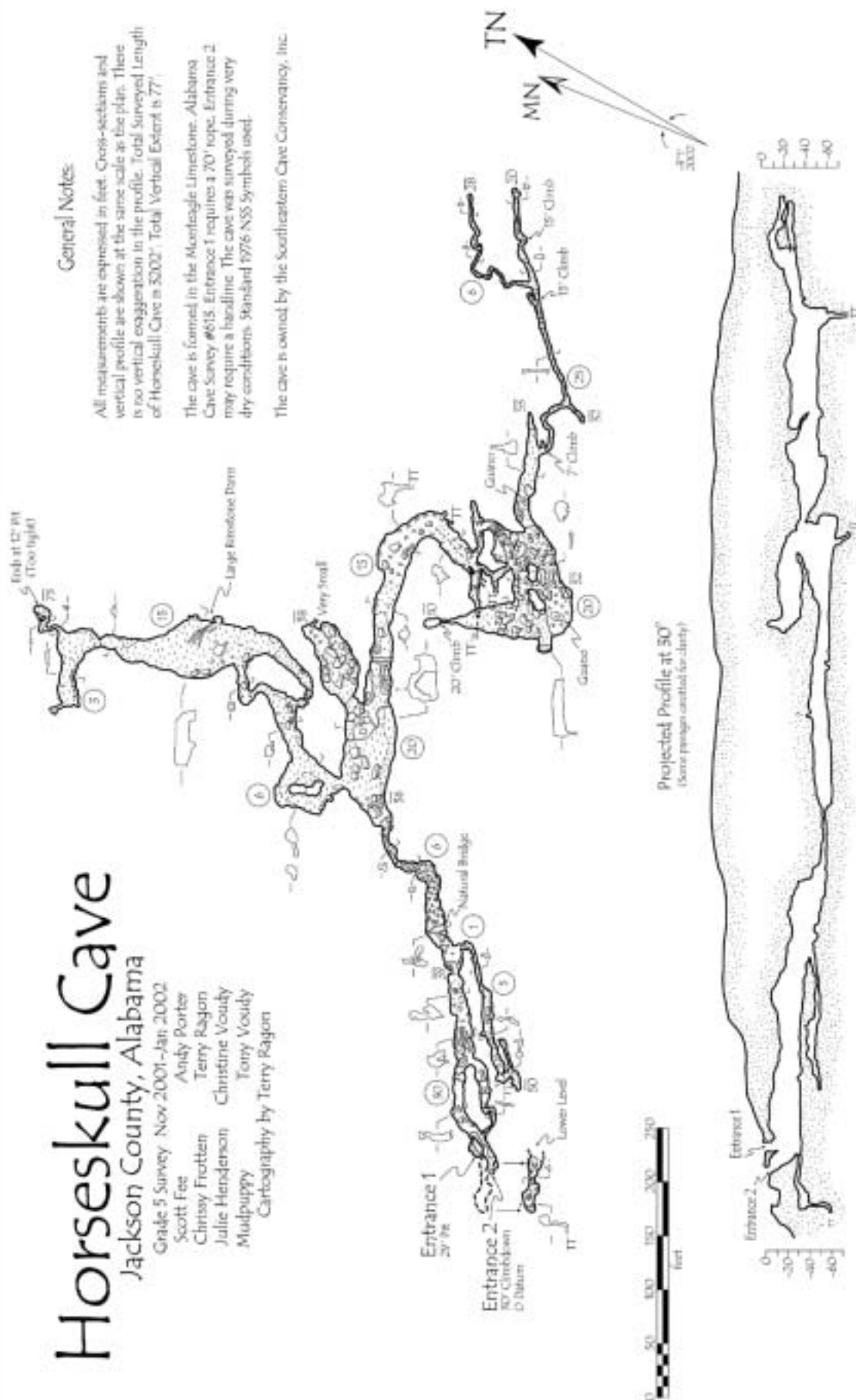
Cartography by Terry Ragom

## General Notes

All measurements are expressed in feet. Cross-sections and vertical profile are shown at the same scale as the plan. There is no vertical exaggeration in the profile. Total Surveyed Length of Horseshull Cave is 3002'. Total Vertical Extent is 77'.

The cave is formed in the Murtagie Limestone. Alabama Cave Survey #615. Entrance 1 requires a 70' rope. Entrance 2 may require a handline. The cave was surveyed during very dry conditions. Standard 1976 NSS Symbols used.

The cave is owned by the Southeastern Cave Conservancy, Inc.

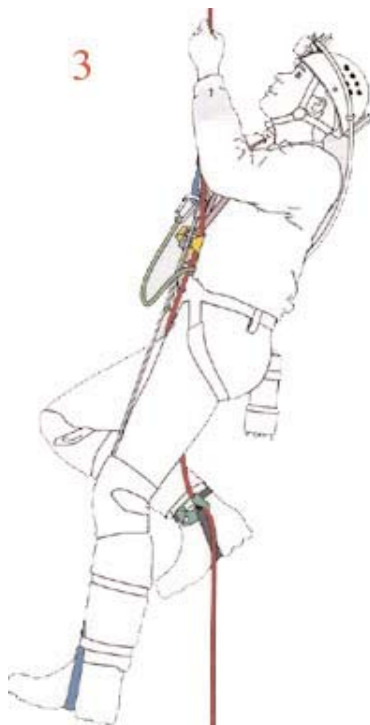
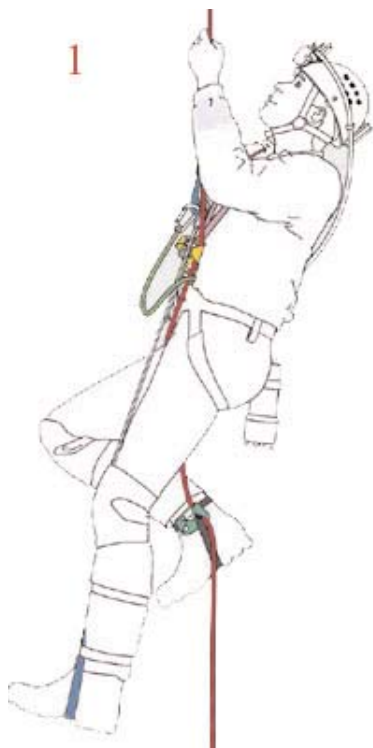


## The Petzl Pantin



In a recent survey conducted by Caves.com participants were asked among other things if they use a Petzl Pantin or similar device. 58 cavers from around the world participated, and 11 of those or approximately 19% currently stated that they use the Pantin.

Petzl states on their site that the Pantin offers a big advantage for long rope ascents and helps to hold the body in a more upright position with faster ascents and less tiring of the arms. It is not an item of Personal Protective Equipment (PPE).



## The Pantin by Yvonne Droms

The Pantin foot ascender is a nifty little device that helps you climb ropes more effortlessly when using a frog system. It has been around for a few years but has only recently been widely adopted by froggers. This is especially true in Europe, but I am starting to see it being used more and more in the US. I was introduced to the Pantin by a British caver, Robbie Warke, during an expedition to Mexico in 2001. There was a sequence of pits that included a 150-foot climb followed almost immediately by a 300-foot one. Robbie showed me his Pantin, and explained that it made climbing long drops with a frog system much more efficient.

After trying it out myself, I was convinced. The main problem with climbing long-distance with a frog system for me was always that I tired out my arms after a while, maybe due to poor form. The Pantin forced me to keep my position on rope vertical, which allowed me to climb without using my arms as much to pull myself towards the rope at each step. This is because when you step on the Pantin, it straightens the rope with the weight of your body, thereby lining up the three ascenders vertically.

Once back in the US, I got myself one and have since used it on all long drops. I don't bother using it on short ascents under 60 feet or so, unless of course I happen to have it strapped to my foot already. This past summer my Pantin came in really handy when working in Hellhole, WV: I would take it down the 160-foot entrance drop and leave it stashed there for the climb out. The other pits were all under 90 feet and so it was not worth dragging the device with me through the crawls, even though it's very lightweight at 125 grams (5 oz) and takes up very little room.

Other advantages of the Pantin include not having to trap the rope in

**Continued on Page 23**

## Continued from Page 22

between your feet when self-starting; having an automatic footstep on rope when needed, for example when doing change-overs from ascent to descent, during rebelay against sheer walls, or when getting off rope at a difficult lip; and keeping your pack's tether from tangling up with the rope while climbing.

The Pantin is not always an advantage on rope: when crossing a deviation or redirect, for example. But luckily it is very easy to disconnect from the rope: by bending your knee and kicking back with your foot, it comes off automatically. Since it does that so easily, the Pantin is strictly considered an accessory on rope, not a main ascending device, and should therefore never be used as a safety or to replace another ascender. It belongs strapped on your foot. This is achieved by means of a little harness that positions the device in the correct place, just a couple of inches above your heel.

In a way the Pantin turns a frog system into something similar to a rope-walker, but not quite. I find it a real help on long climbs and it has now become an integral part of my ascending system.

### Cave soil bacteria battles deadly fungi

by Peter Febbriello

There is a corner of my garden that is flooded frequently by an overflowing spring. Over the years, the soil has become depleted of nutrients in that area and nothing but evil weeds seems able to grow there. Garden plants die off soon after planting, or simply don't do well at all, even with improved drainage, adequate fertilization, and soil replacement. Eventually, I was able to culture *Geotrichum* fungus from the effected area.

*Geotrichum* is a common soil fungus with a modest history of troublemaking. Some skin ailments are traced to it, and it is sometimes a causative

agent in cases of intestinal discomfort. Internal infections can become terminal.

*Geotrichum candidum* is preventing my garden from growing.

It may also be the reason inhabitants of Mumbai, India cannot grow crops. Soil samples from that region were sent to me to investigate causes of crop failure, and *Geotrichum* was the only organism cultured. It has been found in some samples of Foval formations from Zinzalusa Cave, Italy, and also from cave soils from Eggleston County, Virginia. When this fungus is found in caves, I have discovered that the bacteria that grow along with it are producing chemicals, which are actively inhibiting the growth of *Geotrichum*.

This could be a good thing. Although *Geotrichum* is not as troublesome as Histoplasmosis or Aspergillus, it is a good indicator for screening bacterial cultures for antimycotic activity since it is easily contained, does not produce dangerous aerosols or airborne spores and is fast growing, producing results virtually overnight.

Antibiotics against fungi are sorely needed in the medical community. Procedures such as stem cell transplants for treatment of Leukemia are highly dependant on the use of toxic antibiotics such as Amphotericin, to protect patients from fungal infection during the period of vulnerability when the immune system has been shut down by therapy.

This drug is much despised by patients due to the severe and sometimes dangerous side effects that are experienced. In the search for a better drug, extracts from the cave-bacteria media that contain unknown anti-fungal activity, have been sent to Biomes Inc. where Dr. Miles Hacker will begin the long, tedious task of determining the nature and structure of the substances. Even if these chemicals prove unsuitable for human or animal use, they might be beneficial in the recovery of agricultural lands.

There could be similar bacteria-fungus battles being fought in many caves.

Can we find a similar system in all caves throughout the world? Cavers are being asked to submit soil and mud samples for screening. Newly opened caves are prime sources for new discoveries. The weapons of war in the battle against disease are found in the simplest and quietest of places, such as a pinch of soil in an unseen passage of an inaccessible cave.

Contact Peter at email:

[researchsupport@skyweb.net](mailto:researchsupport@skyweb.net)

**Note:** Peter is the moderator of the Caves.com Biology Discussion Group. To join go to <http://groups.yahoo.com/group/cavescomcavebiology/>

### Protect Your Investment

by Steve Wells

The custom built drill case by Howie's Harnesses, below photo, can be made by contacting them at: 304-227-3675 There may be other firms that can manufacture a case to fit your drill as well.



**Below:** Batteries Expensive? Try a Chicago electric battery and charge. The batteries run about \$50 and the charger is around \$20 (its a 1.7 amp hour battery).

For the adapter we dremeled a piece of lexan an inch and a quarter to fit in the drill comparable to the original battery. The rest is simply soldering a few trailer hitches.





## Jay's Background:

I began caving in 1977 in Maryland with the Frederick Grotto. My first "wild" caving trip was remapping George Washington Cave in the eastern panhandle of West Virginia with the guy who got me into caving in the first place, Mark Johnsson. In 1978-1982 I was a student at Virginia Tech, where I was active in the cave club mapping in the caves of Skydusky Hollow, Virginia.

I took a hiatus from caving during my military service from 1984-1993, although I did some lava tubing on Cheju-do Island, Korea and also poked my weapon/head into some holes in the Kurdish territory of Turkey and Iraq. During training with the Austrian Mountain Troops on the Loferer Steinberge mountain I looked down a few alpine shafts and got back into caving upon my return to Fort Bragg in 1992. I caved there with the Triangle Troglodytes and also became a member of the West Virginia Association for Cave Studies. From 1993-95 I lived in Baltimore where I was studying pre-med and caving/diving with the Baltimore Grotto. Much of my caving was in Virginia and West Virginia. I also trained for sump diving specific caves with Joe Kaffl and the Northeast Sump Exploration Team (NEST).

In 1995 I entered the University of Minnesota School of Medicine and graduated as a physician in 1999. During my time there I became good friends with Dave Gerboth and John Ackermann. Most of my MN caving was in John's karst preserve caves: Spring Valley Caverns, the Big One, and Riverview Cave as well as the smaller ones in the preserve. I managed to attend the 1998 NSS Convention in Sewanee, TN and spent the week prior to this doing Alan Cressler's "TAG Deep caving camp" in the area of Little Coon Valley.

After med school I moved to South Dakota for my residency training in family medicine (just completed this past June) and got involved with Jewel and Wind Caves. I map with Rod Horrocks in Wind Cave when I get the chance. The Colorado Grotto has also been very kind to include me in their monthly weekend mapping trips into Wind Cave. I've mapped a couple small caves here in the Black Hills, namely Blue Rock Crystal Cave, Gravel Springs Cave and Thornton Cave. In 2000 I married Jodi Oberstein, a nurse at the hospital. We have a son, Nicholas, born August of 2001.

Of late I've been doing some fun alpine caving in Montana and Wyoming, mostly with the Northern Rocky Mountains Grotto. They are very active in Montana and enthusiastic cave mappers. My wife's twin sister caves with them. Last year I helped map Lost Creek Siphon (MT), the definitive map is now done after over thirty years' effort. It is a cold alpine river cave that is almost entirely a series of shafts taking lots of water and was very intimidating to some of the explorers. Rebelay technique and modern cave suits, along with Willie Hunt's water-resistant radios, allowed us to bottom the cave multiple times during the survey. This past summer I had the

privilege of going to the South Cirque of Silvertip Mountain (in the Bob Marshall Wilderness Area of Montana) with Hans Bodenhamer and Jason Balensky. The hike in was grueling but the area is a magnificent karst pavement with some very neat caves. In September I participated in the International SRT Exchange near Driggs, Idaho and really learned a lot of interesting vertical techniques from the cavers of the Polish Mountaineering Association.

At the present I'm on "break" from medicine awaiting the results of my licensing examination, which I took last week. I'm working on an article on harness-hang syndrome as well as evaluating Petzl's NEST S61 Cave Rescue Stretcher. I'm also trying to get more survey trips with Rod into Wind Cave, which I find to be an absolutely fascinating cave. My caving interests include expedition caving, alpine karst systems, vertical techniques (and gear in general) and caving medicine. I've done some explosives work with John Ackermann and want to learn micro-blasting soon. Bolting is one of my specialties: I have Hitachi and Bosch rotary hammer drills (wired for lead-acid batteries) as well as 10mm and 8mm self-drill kits. While in Minnesota I bolted solo up an overhung 10meter wall (under a waterfall's spray) in Spring Valley Caverns to find some nicely decorated passage: we had to terminate the survey of the stream passage up there rather than break the pretties.

Since 2000 I've been the grotto newsletter editor of the NSS News. I first met the present NSS News editor Dave Bunnell during a Flower Pot (an interesting WV vertical cave) trip during OTR '79 when he was at the University of Virginia, Ron Simmons was also on the trip. I caved again with Dave at the TAG deep cave camp. When the editor opening came up I applied and was selected, in large part because Dave wouldn't mind chewing me out if I was late with my copy! I love reading the various grotto newsletters as well as section publications like Nylon Highway.

At present, I belong to the Paha Sapa Grotto (SD), Vertical Section, Survey and Cartography Section, the Northeast Sump Exploration Team (where I am Medical Director), West Virginia Association for Cave Studies and am a life member of the NSS.



Jay geared up for Spin Shaft, South Cirque, Silvertip, MT. July, 2002

Continued on Page 25

**Aaron Bird:** Tell me how you got into caving.

**Jay Kennedy:** I went to high school in Maryland and one of my classmates was named Mark Johnsson, who is now a PhD in Geology, I think he's out in California now, but last I knew he was up at Bryn Mawr, Pennsylvania. Anyway, I was just sort of constantly exposed to it... in class he was telling about how to work a carbide light, and always bringing in his cave maps; he's a very active mapper. He mapped some of the caves down in the Swago Creek area in West Virginia.

Actually the first wild trip I took in January 1977, we went with Paul Roney from Frederick Grotto to George Washington Cave in Jefferson County, WV near Charlestown, and mapped that. It was an old commercial cave and has what is believed to be an authentic carving of Washington's name in a little alcove in the back. Jack Speece sells a little book and that map we generated from that trip is in there. So all that happened through my classmate.

As a high school student, my parents trusted me enough to let me go for these weekend or week-long trips down to West Virginia where Frederick Grotto had a little field-house and we would go exploring in Organ Cave, Higganbotham System.

**Aaron:** So when was this going on?

**Jay:** This was 1977 still. So I got out of high school in 1978 and went to Virginia Tech and a large part of my choice for attending that school was the cave club there, which was very active then, and actually is still active today.

**Aaron:** Yeah, they are very active. They've got some good people. I occasionally cave with some of the Virginia Tech people now in Greenbrier County, West Virginia.



**Jay:** That's where we had our field-house... down by Higganbotham's. I think it was basically an old slave quarters.

**Aaron:** Was that Kathy's Farm?

**Jay:** I'm not sure. It was up above Higganbotham's # 4.

**Aaron:** O.K., so how about after that time? Wasn't there some military time in there?

**Jay:** Yep, I moved back to Maryland after I graduated from V.P.I. and worked as a waiter in a restaurant, and applied for a Federal Law Enforcement job with the Border Patrol. It seemed to go on forever... took the exam, had to go to what they called the "Murder Board" where three seasoned Agents basically put you in all kinds of situations to see how you can think on your feet.

I did pretty good at that and I did well on the test and the next thing was the background check. That went from I guess... April until December and I thought, "My gosh! What could they be finding about me?" I had never been arrested or been in any trouble, but I guess that's just the Federal bureaucracy at work, but it went on for so long that I thought, "Well, maybe they're not interested anymore," so I signed an enlistment contract with the Army to go in the Airborne Infantry, and actually after I did that, I got a hiring notice.

It's probably just as well because I would have had to go to Chula Vista, California for my first border patrol assignment, and then turn around the come back to Glenco, Georgia for the Federal Law Enforcement Training Center. So just a little impatience on my part... I ended up going into the military instead of being a Fed.

**Aaron:** Did you get to do any caving while you were in the military?

**Jay:** Nah, not really. I kinda wish I

had because I spent a couple years at the 3rd Ranger Battalion at Fort Benning, Georgia, which is about an hour and a half from TAG... but what little free time I did have, I didn't feel like traveling because I did so much as part of Duty.

I did do a little bit of caving in Korea on Cheju-do, which is a volcanic island off the southern coast. Its pretty interesting, they have a really good-sized cave there that's commercially developed along with a bunch of smaller lava tubes.

When I really got interested in caving again was in 1990, when I was working with the Austrian Mountain Troops on several of their high mountain peaks, and I earned their High Altitude Mountaineering Badge. In the process of doing that we got up onto some karst and mountain ice and found out later we were on the Loferer Steinberge which was where some of the English [caving] groups were working.

We were looking down these pits with our lights, and I thought, "Huh. Looks like cavers have been in these shafts." We're tossing rocks down and they're going for quite a ways. When I got back from that trip I had kind of renewed my interest in caving.

In my last year at Fort Bragg as a survival instructor, at the John F. Kennedy Special Warfare Center, I started caving again with the Triangle Troglodytes, and I also got accepted into WVACS, which is the West Virginia Association for Cave Studies. I did a lot of caving up in West Virginia and Virginia.

**Aaron:** What were some of the projects you were working on then?

**Jay:** Back in my Virginia Tech days, I mapped in Skydusky Hollow with Ed Devine. I remember Buddy Penley's, Paul Penley's... I missed the big rescue they had in 1982 because I was with John Mumry climbing at Seneca Rocks and cav-

**Continued on Page 26**

ing in the Swago Creek area. It was the weekend of my 22 birthday... probably one of the more challenging rescues the Club had.

Bob Wolfers had a depressed skull fracture and Pete Sauvigne broke both of his arms and it required quite an effort to bring them up a 120' pit and then about ¾ of mile of cave to get 'em out.

So did some mapping in Skydusky Hollow... and the usual cave club antics. Also, one of the more infamous things I did, was I rappelled the new stadium addition. I think it was about 1979 or '80, when they put up the new visitor's section. I remember doing it on a Whaletail on Bluewater rope off a single bolt. It's something I probably wouldn't try nowadays.

**Aaron:** It's hard to even find a Whaletail around now.

**Jay:** Yep, but I still have that same Whaletail around in one of my boxes of gear... probably one of the few that came into the country.

**Aaron:** Yep, probably was. So, what was the next group you were involved with after your military career?

**Jay:** Triangle Troglodytes. We were doing some mapping up in Smythe County, Virginia... or "Smith County" depending on how you pronounce it. Then with the West Virginia Association for Cave Studies, I went mapping in Ludington's with Sonja Ostrander and other WVACS members, and that was a pretty good trip into Ludington's.

I remember a really interesting trip to the Little Red Wagon Dig in Organ Cave, which I understand is still underway, but now they've brought fans into the dig area to ventilate it better.

**Aaron:** I think they have a bellows there now.

**Jay:** Back in those days, we would fill up plastic garbage bags outside

the dig, tie them off, send them, and open them up to actually taste the fresh air.

**Aaron [laughing]:** Oh!

**Jay:** Carbon dioxide builds up so badly at the dig face.

**Aaron:** I think what they do know is have someone operate a hand-cranked bellows.

**Jay:** Uh huh. I read in one the newsletters that I receive as the Newsletter Editor for the NSS News, that they got like a blacksmith's forge bellows. And I think they used dryer duct work from a standard clothes dryer. They also have to shove a bar in at the dig face to see if any water comes in because they think they're getting close to a stream in a neighboring cave. It would be kind of exciting to suddenly have water come gushing in your dig while you're in it.

**Aaron [laughing again]:** Yes, it would.

**Jay:** After that, I got up to Baltimore and did some caving around the Friar's Hole area. Also got involved with the North-East Sump Exploration Team, and started doing an awful lot of scuba diving. I had been dive certified since 1982, but hadn't gotten my cave certification yet, but I did train to do a couple of sumps with NEST.

One was Locust Spring Cave... it was Locust Spring Cave in Pocahontas County (WV) that Joe Kaffl was mapping in. It's a pretty interesting cave...about a 220' sump and multi-mile passage on the far side and they were continuing to bolt across a series of pits in there.

The other one was Alexander's Cave up in Pennsylvania, but that trip actually was a no-go because Joe ended up getting a bone infection. Actually I had come home (to Maryland) from medical school (in Minnesota), that was 1998, and had my tanks and everything in the car when we had to cancel. I also went

to the convention down in Sewanee and had done some caving in TAG for the first time. I thought that was a really interesting area.

**Aaron:** So did you take part in Alan Cressler's Cave Camp as well?

**Jay:** Yeah! The Deep Cave Camp. That was really interesting. That was also where I ran into Dave Bunnell again after umpteen years. I had gone on a trip with him and Ron Simmons at Old Timer's of 1979, to Flower Pot Cave. I believe he was a grad student at the University of Virginia, when Ron Simmons was also at the University of Virginia. I was just basically a teenage kid from V.P.I. It was fun trip... wet cave, couple drops in there that were pretty interesting... a lot of flood debris. I guess later on in the day, it rained pretty hard. The cave must have been pretty spectacular when it was taking all that rain.

Anyhow, I ran into Dave at the Deep Camp, and went up to Thunder Hole with him on a rigging trip and actually did the cave a couple more times because I liked it so much. We were based out of the Little Coon Valley and Alan did a great job with that trip because there were quite a few people there who hadn't been to TAG before and they got a chance to see some really interesting cave.

**Aaron:** You had mentioned that you're the Grotto Newsletter Editor for the NSS News?

**Jay:** I've been doing that since April of 2000. It's a pretty interesting...pastime, I guess, or service to the NSS. I always enjoyed reading Dyas' Digest back in the '70's when Mike Dyas did it. You can get the "skinny" on what the different clubs are doing and the interesting caving that's going on around the country.

**Aaron:** How many do you read... let's say in a month?

Jay: Ah, I couldn't tell you off hand. I

**Continued on Page 27**



try to read 'em as soon as I get 'em, and the ones that have something that the general Membership would be interested in goes into one pile and the rest go into a box that one of these days I'll send to the NSS library. I try to look at it from the standpoint of what the general reader of the NSS News wants to know about.

**Aaron:** Sure. So what's something interesting that you've read lately?

**Jay:** Gosh... so much interesting stuff... well, the NSS apparently is going to acquire Great Expectations Cave in Wyoming, which is a world-class cave. I haven't been in the cave myself, but I've been by the entrance several times with John Scheltens when we're out at the Western Regional this year, which was held probably five miles south of there. I've been interested in that cave since the late '70s, early '80s, when they were really pushing it. From my understanding it's about 1200' deep, or so, but it's five miles long as a through-trip. What boggles my mind, is I'll be on some of the high ground around here (Black Hills) and visualize one of the towns that's about five miles away and try to imagine entering the ground where I'm at and coming out at that town.

**Aaron:** Isn't there an infamous crawlway in that cave?

**Jay:** It's called the 'Grim Crawl of Death'.

**Aaron:** Yeah, that's it.

**Jay:** It has gobbled up a lot of caving gear over the years, because people will come through it from the upper entrance and by that time, they're pretty well spent, so when their pack opens up, they don't take much of an interest in recovering the equipment that spills out. It's pretty low and you have to be careful in spots how you turn your head because there's a tendency for the water to grab you by the helmet. Pretty sobering cave I think.

**Aaron:** I read a story once about a through trip in that cave, where someone started at the top and another started at the bottom, just two guys, and they met in the middle and then each went on their way. Actually, maybe that happened more than once.

**Jay:** Yeah, I think that was Tommy Shifflet and Don Coons that did a solo crossover trip.

**Aaron:** Wow. O.K., so there is another Rocky Mountain Cave you've been involved with, in Montana?

**Jay:** Lost Creek Siphon. Actually it was Joe Oliphant's project. He moved to Montana from Indiana and basically rejuvenated caving there, I believe. Anyway, he invited me on that project and that began Labor Day of 2001. Willie Hunt and I hauled up the ropes and most of the rigging that we would require. Based on previous explorers' estimates of

What we ended up doing, over a series of 6 trips, we proceeded in rigging the cave in almost pure European style, staying out of the water. One pit that was really daunting was one called Puberty Pit, so named because it separated the men from the boys on previous trips. Actually, Jim Chester almost died in there when he had trouble climbing back out... he actually had to be pulled out by the other members of the party.

That was a pretty intimidating cave in that it's so loud in there that the survey party would have difficulty hearing each other. Willie Hunt had come up with these really ingenious waterproof radios based on a fairly straightforward design and use an inexpensive transceiver and ear buds and throat mikes helped make it pretty easy to survey in there. I think what really helped was the technology.

Of the original parties, I think maybe



the cave, though they had tried it several times, but no one had ever finished a map because of the 35-degree air and water, 7 drops, and 1500' elevation change in a 5-mile walk from the road head just to get up there.

only one or two wore wetsuits. Willie and I wore wetsuits when we first went up to start rigging, but we quickly abandoned those in favor of hooded oversuits, and furry undersuits. Most everybody wore a pair of

**Continued on Page 28**

chest waders of some type, because at one point, you have to go through a plunge pool and you get wet up to your waist. That made it a lot less exhausting than having a wet suit because the wetsuit basically squeezes your body constantly.



I think the second trip when we were actually doing survey we made it to the bottom and back out and that was a 15-hour marathon. There were three of us, Mark Madsen, Hans Bodenhamer, and myself. Hans did a great job on the map.



*In Lost Creek Siphon, MT*

When you look at it, the plan view doesn't look very impressive... it's maybe on an 8 ½ by 11 sheet of paper, but when you see the profile, it's like 4-feet high! The original explorers thought it was 750 feet deep, but our data brought it out closer to 650'. It was probably one of the more challenging caves I've

ever been involved in the mapping of.

In a couple of days, my sister-in-law is going to bring the ropes that were used up there. We ended up bringing the rope out in stages. In fact, one of the ropes had to be chopped because it had been frozen into the ice at the entrance, which is kind of a big swallet hole that really funnels in the cold air in the winter.



The last trip I took there was December of 2001, I ended up getting a frost-bitten finger on my left hand because I was climbing an icy rope and wore out the glove on that hand breaking ice. Very challenging cave.

I've also been involved this year in the Silvertip, which is an area I've been interested in for a while. I went there with Hans Bodenhamer and a real strong caver from California named Jason Ballensky. We were basically tying up a bunch of leads that Jason and Hans had from previous years. There's some pretty neat stuff up there. There's one cave called Spin Shaft that's 217 feet



*Jason Ballensky checking out a vertical lead, South Cirque, Silvertip Mountain, MT. July 2002*

deep. It's a really nice pit...looks like it belongs in TAG, but it's under a little ledge in the middle of a huge alpine karst pavement at about 8000' elevation. Then there's a bunch of

smaller caves... this is on the South Cirque, which hasn't been pushed as extensively as the North Cirque was in the late '70s and early '80s.

**Aaron:** Is there potential there for a deep system like in other areas of the Rockies?

**Jay:** Yeah... It's just a matter of... the snowmelt and things change. Actually I think there's going to be a trip by Montana cavers up there next summer. We're going to reexamine some of the old systems and see if anything has changed. There might be climbs that weren't really looked at hard before that could bypass some of the known obstacles.

It's a very interesting area. It's about a 16 mile walk in from the road head with about a 2500' elevation change. It's also prime Grizzly bear country too, which is a sobering thought. You have to really stay on your toes while you're up there. You can't just leave your food out. Pretty sobering to know that three people are dependent on each other since we're that far from a road. We do have quite a bit of rope cached up there and that lessens the load that would have to be brought in. I think the next time we go in it would be nice to have a horse packer to take a lot of the stuff up. It's something they've done in previous years.

I'm also trying to get more involved with the caving in Glacier National Park. I did some caving there in 1997... went to one called Poia Lake Cave, which is interesting because Poia Lake is fed by a creek called Kennedy Creek, which was named for my great-great grandfather, who was a whisky trader among the Blackfoot Indians. That cave is actually another very fascinating one, again an alpine cave, fed by glacial melt water. I lugged a wetsuit back there, and was glad I did. I went up a few of the crawlways and just started getting pretty cold and decided to turn back to where I had left a couple of my classmates from med school at a little climbdown.

**Continued on Page 29**

So, some interesting caves there, and we're working with the Park Service trying to work out some type of agreement. They're a little more amenable to working with cavers than probably in previous years.

**Aaron:** Wow, that's a pretty interesting bit of caving you've done. In addition to caving, you've also done some tests on equipment?

**Jay:** A bit. I don't really do things like pull tests or testing to destruction. I generally like getting a hold of stuff and playing with it. I'm writing an article for the first issue of the rejuvenated Alpine Karst magazine that Joe Oliphant has resurrected after twenty-some years. Its going to be on ultra-light rigging techniques, which is something the French and other European cavers have been doing for some time, but here in American we're still pretty much quite fond of the 11-mm rope and our style of vertical, although most of the guys I caved with now use Frogs and 9- or 10-mm rope.

I've used ropes as small as 8-mm for the article, mostly doing user evaluations on some of the local cliffs. I have a couple of different routes set up where the climbers don't really care for the rock, but it's O.K. for caving-type courses... overhung, or kind of loose, or not really amenable to climbing.

**Aaron:** And you rig those with rebelay then?

**Jay:** Yeah, rebelay. I have a couple of routes set up with stainless steel bolts and a couple with 8-mm self drives, and I get to practice with different kinds of hangers.

**Aaron:** Do you have a favorite rope?

**Jay:** Hmm... boy that would get me in trouble probably. There's one I've been testing lately that I'm really fond of, which is an 8-mm polyester rope made by the Canadian Cordage Company, CanCord. Available in the States from Becky Jones and Gonzo Guano Gear.

At first it was a little intimidating climbing rope that is substantially smaller than your cow's tail. The Bluewater in 9 mm, actually 9.5 mm, is a very stout rope, as is the 9-mm PMI. Bluewater sent me a sample of some 8-mm that they're developing for canyoneering with a Spectra™ core and polyester sheath.

**Aaron:** Wow. That's neat.

**Jay:** Its pretty static. In fact the closest thing I can compare it to is like prussiking on a steel rod it's so static.

**Aaron:** So how is holding up?

**Jay:** Its really good and it's a really stout rope, but unfortunately it has some sheath slippage with it, which I think probably isn't in a problem in canyoneering because they tend to double their ropes and do pull downs, but in this case, I just milked off the extra sheath, and cut it... now it looks almost as small as Spectra™ sling. It looks like a very exciting product, though it's a bit expensive due to the core construction.

**Aaron:** How is the abrasion resistance on it?

**Jay:** Well, it's a polyester sheath and so far I've been able to rig it in impeccable European style and haven't had any abrasion on it. Some of the other ropes have had a little bit of abrasion. One of the ropes I'm testing is a French rope made by Beal, called the Antipodes.

When the Poles were here for the International SRT workshop, they really liked the Antipodes ropes, and I've gotten hold of a spool of it... 200 meters. I remember climbing on it in a tree in my backyard and commenting to my wife, "This is some spooky stuff," but now I've gotten a little more accustomed to it. It has a little more bounce than the American skinny ropes. I think what I'll use it for though is pre-cut sections making pre-rigged haul lines and things for cave rescue.

**Aaron:** Are there any other pieces of  
[Caves.com](http://Caves.com)

equipment you've worked with?

**Jay:** Back in the '90s, I did some evaluation of the new SpeleoTechnics products. The FX3, CX3, which is the headlight, and I still use the original specimen that SpeleoTechnics sent me. It's a pretty good light. Now they've upgraded with a 7-LED system in the head-piece, so it lasts pretty much for the length of the common cave trips I take, which are usually up to 12 hours.

**Aaron:** Have you used the newer LEDs that are built for the Petzl Duo?

**Jay:** Yeah, I do. I have one, I believe made by Paul Montgomery in Virginia, though I don't know if he still is. The North East Sump Team adopted that as their standard dry caving light, and I was able to get one from Paul. Actually I just used that in Wind Cave this past weekend on an 8-hour survey trip. Pretty good, except that I like using the nickel-metal hydride cells and usually only get three to four hours out of a set of the AA cells before I have to change.

**Aaron:** How do you like the light the LEDs cast?

**Jay:** I've been a carbide caver most of my caving career and in the case of Paul's light it gives you a very nice area light, similar to a carbide lamp. It doesn't seem to have the bluish tint like some of the LEDs. Rod Horrocks was using the new light from Lupine, which is a German company, and I think it has 23 LEDs. I think it actually had a better light pattern than Paul's, then it's a pretty pricey light... in the range of about \$250.

**Aaron:** Cavers are willing to pay a pretty good amount of money for equipment nowadays, I've noticed.

**Jay:** I heard it from a rather well-respected Western caver last year, Pete Shifflett, I think he put it like

**Continued on Page 30**



this, "You go with the best cave light you can afford, knowing that in a couple of years you'll probably have to replace it." I've found that to be true. I've gone from the carbide light to the SpeleoTechnics lights to a variety of Petzls. Now I pretty much use the CX3 headlight and the 23-LED modification, although I was caught with a carbide light about three weeks ago on a mapping trip for a week-night jaunt into Wind Cave.

**Aaron:** Do you survey often in Wind?

**Jay:** Yes, I'm trying to get as many trips in there as I can. I've gotten ten so far. We're trying to keep the cave ahead of Fisher Ridge at the present time.

**Aaron:** How long is it right now?

**Jay:** 106.02 miles, I believe is the last number Rod Horrocks quoted me. There are just so many leads in there. A lot of them are actually fairly close to the developed sections of the tourist trails and it's really amazing. One thing I can't get over is the sheer amount of mineralogical wealth or extravagance in that cave. There's helictites and anthodites, boxwork and crystals everywhere. You go crawling past something, that people back East would crawl for a mile for, and don't even give it a second thought. It's just an interesting cave.

**Aaron:** How about Jewel? Have you worked in there?

**Jay:** I haven't done anything but sport trips into Jewel. I've done what's called the Hub Room Loop, which is a four-hour trip. Mile Wiles, Vice President of our local Paha Sapa Grotto, actually gave a very nice slide show at the last meeting about the history of mapping in Jewel. They continue to push off the southwestern corner of the map. What's required now is in-cave camping, similar to Lechuguilla where they have to bring in their food and alcohol for the alcohol stoves, and then bring all their body

waste out.

**Aaron:** Its up there pretty high too, isn't it?

**Jay:** 126 miles.

**Aaron:** Is Wind catching up?

**Jay:** We joke about it, and hope that we'll catch Lechuguilla one day.

**Aaron:** Let's change the subject a bit now. You're a doctor and often cave doctors get involved with cave rescue. Have become involved with cave or wilderness rescue?

**Jay:** Yep, that's actually what I did over the summer, which was to get more involved with that. I guess there's not very many caving doctors and among them, there are probably fewer that are as comfortable on a rope as I am. I actually have a pretty good bit of rescue equipment, and have done some development of rescue equipment.

I gave a presentation at the Sewanee convention in '98 on the a type of stretcher called the Urban Search and Rescue Stretcher, which is similar to a SKED and has a wrap-around design and acts as a full-body splint. It has built-in lifting bridle that allows lifting either horizontally or vertically. At the present time, in my guest bedroom is one of the two Petzl Nest Stretchers in the U.S. that I've been playing with. It's a very nice product, very high quality. Unfortunately I don't think the price is very amenable to cave rescue groups in the U.S. picking them up. Most cave-rescue organizations in France are sponsored by "Departements," which is kind of analogous to a county or state, here in the U.S, so they have better funding than our organizations.

**Aaron:** Do you think that Petzl Nest is rigorous enough to stand up to a cave rescue?

**Jay:** Well, it is designed for the kind of caving they do in France, which is generally vertical, and I think it kind of mirrors French cavers: its kind of

long and skinny... I don't know if some of our larger American cavers would fit in it.

**Aaron:** I saw one at OTR this past September.

**Jay:** That was probably at Karst Sports' display. I think Doug Moore had it before I did.

**Aaron:** Oh, O.K. the same one then. It was pretty interesting. They had people in it, carrying them around, and it looked like something that could be useful in certain situations.

**Jay:** I like it too because it has a built in harness, but then again it is fairly specialized product, and when you can buy three SKED's for the price of the Petzl, its going to be tough for it to compete.

I also have two of the Urban Search and Rescue Stretchers as part of my assistance with Smith Safety in developing it. One of them I left with Joe Kaffl as the stretcher for the North East Sump Team, and the other one I have out in the garage. Unfortunately the one in the garage doesn't have a skid plate on it, but I have a SKED that I would use if I had to drag anyone for any real distance.

Wilderness medicine is pretty interesting. During my residency I saw quite a few people come through here, who were interested in that, being located on the edge of the Black Hills. I'm pretty well tied into the community from doing my residency here. I'm probably going to be working at the Indian hospital, which is ½ a mile from where I live.

I went through medical school on an Indian Health Service scholarship, and I'm an enrolled member of the Black Feet Tribe in Montana. I wanted to go to Montana to practice, but ended up taking some time off after residency and being a caver bum for a few months, and a stay-at-home daddy, and took my Boards in October, got the results back in

**Continued on Page 31**

November and passed 'em, and now I'm getting a License. I've already interviewed and now it's just a matter of going through with the formalities.

**Aaron:** Well congratulations.

**Jay:** It's a nice Indian hospital, here in Rapid City, though its fairly small, but it serves a badly underserved population of Natives that really need dedicated health-care professionals. One of the things I do along those lines is addiction medicine.... dealing with alcohol, nicotine, and to a lesser extent, opiates.

**Aaron:** What percent of the local population there in South Dakota are Native Americans?

**Jay:** Probably... upwards of 30% of the population. On the north side of town, there seems to be a higher population of Natives. We have Pine Ridge, which I think is in the poorest county in the U.S. and it's 90-minutes from here, and when I was a resident, we actually got quite a few patients transferred from the Indian Health Service facility there up to the regional hospital here in Rapid City.

**Aaron:** I went to South Dakota in 1988 for the NSS Convention in Hot Springs.

**Jay:** You were at John Scheltens' ranch.

**Aaron:** Yep, that's right. It's such amazing countryside in that area. Incredible place.

**Jay:** He's very graciously hosted something called the Black Hills Cavers' Classic there for the past 10 years. Always fun getting together with other cavers. This year it had a pretty good turnout and they pressed me into carving up the pig... [laughing] thinking that my superior knowledge of anatomy would help. My wife and son came down to visit that day. We got some good pictures of Nicholas. He's 16 months old now, and was about a year old then. He was fascinated with John's dog.

**Aaron:** So, is Nicholas a caver yet?

**Jay [laughing]:** Not quite. I'm training him. He likes wearing a headlamp around and every now and again I'll get down on my hands and knees and go crawling under the furniture and he just thinks that's the greatest thing. He loves playing with my vertical gear when I have it in the house. I have some nice pictures of him crawling under piles of rope.

**Aaron:** Getting him ready for some Wind and Jewel surveying when he gets older, huh?

**Jay:** Yep.

**Aaron:** So, we've been over a lot already, are there any other significant caves you've worked in and want to tell us about?

**Jay:** When I was in medical school, well the first year I kind of fell into the myth that you had to study constantly, and I almost burned myself out pretty badly. The second year I started caving more with John Ackerman and Dave Gerboth at John's karst preserve at Spring Valley, and my grades actually improved because I lived for that Saturday change of pace to go and wallow around in the mud. That was a fun time for me because John was very active pushing the cave.

**Aaron:** That's Spring Valley System?

**Jay:** Spring Valley Caverns. I think it's the second longest in Minnesota now. Considering when John originally bought the farm there, it was just a small formerly commercialized cave, John did some digging in one spot and found about four more miles of cave. Now it has... four entrances. What they would do is use a cave radio to find a suitable place on the surface and then blast and use a backhoe to get down to it, and then put in a culvert with a steel ladder.

I think it was my first trip there with him, we went back to something called the Paradox Sump and on the way there went through one of the

bigger rooms in the cave system called the Colossal Room, and I remember seeing this waterfall coming out of a hole in the ceiling and I asked John, "Hey, what's up there?" and he's like, "Don't know, no one has ever been up there."

So two years later I bolted up to it on a series of solo trips and found several hundred feet of really nice streamway, which John and I mapped and it ended at an area that had so many speleothems that we couldn't go on without breaking them, so we terminated the survey there. That's still one of the more interesting parts of the cave I like to go and visit. It's about a 10-meter rope climb to get up to it.

**Aaron:** That sounds like a pretty nice discovery. Well, I want to thank you for talking with me this evening.

**Jay:** Well if you get out here, out west, give me a call, we always have space for cavers.

**Aaron:** O.K. then, thanks. It's been nice talking with you.

## Cool Links

**Custom design a topomap**  
<http://www.mytopo.com>

**Morph/Stitch Aerial Photos/Topo images and make Panoramic images**  
<http://www.panavue.com>

**NiChrome Wire Source with Tutorial Links**  
<http://www.aeroconsystems.com/electronics/nichrome.htm>

**Cartos-Warps digitized sketches to fit the survey data**  
<http://www.psc-cavers.org/carto/index.html>

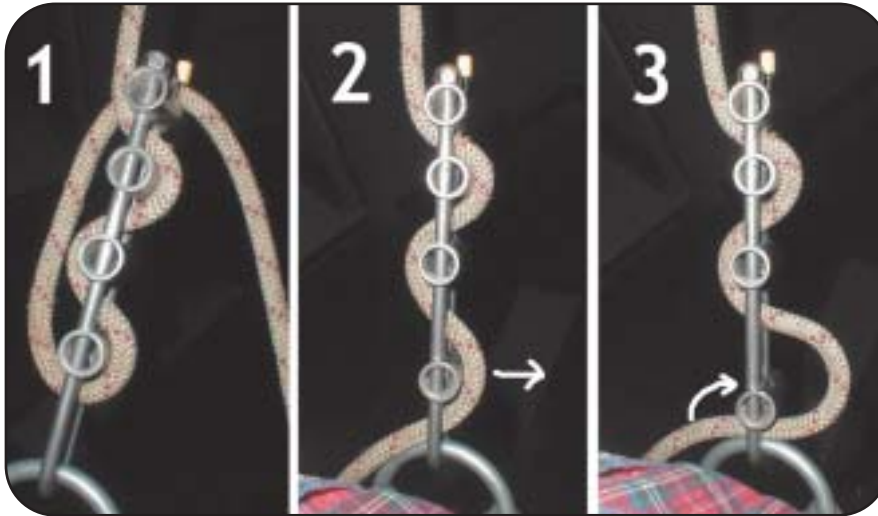
## Danger! Don't feed the micro-rack! by Scott McCrea

Note from the editor: Scott McCrea is the moderator of the Caves.com Vertical Discussion Group which you can join online at <http://groups.yahoo.com/group/cavescomverticalcaving/>

I began vertical caving in 1993 with the Cleveland Grotto. I have been vertical in TAG, NC, VA, WV, OH and KY. Through this group, I hope to learn more and hopefully help others learn some stuff too.

I love my micro-rack. It's great for most drops and works great with a frog system. However, there is a potential hazard with them. It is possible to accidentally drop to two of the four bars. This happens when there is too much friction and a rappeller resorts to feeding rope causing the bottom bar to pop off. It is possible to pop bars off of any rack while feeding, but since a micro-rack only has four bars, the margin for error is slight. The micro-rack is unique among racks in that very little variation in friction is available. Bars cannot be added or dropped like on a regular rack. There is only a small amount of space to spread the bars (there are long micro-racks available which increase

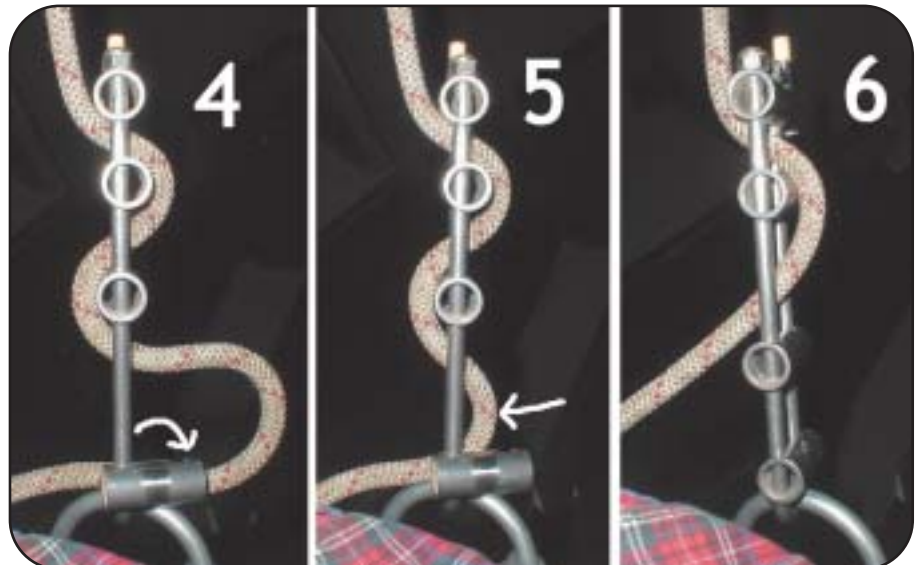
the spreading space, but the feeding issue is still there). So, often the only option is to feed rope. Imagine a caver rigs his trusty but stiff and dirty rope to a tree about 20 feet from the lip. The approach to the lip is sloped but not steep. The rappeller rigs his micro-rack a safe distance from the lip, but as he begins to back down towards the edge there is too much friction. He struggles to inch down the rope. Even without the hyper-bar and the bars spread, it's tough going. Feeding some rope into the rack speeds things up. At the lip, he turns around to look down the pit and plan his next move. Still feeding rope, he removes his hand from the rack, maybe to adjust a pad, swat a bee or to help balance. A loop of rope gets fed into the rack and all of a sudden, he's on two bars and going a lot faster.



1. Micro-rack rigged with all bars including the hyper-bar.
2. Hyper-bar disengaged, rope being fed creating a loop.
3. The rope outside the rack will push up and in on the bar and pop it off.

### So, how can this be prevented?

Simple, pay attention. Ok, that's a little obvious. The best way to prevent this is to follow a simple but often broken rule that applies to any and all unlocked racks—ALWAYS keep a hand, finger, thumb, or something on the last engaged bar. A bar that you are holding will not come off. Please note, there is nothing wrong with these racks. This can happen with any four bar, U-shaped rack. They all work just fine, as long as they are used correctly. I am definitely not giving up my micro-rack and neither should you. Just be aware of the hazards, be prepared, practice, simplify and think. Scott McCrea Asheville, NC, USA  
NSS 40839 [scott@flittermouse.org](mailto:scott@flittermouse.org)



4. Bar swings open.
5. Rope slips out of the rack.
6. Rack is now rigged with only two bars.

**NOTE:** The next issue(#5) of Caves.com Magazine will have a related article submitted by Carroll Bassett of BMS.



## Three Dimensional Merging of Cave Surveys and Topographical Maps

by Garry Petrie

Cavers who are cartographers want to visualize the cave systems they are working on in three dimensions on their personal computers.

Several programs available can plot terrain in three dimensions, drape topographical maps over the 3D model and pull in data from a GPS unit. The problem is most of these programs do not have an avenue to bring in cave survey data.

OziExplorer with the 3D extension does allow cavers to perform this trick for a modest cost.

OziExplorer is an interactive, raster image, trip planning and moving map program. It allows the user to add Waypoints, Routes and Tracks to the Map by simple point and click and then download these to a GPS. OziExplorer3D is a program which allows users to view map images in 3D with the ability to rotate in all directions and zoom in and out of the view.

What is the recipe for creating a three dimensional image with a cave survey? First, you start with the ingredients. Get your software installed on your computer, OziExplorer, OziExplorer3D, WinKarst and possibly some sort of image editing program. Then get your data, cave survey with an entrance tied to geographic coordinates, an image of a topographical map where the cave is located and a digital elevation model covering the same area.

Next, begin mixing the ingredients. The user starts in WinKarst by loading the cave survey file. Then bring in the digital elevation model. Users can find models from various internet web sites and should be of the 7.5-minute SDTS variety. Web sites usually list models by topographical quad name. Verify in WinKarst the cave is inside the area covered by the model by zooming out the plan view far enough to see the bounding box of the quad. The user then exports a Garmin track file from

WinKarst with the WGS84 datum; the exported file should have the TRK extension. The track file will represent the survey shots coordinates in geographic format and elevation referenced from sea level. Unfortunately, OziExplorer does not read SDTS digital elevation models directly, but rather the older DEM ASCII format. The user can convert the SDTS file into a DEM file by using a utility provided by Ozi or by using a companion program of WinKarst called BasicDEM.

OziExplorer requires the DEM files placed in a directory specified from within the program.

The third element Ozi requires is a topographic map image. Often, web sites that store SDTS files also have map images and the sites sometimes call them Digital Raster Graphs (DRG). Alternately, the user can scan paper USGS 7.5-minute topographical maps. To keep the data files manageable, the user should crop the image to a reasonable size of the area surrounding the cave, but be sure to include either UTM or geographic coordinates somewhere on the image. Ozi uses the coordinates to register the image into geographic space.

Now OziExplorer can bring together the three dimensional cave survey, DEM data and topographical map image. The user begins by loading and calibrating the map. This can be a confusing step for the users because to get good results the user must understand at little about geographic Datums and map projections. Almost all USGS 7.5-minute topographic maps use the NAD27 datum. Ozi requires the user specify a datum in the calibration process. The other point is what map projection to use in the calibration process. All USGS 7.5-minute maps published after 1957 use the Lambert projection, even if the map legend says otherwise. The maps often have a UTM grid superimposed across the map or at least UTM tick marks along the edge. The important point to realize is the UTM north is not the same north as the Lambert projection. The legend on the map will specify the UTM grid rotation. Depending on the source of the map

image, the publisher may rotate the images slightly to account for the UTM grid, placing the UTM north straight up vertical.

From a practical standpoint within OziExplorer, if the user wants to use UTM coordinates, specify the UTM map projection. If the user wants to use geographic coordinates (latitude and longitude), select the Lambert projection. Ozi can account for image rotation in either case of map projection. The user only needs to specify the UTM zone when using the UTM projection. The user must specify a central meridian and two tangential latitudes in the Lambert projection. The central meridian is just the longitude vertically down the center of the map. Cartographers specify the two tangential latitudes as one sixth of the way towards the center from the top and bottom edges. For example, for a 7.5 minute map at the 46 degree of latitude, the tangential lines are  $46 + (7.5/60)/6$  and  $46 + 5*(7.5/60)/6$  in decimal degrees. Wow, UTM coordinates are a lot easier!

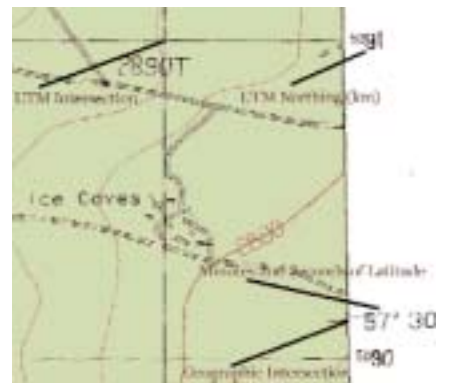


Figure 1. Locating Reference Points

Once the user specifies which map datum and projections in Ozi, they pick at least three points on the map and then specify the coordinates of the locations. For the UTM system, pick intersection points of the grid. For Lambert, pick points along the edge of the map (did you crop a corner?). Figure 1 shows the right edge of a topographical map with caves. The numbers 5091 and 5090 are UTM northing in kilometers. The number 57° 30 is the minutes and seconds of the latitude, which is added to the overall latitude of the quad. Set a UTM grid point at the intersection of the grid, reading the

UTM easting from the top or bottom edge of the map. For the other case, the geographic intersection is the tick mark on the inside edge of the map.

For the best registration, the user should select points as far away as possible. The user then configures Ozi to use a Garmin GPS device and imports the cave survey track from the Garmin|PCX5 Support menu choice. If the user completes everything correctly, the cave survey will appear on the map at its proper location. Figure 2 shows a cave survey imported on to a registered topographic map in OziExplorer and yes, the Forest Service built the road directly over the cave!

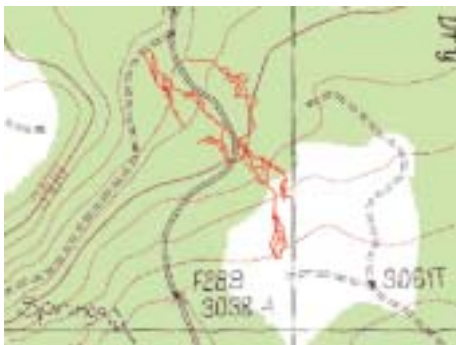


Figure 2. Imported Cave Survey

The user will find the final steps in creating a three-dimensional map in the OziExplorer menu "3D/Elevation||Elevation Configuration" and "3D/Elevation|3D Map Control." Inside the configuration dialog, the user specifies the location of the DEM data files and Ozi will parse the files for correctness. In the 3D Map Control dialog, the user specifies the resolution of the image Ozi will generate and draws a rectangle around the area of interest by clicking the "Draw Box" button. They then click on the "Create the 3D map" button to calculate the three dimensional model. After some processing, OziExplorer3D starts up and displays an image much like Figure 3. OziExplorer3D lets the user view the terrain from any direction and specify the sun light direction. The caver can easily verify the cave survey is below the surface. The image will also show a projection of the cave survey on the surface terrain.

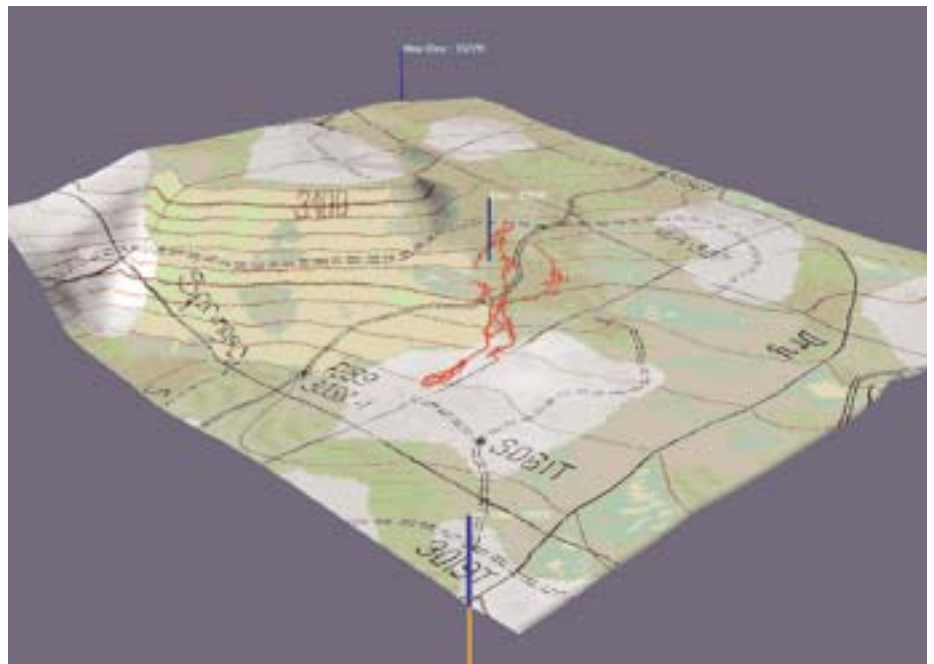


Figure 3. Finished Three Dimensional View

## Resources

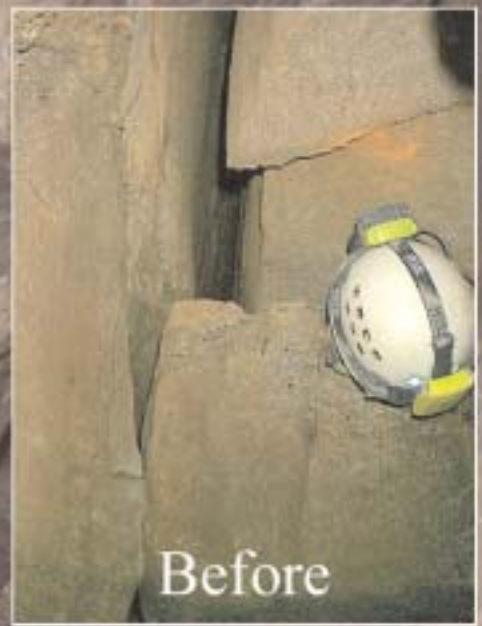
<http://www.resurgentsoftware.com/winkarst.html>  
<http://www.ozexplorer.com>  
<http://www.gisdatadepot.com>  
<http://edc.usgs.gov/geodata/>  
<http://mcmcweb.er.usgs.gov/sdts/>

## Parting Shot

Aaron Bird dumps dye into the Deels Hole stream  
Raders Valley, WV in December 2002







Before

Rachel Bosch begins the  
survey into virgin cave

After

Photo by: Bob Kirk