

# NSS NEWS

February 2005

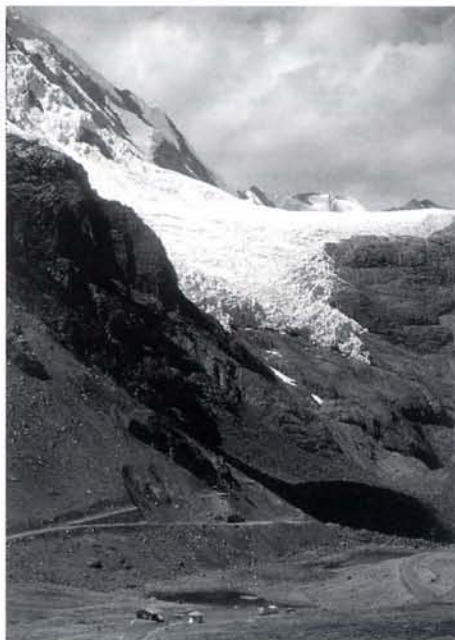




# Deep in the Andean Mists: Peruvian caving on the grim side...

Steve Knutson

Steve Knutson



**Andean karst scene: A road pass at 15,500, with a glacier on limestone in the background.**

*...The damn mist rolls in, as it always does, just when I think I might get a fix on something. Can't see anything....just vague shapes.....and as usual, the batteries in my wonderful Garmin GPS have died... Where the hell are we....?*

This is a brief look at an extraordinary karst area; it is not ordinary because of the number of very deep pits within a working radius from camp, and for its location in a roadless area of the northern Peruvian Andes at an elevation of around 14,000 feet.

Of the 23 known air-filled limestone pits in South America over 100 meters in depth, 18 are in this area, found and explored by us. We found this area in 1996 and have gone to it nearly every year since...

## BACKGROUND

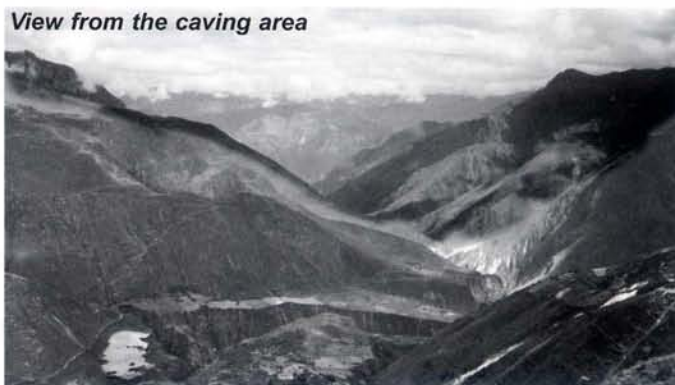
The Andes Mountains of South America dominate the west side of the continent and run the length of it, with elevations of over 22,000 feet. Strangely enough, this forbidding landscape of tall, sometimes glacier-shrouded peaks and 8,000-foot-deep canyons was the ancient home of some very advanced but mysterious cultures, of whom the well-known Inca are but minor late-comers. Ruins left by these ancients are still being found in remote areas.

In 1985, '86, and '87, a Colorado caver named James Miller had some interesting rambles in the Andes of northern Peru. He was a mining geologist and was working at a site on the edge of the Amazon Basin. When work left him with free time, he naturally headed for the alpine country, to look for caves. He was usually alone but occasionally found non-caver companions. His load often included a 300-foot rope, vertical gear, helmet and lights. He made use of such and dropped pits even at over 15,000 feet elevation, at least to the extent of his rope. Solo caving at 14-15,000 feet!

I heard of this, and got interested. Back in the 70s I had become intrigued with Peru, both for the ancient cultural aspects, and for the potential for great cave depth. But I was nervous about the machinations of Maoist anarchists, like the Shining Path and the Tupac Amaru. I settled for Mexico and Central America instead.

If I were going to finally go, it would

## View from the caving area



Andy Zellner

be much better if I had someone to go with, so I talked it up to Jeb Blakeley, from Idaho Falls, Idaho, and his wife, Bitsy, who had been companions on Central American efforts. They thought it was a great idea. Jeb has been a co-leader of the expeditions, ever since. We were going—but exactly where to?

I corresponded with Mark Stock. Some years before, he and Marion Smith had gone to check out a large sink that appeared on a topo map in the Huanuco area but had not found much.

I got out the geologic map of northern Peru that I had got in the 70s and the air navigation topographic map on which I had, for my early fantasies, plotted the extensive limestone bands. These bands run across high altiplano and deep valleys. There was big depth potential everywhere.

Yet there were negative aspects as well. The Andes had been created by rapid mountain uplift, so there may have been little of stable water tables for phreatic development. Indeed, some research showed that previous expeditions had not found anything extraordinary. The longest cave in Peru was only 2.8 km, and the deepest only 407 meters.

To help decide the question, I tracked

**Searching for caves while the mist holds back.**



Steve Knutson



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**Cynthia Ream checking out a big pit entrance in the fog**

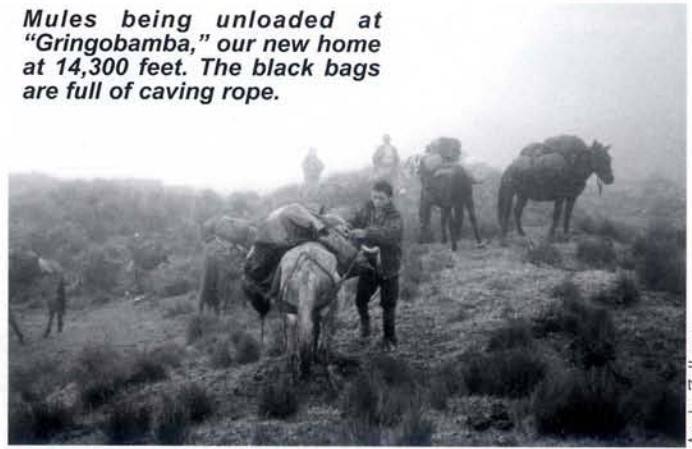




**Mule train, heading for camp.**

Steve Knutson

**Mules being unloaded at "Gringobamba," our new home at 14,300 feet. The black bags are full of caving rope.**



Andy Zellner

Miller down, and asked him if he wanted to go. He was back in school, now had a wife and child, and was in no position to do so. I asked if he were to go, what would he want to see—what was the area or cave that had seemed most promising? He replied that he had heard of a *tragadero* (the Peruvian word for a *sumidero*, a stream or river submergence) at around 12,000 feet elevation that sounded good, and that he never had a chance to check out.

We figured that we needed one trip just to find out about the relevant aspects, travel, weather, local attitudes and so on, and so we settled on April and May of 1996, April to be spent in Peru and May in Ecuador.

#### **AN EDUCATION**

As our departure time grew near, we agreed to include Matt Oliphant and Nancy Pistole, from California, who would be traveling in Peru at about that time.

As it turned out, April and May are still in the wet season in the Peruvian Andes, and the weather was always bad. Traveling

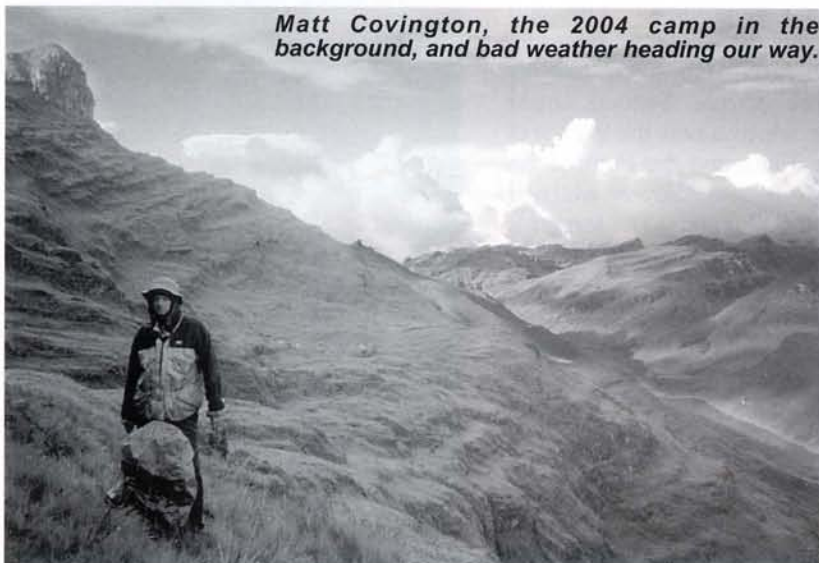
by road we found was very different from that in Mexico or Central America. There are huge roadless areas. Except for the Pan American Highway, which stays on the coastal plain from Lima north to the Ecuadorian border, and one or two highways heading into the mountains, main roads are not paved. No road runs for any distance north and south along the axis of the Andes—they all run mostly west to east, from the coast into the mountains to a particular town and then usually end. Few vehicles traverse what roads exist. If you take transport partway to your destination, you may find yourself stranded for a time. We spent two days in one town, and no vehicles passed through in that time.

At roads' end we were told that the *tragadero*, still over a day away on foot or horse, was not enterable. Damn, all that trouble for nothing? Well, they said, there are some "*Infiernillos*" up on the mountain, above town. But they are just holes in the ground...of little interest...just a local hazard for grazing animals.

Well, we were there, so what the heck. The plateau in question was at over 14,000 feet, and the town at 10,000, so we arranged for horses and mules to pack our gear up there, and a day or two later, were off.

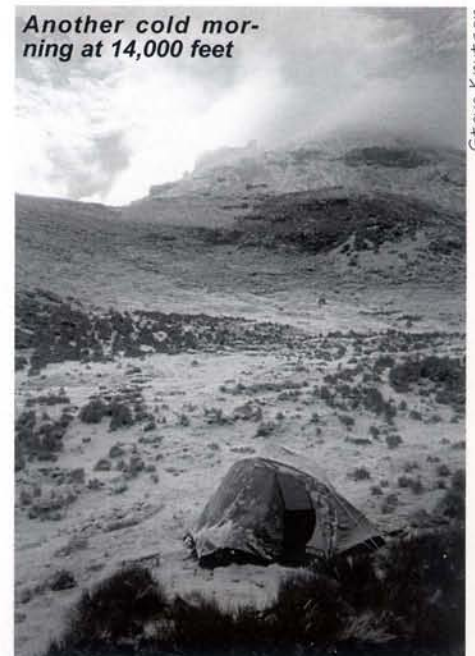
The horse packer was dubious. Tourists never came to this area. What were these strange-looking folks up to? They hadn't wanted to buy the Chachapoyan mummies that townsfolk offered them. Now they wanted to look at holes in the ground?

So at the breakover at the top he stopped, got off his horse and called us over to a gaping pit just off the trail. Picking up a big rock, he gave it a toss, and then turned with a stern look, to judge our reaction. The rock fell 2 or 3 seconds, hit something, then another interval, hit again, and repeated this until the sounds faded into the depths. Wow! Our looks and exclamations told him enough—these



**Matt Covington, the 2004 camp in the background, and bad weather heading our way.**

Steve Knutson



**Another cold morning at 14,000 feet**

Steve Knutson

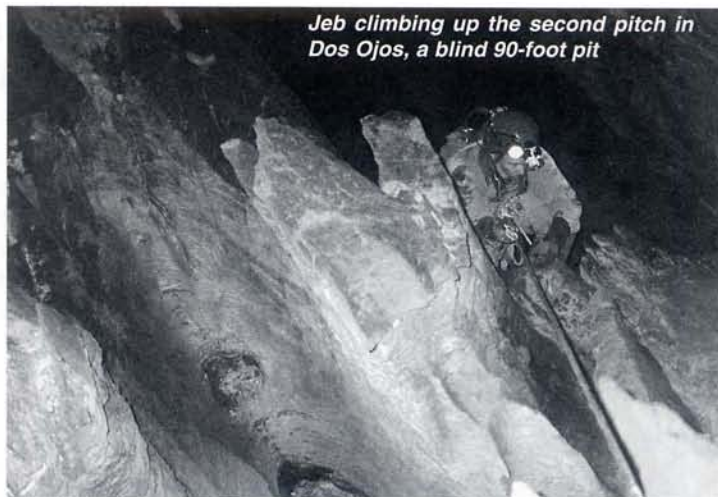


Surveying in Conejos



Andy Zellner

Jeb climbing up the second pitch in Dos Ojos, a blind 90-foot pit



Andy Zellner

*pendejos locos* actually like these deep holes!

We stayed up there for several rainy, snowy days and saw enough—there were several of such pits around—this needed more manpower, more rope, and better weather. We vowed to return in 97!

We have been returning ever since, with no end of deep pits...

Of course, we always hoped for continuing cave, and there are signs that such may be imminent. We will see...

#### NORTHERN PERUVIAN GEOLOGY/ GEOGRAPHY AND CAVE DEVELOPMENT

The Andes are lowest near the border with Ecuador, and broadest south of Lima and on into Bolivia. The structure seems similar to mountains such as the Klamath and Sierras of the American west, with the volcanism of the Cascades occasionally thrown in.

Structure is aligned north-south. In places there are huge volcanoes, but the

volcanism is mainly in Ecuador and Colombia, and then on south of Lima and through Bolivia and Chile/Argentina, but not in northern Peru.

It seems never to be a single mountain ridge. Canyons between ridges are sometimes stupendous, over 8,000 feet in depth. There are several major limestone bands along the axis of the mountains and these cross these canyons in places and provide great depth potential for caves. Indeed, some of the highest limestone in the world is present, and I have seen it up to 18,600 feet.

The downside for cave development is that the uplift, the orogeny, of this range is said to have been rapid. One published opinion said there was a stable period during the uplift but there may have been little chance for ordinary phreatic development. On the positive side there are many sites of great vertical relief, to allow vadose solution, and there could be thermal water development. Also, in such a big area there are bound to be situations of special geology, where water is trapped or concentrated along the structure, and extensive or significant caves are the result.

Examples of this found just recently are the cave above Soloco, near Chachapoyas, which is now the longest in Peru at some 4 km, and the Pumacocha cave, in the Cordillera Yauyos, which is the deepest, at 638 meters. The former is in limestone sitting on an underlying sandstone base, thus trapping the drainage, and the latter is in a narrow band of limestone, catching a surface stream coming off granitic rock, creating a vadose cave. The former was done by French cavers (Jean Loup) and the latter by British cavers (Nick Hawkes).

The thermal water development seems to be a viable idea, as I have seen

large travertine deposits at elevations of over 13,000 feet, as well as at lower elevations.

After scouting a number of areas in northern Peru, I must say that in many places development seems to be at an early stage and as predicted for rapid uplift. Drain-holes for lakes and existing *tragaderos* are often small and pinch out after just a short distance. Big expanses of limestone tend to have few good pits, and large closed basins have small drains.

#### THE PROJECT

We found a campsite near a permanent water hole at just about 14,000 feet and have stayed there each trip, until this year. We once jokingly referred to it as "Gringobamba," and the locals liked that, so the name stuck. "Bamba" or "Marca" apparently means "place of." This site had some pleasant aspects—there were lots of tent sites, a great view, and it was not far from the main trail (a portion of the old

David Cole



Matt Covington at the top of hammered open pit #7, 350 feet deep in Parallel Pit Cave, July 2004.

Garry Petrie



Steve Knutson on rappel





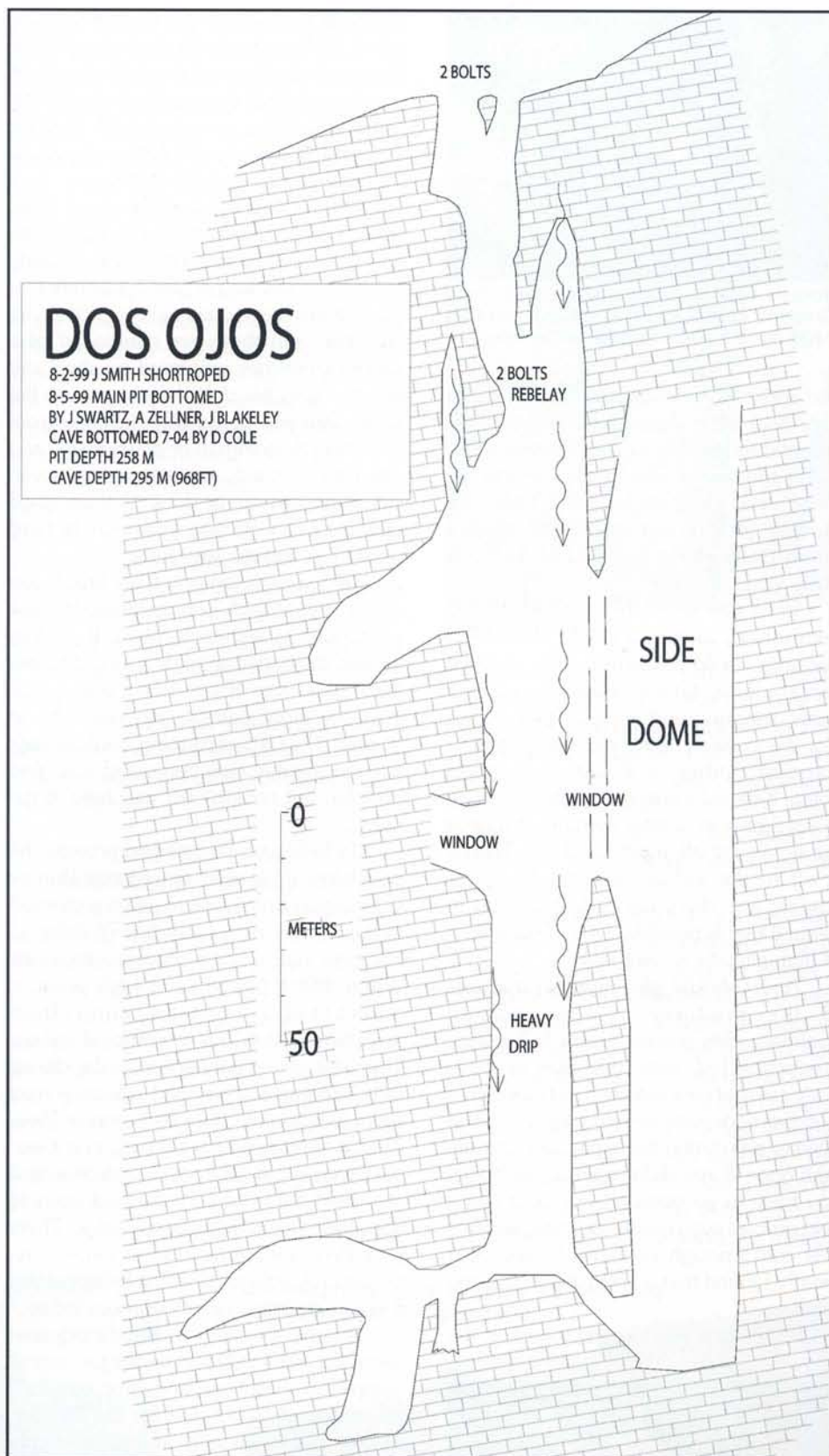
*John Swartz drops into Dos Ojos*

Inca highway system in fact). But the weather proved to be a monster.

Though it isn't obvious, since there are adjacent mountains as far as the eye can see, our campsite is next to a pass where air from a lower, warmer valley to the east rises, cools, and apparently creates weather when it crosses to the west. Every trip saw occasional but regular bad weather, and almost every time we departed, the mules were loaded in a snowstorm. On one expedition the weather was almost continuously bad and we aborted early.



*Andy Zellner at the top of Dos Ojos*



And this is in the "dry" season.

The wind is normally strong. The first large-group cooking tent we brought was destroyed by the trip's end; it only lasted until then by guying it every which way and splicing splintered poles with duct tape and parachute cord. At night you often

slept, if you could, to the wind-whapping vibration of your tent walls. If you were awake the worrisome thought might occur to you that you had not spent enough money on that tent.

The site is not all that far from the equator, so there are no glaciers around





**Bonnie Crystal begins a descent. Paul Greaves captured the 3 images on this page from a Rich Sundquist video.**

and snow never accumulates. But it gets very cold on a clear night. No one has complained of his or her sleeping bag being too warm. And occasionally, on those rare, clear nights, you might be moved to get out and look at the fantastically starry sky and outrageous Milky Way.

We have a group tent, as I have mentioned, and one might think that evenings would be spent in that, in jovial camaraderie, telling stories or playing cards, snacking and enjoying hot drinks. No. We cook in that, and wearing your warmest clothes, and with four stoves going, it stayed warm enough to allow you to eat dinner in relative comfort. But once the stoves are off, it gets cold fast. Then it is off to the individual tents for some reading and diary keeping, and then to sleep, if that is possible. One of the effects of high altitude is insomnia.

And I should also mention that one of the products of the constant acclimatization process seems to be urine production [ed. note: this diuresis is the body's way of concentrating red blood cells to enhance oxygen-carrying capacity]. You need to piss during the night, usually more than once. If you didn't have a piss bottle, you have to go outside to do it. It was a cold process even inside your tent, as often it is cold enough in there, to see your breath. I found that a 500cc bottle was too small.

At this site you are impressed at the



**Rich Sundquist in Pre-Inca Pit**

feeling of isolation. At the town below you are a 14-hour bus ride from the nearest big town, all on a dirt road. At the camp you are a further day's walk, and a 4,000-foot ascent over a rugged trail. Beyond you, to the horizon, are further ranges of mountains, all a vast wilderness.

One of the worst problems is mist. Clouds will roll around you, not above you, and it can suddenly sock in, and visibility can go to a few tens of feet. Since much of the plateau has incised valleys, slopes are common and these are composed of a series of benches separated by short cliff bands. Every bench looks pretty much the same. Anyone going any distance from camp will be going up or down these, and often there is only one place in a given cliff where this can be done. Without good visibility, or a GPS unit, you might be hard pressed to find the way back.

GPS sounds foolproof, but only if you did a constant track, or remembered to take a waypoint at each tricky place. If you run a track, the batteries might give out before the day is over. If you don't, and it gets misty or night comes, you could be in trouble. The GPS, if running, could always tell you in what direction camp was, and how far, but couldn't tell you how to get there.

To help with this, and to provide the possibility of aid in an emergency, Bonnie Crystal got participants to equip with small radios. These only work line-of-sight, so she provided a solar-powered repeater. When this is placed on a high point, it allows radio communication from anywhere within our operational radius. Then she makes connection to the closest radiotelephone office, and sets up a ham radio link to other ham operators in Peru. Thus if something goes wrong in a cave, the cavers could call from the entrance, and she could call to Lima or the local town, to get whatever aid might be available. There is a Peruvian mine rescue capability, presumably equipped with a helicopter, so this was an important step in our safety.

Another problem is altitude sickness. Since the last 4,000 feet on the journey to camp is an abrupt rise, and since we would be at around 14,000 feet for the duration of the session, usually at least a couple weeks, we have to be careful. Pulmonary edema (HAPE) and cerebral edema (HACE) are two extreme forms of altitude sickness and have killed many experienced mountaineers, much less ordinary people. There is no medication that will reverse these conditions. The only known remedy is to remove a victim to lower elevation.



**Andy Z. in upper portion of Pre-Inca Pit**

We haven't yet had a case of this.

Almost everyone experiences lesser symptoms—loss of appetite, sleeplessness, headaches, sore nasal passages and bronchitis. The latter is especially feared, since to get it means a huge drag on your performance—you will not acclimatize as well, and the coughing will keep you awake at night. This has been experienced once by almost everyone who has gone more than once.

### Dos Ojos

August 2 of the 1999 trip dawned normally, with ice on the flies of the tents and on small ponds, the wind gusting fitfully. But the sky was mostly clear. John Swartz, from Atlanta, Georgia was up early as usual, somehow managing to wash dishes in the arctic morning air. In the group tent the MSRs were roaring, the Optimus 00s were smoking, and breakfast somehow got cooked and eaten, perhaps coffee, eggs, bread, maybe potatoes or pasta. Folks teamed up and went off for the day's activities.

Jim Smith (McDonough, Georgia) was suffering from the dread bronchitis but was coughing and hacking his way around anyway. This is dangerous at this elevation, but Jim is a very tough guy. He and Swartz headed back along the trail that the Incas once used, and then traversed to the right, letting their instincts lead them. Very quickly they found a small double pit, with the holes apparently connecting, below. A dropped rock usually hit something a few seconds down, and then eventually made more noise... it sounded deep.

Jim placed a couple bolts, rigged a three hundred and descended to a bulge on one wall, about 67 meters down. The pit, however, clearly continued on down, hugely. The bulge hit the rope, and interrupted the free drop. It was clear that rigging from the other hole would miss it, but the bulge offered a place to reelay. John came down, and Jim placed two more bolts. They tossed a rock, and it took at least seven seconds to hit. They needed



a long rope.

The next day they returned with a 600—all our rope was 11mm, heavy stuff at 14,000 feet. They got this rigged at the bulge, and Jim headed down. For many minutes a look down just showed the adjacent walls of the 20-meter diameter pit, the rope continuing, and blackness below. Finally he came not to the bottom, but to the knot wagging in empty space at the end of the rope. The bottom was now visible, a ways further down. Short-rope'd at near 14,000 feet. He changed over and agonizingly made his way back up, doing an imitation of terminal tuberculosis.

The following day, August 5, Jim was a little worse so John went back to the pit with Andy Zellner (Marietta, Georgia) and Jeb Blakeley (Idaho Falls, Idaho). John borrowed a whistle from Jeb, to signal with. At 11:15 he checked his gear several times and started down. A note in one diary said, "John seems scared—that's good!"

He was carrying a 300 to add to the bottom of the 600. He passed the rebelay and got to the end of the rope without incident. After adding the 300, he passed the knot and got to the bottom. The descent took about ½ hour. At noon Zellner went down, and then Swartz ascended. This took 1½ hours. Then it was Jeb's turn to descend.

He had trouble when the spacers separating the top bars of his rack collapsed. Keeping the bars apart by hand started cramping his arm, but he got down.

At the bottom Andy reported there were three leads. They tied the excess rope over a horn of rock, and Jeb went down the biggest one. This went down for 16 meters at a 60 degree angle and then 12 meters vertically to a gravel-floored chamber with no outlet.

Jeb returned to the main pit bottom, and Zellner climbed out in 59 minutes. You couldn't hear signals from the bottom all

the way at the top, so when Jeb heard Andy signal at the rebelay, he gave him 20 minutes and went up. He climbed to the knot slowly, without stopping, but by the time he got to the bolts it was 20 steps and 5 rest breaths. Still, it only took him 1 hour and 5 minutes. They got back to camp just as it was really getting dark. As I have mentioned, being out after dark was asking to get lost...

The depth was determined by taping to the rebelay and then taping the rope after derigging—846 feet (258 meters). This made it the deepest pit in Peru, and the deepest limestone pit in South America. The only deeper pits were some in quartzite in Venezuela.

This year, in September, a British expedition led by Nick Hawkes was working in Pumacocha Cave, in the Cordillera Yauyos, already the deepest in Peru, and was able to descend an alternate stream route that had a deeper pit, measured at 925 feet (282 meters). Such is the progress in caving—the deepest gets deeper...

We gradually had to work at a greater radius from camp. Jeb Blakeley describes his first descent of our second deepest pit, Deep Surprise:

#### **DEEP SURPRISE (NARRATIVE BY JEB BLAKELEY)**

"It was a rare day when we could see further than half a mile from our camp. When the fog did clear, we could see a bulge on a distant ridge with a huge black crack that was calling our names. The crack was at over 14,000 feet elevation and just above several other pits, so John Swartz and I decided to check it out. We figured it would take 3-4 hours to get there carrying "minimal packs," with 750 feet of rope, a bolt kit, full vertical caving equipment, and foul weather gear.

"Almost 10 days later we had not yet



Andy Zellner

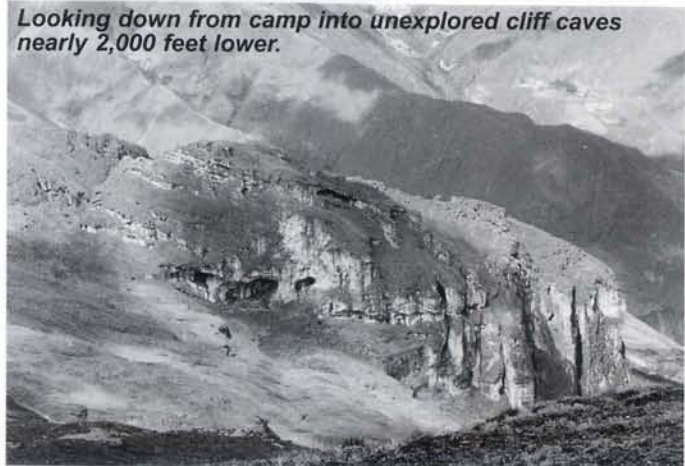
**2nd pit in Conejos**

reached it. The terrain is rough and steep, covered with cliff bands that can only be crossed in selected areas. Slick muddy cow paths lead from one layer to another but they are so exposed we often wondered if Peruvian cattle could belay each other. Hiking on those cow trails did explain the rawhide-like texture of the "steak" we had for lunch on the trip up.

"We had to sidehill across scree slopes and gain and lose hundreds of feet of elevation on loose footing. In places a misstep might send us sliding out of control towards a cliff band 500 feet below. So we hiked carefully. The weather in 2002 had been worse than normal with rain or snow 3 out of 4 days and lots of wind. Daytime highs on a good day were in the 60s and nighttime lows were in the mid 20s. You could count on fog to roll in almost anytime you needed to see the lay of the land.

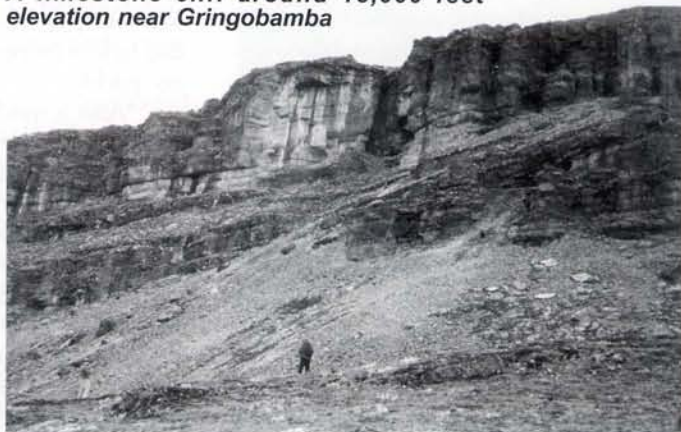
"Challenging as they were, the difficult

**Looking down from camp into unexplored cliff caves nearly 2,000 feet lower.**



Andy Zellner

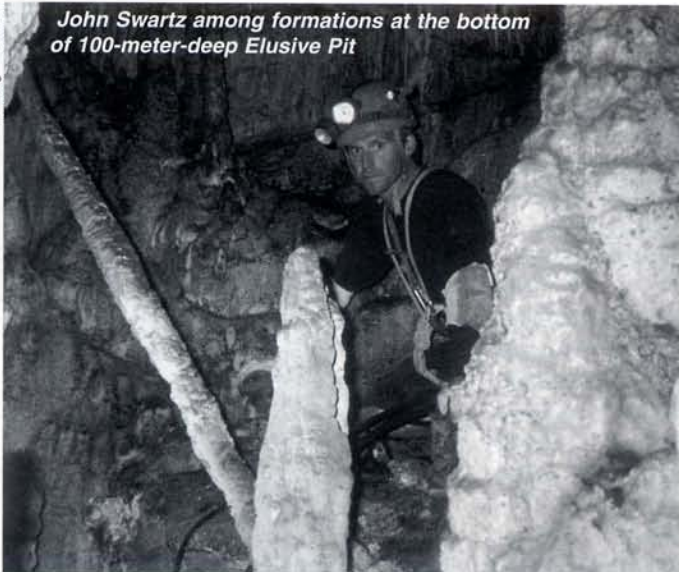
**A limestone cliff around 15,000 feet elevation near Gringobamba**



Andy Zellner



**John Swartz among formations at the bottom of 100-meter-deep Elusive Pit**



terrain and weather are not what kept us from reaching our objective. We just kept getting sidetracked by finding new pits. If they were short, we could drop 2 or 3 a day. The deep ones took longer to rig, drop, measure, and sketch.

"On July 21st we awoke to a cold morning and had to break ice off the watering hole. The thermometer showed 24 °F. We managed an early breakfast of tea, eggs, rolls, and jam in our cramped and soggy group tent. (We always wore our mountain parkas to breakfast so the frost melting off the ceiling wouldn't drip down our necks.) John and I left camp early, hiking past the pits we had finished exploring and continued humping our gear on up towards the ridgetop crack.

"A quarter mile up, we happened upon a funnel-shaped depression in the grassy hillside, about 25 feet in diameter. I tossed a rock that fell 2-3 seconds free, hit a glancing blow, and fell 10-12 seconds more. This one sounded good! We set a couple of bolts on a nearby boulder and rigged the ropes to maximize the length while trying to avoid putting knots in awkward places.

"I dropped along a smooth face past loose clumps of moss, roots and dirt, and into the twilight zone where the vegetation ended. I crossed a bulge and the rappel went free in a straight-walled shaft. Down 210 feet I landed on a steeply sloping, 4-foot-wide ledge where the rope had caught and piled into spaghetti. The drop below swallowed rocks and replied with booming echoes that lasted 12 seconds. It was impossible to tell when the rock fall sounds ended and the echoes started, so the depth was still a mystery.

"After quite a bit of gardening and

setting another bolt, I flopped the pile of rope over and fed it down the shaft. I thought 330 feet of rope would make the bottom, but I went prepared for yet another short-rope experience.

"The next 300 feet was a combination of free drop and toes-against-the-wall easy rappelling. Finally, I could see my bottom knot swinging in space maybe 100 feet above the floor. Short-rope again! I switched over and started climbing

out. When I could reach the sidewall, I dropped a rock and confirmed that we needed an additional 100+ feet of rope. If we re-rigged to make maximum use of all our rope, we might just make it.

"Back on the surface John and I discussed our options and decided to postpone until the next day. We called the pit Deep Surprise since there were no features in the area to suggest such a deep pit hid below the surface. Hiking towards camp after sunset, I stepped on a "dark spot" in the trail between two large clumps of grass and fell up to my armpits with feet dangling in space. Oops! Shortly after that, the fog rolled in, we got off route, and the batteries in the GPS went dead. As we were wandering around, we saw two glowing eyes in our halogen beam and then a fox appeared out of the gloom. He didn't spook easily and we got a good look at his brown fur and bushy tail with a black tip. We staggered into camp about two hours after dark and devoured two big pots of delicious stew David had made for dinner.

"As we headed out the next morning we carried another 150-foot rope just for insurance. We also carried a second bolt kit so John could bolt his new find while I was working Deep Surprise. No rain the day before helped the hike back to the pit go quickly.

"After a quick re-rig to maximize rope length and two knot-crossings, I landed on a sloping mud and gravel floor. I hurried down the slope hoping for a continuation but was disappointed. The end was typical of our findings in this area, a flat muddy floor under a parallel shaft. There were drip holes several inches deep in the mud, and bones littered the floor. During the rainy season a lake formed as water flooded in faster than it could seep out. Back at the

rope, I was surprised to see a tiny speck of daylight directly above me. Pits just don't come more vertical than this.

"Back at the surface, John and I pulled all the rope, measured and re-coiled it. The vertical shaft measured 623 feet and the total depth is 703 feet. John was in a hurry to drop his latest discovery nearby so off we went. We never did make it to that black crack on top of the ridge!"

#### HORIZONTAL AS WELL

In 2002 we were continuing to produce deep pits, like Deep Surprise, but never saw a base level. All precipitation on the plateau was going underground, and that seemed significant even in the dry season, but we never got down to where there were running streams, where the drainage might lead to integration and give us a continuing cave.

The alternative was that you might descend to a water table and the development continue under that, but we never had a pit end in a lake or sump, either.

One day I decided to see if I could find something like a base level. To that purpose I headed down the side of an incised paleo-glacial valley to see if any holes down there might go horizontally. I was just hiking so I didn't take much with me.

At around 13,000 feet on the side of the valley where the dip all goes into the side, I chose a bench at random, and started looking. Up on a little, steep shelf, I could see an opening, so I climbed up. It was only about 5 x 15 feet, but did go in



Matt Covington

**David Cole ready to go deeper in Parallel Pit Cave, July 2004.**



horizontally. Still, in all the previous years, everything that seemed to have a horizontal entrance, led right away to a deep pit, so that is what I expected.

I discovered I had brought no lights, except a key-chain red LED squeeze light on a cord around my neck. One of my laws of cave discovery is that the less light you bring, the bigger the cave you will find, but this was ridiculous. My eyes were adjusted to the brightness outside, and so as I headed in, I could see almost nothing. I decided to crawl, so I would be sure to see a drop-off before it was too late.

I had crawled about 50 feet before I realized the ceiling was no longer close above me. I stood up and saw that it was in fact a passage and right there was about 20 feet wide and 25 feet high. Where was the inevitable pit? I continued on, agonizingly slow, because my wonderful high-tech light illuminated only about 4 feet in front of me, and in an unearthly red glow. Finally, I was forced to conclude I had by the strange chance of the cave gods, found what I was fanaticizing about—this thing is horizontal and it goes! It had to be named LED Cave.

I went back with John, Jeb and Andy and we mapped 270 meters into it. That brought us to a dome/pit that had intersected the passage. Andy did a belayed traverse of this, placing several points of protection, and found that the passage continued on the other side, perhaps with a little down-cave airflow. It went horizontally all right, but was clearly a paleo base level, as there was no stream at all. Stalactites had side growths up to 5 inches long pointing toward the entrance, indicating persistent paleo airflow, down cave.

The included map shows how later pit development, so typical of this area, has intersected and passed through this paleo cave. Andy dropped most of the pits in the cave and none were over about 90 foot in depth.

I looked around the valley side in that area, and there is no impenetrable, insoluble layer, as one might expect, to force a water table and help create such a thing. So it must represent an old, stable period. But it is still not the base level we are looking for.

### CYCLONE VALLEY

This year we moved our base camp out a ways. Some of us had hiked out there in the past, and there are a couple nice synclines and a moderate dip to the limestone that appeared to have the

chance to have focused the drainage and might give us the integrated deep cave we wanted, or indeed just a going cave. The LED Cave was near that new site and might be more accessible as well.

In '02 I had gone out there and found a hanging valley pretty much right at the bottom of a syncline and there was water there and tent sites, all at about 4000 meters. We came to call this Cyclone Valley.

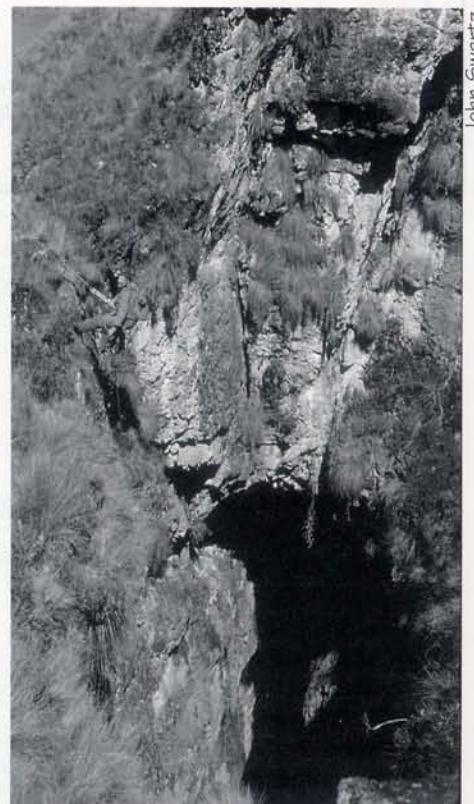
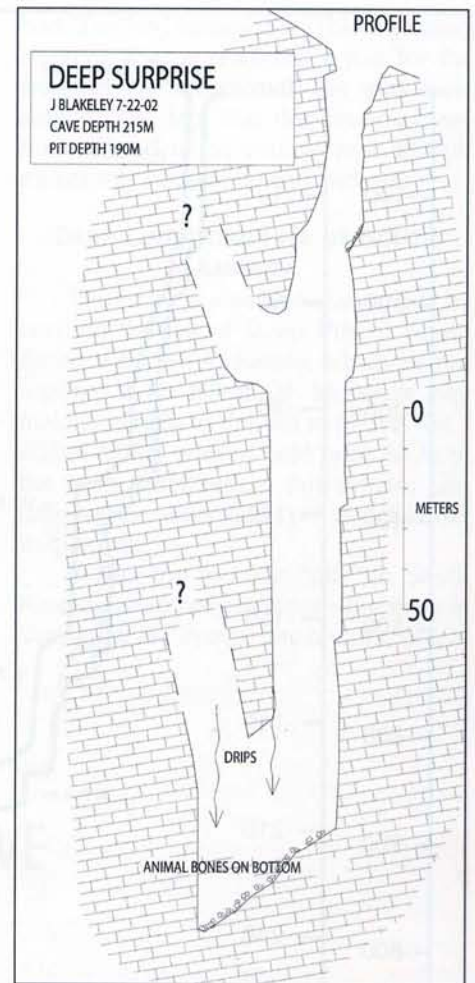
This camp is in the midst of some interesting holes. Once camp was set up we noticed a pit about 6 feet across, only 50 feet from the group tent. Matt Covington (Stanford, California) dropped this and found that it was over 265 feet deep and belled out hugely. One day Bonnie Crystal was watching camp, and napping in her tent, and found she could hear David Cole (Lookout Mountain, Tennessee) and Matt, pounding bolts in a nearby cave, through the rock.

Several caves in this area have yielded continuations, and small streams of water as well as down-cave air flow, indicating we may indeed be on the right track, in choosing this geologic setting. But the wetness of the caves in this area also was a limitation. It proved clear that wetsuits, which we hadn't brought, are now necessary, and several continuations were left for next year. One cave, Windy Rift, was pushed by David and Matt to where it narrowed and was not quite big enough to get through. It was taking water and air at that point, but gave us our deepest yet.

### WINDY RIFT CAVE

David Cole, sometimes with Ashley Chan (Marietta, Georgia) and Jack Thomison (Knoxville, Tennessee) had started working at the first syncline in 2002, day-hiking there from Gringobamba. They explored a number of pits and multi-drop caves, including 300- and 421-foot pits (Cole), a 257-foot pit (Thomison, Chan), a 502-foot deep cave with pits of 268 and 225 feet (Cole, Chan), and a 545-foot deep cave (Cole, Chan) with some nasty loose rock slopes above the drops.

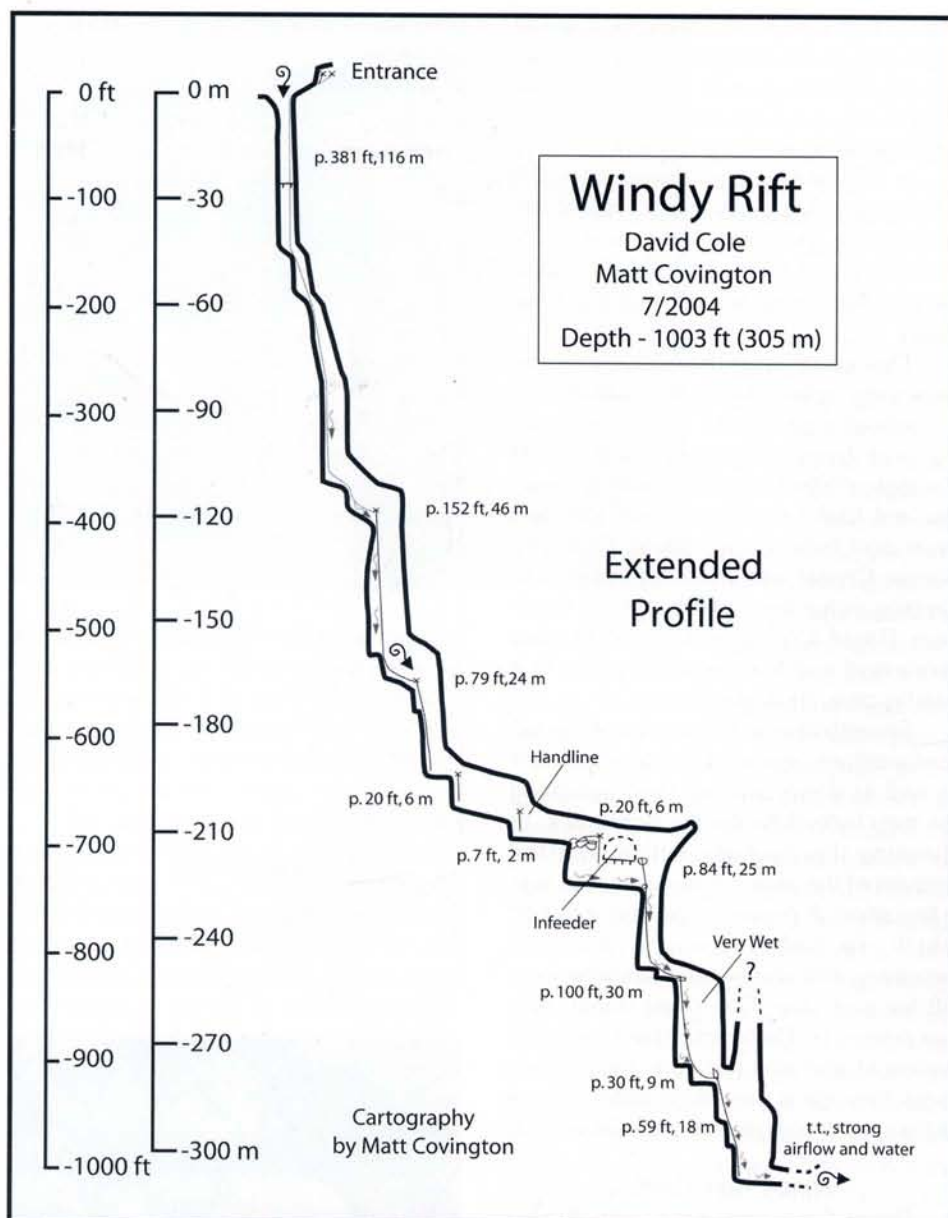
On July 27 Cole was alone and found a deep pit with a nice 18- to 20-foot-wide surface opening at about 13,800 feet elevation. He placed two bolts for anchors. He had two 300-foot ropes and tied those together, since other pits in the area had been found to be deeper than 300 feet. The shaft proved to be another of those and was later measured at 381 feet. As he descended he got a really positive feeling about this pit, as he could discern a down



Jeb Blakeley dropping into Deep Surprise.

John Swartz





cave breeze, even in the 20-foot diameter shaft. At the bottom he fed the excess rope on down a 40-foot slope and to the top of a second pit. There he placed another bolt and tied the remaining excess entrance rope to it.

The second pit proved to be 152 feet and very drippy. At the bottom was a rift that led on, with strong airflow. This led to a third pit. Below he could hear a running stream. He didn't get a chance to return before the end of the 2002 expedition.

When we got camp set up in 2004, now just 500 feet below the cave, David was chomping at the bit to push Windy Rift. On July 11, before anyone was ready to accompany him, he lugged 900 feet of rope up to it and got down the third pit, a 79-footer. The stream passage at the bottom led right away to a 20-foot drop and on, to where it joined a large dome-pit, with another small stream coming

down.

He got really excited, and started to free-climb down, as the bottom was not far below, but then thought better of it and placed a bolt and rigged a piece of rope. A tall stream canyon led on, and he soon came to a 6<sup>th</sup> drop. That was enough for the day.

Two days later he returned with Matt Covington. Matt provided some narrative beginning with reaching the end of David's push and setting the anchor for the next drop, with his power drill:

#### NARRATIVE BY MATT COVINGTON:

"I straddled the void below me, my feet against one wall and back pressed into the other, and forced the drill bit against the far wall. At almost arm's length, I had to strain to get the drill to bite into the rock. Water rushed under me, shot over the lip, and sprayed into the deep blackness.

David looked on impatiently, ready to continue the push into virgin territory. The drill cut into the rock as its loud scream echoed through the cave. Its pitch faltered and then gradually began to lower. It can't be...how could the battery have died so quickly? I yelled back to David."

"What?"

"Yes, it's dead."

"Often caving becomes a struggle between the desire to push on and the appeal of bailing out. For me, this was one of those schizophrenic moments. We were more than 13,000 feet above sea level, a full day's walk from the nearest village, and 800 feet below the surface of the earth. The cave was growing increasingly wet (a situation for which we were not prepared), the altitude slowed any aerobic activity to a snail's pace, and my expensive drill had just failed after an unusually small number of bolts. By the time we could return to the surface it would be dark and below freezing. My battle was not going well, even though there was no doubt that we were exploring an awesome cave.

"Luckily, David held firm. We had no manual backup for bolting, but he began searching for natural anchors. He managed to find a marginal anchor that would suffice as a rebelay to allow us to drop the next pitch. At first, I told him that I preferred to stay up top and let him check it out, but as I watched him go over the lip the excitement of exploration won out, and I decided to follow.

"He ran out of rope on a ledge about 80 feet below. The drop was quite wet, and there was nowhere for him to get out of the water. I quickly lowered the last 300-foot rope to him. Tying a knot at the ledge, he finished the descent to the bottom of the pitch. I followed him down the long wet pitch and another short one.

"At this point we needed more rigging, but we were running quite low on materials. After much debate, David ended up threading his pack tether through a creatively-solutioned hole in a flake. This kept us mostly out of the water for the next pitch. I descended this pitch first. It stair-stepped for about 60 feet before reaching a small gravel-floored chamber at the bottom. The stream and strong airflow were all pouring into a very tight canyon.

"Tight is my specialty, so I removed my harness and attempted to squeeze in. I managed to work my way about a body length into the crack until it was too tight. I could see that it appeared to get a little bigger about another body length ahead, but there was no way to get there. The walls



were quite grabby and it took me a few minutes to extract myself from the passage.

"We began our long ascent out of the cave, derigging as we went. By the time we reached the bottom of the 533-foot, double-entrance drop we were quite cold and tired. We decided to leave the rope there and come to retrieve it later. We knew the final ascent would be slow and that whoever was waiting on the surface would grow increasingly hypothermic. Because I was carrying the drill and bolting gear, I would be slower. Consequently, I went first so that David wouldn't have to wait for me outside where it was even colder.

"Outside, the clouds had cleared off and revealed the most incredible Milky Way I've ever seen, and, indeed, it was below freezing. Nature is a striking mix of incredible beauty and deadly indifference. I donned a trash bag and proceeded to

march up and down the slope by the entrance to keep semi-warm while David ascended. After about 12 hours underground, we retreated to camp with a hypothermic stumble. The final depth of the cave was 1003 feet (305 meters), making it the deepest known cave in the area.

"Two days later we returned to retrieve the ropes. We ascended the 533 feet each carrying 600 feet of wet 11 mm rope. Given the elevation, this took about an hour each, but a good time was had by all."

#### CONCLUDING REMARKS

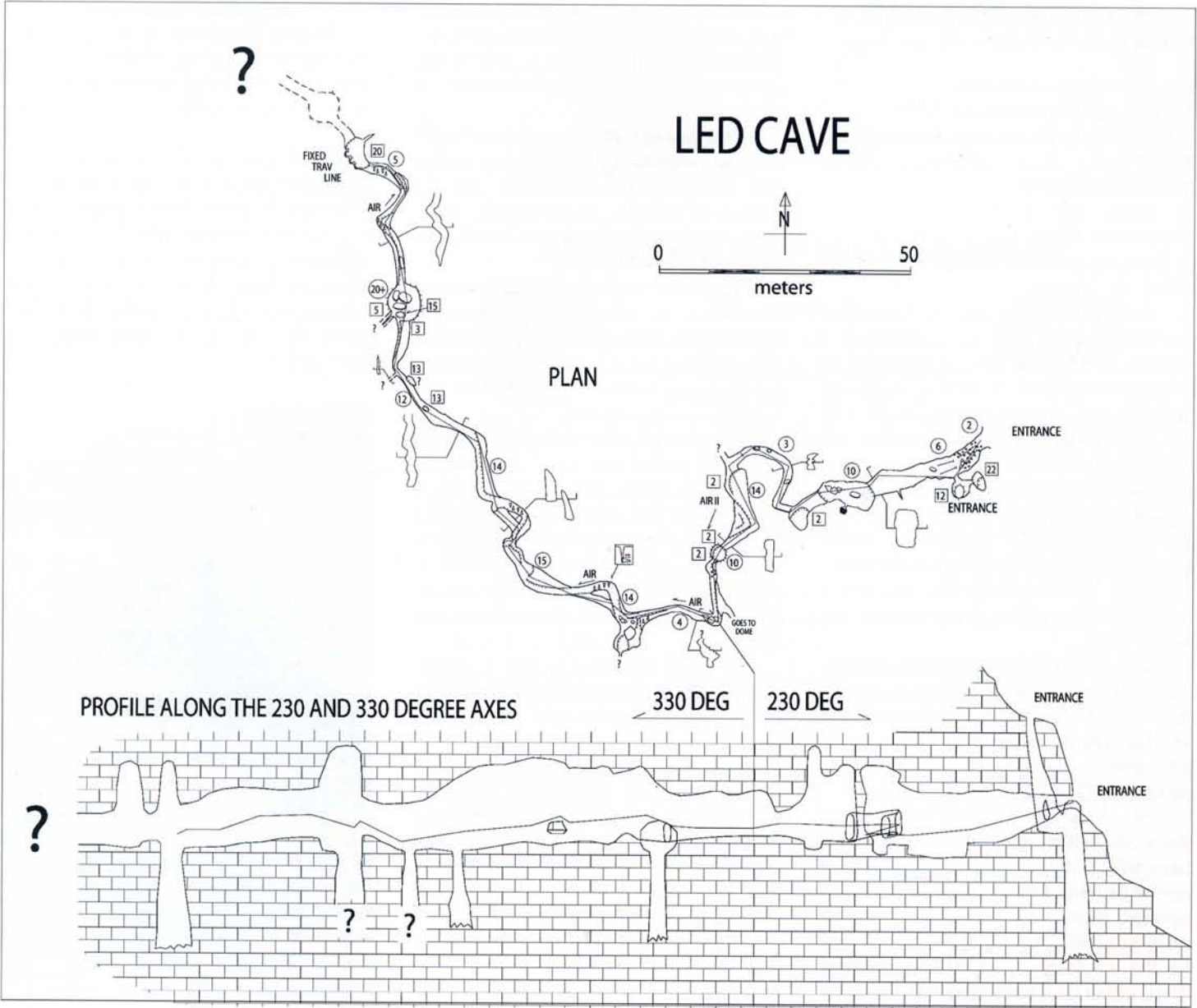
The few caves or pits mentioned here hopefully give an idea of what we are finding. At these high elevations it is a struggle to do even a 200-foot pit and many that deep or deeper have been done. There are lots of hero stories to be

had, if we had more space. This is a caving situation that is challenging just for the weather, the altitude and the wilderness setting. The fact that the caves we are finding tend to be vertical and difficult makes this extreme caving, indeed.

#### DEEP LIMESTONE PITS OF SOUTH AMERICA

The list produced below was made by revising the list of Deep Pits of South America by Ian McKenzie, which he put together in the fall of '04. McKenzie may make additions to this but so far has not. I added all the ones in bold print, all from the area described in this article, and dropped the water filled "pit" and the ones in quartzite.

In fact the top five "pits" in South America are mostly oddities—the three in Venezuela are in quartzite and the one in







**Buena Vista Pit, maybe 100 feet deep.**

Brazil is mostly underwater:

1. Sima Aonda (Venezuela) 320m
2. SP1 in Sima Pumacocha (Peru) 282m
3. Lago Azul (Brazil) 279m (274m underwater)
4. Sima Mayor de Sarisarinama (Venezuela) 275m
5. Sima Auyan-tepui Noroeste (Venezuela) 250m (?)

Since cavers have little use for a "pit" that is underwater, and since quartzite is a medium that usually doesn't lend itself to cave development, I think it is fair to generate a list of pits in just limestone, and air-filled. Not trying to start contention, just trying to stick to real caving interest. Pits in limestone could lead to the deepest or biggest cave in the world; a pit in quartzite isn't likely to go anywhere, even considering the article in last month's issue.

That is, this is a caving list, not a geomorphic list, shown in the table on the facing page.

Thus of the 23 limestone open-air pits over 100 m in depth in all of South America, 18 are located between 13-14,500 feet elevation and within a few kilometers radius of that mysterious deep-pit mecca, Gringobamba.

Also note that there are not as many deep pits at Gringobamba as may have been talked about, or the ones listed may not be as deep as said previously. That is because many of these and others are multi-drop, and the depth mentioned was for the whole cave, which is a series of drops rather than just a single pit. That has

been a point of confusion, but is understandable.

Some of these pits would probably rank high in the whole Southern Hemisphere also, but the Atlas of Great Caves of the World lists only pits over 300 m. As I recall there are two such listed for New Guinea, over 300 meters deep, so presumably there are more deep ones there, over 100 meters. A Southern Hemisphere listing would drop the Venezuelan pits, quartzite or not.

#### ON THE MEASUREMENT OF DEPTH FOR A VERY DEEP PIT

Obviously one cannot simply tape pit depth with a survey tape, usually of 100-foot (30-meter) length. The method often employed in the field is to mark the rope descending the pit at top and bottom, and then to pull (de-rig) it, leaving the knots and markers in place. The portion representing the pit depth is then measured by passing the survey tape along its length, 100 feet at a time, and counting the number of passes and the remainder, at the end.

This doesn't allow for the stretch of the rope, when hung, but with static caving rope the stretch is small. In any case the error is on the side of making the depth measurement a bit shorter than it really is—an error on the short side.

The other likely error would be a tally error, where the measurer forgets a survey tape length, or slips and mentally adds one that actually wasn't used. This always produces an error of +/- 100 feet (30 meters)—usually obvious.

Thus for Dos Ojos, Swartz, Zellner and Blakeley pulled the rope and Swartz passed the metric survey tape along its length to get the depth. This produced a distance of 67 meters from the surface to the rebelay, and 191 meters from there to the pit bottom, for a total of 258 meters. Probably the pit is actually a little deeper than that.

In 2004 we tried a new method. Bonnie Crystal brought a laser rangefinder of appropriate range and with stated accuracy of +/- 1 meter. She descended to the rebelay and shot to a reflector placed on the bottom by David Cole, and then ascended and shot to a reflector at the rebelay. She reports getting a distance of 74 meters from the surface to the rebelay, and 171 meters from the rebelay to the bottom, for a total of 245 meters.

There is a problem here, in that the laser reading, compared to the prior determination, is much greater for the

upper portion, and much less for the bottom portion, and neither difference equals a tally error (30m). The difference is also much greater than any normal operator error in taping the rope. My conclusion is that the instrument was malfunctioning at the time and produced anomalous results.

In addition, the 600 that Smith put on the rebelay and got short-rope on, was a new rope, just off the reel, and PMI always tosses in at least a couple extra meters. Thus, if the bottom portion were really 171 meters (561 feet), he would not have got short-rope, and would have got to the bottom with rope to spare. So the 171 meter reading is suspect for that reason also.

We decided to stick with the older determination by the tried-and-true method, which is usually pretty accurate.

#### ACKNOWLEDGEMENTS

Thanks to all the cavers who have participated in the expeditions that have gone to Peru. They all helped this happen. All but 1998 and 2001 went to this area.

**1996** Jeb Blakeley, Bitsy Blakeley, Steve Knutson, Matt Oliphant and Nancy Pistole.

**1997** Jeb Blakeley, Bitsy Blakeley, Steve Knutson, Ken Marsden and Cynthia Ream.

**1998** Mark Harder and Steve Knutson.

**1999** Jeb Blakeley, Bonnie Crystal, Steve Knutson, Garry Petrie, Cynthia Ream, Jim Smith, Rich Sundquist, John Swartz and Andy Zellner.



**John Swartz peering into a 100-foot pit (Teardrop Well) found on a ridgwalk. We never got to return and explore it.**



**2000** Jeb Blakeley, David Cole, Kris Esterton, Stew Evans, Steve Knutson and Jim Smith.

**2001** Mark Harder, Steve Knutson and Rich Sundquist

**2002** Jeb Blakeley, Ashley Chan, David Cole, Steve Knutson, John Swartz, Jack Thomison and Andy Zellner.

**2004** David Cole, Matt Covington, Bonnie Crystal and Steve Knutson. (Chachapoyas area—Evan Anderson, Bonnie Crystal, Stephanie Juth, and Steve Knutson.)

I would like to thank PMI and Bob Liebman, of Bob and Bob Cave Equipment Suppliers, for deals or donation of rope. We thank the Western Region and Dogwood City Grotto for Grants. Thanks to the National Speleological Society for designating the 1996 trip an Expedition of the NSS.

We also owe a big debt of gratitude to Bonnie Crystal (KQ6XA) and Jessica Stevens (KF6WMY), for bringing or loaning a great deal of very expensive and sometimes heavy radio and electronics gear, and for setting this up and maintaining it. On that regard I need to thank Augusto Yipmantin Sosa (OA4CVT) for being our liaison in Lima as well as our radio contact every day during the expedition, for emergency purposes.

I want of course to thank the very nice people at roads end, Zacharias the hospedaje proprietor, Jaime and Carlos, the muleskinners, and all the other nice folks of the town. Their help and hospitality was essential and greatly appreciated.

#### THE FUTURE

We of course plan to return to this area in July of 2005. If you are interested in participating, contact Steve Knutson, 503-695-6552 or sssknutson@aol.com, or Jeb Blakeley, 208-529-1754 or jebb@cableone.net. Don't be put off by the harsh conditions—we started a new area this year, with better weather, lower elevations and interesting, going caves. We plan to return to that in August next summer, also.



**Matt ascending a typical narrow pit**

## Deep Limestone Pits of South America

| Pit Name                      | Depth     | Country | Reference                     |
|-------------------------------|-----------|---------|-------------------------------|
| 1 SP1 (Pumacocha)             | 925 (282) | Peru    | NHawkes (I McKenzie list)     |
| 2 Dos Ojos                    | 846 (258) | Peru    | J Swartz/A Zellner/J Blakeley |
| 3 Deep Surprise               | 623 (190) | Peru    | J Blakeley                    |
| 4 Pre-Inca                    | 611 (186) | Peru    | R Sundquist/C Ream            |
| 5 Clatter                     | 476 (145) | Peru    | J Blakeley/A Zellner          |
| 6 Humdinger                   | 450 (137) | Peru    | R Sundquist/C Ream            |
| 7 Steve's                     | 450 (137) | Peru    | J Blakeley/C Ream             |
| 8 Inf Grande del Plano        | 431 (131) | Peru    | R Sundquist                   |
| 9 Ojo de Conejo               | 431 (131) | Peru    | J Blakeley/J Swartz/A Zellner |
| 10 Andes Surprise             | 421 (128) | Peru    | D Cole                        |
| 11 Anniversary                | 413 (126) | Peru    | J Blakeley/D Cole             |
| 12 Hidden                     | 410 (125) | Peru    | D Cole                        |
| 13 SP3 (Pumacocha)            | 410 (125) | Peru    | N Hawkes (I McKenzie list)    |
| 14 Devoid                     | 410 (125) | Peru    | J Swartz/A Zellner/D Cole     |
| 15 Velozia (Centeranio)       | 394 (120) | Brazil  | I McKenzie List               |
| 16 Overlooked                 | 380 (117) | Peru    | D Cole/J Blakeley             |
| 17 Entrance Pit (Windy Rift)  | 381 (116) | Peru    | D Cole/M Covington            |
| 18 Gruta de Bocaina           | 381 (116) | Brazil  | I McKenzie List               |
| 19 Skull                      | 376 (115) | Peru    | D Cole                        |
| 20 Friendship Well            | 375 (115) | Peru    | J Swartz                      |
| 21 Ammonite Shaft (Pumacocha) | 371 (113) | Peru    | N Hawkes (I McKenzie list)    |
| 22 Echo                       | 340 (103) | Peru    | D Cole                        |
| 23 Inf del Condor             | 339 (103) | Peru    | J Smith/J Swartz              |

The Reference column lists the surveyor and/or those who first bottomed it. Depth in feet (meters). Inf=Infiernillo.

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