

# ES 1100 Exam 2 Study Guide

## Professor Durand

### Chapter 11: Mountain Building

#### Mountain Building

- ❖ Occurs via many processes
  - Continental collision (Himalayas)
  - Subduction zone compression (Andes)
  - Rifting (East African Rift Zone)
  - Volcanic mountains (Hawaii)

#### Continental Collision

- ❖ Continental crust ends subduction
- ❖ Collision leads to significant stress and forces on rocks
- ❖ Thrust faulting occurs
- ❖ Metamorphic rock often forms

#### Subduction Zones

- ❖ Compression can squeeze crust together, leading to uplift
  - This will cause rocks to fold and lead to thrust faults
- ❖ Exotic terranes: Island fragments of continental crust that are added on to the side of the continent
  - Dominate the western coast of North Africa

#### Rift Zones

- ❖ Crust pulls apart, leading to normal faults
- ❖ Fault blocks rotate, leading to sediment basins and ridges
- ❖ Volcanic mounts form due to rising magma

#### Brittle And Ductile Deformation

- ❖ Brittle: Rocks break (like plate hitting ground and shattering)
  - Occurs at low temperature and pressure
  - Leads to faults and joints
- ❖ Ductile: Rocks bend (like dough being flattened by a book)
  - Occurs at high temperature and pressure
  - Leads to folds

## **Joints**

- ❖ Natural crack or fracture resulting from brittle deformation
- ❖ No displacement occurs at a joint (different than a fault)

## **Faults**

- ❖ Fractures in rock where displacement has occurred
- ❖ They are ubiquitous, and occur at all scales
- ❖ Show whether rocks were being compressed or pulled apart
- ❖ Strike-slip: No vertical motion
- ❖ Dipping or dip-slip: Vertical motion

## **Fault Identification**

- ❖ On a dipping fault, the blocks are classified as the:
  - Hanging-wall block (above the fault), and the
  - Footwall block (below the fault)
- ❖ Standing in a tunnel excavated along the fault:
  - Your head is near the hanging-wall block
  - You are standing of the footwall block

## **Types of Faults**

- ❖ Reverse and Thrust faults
  - Hanging wall is pushed up the footwall
- ❖ Normal Fault
  - Hanging wall is pulled down the footwall

## **Normal Fault**

- ❖ At a normal fault, displacement results from the crust being pulled apart (e.g. in a rift zone)

## **Reverse and Thrust Faults**

- ❖ Displacement occurs from compression of the crust
- ❖ Reverse faults are steeper than 35 degrees (close to vertical)
- ❖ Thrust faults have less of a slope

## **Thrust Faults**

- ❖ Common in places where uplift is occurring due to continental collision

## **Folds**

- ❖ An example of ductile deformation
- ❖ Folds reveal something of the process that has shaped rocks in these areas

## **Anticline**

- ❖ An anticline is a fold that looks like an arch (looks like an upside down U)

## **Syncline**

- ❖ A syncline is a fold that opens upward like a trough (looks like a U)

## **Cratons**

- ❖ Crust that has been formed in 1 Ga
- ❖ Cratonic Platforms: Sedimentary rock covering old (Pre-Cambrian) basement

# **Chapters 12 and 13 Geologic Time and Earth Bio**

## **Earth's Geologic History**

- ❖ How was Earth's geologic history created?
- ❖ By correlating global stratigraphic records, and by radiometric dating

## **Principles of Stratigraphy**

- ❖ Stratigraphy: The branch of geology concerned with the order and relative position of strata and their relationship to the geological time scale
- ❖ Principle of Succession: Age increases with depth
- ❖ Water-borne sediments are deposited in horizontal layers or "strata"
- ❖ In undisturbed strata, age increases with depth
- ❖ A rock unit must be older than any feature that cuts across it
- ❖ Baked contacts
  - When an igneous intrusion "bakes" surrounding rocks
  - The baked rock must have been there first (it is older)
- ❖ Inclusions
  - A rock fragment within another rock
  - Inclusions are always older than the enclosing material