

February 17, 2015

GEOL 1010-002 (Notes)

Lecture 8 - Geologic Time

Geology in the News

- Seismic waves were used to study the inner core
 - ① Revealed that the inner core is subdivided into 2 sub-layers
 - ② Iron crystals in each sub-layer have diff properties from one another

Geologic Time

• Why do we care?

- ① A: 'Time' is a major Q in many studies, we want to know:
 - "When did this occur?"
 - "How old is this?"
 - "What event happened first?"

Dating Methods

• 2 approaches to dating in Earth Science:

- ① 1-Absolute - assign a quantitative age to something
 - Ex. dinosaurs went extinct ca 65 million years ago
 - Methods mainly developed over last century
 - Some very expensive to use
- ② 2-Relative - assign a qualitative age
 - Ex. dinosaurs lived before humans did
 - Often cheaper & easier than absolute dating

Relative Dating

- Key to R.D. is studying fossils - preserved remains of ancient life
- Ppl have always been interested in fossils
- To understand fossils, you have to study strata they're found in
- Fossils only found in Sedimentary rocks
- Q: Why don't you find them in other rock types?
 - ① A: Sedimentary rocks form at Earth's surface, where most organisms live.

- ② Fossils would be destroyed in igneous environments
- ③ Very few fossils survive metamorphism

Relative Dating (Continued)

- Stratigraphy - The study of strata
- If you know how old each layer is, you know how old the fossils in each layer are
- Stratigraphy based on principles devised during 1600s-1800s

Unconformities

- No one place on Earth has a continuous record of strata from all Earth's history
- Ex Strata on right (Slide 8) lacks a layer that's 9 million years old
- Thus, strata everywhere contain gaps that represent missing time
- Unconformity (UCF) - A gap in the stratigraphic record
- Why do UCFs occur?
 - ① Run out of sediment to deposit in a basin
 - ② Run out of accommodation space in the basin
 - ③ Start eroding more sediment than you deposit
- 3 types of UCFs - classified by strata relations

Types of Unconformities

- 1 - Disconformity - Sedimentary rocks above and below the unconformity
 - ① In the strata below, the black line represents an UCF b/t strata of diff types of sedimentary rocks
- 2 - Nonconformity - Sediments overlie igneous/metamorphic rocks
 - ① Shale (a fine-grained clastic rock) overlies basalt (an aphanitic, mafic rock)

- 3-Angular Unconformity - Strata above the UCF are horizontal; strata below the UCF are inclined at an angle

① Several steps involved:

- 1st - lower strata deposited as flat, horizontal layers
- 2nd - those layers get tilted via folding, tectonic uplift, etc
- 3rd - part of uplifted strata are eroded away
- 4th - new strata are deposited as horizontal layers on top

* Takes a long time to form an angular UCF *

Unconformities (Continued)

- UCFs cause problems for geologists

① 1 - not always easy to ID in the field

- Ex. Especially disconformities

② 2 - how much time got 'lost' in that gap?

- A few centuries, or tens of millions of years?

Stratigraphic Principles

- 1 - P. of original horizontality - Strata are initially formed as horizontal layers (L) ^{L=Left}

① Can't pile loose sediment / rocks on a steep slope (M) or straight up (R) ^{R=Right, M=Middle}

② Useful b/c when you see strata that are not horizontal, you know they were altered after they formed

- 2 - P. of Superposition - The bottommost layer is oldest, and each layer above it gets successively younger

① Now we're assigning qualitative dates to strata

- 3 - P. of Cross-Cutting - when 2 geologic features intersect, the one that cuts through the other is the youngest

① Ex. The fault (black line) is younger than the rock layers it cuts through (Slide 17)