Overview: On our first field trip we will see some of the oldest unmetamorphosed sedimentary rocks (rocks that have not been subjected to heat or pressure) in New York. These rocks include, in ascending order, the Potsdam Formation, the Galway Formation, and the Little Falls Dolomite. The Potsdam Formation, which is composed of conglomerates, and quartz-rich sandstones, is conformably overlain by the Galway Formation which is composed of interbedded quartz sandstone and dolostone that locally contains marine fossils. The Galway Formation contains the Mosherville Sandstone Member (a formal term) near its top. The Mosherville Sandstone Member will be studied in detail at the Costanzos farm. Above the Mosherville Sandstone Member, the Galway Formation passes gradationally upward into dolostones of the Little Falls Dolomite, which we will not see on this trip. Note, however, that in this area, the Little Falls Dolomite locally contains oolites - small spherical accumulations of calcium carbonate that form in agitated (waves) water (see Boggs). Both the Potsdam and the Galway Formations unconformably overlie the Grenville age Precambrian basement rocks that are well exposed in the Adirondacks. In Galway, the Grenville-aged rocks are composed of biotite gneisses (rich in the black mica called biotite) and quartzites (a metamorphosed quartz-rich sandstone). Similar to rocks in the Adirondack Mountains, the rocks in the Galway area suffered a severe metamorphic and thermal event at about 1,100 Ma. After this time they must have been cooled and uplifted significantly because by the Cambrian (ca. 570 to 505 Ma) they were covered by sediments of the Potsdam Formation which were deposited on the surface.

We will briefly examine the Potsdam Formation, but at this locality the unit is somewhat atypical because here it is unusually coarse-grained. We will then focus on the Galway Formation, which is transitional between the sandstones of the underlying Potsdam Formation and carbonates of the overlying Little Falls Dolomite. Good sedimentary structures in the Galway Formation provide important paleoenvironmental indicators. We will study the sedimentary structures and use them to interpret the depositional environments of the Galway Formation.

Age: All three units are diachronous, meaning that the formations are slightly different ages in different places. Geologists recognize a clear trend in which all three units get younger to the west. Please bear this in mind as you are pondering your final writeup. The Potsdam Formation and the Galway Formation, both of which are poorly fossiliferous, have a depositional age range from the Early Cambrian to Early Ordovician. In this area, they were deposited during the Franconian period of the Late Cambrian.

Objectives: The objectives of this lab exercise are to: 1) recognize, describe, sketch, and interpret the environmental significance of sedimentary structures in the Galway Formation; and 2) measure, plot and interpret the environmental significance of crossbedding within a 1-2 meter thick sandstone bed at the Costanzos Farm. The goal of this exercise is to use the environmental interpretations to determine the influence of sea level on sequence development.

Procedure: 1) Costanzos Farm. Examine the prominent rock ledge between the red barn (with the adjacent silo) and the road. Briefly describe the rock type, color, composition, texture, sorting of clastic grains, bedding types, and sedimentary structures. We will spend quite a bit of time here because the cross-bedding displayed by these sandstones is excellent. To better understand the depositional environments and sediment dispersal mechanisms, we will measure the orientation of cross beds in order to determine paleocurrent orientations.

An inclined foreset lamina in a cross-bed is inclined in the direction of dune migration (see figure below). If one measures the orientation of the inclined foreset (this is a plane so it will have a strike and a dip) then the inferred paleoflow direction is perpendicular (90 degrees) to the strike in the direction of the dip. When beds are steeply tilted one must rotate the beds to horizontal before the paleoflow direction can be determined, but we do not have to do this because these beds are close enough to horizontal.

Record your measurements carefully in your notebook. Record general information about the time, location, and rocks to be visited at each stop. Describe the general and specific appearance of the rock ledge. Once the basics have been covered, partition a page of your notebook into 4 columns. From left to
right the columns should read: 1) location; 2) x-bed height; 3) strike and dip; 4) paleocurrent azimuth. You should measure at least seven to ten different foresets from two or three localities.

Plot these data on a rose diagram (Use the attached as a template) and include them in your final report. When plotting these data, plot them using 20 degree increments. Read pages 151-154; 320-327; 377-395 for a brief review of the environmental significance of paleocurrents. What type of pattern do these data produce?

2) RT. 29 Outcrops. We will make two roadside stops. For both you will be responsible for summarizing the following information: a) rock types, b) bedding relationships, 3) sediment composition, and , most importantly 4) sedimentary structures. Sketch the different sedimentary structures seen at each outcrop.

Writeup: Your neat, concise, and well-written lab report, which should be typed using a word processing program, should include the following sections:

1) Title page with an appropriate project title.

2) Abstract on its own page. This should be a 250 word or less summary of where you studied rocks, what rocks you studied, what data you collected, and what you determined. Write this last.

3) An Introduction that should include a description of the trip location, formations and ages of formations studied, purpose of the trip, and approach to the problem (what you did). The introduction should be written such that anyone could pick up your report and figure out what you did, where you did it, and why you did what you did. Could you send this home to a member of your family and have it make any sense? DO NOT WRITE YOUR REPORT AS A NARRATIVE (i.e. "We then went to another outcrop on Rt. 29" instead say " several outcrops were visited for this study. These include..."). In fact, the word "we" should not appear in your report. Remember all rock outcrops are still there, so do not use past tense when describing them.

4) Data Presentation. This section(s) should include a concise summary of the different rocks encountered at each site visited.

5) Interpretation of the Data. Using the data described in the previous two sections, interpret the depositional environment of these rocks. Be extremely careful to cite evidence when you make different interpretations. You will find that only certain data are useful when interpreting different environments.

6) Interpretation of the sequence as a whole. What does this sequence represent? What changes occur as you go from the Potsdam Formation to the Little Falls Dolomite? Why is the sequence diachronous? What was the principle source terrane for the clastic sediments in this succession?

7) A paleocurrent rose diagram, using 20 degree intervals, showing the data from the Costanzos Farm, and a rose diagram for the Rt 29 outcrops. You may use the software Rose to plot your data, see me if you would like to learn how to use this program.

8) Neatly redrawn sketches of important sedimentary structures encountered at any of the three different outcrops encountered.

9) Other figures that would aid your discussion. Please include a location map (Fig.1) and a summary of the stratigraphy of the area (Fig. 2). FIGURE 1 IN ALL REPORTS MUST BE A LOCATION MAP.