Geoscience 001 Fall 2005 Field Trip: Bald Eagle Formation near Potter's Mills

This is the second of two field trips to a large exposure south of Potter's Mills, approximately 12 miles east of State College. This is also our final field lab, where we conclude our exploration of the local geologic history. The purpose of this trip is to examine the Bald Eagle Formation, which is the next formation up-section from the Reedsville Formation. The Bald Eagle is still within the Upper Ordovician period and has a total thickness in this area of around 200 m; we're going to look at a section near the base of the formation.

There are a number of things to look at here and take notes on, and questions to answer, but the aim of it all is to get a sense of what the depositional environment was like and what the regional geography might have looked like.

In the way of background, recall that sandstones are composed of particles that are derived from the weathering, erosion, and transport from some uplifted source. The composition can give us some general clues about the type of area that was providing the sediment — was it a volcanic arc, an uplifted metamorphic rocks, a region of folded and uplifted sedimentary rocks? The best clues about the source region come from the largest particles, so it is worth focusing some attention on the largest grains you see. The roundedness of the grains, and the range of mineralogy can provide some clues about the transport distance and time (well-rounded grains of quartz suggest long transport; less well-rounded grains of a variety of compositions suggest briefer transport). Sedimentary structures like cross-beds, ripples, mud-cracks, etc., can also provide some useful information about the environment of deposition and the flow direction and strength of flows associated with the deposition of the sediment.

Color can sometimes provide useful information, but it is not a conclusive piece of information (still, it provides some useful suggestions). For instance, reddish color in sandstones and shales comes from hematite, which commonly forms in terrestrial environments, whereas, greenish colors and dark gray colors are more commonly associated with deeper, marine environments.

Finally, pay attention to the larger-scale relationships of the beds. In river environments, it is common to see channels, where a coarse sandstone fills a scoured-out depression cut into the underlying beds. In contrast, there are fewer channels in deltaic environments due to stronger subsidence, and fewer channels in shallow marine shelf sands due to the lack of focused current flow such as occurs in a river.

Turn in a couple of pages that document, explain, and interpret your observations on the following aspects of the Bald Eagle Formation seen in this exposure. Your report should include sketches.

The diagrams on the backside of this lab handout should provide useful in making observations and interpreting them.

Sedimentary Structures

Make a list of each different sedimentary structure you can find, including a sketch (with some indications of size) and a brief statement of what you infer about the depositional environment base the sedimentary structure.

Describe the approximate flow direction indicated by at least 5 different sets of cross-beds (from 5 different stratigraphic levels)

Grain Size

Size of grains in the sandstones — average, largest, smallest (this can be in terms of fine sand, coarse sand, pebbles, or in terms of mm)

Composition

What is the mineralogy or lithology (if the grains are actual rocks rather than single minerals) of the larger grains in these beds? What does this suggest in terms of a source region?

Grain Shape

Are the grains well-rounded, slightly-rounded, angular, or variable (some rounded and some angular) What color are the beds?

Summary of Observations and Interpretations

Write a couple of paragraphs in which you summarize the inferences derived from the above observations. You should comment on what the depositional environment was like; what was the means of transport and what were the conditions during deposition (flow direction, velocity, etc.). Where was this place relative to sea level? What was the source region like? Where was the source region most likely located?



Hjulstrom Diagram can be used to estimate approximate flow velocities

trough cross-beds

tabular, planar cross-beds