Research Project 2: Correlation of Ordovician Carbonate Rocks
Part 2 of 2 - Canajoharie Creek
Geology 21: Stratigraphy and Depositional Environments of New York

Overview: Limestone and shale of the Trenton Group overlie dolostone of the upper part of the Beekmantown Group in the river bed of Canajoharie Creek (a native term for "the pot that washes itself"). This well-exposed, and very fossiliferous section records important changes in the depositional history of the Mohawk Valley. The changes in depositional environments and basin geometry are well recorded in both the stratigraphy and lateral and vertical distribution of fossils. As you can imagine, individual organisms (fossils) preferred different depositional settings and therefore they commonly are found in only certain facies. For example, a thick-shelled pelecypod may inhabit a high-energy niche in the shoreface while a thin-shelled brachiopod may have found it's niche in a deep-water environment. Once preserved in the geologic record, these individuals may serve as useful indicators of the energy level during deposition of a particular unit. In addition, the distribution of such fossils may provide important information concerning the original configuration and deepening trends within a basin of deposition.

Rocks in the Canajoharie Creek river bed include the Chuctanunda Creek Dolostone, which is part of the Beekmantown Group, and overlying limestone and shale of the Trenton Group. Interbedded limestone and shale of the "lower Trenton Group" is conformable overlain by the Utica Shale, which is some 305 meters thick at this locality.

Age: All rocks of the Trenton Group were deposited during the Trentonian stage[1] (roughly the upper part of the Caradocian stage[2]) of the Early Late Ordovician (*circa* 448-458 Ma) and the rocks of the Chuctanunda Creek member of the Tribes Hill Formation were deposited during the Gascondian stage[1] (Tremadocian stage[2]) of the Early Ordovician (*circa* 505-488 Ma).

Field Objectives: This part of the research project involves a detailed examination of the rocks of the Trenton Group in the Canajoharie Creek bed. We will measure a section of rock that includes the Chuctanunda Creek Dolostone, the lower Trenton Group (more or less equal to the Glens Falls Limestone) and part of the Utica Shale. When you are measuring this section, recall the sequence at Manny's Corners. *It is very important to pay close attention to the type and abundance of fossils that are present in the rocks as you measure your section.*

Field Procedure:
(1) Measuring a section: As before, when measuring a stratigraphic section, look for the following characteristics (you might want to copy this list into your notebook):

Important features to look for

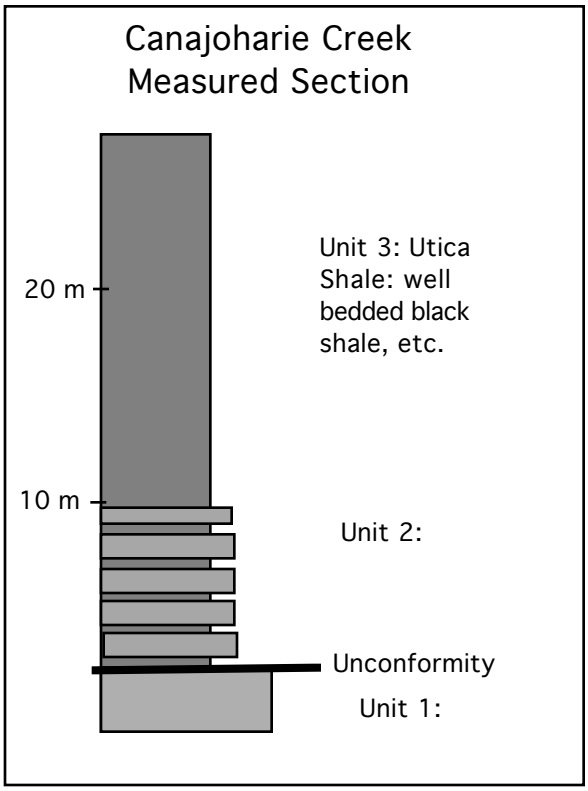
1) Bedding type and thickness (e.g. well-bedded, thin-bedded ss);
2) Sediment texture and type;
3) Percentage of different bedded material (e.g. ss:sh = 2:1);
4) Sedimentary structures;
5) Composition of coarse-clastic material (e.g. quartz sandstone, or limestone and quartz sandstone pebbles in conglomerate),
6) Weathering color of rocks ;
7) Other important features (e.g. scoured bases, lateral continuity, clast size and dimensions, fossil content and relative abundance, etc.).
8) A quick sketch may help; these can be included in your final report.
9) Make a complete list of the types and fossils in each unit, their abundances and their preservation.

Make sure that either you or your partner keep a graphic log as you measure your section!

(2) Note fossil occurrences: Use the fossil handout to aid in your identification of the different fossils. Please carefully note the different species of Graptolites, Trilobites, and Brachiopods. *Take your time and carefully look for fossils at different horizons.*

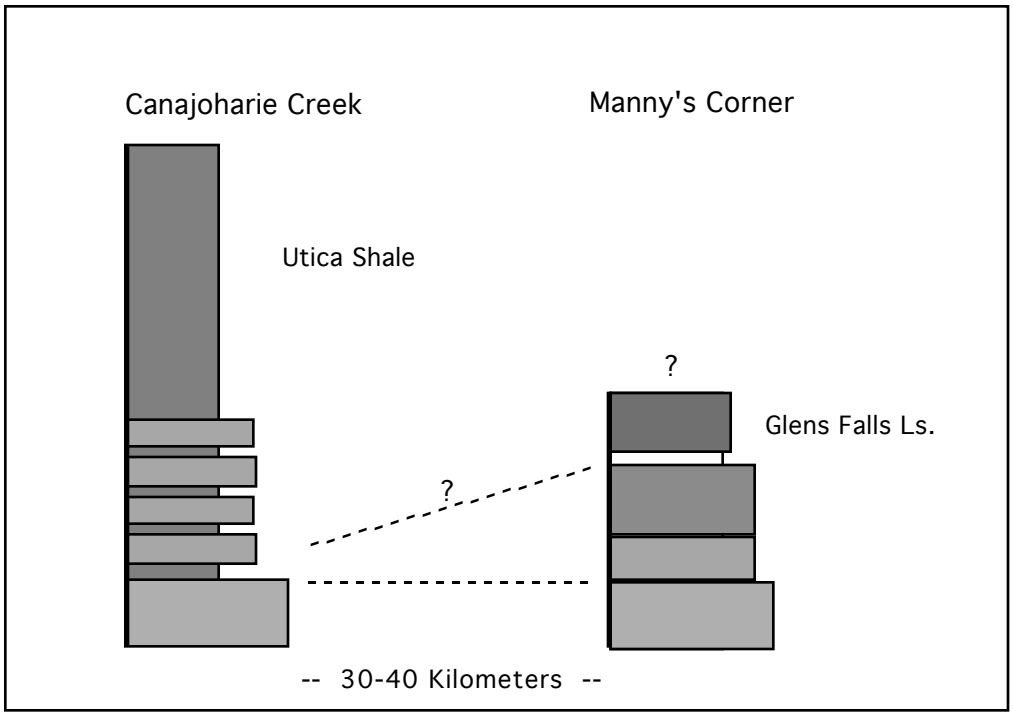
[1] North American stage designation
[2] International stage designation

Lab Procedure:
(1) Stratigraphic sections: A) Draw your stratigraphic section on a piece of graph paper so that it neatly fits on one piece of paper (vertically). Use standard symbols for different rock types, and briefly describe the rocks to the right of the section. Also note important fossils observed at different horizons.



B) On a separate piece of graph paper, using a scale of about 1/2 of your first section, summarize your measured section from Canajoharie Creek and from Manny's Corners (horizontally on a piece of paper). Title each section at the to as to its locality. Label the formations but do not include the detailed descriptions. Use a light dashed line between the sections to correlate similar lithologic units from one section to the other; start by connecting the Knox Unconformity.

(2) Plot the spatial distribution of fossils in the Trenton Group of the Mohawk Valley. The Hypercard stack entitled "Mohawk Fossils" was written and designed by Ray Gildner from a data base the he and his coworkers at Cornell University collected. This stack is intended to show the position and distribution of many different fossil occurrences that they have painstakingly catalogued as part of their research. The stack allows you to access the data base and plot the distribution of a individual fossils on measured sections (represented by a stick) that span over 80 km within the original basin of deposition (see attached stratigraphic summary) . To print a selection, simply click "print card". When you flip though the stack, you will notice that several fossils have rather distinct distributions. Consider the significance of the distribution of different fossils in the basin. You may want to display those fossils that were seen in the field. One important tie to the rocks at Manny's Corners is the occurrence and distribution of Rugose corals. Do they prefer deep or shallow water environments? In addition, I suggest you look at the following:



Trilobites: *Triarthus* - on section
Ceraurus - on section
Isotelus

Brachiopods: *Lingula*
Rafinesquina
Platystrophia

Consider the following questions once you examine your data (make sure you look at the figure that shows the stratigraphy and the measured sections lines at the same time):

a) Just looking at rocks types and fossil abundances, is there a deepening trend in this basin and in what direction?
b) Is there any facies control on the distribution of the fauna?
c) Aside from the water depth, what may determine the distribution of these different fossils?
d) What fossils appear to have a distribution that is independent of facies and what might cause this pattern?

Writeup: Your typewritten, double research report should include the following:

1) Introduction including site locations, formation names and ages of the rocks studied, purpose of the trips, and approach to the problem.

2) Descriptions of all rock types encountered. Start with an introductory paragraph that briefly and concisely describes the outcrop as a whole. Then, describe the particular aspects of each outcrop. Make sure to include a discussion of the fossils present. Remember, there should be no interpretations in this section!! Use section headings to guide the reader through your paper and let the figures do the talking in terms if the details of the rock descriptions.

3) Discuss the depositional setting and the regional correlation of this section. Compare your measured section to the section at Manny's Corners.

4) Discuss the characteristics of the basin during Trenton time. Describe the variation in basin depth from the east to the west. Support your ideas with facts from both your stratigraphic section and

from the distribution of fossils in the basin (you may want to include a diagram showing the distribution of different fossils).

5) Briefly discuss the broader implications concerning the paleogeographic setting of these rocks. Specifically, how deep might this basin be? Why is it getting deeper? Is a change in absolute sea level responsible for what is seen or do you need to invoke crustal subsidence? Why? Be specific and support your ideas with facts.

6) You should include the following figures in your report:
   a) Location map(s) that includes Canajoharie and Manny's Corner.
   b) General stratigraphic section of the area.
   c) Measured stratigraphic section of the exposures at the end of Floral Ave. This should be detailed.
   d) A lithologic correlation chart between the Manny's Corner area and the section at Canajoharie Creek section.
   g) Any diagrams, sketches, or photos that you think will add to the quality of your report.