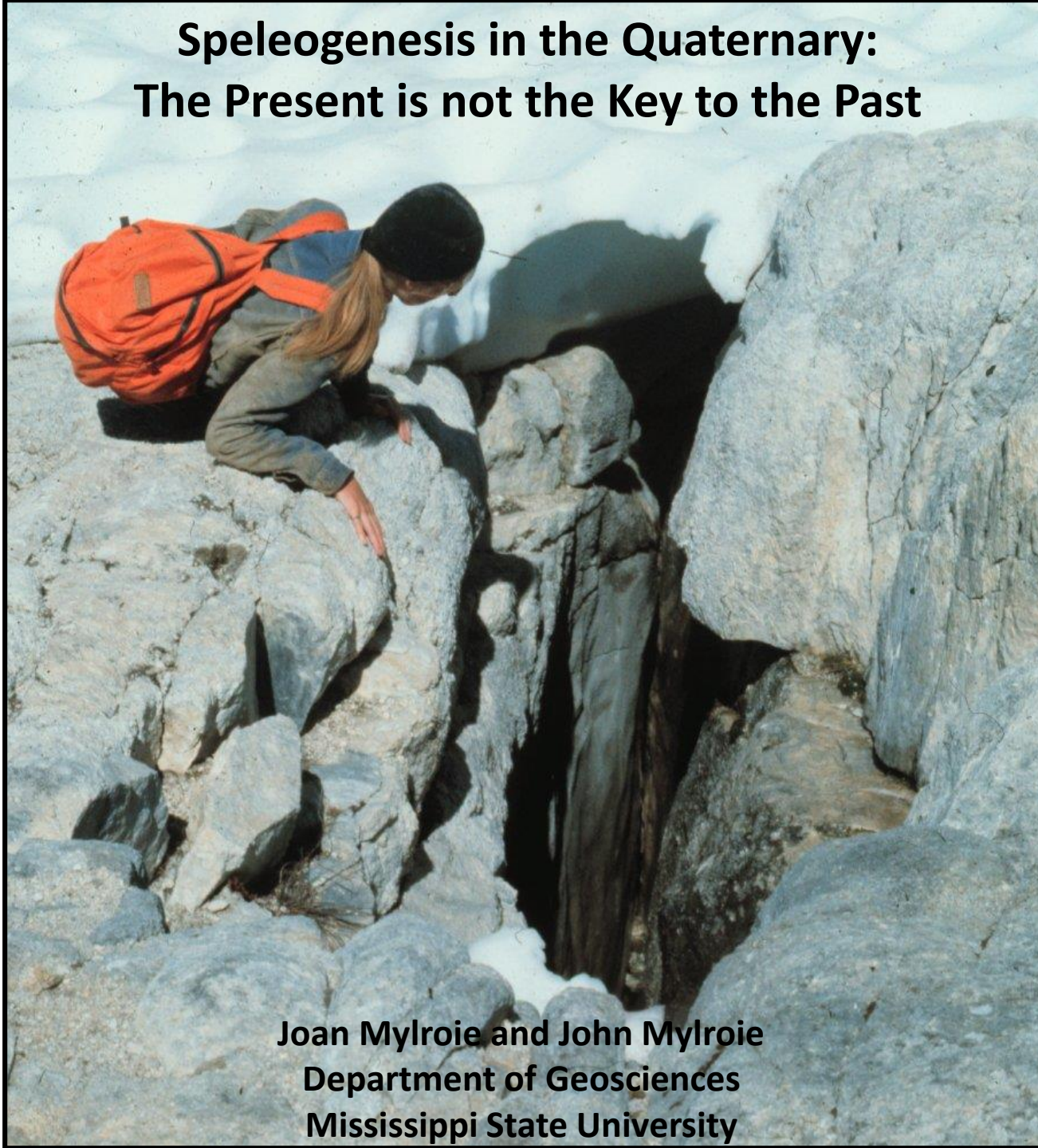


Speleogenesis in the Quaternary: The Present is not the Key to the Past

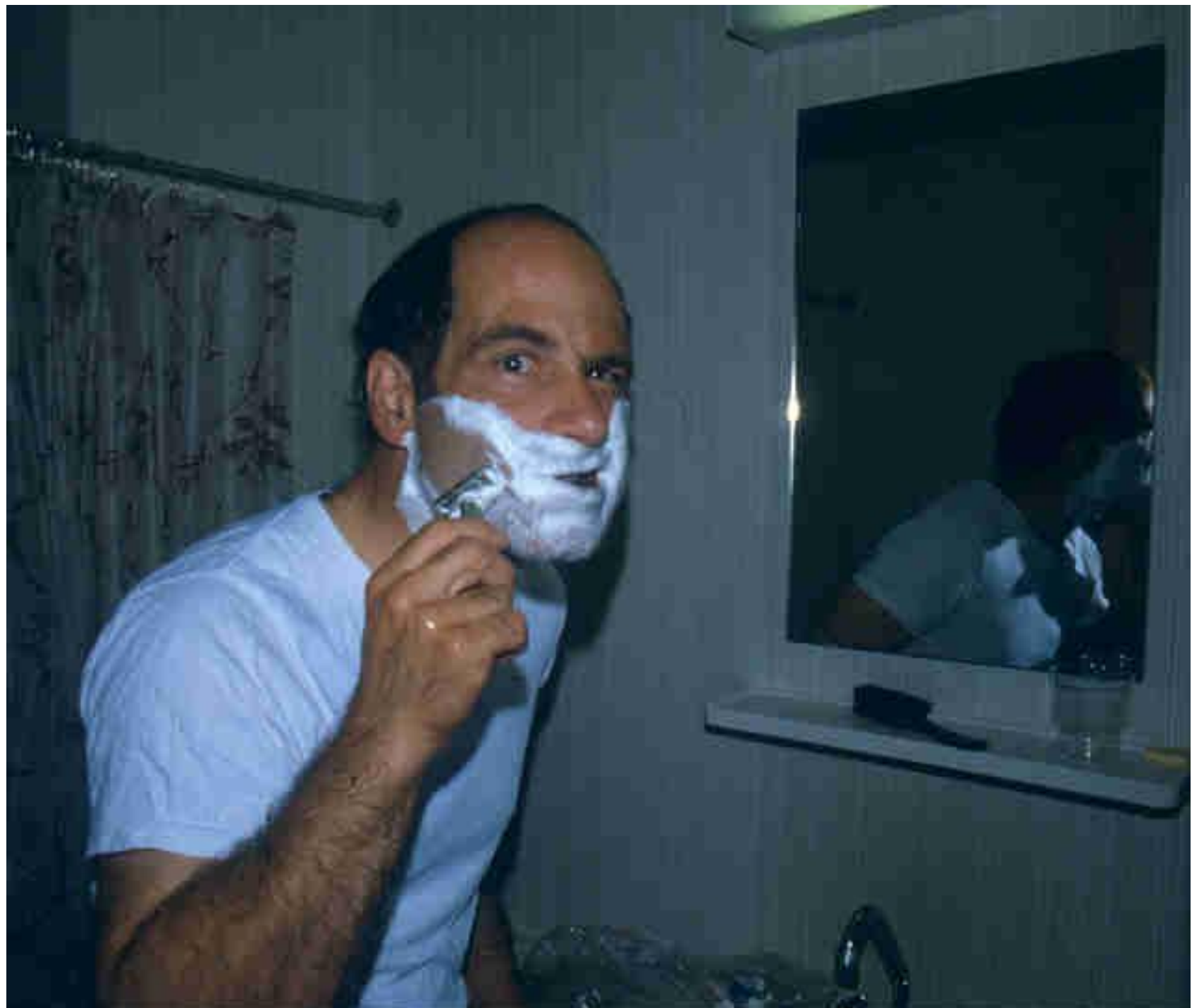


**Joan Mylroie and John Mylroie
Department of Geosciences
Mississippi State University**

**Mineral King,
California**

**Dedicated to:
Art and Peg Palmer**

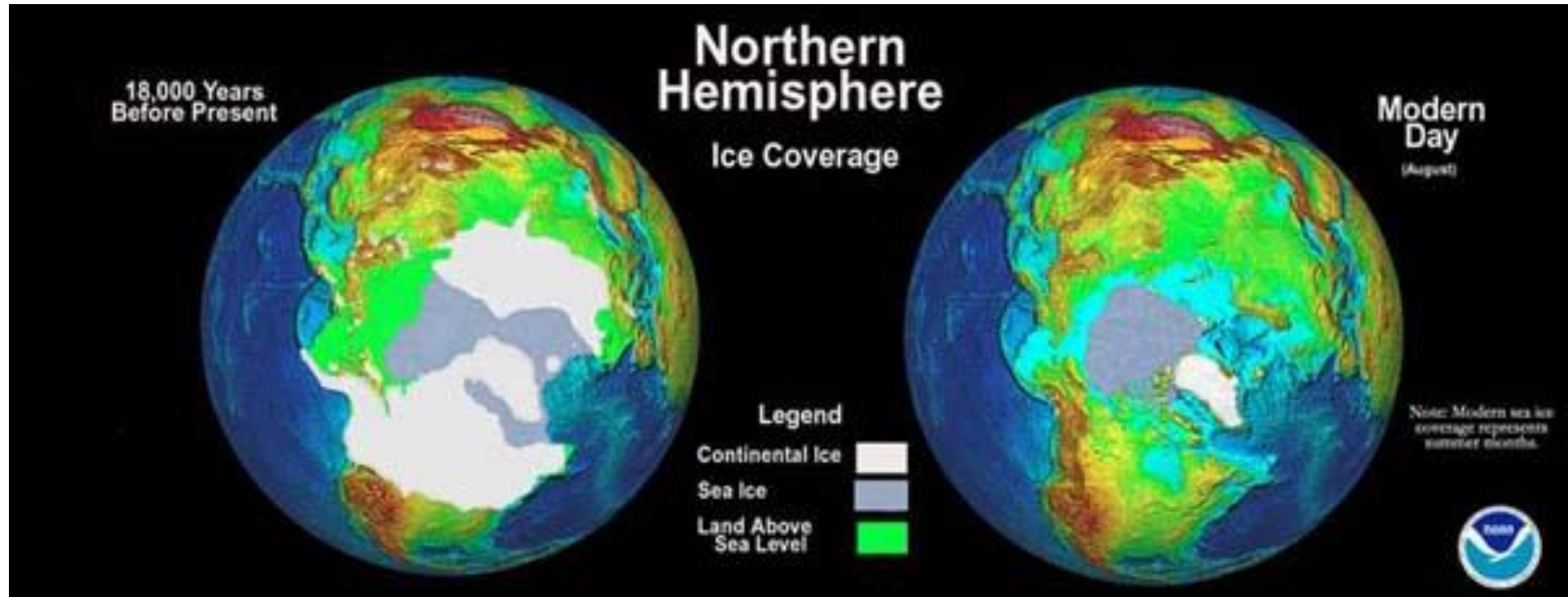




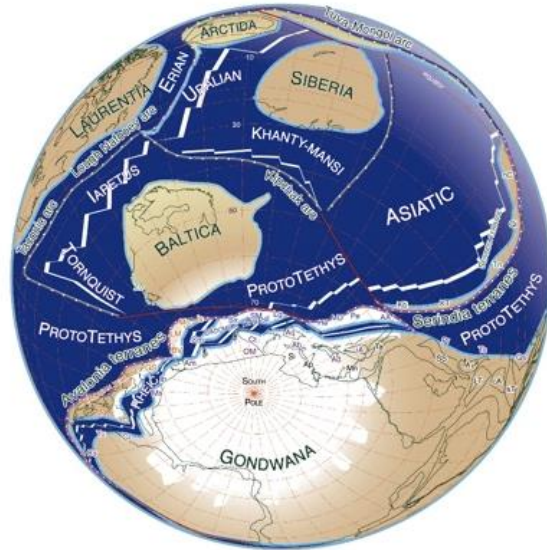
**For Karst Processes, is the statement “The Present Is The Key To The Past”,
in the sense of Charles Lyell, David Hume and James Hutton, correct?**



In the Phanerozoic, continental glaciations
as seen in the Quaternary are rare

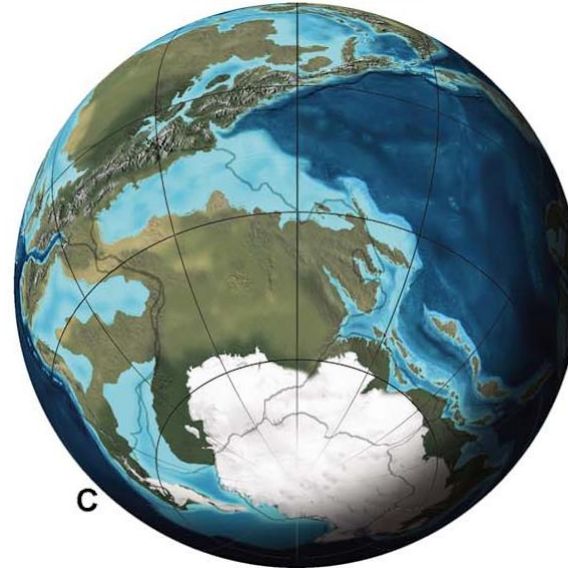


Large-scale continental glaciation cannot occur unless the continents are in polar positions



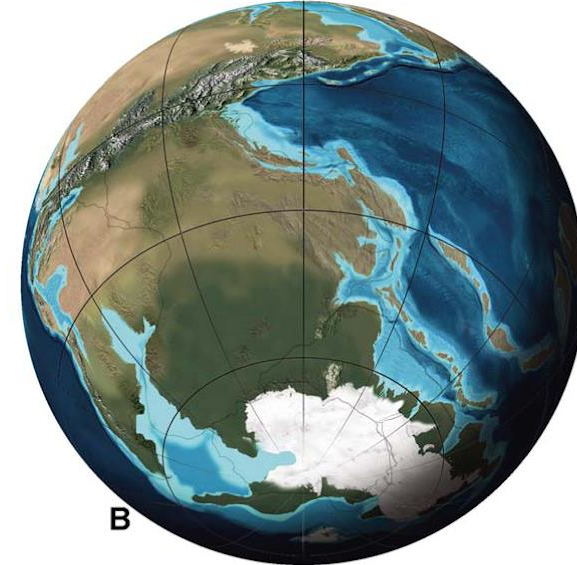
Ordovician

Stamp and Bael 2002



Pennsylvanian

Fielding et al., 2008



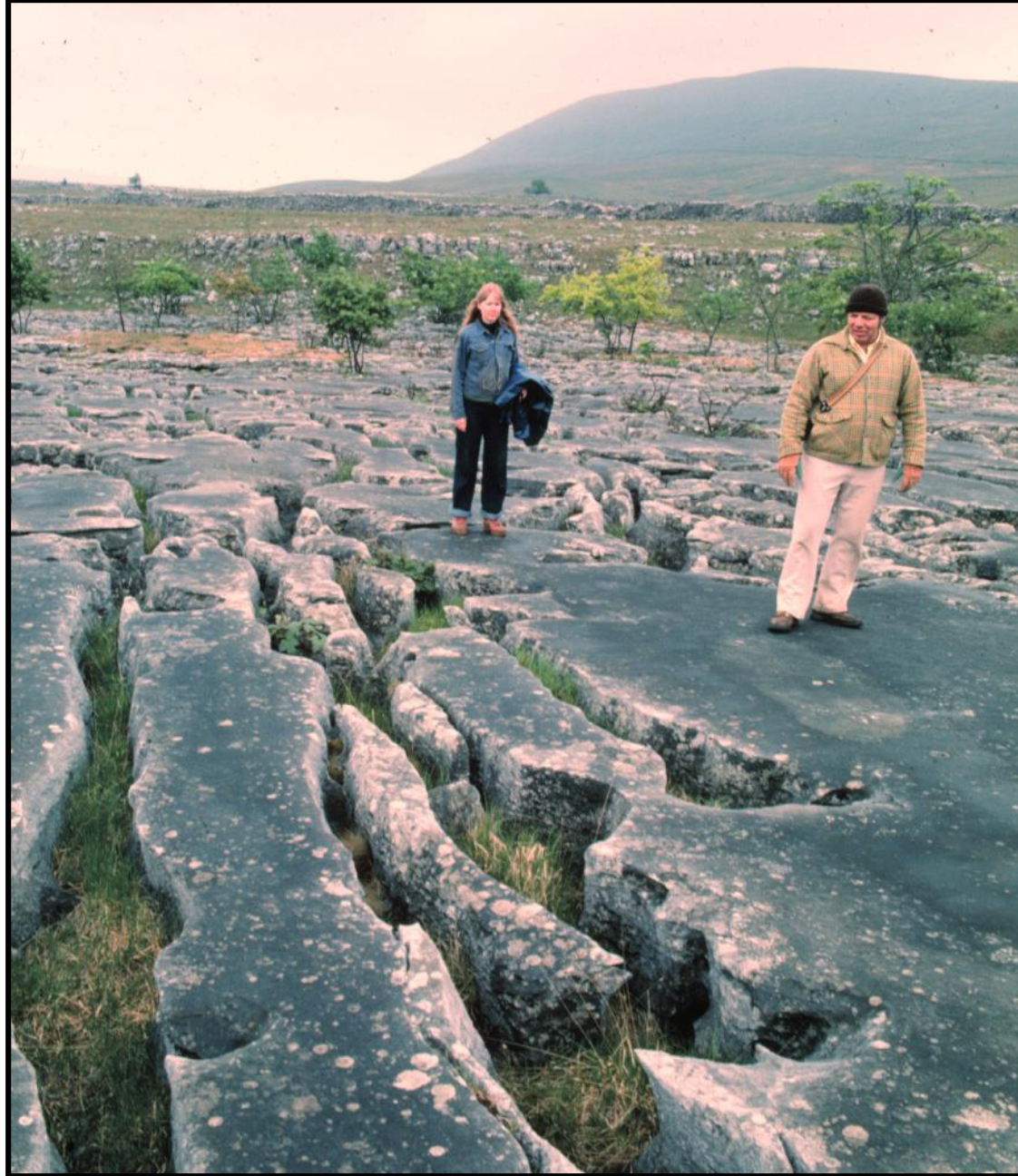
Permian

Fielding et al., 2008

How does glaciation affect Karst Processes?



Front Porch Cave,
Cayman Brac

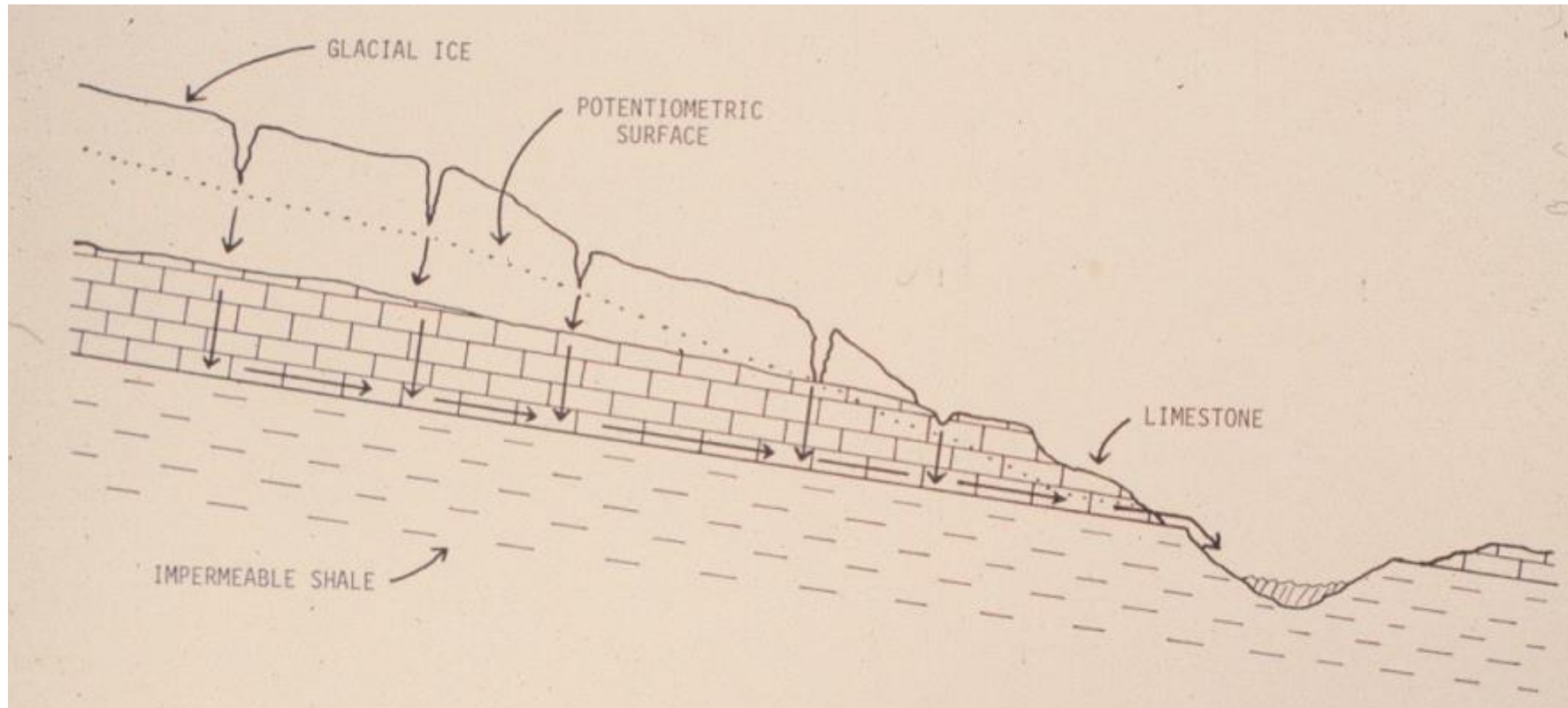


Glaciation Effects Fall Into Three Categories:

1. Ice Contact Effects

Glaciated karren, Yorkshire, UK

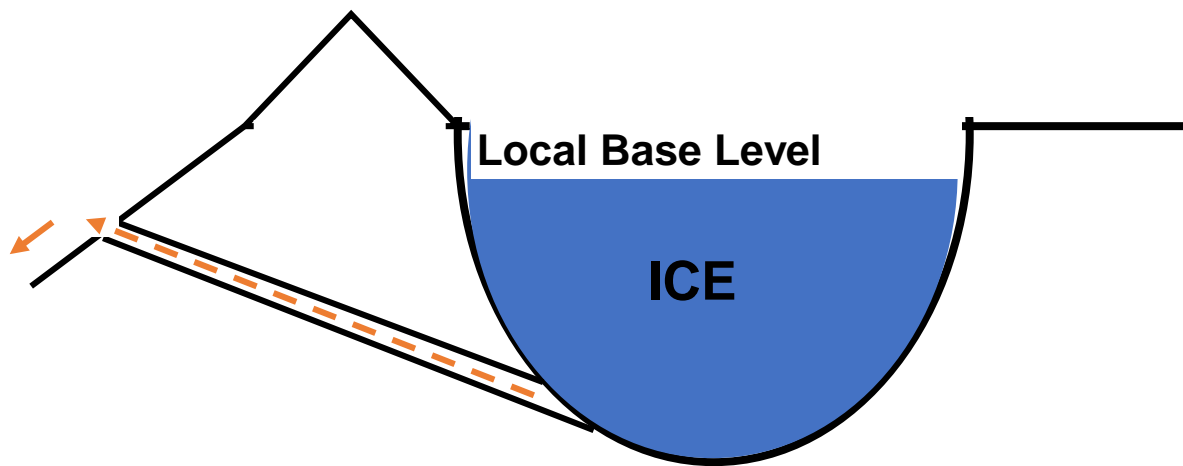
Glacial ice is a hydrological as well as a mechanical influence on speleogenesis



Myloie 1984

Flow Reversal In Glacial Valleys, Norway

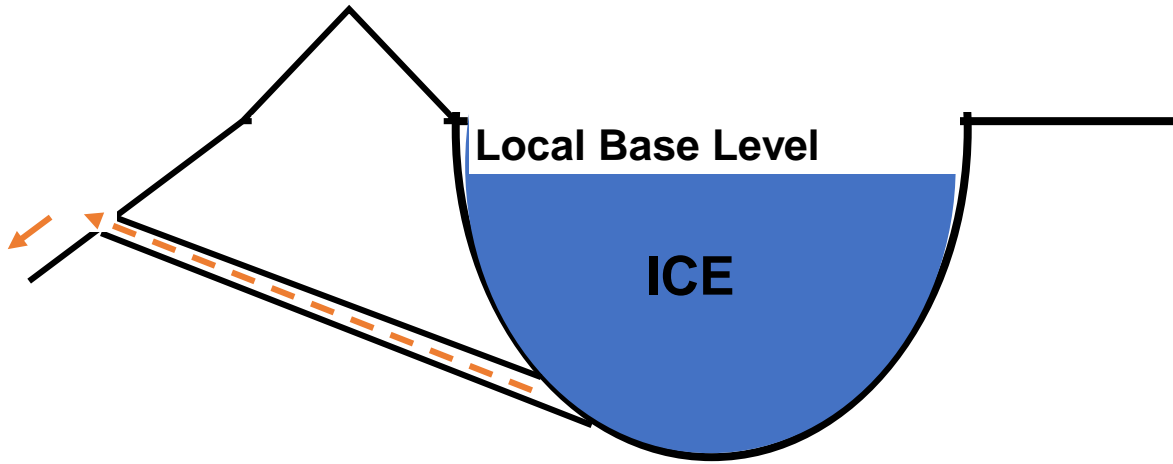
When ice is in the valleys, water escapes the sole of the glacier as a phreatic lift.



Temperate-Based Glacier

Flow Reversal In Glacial Valleys, Norway

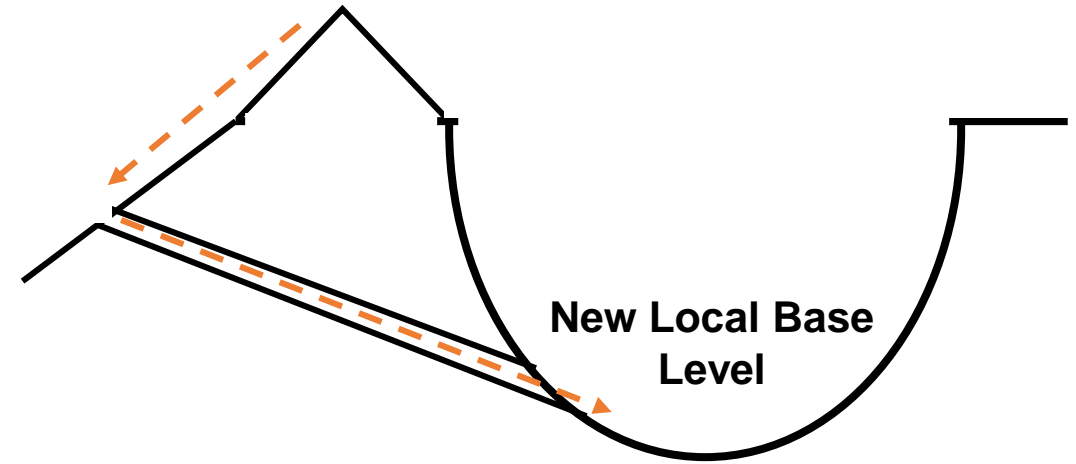
When ice is in the valleys, water escapes the sole of the glacier as a phreatic lift.



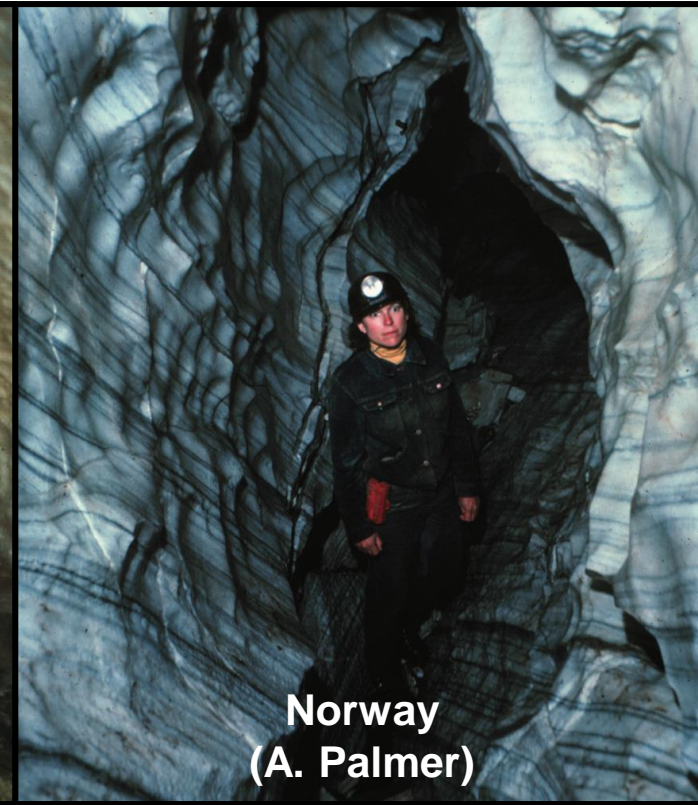
Temperate-Based Glacier

→
GLACIATION ENDS

When the ice melts, base level drops to the valley floor, and the phreatic lift becomes a vadose tributary.



Flow reversal, overprinting, and reactivation of cave passages are common in glaciated karst

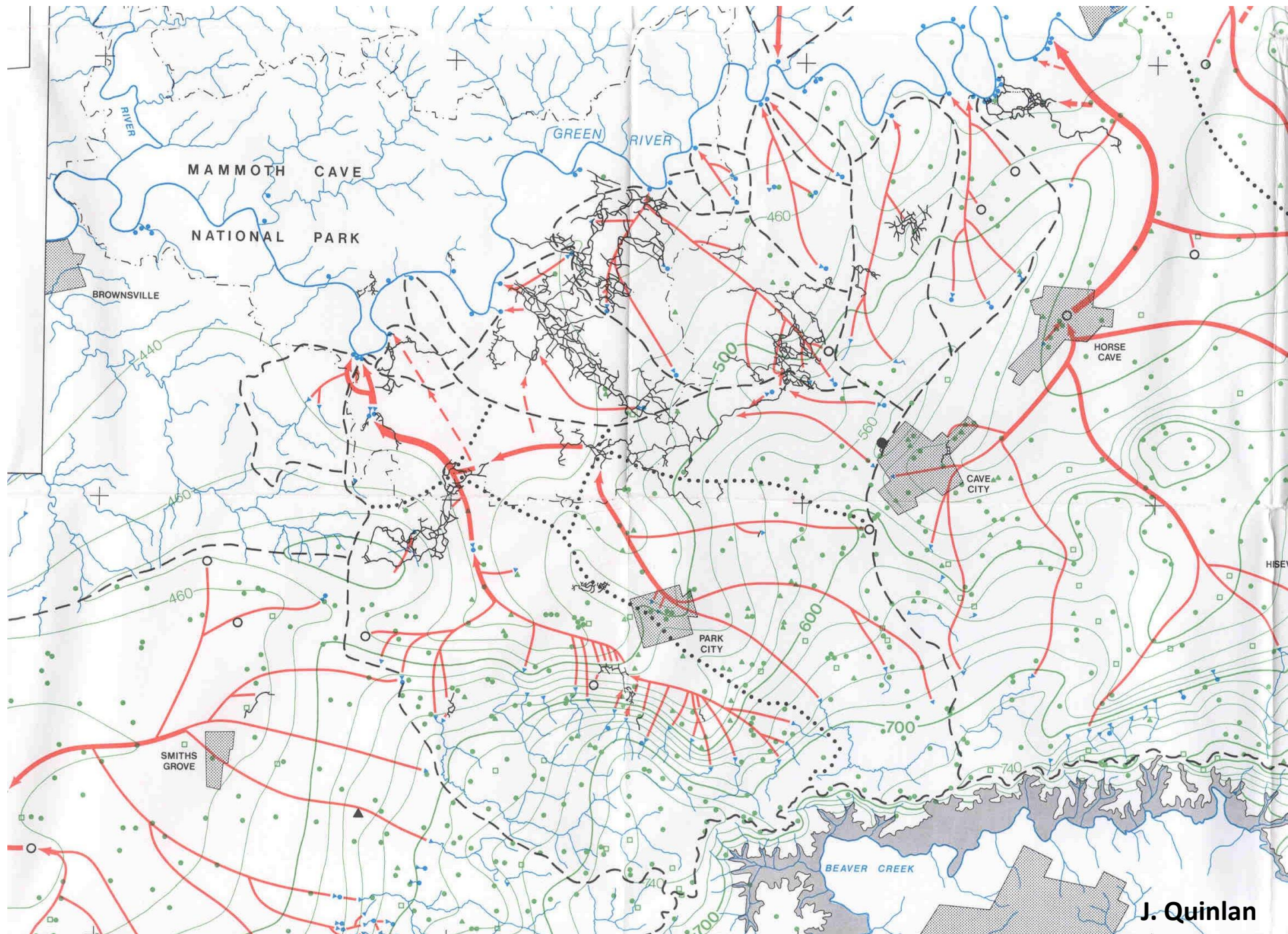


Glaciation Effects Fall Into Three Categories:

- 1. Ice Contact Effects**
- 2. Ice Proximity Effects**

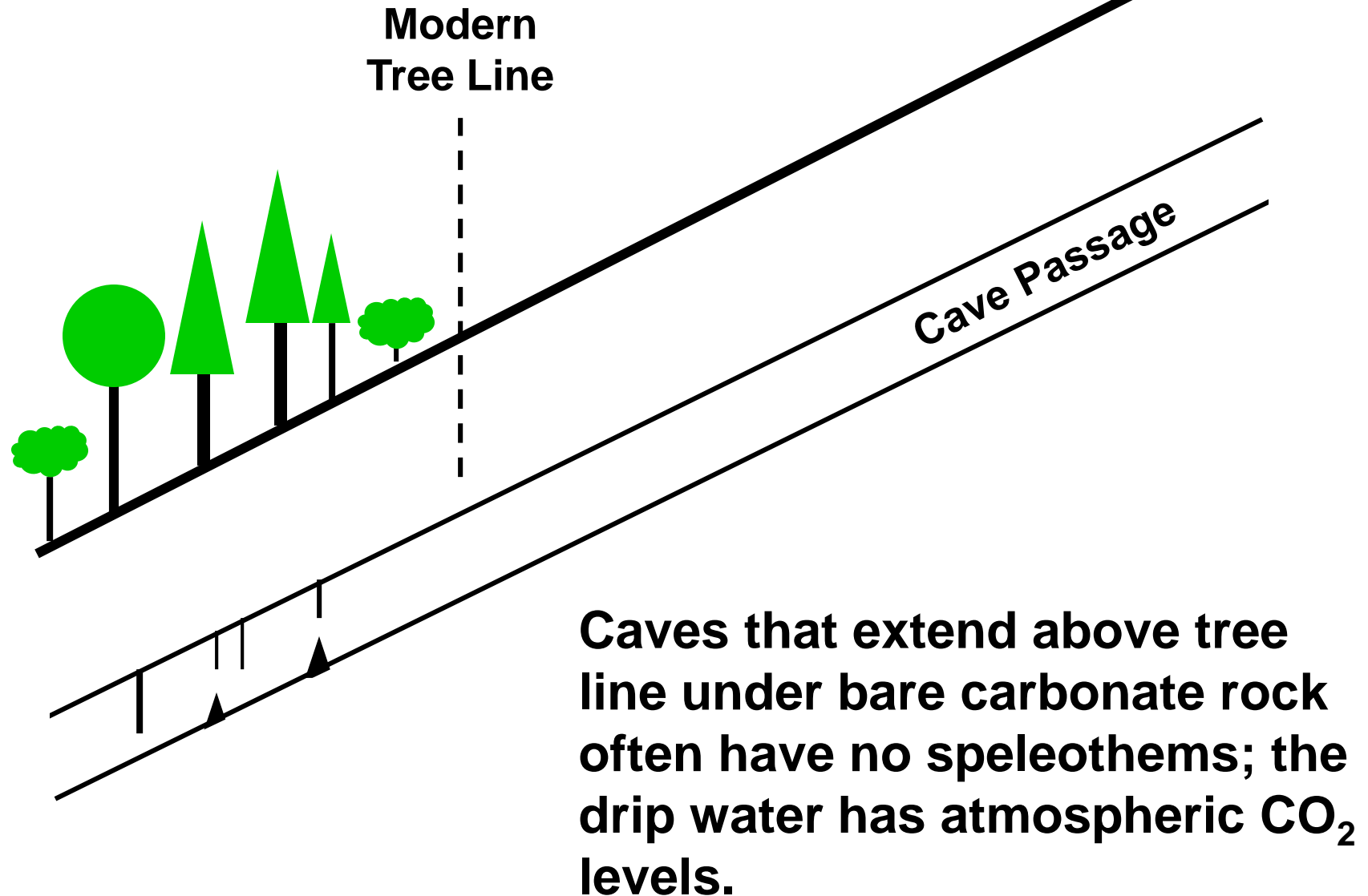


**Glacial Lake Schoharie deposits in Caboose
Cave, Schoharie County, NY**

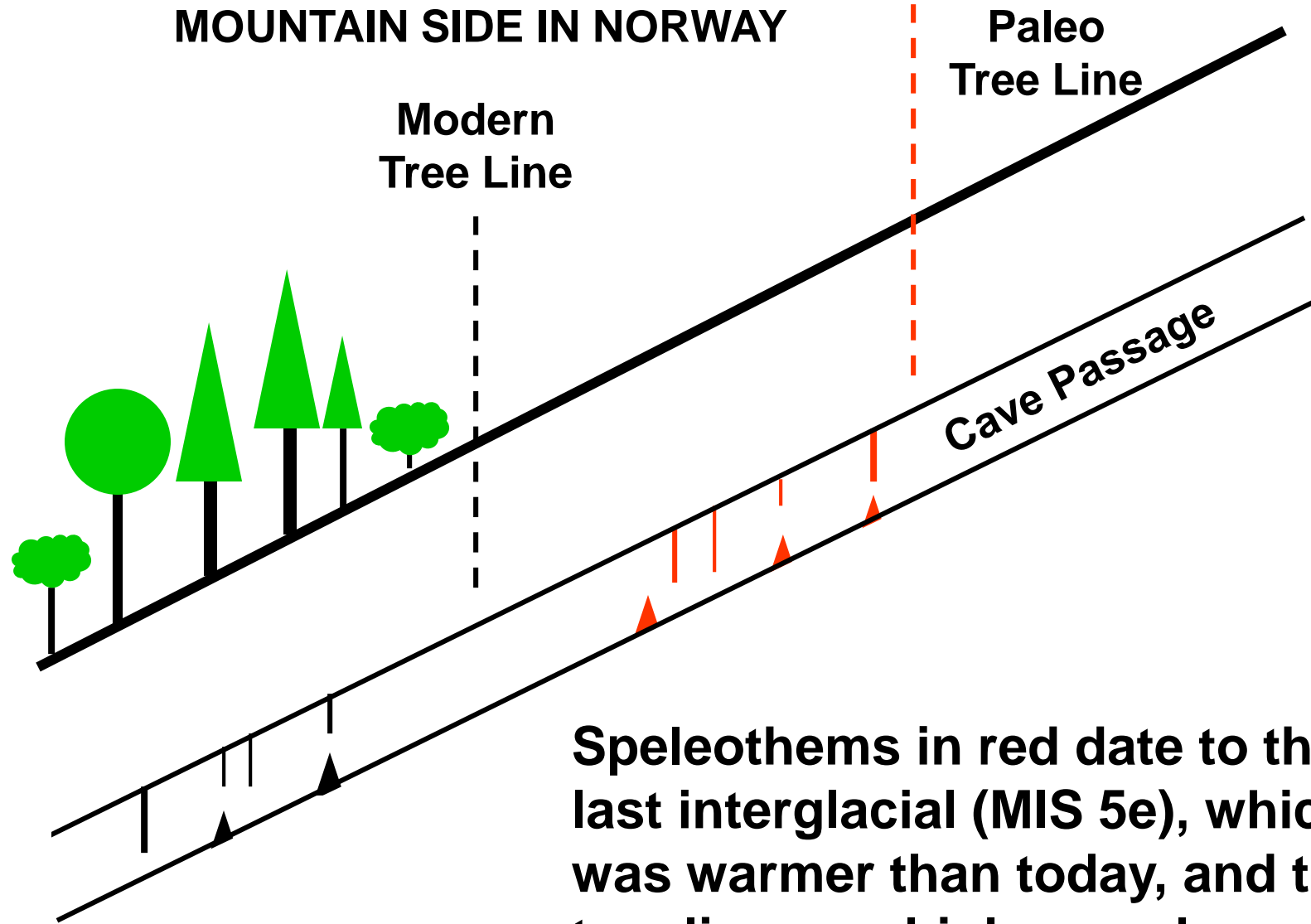


J. Quinlan

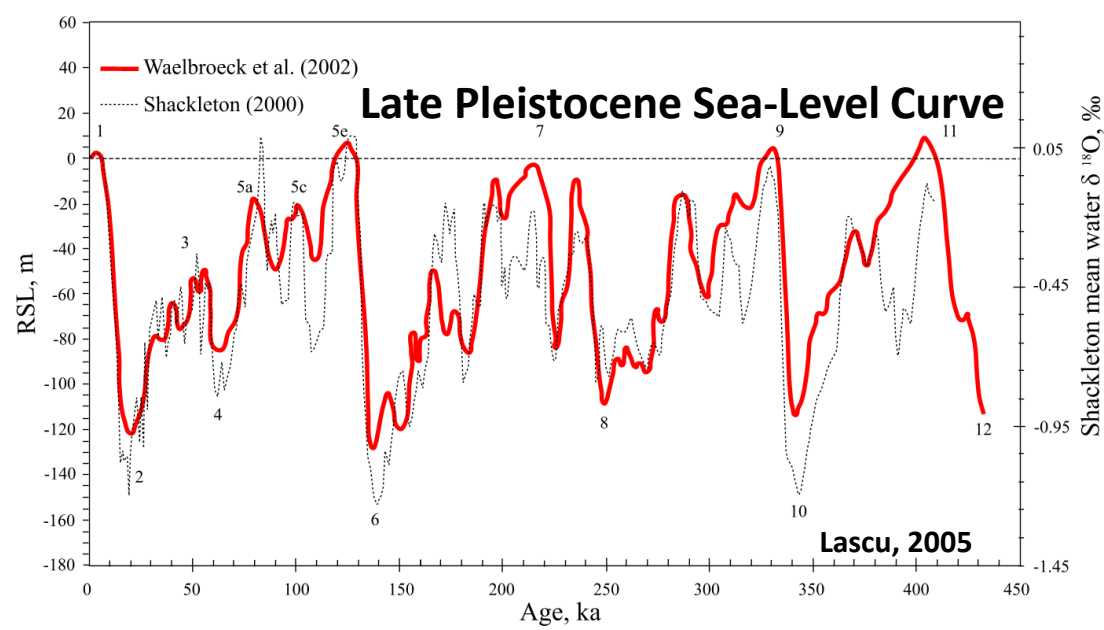
MOUNTAIN SIDE IN NORWAY



MOUNTAIN SIDE IN NORWAY

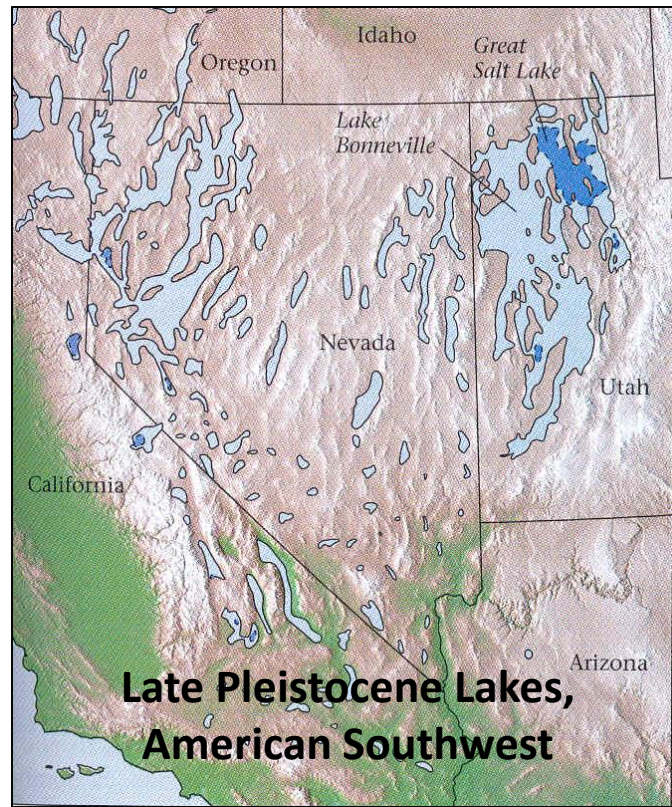


Speleothems in red date to the last interglacial (MIS 5e), which was warmer than today, and the tree line was higher upslope.



Glaciation Effects Fall Into Three Categories:

1. Ice Contact Effects
2. Ice Proximity Effects
3. Global Effects





Southern Nevada

**We have a good grasp of how cave processes
work today, and we extrapolate to the past**



**Cool Spring Cave,
Trigg County, KY**

**What about the Mesozoic, when there were
no significant continental glaciations?**



Dinosaur National Monument, Utah

The key to resolving the question is to determine if caves are:

1. Persistent in the rock record



Paleozoic Cave Deposits, Jenolan, Australia

The key to resolving the question is to determine if caves are:

1. Persistent in the rock record

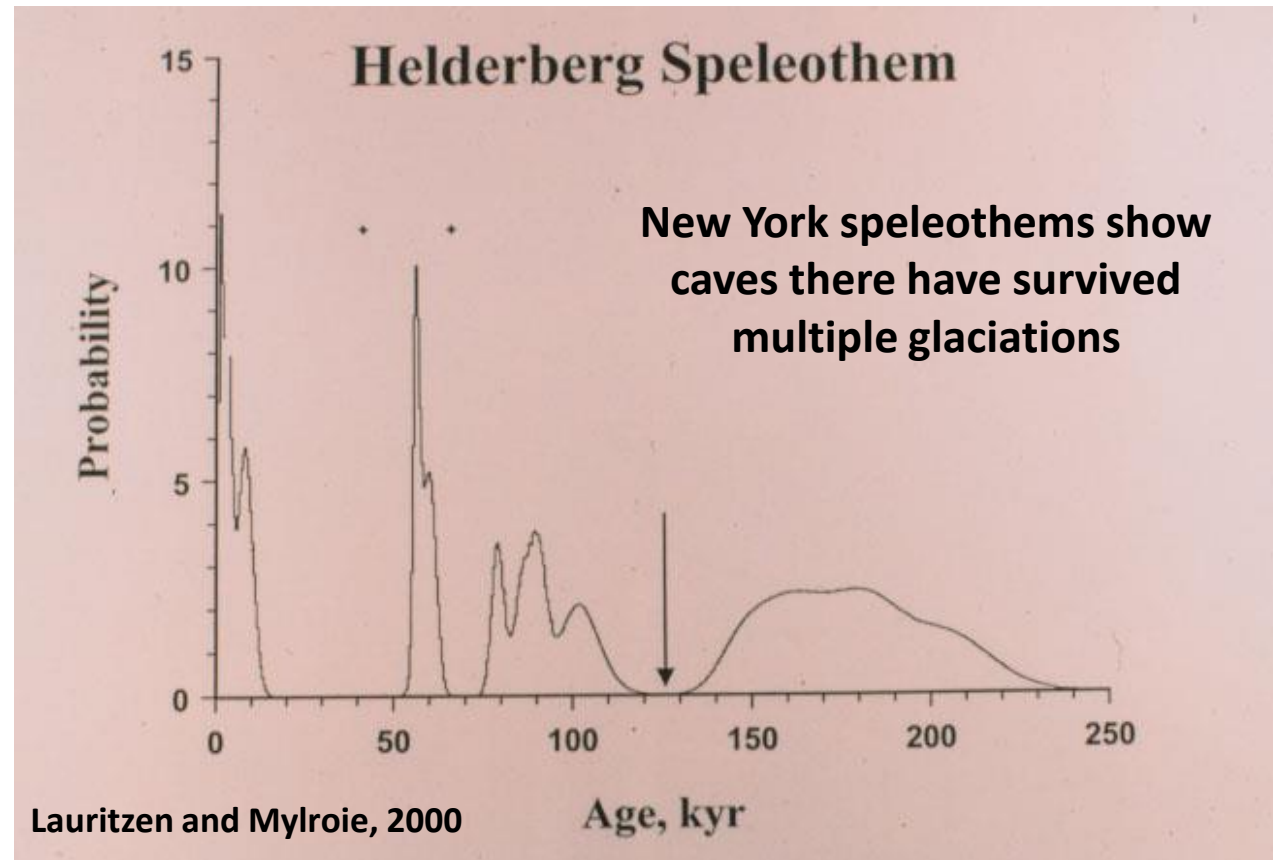
2. React rapidly to changing conditions



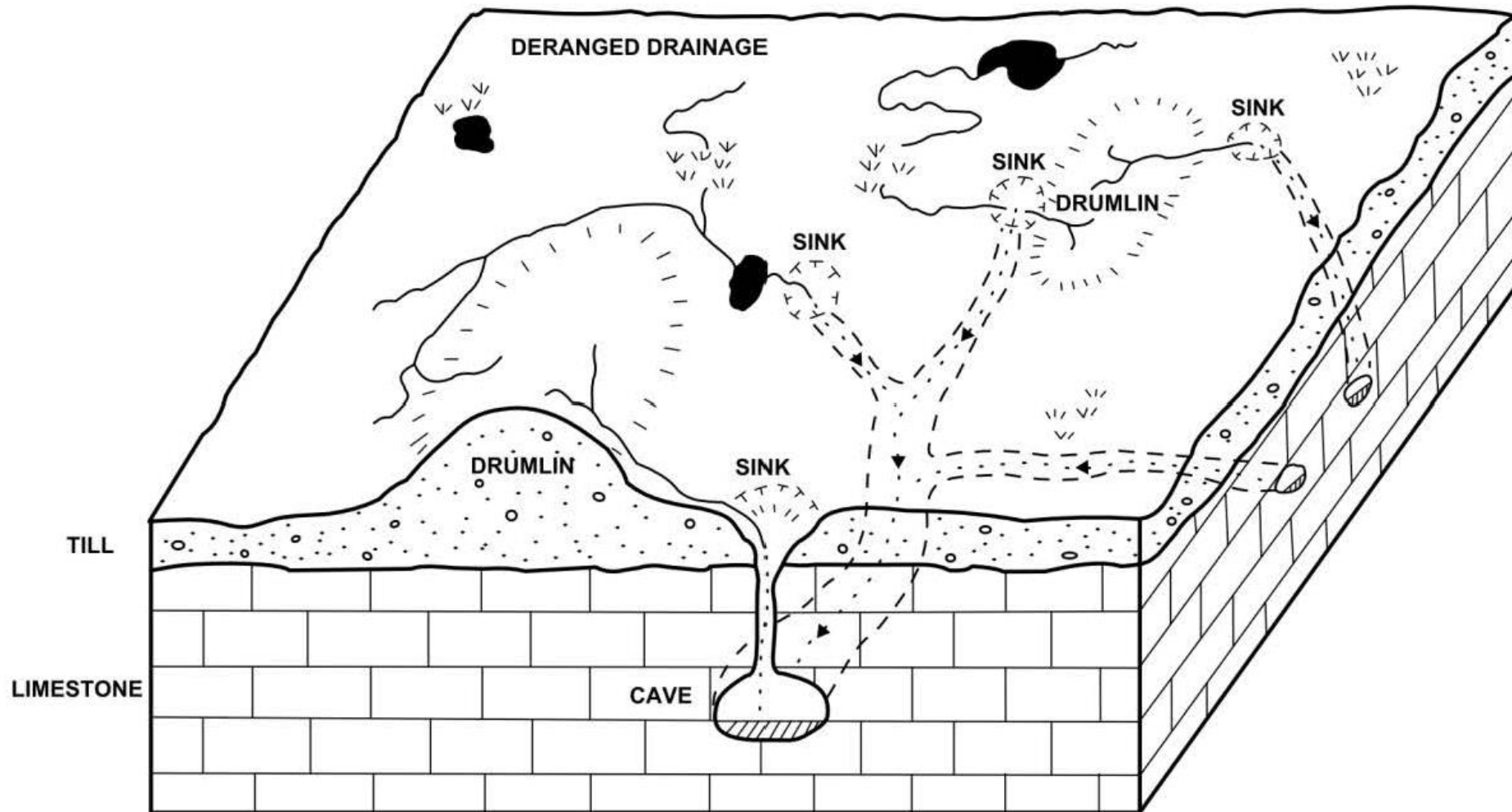
Banana Hole, San Salvador island, formed during MIS 5e

The key to resolving the question is to determine if caves are:

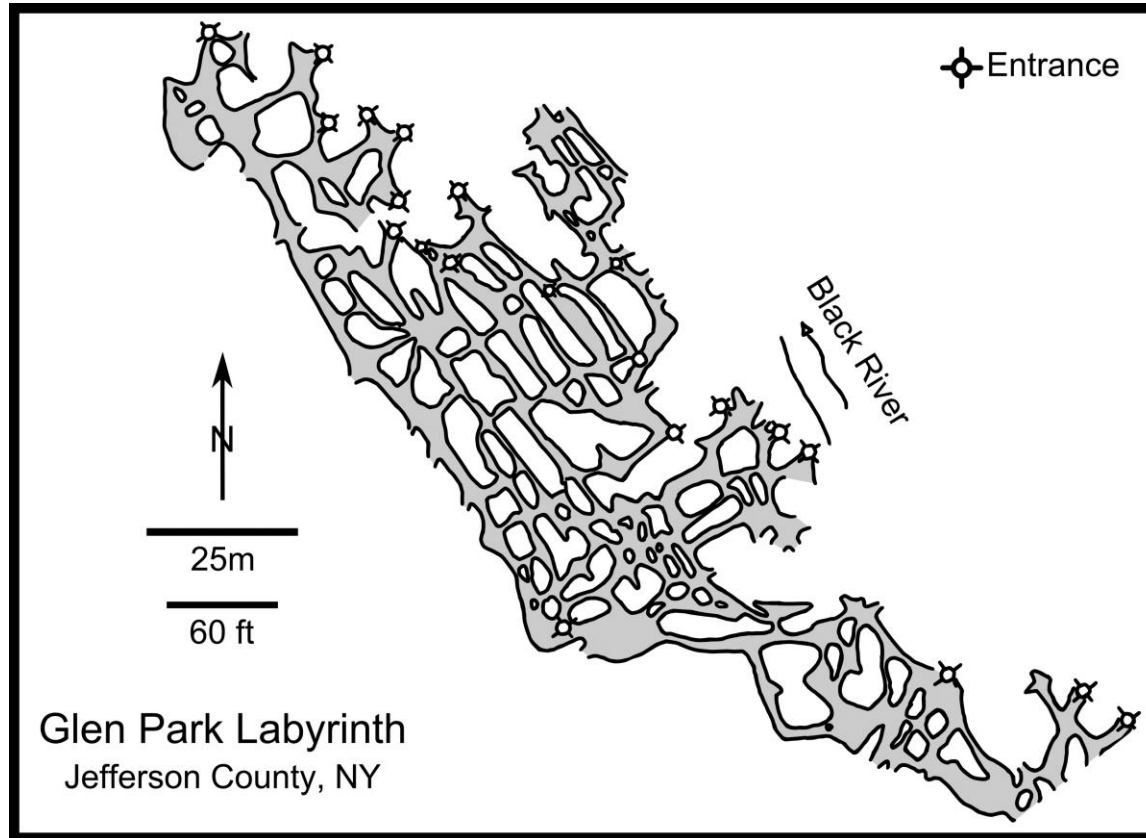
- 1. Persistent in the rock record**
- 2. React rapidly to changing conditions**
- 3. Survive those changing conditions**



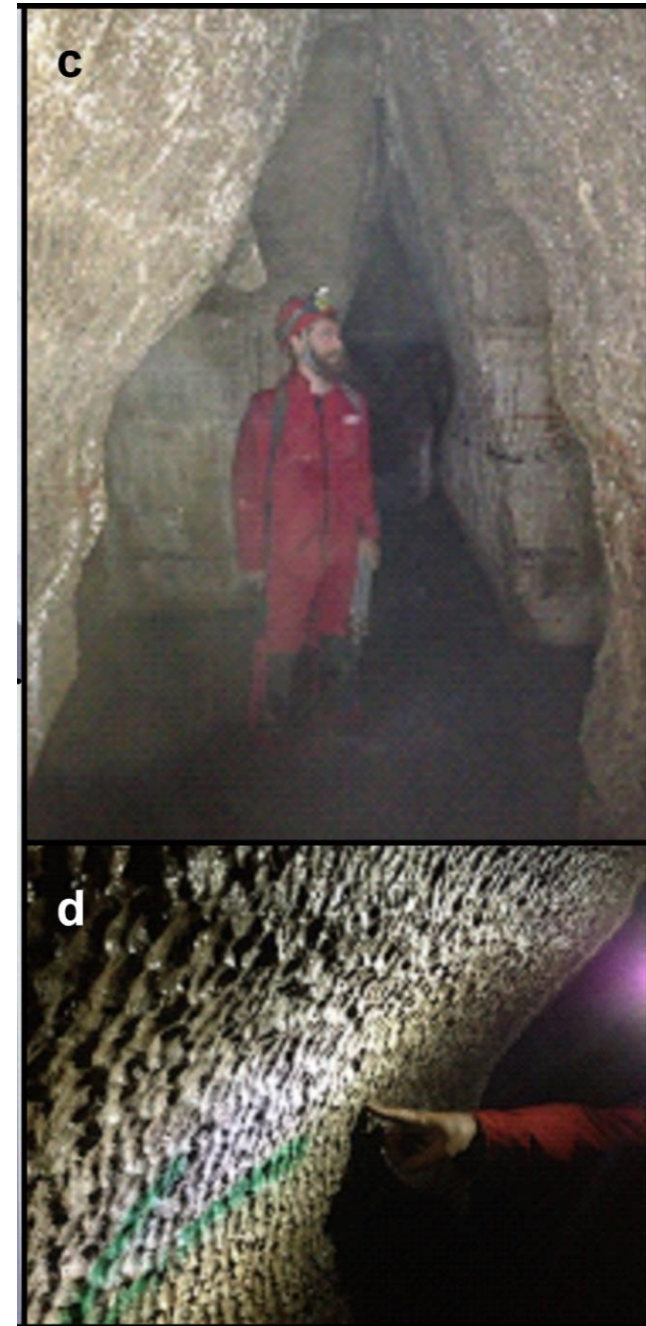
Cave passages have formed post glacially to adapt to the new and deranged surficial flow system.



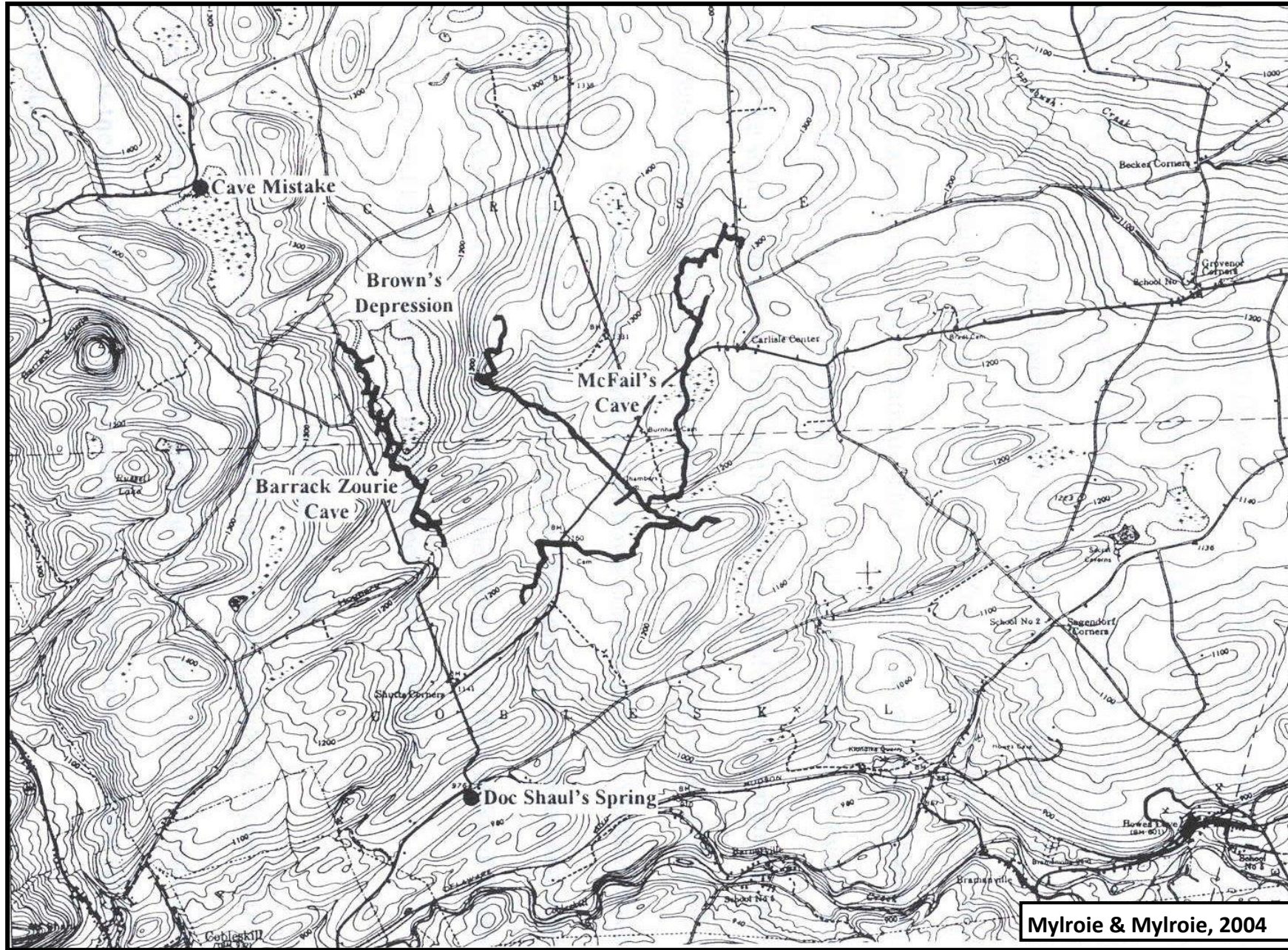
Post-glacial backflood maze caves are found along post-glacial rivers



Cooper and Mylroie, 2015



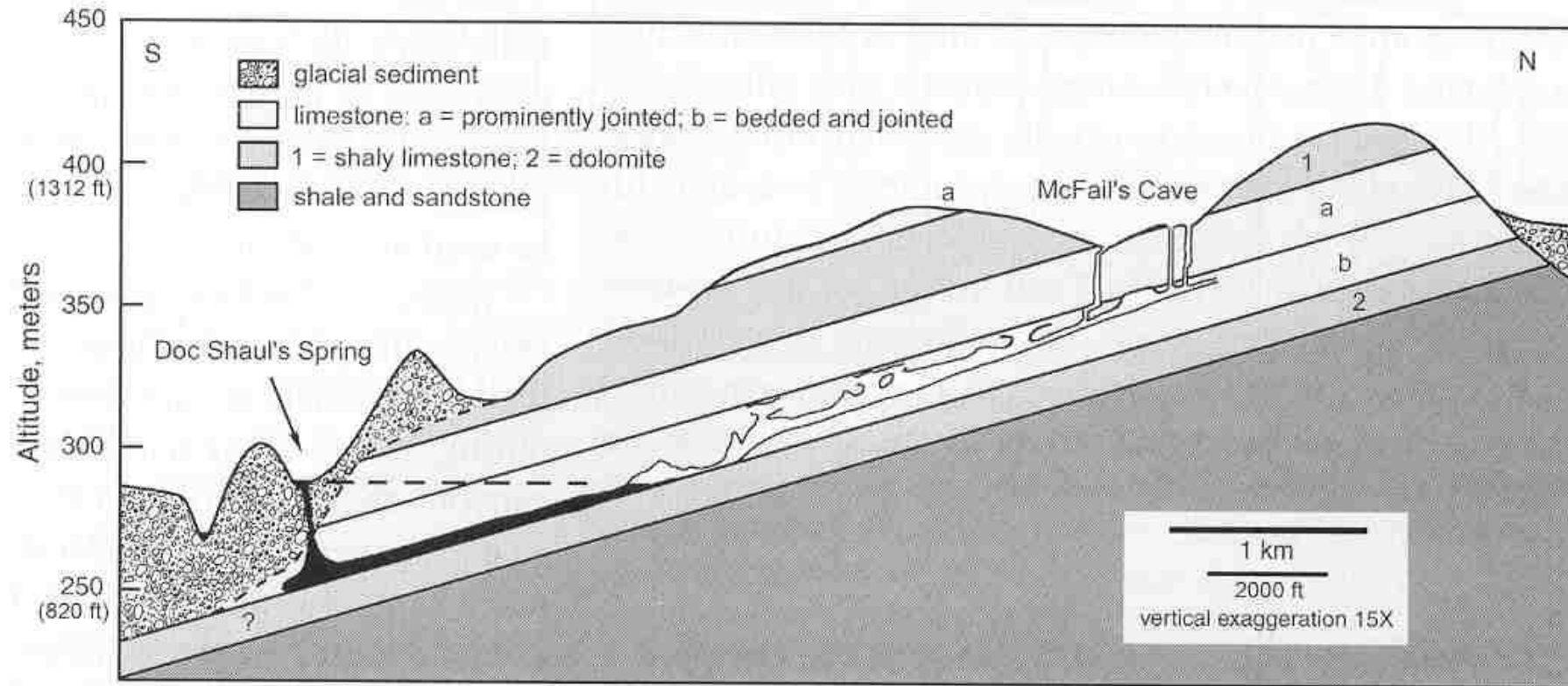
Cave systems show pre-glacial trunk passages with post-glacial infeeders



**Doc Shauls Spring, the resurgence for McFails Cave,
has piped upward 30 m through glacial till**

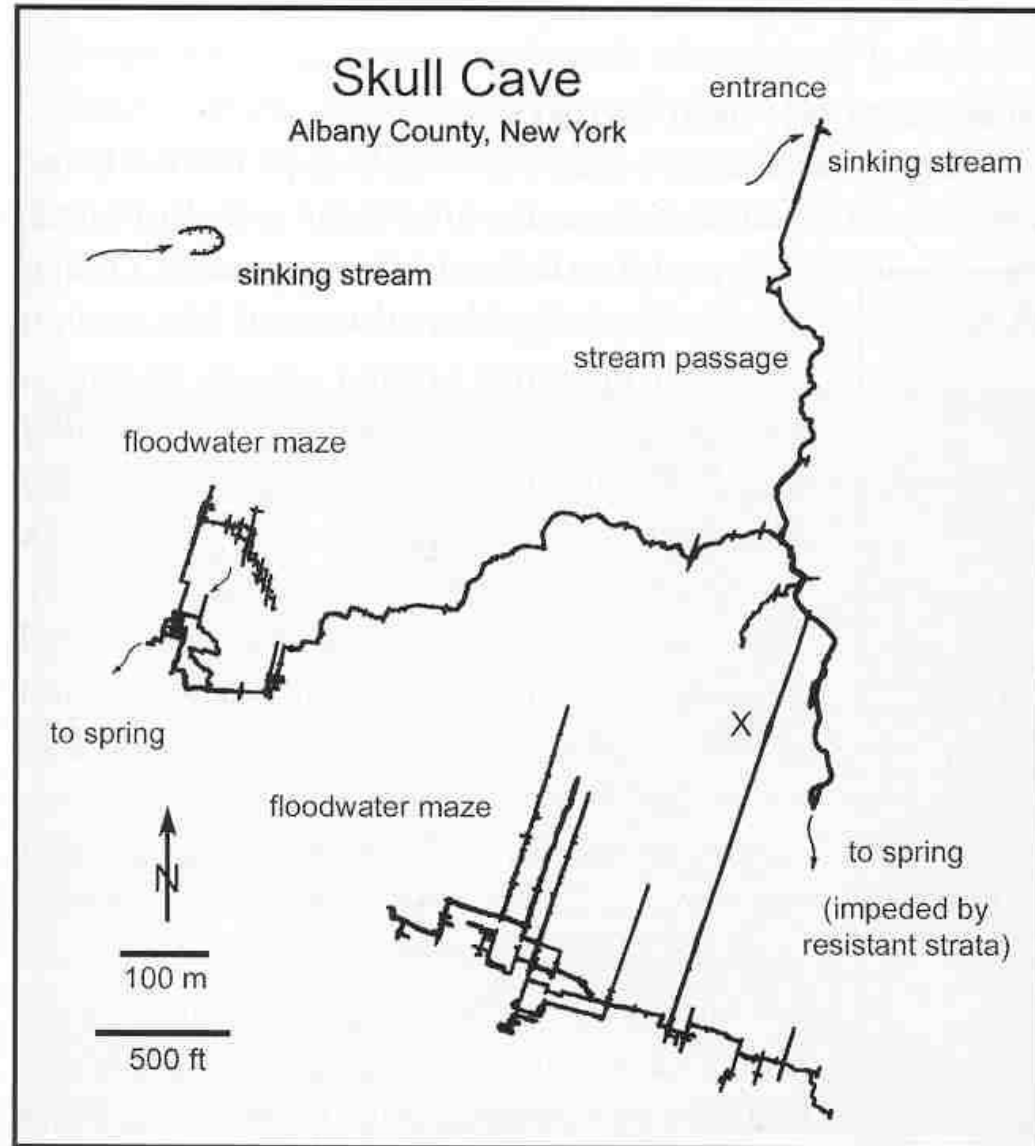


If inputs are new, what happens to outputs?



A. Palmer, 2007

Backflooding creates new passages superimposed on pre-existing passages

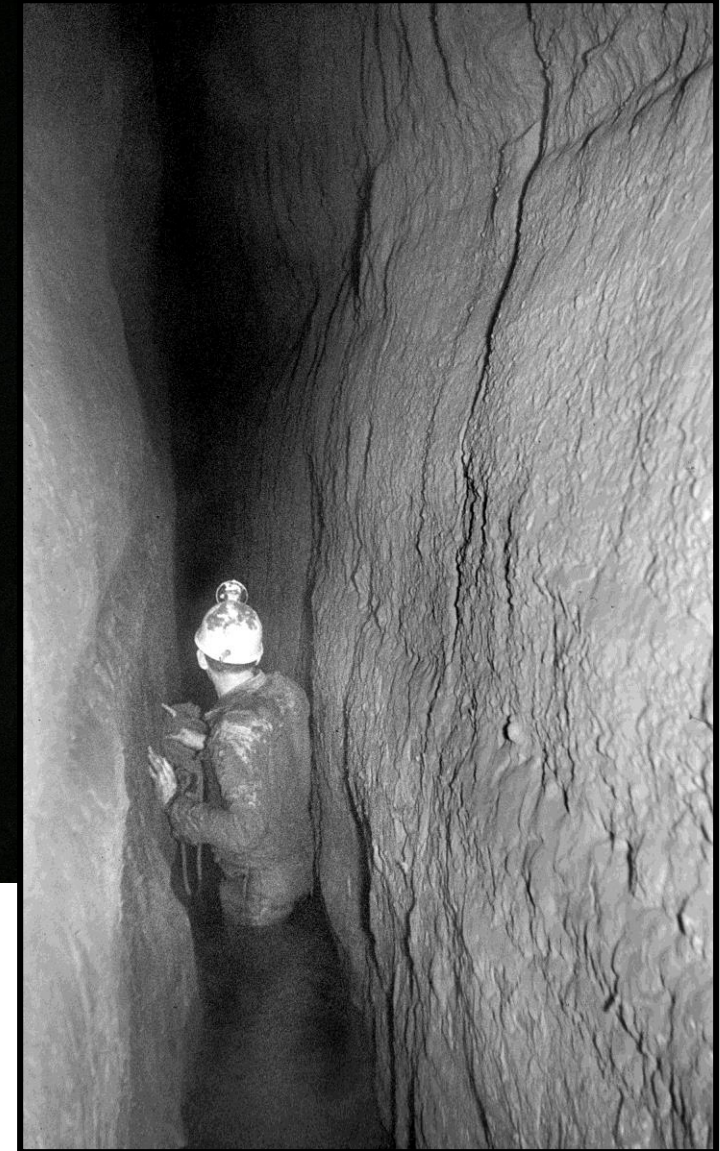


Skull Cave, Albany County, NY

Phreatic tube along strike



Backflood joint passage



A. Palmer Photos

The key to resolving the question is to determine if caves are:

1. Persistent in the rock record.....YES

2. React rapidly to changing conditions.....YES

3. Survive those changing conditions.....YES



**R. Palmer Photo,
Grand Bahama
Island**

So, we ponder the question: Does glaciation matter?



**Mineral King,
California**



**We need to avoid getting
stuck in tight arguments**

A. Palmer photo, Bermuda

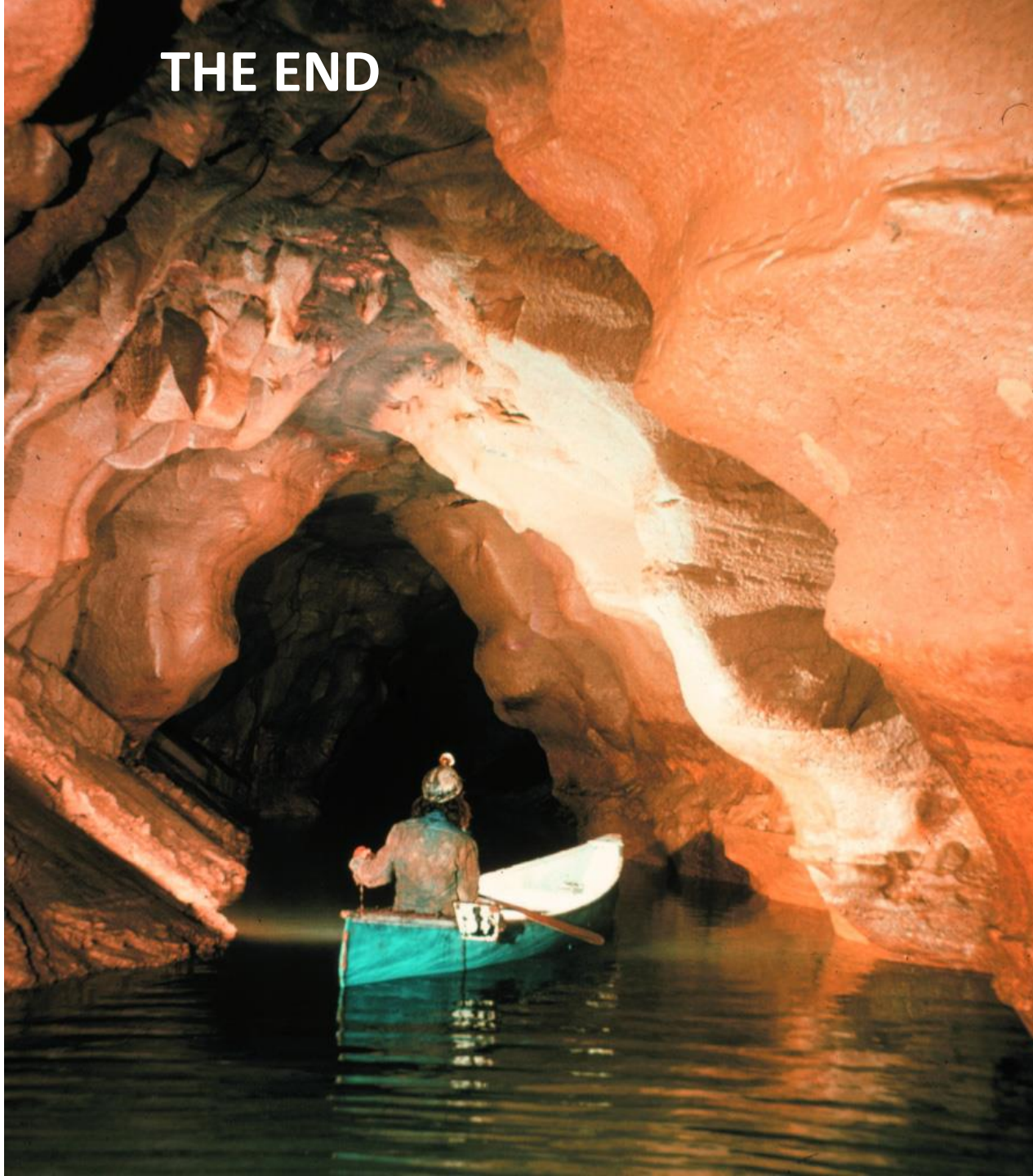


CONCLUSION

Do we *cling* to ideas of uniformitarianism, or do we recognize that epigenic cave and karst processes are a long-lived, high-fidelity record of all aspects of the variation in the Earth's surficial history?

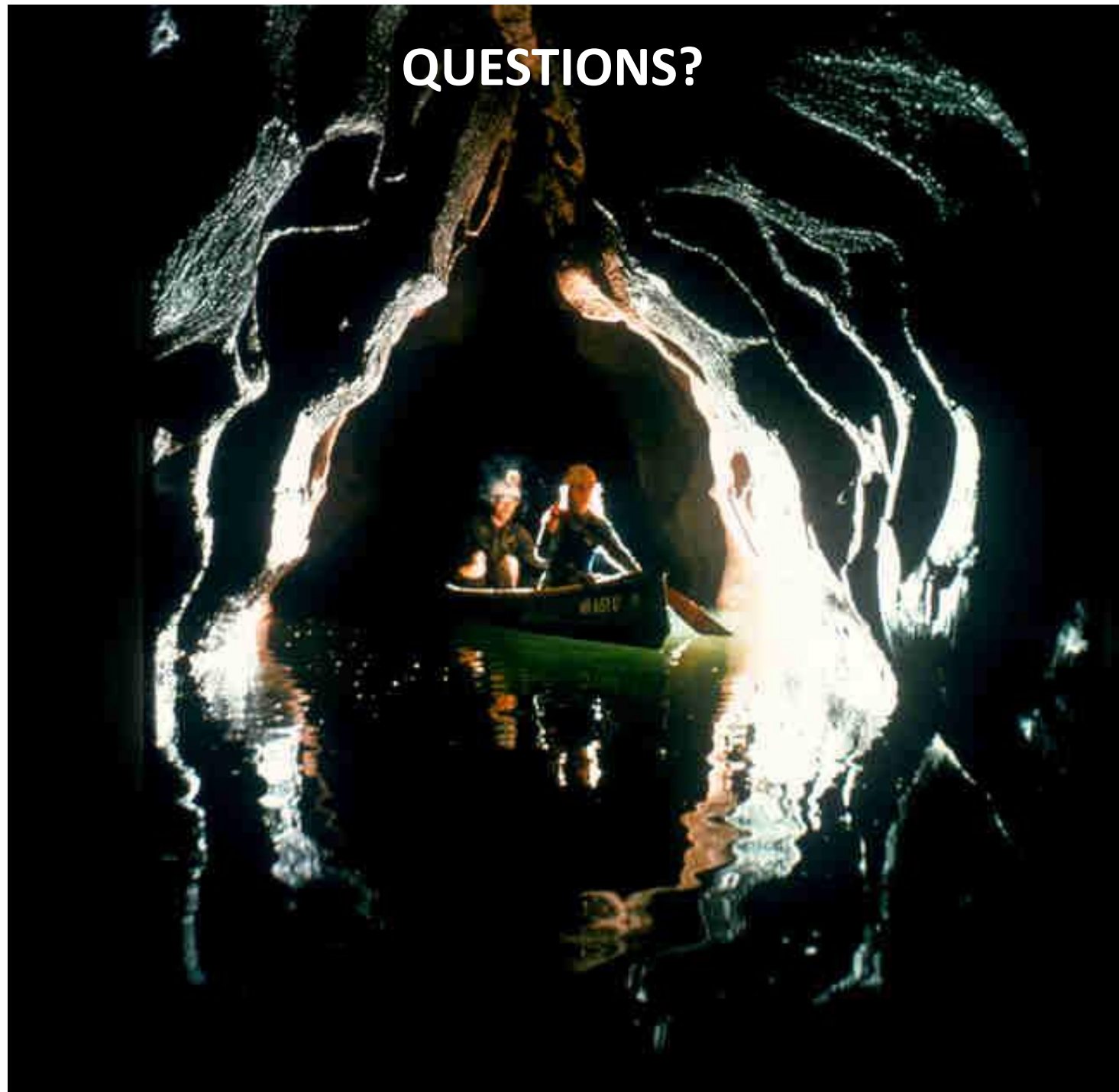
A. Palmer photo, Norway

THE END



**A. Palmer
photo,
Indiana**

QUESTIONS?



**A. Palmer
photo,
Indiana**