UNDERWATER SPELEOLOGY

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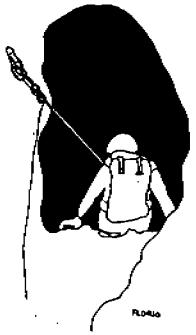
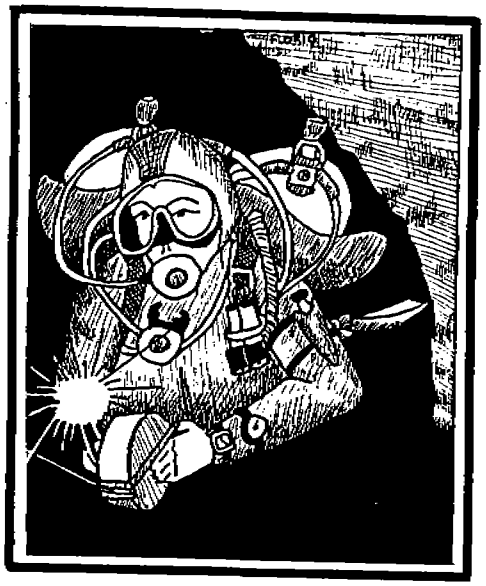
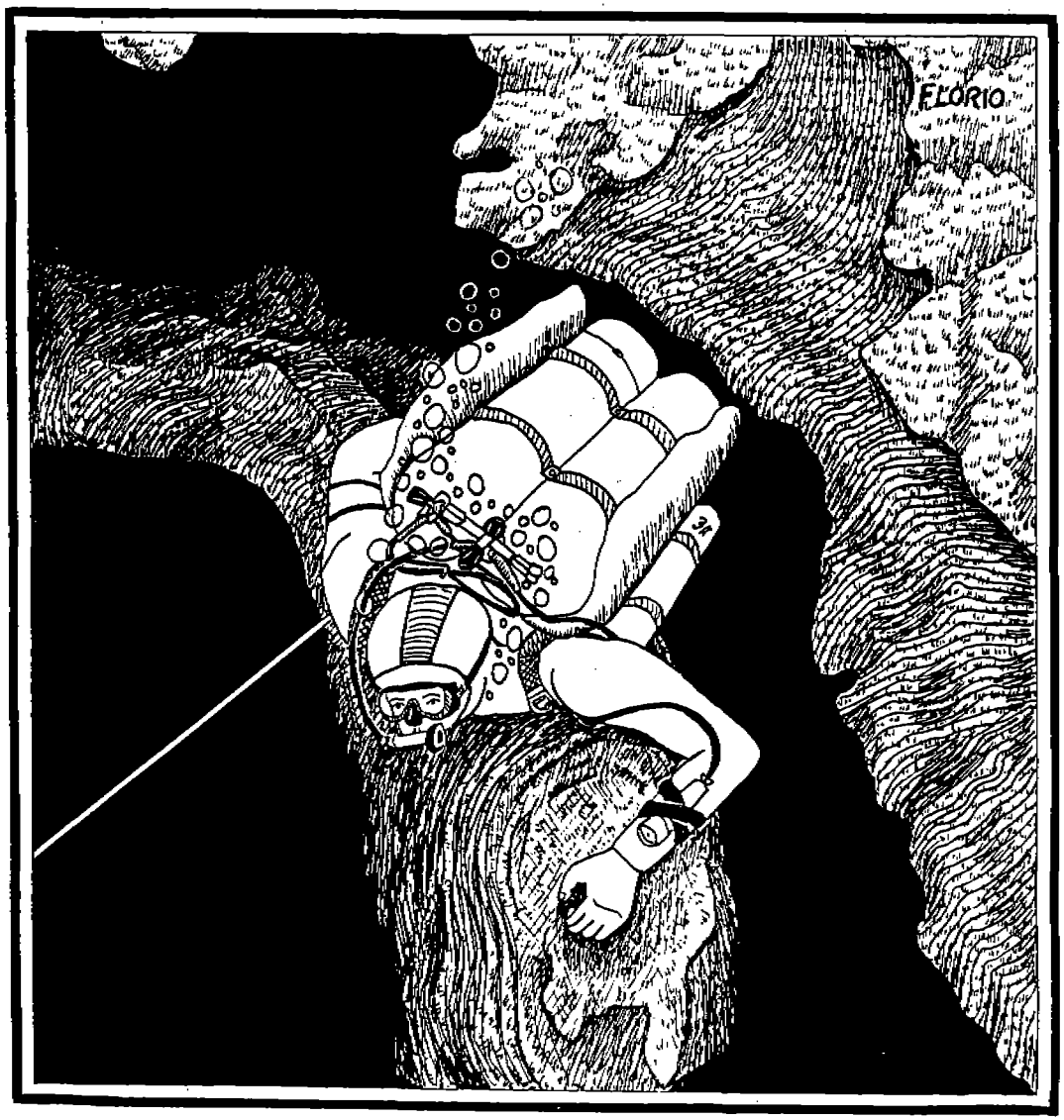
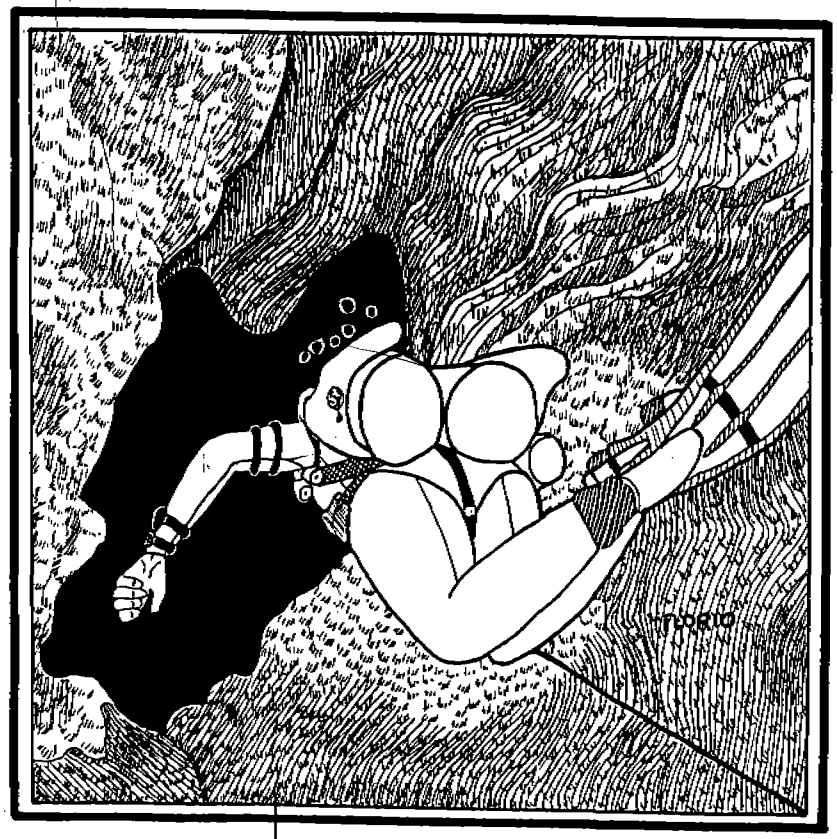






Peacock Springs
by
Joanna Florio-Jefferys



Underwater Speleology is the official newsletter of the
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THE NSS AND CAVE DIVING. Founded in 1941, the National Speleological Society joins together thousands of individuals dedicated to the safe study, exploration, and conservation of caves. The first cave-diving information ever published in the U.S. was in a 1947 *NSS Bulletin*. In 1948, NSS divers were responsible for the first cave dives in the U.S. using scuba. Prior to 1973, cave diving within the NSS was on a purely local level. That year saw the creation of the NSS Cave Diving Section to provide a vehicle for information exchange. Today, with over 400 members, the Cave Diving Section promotes safe cave diving through semi-annual workshops; cavern- and cave-diving training programs; warning-sign installation; search, rescue, and recovery through the National Cave Rescue Commission; cave exploration and mapping; several texts and publications on cave diving; and the bi-monthly newsletter-journal, *Underwater Speleology*, that you are presently reading.

MEMBERSHIP. The National Speleological Society welcomes the interest of anyone who has a sincere concern in the safe study, exploration, and conservation of caves, wet or dry. You may join the NSS either by writing to the NSS main office directly (National Speleological Society, Inc., Cave Avenue, Huntsville, AL 35810) or to the Cave Diving Section (NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950.). Regular NSS Membership is now $25.00 per year, and entitles the member to monthly issues of *NSS News* and a semi-annual technical journal on speleology, voting privileges, and discounts on publications, convention fees, etc.

As a sub-organization or "section" of the NSS, the Cave Diving Section is subject to the by-laws and ethics of the NSS. Membership in the Cave Diving Section is open to anyone who is a member in good standing of the NSS. Regular membership is $5.00 per year, and we also offer a CDS Family Membership for $1.00 for family members (who are also NSS members) of regular CDS members. Membership in the Cave Diving Section includes subscription to our bi-monthly (6 issues/year) newsletter, *Underwater Speleology*, voting privileges, discounts on publications items, workshop registration fees, etc.

NEWSLETTER SUBSCRIPTION. If you do not wish to join the Cave Diving Section, but would like to keep current on cave-diving events, exploration, and technology, you are invited to subscribe to *Underwater Speleology* for $15.00 per year.

WHAT THE NSS-CDS HAS TO OFFER. The NSS Cave Diving Section sponsors two Safety and Information Exchange Workshops each year, traditionally held in Branford, Florida over the Memorial Day and New Year's Day weekends, although exact dates and formats vary. This year's WINTER WORKSHOP will be held at the Branford High School on Dec. 31, 1988 - Jan. 1, 1989. The SPRING WORKSHOP will be conducted on May 27-28, 1989. Information and pre-registration materials are published in the newsletter and can be obtained by writing to the NSS Cave Diving Section (P.O. Box 950, Branford, FL 32008-0950).

Information on cave-diving books, back issues of *Underwater Speleology*, T-shirts, Maps (available only to people with a cave-diving certification from an accredited agency such as NSS-CDS, NACD, YMCA, or NAUI), and free safety brochures may be obtained by writing to NSS-CDS Publications Coordinator (NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950).

Information on cavern- and cave-diving training can be obtained by writing to the NSS-CDS Training Director (NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950).

CHANGES OF ADDRESS. Members and subscribers are urged to report any change of address or address corrections in writing immediately to the Section in order to insure continuity of newsletter receipt. Membership/subscription status, applications, and general information may be obtained by writing to the Secretary-Treasurer c/o the Section's permanent address:

Secretary/Treasurer
NSS Cave Diving Section
P.O. Box 950
Branford, FL 32008-0950

NEWSLETTER SUBMISSIONS. We welcome all current news items, reports, articles, photographs, negatives, slides, cartoons, notices for gear wanted/for sale (individuals only), or other submissions of relevance or potential interest for publication in this newsletter. We can now accept textual information on computer diskette if it is in an IBM-XT-compatible standard ASCII text format or WordStar version 3.3 or lower, using 5-1/4" 360K floppies; however, all computer diskettes must be accompanied by a complete paper printout. All newsletter submissions should be sent in directly to the Editor:

H.V. Grey, Editor, UWS
P.O. Box 575
Venice, FL 34284-0575

CALENDAR

Nov. 4-6, 1988 - YMCA Scuba Conference. Amberley Suites Hotel, Atlanta, Georgia. See announcement p. 3.

Nov. 5-6, 1988 - NACD Annual Cave Diving Seminar "Exploration '88." Kamp Kulaqua (Hornsby Springs), High Springs, Florida. See announcement p. 3.

Nov. 18-20, 1988 - NSS-CDS Instructor Institute. To be held in Florida. For additional information, contact the Section or Training Chairman.

Dec. 31, 1988 - Jan. 1, 1989 - NSS-CDS Winter Cave Diving Workshop. Branford, Florida. See announcement p. 3.

Feb. 3-5, 1989 - NSS-CDS Instructor Institute. To be held in Florida. For additional information, contact the Section or Training Chairman.

May 27-28, 1989 - NSS-CDS Spring Cave Diving Workshop. Branford, Florida.

Nov. 17-19, 1989 - NSS-CDS Instructor Institute. To be held in Florida. For additional information, contact the Section or Training Chairman.

NACD CAVE DIVING SEMINAR - "EXPLORATION '88"

The National Association for Cave Diving (NACD) will be hosting its 20th Annual Cave Diving Seminar, "Exploration '88," Nov. 5-6, 1988 at Kamp Kulaqua, High Springs, Florida. The beautiful Hornsby Springs Cave System is located on the property.

One of the featured speakers will be Dr. Bill Hamilton of Tarrytown, New York, who is a physiologist with 23 years' specialization in diving, aerospace, and environmental physiology, with particular interest in decompression, breathing gases, and the effects of pressure. He has been involved as an advisor in many recent cave-diving projects including the Sullivan Sink Connection, the Wakulla Springs Project, the Andros Island Expedition, and the record deep cave dive in northern Mexico at Naciemento Mante. Lt. Henry Nicholson will also be offering an NSS Rescue/Recovery Workshop.

Anyone interested is invited to attend. For more information write: NACD, P.O. Box 14492, Gainesville, FL 32604.

NSS-CDS WINTER CAVE DIVING WORKSHOP

The NSS-CDS's 16th annual Winter Cave Diving Workshop will be held at the Branford High School in Branford, Florida Saturday, Dec. 31, 1988 - Sunday, Jan. 1, 1989. Registration will begin at 8:00 am Saturday morning.

Workshop plans and speaker arrangements are already well underway, and individuals interested in presenting exploration slides or videos, or in giving a lecture presentation or technical seminar should contact Workshop Chairman Kathy McNally at (305) 666-0748 at once.

All interested persons are invited to attend. Pre-registration forms and agenda will be mailed to all NSS-CDS members and newsletter subscribers.

YMCA SCUBA CONFERENCE

The YMCA Scuba Program will be hosting its annual convention at the Amberley Suites Hotel in Atlanta, Georgia, Nov. 4-6, 1988. Special features include a Marketing Seminar, Risk Management Workshop, a Formal Mock Trail (reenacting a real scuba-accident lawsuit at a real courthouse), and a Dive Tables Workshop. Registration for the complete conference is $80 before Oct. 24, and $90 at the door; room accommodations are $45 per night for 1-4 persons.

NEW MAPS AVAILABLE

The NSS-CDS Cartography Committee is pleased to announce the availability of three new Grade 5, Class D underwater-cave maps:

1. **GINNIE SPRING** (cavern), by Burge, Howard, & Skiles. [Open-water certification required for purchase.]

2. **MORRISON SPRING** (cavern), by Burge, Howard, & McKinnon. [Cavern certification required for purchase.]

3. **TWIN CAVE** (cavern and first 1200' of passage), by Burge & Howard. [Basic Cave certification required for purchase.]

The maps are $8.00 each and can be ordered from NSS-CDS Publications, P.O. Box 950, Branford, FL 32008-0950.

Please send along a copy of both sides of your Open-Water, Cavern, Basic Cave (or Cave) Diver certification card with your order as specified.

NSS-CDS/NACD JOINT LINE PROJECT FINALLY COMPLETED - by John Burge

After years of dialogue with the owners of Morrison Spring, John Burge (NSS-CDS officer and NACD member) and Parker Turner (NACD officer and NSS-CDS member) have combined their persuasive charm and talents, their engineering skills and their cave-diving abilities, and installed a permanent novice guideline in the lower chamber of Morrison Springs.

On June 24th, John and Parker installed a "temporary" 1/2" permanent line to be in place prior to the crowds hitting the spring over the July 4th weekend. On July 21st, they removed that line and installed a 3/8" braid-on-braid line anchored with eyelet hardware and expansion pins in dolomite at each end with chafe guard where it makes contact with hard surface. Cable clamps were used in lieu of tying the line, so it should be there to stay for a while.

This line has been installed with the full cooperation of the owner and manager of Morrison.

Let's hope that we have seen the last accident there!

COMMENT ON THE DEATHS OF BILL MCFADEN AND ROBERTA SWICEGOOD - by Joe Prosser

Being new to the position of Training Chairman of the Cave Diving Section, I had imagined that my first communiqué to the caving and diving communities would praise the many recent accomplishments of the Section and the cave-diving community at large. Indeed, in the specific areas of safety awareness and training, 1988 began very well. The two American cave-diver organizations had reached agreement on the basic definition of a cavern and cave diver. The National Association for Cave Diving (NACD) and the CDS had worked hand in hand with a major open-water training agency to develop and distribute one of the largest underwater warning-sign projects ever undertaken. Two new diver training manuals were introduced by the Cave Diving Section. These manuals were devoted to cavern diving (a first-ever publication) and phreatic-cave surveying respectively. Two new specialty courses were introduced: the DPV Pilot Course, devoted to the use of diver-propulsion vehicles in caves, and the Basic Surveyor Course, whose objective is to increase the quality and quantity of surveys, and overall diver safety during the survey; both courses also represent first-evers. A brand new safety brochure was introduced specifically targeted at open-water divers wishing to explore the area just inside of a cave. This pamphlet was so favorably received that an all-Spanish version was requested and is in production for use in Latin American countries. Even the tried and true, but dated, "Cave Diving Safety Brochure" was completely rewritten and revamped in 1988. Total training for the CDS is expected to top 7000 by the end of the year. Any, or all, of these accomplishments are worthy of lengthy commendation. Any, and all, of these are indications of the increased awareness of safety that has been affecting the cave-diving community at large.

Against this background, we are saddened to report the recent deaths of two trained, competent NSS-certified cave divers in separate incidents in May and June of this year. Bill McFaden (NSS# 29053) died while exploring Little Dismal Sink near Tallahassee, Florida, on May 15. Roberta Swicegood (NSS# 20290) died while exploring the second sump of Arch Spring in northwestern Pennsylvania on June 22, 1988. Their deaths represent the 26th and 27th American-trained cave divers and the first NSS-certified cave divers to die while exploring underwater caves.

Both McFaden and Swicegood had come into cave diving in the classic manner, that is, both were traditional dry-cave explorers long before either became involved with cave diving.

McFaden was, at one time, president of the Florida State Cave Club. Swicegood was a well-known figure at many NSS activities and her articles on surveying techniques were widely read and distributed. Both were rising stars of the cave-diving community. Several months before his death, Bill McFaden was appointed Surveying Coordinator for the NACD, and he had recently completed the McBride's Slough survey project. For over a year, Roberta Swicegood was the Sump-Diving Coordinator for the CDS. Her job was to investigate current sump-diving practices and recommend a plan for the CDS to implement to make this aspect of cave diving safer. Both divers were familiar with the sites that they died at. McFaden was trying to complete a survey in time to publish his map for the CDS Spring Workshop. Swicegood was completing a survey begun earlier. Both were well known, well liked, and capable cave divers. While the specific details of these two deaths are presented separately elsewhere, both deaths follow the general pattern of previous fatalities involving trained cave divers.

During the Cavern Diver Course, students are apprised of the five general categories that cave-diving-related fatalities fall into. These categories represent classic "Accident Analysis." The categories are grouped from "most frequent" to "least frequent." The most common factor is 1) a lack of training in cave diving, followed by 2) a failure to run a continuous guideline to the cave entrance, 3) failure to reserve at least 2/3's of the beginning air supply for the exit from the cave, 4) diving at depths beyond the operational limit of compressed air (130'), and 5) failure to employ adequate lights. At the next level of training, Basic Cave Diver, students again review "Accident Analysis," but now the review is focused upon those fatalities involving trained cave divers. From this prospective students learn that only three categories account for all deaths thus far: 1) diving at depths beyond the operational limit of compressed air (130'), 2) failure to reserve at least 2/3's of the beginning air supply for the exit from the cave, and 3) failure to run a continuous guideline from the cave entrance.

In McFaden's case, he and his two dive partners were exploring a portion of the cave at depths over 200' deep. All members of his team were using compressed air. Problems began to arise when McFaden failed to follow one of the divers out through a low silty section at this depth. When a second diver returned to look for him, he reportedly found McFaden off the line but otherwise okay. The two proceeded to link up with the third diver. Upon reuniting, the group was to begin the return trip to the surface. Because valuable time was spent in the search for McFaden, and before the exit swim for the group could begin, McFaden signaled he was **out of air.**

Although the initial air sharing was without difficulty, McFaden quickly became stressed. Difficulties began to arise as McFaden was unable to deal with the increased buoyancy of his drysuit as the team ascended. With both buddies attending McFaden, the exit was slow. McFaden was unable to directly assist his rescuers and all he could manage was to hold on to the valve assembly of the one buddy while the other attempted to control his profile. When the buddy with whom McFaden was air sharing also ran out of air, then the third buddy was forced to cease his assistance to McFaden and redirect his attention to the second diver. The immediate problem facing the dive team was that now two members were out of air and only one had air to share. For the team to successfully exit the cave, all three members had to contribute to the rescue and deal with the increased task loading of sharing air from one set of tanks. This added difficulty required more decision making and response than McFaden was capable of rendering. The second diver was able to deal with these stresses but McFaden was not. A post-mortem examination did reveal that McFaden had suffered an embolism on this dive. It is not known whether the embolism occurred early on in the dive or as a result of breath-holding near the end, or even if it occurred during the recovery.

McFaden's problems began at depth, when he failed to follow his partner directly out of the deep, silty section. He was at least responding when the second diver found him and directed him out of the area. By the time the group reunited and McFaden signaled **out-of-air**, his abilities to cope with the added stresses were reduced. Although he handled the initial air sharing without difficulty, he was able to cope with little else beyond breathing and holding onto the second diver's manifold. When the second diver also ran out of air, McFaden was unable to adjust to these added difficulties.

Reviewing this fatality through traditional "Accident Analysis," it may be concluded that McFaden and his dive partners failed to reserve adequate air for the evacuation from the cave. Under normal circumstances the amount of air required for exiting this cave, from the point at which major breakdowns began to affect the team, was minor as compared to the total amount of air that the team began the dive with. However, as problems began to occur, the lack of remaining air reserve prevented the team from ever regaining complete control of the situation. Conditions only began to grow worse, and McFaden's abilities to cope with these conditions also deteriorated.

We know that using compressed air at depths beyond 130' will impair the mind. This impairment affects different people to different degrees, and the effects can vary from dive to dive and from moment to moment during the dive. As the stresses of this dive continued to mount, McFaden became less able to cope with them. When the final major test of air sharing with two others faced him, McFaden was not able to adjust even though this final obstacle was encountered in relatively shallow water. In the past some of the most experienced cave divers (of their time) have died as a result of attempting to explore caves at depth with compressed air. McFaden, at least somewhat experienced with mixed gas, believed that he could handle the unpredictable and myriad problems of diving at depth on compressed air. But problems encountered at depth created a chain of events that continued even though the team was able to ascend to shallower water.

McFaden's death came on the heels of the successful Wakulla Project, conducted at greater depths but with the use of mixed gas. Mixed gas is not without its own problems. Chief among these problems are the complex mixing requirements (accurate and consistent mixing can only come from the use of sophisticated measuring instruments) and immense backup required for the decompression needs (divers must switch mixtures underwater and a mixture suitable for one depth may not be proper for another; further, the use of mixed gases requires special decompression tables). Mixed gas, properly prepared and used, is the only safe breathing medium for cave divers to consider when they are compelled to explore at depths beyond the operational limits of compressed air.

When Roberta Swicegood met John Schweyen in the "dry" portion of the cave between the first and second sumps, she reported that she had 2750 psig remaining in one of her 95-cubic-foot cylinders and 3000 psig left in the other. Her dive plan called for her to survey the last 200' of the approximately 1000'-long second sump. To get to this last section, Swicegood had to negotiate a restriction (some 600' in) with great care to avoid entanglement and possible entrapment. Depths in this sump range from 105' near the beginning, to 65' about 300' into the sump. Visibilities within the sump are described as 3-4' under good conditions. When she failed to surface within the allotted time, Schweyen returned to the area between Sump 1 and Sump 2 to look for her. When he could not find her, Schweyen called upon the NCRC for assistance. Recovery divers found her body some 650' into the sump. Her cylinders were empty and her guideline was severed.

Sump divers, in the Northeast at least, tend to explore

submerged caves solo. The reasoning for this approach, simply stated, is that two divers entering a low, tight sump at the same time are more of a danger to each other than the dangers encountered by diving solo. Sump divers also tend to lay their own line with each dive. The reasoning for this, also simply stated, is that permanent lines often are buried in the mud, damaged by local flooding within the sump, or otherwise inappropriately laid for practical use by the current sump diver. Permanent lines, when they are located, may be of some use in following the general direction of the cave but otherwise are considered unsound. At times, depending on the complexity of the particular cave, permanent lines may cross one another as the divers explore one passageway then another. On this particular dive Schweyen had installed the "second" line on his dive and Swicegood was to confirm his survey and remove the line. Although some of the above played a role in Swicegood's demise, it is provided mainly to set the scene for the fatal dive.

Since there were no survivors from this dive, exact details of exactly all of what took place are unknown. All we know for certain is that she lost her continuous guideline to the sump entrance and failed to reserve adequate air for her escape. Evidence at the site confirms these basic conclusions. What is left for us to theorize is why she failed to deploy her safety reel to search for the lost line and why did she apparently leave so little air in reserve for a site she had explored previously? Evidence suggests that Swicegood did begin her survey as planned. However, somewhere after Survey Station #1 she lost her compass. Her survey slate contained notes from Station #1 but no other station and her compass was not located during the recovery. At some point, with an unknown amount of air remaining, she became entangled in the guideline. When Swicegood cut the line to evade the entanglement, she failed to adequately secure the loose end of the line and lost touch with it. With no guideline and no compass to aid her in choosing a direction for retreat, she wandered until she ran out of air.

Evidence found during the recovery, and on a later dive by John Schweyen, provides at least one explanation of what may have occurred. Of the four rips found in Swicegood's drysuit, only one can be definitely linked to the recovery. Two of the tears were near her wrist seals. We speculate that at least one of these occurred during her traverse of the restriction. With the seal of her drysuit breached, Swicegood was immersed in 51° F (10.5° C) water. Initially she elected to continue with the survey and completed Station #1. Realizing that she was becoming cold, and perhaps using air faster than anticipated, Swicegood abandoned the survey but did not call the dive. Instead she decided to retrieve the line and reel rather than leave it for another dive. By the time she got to the reel tie-off point hypothermia was beginning to have its effect. Swicegood dropped or lost her compass while retrieving the reel. Now beginning the final exit, Swicegood had lost the sure control necessary for handling a line and reel in a sump. When the entanglement occurred she was unable to eliminate it and opted to cut the line. With unsure hands, due to the increasing effects of hypothermia, the exit line was lost. Swicegood's breathing rate was no doubt increasing as her ability to deal with these added problems was decreasing. She may have attempted to deploy her safety reel, but cold hands and an unsure grip could have defeated attempts to deploy this reel.

Solo diving, regardless of the justification, entails a great deal of risk; the potential difficulties one may encounter can quickly become life threatening. What may well have begun as a simple line entanglement took on life-threatening proportions when Swicegood lost control of the guideline. The value of a dive partner under these circumstances must be weighed against the potential difficulties that the dive partner could present under other circumstances. Note that while the initial rescue-search for Swicegood began as solo dives, the final recovery required a team. Recall also that the recovery team faced far more hostile conditions than did Swicegood when she began her final dive. This is not meant to be a rekindling of old debates on the value of a dive partner; it is meant to be a reminder that regardless of standard customs of dive planning, the decision to dive solo must be carefully considered before the commitment is made. A dive partner, under these circumstances, may well have provided the extra control necessary to deal with the entanglement. A dive partner may also have added some checks to the decision-making process by electing to call the dive when problems first began to appear.

Swicegood, like McFaden, failed to reserve adequate air for the exit. Under "normal" circumstances, both had plenty of air at the beginning of their dive to cover an exit. At some point during the dive both went past adequate reserves and moved toward minimum or even less-than-minimum reserves. Reserves are established according to expected problems to be encountered during the dive, plus a reserve to counter problems which may not be expected on the dive but could occur. This represents the most difficult aspect of the cave diver's task: planning for the unexpected. If a cave diver chooses to interpret basic cave-diver philosophy on air planning as "reserve 2/3's of your air for the exit," instead of "reserve ***at least*** 2/3's of your air for the exit," then the cave diver moves from adequate air reserve to minimal air reserve. Problems seldom reveal themselves as immediately life threatening, but rather as nuisances. Once nuisances begin to develop into problems, minimum reserves may no longer be adequate.

The deaths of McFaden and Swicegood are indeed tragic. The tragedy could be further deepened for current and future cave divers, and their families, if the basic mistakes these two divers made are not acknowledged and reflected in our own dive planning. When one is involved with a submerged-cave endeavor, one must be constantly aware of the total safety demands of that project. We are all explorers, and it makes no difference if that exploration is limited to occasional dives at the local grotto or major projects like the ones McFaden and Swicegood were involved with; we evaluate and take risks every day. It can often be easy to justify a deviation from basic safety principles when one is motivated to achieve a goal within a very limited time frame, especially when one becomes concerned with the end result rather than with the process used to obtain that goal. It also makes no difference how many times you have completed the same dive, or one just like it. As explorers, we have an obligation to ourselves, our families, our dive partners, and this community to approach each and every dive with the utmost respect for the potential hazards of this environment and our reappearance at the surface. Safety Demands make no allowances for the chivalrous causes of our dive(s).

TYTOONA CAVE CLOSED

[Letter to the Cave Diving Section from the Western Pennsylvania Conservancy]

July 28, 1988

Dear Gentlemen:

You are aware of the unfortunate accident at Arch Spring Cave this past June. This was a tragic incident and a loss felt very strongly.

In light of the incident, the Western Pennsylvania Conservancy is prohibiting diving from the Tytoona Cave entrance unless there is a defined scientific purpose. This includes both the downstream and upstream portions of Tytoona Cave.

If you have any questions, please feel free to contact me.

Sincerely,

Paul G. Wiegman
Director, Natural Areas Program

RECENT DISCOVERIES ON NORTHERN VANCOUVER ISLAND, CANADA - by John Pollack and Keith D. Sawatzky, M.D.

Between July 9-16, 1988, we once again headed into the Pacific rain forests near Port McNeil, British Columbia to push a number of untouched river and stream caves. This area has received much attention recently from Canadian cave divers, thanks to its easy access, and the promise of long dives and virgin dry cave. The complicating factors in this wild environment include large off-road logging trucks, dense vegetation with quantities of a poisonous, spike plant known as Devil's Club, and large bears which are not NSS-CDS certified...

The week of diving can be summarized as follows:

Pitchford's/Minigill Connection. Minigill, a fine river cave with 1.5 miles of known passage, was discovered in 1977 via a 110' shaft that drops into the cave halfway between the upstream and downstream sumps. The underground river reappears in Pitchford's cave, which is located in the canyon wall of the nearby Raging River. Pitchford's is a phreatic oval 20' wide by 7' tall with waist-to-chest-deep water for the first 400'. The sump was previously dived for 350' to an airbell by a team of Quebeçois divers. We found their line intact after 5 years, and moved up it against a strong current to continue through a 35'-deep maze of passages—some of which carried current, and some of which didn't. Two dives were required to traverse a total of 950' of flooded passage through three sumps and make the connection to the terminal sump in Minigill. Naturally, the first dive was turned within 50' of the connection. Upstream visibility is 30' with a return viz of 3-6' and water temperature is 42° F.

The highlight of the return trip is an insoluble dike 2/3 through the cave. One quickly ascends on the upstream side of the dike to air, is propelled over the edge in a pour only 3' wide, and must dive immediately to stay on the line. The experience is similar to being flushed down a toilet.

The connection creates the opportunity for an exciting through trip. After confirming the line is intact, one could rappel the drop into Minigill, carry through 1000' of river cave, and dive out via Pitchford's.

Mystery Cave. In 1987, we passed three short sumps totalling 350' to discover 700' of virgin streamway and large, upper-level rooms in this resurgence cave. This year we pushed a formerly unnoticed passage (it was obvious, therefore Sawatzky missed it) to find 3000' of decorated upper-level passage, rooms and streamway. A set of 40's was hauled upstream and Sawatzky dived Sump 4 (100' long and 20' deep) to reach another 300' of streamway ending in a massive breakdown and wood choke. A still-water Sump 5 awaits as a possible route around the choke. Mystery should produce more passage, but its obstacles include frequent flooding (Sump 1 fluctuated 8' vertically over 48 hours), a 25' waterfall climb, and poor return visibility (often below 1').

Reappearing River. In 1987, 3500' of large river cave was surveyed through six sumps. This year we hauled a set of overfilled 72's through the 700' of dry borehole known as Never Never Land, and set up Sawatzky for a solo dive. He pushed through 650' of Sump 6 (passed by MacGregor in 1987), 350' of Sump 7, and emerged in a large new room (The Octagon) 150' by 60' with perfectly vertical walls rising 200' to a dome ceiling. The river passage continues into Sump 8, which drops steeply to a depth of 70'. It could be seen going down to 95' and beyond. Cold and at his margins, Sawatzky left to find easier prey.

Reappearing River will haunt the dreams of Canadian cave divers for some time—there is every indication this resurgence cave will continue for several miles provided depth doesn't shut us out.

Tsultan River Resurgence. Two 1000'-deep caves—Arch and Glory Hole—lie in a ridge above the Tsultan River Resurgence. This large spring issues from a low arch within 250' of the road. On July 15, 1988, Kirk MacGregor made the first penetration of the cave, laying 350' of line through a gently descending, clean-washed 15'-wide-by-3-5'-high passage. Pollack followed a day later, laying line to 600' and a depth of 40', past two constrictions. The cave just keeps right on going, with the promise for a long dive. Return viz is excellent at 6'.

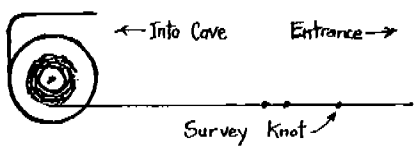
Canadian tactics and equipment may be of interest to warmer-water divers. Most B.C. dives are sump dives with low return visibility, and they are definitely side-mount country; back mounts are seldom seen. The mounts are simple chest slings equipped with D-rings, and tanks are fastened with cam-tightened, 2" webbings and rapides. Tank positioning is maintained with a crotch (not thigh) strap for a surprisingly rigid configuration. Tanks tend to be 40's or overblown 72's with K's or occasionally Y's; 100's should appear by 1989. Most divers rely upon Blizzards and other cold-water regs if they also dive in the Rockies. Wetsuits are preferred for the ease of travel in dry passage, by drysuits are in the truck as well. Water temperatures are 40-44° F on the Island, and 34-36° F in the Rockies, and exposure can be a big problem for thin divers. The cold water usually dictates the use of mitts, therefore lines are thick (#72 to #48 nylon gang line) and stiff, and backup regs must be carefully positioned on the upper chest with surgical-tubing snares. Two to three small helmet lights are usually supplemented with a large hand unit (8 watts) for pushing. Line reels are home manufactured, and they are considered highly disposable. Junctions are pinned, and small safety reels are carried to relocate lost lines. Main lines are usually knotted and marked for "in-out" orientation. Solo diving is normal, but close partners often buddy-dive as two-man teams when conditions permit.

We hope to forge closer ties with Florida NSS-CDS members during a training trip south next spring.

DIRECTIONAL INDICATORS FOR LOW-VISIBILITY SUMP DIVING: A Proposed Standard - by John Schweyen

Many sump divers avoid using line arrows as directional indicators unless they are at a junction. (In a low-visibility sump, where a diver is in contact with the line, arrows break the rhythm of line following and tend to snag on equipment. In addition, they will trap small debris like leaves and grass.) As a result, some relatively long sumps are rigged with completely unmarked line; this is a potential hazard—if the line is lost momentarily, it may not be obvious how to proceed after finding it.

Some divers have started experimenting with a three-knot code to indicate direction. At every twenty or thirty feet, two closely spaced knots are placed in the vicinity of the survey knot. Since there are two possible patterns for three knots to indicate direction, a convention should be established to avoid confusion. I am proposing that the two closely spaced knots point into the cave, so that the isolated or widely spaced knot points towards the entrance from which the cave was explored (see diagram). Obviously, this knot code does not always indicate where the nearest airspace is, but it does give some directional information, which is better than none at all. I am not suggesting that sump divers should rush out and start using a knot code, but those who do should adhere to some convention.



THE WILD WELL PROJECT, CLAYTON COUNTY, IOWA - by Mike Nelson

Trip Report: 4-30-88. "THE CONFIRMATION DIVE," Mike Nelson and Doug Schmuecker.

Doug Schmuecker and I had been wanting to get back to the Wild Well for some time now, to verify the side passage he believed he'd taken on his dive last November [reported in UWS 15:3, May/June]. Along with Lowell Burkhead and my son Aaron and his new pup, Ellie, we assembled near the landowners' house and proceeded to their house to notify them of our presence on the property, then drove down to the Well.

The few branches on the road from some logging didn't seem anything to worry about, but Doug's car wouldn't shift at the place we had to turn the vehicles around. A minor repair job, and we backtracked up to the site.

The plan was for me to dive first, using the guideline laid in by Randy Kwiatkowski and Art Dahms, with Doug following. At the first airbell, we would scan from side to side, looking for Doug's lead and anything else that might be there to be seen. All the time Doug and I were getting ready, he kept talking about how much lower the water looked than on his first dive. This, and my "assuming," led us astray of our plans.

The first airbell I reached would have been close with both of our heads in it, and wouldn't have existed with the water level much higher. The second airspace was much smaller, and my educated guess is that it was a result of exhaled air from previous trips. The third space was the first place that looked like a room to me, so this is where I surfaced to wait for Doug. (We were both rigged to dive solo, though operating as a team, supposedly.)

Meanwhile, as he was approaching the first airbell, Doug had surmised that I had swum right on past it, while simultaneously experienced a free-flow problem with his regulator. He wisely reversed his course, and I waited X number of minutes for him. When he didn't show, I followed suit.

I had tried to count the knots in the line (at 10' intervals) to determine how far in I had gotten, but the excitement of, and concentration needed for, my first dive into truly large submerged cave precluded accomplishing this chore. The visibility was fine most of the way out, satisfying me as to my technique in swimming, once I had established buoyancy. It was murky, but I still had 3-4' of visibility at the first airbell, and I only ran into zero visibility from there on out. When the line came up differently than expected and I ran into rock, I correctly reasoned that I was simply on the wrong side of it. Moving over a little, I surfaced.

We discussed our misunderstandings. In the future I will err on the side of caution, better to meet up closer than anticipated than later or not at all. Doug confirmed that the direction that both the line and I went was the same way he had gone last November, scratch 86' of virgin side lead. I was pleased that, even though aided by an established line, I had penetrated the Wild Well as far on my first dive into it, as anyone had, until Randy and Art came along. This dive provided me with the incentive to plan on going to Florida to take the Cavern and Basic Cave courses required to be cave-diving certified. I knew, as I planned this dive, it would either be that or sell all my gear when I had completed it.

Doug attempted to do another short dive to check the right wall immediately inside the submerged portion of the cave, but another piece of line that was laid in the '70's snagged him. We removed several feet on the cave side, but a longer piece in the entrance alcove got away from us. It should turn up if we take a few swipes looking for it each time we go in, and shouldn't pose a hazard.

As we prepared to leave, I noticed my IH making louder-than-normal exhaust noises. After speaking to the owner on our way out, I did a quick fix and we were on our way. The small branches on the road down to the Well deserved a bit more attention than we gave them. Thanks go to Lowell for tossing some of the larger ones aside.

Trip Report: 7-9-88. "WIN A FEW, LOSE A FEW," Mike Nelson, Delores Nelson, Aaron Nelson, Art Dahms, Kim Dahms, Cody Dahms, Randy Kwiatkowski, Lowell Burkhead, Greg McCarty.

We all showed up and got the divers, Randy and Art, into the cave at 11:50 am. The conditions were somewhat better than the last dive when it was below 10 degrees outside. On this nice summer day they were still in a hurry to get into the water, but to cool off, not warm up.

Once they were underway on their planned dive of 5-6 hours, we dropped the women and kids off at the Spook Cave Campground and Greg, Lowell and I went over to remove the stick jam in Henkes' Lost Creek Cave. There was a little weather to the north of us and Lowell was going to say on the surface to monitor it while Greg and I got muddy. I had gotten to the bottom of the second drop and Greg was rigging to lower the digging tools from the base of the first drop when Lowell hollered in that the system was moving our way fast with considerable lightning. Lightning has an affinity for caves and can reach deep into them. We beat a hasty retreat, but not before I had glanced into the crawlway to check its condition. Half of the passage had filled with a fine loamy soil above the pea-soup-type mud I had worked through last time. We were faced with either a big dig or waiting until the area experienced a good storm in order to reach the stick jam 30-35' down the crawlway. We went back to Spook and killed time 'til the system blew over.

Later Delores and Aaron joined us as we went over to see if Deep Misery Cave was still open. (It's not the cave that's deep, it's the misery. —Lowell Burkhead.) I trespassed on in to see if it was open, in which case we would get official permission to fool around. The opening could not be found amid the refuse and old car bodies, all of which dated to the teen years of the 1900's. I walked up the ravine aways and called out, "Here's the cave, here." Covered with a few boards and fence posts nailed together was a deep enterable pit cave. Greg and Lowell marveled over this new cave. Then Greg went to get permission to look at it, which he and Lowell did. A report will be filed by Greg, but an interesting note is that this opened up within two months of the last trip there, 12 years ago. I had to head back to the Well, as the 5-hour mark was approaching and I wanted to be there when Randy and Art emerged.

We stopped by Spook and picked up Kim and Cody and got to the site at 5:00 pm. All the way there I was hoping they would still be in the cave, as, if the trip was the minimum time allowed, it probably indicated either serious problems or an end to relatively easy passage. Rats, when we pulled up they were in the very early stages of doffing gear. They had been out 5 minutes and the dive had lasted 5 hours and 5 minutes.

They had laid another 290' of line through water and traversed about 75-100' more of air space. (Bringing the total length to about 1500'.) Towards the end the sumps were short and the air spaces between them likewise. It took a tremendous toll in energy and neoprene to derig themselves, tote gear over muddy breakdown, rerig and dive, then do it all again.

The passage remained in the area of 15' wide and varying but adequate height right up to a room entirely filled with unstable breakdown. The water could be seen around the edges, some holes seen into the pile, but it was not safe to progress.

Randy had lost his pack containing survey gear. It will give him cause to return to Wild Well to look for it, but did in the prospects of any work they had intended doing in the cave this

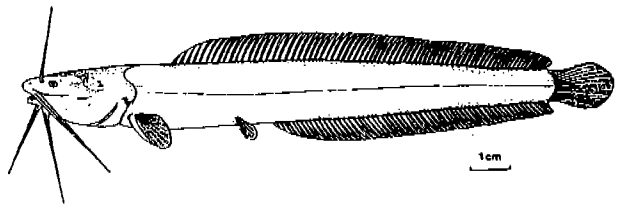
day and on a subsequent dive planned for the next day.

Of course, this is viewed as a setback, but this is not the end of the Wild Well Project. The straightforward exploration has been accomplished. Next will be some equipment recovery. Then the surveying and the serious work of scanning the limits of the cave beyond the visibility of the line laid in during exploration. Who knows what may be found yet? Then there is the more thorough search of the 315'-long stream-passage room. There is yet much to be optimistic about concerning the Wild Well. Stay tuned.

NOTES ON THE COLLECTION OF BLIND CAVE CATFISH FROM AIGAMAS CAVE - by A. J. Penney

During the survey of Dragon's Breath Lake, an opportunity was taken to visit Aigamas Cave [near Otavi in northern Namibia, Africa] together with Dr. P. Skelton of the J.L.B. Smith Institute of Ichthyology, in order to assess the population of the blind cave catfish, *Clarius cavernicola*. Dr. Skelton also wished to collect a limited number of specimens of this unique fish to serve as the nucleus of a captive experimental breeding population at the Institute.

The cave catfish is a small clariid catfish, up to 130mm long, devoid of pigmentation and transparent to pinkish-white in life. The eyes are degenerate or absent but, as in other catfish, the species possesses four pairs of sensory barbels around the mouth area, which it uses to locate food. The cave catfish was described from Aigamas in 1936 and appears to be restricted to this relatively small cave system. It would appear that the species has evolved from *Clarius* catfish inhabiting the marshy areas in the southern Okavango delta, probably following the entrapment of water from this area by the subsidence of eroded dolomite cave systems. The species eats practically anything that it locates in the water, but survives principally on a diet rich in insect remains derived from both baboon faeces and bat guano dropping into Aigamas.



Simplified illustration of a specimen of the cave-dwelling catfish, *Clarius cavernicola*, collected from Aigamas Cave near Otavi in northern Namibia.

During the visit to Aigamas, it was attempted to assess both the size of the available habitat occupied by the species and the number of fish in the population. The catfish only occur down to a depth of 10m, generally remaining in close proximity to the cave walls. The highest density of fish occurs directly below the main access slope to the system and the species is, in fact, rapidly attracted to any disturbance in the water, probably in order to capture food falling into the cave. 40-60 fish were counted in the area below the entrance, in a water volume of approximately 250 cubic meters. From the available maps, the total habitat available to the cave catfish in Aigamas appears to be roughly two or three times the area counted, so that total population of this species can be estimated at 150-200 fish.

Although the population estimate of this species is similar to that obtained during the first assessment done in the 1930's, there is still cause for concern that the species could easily become extinct. Although it has no predators at present, it occurs in no other cave system and the water levels in the area are dropping rapidly. Accidental introduction of other fish species or the further degradation of the habitat would undoubtedly have disastrous consequences for the species and for this reason Dr. Skelton has recently included the blind cave catfish in the "Red Data Book" of endangered species.

The catfish collected from Aigamas were successfully transported to Grahamstown and are now being studied in a simulated cave environment. These will hopefully form a captive breeding population, insuring the survival of the species, at least in captivity. If the species does breed in captivity, developmental studies will be conducted in an attempt to elucidate the process by which this species evolved from its freshwater relatives to the north.

UNDERWATER USA ARTICLES ON CAVE DIVING

[The following letter by Dan Butler, an NSS-CDS Cave Diving Instructor residing and teaching in Hawaii, was printed in the July, 1988 issue of *Underwater USS*, along with two articles on cave diving, one written by Training Chairman Joe Prosser, and the other concerning north Florida exploration and featuring a full two-page spread of outstanding underwater photographs by former Training Chairman Wes Skiles.]

May 6, 1988

Dear Mr. Pelton [*Underwater USA* Editor],

I am writing in regards to Mr. Steve Rosenberg's article in the March, 1988 edition of *Underwater USA*, on diving Hawaii's lava tubes. The article does a wonderful job of elaborating on the points which make this type of diving enjoyable, but does not address the specialty training, which is a must if cavern and cave diving are to be pursued in a safe manner. It is widely recognized by the major SCUBA certifying organizations that open-water training does not adequately prepare an individual for diving in an overhead environment, be it in a wreck, a cavern, or under ice. The lava tubes of Hawaii are no exception, as evidenced by the tragic triple drowning which occurred in lava tubes off Oahu, Hawaii in July of 1987.

The Cave Diving Section of the National Speleological Society (NSS/CDS) has pioneered the development of the special training and equipment necessary to safely dive in underwater caves and caverns. Recognizing the need for specialized training if one is to safely dive in this overhead environment, several of the major SCUBA certifying organizations have also developed cavern- and cave-diving courses.

Drownings in underwater caves will continue to occur unless the professionals of the diving community recognize that diving in an overhead environment is not simply an extension of open-water diving, but rather is a specialized, unforgiving endeavor which must be preceded by specialized training. As long as there are caves underwater, there will be people who are going to dive in them. As such, the training required to allow this type of diving to be conducted safely must not be ignored. Your publication can perform a vital function by making the availability of specialty training known in articles such as the one on lava-tube diving printed in March.

Information on specialized cavern- and cave-diving training available from the National Speleological Society/Cave Diving Section can be obtained by writing to the addresses included in this letter.

Sincerely, Daniel B. Butler

[Editor: the details of the triple drowning referred to above are finally available and appear below.]

1987 TRIPLE DROWNING IN HAWAII

According to written reports filed by the Honolulu Fire Department, on July 3, 1987 a Marine at Kanohe Marine Corps Air Station, contacted the Fire Department to report that three friends (also servicemen) had failed to return from a dive in the Sharks' Cove area off Sunset Beach. The Marine calling in was supposed to have joined them for the dive but arrived late and found that the other three had already gone diving. When they failed to reappear after a reasonable length of time, he called for help.

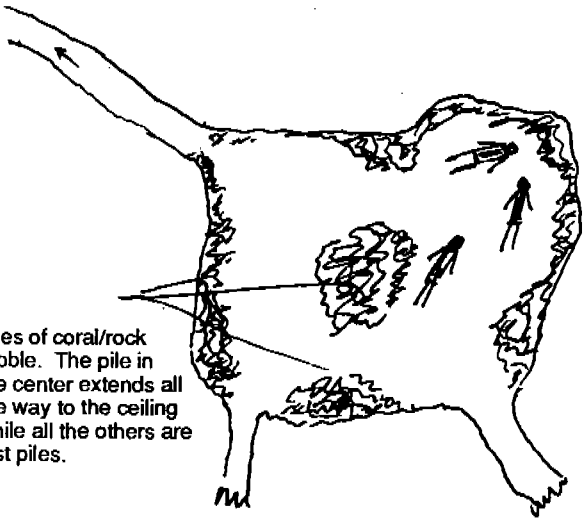
After conducting an initial search with boats and helicopters, fire-department personnel were joined by the Marine Sergeant who initially called the report in and another serviceman, who were able to provide information about the caves and the missing divers' dive plan.

On their second dive, would-be rescuers "were able to find all three victims in approximately 20 feet of water, approximately 180-200 feet inside of a twisting, tube-like cave, where they had apparently been exploring, become disoriented and run out of air. The three victims were extricated through the narrow, twisting and turning tube, but conditions required that some of their equipment had to be left behind to allow maneuverability and recovery." [A second report states that the divers' bodies were located more than 250 feet inside the cave.] Fire Chief Capt. G. Matthew's report reads:

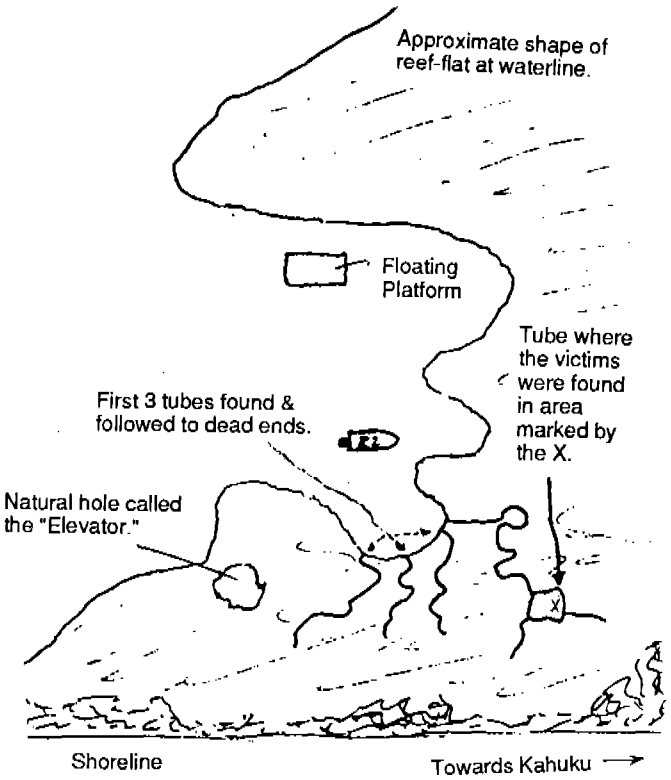
When Rescue 2 began our initial search, we were at the inside of the cove in the vicinity of an opening known as the "elevator." There were a lot of archways, some short (20-40' long) lava tubes with numerous "skylights" or openings to the surface through the reef of varying size; there were several intersecting tubes and some recessed areas with overhanging ledges, even caves of varying dimensions—none more than 25-30 feet long.

During our search of this area, I met Mr. Ronnie Redd, who had been the person to turn in the alarm and was supposed to have been diving with the victims, but had arrived late. From talking with Mr. Redd, I learned that there were some longer, narrower lava tubes further along on the reef, and their dive plan had been to explore them.

Rescue 2 personnel accompanied by Mr. Redd and Mr. Leppela [the other adviser] began a search of these tubes. After checking the first three of these tubes and one false discovery report that turned out to be a piece of old clothing, Mr. Leppela and I found the three victims approximately 250 feet from the entrance to the fourth lava tube.



Close-up of "Chamber" area where the three victims were found in the approximate locations indicated.



The victims were in an area that can best be described as a room or chamber 3-4 feet high and about 25-30 feet across. The chamber had a pile of rock/coral rubble in the center, extending from the floor to the ceiling, and a very fine sand or silt bottom. The entrance was in one corner (see drawing for details) and there were at least two more tubes branching off from this chamber. The victims were in the corner opposite the entrance. All were in the prone position and approximately 3-5 feet apart. There were no obvious injuries, no signs of any struggle, and all were still wearing their scuba equipment—although none had a mouthpiece in his mouth. The chamber was totally black, except for our lights. If they had had lights, they were off or had died out. None of them had anything in his hands.

Due to the fact that Mr. Leppela and I were low on air, we withdrew at this point to change tanks, report our find and organize the recovery operation. The recovery of the victims was a slow, difficult operation that required all available help because of several factors—the distance between the tube's entrance and the location of the victims; the numerous twists and turns (both horizontally and vertically) in the tube; and the numerous tight spots that forced even the rescuers to wriggle through cracks between rocks and coral.

The first victim was brought out with his scuba gear on, but because of the amount of difficulty that we had encountered, we removed the scuba gear from the next two victims and it was left in the chamber. The equipment was not recovered afterwards because of a lack of enough full scuba tanks.

Since the incident occurred, the most frequently asked question is: "How could three people drown in the one incident?" Without claiming to be psychic, we have been able to piece together a plausible explanation based upon the following information:

1. The first three lava tubes averaged approximately 100-150 feet in length, while the one that the victims were found in was more than 250 feet long. (This is based on the diving floater with 220 feet of line that we used as a guideline. It ended

some 40-50 feet short of the chamber.)

2. There were two more branches off of the chamber of undetermined length, but both extended beyond the 200-foot range of my light beam.

3. The sand/silt bottom of the chamber was very easily stirred up, and once agitated, the suspended particles would reflect our light beams, producing a nearly blinding glare.

4. Evidently the three divers had not been using any string, line or other means of marking their progress. This is probably because the other tubes were very simple—having only one way in and out—without any branches or intersecting tubes to confuse or mislead them.

5. Mr. Redd's information was that their plan was to start at the first tube and to explore each subsequent tube. If they had done this, then we found them in what could have been their fourth tube—on one tank of air, because according to Mr. Redd, they hadn't come back to their cars to change tanks.

Our supposition is that since they made it as far as the chamber, they might have tried to explore either or both of the branches, run low on air and only made it back as far as the area where they were found. Factors that could have contributed or compounded their problems are:

1. Since it is unlikely that all three breathed at the same rate, one or more of them could have run out of air early, forcing them to try to "buddy breathe," but they were too far from the entrance to get out.

2. The silt bottom in the chamber could have been agitated, and contributed to any disorientation and panic, accompanied by increased breathing rates which would have set in, making things worse.

GEAR FOR SALE

1 Off Shore Drysuit - Medium, red/blue with blue "woolies," new seals, does not leak.
1 Oxygen tank with oxygen nipple.
1 English Engineering light head (tested to below 400').
1 Goodman Belly-bag B.C.

Contact Mary Ellen Eckhoff, Rt. 2, Box 40A, Live Oak, FL 32060

1 U.S. Divers single-orifice dual-tank manifold and backpack for twin 80's.

Contact Steve Moore, (813) 485-7747.

NEWSWEEK ARTICLE ON CAVE DIVING

The Aug. 15, 1988 issue of *Newsweek* contained a relatively accurate 3/4-page article on cave diving under the "Trends" section, quoting Joe Prosser, Wes Skiles, and Pete Butt, with an underwater photo of Ginnie Springs by Robert Holland.

LETTERS TO THE EDITOR

April 29, 1988

Dear Editor,

I have recently received a Regulator Safety Valve from RSV, Inc., and have been testing this interesting unit. The RSV, as mentioned in *NACD News* after DEMA, is a small device that connects between your regulator low-pressure hose and the regulator second stage. This is basically an ON/OFF switch to that second stage, and allows one to TURN OFF a malfunctioning (read that free flowing) second stage. This is ideal, as it allows me to turn off a second stage that is free flowing, and attempt to correct the cause of that malfunction (e.g., foreign matter clogging the second stage) without having to turn off the tank valve to that regulator.

This is the primary function of this device, but I am sure that you can see the advantages to the Cave Diver if used on the back-up regulator. It additionally allows one to turn off his redundant second stage while entering high-flow systems or during a dive using a diver propulsion vehicle, thus preventing loss of air during this phase of the dive.

I have tested this unit on a multitude of low-pressure hoses and second stages (Sherwood, U.S. Divers, ScubaPro, Dacor, Tekna) and this unit worked well in all configurations I tested, with no leaks or other malfunctions noted. I tested this unit on a Poseidon first stage that allowed me to easily increase the intermediate pressures, and the device functioned perfectly at pressures of 125 psi to 250 psi. At pressures greater than 250 psi, the overpressure relief vented as the device was designed to do.

Based on my evaluation of this unit, the RSV has become a permanent part of my cave-diving equipment. I can recommend the RSV without reservations to you and any other member of the cave-diving community.

John Crea, Bainbridge, Georgia

September 1, 1988

Dear Editor:

I read with interest Norman Cooter's article on "solo diving" in the July/August 1988 issue of *Underwater Speleology* and would like to express my views on it.

About 95% of my diving is done in Florida sinkholes, springs, and caves within the Pasco and Hernando counties area.

I am addicted to deep-water diving in sinkholes, which I consider myself quite proficient and experienced at. I relish the thought of making a couple of dives each week in excess of 175-200 feet. Anything less is no real challenge or of any real enjoyment.

Unfortunately, I have run into a problem that I am sure Mr. Cooter and other divers have run into because of the type of diving I do. This is the problem of finding experienced, trained, dependable buddies. Due to shift work as a police officer, I do most of my diving on weekdays, which is another problem.

As a result of these problems, I have done quite a bit of solo diving. It requires me carrying additional backup equipment, which adds to task loading somewhat, but I have found out that I usually enjoy solo diving more.

I have yet to make a solo dive where a problem occurred. I am able to dive where I want, go as deep as I want, stay down as long as I want, and generally perform the objective of the dive without distractions, worries, and nursemaiding.

When diving with buddies, I have dealt with lost fins, malfunctioning obsolete regulators, stirring up silt, improper response to signals, turning a dive early because of an "air hog," narcosis, inexperience, not properly equipped, and so on. This obviously causes stress during the dive, which does not make the dive enjoyable.

When the opportunity comes up when I am able to dive with buddies of the same experience or more experience than I, I do not pass it up. Having dependable, experienced buddies who do my kind of diving are a rarity.

I wholeheartedly concur with Mr. Cooter. I do not and will not promote solo diving. It is a diver's personal preference as to whether that diver should solo dive or not.

I have been diving over two years. I am certified Advanced Open Water, Advanced Deep Diving, and Basic Cave. My deepest dive is 281 feet in open water and 246 feet in a sinkhole. Neither one of these dives were solo, by the way! As a solo diver, common sense tells you to draw the line somewhere. As a solo diver, know your limitations and stick with them.

I hope some of you out there found some interest in this article and in allowing me to express my views. To all you solo divers out there, I would like to hear from you or to see your views on solo diving appear in future issues of *Underwater Speleology*. May your dives be enjoyable!

Sincerely, Frank R. Lavallee

(913 Dew Bloom Rd., Brandon, FL 33511)

CANADIAN SUMP-DIVING DEATH

The new Sump Diving Project Coordinator John Schweyen of New Jersey wrote in with information he had received from Canadian cave divers Steve Worthington and Dr. Keith Sawatzky, concerning a recent sump-diving death in Canada at Ottawa River. "The victim, John LeMar (?), reached the end of a survey with his buddy, who headed out first. The buddy found that LeMar was not behind him when he reached the surface. Other divers went in to look around and found him still at the end of the survey, on the line, with air in his tanks and blood in his mask. The mask was not cracked. I've been keeping up to date on this cave and I don't remember any mention of deep diving in that area. Keith Sawatzky is a medical doctor and has specialized in diving medicine; he said that he was unable to speculate on what happened and admitted that it was very bizarre. He also said that LeMar was not inexperienced. All this information that I'm relating to you is secondhand, so I'm sure there are inaccuracies."

ROBERTA HEATHER SWICEGOOD
31 July 1951 - 18 June 1988
- by Cady Soukup

Roberta Swicegood died in a cave-diving accident in Arch Spring Cave near Hollidaysburg, Pennsylvania on Saturday, 18 June 1988. She was continuing a project to link Tytoona and Arch Spring Caves, one of many sump-diving projects in which she had been active over the past few years. Roberta was fully trained as a cave diver and had made over 100 cave dives, including several in the Arch Spring-Tytoona Cave system. A full, detailed accident analysis and report appears elsewhere.

Roberta is missed by her mother, co-workers, cats and academic colleagues; she is especially missed by cavers and cave divers. Roberta was a close and treasured friend to many cavers, nationally and internationally; she was a gifted caver who never gave up on a promising lead, whether tight, wet, wall-climbing or arduous; she was a vital element in caving projects in Kentucky (Roppel-Mammoth area), Florida ("Suwannacoochee" area), Pennsylvania, and West Virginia (Friar's Hole area, Elk River caves, and Monroe County, among others), and Puerto Rico (Rio Encantado Cave System); she was a driving force in sump diving as Coordinator of the Sump Diving Project of the Cave Diving Section (CDS) of the National Speleological Society (NSS), working on the first, ground-breaking edition of a Sump Diving Handbook; she edited many articles by others that might not otherwise have seen the light of day; she had started some interesting and needed projects in cave-survey accuracy research (above and below the water), in cave-survey programming on the Apple Macintosh computer, and in Florida limestone aquifer hydrology. No one can take her place in our hearts; no one can step in to fill her shoes in the projects close to her heart.

Our one consolation is that she died, as she lived, doing exactly what she loved most: state-of-the-art cave exploration. Her words say it best:

"I was a cave explorer long before I was a diver, and I obtained diving training with the express intent of becoming a sump diver, that is, to dive flooded sections of passage within 'dry' caves (caves that contain an air space, which may be three inches!). The advice I got from experts was: become a good diver before you even begin considering cave diving, let alone sump diving. That made sense, so I marked time doing open-water diving in quarries (good training in terms of both visibility and temperature!), getting specialty certifications, and doing some diving in the Caribbean (Antigua and Bonaire). 50 dives later, I decided I was ready and went to Florida for cave training.

"I received my cave training from a couple of outstanding instructors, and immediately began exploring new caves and doing scientific work. This kind of diving tends to move the diver beyond the moment and beyond the simple fact of the dive. In fact, the dive itself is frequently only a vehicle for obtaining information. A spectacular dive that fails to bring back survey—or water samples—or biological observations—becomes a failed dive."

Many of us know Roberta well from caving circles, or from work, or from diving—she was many more things to many more people than what most of us knew. Roberta was a close friend to a large circle of diverse people. Her background was as varied as her life.

Roberta was born in Fort Knox, Kentucky. Her father, Paul Swicegood, was a Sergeant Major in the US Army. Her mother, Mary Swicegood, then a librarian for the US Army, is now a librarian for the Arlington County public schools. Her parents were divorced in 1964, when Roberta and her mother came to the Washington, DC area to live.

Roberta grew up on Army bases in Texas, Virginia, Kentucky, West Virginia, and Germany. She learned from her father how to shoot guns and "weapon assembly and disassembly"; she learned from her mother horseback riding, a love of books, and a fearless love of life. Her interests as she was growing up included the backstage mechanics of theater productions (stage make-up and lighting), movies, rock & roll and rhythm & blues music, collecting animals and plants, and camping and hiking. She also started her extensive, comprehensive book and music collections early.

Roberta proved herself to be extremely intelligent while still young. A friend of her mother's, for practice, gave Roberta an IQ test. The results shocked everyone but Roberta. While in kindergarten, she received a set of encyclopedias as a gift. She informed her parents that in case of a fire, they were to worry about the books because Roberta was quite capable of taking care of herself. Her life as an Army brat, attending sometimes several schools in one year, proved especially difficult for her. Roberta, never popular in the schools she attended because of her too-obvious intelligence and inability to speak "down" to her fellow students, commented to her mother when she was in sixth grade that she finally had something to "discuss with her peers—the Beatles." Her difficulty making friends changed entirely when she went to college; it changed permanently when she started caving and found a large group of people who shared her interests in serious cave exploration and research.

Roberta attended Washington-Lee High School in Arlington, Virginia until her sophomore year, when a combination of things led to her leaving school for a year with private tutors. She was able to accomplish several unusual things in this year: she started to work with a band, she observed the Martin Luther King assassination riots (which affected her life deeply and her politics permanently), she worked in a big light show at a once-famous rock theater that used to be at the corner of 18th and Columbia. In what was her junior year of high school, she took her college placement tests and did quite well. She left to accept a National Merit Scholarship at Goddard College, a small liberal-arts college in Vermont.

She accrued an excellent record at Goddard (taking Botany and P.E. courses to relieve the "monotony" of linguistics, archeology, comparative literature, and language courses). Among other things, she continued to work backstage in the theater, but also played one of Jennie Bigbeck's whores in a university production of Kurt Weill's *Rise and Fall of Mahogany.* Many of us would have loved to have seen that; she had a very fine sense of the theater and of telling stories—often, the bawdier, the better! She left Goddard in her junior year to go to the University of Iowa, where she received an honors BA in English in 1972, her first degree (and her first graduation). At Goddard, she acquired a large dog, Glauza, who fathered

another large dog, Oki (Okinawa, for long), who were her dearest animal companions for over ten years. Her mother had another large dog, Gus, a German Shepherd, also a close companion. (Oki got a cat, Adam, when Gus died. Adam got companion cats over the years, so the menagerie now consists of three cats since Oki's death: Abigail, the "ament" but beautiful; Adam the bright and moody; Amanda the sweet. Roberta loved them all, but intelligent Adam was her favorite.)

Roberta continued in graduate school at the University of Iowa receiving a Master's Degree in Comparative Literature in 1975. She was a graduate teaching assistant in Freshman Composition. She found out, as many of us knew, that she was a born teacher. Her students were very fond of her. As Avise Nissen, a friend since those days, said, "She had the knack for taking the intimidation out of learning, and of not only selecting and organizing information well for presentation, but also of communicating enthusiasm about it. In short, she made class fun and interesting, always spicing it up with her own sense of humor and, in the winter months, an occasional snowball fight." She was a hit with the returning Viet Nam veterans, who often came to her office just to talk. She was as gifted and compassionate a listener as she was an excellent speaker, an extremely rare combination.

Academically during this time, she studied medieval languages and comparative literature. She was awarded a DAAD fellowship with Fulbright assistance at Tübingen University in West Germany where she lived for two years. While at the University, she also worked on a farm, with a rock band, and as a social worker with West German adolescents (resulting in a comprehensive knowledge of Schwabish-dialect farmers' and German teen-agers' vocabularies). Her gifts for scholarship and languages continued through her life (she knew High German, Middle German, the Schwabish local German dialect, Old German, 3 'flavors' of Greek, Italian, some French, and Old English).

One of the things that she loved most about her stay in Germany was the close friendships she made with the cows and other animals on the farm. She continually told many stories about the cows. When she left, the farmer, Herr Witzemann, wondered how he was going to keep track of the parentage and lineage of all of his dairy cows, since Roberta had effortlessly done it for him while she was there, both out of interest and out of love of the animals. She also learned first-hand the intricacies of haying and of mucking out stalls. She adored the German farm life, perhaps even more than the academic life. It gave vent to all of her naturalistic gifts and to her physical abilities in a way that few other lifestyles would. (She once went out to Tennessee to help on Bill Walter's farm with his haying, so much did she miss the extremely hard, hot work.)

When Roberta came back from Germany in 1975, very fit from two years of farm work, she had no income. She started working at Ideamatics, Inc. as a temporary typist. Her job there quickly grew as Dr. David Danner, the founder of Ideamatics, discovered her many talents. Roberta ended up working at Ideamatics from 1975 to 1986 as the company secretary-treasurer, research assistant, wringer-out of custom software, documentation and proposal specialist, and all-around fast producer of needed work. She brought in Avise Nissen, her friend from University of Iowa and offered her a job (she was always very generous with what she could give to others, from jobs to time and effort). She made many close friends among the Ideamatics staff (one commented that she had taught him how to be a workaholic, whether for good or bad), and continued to work for Ideamatics on a free-lance basis after she left. There was no one who could take her place at any number of jobs. Her description of her job at Ideamatics:

"I have worked for Ideamatics, Inc., for nine years in multiple capacities. While my title is Secretary/Treasurer, my job includes software and hardware testing and quality control, managing and performing requirements analyses, managing and conducting analytical studies, writing and reviewing proposals, managing clerical and professional staff, coordinating new product development, teaching seminars and technical workshops, and general troubleshooting. My academic background includes substantial training in research and critical analysis."

While she had money to live on and a place to live, at home with her mother, she had no outlet for her physical energy. She hiked around Shenandoah National Park extensively, but it wasn't enough. She took several courses with the Smithsonian Associates in various aspects of natural history, but was still looking for the combination of physical and mental rigorous effort. She started some courses in photography, an interest she continued throughout the years, changing camera types with changing habitats (single lens reflex for black-and-white and above-ground nature work; a Nikonos underwater camera with strobe flash for diving; adding to the Nikonos the Simmons flash units for caving and cave diving). When she finally found caving, she was hooked.

She started with short trips (even, heaven forbid, tourist trips), but soon found cave exploration and mapping to be where her heart was. She became an active member of the team that was exploring the largest cave system in West Virginia, Friar's Hole, going on exploration trips in many areas of the cave, including numerous digs and ventures onto, into and under the surrounding hills and valleys. She quickly found that she had the drive and stamina to keep up on the more rigorous trips to the outer edges of the cave system. Her interests, native energy, and intelligence rapidly drew her into what she considered the "cream" of caving: outer-limits cave exploration and surveying. She started her habit of always coming out of a cave with some sort of results, from geological observations to survey notes—and of universally encouraging others to do the same! In 1981, she and Bill Stone, among others, helped Doug and Hazel Medville with the international pre-convention camp in the Friar's Hole area. Typically, Roberta, even though she was working at a high-pressure, high-production job, still found the time and energy to devote nearly all of her weekends to the rugged cave exploration she loved.

In February 1981, she started caving at Roppel Cave in Kentucky, now a part of the Mammoth-Flint-Ridge System. Her first trip to the cave resulted in a compressional fracture of her left wrist; nevertheless, she not only got out of the cave under her own power, she insisted that everyone on the trip should go out to eat before going to the emergency room! (After all, emergency rooms take so much time—and she had some experience in them from some fairly interesting escapades in her childhood, so she was no stranger to pain.) In spite of her somewhat memorable introduction to the cave, it became one of her favorite and longest-lasting projects. She became one of the active Roppel trip leaders, responsible for the discovery and exploration of the H.U.P. Dome complex, the canal section (low & wet, a favorite combination), and for many mop-up and lead-checking trips throughout the cave. Along with Jim Borden, one of the original Roppel discoverers, she was on the first trip through the then newly minted Weller Entrance of Roppel. She also was one of the two groups that connected Roppel Cave with Mammoth-Flint Ridge Cave, the result of several years' of delicate negotiation (some of it by her) between Mammoth-Flint Ridge and Roppel explorers.

Roberta also was the Roppel cavers' CKKC (Central Kentucky Karst Coalition) Newsletter editor, consistently turning out newsletters of the very best quality every quarter (involving an enormous amount of writing on her part and involving many of her non-caving friends as helpers and assistants). She met with Jim Borden at his parents' house on Tuesday nights to plot out the results of Roppel exploration trips so that trip leaders would have working maps. She and Jim had

many lively "discussions" about map scale, mapping philosophy, and the Roppel map in particular, among other things both caving and non-caving. She also was one of the people that made these maps available to trip leaders, spending hours of her own time copying the maps and her own money to send them around the country. She wrote and called Roppel cave explorers constantly to keep up with what was happening in the cave. Through the network of cavers that flocked to Roppel exploration trips, she was introduced to cavers from other regions of the country. Her horizons rapidly widened. Through attending conventions, going on caving trips, and her own extensive reading, she learned of people she was interested in meeting and getting to know. In 1983, largely through her contacts, she put together the Exploration Session at the NSS convention in Elkins, West Virginia.

Although considered a fairly reserved person by most, Roberta had no trouble introducing herself to cavers she admired, getting to know them, and learning from them. Her network of cavers who became close personal friends enlarged every year. Her choice was impeccable enough that many of us have become fast friends with each other, as well as with her. She was tremendously loyal to her friends, spending hundreds of dollars each month on telephone bills to keep up with us all (and incidentally learning the newest in caving techniques and gossip). She became an extremely competent vertical caver, starting a wall-climb to a promising lead in Cass Cave. She also taught beginning vertical caving to cavers and to members of the search and rescue group in the DC area, being throughout a very conscientious and patient instructor.

Roberta's favorite topic of gossip around this time of year (late spring/early summer) was the NSS Lew Bicking Award. She followed the politics and the award candidates every year, faithfully writing letters and lobbying for friends that she admired. Several close friends have won the award over the years: Don Coons, Doug and Hazel Medville, Bill Walter, and Bill Stone were all special friends of hers. I would think that her one regret in leaving us so quickly would be that she didn't receive consideration for this award, which meant so much to her.

In 1983, Roberta was called by the Appalachian Search and Rescue Conference (ASRC), a wilderness search and rescue group active in Virginia, Maryland and Pennsylvania, to assist with the search for Shawn Crawford, a hiker lost near Old Rag Mountain in Shenandoah National Park. After an all-night hike through rain, sleet and mist, she rappelled down the 250' cliffs to an area she thought looked promising. While sitting in her harness 40' off the ground (short-roped due to an unfortunate rigging site), she found Shawn on the ground, called in ground searchers to the area, and hung above them for about 2 hours to give radio control to the ground searchers (cavers, incidentally) who cared for Shawn until help could arrive from above (on a better-rigged, longer rope). Her efforts saved Shawn's life; after over 50 hours' exposure on the mountain he was brought out safely and eventually nearly fully recovered from his ordeal. In 1985, Roberta was a member of ASRC's technical evacuation team responsible for safely bringing down the remains of the people involved in the Henson Airline (commuter airline) crash near Weyer's Cave, Virginia. She was a valued member of the search and rescue community, specializing (not uncharacteristically) in the technical aspects of rescue work.

To repay in part the debt she felt she owed to the Smithsonian Associates, she led cave-related geology field trips for Dr. Bill Melson's Natural History Club and, for the Smithsonian Associates, an extremely popular one-day commercial cave trip by bus. She introduced concepts of cave formation and limestone geology, led the trip attendees through several popular commercial caves, and delivered them home safely at the end of the trip. Her charm and popularity was such that several people hated to miss even one trip—she even had one of the bus drivers charmed into wanting to drive the challenging mountain roads over and over!

Throughout her years of caving, Roberta retained an interest in photography, botany and gardening. She helped her mother with a photography course. Her garden at her mother's home in Arlington is a year-long extravaganza of flowers and shrubs. She meticulously kept records of plants, gathering and keeping seeds from one year to the next. She was most interested in raising difficult plants from seed, having acquired extensive knowledge of the "tricks of the trade" over the years. She left a refrigerator full of carefully labeled seeds, and a well-established garden of self-seeding annuals and hardy perennials that will give her mother and friends pleasure for many years. She designed a deck for the house, part of her ongoing interest in construction enterprises, from back porches to furniture. She developed an extensive correspondence with people interested in heaths and heathers so she could learn more about these plants that intrigued her.

Other aspects of her interests that were not commonly known were her love of the sport of baseball (strictly as an observer and fan of a few, exceptional players and baseball writers rather than as a fan of one team or another), and her enjoyment of spectator sports (she read the Post Sports section avidly and kept up with several sports, horse racing, and other tidbits of interest). She followed political events closely; being a child of the liberal '60's and early '70's, she had quite definite ideas of the responsibility of government to the people, and a very well-developed sense of moral and ethical behavior—which was reflected in her life and her treatment of even casual acquaintances who were fellow seekers of knowledge. Perhaps most surprising, Roberta was an excellent cook, who took her ability in the kitchen quite seriously. She gave away breads (her favorite) for several Christmas gifts. She may not have cooked often, but she could cook very well when it suited her.

With her widening cave-exploration horizons, Roberta became interested in caving outside the US. She was active on the NSS Costa Rica trip in 1982. In 1983 she went on an expedition to check leads in several caves on the Xilitla Plateau. In 1984, she worked with Don Coons and Sherry Engler on a project in Puerto Rico, started many years ago by Russ and Jeanne Gurnee, the Rio Encantado system. The Puerto Rico project became larger than anyone expected. Dye traces at springs and caves intimated at fairly large cave passage underlying an entire area of the Puerto Rican countryside. Most intriguingly, the largest caves included long active river passages with several near-sumps which finally fully sumped out in promising directions. The lure of Puerto Rico cave exploration insisted upon learning to cave dive.

In 1984, Wes Skiles came to Kentucky with his wife Terri to dive the Logsdon River lead in Roppel with Ron Simmons. The friendships created among the team members (sherpas and divers) on the sump-diving trip in Roppel initiated several on-going collaborations. With the Roppel sump and the Puerto Rico sumps as beckoning initiatives, Roberta started taking diving lessons to prepare herself for sump diving. She made many close friends among the SCUBA divers, and for her dive-master certification requirements, mapped the Haymarket Quarry using cave-mapping techniques so well that it has become a popular T-shirt design among divers in the Washington, DC area! Her goal always was to learn to dive well enough that she could start cave-diving lessons.

Throughout the years, Roberta relaxed sometimes to go on strictly "photo" trips, a departure from her usual rugged, hard-core trips. Her mother has a fine collection of photographs and slides of Roberta's from caves around the country, Puerto Rico, Mexico and Costa Rica. She will also be remembered for her many wonderful photographic poses in caves for her cave

photographer friends: Roberta rising out of the hip-deep sucking mud in Fortune Radish Cave's Happy Maggot Passage; Roberta's face sideways, nearly in the water, with a wonderful, puckish sort of half grin; Roberta, squeezing through an inferred-to-be-tiny hole in Hell Hole Cave (otherwise, why would she be in just that position?); Roberta in Monroe County, West Virginia, readying herself for an exploratory cave dive; Roberta, with strategically placed mud spots from a belly-to-the-mud dig on the front of her T-shirt, standing in front of Left It Pit, grinning to us all.

Her presence was a real addition to trips: she had a fine eye for male physique of all types in wet suits (we often fantasized about "the perfect wetsuit trip"); she had a tremendously raunchy sense of humor with a memory chock-full of bawdy limericks, jokes, and stories to shock and entertain; she had virtually unlimited energy on long trips, which came in handy on the drive home. In fact, the drives to and from the cave, with Roberta as a partner, often became as interesting as the cave trip itself. Her stories and jokes and exploratory conversation were always fun and often enlightening. Many of us saved up tidbits from our lives to exchange and comment on with her.

Roberta concentrated hard enough on diving to get her requirement for 50 dives before starting her cave-diving training, as recommended by experienced cave divers. By the end of 1984, she took her first courses in Cavern Diving and Basic Cave Diving from Wes Skiles and Jeff Bozanic in the Ginnie Springs area in Florida. While talking to the owner of Ginnie Springs, she discovered that they were about to computerize the shop. She carefully analyzed their requirements for a computer system, made recommendations, and assisted in the purchasing of equipment. She consistently kept in touch with them for trouble-shooting and assistance. (Some of the many calls she received from cavers around the world included requests for assistance with various computer programs and setups.) She took to cave diving happily, making friends and arrangements for week-long trips to Florida to dive with Ron Simmons, Woody Jasper, Wes Skiles, and Tom Morris, among others. She viewed all of her diving as training for the 'real thing'—sump diving in the caves in West Virginia and surrounding states. Wes was also invited along on the 1985 Puerto Rico expedition to dive the enticing sumps.

The Puerto Rico project enlarged each year. Cave diving enhanced the information collected through dye tracing. Without dye tracing, the incentive for cave diving wouldn't have been as all-encompassing. Roberta was able to do some easy dives in 1985; by 1986 she had become experienced enough to be a full-fledged member of the diving team. During the year, she worked on making up the map of the Rio Encantado system, corresponding with all who had done work in the area and reporting her findings to the Friends of the Karst meetings held in the Caribbean each year. She entered the data into the popular cave mapping program SMAPS, becoming an expert in troubleshooting with it as well. (She helped Wes Skiles with his computer mapping setup, starting him off with the gift of a programmable calculator that would automatically figure out x, y, and z values for both air- and underwater-cave mapping.)

In 1985 she took a Hydrology course at the University of Kentucky extension courses at Mammoth Cave. Peter Smart was her instructor, quite an inspiration to her. The information was all she needed to make Puerto Rico a true research project. Peter Smart, James Quinlan, and other hydrologists became very interested in her research ventures and data. She started extensive correspondence and close personal relationships with her hydrology mentors, bringing them in to help her with her projects. She never skimped on sending data to others who had a legitimate research interest, often sending out the information (requiring extensive copying of original notes and no little customized analysis) by return mail. Her natural academic interests brought her into state-of-the-art hydrology research. Her assessment of the Rio Encantado Cave System was, "Connected Juan Nieves, Rio Encantado, and Escalera Caves into the Rio Encantado Cave System, the longest surveyed underground river in the world. Six Sumps had to be passed to achieve the connection." She also found fossilized manatee bones which her mother finally donated to the Smithsonian (Roberta's intention all along, she just never got around to it).

With the hydrology course as an inspiration, Roberta started to look at areas of Florida with new interest. She made the acquaintance of Tom Morris, a talented cave diver and professional environmental biologist and naturalist in Florida, who is also, incidentally, the owner of Thunderhole, a cave that became geologically and hydrologically more interesting to both of them. She copied her course materials for Tom, who devoured them, asked for more information, and argued points with her on exactly how Florida was different from all the paradigms that were given in the research papers. She started an extremely productive collaboration with Tom on a hydrological study of the Withlacoochee-Suwannee River area, concentrating on the mechanism of cave formation and aquifer ground-water transfer. The study remains in its infancy; Roberta's and Tom's combined vision started a project larger, more interesting, and more important than either would, or could have done alone.

Again, a brief description of her projects, in her words:

"My current interests include a project studying the caves of the Withlacoochee River/Suwannee River junction in Florida, and a cave- and spring-diving project in Kentucky. The "Suwannacoochee" project involves dye tracing, diving, and surface geological work. The caves in that area are frequently deep (145 to 190 feet), with visibility that ranges from outstanding to murky."

In 1986, Roberta left Ideamatics to work for Planning Research Corporation. She became an integral part of the staff on the project to automate the US Patent and Trademark Office. (Upon learning of her death, the COTR at the Patent Office expressed his and his staff's condolences, and suspended a milestone delivery date.) She turned out a prodigious amount of work of extremely high quality: position papers, feasibility studies, reports, and other papers. She was a source of communication between several disparate elements of a very large, very long-term project which tended to have diverse groups of specialists with limited interaction.

When she learned that the PRC secretaries were expected to use a new PC wordprocessing program without training, she developed a course within 24 hours. She also took the time to go to each secretary and make sure that her computer and printer were correctly configured, becoming a company favorite in record time.

While at PRC, she met Tom Davis, a PTO project mainframe computer programmer who is also a musician talented enough to have several records to his credit. Tom became a very special friend. She introduced him to caving and inspired him to create a cave mapping program (code-named Project Purple) on the Macintosh computer. The program, inspired by Roberta and crafted by Tom, is nearly finished and (by all reports) is one of the best of its kind, using all of the graphics and intuitive interface options that distinguish the Macintosh. Tom shared his music with Roberta; they collaborated on musical projects, with Tom providing the musical expertise and Roberta providing a critical ear and splendid gift for description. One of their "projects" was the whole-cloth creation of a very inventive family of musicians in Maine, who quickly became both a source of raunchy stories and of fun, rollicking music.

Roberta's continuing interest in West Virginia and Kentucky caves and "northern" sump diving (appropriately labeled "cold chocolate milk" diving) led her to search out others interested

in the same types of extreme cave-diving conditions. She started to explore the options that were open to her, as a sump diver. Her goal was to make sump diving another tool of exploration, much as vertical techniques had become another tool. Her interests and obvious abilities led to her being named as the Sump Diving Project Coordinator of the NSS-CDS. She started compiling information and working on a Sump Diving Handbook for the CDS, encouraged (aided and abetted) by other sump divers in the US and Britain. She started collecting information from Florida divers and from other divers about their side-mount rigs, and started correspondence with British cave divers about their styles of side-mount rigs, the reasoning for the rigs, and other equipment esoterica. She spent hours sewing up rigs and test diving them in local pools. (It is different setting up a side-mount rig on a short, obviously female body than it is on a slender, obviously male body—one constant source of irritation and invention for her.) She promised a comprehensive, comparative article on side-mount diving in the US to the British Cave Research Association, on which she had done extensive work. She also worked on an article for *Underwater Speleology*, the newsletter of the NSS-CDS, on the same topic (it should be available soon).

In the fall of 1987, she and John Schweyen finally met, after hearing of each other for quite a while. John has been doing the type of diving that interested her most: northern sump diving in less than perfect conditions. His style of caving and cave projects were a source of inspiration for her. Roberta knew she still had a lot to learn about sump diving. She spent a considerable amount of her time talking to manufacturers and other cave divers about equipment. She researched different styles of side-mount rigs to find one that suited her. She practiced in the Haymarket Quarry: laying line, following line, picking up line, buoyancy drills, drysuit practicing. She and John started a series of dives to get her accustomed to the conditions in northern sumps. She started diving virtually every weekend with John, often spending hours during the week conditioning, reconditioning, tracking, and repairing her gear. She paid attention to details, read equipment analysis reports, critically observed her own abilities and equipment. In all this, she was consistently reinforced by John Schweyen and all the others she talked to, who reminded her of anything she might have forgotten, talking endlessly about techniques and equipment.

John and Roberta started to plan projects in Pennsylvania, West Virginia, and Kentucky. Her report of their diving projects in Kentucky:

"The Kentucky project, being done in cooperation with Dr. Jim Quinlan of Mammoth Cave National Park, involves cave surveying, water sampling, and dye tracing. Kentucky diving mostly resembles diving in refrigerated chocolate milk. Our most recent dives there have been in Lawler Blue Hole: 54 degrees, two to three feet of visibility, and 70 feet deep. As part of the Kentucky project, John Schweyen and I are currently exploring Lawler Blue Hole. This cave drains a significant area of the Central Kentucky Karst and is the resurgence for Crump Cave and Fisher Ridge Cave, altogether about 65 miles of dry cave. Earlier work was done in Roaring River, Mammoth Cave, and Logsdon River, Roppel Cave."

Roberta convinced John to dive in Florida to round out his education. John convinced Roberta to dive in the finger lakes of New York to explore her tolerance for nitrogen narcosis and deep diving in cold conditions. They worked on John's on-going projects and started to work on some of Roberta's wish list of projects in Kentucky and West Virginia. Roberta also started some work on her own and with Doug and Hazel Medville, among others, in Monroe County. Cave diving had opened a new arena of exploration possibilities to her, possibilities she was determined to follow through to the end. She had a lot of projects started, and the energy to keep them going.

While diving with John Schweyen on the weekend of 18 June, Roberta found herself in an unrecoverable situation, whatever it might have been. She was diving in an unforgiving environment, her favorite. She knew the risks explicitly; she had made the decision to be exactly where she was; no one could have stopped her. We can only be grateful for what we knew of her, what we found in her, what she helped us discover while she was with us. Her caliber of intellect and spirit is a shining, rare thing in our world.

A memorial scholarship fund has been set up for her at the Smithsonian Institution, a fitting memorial to one who so embodied the goals of the Smithsonian: teaching and research. Roberta created for herself the ideal of an academic life in non-academic surroundings, living it all with style, as only she could. To donate to the Roberta H. Swicegood Memorial Scholarship Fund, send a check made out to the Smithsonian Institution indicating on it somewhere the RHS fund, to: Dr. Daniel Appleman, Department of Mineral Sciences, NHB 119, Smithsonian Institution, Washington, DC 20560.

Thanks for the memories, Roberta.

COMPRESSED-GAS INJURIES
- by James A. Corry

In addition to the usual cuts, broken bones, and abrasions that the general public suffers, sport divers occasionally suffer unique, compressed-gas injuries that few Emergency Medical Technicians understand or are prepared to handle. These injuries are decompression sickness and air embolism. Both of these maladies require immediate treatment with hyperbaric oxygen in a recompression chamber. Divers suffering from only pneumothorax, mediastinal emphysema, or subcutaneous emphysema will probably not be treated in a chamber if they are not also suffering from air embolism or decompression sickness. Nitrogen narcosis or "rapture of the deep" is caused by the narcotic effect of the nitrogen in the diver's breathing medium and disappears when the diver moves into shallower water or surfaces.

DECOMPRESSION SICKNESS. Decompression sickness is generally regarded as a venous gas embolism (VGE) brought about by the diver absorbing too much nitrogen from the compressed air breathed while diving. If the diver stays too long at any given depth and returns to the surface without stopping at pre-determined depths to decompress, the nitrogen in the body will begin to bubble similar to the carbon dioxide in a soft drink that is opened too quickly. This can result in pain so great that the diver is bent over in agony or has difficulty walking. This is why decompression sickness is often referred to as the "bends" or the "staggers." It may also be called the "chokes" due to respiratory problems caused by bubbles filtered by and collecting in the pulmonary capillary bed.

Remember: Decompression sickness (venous gas embolism) is a venous event caused by bubbles forming on the low-pressure, venous side of the circulation. These bubbles cause mechanical distortions in the tissues causing pain, edema, and resultant hypoxia or in the spinal column causing neurological impairment.

AIR EMBOLISM. Air embolism or arterial gas embolism (AGE) is associated with lung over-pressure accidents. As the diver ascends from a dive, the pressure exerted on the body by the water decreases. This results in expansion of the air in his/her lungs. The diver must breathe normally on ascent or risk over-pressurization (over-inflation) of the lungs. If the lung is over-pressurized from a depth as shallow as even four feet of sea water (4 fsw), air may rupture the alveoli and enter the pulmonary circulation. This will return to the heart where the air passes into the arterial circulation. This air (bubble) typically is transported to the brain where blockage of blood flow will occur depriving the brain of oxygen. Individuals who have a history

of smoking or lung problems such as asthma or bronchitis are at greater risk of pulmonary over-pressure accidents.

Remember: Air embolism is an arterial event caused by air from the lungs being "injected" into the diver's arterial circulation. It is very possible to find this diver in respiratory and cardiac arrest.

SYMPTOMS.

Decompression Sickness

1. Joint Pain
2. Chest Pain
3. Headache/Dizziness
4. Back and/or Abdominal Pain
5. Confusion
6. Shortness of Breath
7. Numbness and/or Paralysis
8. Tingling in Extremities
9. Partial Blindness
10. Lost of Bowel and/or Bladder Control

Air Embolism

1. Vision Disturbances
2. Dizziness/Nausea
3. Weakness
4. Confusion
5. Headache
6. Paralysis
7. Chest Pain
8. Unconsciousness
9. Bloody Froth*
10. Other Neurological Disturbances

* The typical scenario involves the diver suffering a pulmonary over-pressure accident during ascent, signalling for assistance on the surface upon realization of a problem, and becoming unconscious, face down in the water. Although not regularly seen, bloody froth at the mouth is most likely the result of aspiration of fluids into the lungs. Absence of this sign should not dismiss suspicions of arterial gas embolism.

SURVEY. It is very difficult for even diving medical experts to differentiate between decompression sickness and air embolism without a patient history. Many air-embolism victims are also suffering from decompression sickness. During your secondary survey, ask questions of the victim or the diving buddy that will assist the physician:

1. Have you been scuba diving or breathing any sort of compressed gas recently?
2. Were there any equipment problems during the diving?
3. Was there any sort of forced, rapid ascent during any dive?
4. Did you or your buddy run out of air at any time?
5. Did you or your buddy drop your weight belts at any time?

Above all, keep a record of how the victim's symptoms have changed or are changing in your presence. Attempt to reconstruct the victim's diving profile during the preceding 24-72 hours.

Perform a good, head-to-toe neurological examination looking for any deficits in sensory, motor, or reflexive function. A good clue is whether the overall muscular strength is the same on both sides of the body (bilateral). The victim's buddy is an excellent source of information for the diving physician. Attempt to take the diving buddy with the patient in order to provide information to the physician or chamber medical team. DO NOT ALLOW THE VICTIM TO PERFORM IN-WATER DECOMPRESSION. This will only "feed" nitrogen to the offending bubbles. In-water decompression with oxygen should not be attempted due to the risk of convulsions from high-pressure oxygen toxicity.

If this diver is in full arrest or otherwise seriously deteriorating, immediate helicopter medi-vac from the accident scene to the nearest available chamber is indicated. The pilot should be instructed to fly at an altitude of 500-1000 feet above sea level or as low as is safely possible to prevent further reduction of pressure on the diver. Commercial aircraft cannot appreciably increase cabin pressure without physically decreasing altitude. One major airline has stated that they would only consider such a reduction in altitude if the victim was in critical condition. Aircraft such as a Lear jet or C-130 can be pressurized to sea level (1 ATA) and the flight crews advised as such.

TREATMENT. Since it is so difficult to differentiate between decompression sickness and air embolism, this treatment protocol is regarded by diving physicians and Emergency Medical Technician educators to be the best for field treatment of both, while maintaining consistency with other treatment protocols being taught in most Emergency Medical Technician programs.

1. **Calm and reassure the victim.**
2. **History and vitals.**
3. **Administer Fluids.** The diver will undoubtedly be dehydrated from breathing very dry compressed air as well as from the diuretic effects of immersion. The ideal fluid is intravenously administered lactated Ringer's solution. Dextrose in water absolutely should not be administered. Intravenous fluids should be started immediately. In the absence of IV capability, balanced, oral fluids such as one-half strength Gatorade may be used. This fluid administration should be the same as for shock victims: **If more than one hour from medical help, allow the victim oral fluids at the rate of 4 fluid ounces every 15 minutes as tolerated.** Oral fluids should be withheld if transport time is less than one hour. Urine output should be monitored and recorded.
4. **Place victim in a 30-degree head-low position.** This head-low position is indicated for the victim suffering from cerebral air embolism (AGE) and is probably only good during the first hour after the accident has occurred. The idea is to vasodilate the cerebral circulation to either drive the offending bubbles deeper into the cerebral circulation or actually pass some of the offending bubbles over into the venous return. Unfortunately, this position induces cerebral edema and respirator discomfort. The head-low position will probably be dictated by the comfort level of the victim who likely will not be able to tolerate it any longer than 30 minutes. Raising only the legs 30 degrees may prevent respiratory discomfort and still aid the cerebral circulation. Some authorities additionally advocate a 15-decree left tilt of the body to trap bubbles in the low-pressure right side of the heart. The effectiveness of this additional positioning is questionable. This left tilt is probably only indicated for airway management in the nauseated victim. All compressed-gas injured victims should at least be placed in a supine (flat on back) position.
5. **Administer 100% oxygen.** Oxygen is a diatomic, colorless, odorless, tasteless gas responsible for 21% of the air we breathe. During the management of a diving accident, it is critical to administer as high a concentration of oxygen as possible to the victim. The oxygen serves to reduce the partial pressure of the offending nitrogen, deals with resulting tissue edema and hypoxia, and generally assists the breathing of the victim. The ultimate goal is to deliver 100% oxygen to this victim from the time the accident is recognized until medical authorities order it discontinued or the oxygen supply is exhausted.

Due to equipment limitations, we find that only a demand valve with a tight-sealing oronasal mask will actually deliver 100% oxygen to the victim. Constant-flow devices (inhalators) will only deliver low, inefficient concentrations (25-60%)

depending upon the metered flow rate and/or device (nasal cannula, simple elongated face mask, partial rebreather mask, etc.) used to deliver the oxygen to the victim. If only a limited supply of oxygen is available, it should be administered in heavy concentration by demand valve from the time the accident is recognized until the supply of oxygen is exhausted. A non-breathing victim may be supported using a pocket mask with an oxygen inlet connected to 10 liters per minute of constant-flow oxygen. If only constant-flow oxygen is available, it should be administered through a non-rebreather mask at an ideal flow rate of 10 liters per minute. If a large quantity of oxygen is available in this situation, higher flow rates may be utilized.

Even though the oxygen may cause symptoms to disappear, this individual should still be transported for professional medical evaluation and a hyperbaric-oxygen treatment.

6. **Transport to nearest medical facility/recompression chamber.** The sooner a victim is transported to and treated in a chamber, the better he/she will probably resolve. However, if several days have passed since the original accident, it is NOT TOO LATE FOR CHAMBER TREATMENT. Some success has been seen in treating victims in a chamber up to 28 days after the accident. Many chambers are in use today primarily for non-diving medical treatments. Some of these chambers are not necessarily ideal for the treatment of injured scuba divers. The ideal chamber is capable of containing the patient and support personnel, can be pressurized to 165 fsw (6 ATA), and will allow extended hyperbaric oxygen therapy. Aside from being within reasonable transport distance, a chamber should be selected in the following order:

A. Multi-place chamber with built-in breathing system (BIBS).

B. Mono-place chamber with built-in breathing system (BIBS).

C. Mono-place chamber without built-in breathing system (BIBS).

Any further questions regarding availability of emergency chambers or diving medicine may directed to:

Divers Alert Network (DAN)
Box 3823, Duke University Medical Center
Durham, NC 27710
(919) 684-8111 (24-hour: Emergency)
(919) 684-2948 (Office)

A comprehensive training course entitled "Emergency Oxygen Administration and Field Management of Scuba Diving Accidents" has been jointly developed by the National Association for Search and Rescue (NASAR) and The National Association of Underwater Instructors (NAUI). Included in this program are such topics as the basics of oxygen administration; equipment selection, use, and applications; basic maintenance; causes, symptoms, prevention, and basic physiology of both air embolism and decompression sickness; hyperbaric-chamber operations and treatment; drowning; and field evaluation, care and transportation of the compressed-gas injured victim. Half of the 8-10-hour workshop is devoted to hands-on skill sessions. This program is approved by both the Council for Continuing Education Units and the National Registry of Emergency Medical Technicians for continuing education credits. Further information is available from:

National Association for Search and Rescue (NASAR)
P.O. Box 3709
Fairfax, VA 22038
(703) 352-1349

National Association of Underwater Instructors (NAUI)
P.O. Box 14650
Montclair, CA 91763-1150
(714) 621-5801

TRAINING FOR NITROX USE

A one-day course in the proper use of nitrox is being offered by Hyperbarics International, Inc., 490 Caribbean Dr., Key Largo, FL 33037, (305) 451-2551 [located at Ocean Divers].

The Course Director, Dick Rutkowski, is described in their brochure as having "recently retired from the National Oceanic and Atmosphere Administration with 33 years of federal service, and having served as Deputy Diving Coordinator and Director of the NOAA Diving/Hyperbaric Training and Diver Treatment Facility from 1973 to 1985.

"Mr. Rutkowski also served as Director of NOAA Diver Training since 1965 and has acquired vast knowledge in diving life-support systems and gases. Upon retiring from federal service Mr. Rutkowski formed Hyperbarics International primarily to be an educational organization."

Courses are offered weekly at the Hyperbarics International Key Largo facility for individuals or groups, culminating with a wreck dive if desired. Course fee is $150.00 per person, and includes classroom materials, use of a tank of nitrox, and a guided wreck dive. The fee covers only teaching the proper use of nitrox; techniques for mixing and preparation are not included. However, "separate arrangements can be made with interested companies for the mixing program." Upon satisfactory completion of the course, each student will receive a certificate of completion and a "NITROX Diver" certification card. Arrangements can also be made to have the course taught at a private facility for an additional cost.

The one-day course comprises the following subjects: history, benefits, and disadvantages of using nitrox; review of ATA's, PO2's, FO2's and PSI; oxygen life-support ranges; oxygen physiology and pathophysiology; oxygen operational limits, safety and handling; NOAA Nitrox I, limitations, advantages and use of NOAA Nitrox I tables; EAD [Equivalent Air Depth] concept (basis for all Nitrox diving); NOAA Nitrox II use and validity; advantages and disadvantages of the EAD concept; overview of dangers of blending O2, mixing by partial pressures; oxygen analyzers/monitors and their use for nitrox diving; and the diver's responsibility before attempting use of any nitrox. Students are then given an examination and briefed for the wreck dive.

Brochure reprint of "Nitrox Use and Abuses," by J. Morgan Wells, from *Triage*, No. 10, April 1985:

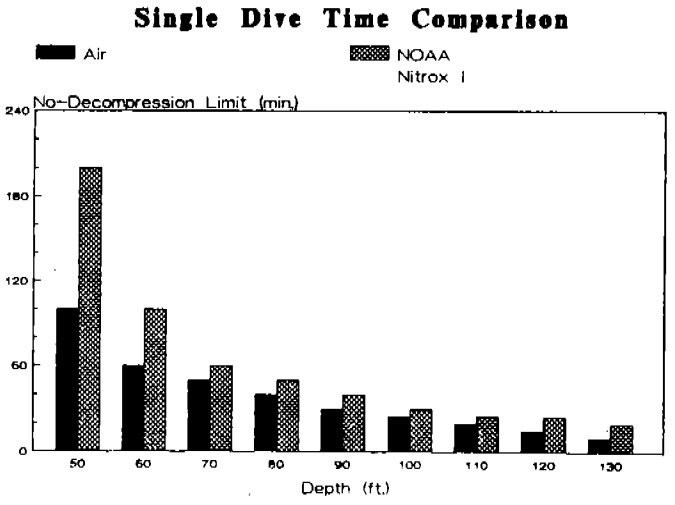
Mixtures of N2/O2, other than air, have been used with significant advantages in diving and recompression therapy for a number of years. They have been used by NOAA divers to reduce decompression obligation (32% O2/N2 Nitrox I), and as a therapy gas during recompression treatments (40% O2/N2).

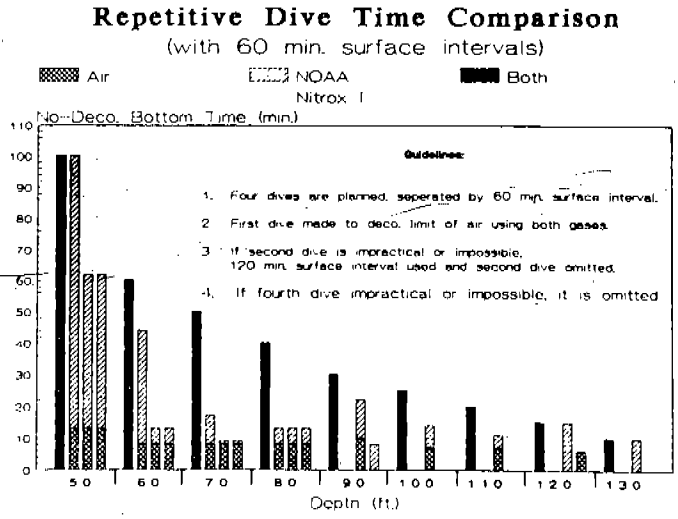
NOAA Nitrox I (NNI) was introduced in 1978 to reduce decompression obligation at depths down to 130 fsw. By breathing a nitrox mixture containing 32% O2, the N2 partial pressure is reduced enough to double (at some depths) the no-decompression limits and/or significantly reduce the decompression time required when compared to that of air diving. This is not without potential problems, however. The increased O2 fraction limits the depth and time of dives to those which do not exceed allowable oxygen partial pressures. (Ref., O2 Partial Pressure Limits *U.S.N.* and/or *NOAA Diving Manual*). Additional constraints regarding the use of nitrox involve the expense of its purchase, or its preparation and analysis. In spite of these drawbacks, nitrox can offer rather significant operational advantages if used properly. NNI decompression tables and instructions are contained in Appendix E of the *NOAA Diving Manual*. The Decompression Tables, Residual Nitrogen Times, and Residual Nitrogen Timetable for Repetitive Dives are in the same format as the standard air tables. No-decompression limits and maximum normal times at depth are listed. Air no-decompression limits are listed for comparison....

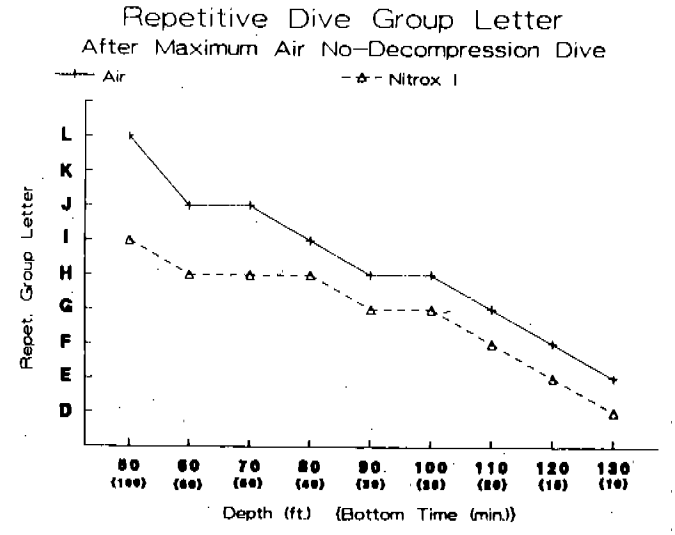
A sport diver who had been diving with NNI was recently treated for DCS in a NOAA chamber. The history of this case reveals several abuses of Nitrox. The cause of DCS was quite obvious—omitted decompression on several repetitive dives.

Other rather surprising abuses were discovered. The 32% O2/N2 was prepared by pumping a SCUBA cylinder to a precalculated pressure with oxygen, and then filling with air. The mixture was not analyzed. We were told that this is common practice for some divers. Adding pure H.P. oxygen to air which was pumped with an oil-lubricated compressor, in a system which has not been cleaned for oxygen service, can easily lead to an explosion. Preparing and breathing a gas mixture without analysis is likewise a risky undertaking. If the oxygen content is too high, CNS oxygen toxicity is likely. A lower than expected oxygen content could lead to decompression sickness, even if the nitrox tables are followed exactly.

Air is a rather "forgiving" breathing medium. Nitrogen narcosis generally limits its use to depths where oxygen toxicity is not a problem. Misuse/abuse of nitrox mixtures can easily lead to injury from an explosion, CNS oxygen toxicity or decompression sickness.







DIVING INTO NORWAY'S ARCTIC UNDERWORLD - by Russell England

[Reprinted from British *Diver*, Feb. 1986; sent in to UWS simultaneously by Rob Power and Randy Bohrer.]

Northern Norway boasts some of the most dramatic scenery in the world. With massive glaciers, towering mountains, and a myriad of rivers and streams flowing down to crystal clear blue lakes and fjords, this remote region inside the Arctic Circle has a beauty all of its own. It was not until recently, however, that a hidden landscape revealed itself. A landscape just a beautiful, but underground, beneath the rock.

In 1981 an expedition to the area visited Svartisen, Europe's largest glacier, to explore the surrounding area, and in particular Lake Glomdal, an area rich in limestone where caves were thought to exist. It was noticed that the waters of the lake disappeared vertically into the rock in a large swirling whirlpool, to reemerge more than half a kilometer further down the valley.

Although made up largely of cavers, the party included two divers who attempted to explore the entrance to the water-filled cave system. Andrew Ive, a PADI Instructor, and Barry Wilkinson, managed to get about 30 meters in, at a depth of about 23 meters, but, faced by worsening weather conditions, they were forced to abandon the exploration.

What they had discovered, however, was that the entrance to the cave, beneath the whirlpool, was about 8 meters in diameter and sloped down at an angle of approximately 50 degrees to a depth of 23 meters before levelling off. But what excited them more was that the water was gin clear, and that the cave seemed to be almost entirely carved out of white marble, an extremely rare from of limestone.

It was not until 1985 that a cave-diving expedition was put together to attempt the complete exploration of the hidden waters of Lake Glomdal—and possibly to make a connection between the Sink, where the waters disappeared, to the Resurgence, over 600 meters to the south.

Water tracing using fluorescent dye had shown that the water entering the system was the same that reemerged. But would it be possible for a man to swim through the cave? Perhaps the passage would become too tight, or would the diver be swept to his death in the dark?

The attempt would require the most experienced of divers, and so the expedition turned to Geoff Crossley and Jim Abbott, two of Britain's best cave divers. The dive leader was Andrew Ive, who had made the original dive four years previously, and the expedition leader was Stein-Erik Lauritzen, Norway's leading cave scientist from Oslo University, the main sponsor behind the attempt. With Norway's only three cave divers—Dag Grepperud, Ronny Arnessen, and Stein Johnsen—there to assist the British divers, and a backup team of cavers from both Norway and Britain, this was to be a truly Anglo-Norwegian bid.

Mike Pitts, an underwater cameraman, and myself as filming director, were asked to make a film and photographic

record of the attempt. We were assisted by Michael James as camera assistant, and his wife Lesley, who took still photographs. If the attempt was successful, the BBC would, they said, be interested in using our material.

There are only a few weeks every year when the water flowing from Lake Glomdal slows to a rate safe for diving. A time was chosen after the late spring melt and before the rains of Autumn, and at the beginning of the last week in July we set off from Mo-i-rana, the closest town, backpacking our personal gear, while all the filming and diving equipment was flown in by seaplane.

When we arrived at the dive site the sun was shining and the flow-rate into the cave entrance had slowed to under a third of a knot. With everyone in shorts and T-shirts, this was definitely not the Arctic Circle we had expected. But we knew that we would have to make our attempt as swiftly as possible because of the unpredictability of the weather.

While the cave divers made their initial recce ["REK-ee" - reconnaissance - Ed.] of the underwater system, we set about going through the equipment needed to film in such inhospitable conditions.

Here, the size of the camera was not a problem because the entrance of the cave was at least 20' wide. The camera used by Mike Pitts, an Arriflex 16SRII, would give the best possible 16mm pictures, and in its Seacam cast-aluminum housing it would be safe from the inevitable battering it would sustain underwater in the cave.

The lighting, however, was more of a problem. A mobile generator was flown in to provide power for a 500-watt underwater light, and with four 100-watt battery lights as well, we hoped that this would be sufficient to get the necessary light for filming. The white marble walls with their high reflectivity would also help.

As the exploration of the cave continued, Mike Pitts began filming underwater---always taking another diver along with him as safety cover. Everything went well until Mike attempted to film the divers in the Middle Entrance, a large cave about a third of the way along the route from the Sink in Lake Glomdal.

Here, peering through the lens of the camera, Mike failed to see a large tree which had been swept into the cave during the Spring thaw. He lost his life line, was engulfed in a cloud of sediment, and became disoriented. The film he was shooting goes completely blank at this point, testifying to the seriousness of the situation, but fortunately, with the help of Jim Abbott, he was able to locate the other divers again and rejoin them.

With the exploration continuing well, the final push from the Resurgence to the Middle Entrance was now attempted. The Norwegian divers had run a 300' line from the Middle Entrance towards the Resurgence, and all that was now needed for a complete link-up was a dive from the Resurgence by Geoff and Jim to find it. This was the longest and most hazardous dive. Would they be able to find the line in the pitch darkness, nearly 1000' into the cave?

We waited anxiously on the surface, ready to film them as they reappeared. Bubbles began to rise from within the cave, and after nearly 40 minutes their lights could be seen shining dimly under the water. We set the camera rolling and trained it on the patch of water where we had spotted the lights coming closer.

They surfaced together. Jim Abbott raised his arm in a victory salute, and Geoff Crossley shouted, "Done it!" Relieved, we broke out in a round of spontaneous applause.

On Aug. 19, 1985, BBC television news reported the successful attempt by our team on the Glomdal river system, and broadcast some of the dramatic pictures taken on the expedition. For all of us it was the successful conclusion of a unique experience. We are now hoping that a documentary of the expedition's bid based on the 16mm underwater and topside footage we took will appear on television in the next few months.

SUSAN LUCAS - CANDIDATE FOR NAUI BOARD - by Susan Lucas

NSS-CDS member Susan Lucas is a candidate for the National Association of Underwater Instructors (NAUI) Board of Directors. Susan, NAUI 6306L, is the only candidate on the ballot who is a member of a cave-diving organization. Ballots are being mailed to NAUI Instructors mid-October and must be returned before Jan. 1, 1989.

BIOSKETCH. Residence: Richardson, Texas.

Susan manages computer applications processing for a major international bank. She is a solutions-oriented manager with the authority and responsibility to bring in multi-million-dollar projects on time, within budget!

Quality control, finance, and management are all part of the job. She knows the difference between advertising and marketing as these are part of her leadership responsibilities. Susan is known for her open-door managerial style.

An active diver for 12 years, she had supported NAUI programs and conferences even before she became an instructor in 1981. She has considerable experience in all levels of diving instruction and has regularly led Instructor training.

Susan has been active within the Southwest Branch and the North Atlantic Branch as well. She has experienced many diving locations, always interested in the peculiarities of the diverse locales and the solutions to the individual problems.

Participation in other diving activities outside instruction includes:

- Speaker at various shows such as "Our World Underwater"
- National Championship in Scuba Skills '79 and '80 - Underwater Society of America
- "Diver of the Year" - Southwest Council of Diving Clubs
- Member, NSS-CDS and NACD
- Treasurer, Southwest Council of Diving Clubs
- President, dive club

As part of her continuing support of NAUI, she has submitted to HQ and board members detailed proposals and procedures on issues of membership communications and improvement of membership service.

POSITION STATEMENT. I attended the 1988 [NAUI] BOD meeting in Montclair. I believed that an informed candidate is best prepared to serve as a director.

The three days invested demonstrate my continued commitment. It separates me from those who might be newly elected. I know that issues that face NAUI now!

The past two years you have elected people who represented aggressive change. Observing the Montclair meeting and attempts to close it demonstrated to me that the BOD is closely split on important issues. That there were foot-draggers. That the BOD lacked leadership!

The NAUI BOD must:

- Manage technology effectively to enhance service.
- Measure/enforce policies/procedures for quality assurance, instructor standards and continuing education.
- Measure service by independent survey.
- Move the many stalled programs to the membership now.
- Stop the "scatter gun" national marketing and create effective marketing tools.

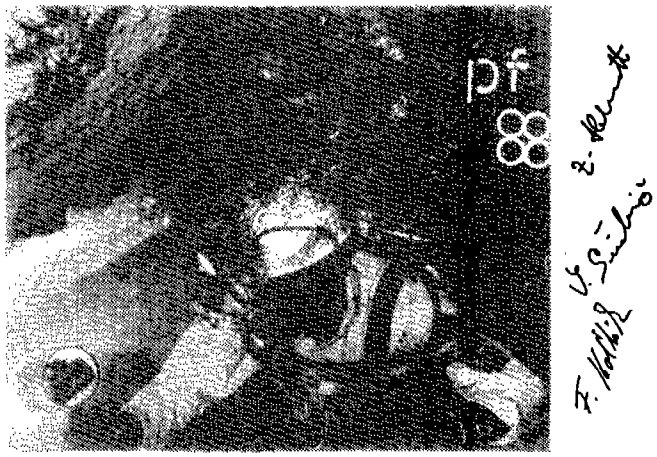
NAUI represents commitment to quality diver education. You belong to NAUI because you expect the best in products and service, membership relations, communications, and leadership in establishing industry policies.

I believe in the course of change the membership has set. I'd like to be the change on the NAUI board that makes not just the quality difference, but the majority voting difference as well.

Telephone: (214) 231-7739. I ask for your vote.

GREETINGS FROM CZECHOSLOVAKIA!

Slovenská speleologická spoločnost. Sekcia podvodnej speleológie.



LETTER TO THE EDITOR

Aug. 11, 1988

Dear Editor:

I have been reading with an increasing sense of dismay, the articles by Milledge Murphey and others concerning the unimpeded—and quite possibly unimpedable—closure of underwater cave sites. I was struck by the blunt phraseology of the new cavern manual: "There is no unowned land. We enter caves at the discretion of their owners—be they private individuals, corporations, or governments." Without violating the democratic tenets of "property rights" which form a cornerstone for our system of government, there is no way around having to cave dive at the discretion (a polite euphemism for "mercy") of the landowners.

At present we cave divers are caught in a double bind, in an "actively compacting garbage masher," to use a *Star Wars* analogy, between increasing population pressures on the one hand (which put additional strain on already overburdened public wilderness parks and areas, not to mention roads, water, sewer, fuel, etc., and raise real property values due to the simple fact of increasing scarcity—or "the total population is increasing, the total land mass is not"), and an out-of-control liability-insurance and negligence/wrongful-death-lawsuit climate on the other (that people play like a million-dollar lottery, their chance to strike it rich, a minimum outlay for a maximum return). Something like every 4th or 5th drowning results in the closing of a cave, and it doesn't seem to make any difference whether the person was trained and qualified or not.

As individuals, or even as a small organization with a couple of hundred members who pay dues of a whopping $5 apiece, we seem to have our hands full just trying to educate divers and keep them from getting themselves killed. And this is a very important aspect of preventing future cave closings. But we are virtually powerless to effect the kinds of changes that would be required to reverse the situation on either the increasing-land-scarcity/increasing-population or liability-lawsuit fronts. (I am reminded of a friend who was a member of a service club during college. A girl came up to the service-club table at the Student Union and asked him what the service club accomplished. "Oh, we stop wars, end famines, hold trash pick-ups...." The CDS "purchases cave properties, defeats the insurance industry and legal profession, holds trash pick-ups....")

Short of becoming active with other organizations whose purpose is to specifically address these individual issues, we can only write to our state and federal legislators urging them to create a legal liability environment that would recognize the assumption of risk on the part of the participant in a high-risk activity such as cave diving or mountain climbing and relieve the landowning individual, corporation, or government of any liability risk whatsoever. We can only write to our state and federal legislators urging them to purchase more park and unrestricted-use wilderness land. We can only write to our state and federal legislators urging them to create population-limiting legislation, both in the areas of immigration (since, as a nation, we cannot control the irresponsible population policies of other sovereign states, we will have to settle for insisting that they keep the products of their own population-explosion politics as the only way of controlling our own) and reproduction (since national birthrate statistics indicate that people have no intention of reducing it of their own initiative).

In some sense this last, long-term, long-range, and wide-spread task of zero- or even negative-population growth is the most critical, because it is the overburdening of our environment that is at root of almost all of the problems that we face, both as a nation, and a planet—from the depletion and scarcity of natural resources; energy and food shortages; water, ground, and air pollution; and hazardous-waste disposal, to the increasingly crowded and violent conditions we have to live in. As "enlightened" cave divers, with a personal, vested interest in all the positive benefits of reduced environmental impact, we can at least try to be a part of the solution rather than contributing to the problem. I look forward to reading feedback from other cave divers on these issues.

Sincerely, Jonathan Luchars, Atlanta, Georgia

NSS Cave Diving Section
P.O. Box 950
Branford, FL 32008-0950

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