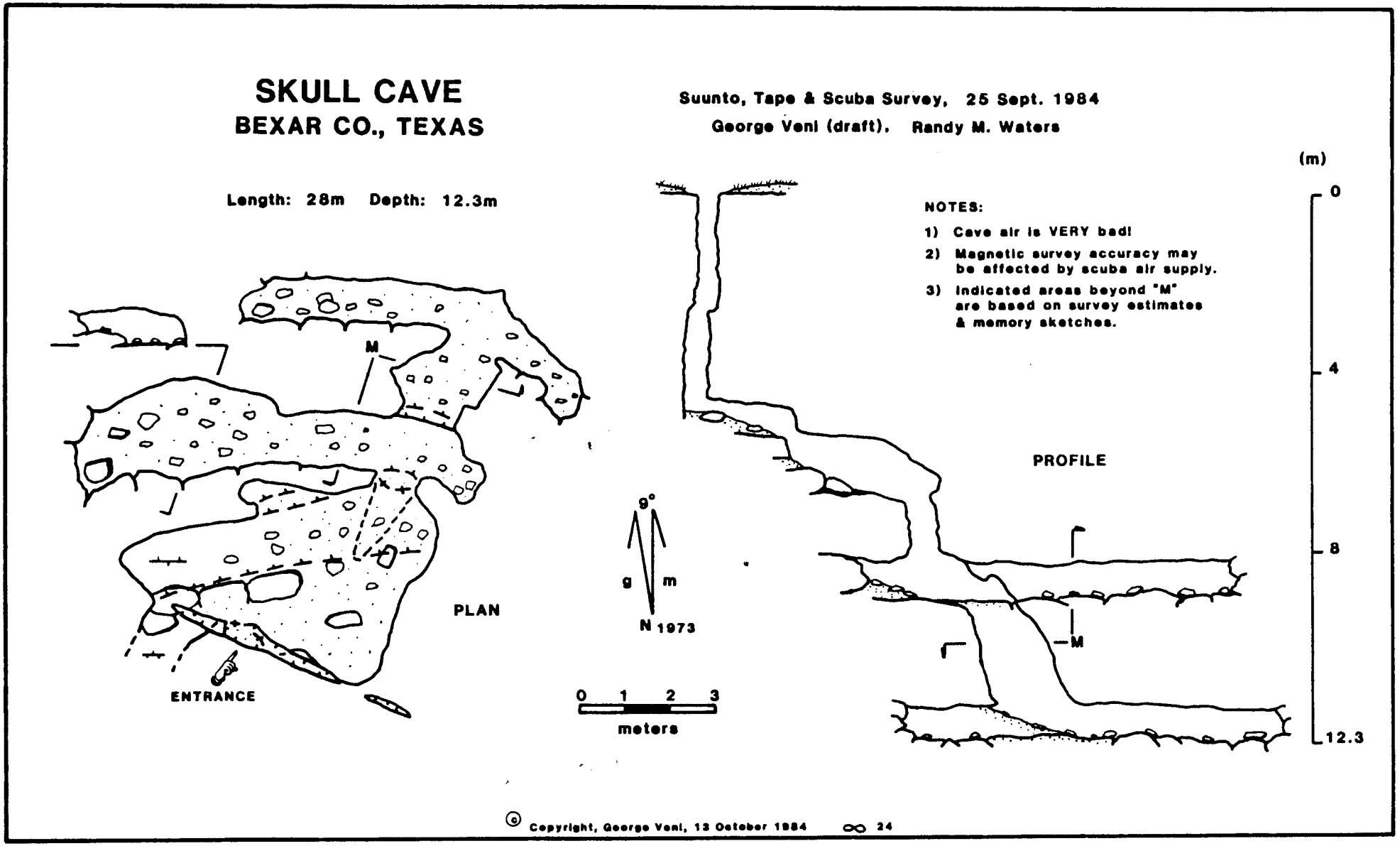
COMPASS & TAPE



Volume 3 Number 1 Summer 1985

COMPASS & TAPE

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Contacts

Dues, Memberships, Subscriptions, Address Changes, etc.:

Lance Lide
SACS Treasurer
P.O. Box 2601
Little Rock, AR 72203
H:501-354-2633
W:501-569-3349

Articles, Maps, Letters, Comments, Tips, Photos, etc. :

John Ganter
Editor, COMPASS & TAPE
1016 Taylor St.
State College, PA 16801
H:814-238-0957

COVER: Skull Cave, by George Veni. Located in the city of San Antonio, TX, this cave gives the term "bad air" new meaning. Full write-up, including a photo of Randy Waters breathing desperately through his Scuba regulator while trying to take an instrument reading, is in the April, 1985 TEXAS CAVER.

Contents

An Outsider's Look At The Inside Of A Cave

by **Ellen Bartsch**

I have never been inside a cave. The closest I have ever come to one is seeing the signs along the roads of central Pennsylvania which point the way to "Penn's Cave" or "Indian Caverns". The thought of taking a journey into the deep, dark netherworld of a cave makes me extremely uneasy, so I may never go into one. Yet, in spite of my fear of going underground, I like caves because I am intrigued by the way they are mapped. I am a cartographer.

Cave mapping was first brought to my attention through a map production class I was teaching at Penn State University. The students were asked to bring in any maps that they wanted to so that we could examine them for the common errors in cartographic design. One of the students brought in a map of a cave. I had never seen such a map and I was completely amazed by the whole idea of representing underground space on a piece of paper. You must understand that we cartographers are always interested in looking at new things to map or at finding new ways to map old information. When I looked through more cave maps, I continued to be fascinated but I was convinced that there needed to be more work done toward developing better cave mapping methods. I started looking into the cartographic literature to see what had already been written about cave maps; I did not find much.

Research into cartographic representation of spatial relationships in the physical environment is limited primarily to topographic maps, i.e. those which depict space at or above the surface of the earth. Space beneath the earth's surface has been almost completely ignored in cartographic research. The theories and practices of topographic mapping are well- established. It would be optimal for cave cartographers if some of the principles used in topographic mapping could also be used to map subsurface forms. This is, unfortunately, not the case.

The visual basis for cartographic symbolization in conventional topographic mapping systems is the exposed land surface. To put it simply, as long as the surface of a feature is visible from the bird's eye perspective it can be symbolized and mapped. Information on the significant dimensions of features--elevation, width, and length--can be shown using numerous different techniques, e.g. contours, hachures, or hill shading. Even fairly complex phenomena, such as dynamic processes of weathering or human alterations, can be symbolized on or at least inferred from many topographic maps. Each method of topographic representation shows landforms in a unique way, and each method has advantages and disadvantages over the others. For example, contour maps are extremely useful for showing fairly detailed information and are excellent for pinpointing elevations and feature location, but they are poor depictions of what the landform really looks like; it takes a trained eye to figure

out what all those squiggly lines mean (fig. 1). Although a map is a two-dimensional graphic surface, cartographers are able to show spatial relationships so that the map gives the appearance of showing three dimensions.

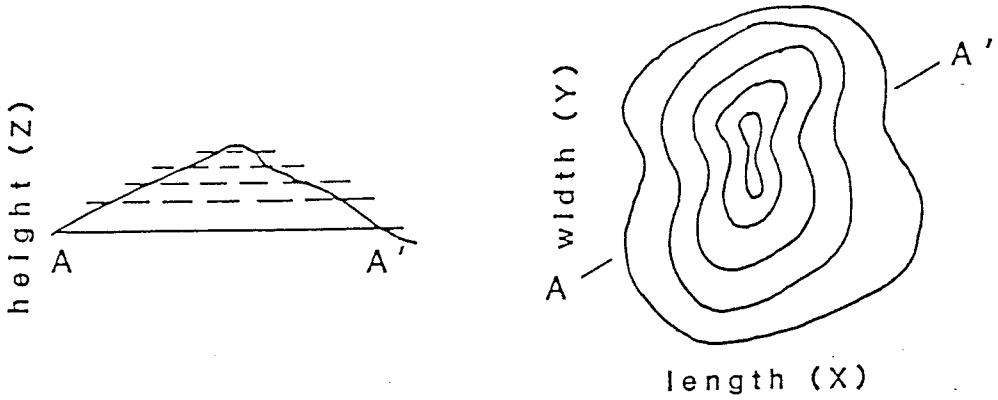

Fig. 1 -- How contours work

Most topographic mapping systems also utilize a method for precise location of features. The geographic grid, aka latitude and longitude, is the most common locational system used in cartography. This adaptable system allows points to be located on the surface of the spherical earth and on the flat map surface. Other systems used for surface feature location utilize a rectangular rather than a spherical coordinate system. These include the Universal Transverse Mercator grid system (UTM) and the State Plane Coordinate System (SPCS).

Cave mapping does not involve a simple adaptation of topographic mapping techniques to the subsurface environment. The relationships between caves and their surroundings are conceptually complex, graphically difficult, and almost entirely different from the conditions which pertain to surface landforms. Caves are spaces which are walled inside of the earth. Their boundaries are delimited by how far into the cave space the geologic surroundings intrude. The cave's surface are its walls, floor, and ceiling, and the surface is visible only from a perspective inside the cave. The bird's eye vantage point necessary for topographic mapping is impossible for cave mapping; a cave cannot be seen from above. It is necessary to use a mapping system which allows the cave to be visible within its stoney surroundings.

The complexities of cave mapping can be divided into two major categories; how to show the configuration and appearance of the cave, and how to show where the cave and its component parts are located in space. Showing what the cave looks like involves accurate representation of the three dimensions of the cave. This is not an easy task because most cave structures are dimensionally complex. A cave is not a simple tube; the height and width of a cave vary continuously along its length. There may be voids

above, below, or to the sides of the main cave passage. In addition, the cave passage itself may have a general diagonal inclination. The odd dimensionality of a cave is most simply shown with cross- sectional views similar to those used in architectural drawings; a plan view, which shows width and length, an elevation view for showing length and height (called a longitudinal profile), and cross-sectional views along the cave passage to show height and width (fig. 2). Using this cross-sectional technique is accurate, but it does not allow for more than two dimensions to be shown in one view, so it is difficult to get a clear idea of the cave's physical appearance. A more artistic approach to showing the cave involves the graphic reversal of the physical properties of the cave and the surrounding bedrock so that the cave appears as a solid figure "floating" in

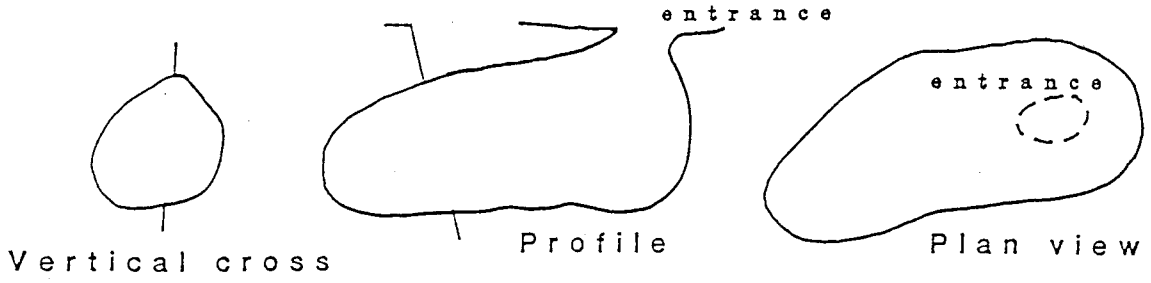

Fig. 2 -- cave cross sections

rock.[1] While this method shows all the dimensions of a cave in one view, it is difficult to make such a map because of its artistic complexity, and there is much less dimensional accuracy.

Establishing a system for locational referencing of caves is necessary both for locating where the cave is from the surface, or plane perspective, and for identifying the cave's location within the subsurface environment. Showing the cave's location from the surficial perspective is usually carried out by projecting the progressive horizontal development of the cave onto a single visual plane and then tracing the results onto a topographic map (fig. 3). This is somewhat misleading, since the linear development of the cave may (and usually does) occur at a slope, so that the trace of the cave's horizontal dimension will appear shorter than the cave really is (Chabert and Watson, 1981). In order to have any usefulness as a locational referencing aid to cavers, a cave map should show where the cave is beneath the surface along with an above-ground reference. A fairly complicated system for subsurface location exists in mine surveying (see Williams, 1983). This system is highly accurate for mining, but its applicability to cave mapping is questionable, both in terms of its execution and its comprehendibility.

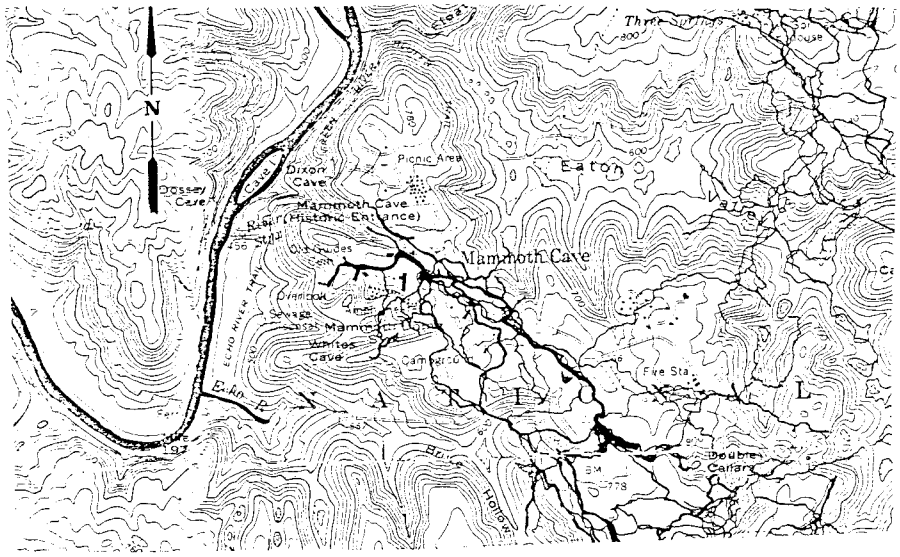

Fig. 3 -- Mammoth Cave (National Park Service, 1975)

In practice, cave mapping is both confusing and complex. A conventional cartographer would go crazy if faced with the same set of demands and conditions that the cave mapper faces. When mapping surface features, a cartographer is usually able to borrow base information that has been mapped, surveyed, or photographed by somebody else. The cave mapper, on the other hand, must personally survey each cave, as there are rarely any existing sources of cave information. There is a broad variety of interests among cavers and, as a result, there are many demands for information to be included on a cave map. Recreational cavers, geologists, hydrologists, and archeologists all explore caves, and they all need information about what is in the cave. Therefore, the cave mapper must be a surveyor, a scientist, and a cartographer. That is a lot to demand of one person.

One reason that cave maps are so confusing may be because cave mappers spend more time on the survey and exploration of the cave than they do on making sure their map is graphically understandable. Cave mappers, like all cartographers, need to critically evaluate their products at every stage of the design process. Such evaluation simply centers around answering two very basic questions:

1) What cave information must be shown on the map?
2) What is the best way to show this information?

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[1] The Mammoth Cave map in the October, 1984 issue of the National Geographic Traveler shows this technique.

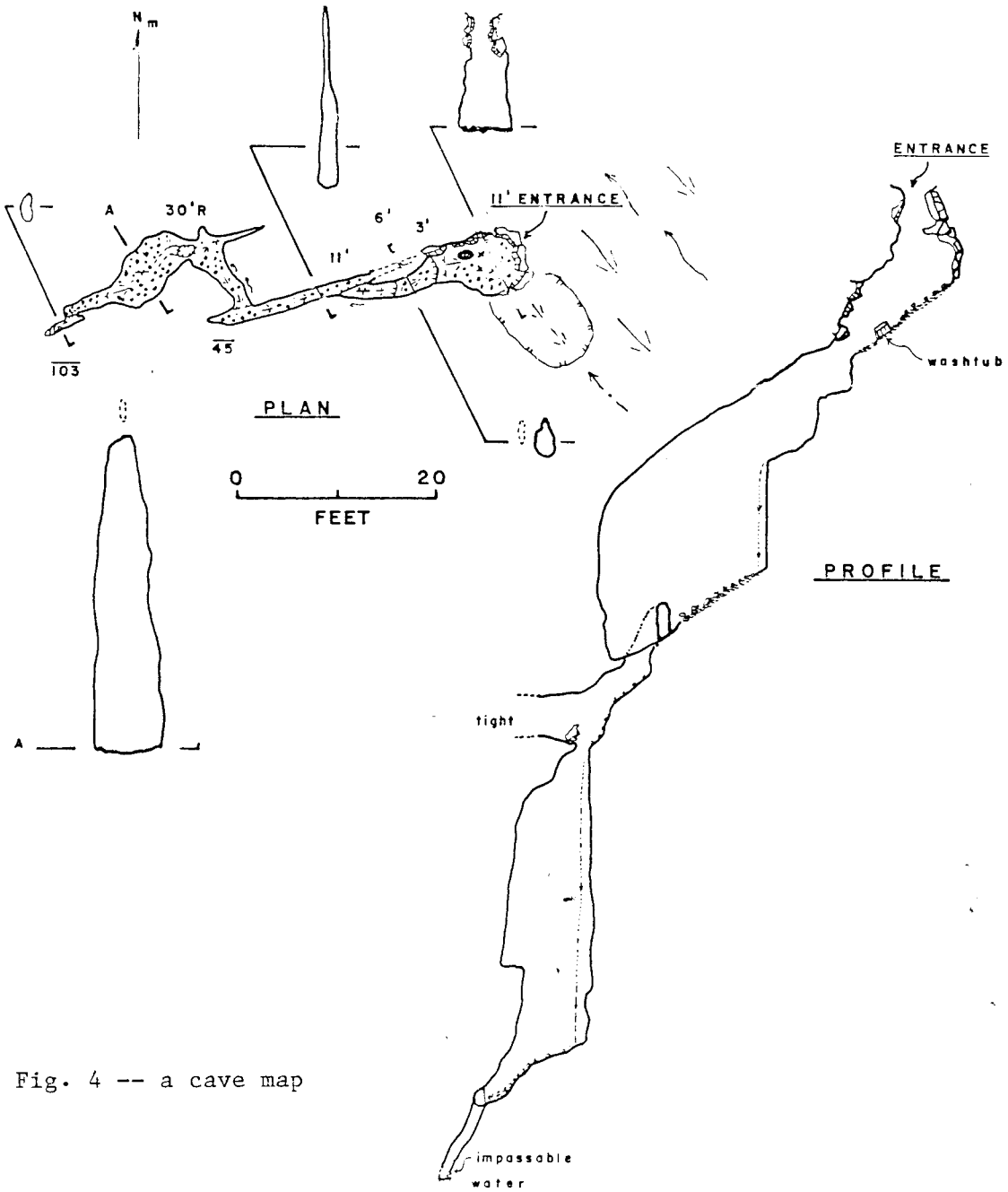

Fig. 4 -- a cave map

Nearly all cave maps I have seen have an incredible amount of detail; it is rare that a cave map has blank areas along the cave passage. The first question in design is particularly pertinent here; how much of this information must be shown on the cave map? I am not prepared to answer this question since I have never been in a cave; only a caver can ascertain how much information is truly necessary and sufficient to make a successful cave map. I do know that most of the cave maps around look cluttered and confusing. Assuming all information on cave maps is necessary and none of it can be left off, then the next logical question is this; how can all this symbolization be modified so that the information about the cave can be communicated effectively?

No symbolization system will work if it is not used effectively. The cartographer's task in communicating information begins with deciding what information is important; developing a hierarchy for features which will appear on the map is an absolute necessity. At the top of such a hierarchy should go those features which the cartographer wants to emphasize as being more important than other features. The remaining features can then be visually depicted as being less significant.

The map shown in figure 4 shows a lot of information that is poorly communicated. There is no visual distinction made between features in the cave passages--the same line weights and point symbol sizes are used for all data--so one gets the visual impression that everything is of equal importance. A very simple feature hierarchy could be developed for the information in this cave which, when applied to devising symbolization, could make a much clearer and more legible map.

The sample cave has the following features; an entrance, walls, floor, ceiling, floor materials, water, and some speleothems and speleoclasts. From this list, a simple feature hierarchy can be developed. The least important information in the cave is the floor material. It is certainly important for the caver to know what the floor is made of. However, because the floor of the cave is continuous, the symbolization used to depict the composition of floor material could overwhelm the entire map, which it does in the example. A more appropriate method for symbolizing the cave floor would be to use a fine screen (e.g. 20%), the density of which can vary for each type of floor material. Water can be shown with a diagonal line pattern as long as it is a fairly fine line weight. Using fine line or dot patterns will give the visual impression that this data exists, but it is not the most important information on the map.

The next level of the visual hierarchy consists of the data which define the shape of the cave passage. Included here are the cave entrance, walls, and the floor and ceiling ledges, domes, pits, and columns. In order for the cave to be perceived as the subject ("figure") of the map, the structure of the cave must be visually distinct from other information. The entrance is certainly an important feature, and on the sample map it disappears amidst a lot of other linework. A heavier line for the entrance, or a heavy dashed line, would help distinguish the cave entrance and would give the visual impression that the entrance was above the level of the rest of the cave. The cave's walls act as a visual border for the cave passage, so the line weight must be heavy enough to make the extent of the cave immediately apparent. The floor and ceiling ledges of the cave are made fairly distinct with the use of tick marks, but a slightly heavier line weight for these features may be beneficial.

The highest class of information is made up of the features which appear infrequently and/or are generally depicted by point symbols, e.g. stalagtites, stalagmites, and

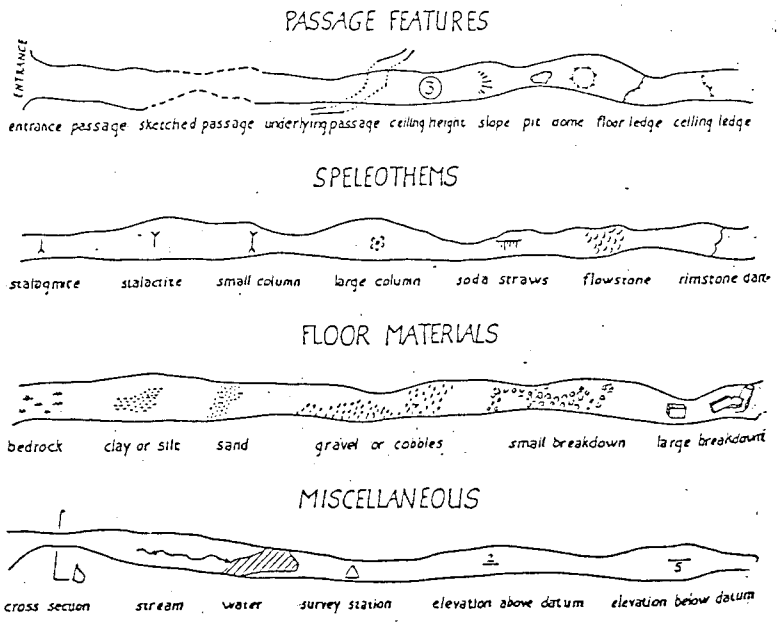

Fig. 5 -- NSS Symbolization (Hedges, et al, 1976)

breakdowns. These are not the most important features to all cavers, but because they appear individually and are qualitatively distinct from one another they must be carefully designed to reflect these distinctions. The point symbols used by the National Speleological Society and the Association of Mexican Cave Studies do not work visually; they are generally not distinct from one another, are too small, and are often poorly drawn (fig. 5). No one, save an excellent and patient artist, should be expected to draw point symbols by hand. There is a wide variety of preprinted point symbols available on the market, some of which could be used or adapted for use on cave maps. Using clean and clear point symbols, e.g. triangles pointing upwards for stalagmites and downwards for stalagtites, circles for domes, and ticked circles for pits, would be a dramatic visual improvement over the symbols used on most cave maps.

Developing feature hierarchy and an appropriate symbolization system is a difficult but necessary task for the cave cartographer. If a cartographer defines his/her symbolization and design system before making the map and then follows through with that system to the end where the system is clearly explained in a legend, then the likelihood for the cave map to be successful at communicating cave information is great.

There is one obvious conclusion about the whole procedure of cave mapping; it needs to be refined. There is no question that a lot is demanded of a cave mapper. He/she must be skilled scientifically, physically, and cartographically. Perhaps it would be better if the cave surveyor turned over the base information to one who is trained in cartography, thus eliminating the requirement that a caver

also be a good cartographer. On the other hand, keeping all those jobs under the control of one person makes for a more pertinent, if not more accurate, map because this person knows what is in the cave and what is important about it.

If cave mappers would take the time to read some very basic cartographic literature and utilize some of the basic techniques, part of the problems of symbol illegibility and ambiguity might be solved. However, one of the greatest shortcomings of cartographic research is its failure to address specific applications of cartographic principles. Learning to be a cartographer sometimes takes on the air of being a sorcerer's apprentice; the principles of cartography must be gleaned from someone who has experience in the field, i.e. someone who has taken the time to sort out the important information in cartographic research by actually "doing" cartography.

More experimentation needs to be done by cave mappers and conventional cartographers toward developing graphic methods for communicating cave information. Such work could ultimately lead to cave maps that would be more useful in meeting the diverse needs of cavers, and would also be beneficial to cartographers for exploring new graphic methods of depicting spatial relationships.

(Editor's Note: Ellen Bartsch is a Phd. candidate in Geography at Penn State (Dept. of Geography, Walker Building, University Park, PA 16802). She has worked as a professional cartographer at two universities, and in both the public and private sectors.)

SUGGESTED READING LIST

The following references are basic to geographic cartography and would be helpful aids to cave mappers.

Keates, J.S. (1973) Cartographic Design and Production , Longman Group Ltd., London.
This is a good but somewhat dated text for production and reproduction of maps. Despite its technical tone, this is a valuable reference for photographic methods and other production techniques.

Robinson, A., R. Sale, J.L. Morrison, and P. Muehrcke (1984) Elements of Cartography , 5th edition, John Wiley and Sons, New York.
Elements of Cartography is the classic American text on cartographic design. Along with design principles, there are thorough discussions on production, symbolization, computer mapping, etc. This book is an essential part of any cartographic library.

American Congress on Surveying and Mapping (1974 -) The American Cartographer , Washington D.C.
The quarterly journal of the ACSM contains articles on theoretical as well as practical research. A special section called "Technical Notes" provides helpful hints on design and production.

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Hedges, J., B. Russell, B. Thrun, and W.B. White (1979) "The 1976 NSS Standard Map Symbols", NSS Bulletin , vol. 41, no. 2, pp. 35.

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Steinke, T.R. (1971) "The Vertical Contour Method of Cave Representation", NSS Bulletin , vol. 33, no. 4, pp. 129-134.

Williams, W.R. (1983) Mine Mapping and Layout , Prentiss Hall, Englewood Cliffs, N.J., 416 pp.

Financial Report

1983-1984 YEAR

IN:	Dues (130) $520	$520
	Sales during 84/85 (39)	156
	Consignment Sales '85 (15)	40.50
		$716.50
OUT:	Printing	$276.71
	Postage	149.82
	Reprints	86.75
	Advertising	17.45
	Production Costs	12.68
		543.41

Balance: $173.09

1984-1985 YEAR

IN:	Dues (164)	$656.00
	Consignment Sales (22)	79.20
		735.20
OUT:	Printing	$426.99
	Postage	221.00
	Advertising	25.96
	Production Costs	8.58
	Misc	8.00
		690.53

Balance: $44.67

1985-1986 YEAR

Dues (124) $496.00

1986-1987 YEAR

Dues (49) $196.00

(Prepared by John Ganter, 8-26-85)

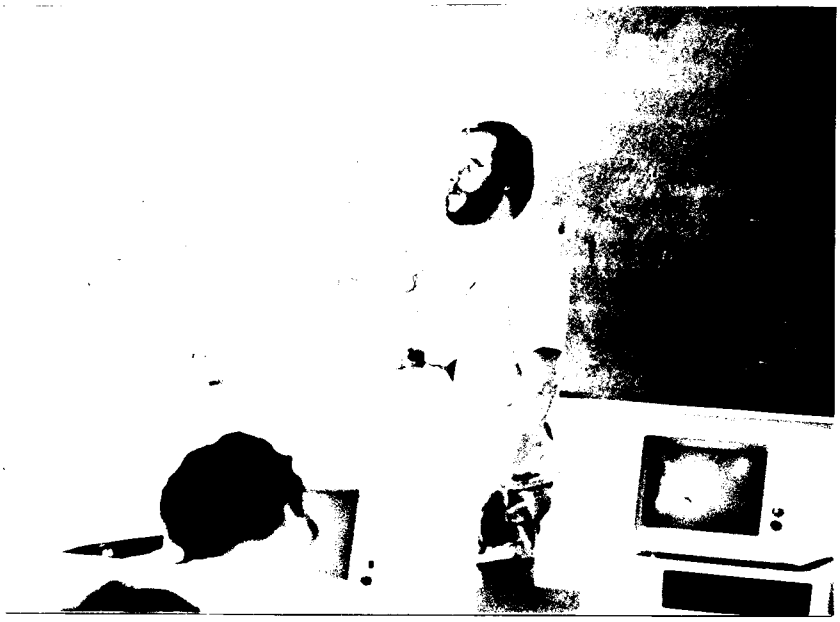
SACS Activities at Convention '85

Kentucky State University, Frankfort, Kentucky

by John Ganter

The educational theme of this year's Convention gave both novice and experienced cave mappers the chance to learn and exchange ideas.

Despite a number of snags and problems, 2/3 of an overall introduction to cave mapping took place. On Monday, Charlie Bishop discussed cave surveying, emphasizing a traditional Kentucky approach to the subject. On Tuesday, Doug Dotson covered various means of data processing, emphasizing the SMAPS (Survey Manipulation and Plotting System) that he has developed to run on a number of microcomputers. The system is completely menu-driven and those trying it out in the KSU micro lab were soon processing and plotting survey data. A few "bugs" were found, but their frequency is decreasing.



Right: Doug Dotson illustrates how SMAPS handles "strings" of cave survey when distributing closure error.

Bright and early Wednesday morning, the SACS session began with Ray Keeler's discussion on "Magnetic Anomolies in Arizona Lava Tubes." Unfortunately, I missed this due to a sworn vow to see another members talk in the Exploration Session, so I can't say anything about it.

Next came Bob Richards on "The Design, Layout and Printing of Cave Maps." Bob took us on a slide tour of his place of employment, which left everyone drooling over the phototypsetters, Kroy machines, Xerox 2080s, etc. He also illustrated the basics of drafting media, pens, etc. and gave a few tips from the viewpoint of someone who makes maps for a living.

Roger Bartholomew then gave a very cautionary talk on "Suunto Sighting Phenomenon." Roger did some careful testing, involving a Suunto compass mounted on a tripod and aimed at a fixed target, and confirmed the current wisdom on proper sighting practice: "do it with one eye!" He also quoted the results of some research he did into the literature on human binocular vision, which definitely confirms this finding, and raises the question of why the Suunto company is advising use of two eyes in sighting the instrument.

Roger also gave three other talks during the session. "Improvements in Cave Survey Instrumentation" was a demonstration of a number of interesting devices, including a highly-modified Brunton compass for taking high-angle azimuth readings. I think I went to the restroom or something during "Correcting for Magnetic Declination Changes," so Roger will have to write an article on that one! "The Spider Tripod" looked like something out of a science-fiction movie, and everyone agreed that its long, flexible legs would allow it to be set up in any strange position that a cave could offer.

John Smyre discussed his "Multicolored Map of Cagle Chasm", suggesting that new methods of cartographic presentation will need to be developed for caves like this which have numerous overlying levels. He expressed hope that new advances in computer technology, and rapidly decreasing costs for sophisticated equipment will help in solving this problem.

Right: Lang Brod directs a question, as others look on in thrilled amazement.

Carol Vesely gave a thought-provoking talk entitled "Psychology of Cave Maps." She began by exploring how we set up our "mental maps" of caves, which is particularly dependent on landmarks: specific features in a cave which stick in our minds. Then she showed, through slides, a number of maps and considered how they took this (and other) human tendencies into account.

Concluding the Session was an informal series of little talks by various members of the audience who are connected with state cave surveys. This was an excellent opportunity to view first-hand the large variations in these group (and in some cases, "non-groups"). Doug Medville closed the discussion by stating that he is studying the subject of state cave surveys in preparation for a report to the NSS Board of Governors, with an aim of determining whether the NSS Cave Files is a redundant and obsolete concept.

With that, we adjourned to lunch, which you can read all about elsewhere in this issue.

One of the last things to occur Convention week, on Friday afternoon, was the Cartographic Salon Workshop, directed by Ernst

Kastning, who runs this event. A sizable crowd showed up, and Ernst read the Judge's comments on most of the Salon entries. This resulted in considerable and somewhat heated debate, but most entrants seemed to find the experience quite valuable. Ernst also let the entrants read over the comments and suggestions, which he promised to mail later.

Right: Ernst Kastning reads and explains the Judge's comments on a Cart Salon entry.

Left: Carol Vesely explains the psychological aspects of cave maps.

In conclusion, it was a lot of fun.I hope you will consider attending the 1986 Convention and giving a paper on some aspect of cave surveying and cartography.

SACS Annual Meeting Minutes

The 1985 meeting of the Survey & Cartography Section of the National Speleological Society was held in conjunction with the annual convention of the NSS on Wednesday, June 26, at the Kentucky State University campus in Frankfort, Kentucky.

In attendence were 35 members and friends of the Section. They were:

Bill Balfour	Shari Forsythe	Doug Medville
Twylia Balfour	Mike Futrell	Bill Mixon
Rick Banning	John Ganter	John Mylroie
Mike Beer	Bob Gulden	Charlie Plantz
Lang Brod	John Halleck	Mary C. Prante
Barry Chute	Paul Hill	Peter Quick
Dan Crowl	Bob Hoke	Bob Richards
George Dasher	Frank Hutchinson	Bob Thrun
Mike DiTonto	Kenneth Huffines	Carol Vesely
Mike Dyas	Bob Jagnow	Dave West
Doug Dotson	Ray Keeler	Jack White
Preston Forsythe	Dave Lemberg	

The Chairman, John Ganter, called the meeting to order at 12:26 pm, welcomed the members, and introduced the officers. The Secretary, George Dasher, read the minutes from the 1984 Sheridan, Wyoming meeting. John Ganter thanked those people who had helped the Section at the 1985 Convention: Charlie Bishop for running the surveying course, Doug Dotson for teaching a class/lab in the use of the SMAPS system, and Paul Hill for coordinating the Sessions.

John said that there had been problems with the Treasurer's job: both he, and Ray Keeler, the Treasurer, had been doing it. John gave the Financial Report, stating that there $700.00 in expenses and 75 dues paid for the coming year, which gives the Section $120.00 to work with. (Ed. note: This is simplified and now outdated, see "Financial Report", this issue.) John recommended that William G. "Lance" Lide be the next Section tresurer. Although Lance was not at the meeting, John had spoken to him previously and assured the Section that that Lance was available, and had the abilities and the computer to do the job.

John Ganter gave the editor's report, thanking the members for their submissions and stating that the Section needs more members and subscriptions to do bulk rate mailing. John said that members should check and see if their local libraries would like to purchase subscriptions, and added that the money could be put to good use. There was a brief discussion of the newsletter.

The first order of Old Business was a report on the Section's book on surveying, given by Ray Keeler, the editor. Ray said that Lang Brod had done the original manuscript, George Dasher had finished the surveying part, Paul Hill is going to write on computers

and Carol Vesely will handle the cartography part. Ray said that the book was to have been ready by June, 1985, but it was not. He thanked George Dasher for his completed section.

There was some discussion of the book. Carol Vesely said that she was having problems because she did not know what the others had written. George Dasher said that Ray had a copy of his work and that he would like to have his floppy disk back. Ray said that this had been bent in the mail. It was decided that Doug Medville would do the introduction because of his article in COMPASS & TAPE. Ray announced that there would be a meeting of all those involvrd with the book immediately after the Section meeting. He further stated that he would begin work on the book before next year's Convention.

Doug Medville stated that the Missouri Speleological Survey has completed a 123 page book on cave mapping and he questioned the need for the Section to complete the NSS book. He felt it would put us in the awkward position of putting together a redundant book. There was more discussion, and it was decided that the book group should look at the MSS book and decide whether to proceed with ours. Ray stated that John Scheltens, NSS Executive Vice-President, wanted a Yes or No answer soon, and felt that it was most important for the Section to stay within a 2-year deadline in completing the book. John Ganter said that it was Ray Keeler's decision whether or not the book would be finished; therefore, Ray will look at the MSS book and make a decision.

The second order of Old Business was the aborted surveying course that the Section was to have hosted at the 1985 Convention. George Dasher complained bitterly and at length against those members of the Section who the previous year had been very enthused about the course, placed him in charge of it, and then did absolutely nothing to help out. What contributed most to George's cancellation of the course was the lack of communication from Doc Dougherty. There was some discussion and Carol Vesely pointed out that she was very upset to arrive at Convention and discover her that her name was in the Convention program as leading the Cartography Workshop. She felt that this had hurt her reputation. (Ed. note: ...and like Momma always said ...) George said that Doc had several good reasons for not helping with the course, but there was no excuse for not informing the Section of what was going on, or leaving the cancelled course in the Program.

John Mylroie moved that "the Section motivate the Convention-Committee to refund the $5.00 to each person who signed up for the course and explain what had happened." Mary Prante siad that she had been enrolled in the course and Doc had come to the first meeting and apologized for what had happened and said that the money would be refunded. (Ed. note: This was the surveying part taught at the last minute by Charlie Bishop, who is not affiliated with our Section) John Ganter said that we might attempt to run the final, cartography part, of the course in the two-and-a-half days remaining, noting that 2/3 of the course was finished. Doug Medville seconded Mylroie's motion. Ray Keeler amended the motion to include Ganter's suggestion. There was no second. There was some discussion as to who would talk to the Convention Committee. No one volunteered, but finally Dasher said he would. (Secretary's Note: I did this that afternoon and the following day I thanked the Committee for their cooperation.) A vote was taken on Mylroie's motion, and it passed unanimously.

The first order of New Business was the Section's bylaws. John Ganter said that they were the NSS generic Bylaws and that they needed approval. It was pointed out that there were not enough members at the meeting for a quorum and that there was sloppiness in the wording of the Bylaws as modified by Ganter. A few people wondered if we needed a Constitution. Bill Mixon grabbed the Bylaws and began revising them. It was generally decided that the Section did not need a quorum because it is well-known that there is only one meeting each year, and that it is at the Convention. John Mylroie moved that "Bill Mixon will submit to the Chairman of the Section the properly edited 'Constitution & Bylaws'. Bill Balfour seconded this motion. There was no discussion and the motion passed unanimously. Bill Mixon submitted the Bylaws to Ganter. Frank Hutchinson moved that "the Section submit the Bylaws to the NSS." Mylroie seconded and the motion passed unanimously.

Bob Thrun made the announcement that people are complaining about the NSS Official Cave Map Symbols, and that any member can submit a motion to amend the list. There were no such motions. Bob further stated that the list has stabilized and that it seems to be tolerable to most. Paul Hill suggested that we print the list in COMPASS & TAPE. Doug Medville pointed out that this has already been done. (Ed. note: A clarification; the list printed was a condensed version of the full 1979 NSS symbols, redrawn by George Dasher. It does not reflect any of the numerous suggested changes.) Bob Thrun stated that the Symbols Committee is part of the Geology and Geography Section.

There was much discussion of the matter. Mike Dyas stated that the BOG assigned this job last fall to both GEO2 and SACS. (Ed. note: The GEO2 Committee was formed shortly after the 1979 symbols were released. The BOG motion was passed last fall in an attempt to get something done on the issue by involving the Survey & Cartography Section as well.) Thrun said that the biology symbols have been deleted, the list is very close to its final form, it should be out next year, and that it does need more work. Paul Hill thought that it should be discussed more in the caving community. Ray Keeler called the question. John Ganter said that the BOG motion had directed that SACS would become involved in the matter, but that since the Symbols Committe is a standing committee of GEO2 he would bring the matter up at the GEO2 luncheon the next day. Frank Hutchinson stated that we should make a list of desired changes.

The next item was Section patches, brought up by John Ganter. He said he would have them made using his own funds, and solicited artistic help.

Elections were last. Dasher nominated John Ganter for Chair, Medville seconded, Mylroie moved to close and Mike Beer seconded. George Dasher nominated Ray Keeler for Vice-Chairman, Bob Hoke seconded, then motioned to close. Mylroie seconded. Bill Balfour nominated Lance Lide for Treasurer, Bob Gulden seconded, Balfour moved to close and Hill seconded. George Dasher gave a little speech to the effect that he wasn't sure how many more Conventions he could make, and nominated Bob Hoke, who declined. Keeler nominated Rick Banning, who declined. Medville nominated Mylroie, who declined. Dasher nominated Barry Chute, who declined. Ganter nominated Dasher, Mylroie seconded, Balfour closed and Hutchinson seconded.

At 1:33 pm, John Mylroie moved that the meeting be adjourned.

Respectfully submitted by George Dasher, SACS Secretary

(Ed. note: On August 21, 1985, Ray Keeler announced that he was resigning as editor of the cave mapping book.)

Balloons in Action: Climax Cave, Georgia

by Frank Hutchison

We used Spencer Gifts foil-mylar helium balloons a few years ago to measure seven domes near the entrance of Climax Cave, Georgia. We bought two shapes of these balloons- a heart and a star -and used so-called "invisible mending thread" (it looked more like fine monofilament to me) as a lightweight tether.

By stretching the line out horizontally, it was easy to compare the length against a fiberglass tape. The heart balloon lasted for about 4 domes, until water dripping on it from a seep caused it to collide with the walls, causind a puncture. It very slowly settled to the ground.

We switched over to the healthier star balloon, and noticed that it was much easier for it to notch, cog or gear-tooth its way around both small and large projections on the way to the top of the dome. It would rotate like a wheel to get past these protrusions. Most of these domes were on the order of 3 feet in diameter and up to 38 feet high. The largest ones were up to 8 by 12 feet and 58 feet tall, with flowstone and dripping water.

There are at least 7 other domes in Climax (7 miles surveyed to date) awaiting attention-- but they are mostly beyond constrictions which mean we will need to inflate the balloons at the sites. So far, ballooning has been a satisfying and accurate means of determining dome heights.

(from a letter to J. Ganter, August, 1985)

(Ed. note: For more on ballooning in caves, see C&T Vol.1:1, Summer, 1983, and Carol Vesely's "The Uncharted Waters of Sea Cave Surveying," C&T Vol. 2:3, Winter, 1985.)

The Alabama Cave Survey

by Greg McGill
Joe Domnanovich

The Alabama Cave Survey (ACS) lists 2450 caves (greater than 50 feet in length or depth). Of these, 64% are mapped, with another 20% sketched. About 100 new caves are added each year.

Data is maintained on an IBM 3033 AP running MVS. The data is edited using SPF and printed on a 3800 Laser Printer. The data is stored on a 3380 disk drive, and backed each week to tape.

The data is also on an IBM PC, where it can be accessed with RBASE 4000, and soon dBase III.

The ACS is an internal organization of the NSS, with membership restricted to NSS members. A Cave Files Director and five Executive Board members direct the ACS. The five directors are elected to staggered terms and appoint the Cave Files Director.

The entire state survey (maps and data) is available on microfiche, including a topo map with locations and major cave passage overlays.

The cave locations are stored in the Public Land Survey System, although in recent years the locations ahve been translated to Lat/Long using an Apple II computer with digitizing tablet. LANDSAT photos have been studied, but the resolution is not good enough.

When the NAVSAT network is fully operational (1987) an attempt will be made to borrow equipment to use in determining an EXACT location for all major caves in Alabama.

If the ACS can convince some student to build it, we could place locator beacons at some caves, and sell tracking devices to people who can't read maps. (Ha Ha)

ONGOING PROJECTS

Mapping is done by whoever feels moved to do it. The ACS may suggest that certain caves need maps (or better locations), but is glad to recieve anything.

The ACS cooperates with state, Federal and Local agencies that have a legitimate need for specific limited information about caves. The complete files are not for public use, and our Constitution forbids public disclosure!

An effort is being made to go back and enter a full text of all report forms into a new data base. This will make for some interesting reading and will go a long ways towards documenting the hidtory of cave exploration in Alabama. It is expected that this document will be several hundred pages long.

A complete new ACS book is published at intervals of 500 new caves. This new book (2500 caves) will be ready in the Spring of 1986, with a data cutoff of January 1, 1986. Every effort will be made to keep the cost of the publication down- at the expense of fancy bindings, etc.- this book is for cavers to USE in the field!

(from a handout at the State Cave Surveys discussion, 1985 SACS Session)

1985 NSS Cartographic Salon Entries

ARIZONA		
Fencepost Cave	Gila Co.	Ray Keeler
Lava River (Govmt.) Cave	Coconino Co.	Ray Keeler
BELAU		
Chandalier Cave	Oreor-Koror	Bruce Rogers
CALIFORNIA		
Blimp Hanger Cave (c)	Santa Cruz Is.	Bob Richards (HM)
Bonnie Dune Sea Caves	Santa Cruz Co.	Peter Bosted
Crystal Drano/Roto Rooter	Siskiyou Co.	Randy Boyd (MT)
East Dairy Gulch Sea Caves	Santa Cruz Co.	Peter Bosted
Gaping Hole Lave Tube Syst.	Siskiyou Co.	Bruce Rogers
Millerton Lake Caves (c)	Fresno Co.	Bob Richards (MT)
One-Two-Three Cave	Fresno Co.	Bruce Rogers
Point Buchon Area Sea Caves	San Luis Obispo Co.	Carol Vesely (HM)
Shell Beach Sea Caves	San Luis Obispo Co.	Carol Vesely (MT)
FLORIDA		
Bonnet Springs Cave System	Suwannee Co. (s)	Wes Skiles
Littel River Spring System	Suwannee Co. (s)	Wes Skiles
INDIANA		
Popcorn Swallow Hole	Harrison Co.	Dave Black
Sump Cave	Lawrence Co.	Dave Black (HM)
Valentine Pit	Harrison Co.	Dave Black
JAMAICA		
Pits Around Quickstep	Cornwall Co.	Ray Keeler
Stephenson Cave	Cornwall Co.	Mike DiTonto
KENTUCKY		
Chick Cave	Logan Co.	John Ganter (MT)
Corinth Church Cave	Trigg Co.	John Ganter (MEDAL)
Dickenson Cave	Todd Co.	John Ganter (MT)
MEXICO		
Cueva de El Cañon	Xilitla, S.L.P.	John Ganter (HM)
Sanctuario Adento	San Luis Potosi	Carol Vesely (HM)
MISSOURI		
Cameron Cave	Marion Co.	Scott House (MT)
Great Spirit Cave	Pulaski Co.	Scott House, Jerry Wagner, Doug Baker (MT)
Skaggs Cave	Pulaski Co.	Scott House, Mick Sutton (HM)
NEW MEXICO		
Pink Panther Cave	Eddy Co.	Bruce Rogers (MT)

OKLAHOMA			
Alabaster Caverns St. Park	Woodward Co.	Sue Bozemann	(MT)
Pellet Mound Cave	Greer Co.	Sue Bozemann	(HM)
TENNESSEE			
Indian Cave	Granger Co.	Jeff Bowers, Robert Hamm	(HM)
UTAH			
Green-Eyed Monster Cave	?	Rodney Horrocks	
VIRGINIA			
Black Oak Cave	Bath Co.	Ron Simmons	
Roaring Spring	Highland Co.	Ron Simmons	(HM)
WEST VIRGINIA			
Elkhorn Mountain Cave	Grant Co.	George Dasher	
Organ Cave System (3 maps)	Greenbrier Co.	Paul Stevens	
Spout Cave	Greenbrier Co.	George Dasher	
Windy Run Cave	Randolph Co.	Ron Simmons	(HM)

HM = Honorable Mention
MT = Merit Award
MEDAL = Overall Winner
c = color map
s = submerged cave

Information, Please.

This cryptic advertisement has appeared in several NSS Convention Guidebooks. Does anyone have information on this compass?? If anyone knows the story, please let me know. --Ed.

NIETZ HOLTZ

The Compass Designed With The Caver In Mind

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Preserving Spelean Literature

by Gary K. Soule

Most of us have a cave book, brochure, or some other fine piece of spelean literature that we are most proud of. But valuable old books, like everything else, fall apart. They are constsntly under attack by mold, insects, environmental conditions, and the wear and tear of everyday use. They are also self-destructing from purely internal causes. By understanding their main adversaries and observing a few basic conservation rules, you can prolong the life of spelean literature for many decades to come.

With over 600 hard- and soft-cover books, thousands of assorted cave brochures, 8000 cave post cards, and well over a hundred different grotto publications, I find myself literally making a value judgment. What do you need to get at regularly for research purposes? What is very old? What do you have only one copy of? In In short, you need to judge values and plan accordingly. I never throw anything away, and that includes the printed envelopes, bumper stickers, and even cave ticket stubs. Some people laugh at saving bumper stickers, but they tell a story as well, and I have between 600 and 700 of them on file. No, you will never see me put one on a car, as it will be destroyed soon: if you do, buy two and save one. So, what do you do to protect what you have?

Old cave books face three different, silent but deadly, enemies: heat, humidity and light. Books are made mostly of paper, which is composed of long, thin fibers of cellulose. As the temperature of the air rises and falls, these fibers expand or contract. Many of them break under this stress, causing the pages to become brittle and the books to crumble. The single most useful thing you can do to preserve you old cave books is to store them in a place where the temperature is constant. Luckily for us, 65 to 70° F. is the temperature that they like best. But don't store them above heating vents, near drafty windows and fireplaces, or in other spots where the temperature goes up and down.

Humidity attacks cave books in several ways. When your books were originally manufactured, various chemicals were added to the paper to bleach it or harden the surface. Ever since then, the chemicals have been combining with the moisture in the air to create harsh acids, which eat through the cellulose fibers. Pollutants in the air also combine with the humidity to create new acids that further weaken the paper. Mold spores, which normally lie dormant in the atmosphere, spring to life under warm, humid conditions, and spot your pages with smelly brown and grey splotches. Extremes of humidity can even cause the covers of the books to warp or endpapers to lift off.

You can avoid these effects of humidity by stabilizing the moisture level in the air at about 50%. The easiest way to do this is to keep the temperature between 65 and 70°, since humidity rises with the teperature. A regular window-sized air conditioner will help keep the temperature down in warm weather, and will also filter out many of the acidic pollutants in the air. In the winter, putting pans of w-ter on radiators or registers will help keep the air in your

"speleo-library" from drying out too much. A Taylor guage to measure temperature and humidity costs only a few dollars, and will help you to regulate the humidity more precisely. Most hardware stores should have them.

Light is the third enemy of old cave books. The worst offender is direct sunlight, which will cause the dyes in binding and printing materials to fade, and will raise the temperature of the air. Keep the shades drawn whenever possible. Mine are always closed. Even fluorescent and incandescent bylbs are harmful to paper. Like sunlight, they also contain ultraviolet rays that can speed up the action of the acids and make the paper brittle and brown. Keep the lights in your book areas turned off when they are not needed. You can also buy UV filters for windows and lights which cannot be kept shaded. (C&T ed. note: an opaque curtain can also be hung over one's bookshelf to exclude light, yet allow quick access and normal activity in the room.)

Perhaps in the ideal world of a cave book collector, all the cave literature would be kept in a pitch dark room where the temperature would always be 68° F., and the humidity 50%. But this is not possible, if you make good use of your library. I might also point out that all forms of tape, despite what the manufacturer says, should never be used on any type of literature. The same goes for rubber bands and paper clips, which can both leave marks on your valuable spelean literature for years to come. It is also best to avoid any drinking or smoking around your literature as well, for obvious reasons.

I hope that this article has been helpful, and remember: "the key to the future is in preserving the past!"

(from the June, 1985, WINDY CITY SPELEONEWS)

Preserving Maps

by John Ganter

To go with Gary's article, a few observations more specific to preserving maps.

1) Diazo copies are on cheap paper and don't last long. "Bluelines" fade and yellow rapidly, "Blacklines" seem to last a little longer. Diazo processes onto mylars, etc, are the only ones with any real permanancy.

2) Photoelectrostats ("Xerox") do not fade much because the "ink" is graphite. However, the paper base is a weak point. Try to use heavy bond paper, "archival bond" if you can afford it.

3) Photographic processes, like PMT (photomechanical transfer) and "Dylux" contact prints from negatives, are relatively permanent, but make sure the prints are well fixed and washed after processing.

Many reproductions are intended to have short lives: make sure copy firms know you want yours to last and they'll help you out!

Have You Seen the Book....??

Damn. It finally happened- I lost my survey notebook. We came out of the cave, I dumped my pack on the ground, placed the book carefully on the pickup cap, started working on getting my oversuit off--- and never saw the book again. A search of the area a few days later (we were hundreds of miles away when I noticed the book was missing) turned up nothing. Fortunately, we hadn't surveyed very much, there was nothing else in the book, and the cave needs (needed) another trip anyway. About all I can do is try to make sure this unpleasant (and potentially lethal, depending on your companions) experience does not happen again.

Here are a few suggestions, from the clear vista of hindsight.

1) Use a plastic binder with Rite-In-The-Rain paper for your book, always removing and storing safely the used pages after each trip. (See C&T Vol. 1:2 Fall 1983 "**Cave** Survey Notebooks") These books are nearly indestructible, cheaper than bound ones, and allow easy rearrangement of the pages.

2) If you prefer a bound book with non-removable pages, be sure to keep at least one set of photocopies of the surveys, updated immediately after each trip.

3) Write clearly your name, address and telephone number, plus some message like "Contains valuable scientific data- Reward For Return" in the book. This vastly improves the chances that you'll get your lost book back if it's in a place where someone can find it. I've seen this done in many people's books, thought it was extraordinarily clever and prudent yet never bothered to do it myself.

4) Make a verbal inventory of book, tape and instruments at a minimum of three places: a) before leaving the survey sight b) before leaving the entrance area c) before driving away.

5) Keep your book and notes removed from it in safe place while traveling. Don't store this valuable information with valuable goods. If **your book** is in a knapsack or duffel with your Walkman, 3 Nikonos cameras, a Boombox, your wallet and a light machinegun, it has been lost needlessly, because the thief is going to toss it in the nearest ditch and never look back.

Those are the suggestions I have at the moment- please send others you may think of -- you could spare someone a lot of misery.

Grinding my teeth, John Ganter.

N.S.S. Survey & Cartography Section
BYLAWS

I. The name of this organization shall be the Survey and Cartography Section of the National Speleological Society.

II. The purposes of this organization shall be the same as those of the National Speleological Society, with the additional purpose of promoting the art and science of speleological surveying and cartography.

III. (1) The Survey & Cartography Section shall be governed by an Executive Committee made up of the following officers (all full NSS members) elected annually by the members: Chairman, Vice-Chairman, Secretary, Treasurer.

(2) The Executive Committee shall have the complete power to manage the business of the Section, to raise funds in any way not inconsistent with the goals of the NSS, and to perform all other neccessary functions.

(3) Decisions or actions of the Executive Committee may be overturned by a majority vote at the annual meeting.

IV. An annual meeting shall be held at the annual NSS Convention.

V. The Constitution and Bylaws of the NSS shall be binding on the Survey & Cartography Section. Any action inconsistent therewith shall be null and void.

VI. Full Membership in the Section shall be limited to NSS members.

VII. Any NSS property shall revert to the NSS in the event of dissolution.

VIII. Amendments to these Bylaws shall be made by majority vote at the annual meeting.

IX. In the event of dissolution, the assets of the Section shall be turned over to the National Speleological Society. However, if the above-named recipient is not then in existence or is no longer a qualified distributee, or is unwilling or is unable to accept the distribution, the assets of the Section shall be distributed to a fund, foundation or corporation organized and operated exclusively for the purpose specified in Section 501(c)(3) of the Internal Revenue Code of 1954 (or the corresponding provision of any future U.S. Internal Revenue Law.)

X. This organization is a non-profit organization. No part of the net earnings of the organization shall inure to the benefit of or be distributed to its members, trustees, officers or other private persons, except that the organization shall be empowered to pay reasonable compensation for services rendered and to make payments and distribution in furtherence of the purposes set forth in Article II. No substantial part of the activities of the organization shall be the carrying on of propaganda, or otherwise attempting to influence legislation,* and the organization shall not carry on any other activities not permitted by (a) a corporation exempt from federal income tax under Section 501 (c)(3) of the Int. Rev. Code of1954 (or the corresponding provision of any future U.S. Internal Revenue Law) or (b) a corporation, contributions to which are deductible under Section 170(c)(2) of the Int. Rev. Code of 1954 &c.

* Tax revision of 1976 defines amount of "lobbying" permissable for a 501(c)(3) organization as no more than 20% of the first $500,000 annual budget.

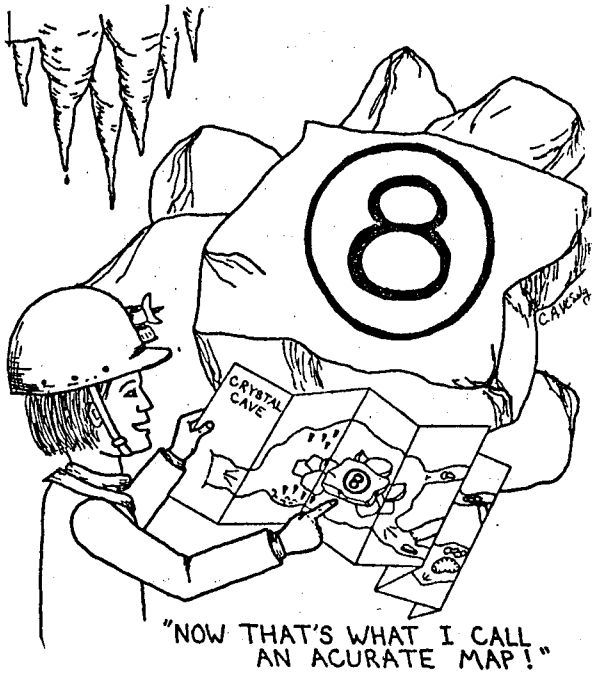
Adopted by the membership on June 26, 1985 at Frankfort, Kentucky.

COMPASS & TAPE
Survey & Cartography Section of the
National Speleological Society
c/o John Ganter, Editor
1016 Taylor St.
State College, PA 16801

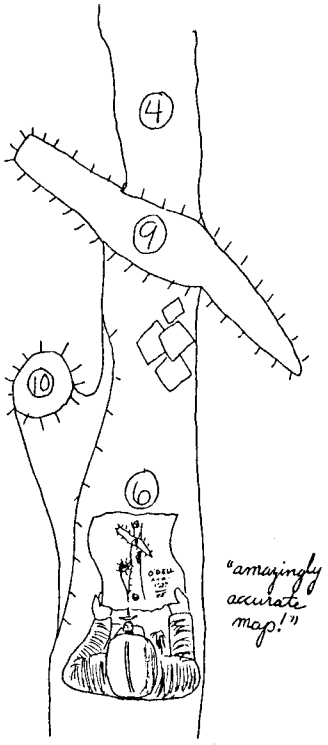
LIBRARY RATE

Non-profit Scientific
Organization

**** REPORT ADDRESS CORRECTIONS TO LANCE LIDE ****



(by Carol Vesely. From THE EXPLORER, Southern California Grotto, April 1985.)



(by Gary O'Dell. From the 1985 CONVENTION GUIDEBOOK, Frankfort, KY.)