Stratigraphic Section Lab Exercise
(40 POINTS)

Background

For this week's lab you will be investigating the geologic history of an unknown location by interpreting a hypothetical, regional stratigraphic section. Recall that *a stratigraphic section is a vertical sequence of rock units (lithologies) with oldest units on bottom and youngest on top (Principle of Superposition)*. Accordingly, you can make interpretations about how the region changed geologically through time by looking at the sequence of lithologies and their relationships to one another.

What you need to do

For this exercise, **you will write a 2-4 page (double-spaced) scientific report discussing the sedimentary depositional environment and tectonic history** of the hypothetical region as recorded in the provided stratigraphic section. Your report should focus on:

(1) Discussion of depositional environments represented by *each* unit/lithology
(2) Identification of transgressive/regressive sequences
(3) Interpretation of tectonic environment(s) and change through the record
(4) Tying it all together into a complete and comprehensive story for the section

Use the abundant evidence preserved in the stratigraphic record to support your interpretations. Recall that *transgressive* sequences are characterized by *deeper* water facies upsection, whereas *regressive* sequences *shallow* upsection. Also recall that an *unconformity marks a gap in time in the record.* As such, drastic changes in environments can occur on either side of these boundaries.

As with most geologic histories **you should discuss the evolution of the hypothetical region in chronologic order – oldest to youngest**. Where possible **you should also provide examples of modern-day depositional environments** that correspond to those interpreted from the record (e.g. the modern Mississippi River is a good example of a meander river and delta system, Death Valley would be example of an alluvial fan setting, etc.).

Words of wisdom

As seen in previous labs, there is not necessarily a unique depositional environment for each lithology. However, a benefit of having a continuous stratigraphic record is that you are provided with context. What this means is that you have additional information about possible depositional environments by considering the sequence as a whole. Specifically, neighboring units in the stratigraphic sequence can aid the interpretation of a logical progression of environments through time.

As we discussed in lecture and in the field, a good way to approach stratigraphic interpretations is to focus first on *observations* for each sedimentary unit or lithology then to use those observations for make *informed interpretations* of the likely depositional environment(s) in which the unit formed. From there, think about each individual identification in the broader context of the complete section.

Ask yourself the following questions, the answers to which will provide the write-up framework:

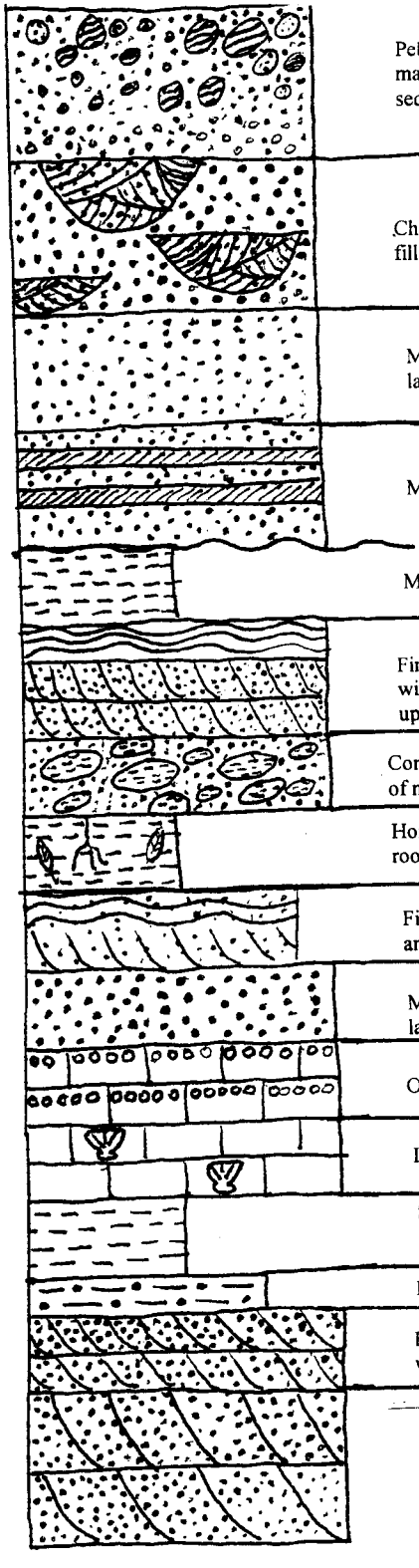
(1) *What does grain size/composition/texture, fossil content, etc. in each unit tell me about the depositional environment's energy, location, etc.? How does this change through time?*
(2) *At what levels do I see evidence for marine deposition and when do units reflect deposition in continental environments?*
(3) *What does a marine-to-continental or continental-to-marine change tell me?*
(4) *Where are there unconformities? What are plausible causes for the unconformities?*

GRADE BREAKDOWN (40 points total):

Geologic observations/interpretations/accuracy:	**30 points**
Writing style, grammar, sentence structure, organization:	**10 points**

CLOSING DISCLAIMER: There is **more than one plausible interpretation** for the provided section (and for most real-world settings!). Accordingly, I will be looking more at your reasoning, evidence, and observations than for a 'right' answer. In short, *DEFEND YOUR INTERPRETATIONS!*

YOUNGEST



UNIT DESCRIPTIONS

Pebble-cobble conglomerate in angular-subangular coarse sand matrix. Coarsening upward. Clasts are of metamorphic and sedimentary origin.

Channelized deposit with trough cross-stratified arkosic ss channel fill. Coarse grained ss around channel deposits.

Medium-coarse grained, subangular subarkose with horizontal laminations.

Medium grained, subangular subarkose with interbedded gypsum.

UNCONFORMITY

Mudstone, horizontal laminations.

Fining upward medium grained, subrounded quartz-rich sandstone with cross-stratification in lower portion transitioning to ripples upsection.

Conglomerate – rounded to subangular, pebble to cobble size clasts of mudstone in a medium grained quartz-rich sandstone matrix

Horizontally laminated mudstone with abundant plant fossils and root traces.

Fine-grained, subrounded quartz arenite with cross-stratification and ripples.

Medium grained, well rounded quartz arenite with subhorizontal laminations.

Oolitic limestone (ooids dominant).

Limestone (wackestone) with abundant brachipod fossils.

Shale (clay and quartz)

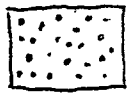
Fining upward siltstone unit with abundant burrows.

Rounded, medium grained, glauconite-rich quartz arenite with well-developed cross-stratification.

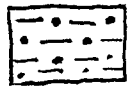
Very well sorted, rounded medium grained quartz arenite with crossbeds on the order of 1-2 m in height. Hematite cement.

OLDEST

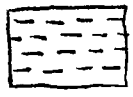
LEGEND



LIMESTONE

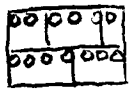


SILTSTONE



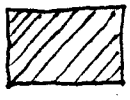
SHALE

SANDSTONE



OOLITIC LIMESTONE

CONGLOMERATE



GYPSUM

UNCONFORMITY