UNDERWATER SPELEOLOGY

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Coming out through the Keyhole in the Devil's Eye System. Photo by Bob Janowski.

UNDERWATER SPELEOLOGY

The official publication of the Cave Diving Section of the National Speleological Society, Inc.
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Magazine Submissions — We welcome all news items, articles, Letters to the Editor, photos, slides, cartoons, and other items of interest or importance to the cave-diving community from all members, subscribers, and other interested parties. They should be sent directly to the Editor (see address on left column). We can also use text processed in most IBM-compatible and some Macintosh formats. (Please contact the Editor directly for details and arrangements.)

Advertising — The NSS-CDS Board of Directors has approved the reinsitution of paid commercial advertising for *Underwater Speleology*. Please contact the Editor for information and arrangements (see address on left column).

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 United States was in a 1947 *NSS Bulletin*. In 1948, NSS divers were responsible for the first cave dives in the United States using scuba. Prior to 1973, cave diving within the NSS was on a purely local level. That year saw the creation off the NSS Cave Diving Section to provide a vehicle for information exchange. Today, with over 500 members, the Cave Diving Section promotes safe cave diving through semi-annual workshops; cavern- and cave-diving training programs; warning-sign installations; search, rescue, and recovery through the National Cave Rescue Commission; cave exploration and mapping; several texts and publications on cave diving; and the bimonthly magazine, *Underwater Speleology*.

NSS Membership — The National Speleological Society welcomes the interest of anyone who has a sincere concern about the safety, study, exploration, and conservation of caves, wet or dry. You may join the NSS either by writing directly to its main office (National Speleological Society, Inc., Cave Avenue, Huntsville, AL 35810) or to the Cave Diving Section. Annual membership is $25.00 and includes subscription to the NSS's monthly magazine, *NSS News*, as well as voting privileges and discounts on publications and conventions.

CDS Membership — As a sub-organization or "section" of the NSS, the Cave Diving Section is subject to the bylaws 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. Annual membership is $5.00 per year and includes subscription to the CDS's bimonthly magazine, *Underwater Speleology*, as well as voting privileges and discounts on publications and workshops.

Subscription — If you do not wish to join the NSS and CDS, 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.

NSS-CDS WINTER WORKSHOP A BIG SUCCESS

The CDS Winter Workshop, held in Branford, Florida over the New Year's weekend, was attended by more than 300 cave divers and other interested persons. It was very efficiently coordinated by Jim Gabriel of High Springs and had an outstanding series of speakers and programs.

The Saturday morning lectures began with Jeff Bozanic, who gave a fascinating slide presentation on the rigors of underwater glacier-cave surveying in the Antarctic and cave diving in Australia and New Zealand. Jim Brown gave a very informative video lecture on the new Mark V Rebreather being developed by Dr. Bill Stone of Cis-Lunar Laboratories in preparation for the next phase of deep exploration at Wakulla Springs. Ron Simmons gave an outstanding slide show on the exploration of Scott Hollow. Bob McGuire presented a fine new video produced by members of the Florida Speleological Researchers, Inc. on the ongoing exploration of the Diepolders cave systems. Jim King presented a slide show on the various new technologies being used in the mixed-gas exploration project at Eagles Nest.

Wendy Short announced the new Abe Davis Safety Award recipients (see the "Safety Line" elsewhere in this issue), and Training Chairman Joe Prosser gave a short summary analysis on the training perspective of the recent drownings of several trained caved divers. As a recommitment to safety, Joe asked all the cave divers present to dedicate their next cave dive to a review of emergency procedures and safety drills.

Park Ranger Joe McGrath gave an update on conditions and regulations at Peacock Springs State Park. He said he expected that sometime in the future a park-use payment of probably $1 per vehicle would be instituted on the honor system. He asked that all dogs be kept on leashes and not be allowed to roam free, as they can be an annoyance to other visitors. He also reluctantly pointed out that he and Parker Ranger Carmen Bales have been having to pick up lots of abandoned duct tape and plastic tie wraps—items which are particularly associated with cave divers—and asked that, in our zeal to dive, we try to be more careful about properly disposing of our trash. He also reminded the audience that the park does close at sundown and that he and Carmen will either have to start issuing citations to violators or stipulate a cutoff time for starting dives. Solo diving has also been officially prohibited as a direct result of the drowning of a solo cave diver in Olsen back in November.

The special Saturday-afternoon workshops included a seminar on Mixed Gas Techniques by Sheck Exley, a Decompression workshop by John Crea, and a Cartography workshop by Kelly Brady. The evening film festival included fine videos by Jim King on Eagles Nest, the "911" Otter Springs Rescue filmed by Wes Skiles, the One-Atmosphere NEWT Suit by Wes Skiles, and a video on Cave Diving in the Yucatan by Tom Young and Jim Coke. The Sunday workshops featured a Cavern Instructor Orientation program by Harry Averill, the NSS-CDS Recovery Workshop by Capt. Henry Nicholson, a Tank Inspection Workshop by Dale Fox, and a Nitrox Course by Mark Leonard.

Our deepest thanks to these many speakers, lecturers, and photographers; to the many people who helped with the behind-the-scenes preparation, set up, registration, and clean up, and with the NSS-CDS publications, maps, and T-shirts; to the Branford K-12 School for the generous use of its fine facilities; and especially to Jim Gabriel for his many months of hard work in putting this excellent workshop together. ■

ANONYMOUS LETTER TO SKIN DIVER MAGAZINE DISAVOWED

by Mark D. Leonard (NSS #23292), CDS Vice-Chairman

Bill Gleason, Editor of *Skin Diver Magazine*, along with other people at Peterson Publishing, advertisers, and training agencies, received an anonymous letter from someone in the cave-diving community. The only purpose of this letter was to damage *Skin Diver Magazine*. Its effect did not damage *Skin Diver Magazine*, but rather, it undid what positive steps the NSS-CDS and NACD have taken in clarifying the November *Skin Diver* cavern article. This unsigned letter did not come from the Board of the NSS-CDS or NACD, nor to my knowledge did any Board member have knowledge of it. It did not express the opinion of the NSS-CDS.

If someone wants to exercise his First Amendment right of free speech, then do so, but take credit for your actions and don't let the NSS-CDS or NACD catch the flack for your personal opinion. Only Board members in agreement with each other can speak officially for the organization.

— January 8, 1991 ■

WINTER B.O.D. MEETING

A meeting of the CDS Board of Directors was held in Branford, Florida at the Suwannee Cove Restaurant Dec. 28, 1990. Present were Board members Mark Leonard, Frank Howard, Joe Prosser, Pete Butt, Lamar Hires, Lee Ann Hires, and Jim Bowden, and board-members elect, Bill Foote and Dan Lins. Guests included Workshop Chairman Jim Gabriel, past-Chairman Steve Ormeroid, and Judy Ormeroid. The meeting was called to order at 7:45pm by Mark Leonard. Minutes of the last meeting were read by Lee Ann Hires and approved.

— OLD BUSINESS —

FEDO Show. Pete Butt reported a successful display. The CDS Booth is very heavy and portable over long distances only by truck; however, the display data and materials are mobile and available for reuse.

DEMA Show, Las Vegas. Steve Ormeroid may go to DEMA and offered to help with a booth. Free space has been offered by Harry Averill through his connections with DEMA; however, we do not have a portable booth to take advantage of the booth space offered. An alternative offered was to post CDS information and materials in a DEMA show registration room. The Board approved a plan to display the materials without a booth, if the details can be worked out.

Dive Equipment for Poland. Two packages of donated dive gear were sent by Lamar Hires to Poland for use by an organization devoted to teaching Polish youths to dive, and receipt has been acknowledged.

— NEW BUSINESS —

Cave Diving Manual. Joe Prosser outlined his plan to finalize the collection of the text and start the editing process. Publication is targeted for book availability at the 1991 Winter Workshop. Joe discussed a plan to promote donations to our tax-free organization to raise the $5000 to $6000 publication costs for the first run. As an alternative, the idea of taking orders for the book at pre-publication prices was suggested. The Board approved Joe's plan to seek donations.

Dr. Bill Stone and the next Wakulla Project Book. There was a brief discussion of the idea that CDS should collaborate with Dr. Bill Stone from the start to give the CDS exclusive rights to the next book. There was general agreement but no specific action outlined.

CDS Property for sale. Joe Prosser expressed the need for review of the pricing structure and procedures for bulk sales. Responsibility rests with the Property Program Coordinator. Lamar Hires accepted the position.

Spring Workshop. Mark Leonard announced that the Program Chairman for the 1991 Spring Workshop scheduled for May 25-26 is Terry DeRouin. Terry has already started to work on it. The Theme is "Back to Basics."

NSS National Conclave for 1991. Steve Ormeroid reported that the NSS National Convention is to be held in Indiana. Because it is to be held in "their neck of the woods," he and Judy would attend and offered to represent the CDS. There was a brief discussion of possible CDS programs. Further discussions would be pursued by the Chairman.

The meeting was adjourned at 9:15pm for the purpose of opening a second meeting, which was called to order by Mark Leonard at 9:15pm.

Election Results. Results of the BOD election were given by Lee Ann Hires. Newly elected to the Board are Bill Foote, Dan Lins, and H.V. Grey. Stepping down from the Board at the expiration of their terms are Pete Butt, Lamar Hires and Lee Ann Hires.

Organization of the Board of Directors. Votes were taken on the organization of the new Board. All votes were unanimous. The new officers are: Chairman, Frank Howard; Vice-Chairman, Mark Leonard; Treasurer, Bill Foote; Secretary, H.V. Grey; Training Chairman, Joe Prosser; Leadership Coordinator, Dan Lins; and Member at Large, Jim Bowden.

The new Chairman, Frank Howard, announced that he would contact each Board member and work out the details and agreements on their duties.

Bill Foote will take immediate action to transfer accounts from Lee Ann Hires to himself. The Chairman requested the new Treasurer to plan for the publishing and distribution of Quarterly Financial Reports to each Board member. Financial books will be closed monthly. Bill Foote will present a summary of the 1990 closing financial statement at the next Board meeting.

Joe Prosser recommended that the CDS continue to retain Paul R. Suid, CPA, as our auditor at least until the current IRS Tax Free Status Probationary Period is completed in 1993. Bill Foote agreed and the Board gave unanimous approval.

The next Board Meeting was scheduled for 7:00pm, March 16, 1991 at the Suwannee Cover Restaurant in Branford, Florida. The meeting was adjourned at 10:00pm. ■

(Minutes prepared by Dan Lins and Frank Howard.)

ITALIAN CAVE DIVING MAGAZINE

John Schweyen (NSS #24848) reports that Vol. 2 of the *Union Internationale de Speleologie Cave Magazine* is now available. It includes exploration articles on cave diving in South Africa, England, Italy, the United States, Mexico, and Czechoslovakia, and technical articles on the French RI 2000 semi-closed-circuit scuba rig, guideline technique, and bad air beyond sumps. Most of the articles are in English.

Copies can be obtained by sending a check for $19 U.S. (which includes shipping) made out to the "Union Internationale de Speleologie" to:

Alessio Fabbricatore
Via Fatebenefratelli 26
34170 Gorizia, Italy ■

SILVER GLEN SPRING EXPLORATION UPDATE

by Bill Foote (NSS #30944)

BACKGROUND: Silver Glen Spring is located about 25 miles east of Ocala, Florida on the Western Edge of Lake George. The Bureau of Geology places Silver Glen Spring in the hydrologic St. Johns subregion. The St. Johns subregion covers 11,310 square miles and is known to include 51 springs. Silver Glen Spring lies in the central part of the subregion and is transected by Marion and Lake counties.

Silver Glen Spring is formed in limestone, typical in Florida's karst regions. The main spring is contained within a pool approximately 200' in diameter and is bordered by semitropical forest at the base of the sandy Ocala National Forest. The spring flows east toward Lake George for approximately ½ mile. The spring's run has widths of more than 200' with an average depth of approximately 5'.

The cobalt-blue head waters discharge from two limestone openings. The main pool has a depth of 21'. Adjacent to the main pool on the southwest edge lies the "Natural Well," which flows from a vertical cavity about 12' in diameter. Sand and shell material have eroded into the discharge areas perhaps from years of public use. This material may be creating a restricting water flow on an increasing basis. Shell mounds surround the site and are suspected to have been accumulated by Indians. The average spring discharge is measured at 112 cubic feet per second, indicative of a first-magnitude spring. (Source: *Springs of Florida*, Department of Natural Resources, Bulletin No. 31, 1977.)

Silver Glen Spring was owned and operated by a private concern as a campground for many years and scuba diving was not allowed. In addition, Marion County Code currently prohibits scuba diving at Silver Glen. In the spring of 1989, the campground was closed, which created some media interest in that the site was popular with boaters. The spring run continues to be used by the boating public; however, the surrounding property is posted. In the early summer of 1989, it was announced that the owner was entering into a contract for sale to the St. Johns River Water Management District. This past fall the St. Johns River Water Management District purchased the site and has subsequently entered into a management agreement with the U.S. Forest Service. Recently funds have been appropriated for the purchase of Silver Glen Spring by the U.S. Forest Service.

CAVE SURVEY: During the acquisition stage a number of inquiries were made about the future of the site and it was suggested that a subaquatic survey would be beneficial to the agencies involved. The underlying motivation was that decisions would be made about the future recreational value of the site. It was important to the local cave divers that an informed decision be made regarding the site. During the course of the last year, several local cave divers convinced interested state and federal agencies that a subaquatic cave survey was the base tool for further study of the site.

Support was solicited from the NACD through the Chairman of the Exploration and Survey Committee, and the NSS-CDS through the Survey Program Coordinator. The positive support of both cave-diving organizations was instrumental in the creation of a formal survey proposal.

It has been necessary to make hundreds of phone calls, write many letters, complete permits, issue a license and select project directions. The Silver Glen Spring Survey Project has been officially sanctioned by the NACD, and the NSS-CDS Survey Program Coordinator is providing special assistance. Since the project is associated with both cave-diving organizations, participation is open to Full Cave-certified individuals. A number of other regulations have been requested by the different government agencies. Additional information can be obtained by writing:

Bill Foote
1433 S.E. 8th St.
Ocala, FL 32671 ■

CONGRATULATIONS TO OUR NEW PARENTS

Congratulations to our new cave-diver parents! Tom and Nancy Morris of Gainesville, Florida are the proud new parents of Scott Lee Morris, who emerged from his first cave dive on December 16, 1990, weighing 8 lbs. 7 oz. Tom was on his way to make an 8-hour cave dive and got the call to go to the hospital just in time.

Lamar and Lee Ann Hires of Lake City, Florida are the proud new parents of Gerard Hires, who successfully negotiated his first major restriction on Jan. 11, weighing 7 lbs. The story has it that Mark Leonard got the phone call and knew that Lamar was out teaching a cave class at Little River. So Mark drove out to Little River, tied a drop weight and a slate saying, "Call your wife," to the receiver of an old telephone, and lowered it down into the water where Lamar and his students were decompressing. Lamar read the note, took a quick look at his decompression meter, decided he'd done enough decompression, and dashed off to the hospital. ■

CANADA'S LONGEST CAVE DIVE: Ottawa River Caves

by David Sawatzky, M.D. (NSS #30362)

The Ottawa River Caves are the largest cave-diving system in Canada, with over 4km (2.5 miles) of passage currently explored and many leads still to be checked. The caves are located on the Ottawa River, approximately 100km (60 miles) upstream from the nation's capital city, Ottawa. They lie under a large peninsula on the Ontario side of the river, under several large islands in the center of the river within the province of Quebec, and under the river bed itself!

The caves are developing in horizontally bedded limestone. The river generally runs in a northwest/southeast direction, but in the region of the cave it has taken a complex S-shaped turn and runs northeast around a large peninsula (1km [0.6 miles] across at the tip). The peninsula is relatively flat, tree covered and 1-4m (3-12') above the normal river level. The river is controlled by a large dam upstream of the cave and when the river level is high about 50% of the peninsula over the caves is underwater.

Some of the water from the river takes "shortcuts" under the peninsula along the fault lines and bedding planes in the limestone and the caves are being formed along a generally rectangular grid with the corners rounded. There are two major sinks, located at the upstream ends of Sumps 8 and 10, and at least 5 major resurgences on the peninsula or in the bed of the river. There is also extensive cave development under the islands. Divers from Quebec have been actively working on the caves under the islands and have explored over 1km (0.6 miles) of passage so far. Where the cave has enlarged and developed too close to the surface (usually at a junction), the roof has collapsed and there is a pool. Every pool is a potential entrance into or exit from the system and often has more than two passages connected to it.

(Note: There are few female Canadian cave divers [my wife, Sandra, is the only one who has been in this system], but gender-free English becomes almost unreadable. Therefore, the male gender will be used to refer to divers of both sexes in this article.)

The author standing by Pool #7 at low water. Photo by Marcus Buck.

PASSAGE DETAILS

The cave system is completely flooded (phreatic passage) and the bedding-lane passages are usually convex-lens shaped in cross section, meaning that they are highest in the center of the passage and that the floor and ceiling meet at the sides without any real walls. Thus, the passage is often too low for a diver to pass near the walls. In addition, there are some passages that have developed along faults in the rock and these passages are more rectangular in cross section. Another feature of the cave is the current, which is faster in the center of the passage and slower near the walls. This means that any silt build up tends to be along the sides of the passage. Both of the major sinks are filled with large log jams. The logs reduce the current through the cave and have been a major factor in the silt deposition. It is fortunate that the logs are there, how-

ever, as the current is 3-5 knots in Sumps 8 and 10 at normal water levels, even with the logs, and exploration would be impossible if the logs were not partially obstructing the flow!

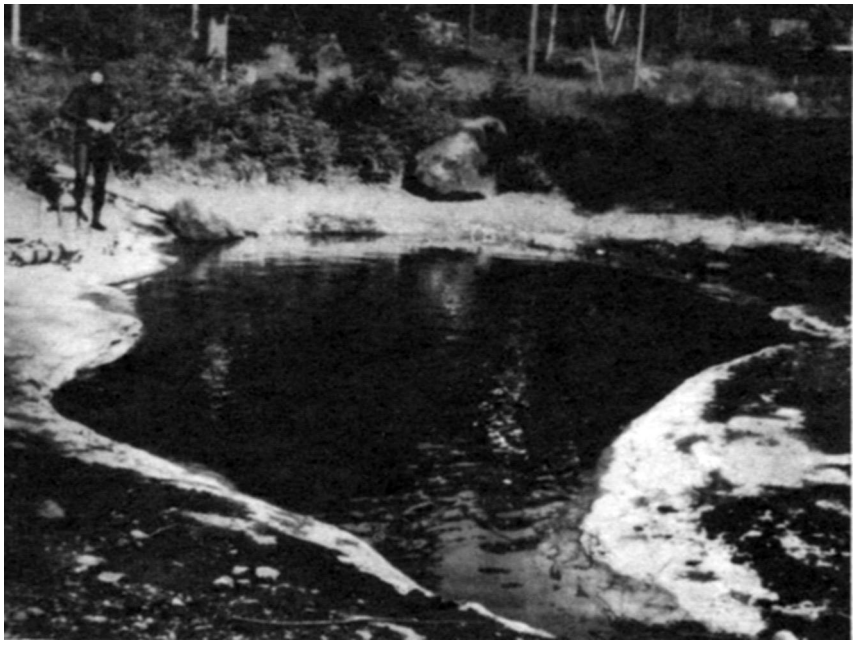
The passage size in the system so far ranges from just barely large enough to squeeze through with dive gear, to 7m (23') high and 25m (100+') wide. The average passage size under the peninsula is 3m (10') high and 10m (33') wide, with a depth of around 3m (10') bellow the surface of the river or pools. Two passages (Sawatzky's delight and Reekie's passage) have formed on a deeper-bedding plane level and run at an average depth of 8m (26'). The very shallow depth makes diving safer as decompression does not have to be considered.

HISTORY

The caves have been known to local area residents for several decades but organized caving first encountered of them in 1983. I (an active dry caver from western Canada) had moved to Petawawa (a one-hour drive from the caves) and was taking my initial open-water diving training. The senior instructor, Al Shamess, was very interested to hear of my dry-caving experience and mentioned that he had heard of several dry caves in the area and one cave-diving site.

Al had been talking to some open-water divers who told him that they had been diving in a cave along the bank of the Ottawa River. The current was going in and they had gone about 30m (100') in on a rope. They had a very difficult time getting back out and refused to tell Al the location of the cave. Al persevered, however, talking to everyone he met about the possibility of caves in the Ottawa River valley. One day he met a fellow who told him he had pools on his property, on the edge of the Ottawa River, with water running through them. Al was ecstatic at finally locating the caves, but due to the season (there was 1m [3'] of snow on the ground!) he was unable to investigate further for several months.

In June 1984 Al visited the site for the first time and was amazed to find several pools with the water boiling and swirling around like giant cauldrons. There had to be large cave passages under the pools! He returned with two of his junior instructors and started diving in pool #1 (see map). That summer and fall they ran ropes through Sumps 1 and 2 and realized that they were into a large, complex cave system.



Kirk MacGregor standing by Pool #1 at low water. This is the only cave in Canada with Florida-style access! Photo by David Sawatzky.

I had moved to Halifax shortly after being taught to dive by Al and not only done a great deal of open-water diving, but was cave diving in Nova Scotia (Diogenes Cave) and New Brunswick (Underground Lake). I had also been trained as a military diver/supervisor and as a military Diving Medicine Specialist (I am a Medical Officer in the Canadian Forces), and was the obvious person for Al to ask for assistance in exploring the caves. I made a trip to Ontario in 1985, and Al and I explored Sumps 3, 4 and 5 as well as the branch in Sump 2. Fortunately, I was posted to Toronto in 1986 and have been leading a team of divers in exploring and surveying the cave system since.

Neither Al nor I had formal training in cave diving and the equipment, exploration and survey methods we used have changed over time as we learned from trial and error, reading books and exchanging information with other active cave divers both in Canada and around the world. In 1988, Al and I went to Florida and became certified as cave divers in the Cave Diving Section of the National Speleological Society. However, the diving conditions in the Ottawa River System are very different from those in the springs in Florida, and we were still forced to develop our own unique methods and technology.

EXPLORATION TECHNIQUES

Every pool is a potential entrance into or exit from the system and every dive must start at one of them or at a sink/resurgence in the riverbed. An exploration line is tied off securely and the diver swims upstream into the cave. Visibility is never more than 5m (even with a 75-watt light) and the diver explores upstream whenever possible for two reasons. First, the silt that the diver kicks up is swept behind him so that he always has the best visibility possible going into new passage. Of course, that means that visibility is near zero coming back out! Second, the current will help him to swim back out. If the diver explores downstream, not only is he groping around in zero visibility, the current pushes him into the cave and he has no way to estimate how much air he will use on the return trip, assuming that he can even swim against the current!

As the diver swims through the cave, he lays a thin exploration line off a dive reel to mark the way back. Even this seemingly simple task can prove fatal. If the passage is large and the visibility low (typical of Ottawa River

David Sawatzky and Dick Browning preparing to survey in Sump #8. Photo by Sandra Lenox

Cave), the diver will be unable to see the walls and therefore will maintain his direction by watching the current move silt that he stirs up on the floor with a finger.

Unfortunately, if the passage does a large S-shaped turn, the diver will assume he has gone in a straight line because he always swam straight into the current. The line he is laying will be pulled into the side passage. When the diver decides to turn back, he will tie the end of the line off, cut the reel free and follow the line back in zero visibility. If the passage has turned as described above, the line will pass through areas near the sides of the passage that are too small for the diver to get through! Limited time (air) and poor visibility make this a very dangerous situation. The answer is to tie the line off frequently going in and to turn around when there is still lots of air so that the diver can deal with problems like this safely.

After the exploration line has been laid, the next step is to replace it with heavier, permanent line. This line is run down the middle of the passage and is securely fastened. In many Ottawa River passages, ½" nylon rope has been used to enable the diver to pull himself against the current using the rope and to ensure that the line does not get broken from rubbing on the rock (much harder and sharper limestone than in Florida) and/or broken from the drag of debris washing through the cave that will inevitably get caught on the line. The exploration line must be removed at the same time the permanent line is installed, or soon thereafter, to prevent confusion and/or entanglement during subsequent dives.

SURVEY TECHNIQUES

The permanent line is surveyed with a compass, tape measure and depth gauge to give the familiar line survey of dry caving. The difference is that in an underwater cave with limited visibility, the line survey team often has no idea where the walls of the passage are! The end result is a general idea of where the cave is located but no passage details. A significant part of the Ottawa River Cave Survey is still at this stage.

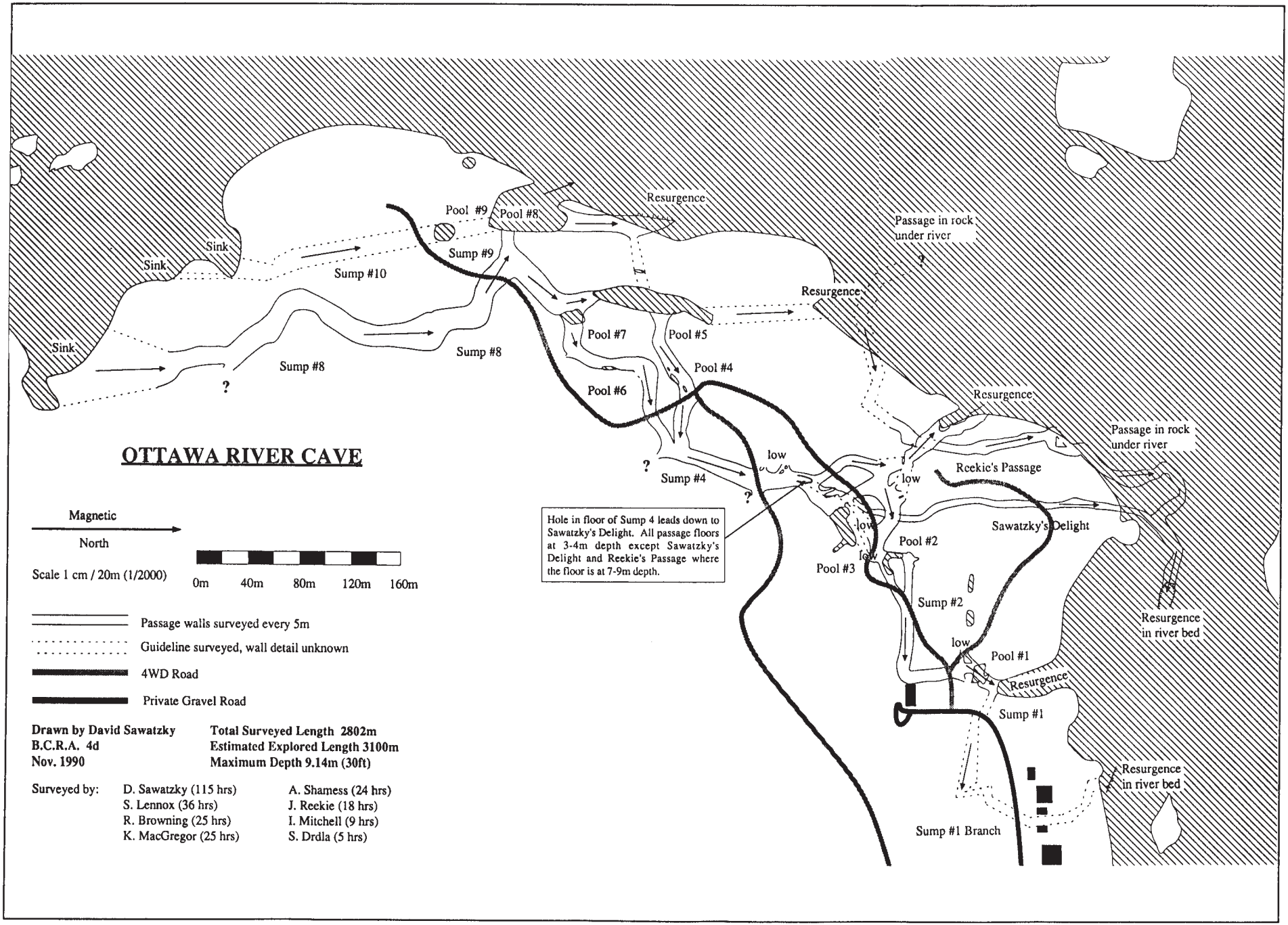
Next the line survey is plotted to scale on an underwater slate. Using pieces of white plastic with the surfaces roughened by sanding as a slate and ordinary lead pencils to write with works very well. The pencil will not wash or rub off but the slate can easily be cleaned on the surface with an eraser. In addition, the markings on the slate can be photocopied before they are erased to gave a permanent record of the original survey data.

Line surveys require the same layout every time and one slate can be permanently marked for this purpose by etching the grid into the plastic and filling the grooves with waterproof ink. The actual survey numbers can be written into the spaces with pencil and the slate erased without having to redraw the grid every time.

Surveying the passage walls is a complex task. Two divers have to work in concert and the task loading is extremely high. The divers are keeping track of up to three tanks, regulators, pressure gauges, depth gauges, lights, watches, knives, fins, mask, buoyancy compensator, drysuit, etc. *and* trying to survey in very poor visibility, with current, all underwater!

Before the wall survey can begin, the main line must be marked every 5m (16.4') along its length. Usually a small cord is tied around the rope, using a tape measure to place the ties, or a special low-stretch survey line knotted every 5m (16.4') is laid out along the main line.

The next step is to survey one wall. One diver takes the end of a tape measure and places it on the first knot on the mainline. The second diver takes the tape reel and proceeds out to the wall, ensuring that he is downstream of the knot. He then pulls the tape tight and slowly moves up the wall until the diver on the line sees that the tape is perpendicular to the main


OTTAWA RIVER CAVE
Magnetic North
Scale 1 cm / 20m (1/2000)
0m 40m 80m 120m 160m
Passage walls surveyed every 5m
Guideline surveyed, wall detail unknown
4WD Road
Private Gravel Road
Drawn by David Sawatzky
B.C.R.A. 4d
Nov. 1990
Total Surveyed Length 2802m
Estimated Explored Length 3100m
Maximum Depth 9.14m (30ft)
Surveyed by: D. Sawatzky (115 hrs), S. Lennox (36 hrs), R. Browning (25 hrs), K. MacGregor (25 hrs), A. Shamess (24 hrs), J. Reekie (18 hrs), I. Mitchell (9 hrs), S. Drdla (5 hrs)
Hole in floor of Sump 4 leads down to Sawatzky's Delight. All passage floors at 3-4m depth except Sawatzky's Delight and Reekie's Passage where the floor is at 7-9m depth.
Sink
Sump #10
Pool #9
Pool #8
Sump #9
Resurgence
Passage in rock under river
Sump #8
Pool #7
Pool #5
Pool #4
Pool #6
Sump #4
low
Reekie's Passage
Sawatzky's Delight
Pool #2
Pool #3
Sump #2
Pool #1
Sump #1
Sump #1 Branch
Resurgence in river bed

line. It is the responsibility of the diver on the line to ensure that the tape runs straight to the diver on the wall and does not get caught on projections or rocks on the floor.

The diver on the line then signals the diver on the wall via tugs on the tape to tell him that he is perpendicular to the line. A complete set of signals has been worked out so that the divers can communicate and must be memorized before the divers enter the water. The diver on the wall reads the tape and marks the wall location on the underwater slate with a ruler. He then signals the diver on the line to move to the next knot (5m, 16.4') and proceeds up the wall until the diver on the line signals him that he is perpendicular to the main line at the next knot. He marks the new wall location on the slate and draws in the intervening 5m (16.4') of wall that he inspected as he moved upstream.

This system works very well and is surprisingly fast once the divers are well trained. Unfortunately, it becomes even more complex and much slower when side passages are encountered, the mainline makes a sharp change of direction, or when the side wall is more than 10m (33') from the mainline. The other wall is done with the same technique via a second sweep of the cave passage from the downstream end after the silt from the first dive has cleared. Underwater hand-held sonar has been used to survey some caves. When visibility is excellent, there is little silt, there are true walls and you only require a distance to the wall, sonar works quite well. In the Ottawa River Cave, however, the walls are out of sight, the passage lens shaped, and the silt banks usually found by the walls make sonar useless (it was tried).

As is apparent from the above description, it takes a minimum of 6 dives through one length of passage to do a survey with passage detail, and most cave divers in Canada do not yet have the experience and skills necessary to do a wall survey accurately and safely under these conditions. This is why the survey is proceeding so slowly and why the map is still incomplete after 6 years of diving and surveying (the author has spent over 115 hours surveying in this system!). In addition, surveying in the cave is only feasible from late June until September, and it is a 5-hour drive from Toronto.

MAP PRODUCTION

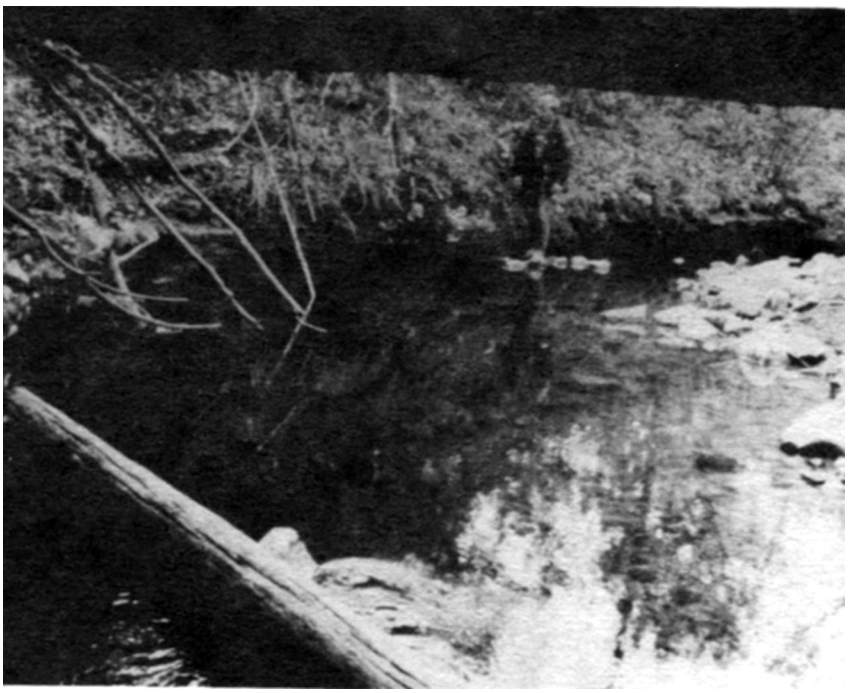
Most computer programs available to convert line-survey data to x, y, z coordinates demand clinometer readings and are therefore useless for underwater surveys. SMAPS fortunately will handle depth-gauge readings and it was used to do the conversions for this map. SMAPS is an IBM-compatible program but it can be run on Macintosh computers is you also run a program called SoftPC. SoftPC is an MS DOS emulator for the Macintosh and allows you to run any IBM program. Version 1.0 will not handle IBM graphics but apparently the most recent version will.

For this map, there were several kilometers of surface survey done to locate the shoreline, the pools, the roads, the trails through the bush and the houses (not all drawn on the map). This data was then converted to x, y, z coordinates and plotted with a Macintosh program called MacDraw II at a scale of 1/1700. An air photograph of the peninsula was enlarged to a 2' x 3' print so that it was also at a scale of 1/1700. The surface survey was printed, superimposed on the photograph and the obvious survey errors corrected.

After all of the major errors had been removed, the multiple loops were closed using SMAPS. The islands and shoreline were drawn in as approximations and then adjusted to correspond to the air photograph. This resulted in a very accurate surface survey and all of the surface survey stations were then considered "fixed" and were not moved again (i.e., the entire surface survey was considered a "benchmark" to which the cave survey was tied). The cave survey was done in the field at a scale of 1/500 and therefore the surface survey in the computer was expanded to this scale (takes seconds with MacDraw II).

The cave survey was then drawn in the computer and each leg was adjusted to close to the surface survey at every entrance and exit (closures done with SMAPS). When entering the survey location, the map was expanded to a scale of 1/125, which allowed them to be located to the nearest 10cm (4")! Another advantage of using a computer program to draw the map was that it was possible to put the surface survey on one "layer," the surface features on a second layer, the cave survey on a third layer, and the cave walls and features on a fourth layer. The program allows the order of the layers to be changed with a click of the mouse and any number of layers can be viewed or printed as desired.

The cave wall details were drawn in by eye, the map scaled by to 1/500, each



David Sawatzky by Pool #2 at low water. Photo by Marcus Buck.

section printed, and the printout held over a xerox of the original survey slate. The walls were adjusted until the match was perfect. Other features of the program are that it will smooth lines, and correcting mistakes or adding items is unbelievably fast and simple. Artistic skills are no longer required to produce quality maps!

When the map was complete at a scale of 1/500, the layers containing the surface and cave features were copied to another file and compressed to a scale of 1/2500 (at a scale of 1/500 the map would cover fifty 8½" x 11" pages!). The title, lettering, north arrow, current arrows, etc. were added and the map printed using an HP inkjet printer (300 dots per inch). As the survey is continued, the map will be updated and a current version can be printed at any time.

CONCLUSION

The Ottawa River Caves are currently Canada's largest cave-diving system. Exploration/surveying are proceeding rapidly and there are at present over 3km (10,000') of passages under the peninsula and the river bed nearby, and over 1km (3000') of passage under the islands.

As the survey is continued many branch passages are being discovered and there remain many unchecked leads. For example, Sump #1 is only 17m (56') long, but when the walls were surveyed a branch passage over 300m (1000') in length was discovered and the walls of that passage have not yet been surveyed! From the information acquired so far and the geology of the area, the known passage length could easily double or triple over the next few years. Diving conditions are very difficult and survey conditions even more complex so progress will continue to be slow.

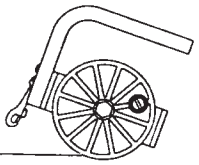
Anyone with cave-diving experience who is interested in helping with the survey and exploration is encouraged to contact the author at:

#41 Wild Gingerway
North York, Ontario
Canada M3H 5W9
(416) 638-2058 (home)
(416) 635-2079 (work)

WARNING: Please do *not* attempt to find the cave and go cave diving by yourself! This is not only very dangerous, as the caves are a maze and many of the lines go in circles, but illegal, as the caves are on private property and the owners do not want people unknown to them diving in the caves.

About the Author: Major Sawatzky is the Head of Diving Medicine for DCIEM, the Canadian Defence and Civil Institute of Environmental Medicine in Toronto, Canada. He has done extensive underwater surveying in the less-than-optimal conditions of Candian caves and sumps, and has authored numerous technical articles on both diving medicine and underwater cave exploration for *Underwater Speleology* and other publications. ■

THE SAFETY LINE: Abe Davis Safety Awards



by Wendy Short (NSS #30802), Safety Coordinator South

In 1977, the Cave Diving Section of the NSS decided to create the Abe Davis Cave Diving Safety Award in honor of America's first known cave diver. This award is presented to any cave diver who has demonstrated a genuine dedication to cave-diving safety as evidenced by the successful completion of at least 100 cave dives.

By making this award available to all cave divers, it is hoped that the award will have a unifying influence on the American cave-diving community. This award will also provide novices with positive motivations to plan and execute their dives as safely as possible while they are in the relatively high-risk area of their experience—the first 100 cave dives.

Further, by encouraging the novice to keep records of his activity to apply for the award, he will be indirectly motivated to be more methodical in his dive planning and analytical toward his dive performance, thereby making his cave diving safer.

Hopefully, this is only the beginning to a stronger commitment to cave-diving safety in these recipients.

The CDS proudly announces the 1990 recipients:

John Bateman
John Bussell
Lorie Beth Conlin
John P. Delaney, III
Doug Del Castillo
Curt DeRemer
Terry DeRouin
Samuel R. Ferra
David R. Janes
John Jay
Tracy Jay
Robert Justesen, Sr.
Thomas E. McDonnell, Jr.
Steve L. Meadows
Marvin E. Perdue
Teresa Petty
Tom Petty
Nancy Pike
Chris Rouse
David Sawatzky
Kurt A. Terry
Harve Thorn
Toni Thorn
Ron Winiker ■

A REPORT FROM MEXICO — or
How I Spent My Summer Vacation
by Jill Yager, Ph.D. (NSS #19089)

Majestically, a frigate bird soars along the shore.... gentle waves break on soft fine sand the color of raw sugar.... every sweat pore in my body is working overtime as I'm walking along a jungle trail. Hold it! I'm not on vacation! I'm on *location!*

It all began with a phone call from Minami Tamura in Ottawa, Canada, asking if I would consider taking part in a television documentary for Nippon Broadcasting Company in Tokyo, Japan. She said it would involve going to Mexico—the Akumal area—to explain my research in submerged caves and my remipede work. After careful consideration of about five seconds I agreed.

Minami asked if the Japanese could film me in the caves doing my work but I explained it was impossible unless they were trained cave divers. I suggested she contact Jim Coke and Mike Madden, both with considerable cave-diving photographic expertise. The purpose of the program was to show a Japanese point of view about the Yucatan Peninsula, so the problem was finding a Japanese cave diver. When the producer couldn't come up with one they decided to use Ryu Uchiyama, an underwater fish photographer, and train him.

The Akumal cave divers were divided into two teams. Jim Coke and Tom Young were in charge of teaching Uchiyama to cave dive and to document his instruction. The second team consisted of Bill Carlson, Mike Madden, Chuck Stevens, and myself (as well as Bruce Schadow on several occasions). Our job was to film Mike exploring, me doing my research, and Uchiyama taking pictures of cave fish.

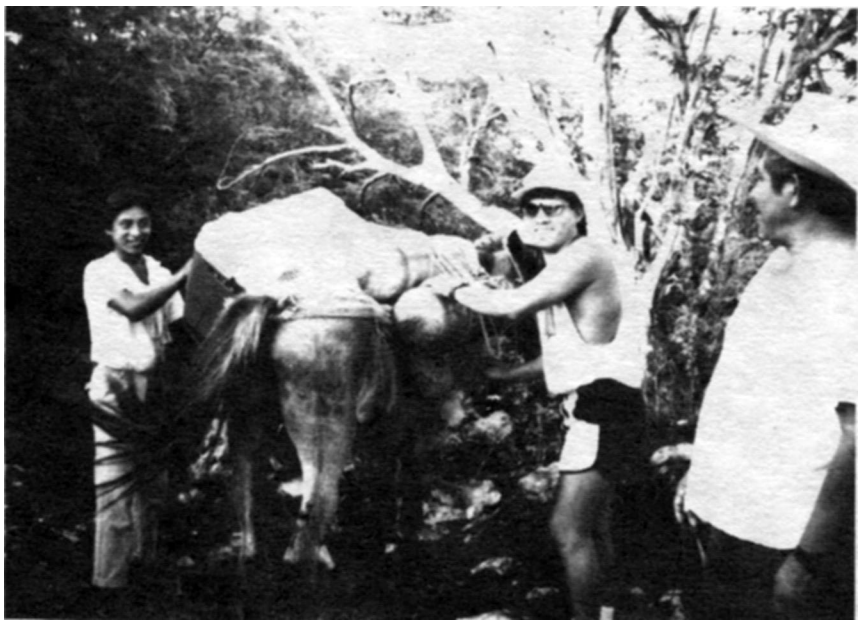
The adventure began with the fabulous Nohoch Nah Chich system. This cave is not only the most awesome cavern snorkel but an incredible cave dive. We had the luxury of multiple long, shallow dives—lots of time for setting up scenes and getting footage. On the day that Uchiyama and the entire production team joined us, it required four pack horses to transport tanks and camera gear!! Quite an impressive sight going down a narrow jungle trail.

Once geared up and underwater, our team quickly learned to communicate "film talk" and we got the lighting and camera angles down to a fine art. My excitement came when I was given a light on day two and became an instant underwater "lighting technician." Better yet was the day I was handed a camera and filmed Bill filming Uchiyama filming Mike!! Because we were using video we could swim out and look at the footage on location. The little dive hut at the mouth of Nohoch was packed with dripping divers, Japanese crew, and Mayans gathered around a tiny monitor, talking in three languages!

After more filming in Carwash and the Temple of Doom, I was finally able to do some research. Chuck Stevens and I made several dives into Carwash to collect water chemistry information. This cave has become one of the sacrificial lambs—it is dived by hoards of tourists. While we were there a group of seven arrived—complete with 20-lb. weight belts, lights, no reels, and gigantic knives strapped to their legs! This activity is causing an alarming ecological event. Some of the surface fish inhabiting the entrance pool are becoming accustomed to divers and follow their lights into the twilight zone and beyond. There the fish voraciously devour the cave crustaceans!!! In addition to this, the remipedes that were once very common in the Chamber of the Ancients have recently been on the decline. The surface fish have even been spotted in this location and may in part be responsible for fewer remipedes. This situation will be closely monitored.

Speaking of remipedes, I can report that more is being learned about their biology. I spent the month of July doing research at the National Museum of Natural History, Smithsonian, Washington, D.C. I focused on the internal anatomy of a species from the

Getting ready for the walk to Nohoch is the cave-diving film crew: Bill Carlson, Chuck Stevens, Mike Madden, and Jill Yager, plus Masa Okajima, Assistant Producer.



Don Pedro looks on as his two sons load a pack horse with tanks and film gear.

Bahamas. I'm looking at the "poison gland" that may help them capture prey. It's still unclear, but I'm making progress. As for remipedes in general, so far they are only recorded from the Atlantic Ocean and Caribbean region. Only one species has been collected form Mexico and Belize.

I'd like to ask anyone cave diving anywhere in the Caribbean to keep your eyes open for remipedes. The animals are easy to spot. The body is long and slender, with legs everywhere! They swim with the same motion as a centipede walks. They have not been found in freshwater and are usually found beneath a density interface, where less salty surface water floats on top of more dense salt water. If you think you've seen one, please let me know! ■

LESSONS FROM OVERHEAD:

A Comparison of Cave and Wreck Diving

Part I - By Bernie Chowdhury (NSS #30691)

Every certifying agency agrees that safer, more enjoyable diving can be achieved by divers continuing their aquatic education. Nowhere is this more applicable than in overhead environments such as caves or wrecks. The diver who finds himself in an overhead situation forfeits the least complicated method of reaching the surface: direct and unhindered ascent. It is alarming to note the incidence of trained open water divers who have perished because they chose to explore facets of the underwater world well beyond their training. Witness the signs placed at the mouth of readily assessable caves: "STOP! PREVENT YOUR DEATH. GO NO FURTHER UNLESS CAVE TRAINED ..." Divers wishing to explore overhead environments require both knowledge and training to survive the experience. The ever-increasing popularity of these unique and exciting environs is attested to by the growing number of divers undergoing sanctioned training.

Not everyone is psychologically and physiologically prepared to dive in overhead environments. The thought of confined spaces is enough to make some individuals uncomfortable. The reality of diving into such a space could be disastrous for these people. Above all, balance is required: good judgment and physical conditioning, coupled with solid diving skills, are the foundation upon which overhead-environment training and experience may be built. There is literally no room in an overhead environment for buoyancy-control problems, neurosis, or overinflated egos! Knowing what is involved in diving into caves and wrecks is important in making a decision about whether this type of activity is for you.

The similarities and contrasts of diving in caves and wrecks are marked and warrant further examination. Because a diver may be trained to dive in caves does not mean he is also trained to dive in wrecks, and vice versa. Knowledge of the two environments should lead the diver to resist being tempted to dive in these areas unless specifically trained for them. This paper will compare the wreck and cave environments, conservation considerations, diving techniques, equipment required, and differences in sanctioned training. In no way is this to be considered an exhaustive study, nor is it intended as a substitute for sanctioned training conducted by a competent instructor.

We shall consider a wreck to be any manmade vessel, vehicle, or platform, e.g., oilrig, that lies permanently flooded underwater. A cave will be considered a tunnel-like passageway or room that has been formed by nature and exists underwater. By definition, a cave starts at the point where natural light cannot be seen by the diver. Water-filled mines are not considered caves for the purposes of our discussion. Solution caves are the most prevalent and are distinguished by long and intricate passageways. Lava, sea

and coral caves are not usually as extensive, nor will they be covered in this discussion.

The most striking difference between caves and wrecks is the fact that the former are manmade, while the latter are a result of nature. This difference means that wrecks are constantly disintegrating, while caves are constantly forming. Wrecks disintegrate as iron and steel rust and organic materials, e.g., wood, are eaten by microscopic marine life. This results in silt. Caves, on the other hand, develop over a period measured in thousands or even millions of years. Much has been written about cave formation. Briefly, caves are thought to be formed by one or more of the following: chemical interaction between sedimentary rock and water; mass movement of water; and shifting of the earth's plates. For a more complete discussion of cave formation, the reader is directed to Chapter 2 of the *NSS Cave Diving Manual.*

Besides material breakdown, several other causes are responsible for wreck destruction. In sport-diving depth, wrecks fall prey to water movement because of storms, currents, and surges, which serve to hasten the wreck's demise. Should the site pose a hazard to navigation, man himself will destroy the structure, either by wire-dragging or by explosives, reducing the area to a junkyard. Salvage operations also may be employed, and the wreck may suffer the indignities of being pried open to yield valuables. In extreme cases, the wreck may be raised, which is utterly silly since ships look infinitely better underwater!

Blueprints and pictures of a ship prior to sinking show us exactly what the structure was once like. Of course, the cause of sinking may have resulted in drastic alterations: a fire might consume most of a ship before its rescue by the sea; a torpedo or other exploding ordinance may have disintegrated a once-proud vessel; perhaps the weight of the ship crashing into the bottom may have caused it to break into pieces. Anyhow, we have some record of what the vessel once looked like, which is a great aid in planning a dive to the site.

Blueprints of caves do not exist until man discovers, explores and surveys the area, which may consume a considerable amount of time. Intricate maps may be made available to the trained cave diver. For the most part, detailed maps of underwater wreck sites are not produced. Sketches of wrecks may be drawn, or blueprints published, but maps listing distances underwater, exact depths and existing structural configurations are nonexistent as far as wreck divers are concerned. Perhaps this is because caves evolve extremely slowly, with sudden, dramatic changes being uncommon at best. Wrecks, on the other hand, may change spectacularly as bulkheads collapse, or the ship suffers the consequences of water movement, as previously mentioned. Detailed surveying would then serve to record a history of what the wreck looked like at a given time. By virtue of the dynamic nature of wrecks, permanent records of structural configurations for use by divers planning excursions are not possible.

Another great difference between caves and wrecks centers on the type of aquatic life found in and around these sites. Wrecks attract a variety of marine life and become artificial reefs, whereas the harsh environment of the cave is less conducive to a proliferation of organisms.

Entire ecosystems develop around a wreck, which may be useful for scientists in their study of the underwater environment. The May, 1976 issue of *National Geographic* magazine (Vol. 149, No. 5) featured an article by Dr. Sylvia A. Earle in which was described scientists' efforts toward measuring marine growth on shipwrecks at Truk. At least 66 Japanese military and merchant ships were sunk during a U.S. raid on Truk, February 17, 1944. Because we know the precise moment at which any given ship was sunk at Truk, the entire Lagoon has become a laboratory in which growth rates for given species of marine life can be ascertained and compared with growth rates in other parts of the world.

The maturing wreck, developing into an artificial reef, also becomes an excellent source of food. Fishermen engage in both sport and subsistence fishing at wreck sites. Invariably, monofilament line and nets become snagged, creating a hazard for divers. Wrecks also become an important source of revenue for commercial fishermen and charter-boat operators. Many areas have followed the example of Florida's Broward County and are sinking ships to attract both marine life and tourist income.

Divers need beware the different types of marine life indigenous to a given area, especially when diving on and in wrecks. Many types of life camouflage themselves and are difficult to detect. The unknowing or careless diver may inadvertently come into contact with a concealed organism that may have sharp spines or teeth as its defense. Stonefish, monkfish and eels are examples.

Although generally not a problem, the appearance of sharks on some wrecks may be a bit unnerving. Barracuda are more common. Activities such as spearfishing or feeding marine life in the presence of sharks or barracuda are definitely not recommended.

Other types of marine life that inhabit wrecks include lobsters, clams, mussels, scallops, octopi, crabs, kelp and other seaweeds, corals, anemone and a plethora of fish species. In short, a cornucopia of life. Most lifeforms existing on wrecks are resilient and suffer man's presence well.

Life in caves is sparser than on wrecks. Where water flows into the cave system (a siphon), more life can be found than in a spring, where water flows out of the system. The reason for this lies in what the water carries: a siphon brings bacteria and microscopic organisms into the cave, which can be consumed by fish. Crayfish, eels, catfish, and shrimp may be found in caves. Beyond the light zone (which is where one enters a cave) aquatic life needs to develop special methods of survival. These methods have included adapting to the lack of light in the cave by becoming almost exclusively reliant on sensing water movement or chemical changes in the environment to detect prey or predator movement in the vicinity.

The question of preservation applies to both caves and wrecks. Man's intrusion invariably results in change to any environment. Underwater caves are subject to scarring because of contact with tanks. Stalactites and stalagmites may be destroyed. Silt may be stirred up and settle on the sides of a cave, particularly on scalloped walls. Pollution in the form of lost line markers, severed guidelines, broken equipment straps, or trash carried into the system by water flow, as in a siphon, contribute to the

altering of a cave.

Perhaps the most severe violation of caves occurs when untrained individuals remove archaeological treasures such as Indian remains and fossilized animal bones. This robs the entire community of knowledge that may be gained as a result of careful study of the area by archaeologists, paleontologists and other scientists. Vandalism, whether intentional or not, permanently alters an environment that may have taken millions of years to develop. Responsible caving organizations, such as the NSS and the NACD, have a standing commitment to conserve caves. Toward this end, all divers are urged to leave caves exactly as they found them.

Wreck preservation has become a highly politicized issue. With the passing of the Abandoned Shipwreck Act of 1987 (S. 858) by the Congress and the Abandoned Shipwreck Act Guidelines (54 FR 13642) by the National Park Service, an attempt has been made to define legally acceptable conduct in and around shipwrecks. Unfortunately, the laws are couched in ambiguous language. Given diametrically opposing viewpoints, this makes for interesting maneuvering by various factions in the political arena.

The American Sport Divers Association (ASDA), led by the intrepid Captain Howard Klein, has hired legal counsel to have the Abandoned Shipwreck Act declared unconstitutional. Captain Klein cites the precedent of Admiralty Law as a cornerstone of the ASDA's contention. A test case is now in the courts. Other organizations, such as the Canadian based Save Our Shipwrecks (SOS), fight for the preservation of wrecks. This organization argues that artifacts should only be recovered and restored by state approved professionals.

The wreck-diving community has been divided by calls for restraint in removing artifacts from wrecks. On the one hand, it is pointed out that divers who remove and restore artifacts are preserving the past for future generations. Many artifacts are displayed in museums or are shown at dive clubs or industry conventions. In this way, many people can experience the beauty and history of a shipwreck. Adherents of this argument point out that unless artifacts are brought up and preserved, they will be lost forever. As we have seen, wrecks are prone to disintegration, so there is merit to this argument.

On the other hand, many people point out that wrecks may be vandalized during artifact removal. There is merit to this: an object that has been underwater for any length of time will be difficult to remove if still attached to the wreck, and some degree of destruction is entailed to retrieve the artifact. This viewpoint sees wreck preservation as benefitting current and future divers because it leaves the site in its natural state for others to see and enjoy. National Underwater Parks, such as those at Tobermory and Truk Lagoon, are fine examples of wreck preservation. Of course, there are other arguments that one may consider. For our purposes this would lead us too far astray.

Various techniques are employed when cave and wreck diving. In overhead environments, modifications to standard open water techniques are required. During basic open-water classes, students are taught to deliver strong flutter kicks, with complete follow-through on the downstroke. A dolphin kick is usually taught as an alternative. In overhead situations, both techniques would result in a siltout because the power of the kick is directed to the floor, where silt or clay rests. In open water dives, the flutter or dolphin kick will also stir up silt or sand when the diver is swimming near the bottom. It is surprising how far away a diver can be from the bottom and still kick up sediment. In clear-water reef situations, most divers don't notice this until the reef dies as a result of being asphyxiated by sand settling on the coral. The solution to this is the same as preventing siltouts in caves or wrecks: use either a modified flutter, or a frog kick, when swimming near the bottom.

Besides the modified flutter and frog kicks, several techniques are used in overhead environments: side-to-side kick; shuffle kick, ceiling push-off, fly walking, and pull-and-glide. Descriptions of these methods are listed below.

The modified flutter involves bending the knees at a 90-degree angle and using short kicks. The thigh remains stationary and the knees bend slightly to effect the kick. This directs the power straight back. If the diver maintains a slightly head-down position, the power is directed back and up, away from the silt on the bottom. The drawback to this kick lies in the muscles involved: practice is required to strengthen the leg. Of course, practice was required to perform a standard flutter kick properly, too . . . !

The frog kick is extremely effective and should prove useful to most divers, open water or otherwise. This kick is best performed when the diver is slightly positive, with the head lower than the legs. It is the same kick used when swimming the breaststroke: the legs are simultaneously extended outward from the knee while the thighs thrust back (the legs form a wide "V") and then the legs are brought together sharply. Unlike other kicks, the *bottom* of the fins are the surface area used to create propulsion. In open water, this kick can be even more effective in propelling a diver than the flutter. In very narrow areas of a cave or wreck, where even slight movement would create silting, the frog kick can be modified so that only the ankles and fins move. This provides less forward propulsion, but caution and slow movement are preferable to a siltout! As with the modified flutter, the power of the frog kick is directed up and away from the bottom.

The side-to-side kick is the same as the standard flutter, with a slight twist: the diver performs this while swimming on his side. This directs the power of the kick to the side, which is useful in large rooms of wrecks or caves. Propulsion is fast and the change of kick may be welcome to our muscle groups, preventing a cramp.

The shuffle kick is another form of modified flutter. The diver, in a horizontal position, executes a restrained flutter using only one leg to kick while holding the other leg such that the fin is directly underneath the fin of the kicking leg. This acts to disperse the power of the downstroke.

The ceiling push-off involves becoming positively buoyant, head slightly down, with the feet resting on the ceiling. The feet alternately "push-off" the ceiling. When properly done, this looks as if one is walking along the ceiling and could aptly be named the "ceiling walk." This method should be used sparingly, as damage to the cave or wreck may occur because of overzealous pushes.

Fly-walking may be used in an area

with a silty bottom and a ceiling offering many available handholds. For that matter, the bottom needn't be silty if the ceiling offers handholds, and one enjoys the unique sensation of traveling upside down! Fly-walking requires slight positive buoyancy, with the diver in the face-up position and the body held horizontally. The finger tips are used to gently grasp available outcroppings and the diver pulls himself along. Considerable headway can be made with this technique, while conserving air: because the diver uses his arms for propulsion, a smaller set of muscles is being used than employed when kicking, requiring less energy and, therefore, less air.

The drawbacks to this method of movement rest with the configuration of the cave or wreck and the possibility of the diver becoming disoriented while upside down. If the diver is travelling quickly and arrives at an area where the ceiling goes up suddenly, as in a cave dome, a rapid ascent is effected. A few things happen simultaneously: the diver needs to clear his ears and dump air from the BC. Air embolism becomes a distinct possibility. This potential loss of control may be avoided by travelling cautiously. Being in an upside-down position requires that the diver crane his head backward almost completely to get a complete forward range-of-vision. This may be difficult, depending on the position of the tank valve(s).

The pull-and-glide uses the same basic principles as those employed during fly-walking, with one significant exception: the diver remains in the traditional face-down position! At times, the diver may wish to swim on his side, pulling at the side of a cave or wreck. Advantages of the pull-and-glide over fly-walking include avoiding the hazards associated with a sudden ceiling rise, and less possibility of disorientation.

Caution should be exercised when using any technique that calls for physical contact to be made with a wreck or cave. Concealed marine life and sharp objects pose a serious threat to diver safety. In addition, contact with the environment usually involves damage to it. Careful consideration and understanding of the particular location will dictate the appropriate technique(s).

Techniques dictated by water movement require the use of both brain and body. One must carefully evaluate the existing conditions at the site and determine the best way to dive it. For example, if a current is present at the wreck site, one may swim on the side opposite the current and thus use the wreck as a shield. Or, if one is swimming with the current, the knees may be bent upward at a 90-degree angle and the fins pointed down to act as a sail, with the water's force propelling the diver. This technique is common to drift diving. If a surge is present, the diver should kick once or twice with the surge and relax when the surge is directed against him. If there is a heavy flow against a diver inside a cave, the diver should swim in the area where there is little or no flow. This is best discovered before the dive by asking a local instructor about the conditions, or hiring a guide.

The unique hazards associated with overhead environments dictate many safety techniques and special equipment considerations. The diver who enters an overhead environment must be fully prepared to cope with and resolve any problem while underwater. There can be no thought of bolting to the surface in an emergency!

The tenets for safety in cave diving and, by logical extension, for wreck diving, come from a study of cave-diving fatalities conducted by Sheck Exley in the 1970's. This has become known as Accident Analysis. Five rules are laid down as the cornerstone of safe cave diving: 1) always run a continuous guideline to open water; 2) save *at least* ⅔'s of your air supply for your exit; 3) never dive deeper than 130 feet of sea water; 4) avoid panic by gradually building experience and being prepared for an emergency and 5) always use at least 3 lights per diver. These and other rules for safe cave diving were published by the NSS-CDS in booklet form under the title *Basic Cave Diving: a Blueprint for Survival*, by Sheck Exley. This invaluable booklet is now in its fifth edition.

Lack of training is the "umbrella" under which 95% of cave-diving fatalities fall. The overwhelming majority of the remaining 5% of cave fatalities come about as a result of violating any one of the first three rules of accident analysis. If a comparable study were done of wreck-diving deaths, one would think the statistics similar. Amazingly, however, this doesn't hold true, at least in recent years.

In the August, 1989 issue of *Undercurrent* magazine, the second in a series of articles entitled "Why Divers Die" dealt with wreck-diving deaths occurring in '86 and '87. The National Underwater Accident Data Center (NUADC) at the University of Rhode Island recorded five wreck-diving deaths in 1986 and five in 1987. No less than 50% of these deaths were a result of air embolism! This is shocking because the divers were in open water when they embolized. The first rule taught to a basic open-water diver is "Never hold your breath when breathing compressed air." The so-called wreck-diving deaths in these cases occurred because of violating the first principle every diver learns (or should learn)! (NOTE: The author is currently engaged in a wreck-diving accident analysis in affiliation with the NUADC. Results of this analysis may be published as a special report.)

All major U.S. sport scuba agencies agree that 130fsw is the limit for recreational diving. Accident Analysis, Rule Number 3, states that divers in caves should not dive deeper than 130 FSW on air. This depth limit for sport scuba diving includes all environments. To follow the first two rules of Accident Analysis (always run a continuous guideline to open water and save at least ⅔'s of your air supply for your exit), we see a need for equipment not required by open-water divers. This, in turn, leads to a need for special techniques.

[TO BE CONTINUED in the next issue.] ■

Address Changes

Such is life: just when we finally get everybody trained to send in changes of address and telephone number to the Secretary/Treasurer (and not the Editor), we up and split the two positions and the Editor by chance also becomes the Secretary. *Therefore*, please notify me in writing or by telephone of any changes to your mailing information:

H. V. Grey
P. O. Box 12
Nokomis, FL 34274-0012
(813) 484-7834 ■

LETTERS

Impartial Investigation of Accidents

[Letter to the Editor]

January 4, 1991

Within the past year, two *UWS* articles depicting the deaths of trained cave divers (Diepolder Sink #2 and Sac Actun) have gained my attention. Both of these "Accident Analyses" were written in the third person and appeared to be official NSS-CDS reports. My concern regarding these articles is, both were authored by divers who had been participants in these tragic incidents. Not readily apparent to a reader of these articles by title or text was the authors' involvement. The last line of small print in the San Actun article is the only indication of the author's participation.

A well-established rule of fact finding/accident analysis, practiced by organizations at all levels of government and nonprofit agencies is that of impartial reporting. It is imperative that the NSS-CDS provide its members with credible accident analysis free of any possible bias. For cave divers to learn from these tragedies, information obtained by a competent, uninvolved third person is a necessity. NSS-CDS-trained recovery divers and cave-diving law-enforcement personnel throughout the cave-diving community have the ability to provide this service.

In no way do I wish to convey any wrongdoing by the authors of the above articles or challenge the factuality of their reports. I respectfully submit that when fatal cave dives occur, all attempts be made to solicit the assistance of a competent third person to gather information and draft an accident report/analysis. An accident analysis, free of the possibility of bias, will only add to the credibility of the NSS-CDS.

Sincerely,
Mark Barstow (NSS #31300)
Special Agent
U.S. Naval Investigative Service
Mayport, Florida

Safety Issues

[Letter to the Editor]

January 3, 1991

I would like to respond to the article, "What Has Gone Wrong?" which was printed in *Underwater Speleology*, Vol. 17:6.

I made a comment a while back, concerning the growing number of divers who are not taking cave-diving seriously.

Some divers are receiving their cave training without sufficient open-water experience, while other divers are cave diving very infrequently, after becoming cave certified—neither of which is conducive to good, safe cave diving.

For a long time, certified cave divers were considered an elite group of divers who took cave diving very seriously and cave dived almost exclusively. This is no longer the case. Many of these new cave divers are just putting another C-Card in their wallet and saying, "I'm a Cave Diver."

I am very much in agreement that our cave-diving instructors need to evaluate their students, prior to training, and not just look at the $$$ signs. For example, how long has a person been diving and how many dives has that person logged? Why does that person want to become cave certified? How committed is that person towards cave diving? Is that person willing to continue his cave-diving education? Is that person willing to purchase and maintain the necessary equipment for safe cave diving?

I believe that most of our cave-diving instructors are sincere in turning out a qualified cave diver. I know my instructor was. I picked him to train me because I was told that he was tougher than most instructors. I looked at this in a positive way, because I knew that if I screwed up, I wasn't going to get my Full Cave card.

Four days and eight cave dives later, I made it. I have since continued to cave dive on a once-to-twice-weekly basis and have logged over 70 cave dives in the past 15 months. Nothing to brag about, but it shows that I take my cave diving very seriously, which I feel we all should.

I also question whether a diver should be allowed to go through the entire eight-day Cavern, Intro Cave, Apprentice Cave, Full Cave course at one time. Granted, some very good cave divers have emerged from this exhaustive eight-day course, but many more have not.

Once a diver has completed Cavern and Intro Cave, I believe that diver should be required to accumulate some experience, prior to proceeding to Full Cave.

I believe that cave-diving fatalities or accidents among certified cave divers are going to occur at an increasing rate, until cave divers take the sport more seriously and continue with their training, experience, and education.

Sincerely,
Frank Lavallee (NSS #27829)
Plant City, Florida

* * *

NSS Membership

[Letter to the Editor]

January 3, 1991

I'd like to comment on the letter from Danny Mackey criticizing the Cave Diving Section's membership policies (published in both the Nov. 1990 *NSS News* and *Underwater Speleology* for Nov./Dec. 1990); as well as Wayne Marshall's in-depth rebuttal appearing in your same newsletter.

Perhaps I should begin by noting that I'm not a diver myself. I've never had the resources or perhaps the psychological makeup for this activity (notwithstanding having acquired something of a reputation for pushing near-sumps and "storm sewer" caves in general). At the same time, I'm well acquainted with a number of notable sump divers and have "sherpa'd" on occasion. I do have the highest admiration for the cave-diving community and especially the Cave Diving Section.

Wayne Marshall makes numerous excellent points in his guest editorial and there's little I might add in support

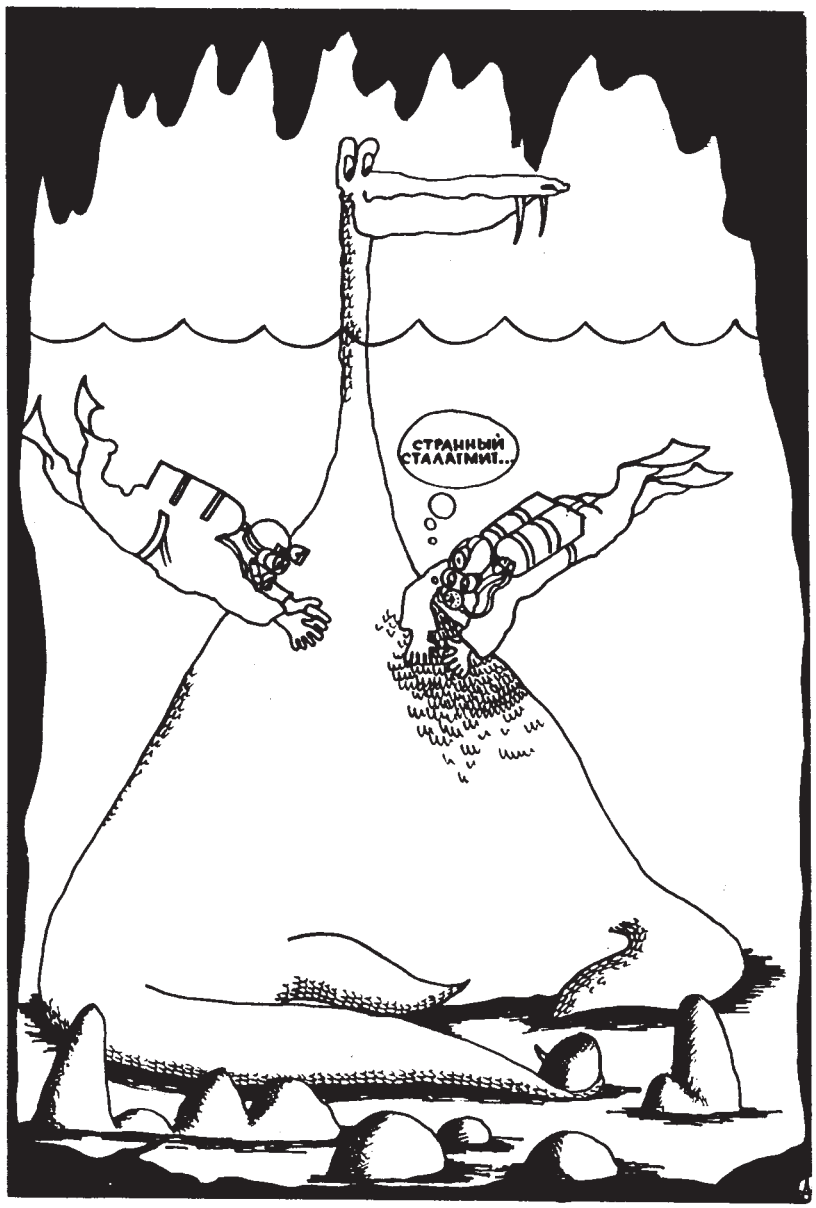
of the case for the CDS maintaining its traditional "all NSS" policy.

As at least a few of your Section's members know, the NSS recently has (again) been considering modifying its long-standing, if rather ignored, rule that all members of Society "internal organizations" (i.e., grottos, sections, etc.) must also belong to the NSS—or join within a year, anyway. (Currently, the only official exception pertains to "student grottos," a somewhat nebulous category.) The policy in question was one of the fundamentals of the late NSS founder, Bill Stephenson. He strongly believed that the NSS should be a nationwide association of *individual* cavers, rather than a loose confederation of clubs, as has been the rule in most countries. (Indeed, while there seem to be no valid statistics, a large percentage of NSS members—possibly a majority—belong to *no* grotto or other "I.O.")

The last time consideration was given to changing this policy was about seven years ago (if I recall correctly). The Board of Governors at the time presumably was impressed by Bill Stephenson's appeal to maintain the status quo. Now that Bill is no longer with us, the latest push to amend the membership policy arose from the Congress of Grottos. (For what it's worth, my own opinion is that some of the persons most vigorously demanding relaxation of the "100% rule" have been motivated by general disgruntlement with the NSS over issues [e.g., the Trout Cave controversy] having no direct correlation with this particular matter).

At its most recent meeting, the NSS Board narrowly decided to keep the "100%" policy—at least for now. The basic vote was a tie; President John Scheltens thus was able to cast the deciding vote. John didn't clearly state his personal position on this issue but indicated in effect that, since feelings were so divided, he shouldn't provide the critical vote for a change at the time. In all probability the matter isn't dead, so those with arguments one way or the other should make themselves heard.

Everyone recognized that the "100% NSS" policy isn't enforced and I don't perceive that anyone argues that it feasibly can or should be. Normally, I'm not in favor of unenforceable rules or laws; but in this case voted to uphold the old custom. I do feel that the NSS at least could do a better job of positively



"What a strange stalagmite . . . " — by Mikhail Aljukov

encouraging "I.O.'s" to see to it that all their members join the NSS and providing wider public recognition for the groups which do so—preeminently the Cave Diving Section.

I for one have been concerned that modifying the "100%" rule could weaken ties between the NSS and the CDS. Of course, even if the NSS relaxed the current policy, the CDS (or other groups which currently uphold "all NSS") wouldn't necessarily have to follow suit. Nevertheless, it would seem probable that the CDS especially should come under pressure to abandon its current practice—if not right away, then within a few years. (I suppose there are a fair number of CDS members who share Danny Mackey's feelings, more or less.)

I'm not all that familiar with the history of the CDS or the "independent" cave-diving groups and how the current relationship between divers and "dry" cavers evolved, as touched on by Wayne Marshall (other than to recognize that personality conflicts among cavers are inevitable). It's clear enough, anyway, that the CDS is an organization which very well could appropriately be

unaffiliated with the NSS. I think that the current ties between the NSS and the CDS are noteworthy and mutually beneficial, in the ways which Wayne emphasizes. I'd certainly be disappointed to see the diving community drift away from cavers overall.

While Wayne points out several respects in which the CDS has benefited by its association with the NSS (capitalizing on NSS prestige or scientific credentials, at least), I've tended to think that the NSS has been getting the better end of the deal and tends to take the Section too much for granted. If this dialogue helps clear the air, very good. In particular, I for one recognize and have pointed out that the much-ballyhooed NSS membership growth in recent years undoubtedly is due in no small way to the prosperity of the Cave Diving Section—and of course, its observance of the "100% NSS" policy!

In particular, I'm glad to note that Wayne Marshall believes it's desirable for there to be at least one diver on the NSS Board of Governors. Indeed, I made this suggestion to a CDS official several years ago, which evidently resulted in Wayne running for Director—once, unsuccessfully, so far, anyhow. I'm encouraged that Wayne is interested in running again and hope that he does so. I'll take the liberty to be sure that the current NSS Nominating Committee is aware of this. Sometimes, candidates for Director have had to run several times to attain the name recognition (or whatever) necessary to win a seat. While Wayne Marshal certainly is a distinguished cave diver (and all-around caver, as he points out), it may well be that he was too little known outside of Florida to have succeeded on his initial try. In any case, if CDS members were to feel sufficiently strongly about this and would "get out the vote," I'm confident that Wayne (or perhaps another CDS representative) would have a good shot at election. How about it?

Well, I appreciate the chance to put in my two cents' worth. I'll only add in closing that you have an excellent publication!

Good caving ("wet" and/or "dry"?),
Mike Dyas (NSS #11393 Fellow)
Director, National Speleological Society
Springfield, Virginia

NSS Membership

[Letter to the Editor]

January 3, 1991

I am writing in response to Danny Mackey's recent letter to the NSS in which he expressed his dissatisfaction with his membership and what he erroneously perceived to be their apparent lack of interest in the Cave Diving Section.

Although I am now and forever will be a cave diver first and foremost, I believe that the ideologies of our dry brethren are synonymous with our own. I also believe that most NSS members echo these same sentiments toward their cave-diving counterparts.

Mr. Mackey fails to appreciate the need for this kinship by overlooking the active role that the NSS has played and continues to play in the Cave Diving Section. Therefore, although I can relate to Mr. Mackey's specific cave-diving interest I cannot understand his narrow-minded perception of NSS membership and dry caving.

Mr. Mackey states that he gets very little from his NSS membership. My response to that is "can't never could until he tried."

In my case, my recent NSS membership, the newfound friends therein and subsequent dry-caving activities have only broadened my understanding of and appreciation for both wet and dry ecosystems. I believe that I am a better cave diver for this reason.

Best regards,
Mark Johnston (NSS #32857)
Chattanooga, Tennessee

* * *

Setting the Record Straight

[Letter to the Editor]

December 17, 1990

Reference is made *[in a Letter to the Editor UWS Vol. 17, No. 6]* to the article, "Di(v)e Deep on Air," appearing in issue 17:4 of the newsletter. This article was listed as having been coauthored by Mr. Averill *[the Editor of 17:4—current Editor's note]* and myself. As a matter of record I did not coauthor this article and can claim no responsibility for same.

Frequently I am asked to review articles planned for publication, for *UWS* and many other publications. With the quantity of articles I receive, my most typical method of critique is to hand write in the side bar my suggestions, evaluations, and, if you will, points of ponder. This you are aware of from our prior collaboration on other subjects. My critique of an article should not be interpreted as being coauthor of that or any article. Rest assured that, in the future, should I coauthor any article you will know about it directly from me.

I would appreciate you passing this on to the readers of *UWS*.

Sincerely,
Joe Prosser (NSS #24253)
Training Chairman
Miami, Florida

* * *

Diving the Yucatan

[Letter to the Editor]

April 1, 1990

I have just returned from a week of cave diving in the Yucatan. The "new frontier," as it is often described, is an awesome array of bright white tunnels, impressive stalactites and stalagmites, as well as the excitement of moving in and out of haloclines. Diving there is certainly worth the effort that some of the sites require to get in and out of.

I have some comments that I hope you will publish for the cave-diving community regarding diving in this area. The first deals with the use of a guide. The dives we executed were seldom in-and-out-type dives. Rooms with potential formations were not on the direct paths. During the course of the week, I often commented, "How did anybody ever find those spots." At the end of the trip, while doing some post-dive analysis, our host, Mr. Tony DeRosa, stated that people diving these sites without guides experienced a better than 60% busted-dive ratio in the sense of not finding the intended dive site's main attraction.

Our guide, Mr. Steve Gerrard, added to that assessment that the additional complication of logistical support for these dives is often overwhelming to people who just come down to cave dive. "They often end up spending

much of their time finding, then obtaining, the necessary dive support." From the traveler's point of view, Steve and Tony's operation made the trip hassle free and let us concentrate on diving.

My second commentary deals with diver care for the environment and the level of expertise required for this trip. You do not need to be the world's most experienced cave diver to dive the sites we covered. You do need to be technique oriented and environmentally concerned from the time you leave the paved road on the treks into the dive sites. The terrain supports an ecosystem under pressure from social development. The dive sites are fragile and formations are easily destroyed. Pull-and-glide should be minimized or forgotten for these dives. In fact, on all of the dives made, following the guide got us to where anyone wanted to go. Divers had merely to concentrate of their best swimming techniques and enjoy the sites.

My last point concerns overall preparation for a trip such as this. Packing carefully is essential and the use of rigid containers for things such as lights and regulators is highly recommended. Standard dive bags for all else is fine. Fitness is equally important. The weather was overcast and cool most of the time for this trip. Some of these walks *with gear* were more than 100m over *rough* terrain. With a clear day and bright sun, it would have been tough to impossible for those people who think the climb out of Olsen Sink is difficult. My recommendation is bring good solid booties and if you need it, walk with gear as a training program for 2-3 months prior to the trip.

In conclusion, the diving there is great and all cave divers need to do it at least once. Unfortunately, there are already signs of wear and tear in these caves. Careless divers, wanting to see it all on one trip, in their haste have taken away an opportunity for someone coming after them to enjoy this underwater splendor. Remember our motto of "Take nothing but pictures, Leave nothing but bubbles, Kill nothing but time," and these caves will remain as a last frontier for many years to come.

Yours truly,
Norman S. Brinsley
Fort Benning, Georgia

(Reading First Aid Book) "Drowning . . . Drowning ? Drowning!"
— by Mikhail Aljukov

UWS Submissions

We welcome news items, articles, letters to the Editor, photography, art, humor, and other contributions of interest or importance to the cave-diving community for consideration for publication in *Underwater Speleology* from all members, subscribers, and other interested persons.

We can read lengthier submissions in several IBM and Macintosh formats, and will soon be able to download materials directly from CompuServe. However, no one should feel that his typewritten or handwritten contributions are not equally welcomed and encouraged. For additional information, please contact the Editor (address and telephone listed on inside cover). ■

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