SPELEOGEOGRAPHY OF MAMMOTH CAVE

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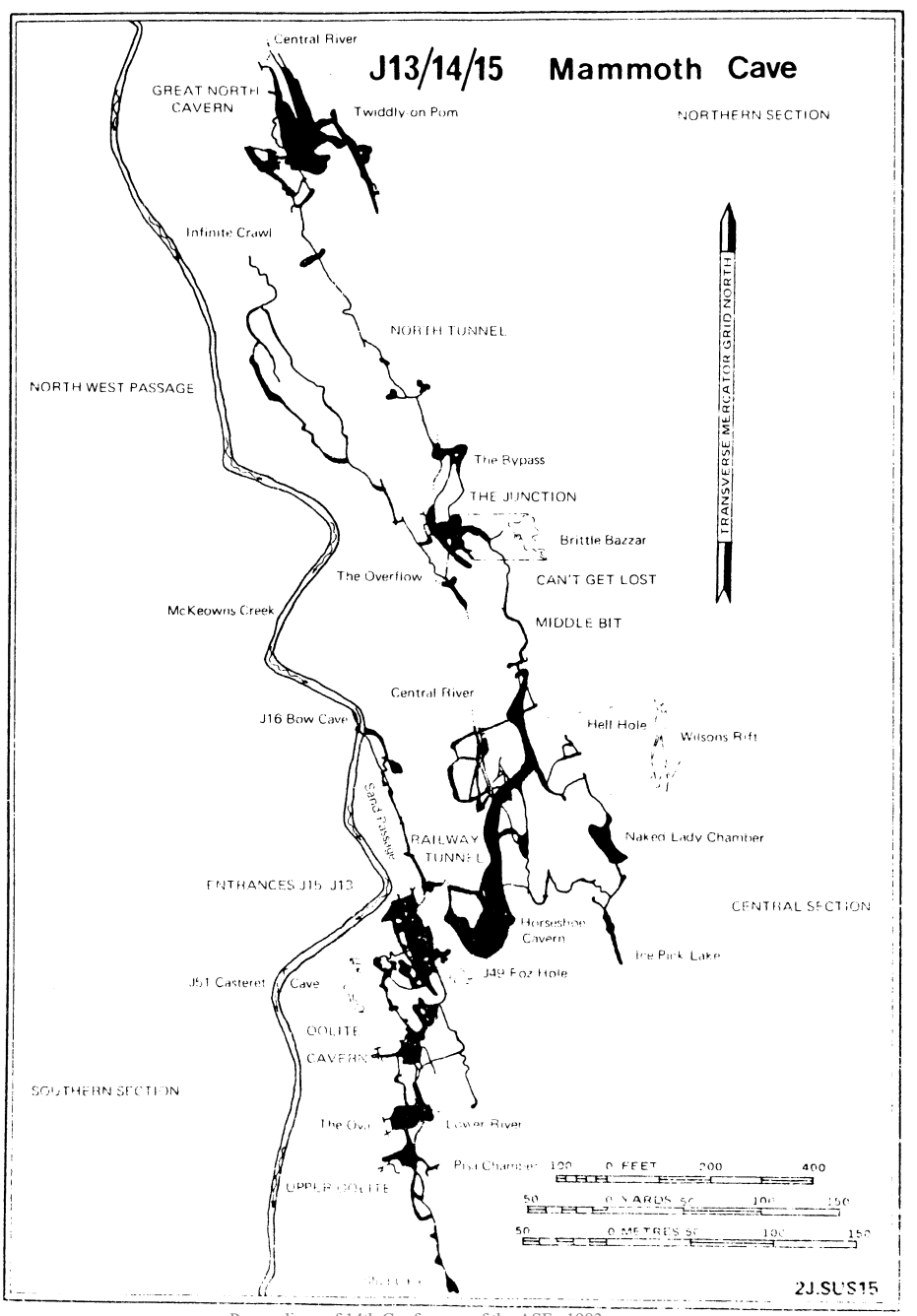
A brief history of the documentation of Mammoth Cave, Jenolan, is used to highlight the value of graphical techniques in depicting a cave and in extracting the most value out of survey data.



Speleogeography is the history of speleology; in this case that of Mammoth Cave, Jenolan Caves Tourist Resort, New South Wales. This paper focuses on the speleological documentation and the future of cave documentation through Mammoth Cave's history. Geomorphologically it is the longest wild cave at Jenolan about 1.5 km long. It was discovered 100 years ago - 1982 being the cave's centenary. The cave besides being interesting for itself, has a long speleological history, thus providing a good case history of speleological documentation.

The discoverer in 1882, Jeremiah Wilson, apparently only described the cave verbally, which was fortunately written down by contemporary journalists, thus providing second-hand documentation. Thankfully today's societies trip reports give a much more accurate account of the development of a cave's documentation and history. This second-hand documentation was inaccurate and exaggerated, and is mainly of historical and nostalgic value in that it gives an account of where the early explorers went. The same applies to signatures of these explorers found within the cave, which do have a secondary role as tourist features.

Interestingly it appears that the cave was forgotten till relocated in 1949 by the newly founded Sydney University Speleological Society. For the next ten years it was a matter of re-exploration by means of old maps and the passing on of passage locations and so on rather than by actual documentation for navigation and further exploration or research.

In 1960 it appears information was collated due to the impetus of symposiums and conferences. An underground camp in 1961, to enable further exploration, also allowed surveying and documentation of all known parts of the cave.

Psycho-historically it should be noted that this surveying was pushed along and emphasised by a few people such as Edward Anderson, who is a professional surveyor, and also John Dunkely and others.

In 1962 surveying was undertaken to correct previous maps. It is at this stage that it becomes apparent that there is a continual strive for accuracy and perfection. This paper deals with this development.

In 1967, the Sydney Speleological Society did some Radio Direction Finding work in the cave, allowing it to be placed on the national grid. When this is related to the documentation of an entire system this becomes important. The first isometric cave map produced in Australia was of Mammoth Cave in 1971, this was mainly due to the nature of the cave and the quality of surveying and people involved. Interestingly this form of mapping has not really taken on, probably due to the lack of detail that it shows. This paper supports the usefulness of this form of mapping. The only extra work involved is in the drawing up of the end product, as the "normal" survey plans drawn by all cavers only need inclinometer readings to proceed to the isometric drawing stage, and these are taken whilst surveying.

It must be noted here, that in many cases this extra type of mapping is not necessary, as a cave system may only have developed on one plane. Isometric mapping is best suited to caves which combine both horizontal and vertical development, as is the case with Mammoth Cave. Once an isometric map has been produced it is only a matter of comparing passage shapes, dimensions and features of development and so on, to see what parts of the cave are related. This is what is happening in Sydney University Speleological Society's cave documentation programmes.

This direction in documentation can be seen to have evolved from the natural progression in surveying. Increasing accuracy is fairly readily obtainable and moving towards recording the whole cave. A three-dimensional map when combined with detailed two-dimensional plans and sections enables the hypotheses of how the caves' parts are related, how they formed and also directing further exploration and research. However this is not the only use for this sort of mapping, because when combined with Radio Direction Finding work and surface maps, a whole picture of the cave can be built up in relation to the surface and the rest of the cave system around it. Within the last few years a silhouette map of the major caves of Jenolan, and their relation to the surface and each other, has been compiled. This gives an indication of where to continue exploration and some indication of karst development. But it is not until isometric or other three-dimensional representations (such as "cut-out" sections) of caves are applied that this form

of cave documentation comes "into its own", as is the case with Mammoth Cave and the whole of Jenolan, where this technique is now being applied. It has not only provided a complete pictorial record of the cave and its elation to the surface, but also to other caves, and has allowed re-location of smaller caves above Mammoth Cave itself. Ultimately a report on the hydrological and geological development will be forthcoming.

Computer graphic applications bring this form of mapping from the next to the present generation, all that is needed is someone with enough interest and knowledge to streamline this form of karst representation, as similar advances were made in the past. In this case it seems to be worthwhile in that it enables a total representation of a cave, its systems and its surrounding environment and ultimately a hypothesis of how the cave evolved. Which is what cave documentation should ultimately be striving for - a biography of a cave.

DISCUSSION

Isometric diagrams have the disadvantage that they show no interior detail. If using computer graphics or a wax mould or physical model (which could be the next step in cave description), it is possible to obtain the interior detail.

We still need 2D plans and sections because when using isometric diagrams we see the cave as a solid and the rock as a void. This always leads to hidden areas of the cave.

We need to improve the process of getting wall and interior detail into isometric maps.

There is a cave (Corra Lynn) in South Australia that no matter which way you draw an isometric diagram of it, many of the cave passages are hidden from view. The cave is a tight network on four major horizontal planes. That requires a horizontal or vertical exaggeration. It is possible to use slices or slabs as a model.

Isometric diagrams are ideal for vertical corkscrew caves. Should be good for Tasmanian caves.

As an alternative to isometrics it is possible to use stacked cross-section or horizontal contours.

SUMMARISED SPELEOGEOGRAPHY OF MAMMOTH CAVE

Discovery of Mammoth Cave	1882	
Signatures and date in cave	1884	
Written description of certain parts of the cave	1889	Cave made known to others
Bushwalkers sketch map	1943	A rough guide to part of the cave
First proper surveys	1953	Scientific recording of the cave has begun
Available knowledge collated and summarised	1960	This provides a guide not only to the cave but also what needs to be done (led to the underground camp expedition)
Higher grade traverse	1962	
Higher grade traverse	1964	
R D F Work	1967	Allows cave to be related to surface and National Grid
Completion of maps for known cave	1970	
	1971	printing of book and Isometric map, nomenclature now standardised
Underwater exploration of sumps	1979	
Silhouettes of Mammoth and nearby cave	1982	Gives some idea of cave relationships
Isometric, Stereoscopic	1984	Isometric projection of the cave and its relation to the surface and other caves
	198?	Computer graphics. This would be a complete documentation and an aid to research, theorising and public representation of the cave.