UNDERWATER SPELEOLOGY

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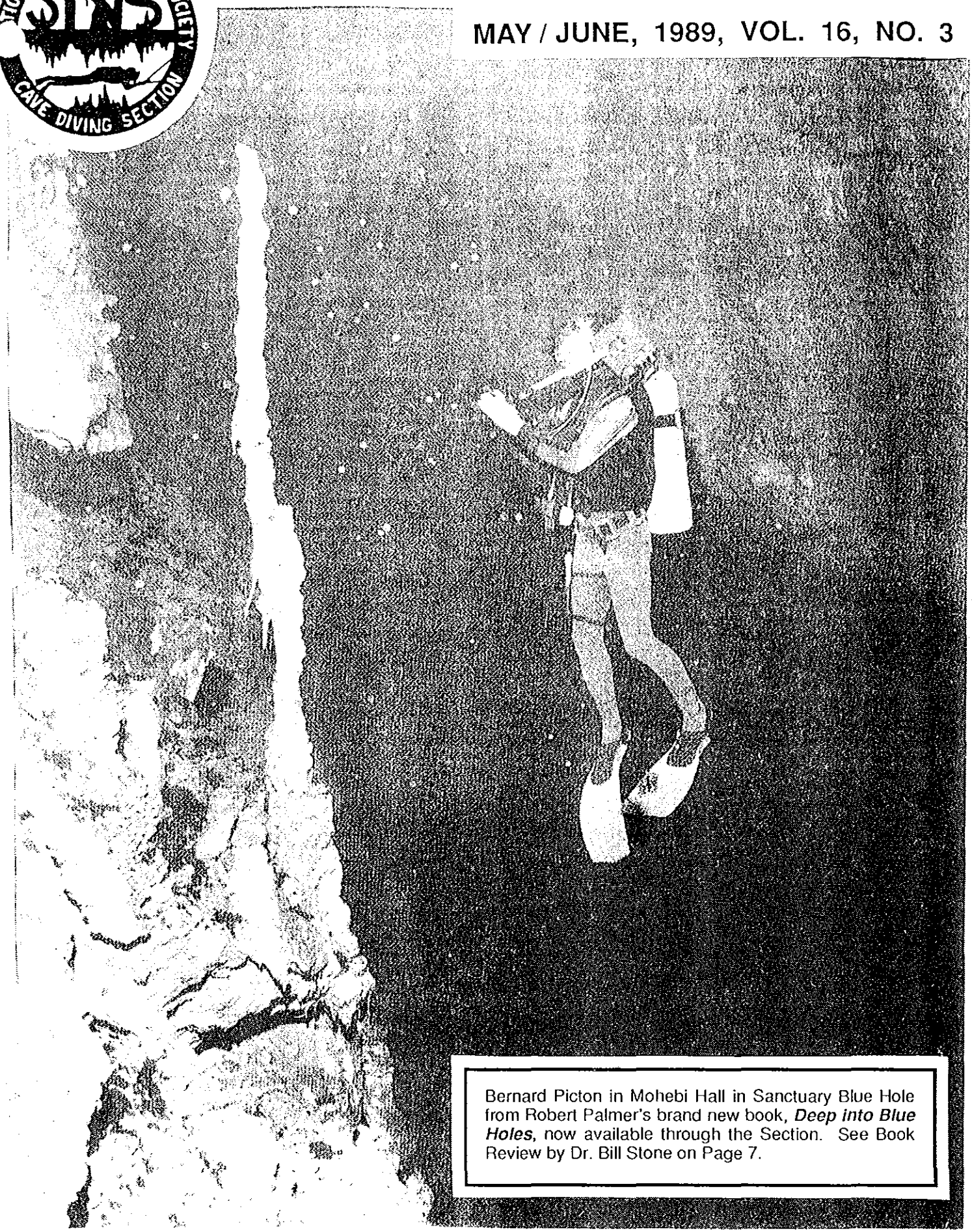

Bernard Picton in Mohebi Hall in Sanctuary Blue Hole from Robert Palmer's brand new book, ***Deep into Blue Holes***, now available through the Section. See Book Review by Dr. Bill Stone on Page 7.

Underwater Speleology is the official newsletter of the
CAVE DIVING SECTION OF THE
NATIONAL SPELEOLOGICAL SOCIETY, INC.
P.O. Box 950, Branford, Florida 32008-0950

RESCUE/RECOVERY TEAM MEMBERS -

Should immediately report any change of address or telephone to their Rescue/Recovery Team Area Coordinator(s).

AREA ONE: North Florida
Lenny Kolczynski
1000 Broward Rd., #1106
Jacksonville, FL 32218
(H) 904-765-1940 / (W) 904-771-6207

AREA TWO: Northwest Florida
G. E. O'Brien
5429 Hamilton Bridge Rd.
Milton, FL 32571
(H) 904-994-6082 / (W) 904-994-4540

AREA THREE: Central Florida
Joe S. Harrell
8162 Darts St.
Brooksville, FL 34613
(H) 904-596-4395 / (W) 813-847-8102

AREA FOUR: South Florida & Caribbean
Joe Prosser
7400 N.W. 55th St.
Miami, FL 33166
(H) 305-966-0619 / (W) 305-592-3146

ARKANSAS & MISSOURI:
Cliff Rooker
Rt. 1 Box CC
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P.O. Box 1906
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1815 Inspiration Lane
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(H) 512-477-5043 / (W) 512-441-3708

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Marysville, OH 43040
(H) 513-642-7775 / (W) 513-644-2559

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. 30-31, 1989. The SPRING WORKSHOP will be conducted on May 26-27, 1990. 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 Secretary-Treasurer in order to insure continuity of newsletter receipt. (The Newsletter Editor does not handle the mailing list, thank God!) Membership/subscription status, applications, and general information may be obtained by writing to the Secretary-Treasurer c/o the Section's permanent address:

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), letters to the Editor, 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 on an IBM-XT-compatible 5-1/4" 360K floppy in standard ASCII text format, WordStar version 3.0 - 5.0, Wordperfect up through 5.0, Multimate, MS-Word, and probably a bunch of other junk I haven't tried yet (no one ever reads this fine print!); however, all computer diskettes must be accompanied by a complete paper printout. For a small fee we can also receive FAX transmissions at the printers [FAX only (813) 484-6665 (8am-5pm M-F)]. All submissions become the property of the NSS-CDS.

All articles and letters to the Editor should include the author's name (even if he wishes to be printed as anonymous), return address, and NSS # (if any). If the subject matter refers to advanced exploration dives or techniques, or controversial topics such as deep diving, solo diving, questionable practices or safety infractions, please also include relevant biographical information such as professional qualifications (e.g., if your job is relevant or you have a doctoral degree - specify field), number of years cave diving, number of cave dives, level of certification, instructor status (if any, and number of students trained), exploration and survey projects participated in, cave-diving or NSS awards, etc. (modesty shall not be tolerated, but approximates are acceptable), so that readers may reflect upon the subject matter in the context of the author's experience or lack thereof. (Newly certified divers or non-divers are more than welcome to express their opinions; however, the advocacy of advanced techniques by unqualified divers—or manifestly unsafe practices by any diver—may be subject to review and/or censure.) 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

Sept. 2, 1989 - NACD "Seminar on Decompression," Tallahassee, Florida. See Page 4.

Sept. 29 - Oct. 1, 1989 - Catalina Hyperbaric Chamber "Chamber Encounter," Santa Catalina Island, California. See Page 4.

Nov. 17-19, 1989 - NSS-CDS Instructor Institute. For additional information, contact the Training Chairman.

Dec. 30-31, 1989 - NSS-CDS Winter Cave Diving Workshop. Branford High School, Branford, Florida. See Page 3.

AND A GOOD TIME WAS HAD BY ALL

This year's Spring Workshop was one of the most successful ever, with an attendance of over 225 persons, and two full days of very interesting lectures, classes, and activities.

Workshop Co-Chairmen Lamar and Lee Ann Hires wish to extend most sincere gratitude—on behalf of us all!—to all the speakers, photographers, mini-workshop leaders, dive guides, pilots, canoeists, publications assistants, door-prize and party donators, and others who helped make this workshop work: Sheck Exley, Rob Palmer, Tom Morris, Kelly Brady, Joe Prosser, Jamie Hempstead, John Burge, Don Landis, Mark Leonard, Wes Skiles, Steve Ormeroid, John Schweyen, Bill Main, Larry Royal, Pennie Bertram, Vince Ferris, Woody Jasper, Jeff Addias, Gene Broome, Karl Sutton, Fred Davis, Mark Long, Darden Davis, Bob McGuire, Pete Butt, Jim Taylor, Carol Evans, Terry Evans, Judy Ormeroid, Kathy McNally, Jeff Bozanic, Ginnie Springs, Spring Systems Dive Center, Branford Dive Center, Manatee Dive Shop, the City of Branford, and the Branford High School.

And our most sincere thanks to Lee Ann and Lamar!

NEW CDS INSTRUCTOR'S TRAINING MANUAL NEARS COMPLETION

Training Chairman Joe Prosser reports that the new *NSS-CDS Instructor's Training Manual* is rapidly nearing completion and will be available within the next few weeks.

Current-status CDS Instructors will receive a copy of the "guts" of the manual directly from the Training Chairman at no cost. (Current-status Instructors wishing to purchase the new tan, CDS-emblem-embossed notebook cover and chapter tabs should contact the Training Chairman for price information.)

Anyone else wishing to update his existing "red" Instructor's Manual may do so by sending the red manual, plus a check for $25 (Florida residents must include 6% sales tax, for a total of $26.50) to the Training Chairman.

Put your name and UPS shipping address (a "physical" address as opposed to a post-office box) and a check for $25 (or $26.50 if a Florida resident) made out to the "NSS-CDS" inside the red manual cover, and return the entire manual directly to the Training Chairman:

Joe Prosser
Prosser Enterprises, Inc.
7400 N.W. 55th St.
Miami, FL 33166
bus: (305) 592-3146
res: (305) 966-0619

NSS-CDS ELECTIONS

It's not too soon to begin thinking about the Section election for new Directors coming up in the Fall. Three Board Member positions and the Board Member/Training Chairman position, all of two years' duration (Jan. 1, 1990 through Dec. 31, 1991), will be coming up for election.

Nominees must be members in good standing of both the NSS and the NSS-CDS; nominees for the Training Chairman/Board Member position must be current-status NSS-CDS Full Cave instructors. Nominations must be received by Secretary/Treasurer Lee Ann Hires either in person or in writing no later than October 1. You may nominate yourself—in fact, are encouraged to do so. Nominees will be given an opportunity to write up platform statements which will be printed with the ballots.

Service on the NSS-CDS Board of Directors can be a richly rewarding volunteer opportunity to help promote the goals of the NSS Cave Diving Section: the conservation, scientific study, and safe exploration and enjoyment of underwater caves.

WINTER WORKSHOP

NSS-CDS instructors Kelly Brady (NSS #26061) and Lt. Henry Nicholson (NSS #21028) have volunteered to co-chair the Winter Workshop, which will be held Dec. 30-31, 1989 in Branford, Florida. Cave divers or others who are interested in presenting lectures or photographic expositions are encouraged to contact them.

Lt. Henry Nicholson	Kelly Brady
4517 Park St.	Rt. 1, Box 910
Jacksonville, FL 32205	High Springs, FL 32643
(904) 384-2818	(904) 454-2202

Members interested in chairing or co-chairing future CDS Winter and Spring Workshops are encouraged to contact the Section Chairman, Vice-Chairman, or any Board Member for further information. While these are demanding positions of considerable responsibility, they are also immensely rewarding in terms of personal learning experience and growth, and the satisfaction of knowing that one has materially promoted the exchange of information on cave-diving exploration, conservation, technology, and safety.

CONGRATULATIONS —

To Kathy McNally, our 1988 Winter Workshop Chairman, who was awarded the degree of Doctor of Medicine from the University of Miami on May 13, 1989. Dr. McNally begins a 3-year residency in Family Practice in San Bernardino, CA.

SHECK EXLEY SETS NEW CAVE-DIVING EXPLORATION DEPTH RECORD

Premier NSS-CDS member and explorer Sheck Exley (NSS #13146 Fellow) extended his exploration of Nacimiento del Rio Mante in Mexico to a new all-time "low" of 867-883' on March 28, 1989. Instead of leveling off as predicted after his record-setting dive to 780' last year, the cave continues down almost vertically as a single pit. Based of the geology of the area, it is possible that the cave rift extends as deep as even 5000'.

The dive, including decompression, lasted 13-1/2 hours and required no less than 12 different gas mixtures in 31 tanks. The dive was conducted with the advice of acknowledged deep-diving physiology experts and the use of a complex set of commercial tables and algorithmic extrapolations. A lecture and slide show on this record-setting dive was one of the featured presentations at the NSS-CDS Spring Workshop over Memorial Day weekend.

The support team for the dive included other prominent cave divers from both Mexico and the United States: Sergio Zambrano, Angel Soto, Ned DeLoach, Paul Heinerth, Tom Bussell, Randy Bohrer, Dave Hodgetts, Paul Smith, Tom Morris and Nancy Morris. To handle the demands of the extreme depth, special back-mounted tanks, a buoyancy compensator manufactured by Dive Rite, and a primary light manufactured by English Engineering were used.

SHERWOOD RECEIVES CDS AWARD

The NSS-CDS Board of Directors voted unanimously to present the Sherwood Scuba Company with an "Outstanding Achievement Award," a handsome engraved plaque which speaks for itself:

"In sincere appreciation of dedicated and continued support to the goals of scientific, explorational, and recreational cave diving, including equipment development and innovation, educational programs and sponsorship of safety awards"

Presented by the NSS Cave Diving Section

NACD SEMINAR ON DECOMPRESSION

The National Association for Cave Diving is conducting a scientific "Seminar on Decompression" Saturday, September 2, 1989 (Labor Day weekend) at the Holiday Inn on Appalachee Parkway in Tallahassee, Florida.

The seminar fee, which includes a buffet lunch at the Holiday Inn, is $25 for NACD members and $35 for nonmembers. **Attendance is limited to the first 60 people to pre-register; there will be no registration at the door.** It is the hope of the NACD that this seminar will meet the needs of the advanced cave diver in the area of information on decompression. A tentative schedule featuring some eminently qualified speakers appears below.

7:30 - 8:00 a.m.	Coffee and donuts
8:00 - 8:15 a.m.	Welcome and Introduction - John Crea
8:15 - 9:15 a.m.	Mathematical Models for Decompression Calculations - John Crea
9:15 - 9:45 a.m.	Development of the New PADI Tables - Ray E. Rogers
9:45 -10:15 a.m.	Testing of New Dive Tables - Ray E. Rogers
10:15 -10:45 a.m.	Break
10:45 -11:15 a.m.	Use of Oxygen During Decompression - Capt. John Zumrick, M.D.
11:15 -11:45 a.m.	Use of Nitrox During Decompression Diving - Dudley Crosson
11:45 - 1:15 p.m.	Buffet Lunch at the Holiday Inn
1:15 - 1:45 p.m.	Diagnosis of Decompression Sickness - Capt. John Zumrick, M.D.
1:45 - 2:15 p.m.	Practical Aspects of Decompression - Dudley Crosson
2:15 - 2:45 p.m.	Use of Decompression Computers - John Crea
2:45 - 3:30 p.m.	Panel Discussion / Questions and Answers

To register, send a check or money order for the appropriate amount ($25 for NACD members, $35 for nonmembers) to:

NACD Decompression Seminar
c/o John Crea
P.O. Box 1906
Bainbridge, GA 31717

Please include the following information with your payment, printed very clearly and legibly: your name, mailing address, city, state, zip code, telephone number, and NACD membership number if applicable.

HYPERBARIC CHAMBER COURSE

The University of Southern California is offering a "Chamber Encounter" at the Catalina Hyperbaric Chamber on Santa Catalina Island, California, over the weekend of September 29 - October 1, 1989. Registration is $195.00 and includes tuition, meals, and lodging.

The weekend program concerns hyperbaric chambers and how they apply to recreational diving, specifically addressing the following questions:

- What is a chamber?
- How does one work?
- What kinds are there?
- What are they used for?
- Where are they located?
- Why are chambers important to divers?
- What are the treatment procedures for divers?
- How is compression in a chamber different from diving?
- What is it like to experience nitrogen narcosis in a chamber?
- What should every diver know about air embolism and decompression sickness?

The University of Southern California's Catalina Marine Science Center is located on Santa Catalina Island, 22 miles offshore from Los Angeles Harbor. Since 1974 the Catalina Chamber has been on emergency standby for the region's diving accidents—treating more than 400 diving accidents. The chamber is internationally recognized as a center for hyperbaric treatment, training, and research.

During this weekend, participants will:

- make chamber dives to 60 and 165 feet seawater
- experience the effects of compression and decompression in a controlled environment
- feel how nitrogen narcosis affects them at 165 feet seawater
- learn hyperbaric chamber types, locations, and support systems
- find out what's new in air embolism and decompression sickness
- hear discussion of recommended diving-accident management techniques at the dive site and during transportation
- have the rationale and methods for hyperbaric treatment explained

A $40.00 deposit is required. Final course information and travel suggestions will be sent upon receipt of the deposit and registration information. Write or call: Andrew A. Pilmanis or Ronald J. Ryan, (213) 743-6793, Catalina Hyperbaric Chamber, P.O. Box 398, Avalon, CA 90704. (In lieu of reproducing their registration form here) with your deposit, include a piece of paper on which you have typed or printed very legibly your name, address, city, state, zip, and daytime and evening phones. Indicate that you are registering for the Sept. 29 - Oct. 1 session, and indicate whether you are male or female, and a smoker or non-smoker. You must also initial or sign the following statement: "I understand that a recent diver medical is required to attend this course."

THANK YOU! —

To the following people who contributed time manning the cave-diving booth at the SEAS Convention in Norfolk, Virginia, February 17-19, 1989: "Munk Peacock" (NSS #30353), John Conway, Ralph Hood (NSS #29042), Edna Laferme, Ben Meeks (NSS #27702), and Minter Molello.

NEW ADVANCED NAUI DIVING TEXT

[NAUI Press Release]

An exciting and different advanced diving textbook has been published by NAUI. This fine new work contains the writings of dozens of experts, and is more than just a support publication for advanced diver training.

The new NAUI text contains comprehensive chapters on the primary subject areas of diving—physics, physiology, equipment, environment, and decompression. The information goes far beyond that of an entry-level text, providing the knowledge base required for leadership-level understanding. An excellent feature of these chapters is that hundreds of diving terms are identified in capital letters and defined in the text as well as in a glossary.

Information about recompression chambers, dive computers, and other important topics not commonly addressed in currently available diving texts, is also contained in NAUI's new book. Another feature of the new publication, entitled *Advanced Diving Technology and Techniques*, is orientation information on many advanced and speciality diving activities. Topics that might be expected, such as navigation, night diving, search and light salvage, and deeper diving, are included; but so are topics such as river diving, drift diving, videography, and drysuit diving—information which is not readily available in other diving texts.

Every diver should have NAUI's latest educational support

product in his or her library. The book is packed with photos and illustrations to help comprehend important concepts that will make them better divers, and the text is a valuable support publication for advanced diver training, regardless of agency affiliation.

Advanced Diving Technology and Techniques is available from NAUI Headquarters, Box 14560, Montclair, CA 91763. (714) 621-5801. [Ed.: No prices or mail-order information were provided with the press release.]

BOOK REVIEW: *THE WAKULLA SPRINGS PROJECT*, by Dr. William C. Stone - reviewed by Robert Palmer

This color-illustrated, lavishly produced report by Bill Stone of the 1987 Wakulla Project deserves to be one of the classics of underwater-exploration literature. For anyone who saw Leo Dickinson's film of the Project aired on TBS April 9 by National Geographic, which explored Florida's legendary and beautiful Wakulla Springs using underwater scooters and mixed gas in scuba sets, this book will fill in the gaps between the unforgettable sequences of space-age underwater exploration. The book allows the reader to enter the world of remote deep-diving exploration technology in underwater caves, where some of the final frontiers of Earth are currently being explored by a handful of extremely experienced, specially trained divers.

The book outlines the history of the spring itself, from the ancient Indian settlements through the Spanish explorer Ponce de Leon's search for the mythical "Fountain of Youth" to the modern designation of the spring as a wildlife sanctuary, in which scuba diving is only rarely allowed. Chapters look at the formation of the cave itself, its biology and its unique place in the Floridian underworld, one of the world's great cave-diving areas.

For those with a practical interest in deep diving and underwater technology, there are chapters on physiology, heliox and nitrox life-support systems, new advances in rebreather technology, and on-site, in-water habitat decompression. For those who simply like a good adventure story, the chapters on the exploration of the cave, involving dives of up to 4,500' at a depth of over 300', both free-swimming and using diver propulsion vehicles, that lasted for up to 12 hours on occasion (including decompression), make occasionally chilling reading.

There was the moment, for example, when Wes Skiles, several hundred feet into one of the huge deep tunnels, lost the ballast lead from his Aquazepp scooter and nearly lost the scooter up a huge, water-filled chamber so high that he would have had to decompress to retrieve it, or when Sheck Exley's scooter broke down almost 3,500' into the cave's D-Tunnel, leaving him to swim most of the way out at an average depth of 300'. The demand valve on his emergency air supply failed, as did one of the bulbs in his light, but he battled out to regain the entrance after a 77-minute bottom time. Ahead of him lay a further 9-1/2 hours of decompression before he could surface and relax.

Some readers might think these divers utterly insane, but they recorded a total of 84 man-dives on heliox in open-circuit scuba, spending over 10 hours in all below 300', and had no decompression problems at all. This was largely due to the professionalism of the team, and the expert assistance of Dr. Bill Hamilton of Hamilton Research, who devised the special decompression schedules for the Project. Information on these schedules is included in the book, together with what may be the next stage in underwater cave exploration—a rebreather system that will allow the diver to stay underwater for 12 hours at a time at 300'. I gather plans are already afoot for "Wakulla 2."

[Ed.: The 210-page book, containing 14 pages of full-color and black-and-white illustrations throughout the text, and detailed maps of the caves, is available by mail order from the NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950 for $32 (Florida residents must add 6% sales tax: $32 + 6% = $33.92) plus $3 postage/handling.]

STYGOBIONT: A Sporadic Column by a Seeker of the Dark - by Dennis Williams

[ABOUT THE AUTHOR: Past NSS-CDS Chairman Dennis Williams has been cave diving since 1976 and instructing since 1979. He was heavily involved in the exploration of Lucayan Caverns and many other blue holes throughout the Bahamas, has participated in the discovery of several new species of troglobytes, and has made several outstanding cave-diving documentary films including the 1985 Smithsonian documentary, "Where None Has Gone Before," and the classic 1980 one-hour film, "Descent Into Darkness." He has explored underwater caves in the Bahamas, Bermuda, Bonaire, the Canary Islands, Guam, Mexico, Palau, the Phillipines, Turks and Caicos, and even the United States, and is currently Conservation Chairman for the NACD.]

The year was 1981. While trying to figure out what a Chairman of the Cave Diving Section is supposed to do, I had an idea about writing a column revealing some of my thoughts to the readers of *Underwater Speleology*. During the last eight years I have written dozens of columns about the things that I found interesting or distressing about cave diving; the truth is, I only thought about them. I filled my diving-damaged brain with column after column of ideas about cave conservation, equipment, maps, world records, cosmic records, egos, galactic egos, death, yuppies, lawyers, folks that seem stupid, and so on. Eight years of cave diving debris piled up while the daily junk of life clogged my attention. For reasons unclear to me, I have at last put to paper this inaugural column. I hope that it is not premature.

Anxiety Insurance. Sometime in 1974 I was sitting in the right-hand seat of a Cessna 150 that was mostly being flown by a student pilot doing touch and go's on Freeport's 11,000-foot runway. It was near the end of a late summer day and there wasn't much else in the plane besides us. Over the previous eight years I had made some 10,000 landings on this stretch of asphaltic concrete, so the guys in the control tower knew from my voice that I was aboard. About an hour before sunset the radio crackled, "Dennis, BASRA (Bahama Air Sea Rescue) has a report that a boat is sinking near West End, Grand Bahama. Do you want to go and have a look?" I was an active member of BASRA and a Senior Flight Officer responsible for coordinating air searches; so the natural thing to do was answer the tower's request with, "Sure, give me the information." My student broke out of the traffic pattern and headed toward West End some twenty miles away.

The BASRA report indicated that a sailboat, with a family aboard, was taking on water somewhere west of West End. A rescue boat was leaving the dock, and our job, in the Cessna, was to find the sailboat, then find the BASRA boat and get the two of them together. It was pretty standard stuff, the kind of thing that I had done dozens of times before. Folks with enough money to leave behind both dry land and common sense are never in short supply, and I was about to prove it.

An hour later, as the Gulf Stream swallowed the setting sun, our four-cylinder Continental engine was pulling us around in slow circles. We were somewhere between Grand Bahama and Palm Beach, and only 800 feet above the ocean. There was no sign of the sailboat and it would soon be too dark to search. I raised the nose slightly and added full power to climb high enough to radio our situation to Freeport Tower. At our distance, we were too low for line-of-sight communication; we would have to gain a few thousand feet before our little radio would reach. The vertical speed indicator showed 500 feet per minute, 4 more minutes and I'd call in.

It was during that four minutes that another part of my brain took charge. For the first time since we left the traffic pattern it occurred to me to take inventory of where I was and what I had with me: two shoes, my shorts, a tee shirt, and one 1600-pound negatively buoyant Cessna. There have been times when I've been smarter than this. I teach people to fly over water. I own thousands of dollars of survival gear: life jackets and life rafts, emergency radios, signal flares, gallon containers filled with drinking water. The equipment that would have made me feel a whole lot better was all back at the flying club. I understood perfectly well our situation. If this small aluminum machine stopped converting six gallons an hour of 100-octane fossilized biomass into forward speed, we were going to lose altitude, get wet, and die.

Interestingly, there are many words that describe what I felt while we waited on the trip back to Freeport: apprehension, stress, worry, alarm, dismay, dread, fear, concern, stupidity, irritation, uneasiness, and a lot more. This experience marked the beginning of a philosophy that I have named "Anxiety Insurance." You can't buy an insurance policy for anxiety with money, although some people try. The purchase is best paid for with knowledge and experience. The idea of anxiety insurance is to inhibit the feelings I described having had during that West End search. Therefore, define the things that stress you, and then work out a plan that diminishes their ability to effect how you feel. The fewer things that you are worried about, the more fun you can have and the safer you will be. After that day, in 1974, I never again found myself beyond the gliding distance from dry land without enough survival equipment to insure my mental well being.

When I started cave diving I borrowed from what I learned flying over water in single-engine airplanes, to buy more anxiety insurance. I designed a new policy that would cover me when I leave behind: dry land, light from the sun, and air held in place only by gravity.

A new cave diver should worry about everything. Remember your first few dives? If you had a caring instructor and you kept those beginning dives shallow, after a while you began to settle down and worry less. The process of acquiring anxiety insurance was well on its way. Now as you gain more experience, the responsibility for adding to your policy shifts from your instructor to you. Think about those things that stress you before, during, or after a cave dive. Then find a stress reduction solution that works for you and add it to your insurance. When Gene Melton and I were doing 3,000'+ penetrations in Lucayan, I thought a great deal about light failure. My solution was to carry seven lights. Even though I never needed more than three of them to see, I found that I needed all seven to see clearly.

Cave Diving is Sumpthing Else.

HOW TO REDUCE YOUR CHANCE OF GETTING BENT WITH YOUR DIVE COMPUTER - by John Crea

[Editor's Note: The opinions expressed in this article are its author's and should not be inferred to represent the official policies or attitudes of the NSS Cave Diving Section. Because no diving table or computer can completely guarantee against decompression sickness, all diving entails certain physiological risks. Decompression diving increases these risks and is beyond the scope of most casual sport divers. Unfortunately, underwater caves were not designed with the no-decompression limits in mind. Stage-decompression diving should be approached with the great caution and a conservative, safety-minded attitude. The recommendations made in the following article have been written toward that end.

ABOUT THE AUTHOR: John Crea is the Vice-President of the NACD, the National Association for Cave Diving, and has been cave diving for several years. As the Director of a hospital Nurse Anesthetists program, he has long had an especial interest in the physics of gases, and has authored numerous in-depth articles on the advanced technological and physiological aspects of cave diving.]

There has been much discussion in the last year about the use of diving computers in Cave Diving, with almost every brand being said to be "UNSAFE" and to get divers "BENT." What are the facts about the safe use of diving computers? How should one dive a computer to minimize the chance of developing the bends?

First, we must realize that all of the diving computers (except for one model of the Suunto computers) calculate the decompression requirements based on any one of several different "models." These models are theoretical concepts as to how the human body takes up inert gas during a dive. These models give rise to an algorithm, which is a mathematical formula which takes into account the time and depth, and applies that to the model and formula to calculate inert-gas uptake and elimination by the body tissues.

It should be realized that the U.S. Navy Tables were calculated utilizing an algorithm based on the work of J. S. Haldane, and modified by scientists at the Navy Experimental Diving Units. The Dacor Micro Brain and Beauchat Aladdin utilize Haldanian models that were developed in Switzerland by A. A. Buhlmann, utilizing more tissue groups with more conservative allowable tissue over-pressure values. The Orca EDGE utilizes a modified Haldanian model (based on the Spencer "No Bubble" tables) with more conservative values for the allowable "over pressure" in each of the tissue groups that it calculates than the U.S. Navy (and more tissue groups than the U.S. Navy model).

The important thing to remember is that all of these algorithms are calculating the ABSOLUTE MINIMUM depth that it is safe to ascend to after a given dive. If anything is even a little bit different than the assumptions that are made by the table/computer developer, then that depth may in fact be too shallow to be safe. Just as with the U.S. Navy tables, where we usually go to the next deeper depth and/or the next longer dive time when we figure our decompression requirements, we should also not "push" the computer tables to their absolute limit.

Thus, a few recommendations for using these dive computers for safer decompression diving.

1. Never ascend to the depth given as the first decompression stop. Stay 5-10' deeper than that minimum stop depth. Studies have shown that ascending to the first stop as calculated with the U.S. Navy tables can produce detectable (although asymptomatic) bubbles. Studies have also shown that stopping 10-20' deeper than the first indicated stop for a

few minutes can virtually eliminate these "silent" bubbles. And, if diving a computer that shows a "ceiling," stay at least 5-10' deeper than that given ceiling.

2. On extremely long or deep dives, the utilization of 100% oxygen at the 10' and 20' stops will insure an extra margin of safety. Studies have shown that utilization of 100% oxygen at the 10' and 20' stops will essentially double the rate at which the inert gas is removed from the body. This does not mean that you should decrease the duration of your 10' and 20' stops. Instead, utilize oxygen to build in a large safety factor in your decompression dives. Also, combining both the 10' and 20' stop with oxygen at the 20' level will augment the "Oxygen Window Effect," which also increases the rate at which the inert gas is removed from the body tissues.

3. After the computer says it is safe to surface, do an additional 10-20 minutes at 10' (you did do your 10' stop at 15-20', didn't you?). The use of oxygen during this stop also increases your safety factor.

4. After you surface, take a "SURFACE STOP." In other words, take it easy, talk over the dive with your buddy, and allow additional inert gas to be released from your body before you make that strenuous climb out of the water, or climb up the hill at Little River. Exertion can enhance the formation/liberation of bubbles from a marginally safe tissue. After exceptionally deep/long dives, you can do this surface stop with any leftover oxygen to add to your safety factor.

5. No hot showers for the first few hours after a decompression dive. I know that after a long dive, and what feels like an even longer decompression, many times you feel like a fugitive from the deep freeze. However, gas solubility is inversely related to temperature, and tissue and blood hold less gas when they are warmed. Thus, a tissue that may be holding the maximum amount of inert gas at your normal temperature, could form bubbles if exposed to an elevated temperature. A hot shower, and especially a soak in a hot-tub, could be the start of something big (bubbles in this case).

6. Drink plenty of fluids before and after the dive. Dehydration can lead to a sluggish micro-circulation, and thus the inert gas is not removed efficiently from those areas. If the inert gas is not removed at the calculated rate (that the algorithm is using), then that tissue will not be adequately decompressed when the computer assumes it is, and bubbles could form. I know that many divers (especially those diving drysuits) try to limit their fluid intake prior to a dive due to a desire not to urinate in drysuits (or wetsuits). However, getting the bends is not worth the esthetics of not peeing in your suit. If you can't hold it, then you need to make shorter dives, not limit your fluid intake.

6a. However, the ingestion of fluids containing alcohol is also not a good idea. First, alcohol is a diuretic, and even though you are taking in fluids, you may be peeing them off even faster. Alcohol ingestion can thus lead to dehydration. Secondly, alcohol is also known to reduce surface tension. Surface tension is one of the forces at work that helps to limit or prevent the growth of bubbles. Theoretically, drinking fluids containing alcohol after a dive could lead to enhanced bubble formation. So, avoid alcohol-containing fluids for at least a few hours after those decompression dives.

These are just a few "common-sense" suggestions for the users of decompression computers. Most of these hold as well for those of you who are using tables, with the substitution of using the next deeper/next longer schedule during your dives. You should also round down to the next lowest repetitive group when doing repetitive decompression dives. In other words, if your calculated repetitive group is "I" just prior to entering the water, change that to a "J."

Remember, the issue here is not how fast can you get out of the water, but HOW CAN I PREVENT MY GETTING THE BENDS WHILE CAVE DIVING? Following these suggestions will decrease the chance that you get BENT. However, there is no such thing as a NO-BENDS table. If you dive, you run the risk of getting the bends, even if you follow all of these suggestions. However, by following these suggestions, your risk of getting bent is greatly reduced.

May all your dives be safe ones. If you don't have DAN insurance, you really ought to look into it. Treatment for the bends can become very EXPENSIVE.

FOREIGN PUBLICATIONS - by John Schweyen

The following two newsletters may be of interest to people who want to stay abreast of developments outside of the U.S.

The Cave Diving Group (CDG) in England is probably the oldest such organization in existence. The CDG newsletter describes explorational dives by CDG members, technical aspects of cave diving, reviews of other publications, and news about what's happening inside and outside of CDG. This is a quarterly newsletter, and can be obtained by writing to:

Paul Whybro
10 Park Rd.
Tanyfron, Wrexham
Clwyd LL11 5SG
Great Britain

I'm not sure about the cost per issue, but there is a $5.00 surcharge for cashing US checks. Probably the quickest and most efficient way to get on the mailing list is to send about $20.00 or $30.00, which should cover a few years.

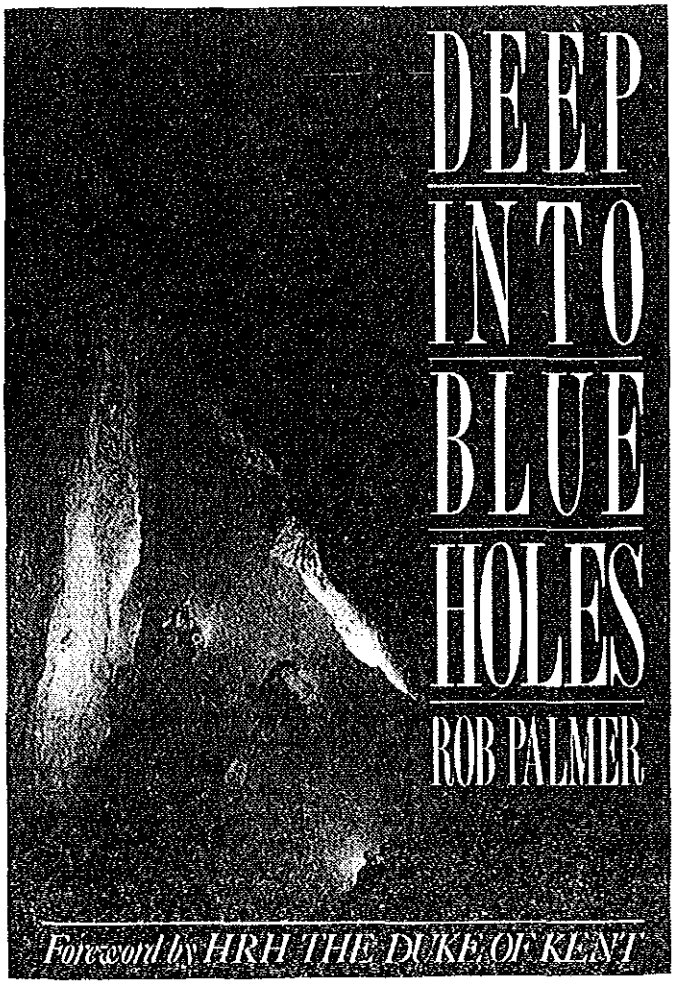
The magazine of the Cave Diving Commission of the International Union of Speleology has a new editor:

Alessio Fabbricatore
Via Fatebenefratelli, 26
34170 Gorizia, Italy

Alessio speaks good English. I'm not sure about the frequency of publication, but the cost per issue is $13.00, which includes shipping. The last issue covers the VII International Camp of Cave Diving. Almost all of it is written in English, even though most of the articles are by divers from Europe.

BOOK REVIEW: *DEEP INTO BLUE HOLES*, by Rob Palmer - reviewed by Dr. Bill Stone (NSS #12783 Fellow)

Deep Into Blue Holes relates six years of underwater exploration in the submerged caverns of Andros Island, the largest of the Bahamas. Andros is distinctly different from what most people envision as the Bahamas: it is a vast, low-elevation slab barely rising above the sea and covered by thorn scrub, poison wood, and jagged karst on the east and thick mangrove swamp on the west. In the summer, when most of the work



described in the book takes place, the thick air boils. When the wind blows in from the sea, which it does persistently along the east coast for most of the day, it is barely tolerable. When the wind stops clouds of thirsty mosquitos rise from unseen cornices to lay waste to the few human inhabitants. During these times it is worth your life to either not be on Andros, or be underwater.

Palmer is the heir apparent to the work begun by Dr. George Benjamin, a Latvian-born Canadian, who carried out a pioneering set of explorations on Andros during the 1960's and early 1970's. The book traces these early efforts and follows with two expeditions to Conch Sound Blue Hole on the north island during 1980 and 1981, co-led by Palmer and Welsh cave diver Martyn Farr.

The descriptions of the cave, while interesting, are secondary to those of the ensuing powerful clash between two very strong personalities...the expedition "co-leaders." A lesser writer might be tempted to use such a forum for the denigration of his adversary. Palmer has deftly tempered his commentary, however, to provide an unusual insight into the issue of personnel problems on expeditions.

Learning from his mistakes, Palmer organized a series of smaller reconnaissance expeditions to Andros during 1984 and 1985, the latter as part of a cooperative effort with "Operation Raleigh," led by the ubiquitous John Blashford Snell of the British military establishment. Palmer's conclusion: don't become involved with mega-military expeditions. With this education, the stage was set for a most ambitious undertaking: the 1987 International Blue Holes Research Project to South Andros.

Unlike the Blue Holes of North Andros, the caves of the southern island are developed along a prominent fault which breaches the island diagonally before eventually heading out to sea towards the renowned "Andros Wall," where the Atlantic Ocean rift drops two kilometers vertically only a kilometer off shore. All of the southern Blue Holes are deep...many in excess of 80m.

It was this depth, postulated to perhaps even exceed 200m, and the quest for positive proof of the level of ocean recession during previous Ice Ages, that led to the unusual premise for the 1987 expeditions: if a diving team could recover intact stalagmitic material from great depths—deposition of which could only have taken place in a previously dry cave—then uranium-isotope dating analyses could be made of the core rings to establish the age. It had been estimated prior to this expedition that the drop in sealevel could have been as much as 120m. Placing a working diver in the remote recesses of a submerged cavern at that depth was radical business in 1987.

The majority of *Deep Into Blue Holes* provides a suspenseful narration, interspersed with poignant quotes from various team members, of this project. To Palmer's credit, the first use of mixed-gas rebreathers for cave diving took place on South Andros, during which team members reached a depth of more than 100m underwater in Stargate Blue Hole. It also marked the first extensive use of Heliox (helium-oxygen breathing gas) for deep cave diving and laid much of the groundwork for the Wakulla Springs Project in north Florida, which was conducted three months following the conclusion of this expedition.

This is Palmer's second book on the Blue Holes of the Bahamas Islands in four years, and it is without doubt his best work to date. While there are few among us who know what it feels like to be at the cutting edge of exploration inside an underwater cavern, there are fewer still who are able to bring this experience to the lay reader in an interesting and provocative manner through the power of the word. Palmer, in addition to being a world-class expedition organizer, is one such gifted writer.

[A limited number of copies of the book are now available through the NSS-CDS for $27 (Florida residents must add 6% sales tax, for a total of $28.62), plus $3 postage/handling. The book is hardcover, 164 glossy pages, with numerous black-and-white and color photographs. Send your check or money order for $30 (or $31.62 if a Florida Resident) to: NSS Cave Diving Section, P.O. Box 950, Branford, FL 32008-0950.]

U.S. SUMP INDEX - by John Schweyen

One of the goals of the Sump Diving Project is to compile an index of sumps located in the United States. The rationale for such a catalogue, which would be available for distribution, is the following:

- Documentation of previous work. Usually, reports involving sump exploration appear in regional or grotto newsletters, where readership interest is highest. A Sump Index would bring pertinent information under one heading, and would reference existing reports in other publications. Presumably, it would also document work that is not reported in other sources.
- An Index would also serve as a guide in planning exploration. Both explored and unexplored sites will be catalogued, regardless of interest or potential. Indexing low-priority sites would increase the likelihood of exploration by making them more visible to sump divers.
- Helps to prevent duplication of effort. Sump diving typically requires considerable time and effort. Most divers would like to avoid pushing or surveying sites that have already been fully explored, and spend their time and money on other projects.
- By providing information on conditions and special

hazards, such an Index would result in safer, more efficient dives in sumps that have been looked at and reported on by other divers.

- In general, the Index would not give precise geographical locations. Following the example of British regional sump indexes, it is meant to be used in conjunction with other regional cave bulletins and information from local cavers.
- Tom Gilleland and John Schweyen will be the editors. Initially, the Index will describe roughly 100 sumps located primarily in the northeast. Additional entries are being solicited. Information can be sent to the following address:

John Schweyen
230 Polifly Rd., Apt. 5
Hackensack, NJ 07601

The following is a list of vital statistics that should be included, if available:

- State, county, name of cave and sump
- Sump conditions: vis (in/out), length, depth, size (restrictions), flow, temp, silt
- Special hazards: line traps, bad line, debris, unstable areas
- Equipment transport: length, technical difficulties
- Status of exploration
- Potential for future exploration
- Maps
- References to articles in other publications

Any additional information will be included, but the main objective is only to identify sumps and provide information on the level of difficulty and the status of exploration.

LETTERS TO THE EDITOR

[The opinions expressed in these letters are their authors' and do not represent official NSS-CDS policies or attitudes.]

Dear Editor:

In the January/February issue of *Underwater Speleology*, Mr. Lamar Hires, a well-known and widely respected member of the cave-diving community, instructor, and BOD member, wrote an article on the "Basic Cave Diver" exceeding his/her training. In this article, he called for a possible change in the certification title from Basic Cave to Advanced Cavern.

As a Basic Cave diver who is very much concerned with the current trend in accidents we appear to be having, I too would like to call for some changes in our training program, though ones which may not be too well received. First off, I would like to call for a tightening up of our selection of diving candidates. I think we need to pay much closer attention to the psychological aspect of the diver's mental profile.

Next, I would like to put forth the possibility of abolishing the Basic Cave certification entirely. If we cannot (and I don't believe we can) keep some Basic Cave divers from exceeding their training, then perhaps we should require them to make the commitment to complete their training in order to be able to make these more advanced types of dives, such as circuits, traverses, and stage dives, safely.

In closing, I would like to bring forth the one idea which I truly believe holds the most merit, and that is the placing of a time limit on the Basic Cave certification for a period of one year. This most likely will meet the needs of both the cave-diving community and the beginning cave diver, while not allowing the Basic Cave diver to amass too much dive time where he/she would be encouraged to try more advanced types of dives.

I hope the cave-diving community will unite behind this last idea and encourage the Board of Directors to consider the necessary changes to this certification.

Sincerely, Brett Evans (NSS #29959), Sunrise, Florida

March 12, 1989

Dear Editor,

I would like to comment on the diving-beyond-training deaths that are becoming a blotch on the safety record of the NSS-CDS, and suggest one more, maybe the elusive, sixth fatal error in accident analysis. One that is an obviously overlooked facet. But first let me give you a brief look at my background, as per the suggestion regarding letters and comments, printed in UWS.

I started caving four short years ago, book trained. This was an edge that allowed me to progress rapidly in the hands of the excellent cavers I fell in with. Within 10 months I was leading some of these same cavers into the very nastiest parts of Iowa's Coldwater Cave (Winneshiek Co.). We were pushing into virgin cave in areas with minimal airspace, things the last generation had left hanging. This eventually led to a large find of large cave and a terminal sump.

Belayed free diving showed more dry passage and I started to acquire gear and information to scuba dive into these areas safely. I had obtained my Open-Water Certification in '81, but was not sufficiently enamored with diving to pursue it until its use as a tool in caving became apparent. Subsequent diving in this area of CWC has opened up considerable large dry passage, of which over 3000' has been surveyed. I've made free dives and scuba dives in Iowa's second largest cave, April Cave, also. Dives in here and in CWC, I am told by people who stay better informed on these things, were novel in that they were done in an alpine style. We had a small group carrying everything for either one diver (myself) or the entire group to sites deep within "dry" caves, doing the dives, and toting things out.

Being the only person actively exploring springs and sumps in this state, I have had to rely on scant information from years past, the early '70's being the last spurt of enthusiasm. I have rechecked many old leads and found good new prospects. At present I have a total of 68 dives logged, with 35 of these being cave dives. Most of these were solo dives of under 5 minutes, with the longest being solo for 25 minutes. Locally I've never had to deal with depths of more than 5'-6'. The majority of them all required returning in zero vis. All along I had no clear-cut idea of what I was doing, other than following the rules laid out in the *NSS Cave Diving Manual* and information I had gathered from friends who had taken the courses. I was figuring things out as I went, using the established guidelines and dry-cave common sense. Herein, I believe, lies the overlooked matter.

I feel that the accident analysis should list whether the fatalities are experienced "cavers" or "cave-trained" open-water divers. I feel that there is a distinctive attitudinal difference between the two. Cavers, especially "push" cavers, are constantly analysing the caves as they go, scoping out hazards, real and potential, and always evaluating their own performance and gut feelings. There is always the chance in any risky endeavor that one will suddenly find oneself "in too deep," but it occurs to me that the recent fatalities never even considered this possibility until it was too late. Having just completed Cavern and Basic Cave classes, and witnessing some of the goings on at the dive sites, instilled this feeling about open-water divers who add cave diving to their list of "specialty" training, as opposed to cavers who opt for this special aspect of caving.

As with any sport in which one's life may be at risk, a slow, sensible approach seems prudent—e.g., my six dives into A.J. Spring Cave (Allamakee Co., Iowa) to push 300 horizontal feet of mostly submerged passage, on the novice extreme, and Sheck Exley's 780' deep cave dive into Rio Mante, on the opposite extreme. What we both have in common is that we are diving from a platform built from experience (and probably both diving a little beyond our training). Common sense, however, cannot be legislated. If one cannot recognize one's

own limitations, one might well become a statistic. Call it natural selection, if you will.

Short of leaving recovered bodies affixed to the warning signs common in Florida cave-diving sites, I can see no way of slowing down this trend of diving beyond abilities. (Note "abilities," not necessarily training.) I guess my hope with this letter is to affect the nature of the statistics. It may someday not only be required to verify training levels to gain access to cave-diving sites, but cave orientation also. Maybe applicants should be required to have "X" number of hours of "dry" cave training along with cave diving training.

Sincerely, Mike Nelson, NSS #27176, Fertile, Iowa

P.S. I forgot to mention manditory Full Cave training to maintain certification. How many dives will be required to maintain this "full" certification status?

A SUMP DIVER'S THOUGHTS ON CAVERN AND BASIC CAVE CLASSES - by Mike Nelson (NSS #27176)

First off, I'd like to comment on the high caliber of our teachers, Jay Bromenschenkel for Cavern, and Marc Eyring for Basic Cave. On the dives we did on the weekend prior to the class, and the classroom situations we observed at other locations, we were exposed to some shoddy practices and what I'd call uncomfortable teaching techniques. These were your basic "stern," "this is serious business" approaches. I'm glad to say that our teachers got this across in a flat-out, matter-of-fact manner. As a matter of fact, that sums up their style of total delivery. The classes were not only effective, but enjoyable.

Second off, I'd like to say that I personally was not happy with my overall performance in the Basic Cave class. I'd brought poor habits into both classes from sump diving. These, I believe, I managed to get a handle on. I was so in awe of what we were doing and where we were doing it (in Peacock !) that I made several gaffs concerning following instructions. I was informed that Marc did not suffer rectal/cranial inversions on the part of his students very well. I must assume that my blunders were minor enough (despite my buddy's [Sue Ecklund] firm belief that she heard him cussing through his regulator) that I didn't receive the chewing I thought I had coming. I'm certainly harder on myself than Marc would have been. Having made this particular type of error and realizing its implications on a "for real" cave dive, the lesson was learned deeply.

If there was a particular weakness that we brought into the classes, it was unhoned open-water skills. Doug Schmuecker, who was the only among us who was more a diver than a caver, was the only one not to suffer from this in some way. Dave Ecklund, his wife, Sue, and I all had poor propulsion techniques, and Sue and I were terrible air wolfers.

Now the big question: will what we learned aid us in sump diving? Florida-style cave diving is a science. Experience and accident analysis have proven that there is an optimum manner in which to operate, and once learned, it can be readily applied to most situations. I don't believe anyone exposed to only this type of cave diving can appreciate diving in 42-46° F water that quickly becomes chocolate milk. Also, every single sump I have ever dived has been different. Each had to be approached and dealt with on an individual basis. So a great deal of what we learned was not transferable to what we do. The single most translatable aspect was gear management, which is even more vital to sumpers than cave divers. It is the exception when we are not in something close. Having things tidy and handy is important, and the entire effort of getting to Florida and taking these classes was worth it for this alone.

Learning that we were doing everything as safely as possible was comforting and encouraging. Adhere to the basics, training, guideline, air rules, depth (not yet a problem in Iowa) and lights, and if you perish, you've invented the sixth major fatal error or violated one of the established five leading causes of cave-diving deaths.

The little things—established means of tying in a guideline in different settings, following and holding of the line, good orientation habits—are not the sort of things that would naturally just come to one. I feel that in any endeavor, the accumulation of subtleties and finesse is the key to long term safe enjoyment.

Here's the big one: buddy training. Training to work as a team has shown me that many of the dives I thought demanded solo work did not. A lot of the dives I've put on a back burner will be reevaluated in light of this. It also showed me that solo is still the only way to approach some sites. In sump diving, though, it is still best for each member to be geared up for the moments when one is effectively diving solo in the course of a "buddy" dive.

Lastly, the total overall experience was inspiring. I feel safe in saying that in the course of these classes we all spent more time in the overhead environment than we have previously accumulated. Personally, it gave me a faith in my equipment that I had heretofore lacked. It fostered the faith in me that riding my motorcycle was still the riskiest activity in my life, the one enjoyment in which I am the least in control of circumstances.

Did we learn anything usable? More than I can really say. The first rule of cave diving is to be trained. I started my caving, and sump diving, both fully book trained. Book training is not as thorough as "hands on" training in the hands of someone who's "been there." I'm fully looking forward to my Full Cave training, even though it will not teach me specifics for sump diving, with much wondering about what I will learn.

SIDE-MOUNT FASHIONS '89 - by Roberta Swicegood (NSS #20290), Tom Morris (NSS #24256), and John Schweyen (NSS #24848)

[Editor's Note: Sump diving is one of the most advanced and technically demanding specialities of cave diving, and as such, is well beyond the scope of most recreational sport cave divers. It is best attempted only after tutelage under experienced and acknowledged sump-diving experts.

ABOUT THE AUTHORS: Until her tragic death while exploring a sump in Pennsylvania last year, Roberta Swicegood, a highly experienced dry-cave explorer and sump diver, headed the NSS-CDS's Sump Diving Project. Supervision of the Project has been assumed by John Schweyen, an avid sump diver active in cave exploration in the northeastern U.S., who has authored several technical articles on sump-diving equipment innovations and theory. Tom Morris, Conservation Coordinator for the Section, is a professional biologist, and has frequently lectured on scientific topics at CDS workshops. He has been cave diving for many years and has participated in numerous cave-diving exploration expeditions to Mexico.]

There has been a lot of excitement lately about side-mounted systems. They are an essential part of sump diving, and they have opened up constricted cave passages to safe exploration in Florida. I have fielded a lot of questions about unusual ways of mounting cylinders, and so I have written this article in response. It is not a set of detailed set of instructions for building and using a particular side-mount, but rather an overview of a number of different systems that are being used in the U.S. and Europe.

A Little Background.

First of all, a side-mounted system is the harness and fastenings used to attach cylinders parallel to a diver's side, with the valves located somewhere between the hips and the

armpits. This flattens the diver profile and brings it more into conformity with the passage that is being explored. The "system" also includes the techniques used to dive efficiently, safely, and gracefully with the resulting rig, something that often takes some practice.

Side-mount systems were originally developed for diving sumps—flooded sections of passage within dry caves. Sumps are frequently low bedding planes or tight fissures, often irregular in cross section, and the diver needs a flattened and streamlined profile to traverse them. Any gear that sticks out (e.g., back-mounted cylinders) or dangles will hang up. For example, in some sumps a waist-mounted battery pack for a cave-diving light will prevent the diver from getting through.

Constricted cave passages are not limited to sumps. The use of side-mounted systems has spread from sump diving to Florida cave diving, as divers explore beyond restrictions and in increasingly small passages. The underwater requirements on the system are the same, but the spring diver has no need to put together lightweight equipment that can be packed down small and hauled long distances.

British sump divers were the first to develop side-mounted systems. They have since used their hip-mounted rigs successfully in exploration of much larger cave systems in the Bahamas. In the northeastern U.S., John Schweyen and Jim Brown are using an interesting variant on British hip-mounts. In Florida, Woody Jasper, Wes Skiles, Lamar Hires, Tom Morris, and others have developed an American variant on the side-mount that moves the cylinders higher on the torso and suspends them from a backplate rather than a hip belt.

What a Flat Profile Can Do.

Figure 1 shows the profiles of divers wearing back-mounted and side-mounted cylinders. The profile of a diver wearing back-mounted cylinders is more or less square, while the profile of the diver wearing side-mounts is a flattened oval.

Diver with Backmounts

Diver with Sidemounts

Figure 1

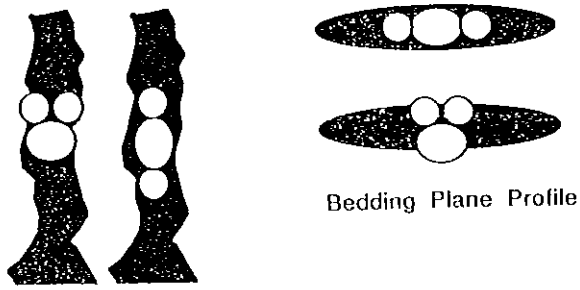
Constricted cave passage tends to come in two flavors: bedding planes and fissures. When the divers are superimposed on constricted passages in Figure 2, it is clear that the diver wearing back-mounted cylinders will not under any circumstances fit through passages that remain fairly comfortable for the diver wearing side-mounts.

The Characteristics of a Side-Mount Rig.

The characteristics of a good side-mounted rig are:

- side-to-side trim that does not pull the diver off balance or cause rotation around the longitudinal axis
- a streamlined, flattened front-to-back profile that allows the diver to fit through low, wide passages or narrow, tall passages, and that allows the diver to move forward or back up with equal facility
- valves and regulators located where the diver can easily reach and manipulate them even in constricted passages, and where they are protected
- simplicity and ease of use, so that a task-loaded diver can manage the system nearly automatically

Side-mounts offer some major safety advantages in addition to the exploration potential of a flatter profile. The valve and regulator assemblies on a side-mount are visible and accessible. Because they are located on the sides of the torso somewhere between the hips and the armpits, the diver can see the problem he or she is solving, whether it is an air leak or a line entanglement. Entanglements behind the diver's head rarely occur, and divers do not have to reach behind their backs to manipulate valves. Valves and regulators are protected to a degree from banging on walls and ceilings.



Fissure Profile

Bedding Plane Profile

Figure 2

The two cylinders of a double side-mount rig are entirely independent air supplies, with all the complexities attendant on that system. The diver is managing two pressure gauges, two second stages, and one or two inflator hoses. The hoses are not as easily distributed and managed as they are with back-mounted cylinders, and a lot of thought has to be given to hose logic (i.e., how the regulators are set up and where the hoses run). On the plus side, the diver is carrying two completely independent air supplies, and the possibility of a total air-supply loss is remote. This is a significant consideration for the solo diver, and many sump dives are done solo.

Caveats.

Diving side-mounted cylinders is not as easy as it looks. The side-mount rig has to be trimmed correctly or it makes for a truly miserable dive, one spent out of balance and rotated sideways in the water. Side-mount rigs have to be adapted to an individual body much more than doubles do. For example, I have long legs and a relatively short torso. I was side-mounting short, fat Scubapro 72's on a check-out dive when the butt end of a cylinder worked its way in front of my thigh. I kicked; my thigh hit the bottom of the cylinder and pushed it forward; and the valve smashed into my jaw, delivering a near-knockout punch.

Side-mounts also eliminate a lot of the places cave divers are accustomed to placing backup equipment. Task loading just from dealing with side-mounts can be high, and side-mounts are usually taken into difficult cave passage, which adds to the stress on the diver.

Some thought needs to be given to cave conservation using side-mounted rigs. Constricted passages are easily scarred and damaged by diver passage, as are some sediment bottoms. The damage can be minimized by eliminating danglies, diving a balanced rig, and diving delicately using the least damaging propulsion techniques possible. Side-mount systems should be tested in open-water or in large cave passages where the chances of damage to the environment (and to the diver!) are lessened.

British Hip-Mounts.

This summer, I had the pleasure of spending a few days with the 1987 Andros cave-diving expedition. There, I dove a British-style hip-mounted doubles rig in Stargate Cave. The hip-mounted system was comfortable, simple to put together and to put on, and had very good valve access. It was well

balanced in the water, and less sensitive to fine points of trim than some of the American variants.

Figure 3 shows the basic configuration of the hip-mounted rig used in the Bahamas. A 2"-wide webbing belt is attached to a jacket BC. Attached to the belt are two wide, rigid cylinder clamps tightened by thumbscrews. Whatever lead is needed is threaded onto the belt at the diver's back. The cylinders are clamped into place with the valves about a foot above the clamps (although exact location is a matter of diver preference). Second stages are clipped onto the BC, and pressure gauges are either clipped on the BC or attached to the diver's wrist with elastic. The inflator hose is pulled upward and attached to the inflator.

The hip-mounted rig shown here was being used in relatively large cave, and it does not include all the features that it is possible to incorporate into hip-mounts. There are hip-mount variants that use a shoulder harness incorporated with the waist belt for attachment points, and that use other arrangements for buoyancy. The placement of cylinders in the clamps also varies; they can be placed so that the valves are at waist level or are much higher on the body.

The disadvantages of the hip-mounted rig are subtle, having mainly to do with controlling the cylinders in tight spots. Because the cylinders are attached at only one point, they are free to pivot. While the diver's body tends to prevent them from shifting from side to side, they can (and do) rotate front to back. As the cylinders are breathed down, their butt ends pivot upward. The photographs of hip-mounted rigs used in Rob Palmer's book, *The Blue Holes of the Bahamas*, illustrate this phenomenon. In large passage, sloppy cylinders are not a problem, but when backing out of very tight places the cylinders can wedge and act like a ratchet. The diver has to adjust the cylinders by pulling up on the neck to bring the ends down parallel with the body or by reaching back and shifting around the bottoms of the cylinders.

On balance, hip-mounts are a good option for side-mount diving. There is more room on the torso and the front of the body for placing backup equipment. They are simple and very comfortable, lacking much of the complexity of attachment points, retainer straps, rebelays, hose restrainers, etc., etc., that seem to afflict most American variants. British-style hip-mounts also provide outstandingly good valve access.

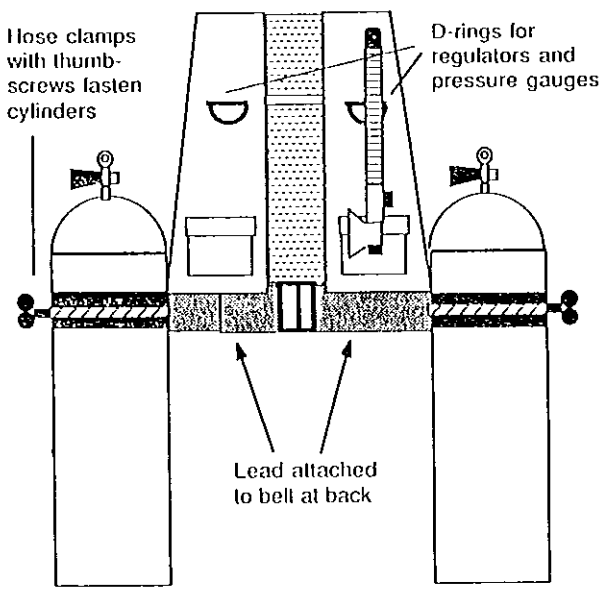


Figure 3

Florida Side-Mounts.

This section will describe the evolution of side-mount rigs in north Florida. The discussion is by no means exhaustive and does not include several variations currently in use. However, the side-mount rigs described here have all been used by at least one of the authors, and the advantages and shortcomings of the various ways of doing things have been well established.

The first Florida side-mounts were developed by Woody Jasper. The standard-shaped aluminum backplate and harness that are locally so popular for back-mounted double tanks were used along with a jacket or horsecollar BC. The tanks were attached to the harness D-rings with clips, in much the same manner as stage bottles. However, it soon became apparent that this setup did not provide a flat profile—the valve end of the tanks tended to ride too far forward and too far below the diver's ventral surface (belly).

In an attempt to solve this problem, small loops of thick surgical tubing were attached to the shoulder-strap D-rings and were stretched over the tank-valve and regulator assemblies. Experience soon proved this setup to be less than ideal—the limited travel, or stretch distance, of the elastic tubing was inadequate for holding the tanks in place. In addition, the raised channel on the backplate tended to catch on ceiling irregularities.

Subsequently, Ron Simmons built a small hinged backplate that solved the ceiling-hangup problem. The elastic loops on the D-rings were replaced with longer elastic loops tied off to the top of the backplate. These were stretched under the armpits, through the harness D-rings, and looped over the valve/regulator assemblies. Boat hooks were then snapped onto the D-rings. This kept the top of the tanks in place, but the elastic tended to chafe the diver's armpits and the shoulder-harness D-ring-attachment point still had the tank valves too far below the diver's ventral surface.

At this time, Wes Skiles and Lamar Hires bolted a set of wings to the inner surface of the Simmons backplate, positioning the wing between the diver's back and the backplate. The harness straps were worn on top of the wings, keeping them close to the diver's body and preventing them from ballooning up and rubbing on the ceiling. This allowed for a thinner back-to-belly profile than could be had with jacket or horsecollar BC's.

Many Florida cave divers feel that wings are less bulky and confining than jackets and horsecollars, that they interfere less with gear attachment, and that they facilitate trim changes because they can be easily moved up or down relative to the divers torso. The main drawback of harness-confined wings is that they cannot be fully inflated, resulting in a partial loss of lift.

Throughout this evolutionary period some thought was given to the control of the bottom of the tanks. It was generally felt that a loose attachment, such as a short 4" length of cord and a boat hook, was not ideal, and that a very rigid and tight bottom attachment was needed. Several methods were tried, including boat hooks mounted flush to the surface of the tanks, and webbing with buckles that could be cinched up tight to the D-rings on the harness waist belt. These did keep the tanks tight to the diver's waist but proved difficult to put on and remove because of the very small space between the tanks and the diver's body. As it turns out, a short length of cord with suitable hooks can be used, but the method is sensitive to tank buoyancy characteristics.

Tank buoyancy characteristics are an important factor in designing side-mount rigs, especially those resembling the latest Florida styles that have a few inches of slack at the waist attachment. In general, tanks that do not go buoyant as they are drained are preferred, such as the new high-pressure steel tanks. These tanks tend to stay in a horizontal position and do not assume the aggravating butt-end-up position that some tanks (aluminum 80's) do as they are drained. Buoyant tanks

require special attachment methods, such as attachment points in opposition, that keep the butt end of the tanks from going up as well as down.

The latest modification of the Florida side-mount rig was designed by Tom Morris. He lowered the elastic attachment point to the middle of the Simmons hinged backplate and eliminated the clips at the neck of the tanks. The elastic attachment consists of a bicycle innertube knotted to the backplate to form a figure 8. The loops of the 8 are pulled forward, well below the armpits, and looped over the valves. The innertube tension can be adjusted by tying more knots in the tube where it attaches to the backplate. The tube tension is adjusted so that the tank necks would be pulled above the back of an immersed diver if not constrained by a limiter strap. This strap runs between the tank necks and across the diver's chest, and is adjusted so the tank necks ride parallel to the diver's sides. The floating attachment method has worked well, especially with the high-volume steel tanks favored by the few active side-mounters in Florida.

The lowering of the tanks toward the hips requires the raising of the short cords and hooks towards the tank necks, to a point about one half the way up the tank's length. The hooks are snapped onto D-rings mounted on the sides of the backplate, well onto the top of the small of the back. Negatively buoyant tanks then hang into position at the sides. The short length of cord allows easy attachment and removal of the tanks, even underwater. If buoyant tanks are used, an opposing cord and hook is required to keep the butt end from rising.

An important consideration in Florida side-mount diving is what to do with the primary-light canister. At first, Florida divers just gave up their trusty primaries and carried various hand-held lights. Then Woody Jasper flashed on carrying the standard battery canister in the V-like angle between the side of the diver's back and the tank. It is secured with elastic tubing and hooks that are fastened to D-rings on the harness shoulder and small-of-the-back D-ring. The canister is amazingly unobtrusive in this position.

There is now a commercially built side-mount harness available to divers. It is made by Paul Smith of Bat-Sew in Gainesville and is designed after the backplate/harness combination described above. It is made to be used with a wing-type BC, but it may also be compatible with other types of compensators. It does not require a metal backplate as there is a wide area of stiff webbing that performs the same function as the hinged plate.

Hip-Mounts with Snares.

The side-mount configuration that was developed by John Schweyen is described in UWS Vol 14, No. 5. Since that article appeared, the fastex buckles and velcro have been replaced with hose clamps, brass snap hooks, and D-rings; two snap hooks per tank. Kitting up is easier with this modification, especially with gloved hands. Dekitting takes a little longer. The hardware is cheaper and more rugged, and different-size tanks are easily accommodated by changing D-ring position on the waist strap.

Basically, this is the British hip-mounted system with heavy surgical tubing snares under the armpits that are used to control valve position. By moving the snares and waist-strap D-rings around, the full range of tank positions can be realized—from bottoms up and valves down to bottoms down and valves up in back of the diver. Nominally, the tank is positioned parallel to the diver. This arrangement was designed to address a specific problem: extended, low, bedding-plane passage in cold water where a drysuit is used. An additional requirement was easy kitting and dekitting underwater with three-fingered mitts.

Some divers may be uncomfortable with this configuration for several reasons. Since the tanks are more rigidly attached to the diver's body, operating the valves and reading pressure gauges may require more effort if the valves are directly under the armpits. Properly worn, the diver cannot see the valves underwater unless they are pulled forward. Also, negotiating irregular restrictions of the type found in some Florida caves is probably more difficult with this arrangement unless the snares are removed—albeit an easy maneuver underwater.

Another drawback for some people is the fact that this system was designed for a diver using only a drysuit for buoyancy control—a front- or back-mounted BC adds a little more thickness to the profile. It has been worn with wetsuits and a belly bag or horsecollar BC, but this means more straps than some would care for. Finally, Schweyen suspects that walking around between sumps with steel tanks any larger than 72's may be uncomfortable. Although the cylinders are usually clipped into the chest-harness D-rings for this purpose, the backplate arrangement may be preferable with larger tanks.

Accessories.

Side-mount rigs are notoriously sensitive to sloppy placement of accessory gear, so a brief discussion of this topic is in order. The second stage of the regulator not in use must be stowed where it will not be dragged along the bottom. This benefits the cave as well as the regulator. D-rings placed high up on the harness shoulder straps have proved to be a good place to clip the second stage. A small clip attached to the second stage by surgical tubing is convenient, allowing easy second-stage stowage and removal. In an emergency, the tubing can be stretched and broken to get at the regulator quickly.

An alternative is to replace the high shoulder D-rings and clips with surgical-tubing loops about as large as a 2" D-ring. The second stages are pulled up through the loops on either side and remain there when not in use. When switching, the diver drops one reg out of the mouth, pulls the other up further through the loop on the other shoulder, and starts breathing again. If gloves are worn, this maneuver is preferable to using clips.

Line reels and other bulky items can be attached to the small-of-the-back D-rings. They tend to hang in the space between the body and the tank, and do not drag on the cave floor. Tank pressure-gauge hoses can be routed in a long "U" down and back up the tanks, and secured with innertubes or surgical-tubing loops around the tank. The gauge head can be attached to the tank neck with tubing and a clip. To read tank pressure, the gauge is pulled away from the tank and into the line of vision. When the gauge is released, it is pulled back to the tank neck by the tubing. It has been the experience of some side-mount divers that the short pressure-gauge hoses often used on stage bottles are prone to stick out and gouge the cave floor, which the side-mount diver is often very close to.

THE DEEPEST UNDERWATER CAVES IN THE WORLD - by Oliver Knab

The following list, revised as of April 14, 1989, reflects the present status of speleological activity in the deepest underwater caves in the world.

The given depths refer to the water depths in the individual caves, and are to be understood as the vertical difference between the surface of the water and the deepest point either physically attained or echo-sounded. The cave water depths have been expressed in both meters and feet, and in consideration for differences between high and low water levels, a probable average has been made.

The caves are listed in order from deepest to shallowest, with the following information: name, country in which located, deepest depth in meters, deepest depth in feet, name and nationality of the explorer providing the information, and reference source (see the legend for complete expansion).

THE DEEPEST UNDERWATER CAVES

#	Cave Name/Country	Meters	Feet	Explorer/Nationality	Reference
1	Fontaine de Vaucluse/France	-315	-1033	Telenaute/France	Info 45, pp. 11-2
2	Hranicka Abyss/Czechosovakia	-267	-876	Soundings, F. Travenek, L. Benyesek/Czech.	Pesteri Scuf. 87, p. 162
3	Nacimiento del Rio Mante/Mexico	-264	-867	S. Exley/USA (3- 28-89)	Personal communication (4-89)
4	Red Snapper Sink/USA	-182.8	-600	Echo-soundings/USA	UWS Vol. 3, No. 4 & Vol. 13, No. 1
5a	Goul du Pont/France	-140	-459	J. Schneider/BRD	Info 46, pp. 3-5
5b	Emergence de la Chaudanne/Switz.	-140	-459	C. Brandt/Switz.	Info 51, p. 29
6	Fontaine des Chartreux/France	-130	-426	C. Touloumdjian/France	-
7a	Lighthouse Reef Blue Hole/Belize	-125	-410	Minisub (A. Falco, A. Laban)	See Biblio. 1
7b	Font de Lussac/France	-125	-410	C. Touloumdjian/France	Info 47, p. 28
8	Sorgente del Elefante Bianco/Italy	-122	-400	J. Bolanz/Switz.	Stalactite 1, 1987, p. 47
9	Lake Guinas/Namibia	-120	-393	Soundings/C. Maxwell, South Africa	UWS Vol. 16, No. 1, p. 17
10	Mystery Sink/USA	-118.9	-390	Soundings/USA	UWS, Vol. 13, No. 1
11	Sorgente di Gorgazzo/Italy	-117	-384	J. Bolanz/Switz.	Stalactite 1, 1987, p. 47
12	Font d'Estramar/France	-115	-377	C. Touloumdjian/France	-
13	Goul de la Tannerie/France	-113	-370	B. Leger/France	Info 35, pp. 11-16
14	Diepolder 2/USA	-109.7	-360	S. Exley/USA	UWS, Vol. 13, No. 1
15	Sinoia Cave/Zimbabwe	-102.1	-335	R. Nyman/South Africa	See Biblio. 2
16	Grotte de Motiers/Switz.	-102	-334	J. Bolanz/Switz.	Reflector 3-85, p. 8
17	Benjamin's Blue Hole/Bahamas	-100	-328	F. Martz/USA	UWS, Vol. 13, No. 2 & Info 13
18	Wakulla Springs/USA	-97.5	-320	R. Parker, W. Skiles, T. Morris, P. Heinerth/GB & USA	
19a	Blue Hole 4, Florida/USA	-97	-318	-/USA	Info 31, p. 5
19b	Stargate, Andros/Bahamas	-97	-318	R. Parker, S. Clough/Great Britain	-
20	Devils Hole, Nevada/USA	-96	-315	J. Houtz/USA	Info 13, pp. 9-10
21	Cenote Ucil, Yucatan/Mexico	-95.2	-312	Soundings, O. Knab/Switz.	Höhlenpost 78, 1988, pp. 74-5
22	Navimiento del Rio Sabinas/Mexico	-95	-311	D. Sweet/USA	AMCS, No. 10/79, pp. 22-31
23a	Grotte des Cent-Fonds/France	-93	-305	E. Segond/France	Info 40, p. 17
23b	Eagles Nest Sink/USA	-93	-305	J. Lockwood, F. Martz/USA	UWS, Vol. 13, No. 1
23c	Sally Ward Sink/USA	-93	-305	-/USA	UWS, Vol. 13, No. 1
23d	Indian Spring/USA	-93	-305	S. Exley/USA	UWS, Vol. 13, No. 1
23e	Deep Lake, DeSoto, FL/USA	-93	-305	S. Exley/USA	UWS, Vol. 13, No. 1
23f	Drachenhauchloch/Namibia	-93	-305	C. Ruli, A. Vuagniaux/Switz.	UWS Vol. 15, No. 3, pp. 6-11
24	Double Key Hole/USA	-91.4	-300	S. Exley/USA	UWS, Vol. 13, No. 1
25	Diepolder 3/USA	-91.1	-299	S. Exley/USA	UWS, Vol. 13, No. 1
26a	Buco del Bossi/Switz.	-90	-295	O. Isler, W. Keusen/Switz.	Reflector 3-85, p. 9
26b	Grotte de la Baume/France	-90	-295	F. Le Guen/France	Info 31, p. 12
26c	Resurgence de Gourney Roux/France	-90	-295	J. Chouquet/France	Info 34, p. 6

LEGEND:

"Info": Info-Plongee, Feuille de Liaison de la Commission Plongee Souterraine, Federationa Française de Speleologie. Contact: CH. Locatelli, 944, Rue Michelet 01100 Oyannax, France.

"UWS": Underwater Speleology, Newsletter of the Cave Diving Section of the National Speleological Society, Inc. Contact: NSS-CDS Secretary/Treasurer, P.O. Box 950, Branford, FL 32008-0950.

"Reflektor": Zeitschrift fur Höhlenforschung. Contact: Reflektor, Postfach, CH-4002 Basel, Schweiz (Switzerland).

"AMCS": AMCS Newsletter. Contact: Association for Mexican Cave Studies, P.O. Box 7672, Austin, TX 78713.

"Stalactite": Zeitschrift der Schwiezerischen Gesellschaft fur Höhlenforschung. Subscriptions: P. Deriaz, Neumatteli 19, CH-5300 Wil-Turgi, Schweiz (Switzerland). Photo-copies: Biblioteque de la Societe Suisse de Speleologie, CH-2300 La Chaux de Fonds, Schweiz (Switzerland).

"Spelunca": Federationa Française de Speleologie, 130 Rue Saint-Maur, 75011 Paris, France.

"Biblio. 1": Jacques Yves Cousteau, Calypso, *1973, p. 171.*

"Biblio. 2": Martyn Farr, The Darkenss Beckons, *1980, pp. 161-163.*

"UWS 13:1": "List of Deepest Underwater Caves in Florida," by Sheck Exley, Underwater Speleology, Vol. 13, No. 1 (1986).

DONATIONS SOLICITED FOR LITTLE DISMAL ENTRANCE PLATFORM

[NACD Press Release]

During 1988, the U.S. Forest Service within the Department of Agriculture, was forced to terminate vehicular access to a 500+-acre parcel of the Apalachicola National Forest in Leon County, Florida. This decision evolved over numerous years of study and complaints of college students, all-terrain vehicles, party goers, freaks, and out-of-control alcohol consumption on this beautiful property. Unfortunately, a few outstanding cave systems were also on this land.

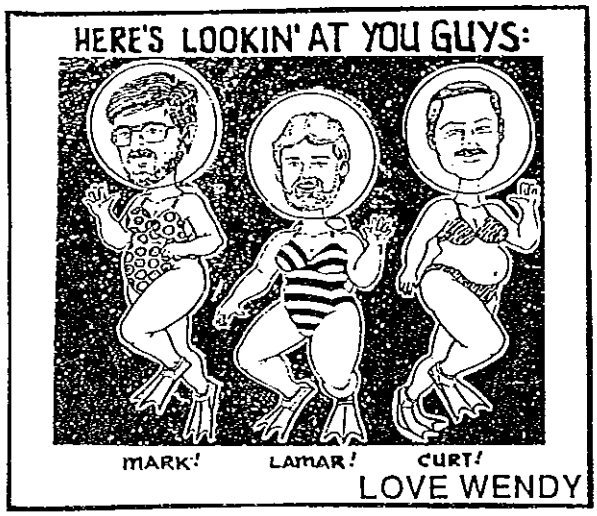
Through cooperation and a positive attitude, the cave-diving community has been able to keep the Little Dismal Sink Cave System and the Sullivan Sink Cave System "open" for cave divers to some reasonable degree.

To maintain this positive and productive relationship of cooperation with the U.S. Forest Service, the National Association for Cave Diving has volunteered to help "finance" the entrance platform to this spectacular cave system [Little Dismal]. The commitment is $600.00 for furthering the cause of safe entrance into and exit out of our sinks without causing

environmental damage. It is a task that can be accomplished where everyone is a winner.

But, for this important project, plus many more in the future, we need your help. We need monies donated by concerned and grateful cave divers who want to continue to see their cave-diving sites remain open and accessible. Do you agree?

If so, please write a check for an amount you feel comfortable and satisfied with, to make this goal become a reality. Your help will insure that this project—plus many more—comes true to benefit Cave Diving. Please identify your check as being a contribution to the LITTLE DISMAL SINK ENTRANCE/EXIT PLATFORM and send it to: NACD, P.O. Box 14492, Gainesville, FL 32604. Thank you for your support and faith!



MEDITATIONS ON THE EXISTENCE OF CAVE-DIVING ETHICS - by H. V. Grey

And the Lord gave unto Moses the holy tablets carved out of limestone atop the sacred Pigeon Mountain:

I. *Thou shalt not dive in a cave without a continuous line to the entrance.*
II. *Thou shalt not dive in a cave without reserving at least two third's of thine air for the exit.*
III. *Thou shalt not dive below 130 feet on compressed air.*

And Moses said unto the Lord, "Lord, that's all very nice, but couldn't you come up with a just a few more commandments? We just had a guy drown who was fully cave trained, and even though he did break at least one of the above commandments, we feel that there were some other factors involved, that kind of precipitated his decision to break those commandments."

And the Lord said, "Well, Moses, I gave you that one about the lights. You know—

IV. *Thou shalt always have at least three separate light sources.*

"And the catch-all about training—

V. *Thou shalt acquire the proper training before diving in caves and thou shalt never exceed the limitations of thy training.*

"What more do you want?"

And Moses said unto the Lord: "Well, Lord, we feel that this guy who died has a lot in common with a great many other divers who are encouraged by their buddies with higher levels of training and a lot more experience, to make dives that push them well beyond the limits that are safe for them. So maybe we could have a commandment along the lines of... 'Always strictly adhere to the above rules, especially when diving with or in the presence of divers who have less experience or are at a lower level of training.'"

"I love it! 'Always do such and such, especially when blah blah blah.' 'Always' is always; it does not admit of any 'especially's.' Who do you think you are?—Jimmy Swaggart?"

"Well, golly, I thought it sounded okay...."

"If you start making special rules about obeying the rules especially in front of students or novices, you are setting yourself up for the obvious implication that it is all right to break the rules under certain circumstances. I had this problem with your grandfather, Noah, on this solo-diving business. His argument rested on the premise that 95% of all open-water dive students are morons and nincompoops and must be given black-and-white rules that are to be followed to the letter, with no questions asked and no special considerations to be taken, er, into consideration. To suggest that divers be encouraged to make allowances for unique circumstances is to imply that they are capable of independent thought, reasoning, mature judgment, and self-responsibility, and nobody wants to do that. In any event...I think you're pretty much stuck with keeping the first five commandments a black-and-white affair. 'Always.' But then that puts you in the awkward position of being hypocrites. Either you don't explore caves below 130 feet on compressed air, or all your best explorers, instructors, and even board members are walking violations."

"What if we were to offer official certification in advanced techniques, that would cover the kinds of survey activity the guy who died and his buddies were doing?"

"Holy Moses, Moses, I thought you had more brains than that. Deep deaths are going to continue to occur as long as people dive deep on air. If you endorse it officially, then you will deserve the trouble you get. Face it, you people have just been real lucky on your deep air dives so far. If I hadn't been watching out for you there would have been a lot more deaths than there have been. It's just that—contrary to popular belief—I can't be everywhere at once. This guy knew the risks involved, and he decided that the risks were worth the potential reward. It's no different from getting into your car and driving down a public street. There is a definite statistical risk involved in driving on public roads. Each person must decide whether or not the potential reward of taking his trip is worth the risk involved. The statistical risk of getting killed on a public highway is considerably higher than that of even diving deep on air. But people take driving risks for granted. You'd be laughed into an insane asylum for refusing to drive simply because there was a high risk attached to it. Ironically, though, flying is much less dangerous than driving—yet people are considered only slightly eccentric for being afraid to fly—not wanting to assume the risk. Yet we allow that those who like to engage in aerobatic flying (relatively risky) are within their 'rights' to indulge in this kind of activity if that's what turns them on. What you don't want to do by endorsing deep training on air is to in any way try to gloss over the fact that there is a demonstrable high risk involved with compressed air at great depth. And without moving to mixed gas and a whole new set of complications and risks, you can't do much about this depth risk, the way you solved other problems with guidelines, equipment redundancy and air rules."

"Well, Lord, what about a commandment that prohibits ordinary cave divers from doing what essentially amounts to instructing?"

"Might not be such a bad idea, Moses, except that, at some point you must confront the Aristotelian problem of infinite regress. At some point, some group of ordinary non-instructor divers had to proclaim themselves as instructors—to pull themselves up by their finstraps, so to speak. Who the hell do these self-proclaimed experts think they are to say that they are the only ones who can self-proclaim themselves? Or take the case of an instructor whose CDS membership has expired. Suddenly, from one day to the next, because he didn't send in his $5, he is no longer officially an instructor—and therefore, I suppose, forgot everything he ever knew and isn't qualified to act as an instructor. Or take the case of the guy with 800 advanced cave dives behind him, who, say, manufactures precision cave-diving equipment, has lectured and written numerous articles on safety techniques, surveys, makes maps, etc. This fellow isn't 'qualified' to teach cavern diving, whereas hypothetical Schmucko, the open-water instructor (with an ego to match) with his 2 co-taught open-water classes or merely 2 years as an OW instructor, his piddly little 25 cavern dives, having bumbled through a Basic Cave course—'any or all of which may be waived by the training committee upon approval by the NSS/CDS Board of Directors.' This clown is technically 'qualified' to teach cavern diving, whereas our other fellow, the one with the 800 cave dives, isn't. And just look at your own organizations' histories; you have a big personality clash in one cave-diving organization and a group of cave divers say to hell with them, make up their own organization, print their own training manual and certification cards. Happens in the open-water world every day. But, Moses, it's just another one of those little anomalies you mortals are so very good at tolerating. Any con man can stand up and claim he's had a revelation from God. And if you believe him it's your

own fault. I don't talk to just anybody, you know!"

"Lord, I'll have you know that I have a tremendous respect for our training program! And I think that if people got the training before attempting the advanced activity instead of after—"

"Moses, Moses. I thought that's how you told me you learned to cave dive, by being led around by much more experienced divers. In fact, I distinctly remember your telling me that when you went to take your Basic Cave course you were worried that you didn't have enough cave dives on your doubles to be able to take the course you were supposed to take before doing any cave diving at all, and that if you hadn't had some 60 full-blown cave dives on doubles, you would never have been able to pass the full Cave course. Can you tell me honestly that you would have learned more or learned more safely it if had been the other way around? Do you think, looking back through your log book, that you didn't receive outstanding tutelage, that you did not, in fact, receive more painstaking and extensive tutelage than any money and courses could ever buy? What's more, I've been keeping my eye on you, Moses, and last week I saw you march right into a cave several hundred feet without a guideline and make no less than 2 ungapped jumps. I know of numerous instances of your diving to 200' and even a time or two in a high-outflow cave where you minced a little bit on the third's rule. What do you have to say to that?"

"Well, uh, gee, Lord...it seemed okay at the time. And these were all very special instances, with unique conditions—"

"Yeah, yeah, that's what they all say. St. Peter has a stack of 'special instances' and 'unique conditions' high enough to reach to the moon. And I've been keeping an eye on some of those other friends of yours, too, Moses! (How do you think they've managed to survive this long?) And they routinely break my first three Accident Analysis commandments, too. And then there was that trained cave-diver fella there at the same place you did the gapless jump, who—in front of students and park rangers—shamelessly went cave diving with only a stage bottle, one regulator, one light, a pair of fins, and a mask."

"You forgot the bathing suit, Lord. We must at least give him credit for that much. And he was only kidding when he said he might try to see if he could make it all the way up to Olsen...at least I hope he was just kidding...."

"But you didn't even try to stop him. You weren't even worried. I happen to know that you weren't the slightest bit apprehensive about his safety. In fact, you thought it was funny, didn't you?"

"That's true. You've got me there, Lord. I did think it was amusing."

"Hmmmph! I've thought up my next commandment."

VI. Thou shalt never consider training and experience to be an acceptable substitute for the proper equipment.

"That's real nice, Lord, but we still haven't done anything about divers being tutored by non-instructor buddies."

"Then how about switching it around to 'Thou shalt never consider equipment to be an acceptable substitute for the proper training and experience'? Look, Moses, there's a point at which your responsibility for other people ends. When three of your certified instructors encountered those open-water idiots at Peacock a couple of Easters ago and did everything but hit them over the head to try to prevent them from going into the cave, I say that they more than exceeded any possible 'duty' that they might have had to those people. Those people's own stupidity, pigheadedness and hubris are what killed that fellow. It not only killed him, it could have killed others (not the least of which were the three cave instructors who rushed in to try to save him), and what's worse, could have resulted in the closing of that cave or, as in other instances, some other caves. If that had happened and it had been me, I think I would have sued the diver's estate for damages, or at least hit his house with a lightning bolt. I didn't get my reputation for being a 'God of Vengeance' for nothing, you know. Irresponsible people like that ought to be drowned. Anyway, don't you think it's enough that you inconvenience yourselves by starting permanent lines way back inside popular systems? If there were no possibility of open-water or otherwise unqualified divers entering the systems, wouldn't you start the lines at Peacock, Devil's Eye, Madison, Little River, etc. right out in the basin where it would be a convenience to you? Of course, you would! And how many times have cave divers, who would have felt more comfortable laying a line to the permanent line, not put one in just to prevent the stupid open-water divers bumbling around in the cavern from following them in? Would you clutter these lovely caves with signs if it weren't a case of trying to prevent fools from dying a fool's death? No, of course not!"

"But Lord, don't you think we have an ethical responsibility to set a good example for open-water divers and cavern and basic-cave students?"

"Hmmmph! As if it would make the slightest bit of difference in their behavior!!"

"Then, Lord, you think that an additional commandment about not taking less experienced divers beyond their training is not advised? Then what do you suggest?"

"A series of safety-oriented, but not overly blatant articles for *Underwater Speleology* that give all sorts of concrete examples of what are essentially safety violations—open-water divers being tutored on advanced cave dives, the extent of the problem, etc. Maybe an article on 'How to dissuade an open-water diver from cave diving,' with 15 different approaches, from firearms, to stuffing safety brochures down their throats, to 'Hi, y'all' with your best southern accent.'"

"Oh, Lord, but I had my heart set on a fancy new set of commandments that we could publish in each issue of *Underwater Speleology*, maybe with a little scroll or something, like the NACD has for its lifetime members, you know, nice calligraphy and the whole nine yards...."

"Well, Moses, I'm going to let you in on a little secret: I lied. The Rules of Accident Analysis really aren't written in limestone."

"No! Really?!"

"I'm sorry, Moses, but that's the truth. They're pretty much arbitrary and off the wall. 130' is just a ballpark figure. I don't know if it really should be 128' or maybe 134.7888' (I tend to think in cubits, and well, statistics were never my forte anyway; I just call an eon a 'day' and let the theologians argue about it—along with how many fairies dance on the heads of pins)—but those numbers are so messy and hard to remember. The Third's Rule... Well, the empirical data really support something more along the lines of the 17/46's rule, but again, that's so untidy. The permanent guideline—here again, no one can really decide where it has to start: in open water, 'in the cavern but just outside the cave entrance' (huh???), or back in the cave 'a ways.' And as more people die, all of these 'rules' are subject to modification. Sufficient people may die on account of air, to have to modify the rule to 1/4. (Geez, you'd have to reprint the coffee cups—heaven forbid!) May have to change the depth rule to 110' or even 100' (just look at the open-water agencies; they can't get it together, yet each one of them makes a flat bald statement with as much smugness and self-assurance as if they'd gotten the number from me!). And some totally new factor may pop up and have to be included the next time a trained cave diver dies above 130', with the proper equipment, and air reserve. (Frankly, I would say you're darned lucky that this recent guy had the decency to have broken at least one, if not more, of my first three commandments.) And when somebody else does die, I have no doubt but that you'll try to ring me up for another commandment. I can just hardly wait."

"So what you're trying to say is, 'Thou shalt exercise good judgment and behave responsibly at all times.' Well, that's easy for you to say!.... Lord?... Lord?... Are you out there, Lord?.... ....What do you mean He's 'Gone cave diving'?"

Cave Diving Section
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