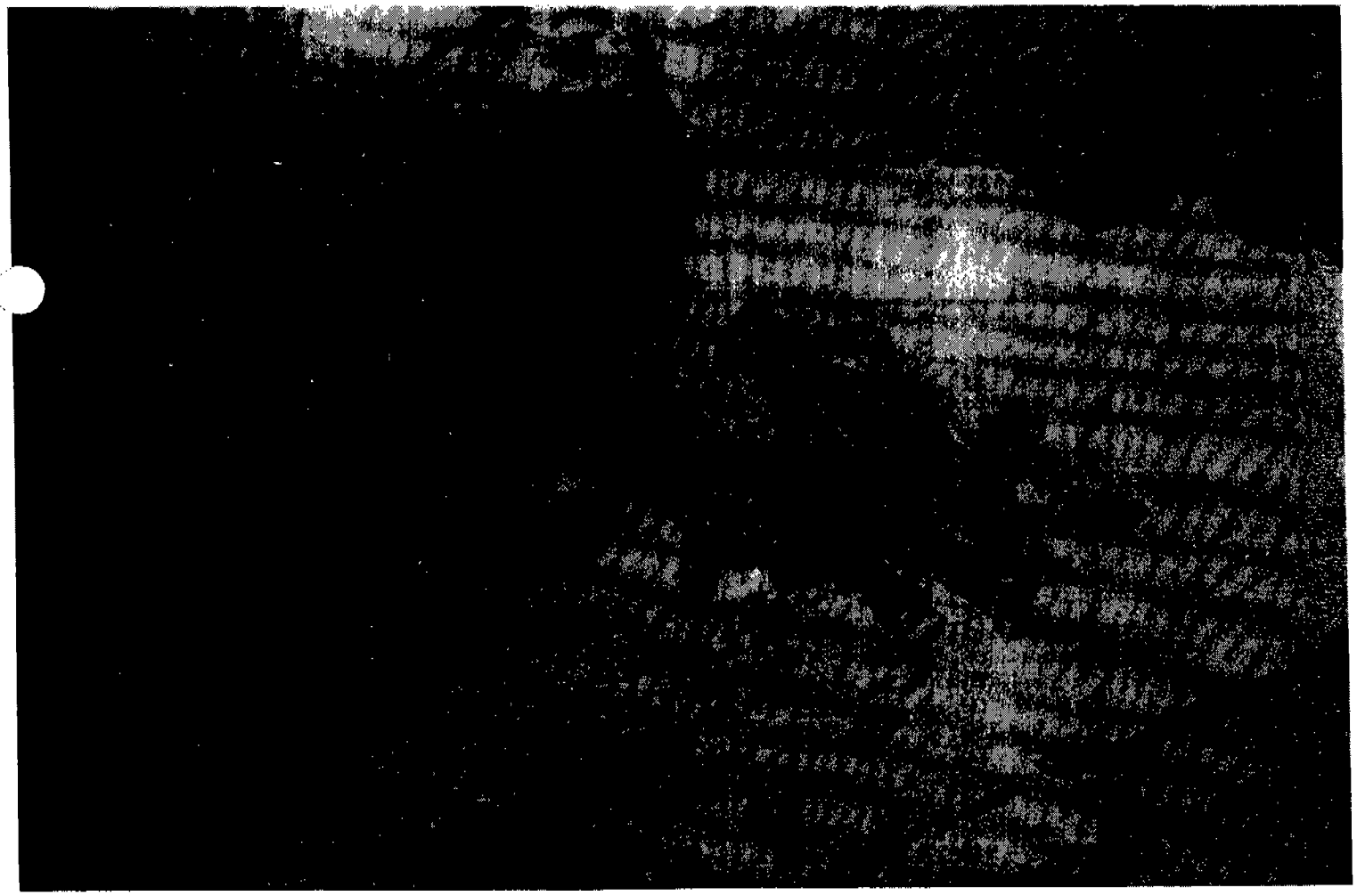
UNDERWATER SPELEOLOGY



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Section membership, which includes a subscription to Underwater Speleology is open to all members in good standing of the National Speleological Society at $5.00 per year. Subscriptions to non-members is $7.00 per year. When making application for membership or requesting subscription information contact:

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Make checks payable to the NSS Cave Diving Section in care of the Treasurer. Opinions expressed in Underwater Speleology are not necessarily those of the section or the NSS.

CALENDAR

May 15-16; May 29-30; July 10-11; NACD Instructor Institute. (National Association of Cave Divers, Box 1222, Gainesville, Fla 33305.)

May 29-30: The 19th National Speleological Society Cave Diving Section Safety Workshop, Branford High School, Branford, Fla. (Steve E. Hudson, 893 Cedar Creek North, S.E. Marietta, Georgia 30067)

June 4-5: National Speleological Society Cave Diving Section Instructors Institute, Branford, Fla. (Forrest Wilson, 2832 Condord Dr., Decatur, Georgia 30033.)

June 19-25: National Cave Rescue Commission Seminar, Columbia, California. (Peri Frantz, 6345 Englewood Ave., Los Gatos, California 95030, 408-356-8506)

June 27-July 3: 1982 National Speleological Society Convention, Bend, Oregon. See NSS News for details.

EDITORIAL

by John Zumrick

New officers elected to the executive committee this past November were William Fehring, chairperson; Stephen E. Hudson, vice-chairperson; and Stephen Straatsma, secretary. They replace Dennis Williams, Karen Wark and Mary Ellen Eckhoff. Continuing on the executive committee are Stephen Maegerlein, Treasurer; Forrest Wilson, Training Director; and John Zumrick, Editor of Underwater Speleology.

I personally would like to thank the outgoing officers for their efforts on behalf of the Cave Diving Section over the past year, and look forward to their continuing support of the section. The lessons they have learned during their term of office will prove helpful to the new executive committee members.

Over the past year several individuals have distinguished themselves by making outstanding contributions to the section. Henry Nicholson and Karen Wark served as workshop chairpersons for the May and December work-

shops. Organizing these workshops requires a great deal of individual effort. Both workshops were an outstanding success based on the various comments I have received from the participants.

During the 18th Cave diving Workshop the long awaited section slide show debuted. Although it contains slides contributed by various section members, the majority of the enormous amount of work required was borne by Wayne Marshall. This slide presentation has already proven an outstanding success and will be of significant benefit to the image of the CDS in the future.

Stephen Maegerlein has for many years performed admirably as our treasurer. As such he performs an extremely tedious, little recognized, but essential function of maintaining our books and important records. The promptness and care with which he performs this little recognized function over the past years has proven of extreme benefit to the section.

The efforts made by the above individuals were made in support of the section and its members. Their work benefitted them little. Their satisfaction has come from doing something useful for the section. Such unselfish efforts on our behalf deserves our most sincere appreciation. Because of the dedicated efforts of section members such as these, the section is what it is today, the largest and most successful of all cave diving organizations.

Many other individuals have played a significant tho less apparent role in support of the section during the past year. Those who have submitted articles, participated in workshops, served actively on the various committees, and worked to improve cave conservation and the section's image to the public have benefitted all of us. I congratulate you.

This issue begins another volume of Underwater Speleology. The new executive committee is hard at work trying to make the section better for you. This year more than ever I feel sure that the outstanding contributions of so many on behalf of the section and its members will continue and even increase so that cave diving and the section will continue to prosper.

SUMMARY SUBMITTED BY WILLIAM FEHRING, CHAIRMAN

SUMMARY OF MARCH 27, 1982 EXECUTIVE COMMITTEE MEETING

A. Purchase Of Signs For Use In Caves.

The Executive Committee voted to authorize Steve Hudson to spend up to $600 to purchase additional signs for distribution in underwater caves. These signs would be made of highly reflective materials such as those used for road signs, and would be sealed. Steve feels he can get about two dozen signs made for the above sum. One half will be similar to signs already deployed in Peacock and Devils Eye Cave Systems. The other half will be more stongly worded as indicated below. Multiple signs may be installed in some caves, like Burma Shave commercials. Completed signs will be turned over to the safety coordinators for installation.

PREVENT YOUR DEATH
BE TRAINED IN CAVE DIVING
OR DON'T GO ANY FURTHER
MANY CERTIFIED DIVERS
HAVE DIED HERE
(EVEN INSTRUCTORS)
PLEASE LISTEN

B. Resolution For City Of Branford.

The Committee approved a resolution of appreciation to the City of Branford to be presented to the mayor at the next workshop in May.

C. Report On May Workshop And NSS Convention

Vice-chairman Steve Hudson reported that the May workshop will be held at the Branford high school auditorium. The committee had previously approved trying to find a larger facility for the workshop. The rental may be higher at the high school, but the committee feels the workshop could remain a finanacial asset.

Steve reported that he will be attending the NSS Convention in Bend, Oregon, in June. He will conduct a meeting of Section members attending and will represent the Section at the convention.

Executive Committee Meeting continued.

D. Increasing Liason With The NSS.

Steve Hudson recommended that the Section Chairman order the monthly internal organization circular produced by the NSS. The committee approved placement of a section ad in the NSS News and submission of accident reports to the NSS News.

E. Cave Files.

The committee approved forwarding of copies of the section's cave files to the NSS cave files. Current policy allows data contributors to stipulate specific restrictions on access to file material.

F. Recovery Workshop.

The committee discussed the information to be requested of applicants for the new recovery workshop. It was decided that any certified cave diver and section member who had completed the evolving training program could be added to the recovery team list. Location of any diver on the regional lists will be based on experience, training, willingness to assume responsibility, etc. These lists will be developed by the program coordinator. The committee approved issuance of recovery team I.D. cards and a processing fee of $1.00.

G. Instructor Institutes.

The committe approved new standards for NSS Cave Diving Instructor Institutes. The standards include provisions regarding institute directors, staff, sanction, fees, candidate prerequisites, performance standards, and records. Copies of these standards are available from the Training Director, Forrest Wilson.

The committee asked the Training Director, assisted by his Training Committee, to review the current requirements for section sanctioned training courses in light of experience gained since they were first adopted. In the course of this review the Training Director and the committee are to consider including an introductory chapter to the training manual which may include language addressing the following areas:

a. Compression of courses into less than a recommended time frame,
b. Running students through the three courses consecutively without a break,
c. Use of borrowed or rental gear by students,
d. Use of vulnerable caves for training,
e. Inappropraite or manipulative motivation of students,
f. Solicitation of students.

H. New Policies On Course Announcements And Media Presentations.

The committee adopted the following new policies concerning course announcements and media presentations sanctioned by or involving the section. In addition, the committee reaffirmed the section's full support of the existing NSS policy on cave conservation.

POLICY ON COURSE ANNOUNCEMENTS

1. Simple course announcements should be distributed to as many locations as possible where they may be seen by divers who may reasonably be expected to travel to and dive in caves or caverns including dive shops, dive clubs, and diving newsletters.

2. Placement of announcements or advertizements in magazines intended primarily for open water recreational divers should be undertaken only with extreme care so as not to be in conflict with policy 3 below.

3. Announcements and advertizements should in no way challenge the reader's ego or in any other way encourage a person without a previous sincere interest in the exploration and understanding of caves to take up cave diving.

4. Announcements or advertizements should not dwell on the attributes of caves or cave exploration so as to create an attraction for the reader. Rather, announcements should stress the safety orientation of the CDS program and the necessity of proper training to successfully participate in this activity.

Rationale

The great preponderance of cave diving accidents involve open water divers entering caves even though they lack appropriate training and experience. Successful cave diving requires mitigation of a great number of potential hazards even by highly trained and experienced participants. Due to the numerous potential hazards involved cave diving cannot be considered as a simple extension of open water recreational diving. Proper risk assessment is a vital part of successful cave diving, and this requires appropriate motivation on the part of participants.

POLICIES ON MEDIA PRESENTATIONS ON CAVE DIVING

1. Presentations should clearly differentiate between cave diving and recreational open water diving. Cave diving should be depicted basically as an extension of caving, not diving.

2. The many safety aspects which are necessary to mitigating the hazards of cave diving should be clearly stressed.

3. Presentations should not glorify underwater caves or cave diving, nor should they challenge the reader's ego, so as to motivate a non-participant into taking up cave diving.

4. Presentations should clearly differentiate between the nature and attributes of specific caves or regions containing caves.

5. Visual or written depictions of cave diving should generally include only proper cave diving equipment and techniques. Depictions of improper equipment or techniques should be clearly labelled as such, and the potentially fatal results of such equipment or techniques should be clearly stated.

NOTES ON ALUMINUM TANKS

You may by now recall that two aluminum dive cylinders recently blew up while being charged, seriously injuring two dive shop em-

RATIONALE

A great deal of training, experience, and technical skill is necessary to successfully mitigate the numerous potential hazards involved in cave diving. Due to these requirements cave diving cannot be considered a simple extension of open water recreational diving. Proper risk assessment is vital to successful cave diving and requires appropriate motivation of participants.

The "risk taking" nature of cave diving makes it highly vulnerable to sensationalistic media coverage. Media exposure of cave diving activities is expanding rapidly as a result of accidents, new applications of cave diving to scientific studies, and previous media coverage. Such media exposure can directly contribute to participation in cave and cavern diving by persons not previously familiar with this activity.

ployees. Investigation showed that the cylinders had been baked in an oven to cure the paint that had just been applied. What followed was a major editorial in Skin Diver magazine on the problem of judging blame for the injuries. Who was at fault? Was it the tanks manufacturer or distributer, the painter of the tank, or the tank owners for not notifying the shop's employee that the tanks had been painted?

It is perhaps interesting that the diving communitee had been warned of just such a problem as far back as May 1977 where in the Underwater Forum of Skin Diver, H. W. Weart, Chairman of the Dept. of Metallurgical and Nuclear Engineering, University of Missouri-Rolla wrote, "The other important metallurgical fact is that tank materials lose their manufactured strength very rapidly if they are overheated even for short times such as in a fire. The 6351 alloy used for aluminum is especially susceptable to this overaging, which can begin in less than 15 minutes at 350°F. It is quite possible for a tank to receive such a heat treatment without any outward sign betraying it because some paints will not even discolor with such a brief

continued on page 11.

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SENSATION SEEKING AND LOCUS OF CONTROL IN SPELUNKERS: FURTHER VALIDATION OF THESE PERSONALITY CONSTRUCTS

Penny R. Lukin and Barry F. Beck
Georgia South Western College, Americus, Georgia 31709, U.S.A.

ABSTRACT

The personality of spelunkers was investigated by means of a mail-survey to a random sample of National Speleological Society members. Demographic variables, amount and intensity of caving activity, sensation-seeking and internal-external locus of control scores were obtained for each subject. Results showed spelunkers to be a heterogeneous group with sensation-seeking and locus of control scores not significantly different from the general population. Amount and intensity of caving activity, however, did correlate significantly with sensation-seeking, with the most active cavers being higher in sensation-seeking. Locus of control scores only showed significant correlations with certain types of spelunking. Males and females showed no significant difference in caving activity.

Why do some people like to crawl, walk or climb in cold, dark holes in the earth? What type of person chooses to be a spelunker? This study was designed to investigate the relationship of certain personality dimensions to amount and nature of caving activity. The dimensions on which the study focused were sensation-seeking and internal versus external control of reinforcement.

Sensation seeking, as conceived by Zuckerman, can be conceptualized as curiosity, exploratory drive or a need for stimulation. The total concept of sensation seeking comprises four distinct subscales: thrill and adventure seeking, boredom susceptibility, disinhibition, and experience seeking. Experience seeking is the need to try a wide-variety of new and different experiences, whereas thrill and adventure seeking is the desire to attempt activities which most would consider exciting, or even dangerous, not just different. Boredom susceptibility and disinhibition are self explanatory. Research has shown wide-spread individual differences in this trait which may be biologically based. (See Zuckerman, 1978 a & b for a more detailed discussion of this construct and a review of the research literature.)

The concept of internal vs. external control of reinforcement was developed by Rotter (1966 & 1971) from social learning theory to describe the degree to which individuals perceive reinforcement contingent upon their own behavior. Internal control refers to individuals who regard the locus of control to be internal (self-generated) while external control refers to individuals who believe reinforcements are not under their personal control, but are under the control of external forces (e.g., luck, chance, fate, powerful others). Both sensation seeking and belief in internal or external control are measured by a forced choice test where the subject selects which of 2 choices best describes him or her.

Since sensation-seeking has been shown to be higher in those involved in physical risk taking, such as skydiving, race car driving, snowmobiling and underwater diving (Zuckerman 1978 a, p. 519), it was hypothesized that spelunkers also would show high sensation-seeking scores. Previous research (Joe, 1971, p. 632) also suggests a relationship between internal-external control and risk-taking behaviour. Internals are more cautious and conservative than externals in risk-taking situations in an attempt to control events. Zuckerman (1978, p.508) also reports a correlation between a belief in external control and various aspects of sensation-seeking. Thus, it was hypothesized that cavers would be high both in sensation-seeking and belief in external control. A random sample (n = 200) of members from the National Speleological Society (NSS) was selected from the NSS 1978-1979 membership list. These subjects were sent: (1) a cover letter explaining the research project; (2) a Background Data Sheet, to ascertain demographic

variables and the amount and intensity of caving activity; (3) a modified version of Rotter's Internal- External (I-E) Locus of Control scale (Rotter, 1966); and (4) Form V of the Sensation-Seeking scale (Zuckerman, 1971). Subjects were asked to complete the questionaires, and return the answer sheet, anonymously if they preferred, to the researchers.

Seventy-nine questionaires were returned, yielding a 40% response rate. Sensation-seeking scales (SSS) were scored for Thrill and Adventure Seeking (TAS), Experience Seeking (ES), Disinhibition (Dis), and Boredom Susceptibility (BS), as well as a total score (TSS). The I-E Locus of Control scale was scored for the amount of belief in external control, with high scores indicating high external orientation, low scores indicating high internal orientation.

The frequency and intensity of caving activity was scored by tabulating responses to various items on the Background Data Sheet. Three scores were derived in the following manner: (1) "Group" caving indicated the amount of participation in group meetings, cave projects, society newsletters, group caving and cave conservation projects; (2) "Sport" caving indicated the extent of involvement in actual spelunking, vertical caving and cave diving; (3) "Carousing" indicated the extent of involvement in partying at NSS conventions, extra and premarital sexual activities, and consumption of marijuana and alcohol.

Histograms were constructed to observe the patterns of scores, and Pearson product-moment correlations computed to explore the relationship between background variables, caving activity and the scores on the personality measures.

Statistical analyses showed that spelunkers as a whole are a heterogeneous group. Their mean scores on the Sensation-Seeking scales did not differ signifcantly from those found in the standardization sample (See Zuckerman, 1971). However, the degree of Carousing, Sport and Group caving all correlated significantly ($p < .05$) with Sensation-Seeking scores and with each other. For example, cavers who are very active in group social activities also tend to be active in sport caving and carousing activities, as well as being high in Sensation-Seeking. However, those high in Carousing or Sport or Group caving were not identical. While all three groups' scores correlated significantly ($p < .05$) with the Sensation-Seeking subscales of Experiences-Seeking and Disinhibition, only those high in Sport caving tended to have high scores on the subscale of Thrill and Adventure Seeking.

Locus of Control scores only correlated significantly with carousing, with high external Locus of Control being significantly correlated ($p < .05$) with amount of carousing.

As an interesting adjunct, all variables were compared for males vs. females. None of the caving related variables showed any significant difference. In fact, only two of all the variables were significantly different: gross income and Thrill and Adventure Seeking subscores. Zuckerman (1978a) had already reported the latter in several studies. An unpublished survey by Carol Besely and Dave Bunnel, conducted at the 1979 NSS Convention, did find significant differences in caving activity between males and females. It is hypothesized that this discrepancy is the result of sampling technique. At a convention, female dependents who are not primarily cavers in their own right are more apt to respond to a survey. On the other hand, non-caving dependents would be unlikely to take the time to respond to a mail survey.

In summary, spelunkers, as reflected by the NSS sample, seem to be a hetergeneous group in personality, with scores on Sensation-Seeking and I-E Locus of Control scales varying as in the general population. High Sensation-Seeking, however, does seem to differentiate between very active and less active cavers. In addition, the Sensation-Seeking subscales differentiate among different types of cavers, with all active groups showing high scores in Experience Seeking and Disinhibition, but only active Sport cavers showing high scores on Thrill and Adventure Seeking.

Locus of Control does not seem to differentiate the active versus less active cavers, except in the area of carousing, where belief in external control was correlated with carousing activity. Thus, those cavers who are

more likely to drink, take drugs, be sexually promiscuous and party frequently are more likely to believe in external locus of control.

Such data adds further construct validity to the concepts of Sensation-Seeking and Locus of Control, in that these personality dimensions seem to have some expected behavioral correlates. Although the original prediction that spelunkers as a total group would be generally higher in Sensation-Seeking was not supported, it can be seen that the amount and intensity of caving activity definitely correlates with Sensation-Seeking. Although caving activity, in general, did not correlate with external locus of control, intensity of carousing activity did. Thus, while spelunker do not seem to be a homogeneous group, clearly distinguishable from the gereral population, the amount and type of caving activity, however, does seem to have various personality correlates.

Acknowlelgements

This research was supported in part by funds from the Charles Mix Foundation.

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A DIVE WITH JOCHEN HASENMAYER

By
Sheck Exley

My recent trip to Germany had four objectives; (1) to view the new 1982 VW's since my VW dealership was paying for the trip, (2) to see the land that my ancestors were chased from 250 years ago, (3) to dive in a German cave, and most importantly to meet Jochen Hasenmayer. I doubt if there is any experienced cave diver in the world who has not heard of Jochen's exploits many of which have involved record dives. It is no exaggeration to say that he has dominated cave diving on the European continent since 1957 (though lately Leger, LeGuen and Isler have offered him some competition). Naturally, when I learned that by far the finest cave dive in Germany is a few miles outside the hometown of my ancestors (Ulm), I had to immediately write Jochen to see if there was any possibility of us getting together.

My dreams were realized despite severe difficulties. Jochen was able to secure extra-special permission for our dive and was able to hurry back from France in time for the only day I could dive in spite of mechanical difficulties with his van. As if this were not enough, he even let me use his tanks and regulators, bought us lunch and souvenirs and his attractive wife Barbara took a lot of pictures for us.

On the appointed Saturday our escape from the autobahn was successful (we had to run 90-100 mph to keep from getting run over in the right lane while in the left lane Porches, Sciroccos and Rabbit GTI's whizzed past at 140 mph on this no speed limit superhighway). My friends Wolfgang Morlock and Franzjorg Krieg had told me that Jochen was about my height and weight, otherwise I would have expected him to be at least six and a half feet tall because of his peerless reputation. Yet I was to learn that the two of us were remarkably similar in many respects, even to having about the same eyeglasses! However, in at least the area of cave diving

I must admit that I was clearly inferior. Consider this: Jochen has independently come up with almost every innovation in equipment and procedure that has been produced by the entire Florida cave diving community many of them years before us! And he has many additional ideas that have yet to occur to us. And consider that he has gone 5740 feet in a French spring 230 feet deep with 50°F water requiring ten hours duration, a dive beyond the immagination of any other European, British, American, or Australian cave diver. It is no wonder that Jochen is the world's only full time professional cave diver.

From our dive in Blautopf, German for surprise!-Blue Spring, Jochen let me use two single 20 liter tanks hooked together and mounted on the back like our twin 100's except about eight inches longer. Each tank had dual screw type vlaves especially machined by Jochen to accomodate two O'rings for safety. On some dives he actually uses four of these huge tanks, all back mounted. His homemade dry suit is clearly superior to anything on the commercial market. His helmet mounted quartz lamps are the equivalent of Aqua-suns without their wiring problems and redundancy in his equipment even extends to dual watches.

Blautopf itself is a beautiful blue basin about 200 feet in diameter at the base of an imposing cliff of the Schwabish Alps. The basin is filled with very clear water (we had 40 foot visibility which Jochen says sometimes in September gets as good as 100 feet.) and loads of plants and fish. Unfortunately, at 48°F the water was two degrees colder than any cave water I had ever been in, and by the end of our hour and a half dive I was quite chilled. Jochen looked like he was good for at least another half day or so. The cave entrance was at a depth of about 70 feet, at the bottom of a large cavity in the center of the basin. Inside the cave quickly opened up into very comfortable dimensions and a fairly linear trend (Jochen joked, "West toward California, east is home toward Florida."). Some of the rooms were quite large and irregular, but no side passages were spotted.

At 500 feet back we dipped down to about 130 feet depth. My tanks became uncomfortably positively bouyant at 1150 feet as we ascended above 60 feet, and I called the dive despite my desires to see more of the cave. Jochen reacted instantly to my light signal, which was typical of his excellent alertness and attentiveness, putting forever to rest the myth that solo divers do not make good buddies. His silt technique was also excellent and he was extremely relaxed. For my own part I was a little uncomfortable because of the extreme cold and strange equipment despite Jochen's help. Nevertheless, during decompression there was only one word I could write on my slate to Jochen Hasenmayer, the world's best cave diver: Wunderbar!

You know you have been decompressing too long when:

- You begin searching under rubble for food;

- Your dentist's efforts and years of braces-fail as you bite takes on the current form of your regulator mouthpiece;

- You begin reading books you would never admit to even looking at topside;

- Upon emergence from the spring your dry-suit resembles an individual with a severe case of elephantiasis;

- Your woodcarving of the New York Skyline is completed and your decompression tree resembles a totem pole;

- You give up looking for food and begin eating limestone, wood, or mud;

- Your bottom timer runs down;

- You take your fins off and revive ballroom dancing (preferably at a ten foot stop with a sand floor, music optional);

- You resemble a Christmas tree with snails on every conceivable projection;

- You switch to the gallon size Joy dishwashing liquid for penance in the spring after the dive;

- You are writing your life story and run out of things to say.

CAVE DIVER WORKING TO TURN SPORT INTO TOOL FOR RESEARCH

By Gil Klein
Reprinted Courtesy of the Tampa Tribune

It ranks among the most hazardous ways to gather data, but a group of cave divers wants to mold its adventurous sport for scientific research that could provide Florida with new supplies of fresh water, protect known water supplies from pollution and find potential sinkholes.

"One little sinkhole that's no bigger than my desk can connect to thousands and thousands of feet of tunnels and caverns," said Dr. William Fehring. "A lot of people dive into caves for the thrill of exploring the unknown, but there's a place for someone with the interest and training to search for the scientific unknowns too."

Fehring spends a great deal of his free time form his job as the Tampa Port Authority's environmental affairs director diving into caves and squeezing through crevices to explore the caverns under Florida.

He was recently appointed chairman of the cave diving section of the National Geological (sic) Society, and he is now trying to encourage interest in the scientific value of his sport.

A homeowner sitting next to his pool in the Beacon Woods subdivision in Pasco County was startled recently to hear a voice come out of a small nearby pond shouting, "Where are we?" Two divers were splashing around in the pond, and as mysteriously as they appeared, they disappeared back underwater.

That was Fehring and a fellow diver studying the interconnecting cave system under Beacon Woods. He said he did not think that the subdivision was in danger of dropping into sinkholes, but he warned developers to be careful what they dump into the area's ponds because the water in them is linked directly to a public water supply well.

Fehring is quick to emphasize the hazard of cave diving, and to warn poeople that unless they are highly trained and have the right equipment, they are taking a potentially fatal risk.

"I've personally recovered three bodies from sinkholes in the past 10 days," Fehring said earlier this month. "Sixteen people have died in caves during the past year. There's a very limited number of people who are willing to make the total commitment to safety that this requires."

Much of Florida north of Tampa and west of the state's central ridge is permeated with tunnels and caverns that have formed in limestone deposits during millions of years.

Layers of limestone, which is largely compressed coral, were created each time the sea level rose to wash over the land. Those layers make up Florida's aquifer, the fresh water-laden rock that supplies most of the state's drinking water.

As the sea level receded, the limestone was exposed to rainwater which is slightly acidic from carbon dioxide and soil acids.

The acidity dissolved the limestone along its cracks and fissures, which created sinkholes dropping scores of feet, tunnels hundreds of feet long, and caverns as large as Tampa Stadium.

The caverns became interconnected by the tunnels to form underground rivers that eventually pop out as springs. Some of those springs are along the marshland that borders the Gulf of Mexico, and the fresh water pouring out of them has become an integral part of the coastline ecology.

Until the middle 1960's, researchers working with drills only had a vague idea that these underground caves and rivers existed. But with the widespread use of the Aqua-Lung scuba device, people began to dive down into springs and sinholes and discover the tunnels.

"We can actually see the geology laid out down there just like the Grand Canyon," Fehring said in explaining why diving into the cavers produces more information than drilling rock samples. "A core boring from a well can only look at a narrow piece, but the diver is looking at a whole geological system.

"For the price of one fill-up of air, we can gather much more information than a number of core borings, and we can do it a lot faster," he said. "A core boring can only look at a vertical sample of the rock. A diver can look at the formations laterally."

William Sinclair, a researcher for the U.S. Geological Survey, agreed that the cave divers could provide important information that would be difficult to get any other way.

"We have computer models of the aquifer, but they are only generalities of what is underground," he said. "The divers are looking at the anomalies. An underground river is a unique thing."

This information could be valuable to provide Florida with a more reliable water supply, he said. Now, most of Florida's water comes form wellfields where wells are drilled into the aquifer and water is sucked out from the crevices in the porous limestone.

The city of Tampa experimented by pumping water from a sinkhole near the Morris Bridge wellfield and from the wellfield itself, Sinclair said. The results showed that pumping from the sinkhole lowered the ground water level less than pumping from the wellfield.

Finding these underground systems could save Floridians untold amounts of money; and controversy to supply water-poor southwest Florida in the future, he said.

"There may already be natural pipelines," he said. "We have to find where they are."

And while the divers are exploring, he said, they may be able to spot potential sinkholes.

"If they look up and see a dome that's lined with clay rather than limestone, and it's got roots coming out of it," Sinclair said, "they will have found a spot that sooner or later is going to cave in."

Fehring said water conservation and pollution control are as much a part of his group's research as water supply.

Some subdivisions drain their storm-water runoff into ponds that are actually sinkholes, he said. That means all the oils, metals and chemicals that wash down suburban streets are dropping into these interconnecting rivers of fresh water that may stretch for miles.

Some of these tunnels open under the Gulf of Mexico, he said, so that the water running through the system ebbs and flows with the tides. That means the pollutants dumped into sinkholes could be pushed farther inland with incoming tides until they are under water-supply wells.

If a garbage landfill is built over a cavern syatem, he said, toxic pollutants could seep down into the underground river system and be carried farther than anyone realizes.

Tanks, continued from page 5.

temperature excursion... The implication is clear: any aluminum tank with discolored paint or that is suspected to have been heated above 300°F for more than a few minutes should be hydrotested before being refilled."

COMING IN FUTURE ISSUES OF UNDERWATER SPELEOLOGY

A New Cave Diving Light

The Use of Composite Cylinders for Cave Diving

The Story of DiePolders Sinks, Its early exploration and the reopening