

An Inquiry Into the Evolution and Sediments of Caves Along the Scioto River.

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1) Introduction

There is an important relationship between the growth of caves and the base water level of the streams they connect with:

- A **phreatic** cave passage occurs when the cave is at the current base level of the stream. (Fig. 2)
- A **vadose** cave passage occurs when the cave is trying to erode down to the current base level of the stream. (Fig. 2)

The cave passages gives us a window into the water levels of the streams during different points of a cave's existence. This, in addition, to information about the sediment in the cave can record large-scale climate changes.

The Wisconsin Glaciation of Ohio occurred from 24,000-14,000 years ago. The Powell Moraine reached down through Delaware and Union Counties, and penetrated the very top of Franklin county. According to Goldthwait (1958), "[The retreat in Franklin County] took place about 16,000 years ago" (p. 18). The major rivers and tributaries of the Columbus area served as outlets for glacial meltwaters.

The caves are located in Dublin, Ohio and this project focuses on the North and South Indian Run Caves.

2) Methods

There were two components to the research: Collection of sediment samples and searches of the surrounding area for clues to explain the caves' evolution.

- ❖ Samples were collected in two major ways.
 - The first, involved extracting surface sediment from caves with a rock hammer.
 - The second employed a manual corer to extract deeper layers of sediment whenever possible.
- After collection, images of the samples were recorded to scale using a light station and camera.
- ❖ The exploration of the area included:
 - Traveling to several waterfalls in the area.
 - Viewing a spring on the shore along the Scioto River.
 - Locating and exploring another set of caves on the other side of the Scioto River.
 - Visiting Ohio Cavers and exploring Ohio Caverns



Figure 1: Sediment core from South Indian Run Cave broken in half for a more encompassing view.



Figure 2: Sediment core from South Indian Run Cave; segment broken in half, with one half split again for alternate view.



Figure 3: Sample of breccia from North Indian Run Cave.

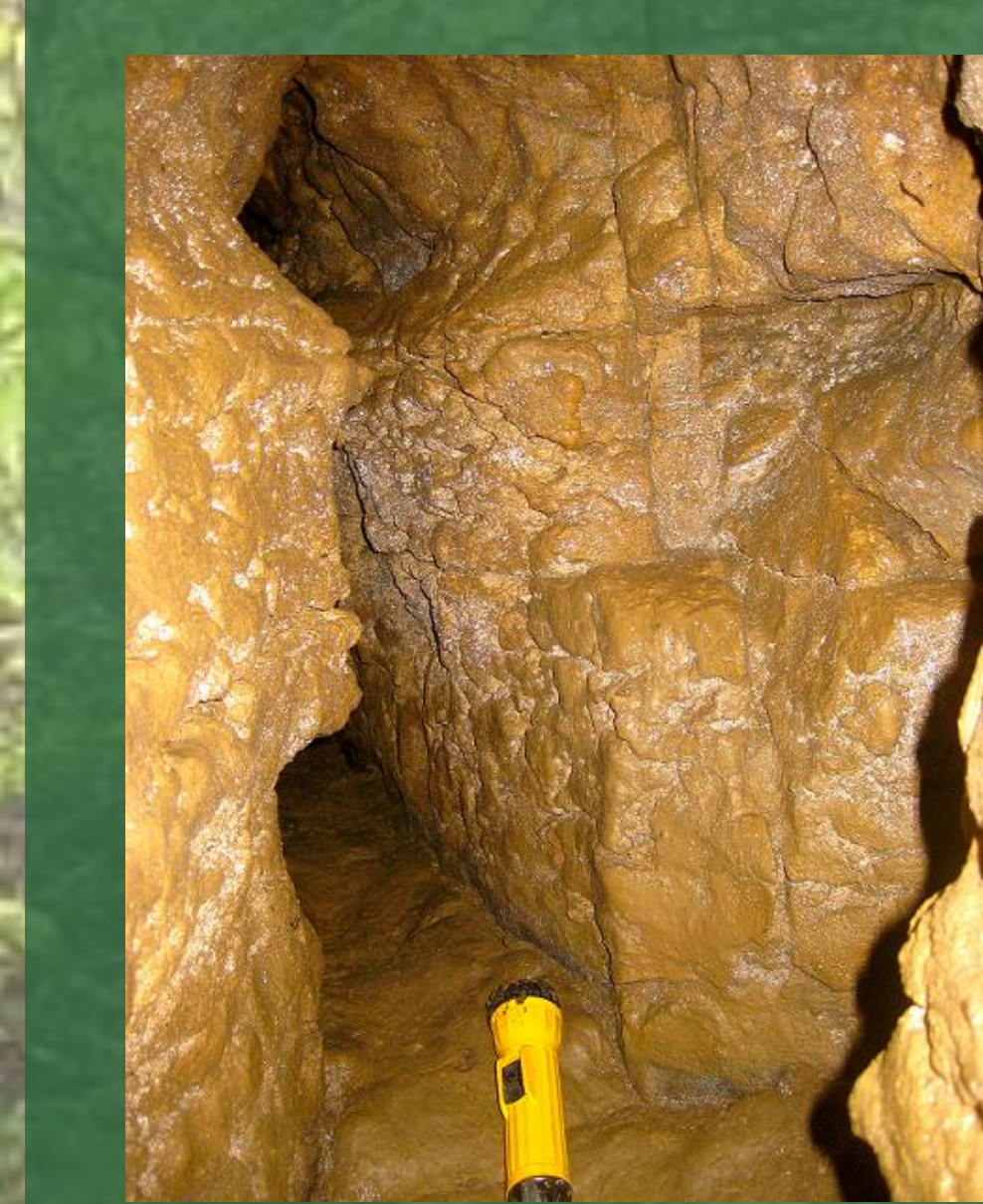


Figure 4: Example of the phreatic (top) to vadose (middle and bottom) transition in South Indian Run Cave.



Figure 5: View of South Indian Run Cave. Depicts how Indian Run bisected the caves.



Figure 6: Example of a phreatic to vadose transition in a passage in Ohio Caverns. Vadose region descends much further, but is filled by sediment.



Figure 7: Current point of entrance for water in South Indian Run Cave, on the passage floor. (Opening roughly baseball sized.)

Figure 10: Example of a phreatic to vadose transition in the cave on the other side of the Scioto River.

3) Results

- The explorations determined that the phreatic to vadose transition was present in all the visited caves. (Fig. 4, 6, 10) This lends credence to the fact that the transition was not an isolated occurrence and supports the idea that the stark transition from phreatic to vadose was caused by deglaciation, something that occurred over a large portion of the state. It is likely that the erosion caused by glacial travel lowered the base level of the region. With the large volume of meltwaters that followed, a steep vadose passage began to form.
- The caves at Indian Run are directly across from one another on opposite banks. This suggests that, at one point, the two were connected and, then, bisected by the Indian Run stream over time. The discovery of the second set of caves on the other side of the Scioto with the same relative bank locations supports this theory.
- The cored sediment (Fig. 1, 2) proved to be a fine-grained, damp clay with some particles of larger size mixed in. The nature of the sediment was incompatible with the planned sieve analyses.
- The presence of breccia in North Indian Run cave (Fig. 3, 9) suggests that the Indian Run caves were fed through a sinkhole in the past. Similar evidence could not be found in the other cave, possibly due to sediment fill.

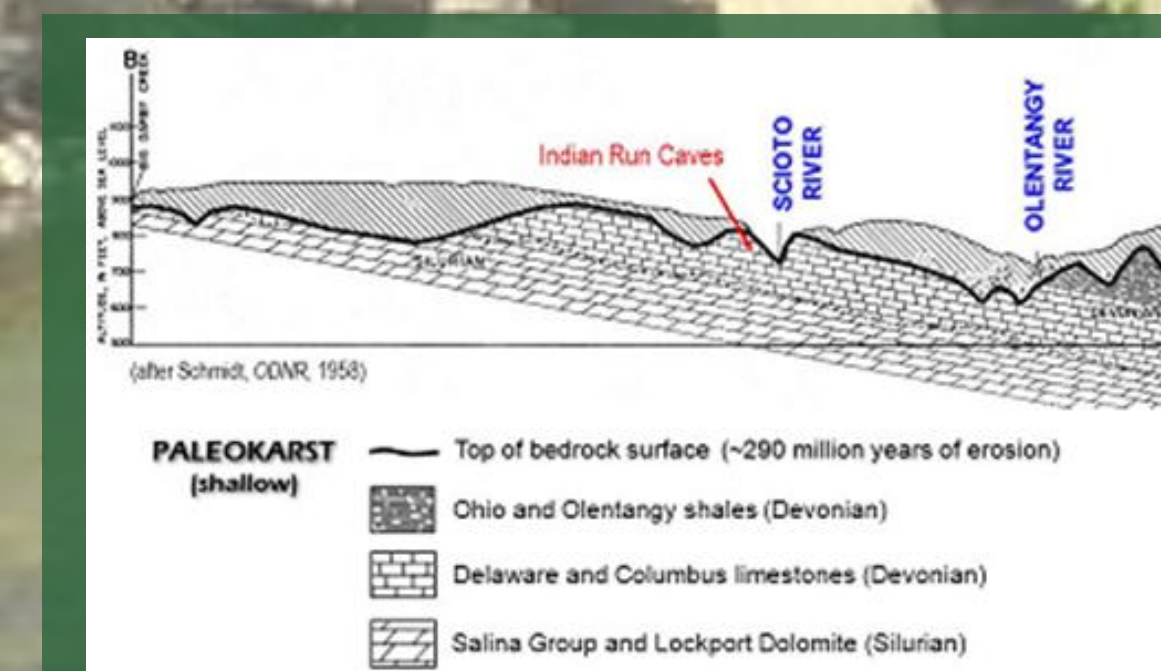


Figure 8: Location of Indian Run Caves with respect to Scioto and Olentangy Rivers, and a cross section of the rocks in the surrounding area.



Figure 9: Example of breccia in North Indian Run Cave.



4) Conclusions

- ➔ The caves situated parallel on the banks of the streams were bisected by downcutting of Indian Run.
- ➔ Caves likely were fed by sinkholes, evidenced by the breccia found in the north cave.
- ➔ The sediment in the caves is fine-grained clay with some larger particles present.
- ➔ The transition from phreatic to vadose passages in the cave suggests a period of rapid downcutting of the outwash sands and gravels in the Scioto River valley by meltwater streams as the glacial lobe retreated northward.

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6) References

1. Goldthwait, R. P. (1958). Character and Distribution of the Glacial and Alluvial Deposits. In *The ground-water resources of Franklin County, Ohio* (Vol. 30, pp. 17-18). Columbus, OH: State of Ohio Department of Natural Resources.