# Virtual Geology of Beloit College

How do you make a geologic map?

## Purpose:

We have been using geologic maps for the last several weeks, but how do you actually make a geologic map? The goals of this exercise are to produce your own geologic map and cross-section of the Beloit College campus and to describe the geological history of the campus based on your interpretations. You will have a chance to integrate what you have learned about minerals and rocks, topographic maps, GPS technology, and geologic structures.

Because the college sits on glacial sands and gravels that overlie the mostly horizontal Platteville Formation, our map would be rather simple if we used the actual geology. Therefore, we are going to map the **virtual geology** of Beloit College. To do this, we created 42 **virtual** outcrops around the campus. At many of the outcrops, observations and measurements have already been made. However, you need to collect information at the remaining ones.

## Background:

There are five rock formations in the area, the MI sandstone, the Smith diabase, the Pearsons shale, the Godfrey limestone, and the MC siltstone. The Smith diabase has an U-Pb age of 43 Ma. The other formations have not been dated.

## Tools

Your mapping equipment includes:

- Two maps of campus: one with buildings to use in the field, one without buildings for your final map.
- A list of outcrops
- A Brunton compass (one per group)
- A Trimble GeoXM (one per group)

## Overall Mapping Procedure:

1. The list of outcrops and the map of campus should get you started with finding the locations of the outcrops that you need to measure. Each GeoXM is also loaded with an aerial photograph of the campus for reference. When you find an outcrop, you and your partner(s) should measure strike and dip, if possible. You will know if you can measure strike and dip if a ramp is present at the outcrop – the ramp represents the **virtual** strike and dip of bedding planes or the geologic contact at that location. **Please take care not to move the ramps**. If you think one of the sites has been disturbed please tell me or the TA so that we can fix it.

2. Prior to leaving the site, use the Trimble GeoXM to record
   - the actual GPS coordinates for the outcrop,
   - a rock description, and
   - the strike and dip.

Instructions on how to save this information will be provided in class, but in case you forget, the general procedure follows:

- In TerraSync, select Data from the TerraSync main menu (upper left drop down box).
- Choose Collect Features from the drop down box below the TerraSync main menu.
- When you are ready to mark the location, select Create (button on the right).
- Fill out the form with all of the outcrop information.
- Then press OK (otherwise press Cancel if you want to move to a different location).
- After creating (or cancelling) you return to the Collect screen. To go back to the map, select Map from the TerraSync main menu.

3. When you finish mapping outside, come back to the lab so that we can download your data from the GeoXM and print it out.

4. Now, you can begin making your geological map. The first step is to plot the strike and dips on the map (**use light pencil!**) and note the rock types.

5. Draw in the contacts between the different formations. (**Again, use light pencil!**) Note that sedimentary formations tend to have uniform thicknesses at the scale of your map. That is, *be sure to keep thicknesses somewhat constant unless you have a compelling reason not to.* Once initial contacts are sketched in, identify the structure(s).

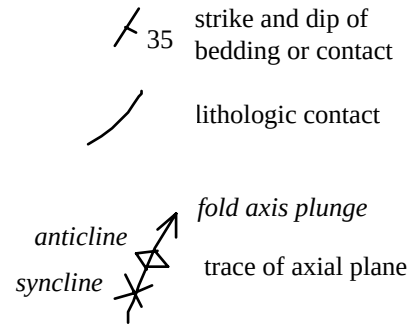
6. Construct a legend at the bottom of the map putting the **oldest rock at the bottom and youngest at top**. Be sure to include a complete description of each rock type based on the rock descriptions you made and recorded in the field. Define any symbols you used on your map (e.g., strike and dip, contacts, trace of axial planes and plunge of fold axes):

## Legend

☐ youngest formation name: rock description

☐

☐ oldest formation name: rock description




7. If there are folds on your map, draw in the axial trace of the fold using a dashed line and show the plunge direction with an arrow.

8. Once you are happy with your map, **ink in all your lines and strike and dip symbols with black ink**. Choose a color for each rock type and **lightly** color using colored pencils.

## Constructing Cross Section A-A'.

9. Now that you have a **carefully drawn and beautifully colored** geological map, you can construct a cross section to see how the surface geology projects into the subsurface. Note that the horizontal scale of the cross-section handout is the same as that of your map. First, draw the topographic profile along A-A' on your cross section.

10. Now you need to transfer the geologic contacts from your map onto the cross section. Similar to drawing the topographic profile, use a large piece of paper and mark off the intersections of the geology with the line of the cross section and then transfer to your cross section. Remember your map is a representation of the geology at the surface of the Earth.

11. Once you have the contacts located on your cross section, interpolate how the contacts must be projected into the subsurface. To get started, use the dip angles of the measurements closest to the line of section. As you interpolate the subsurface structure, be sure you keep thicknesses of sedimentary units relatively constant.

12. Once you have all the contacts where you want them, ink in the contacts and color the units, using the same colors you used on your map.

## Geologic History of the Beloit College Campus.

13. Finally, write (double-spaced) a geological history for the area based on your map and cross section. Include such information as order and age of deposition (when determinable), time of deformation (if applicable), structures present, and the environment of deposition of sedimentary units. The geologic history should be about 1 page long. Turn in everything (map, cross-section, history – folded and paper clipped) by the end of the day on **December 1**.

## Grading: 30 points

- Geologic Map 15 points
- Cross section 10 points
- Geologic History 5 points