Basin-scale stratigraphy and stratigraphic architecture: using Jurassic Tank to understand large-scale stratigraphic controls (DUE: 12/11, end of lab)

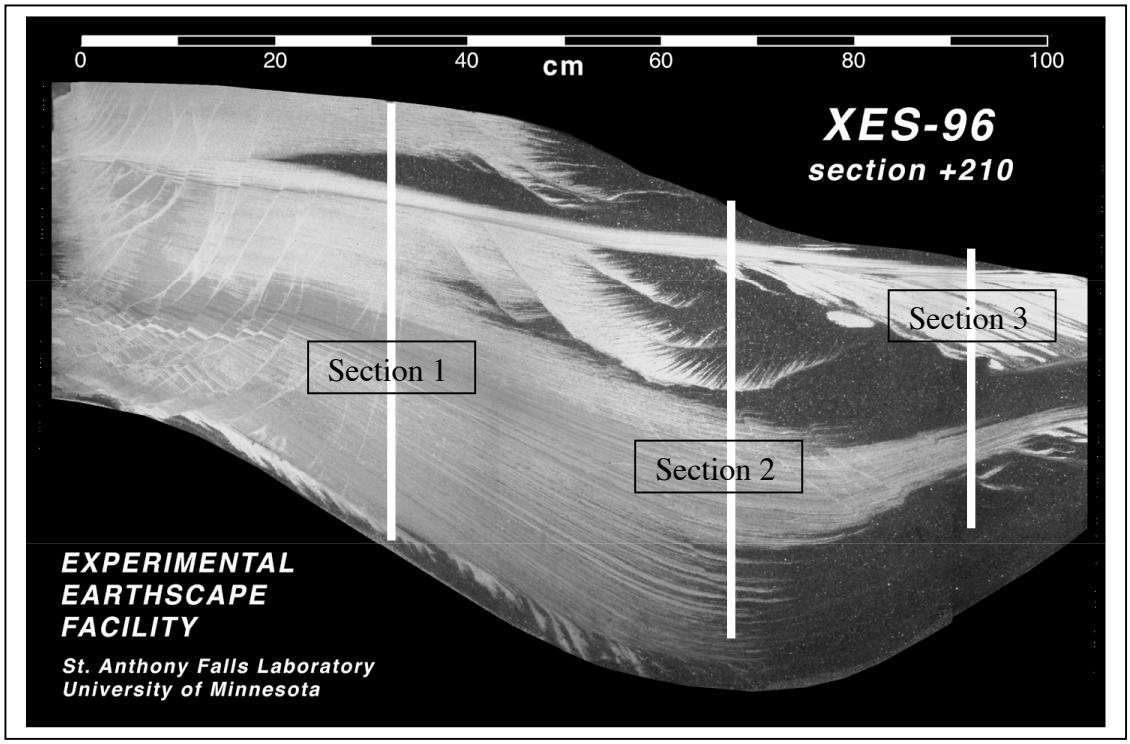

Figure 1. Dip section (cut parallel to flow) of the Jurassic Tank 96 run stratigraphy, taken about mid-way through the experimental deposit. Flow is from left to right. White material is fine sand (that behaves like the coarse fraction) and the dark material is crushed anthracite coal (that has a lower density than quartz sand and behaves like the fine, mud fraction).

Goals

By the end of this project, you should be able to:

- explain how Jurassic Tank works, why it was built, and how it can be used to link the real world (outcrops and subsurface, well data) with numerical models of basin-scale sedimentation.
- interpret a cross section diagram, like figure 1, in terms of changes in base level, subsidence, or sediment supply.
- link specific, real-world depositional environments to parts of figure 1 and understand how they respond to changes in base level, subsidence, or sediment supply.
- apply sequence stratigraphic concepts and terminology to the cross section diagram (figure 1).

The project

By now you have traveled to the St. Anthony Falls Lab, seen how Jurassic Tank works, and you understand how images like figure 1 were made. For this project, you should consider figure 1 as your outcrop or analogous to a seismic line. You can find a very high resolution version of figure 1 on the course website. For this project, you should place all of your interpretations on this high resolution version (not the one above), using Adobe Illustrator. No line drawings overlain on a paper copy will be accepted; you must make your interpretations and other illustrations using Adobe Illustrator.

The final product for this project is a poster, created in Adobe Illustrator, with the following dimensions: 32" tall by 50" wide. We will not print these posters out at full scale. You will save them as Adobe Acrobat .pdf files and make a small (11" X 17") print out to hand in along with the digital .pdf document. Poster specifications will be outlined below. The poster will be an integrated interpretation of the cross section above.

Parts of the poster:

Interpreting depositional environments

What real-world depositional environments might JT effectively emulate? In other words, JT can be viewed as an analog for several different, real-world environments (laterally linked and vertically stacked *via* Walther's Law); on a digital version of figure 1, label these different environments by outlining their deposits in different colors and provide images of these environments (you can download images from the web or scan them in using the scanner in the back of the room) so that the viewer has an idea of what these analogous environments look like in the real world.

Stratigraphic sections

On figure 1 you will see the location of three measured sections (sections 1 through 3). What would measured sections look like at these locations and what would a correlation diagram look like? Your measured sections should embody the real-world depositional environments you outlined above. What this means is that your stratigraphic sections shouldn't just be coal and sand, but should take into account the *actual* features you might expect to find in the depositional environments that they cross. You should also think about coarsening and fining upward trends and how this would be reflected in the details of the stratigraphic section(s). The correlation diagram should show how different lithologic units are correlated laterally, based on what you know about the cross section.

Interpreting the overall architecture of figure 1

As you know, one of the great advantages of Jurassic Tank is that we can precisely control the main parameters that affect the geometry (architecture) of a stratigraphic section or sedimentary basin fill. In a well-designed experiment, we would only change one parameter and see how this one parameter affects the stratigraphic architecture. This is what was done to produce the stratigraphy you see in figure 1. One parameter was changed and all else remained constant. The final part of your poster should be an interpretation of figure 1 that answers the following question: "what parameter was changed to create the stratigraphy of figure 1 and how was that parameter changed through time?" This interpretation should follow a sequence stratigraphic framework (ch. 15 in Boggs), looking for sequence boundaries, maximum flooding surfaces, etc. You should incorporate a short write-up that explains your interpretation. Although in reality only one thing was changed, there is more than one right answer and interpretation here; you just need to support your interpretation effectively.

Poster format

- 32” tall by 50” wide (template available from course web site)
- Font: 36 point minimum
- The poster should have a descriptive title (144 pt) and your name
- All figures should be readable from a distance of 5 feet (view at 100% zoom and see if you can read the screen from 5 feet away)
- The final poster should be saved as a .pdf file and uploaded to my computer by the last official day of class (December 11) at the end of lab time.