

Geol 104 Lecture 20
Sierra Nevada: Yosemite, Kings Canyon and Sequoia NP

I. Introduction

- A. We will lump the parks of the Sierra Nevada into one lecture
- B. Forming the Sierra Nevada
 - 1. Paleozoic-Mesozoic accreted terrains
 - 2. Sevier Orogeny
 - 3. Eocene Uplift
- C. Pliocene/Pleistocene Glacial Features
- D. Big Trees!

I. Location

- A. Western margin of Basin and Range
 - 1. Owens' Valley Fault marks the east side of Sierra Nevada
 - 2. Basin and range province is to the East

- B. Great Valley of CA is to the West – recall this is the former for-arc basin of subduction zone

- C. Sierra Nevada Runs length of CA
 - Related Mesozoic plutons extend down through Baja Peninsula

II. Formation of Sierra Nevada Mountains

- A. Paleozoic-Mesozoic subduction (Antler Orogeny)
 - 1. Accreted Terrains were added to Laurentia
 - Blocks of crust sutured to Laurentia during subduction reversals
 - 2. These represent the crust upon which subduction during the Sevier Orogeny built a volcanic Arc
 - Think Andes volcanoes on SA crust

- B. Sevier Orogeny (165-80 Ma)
 - 1. Accretionary Prism and Forearc Basin
 - Recall coastal ranges of CA and the Great Valley
 - 2. Volcanic Arc builds on the crust
 - a. The crustal magma chambers that feed these volcanoes are later exposed as the Sierra Nevada Batholith
 - b. A Batholith is a huge (100s km x 100s km), thick body of intrusive igneous rock
 - 3. Fold and thrust belt behind the arc
 - Recall Death Valley, and Glacier National Park

- C. Laramide uplift and Basin and Range Extension
 - 1. Laramide (80-40 Ma) Orogeny
 - a. Shallowing of slab causes volcanisms to migrate eastward
 - Recall Absaroka Volcanics, Devils Tower
 - b. Uplifts the old arc and much of the crust to the east
 - i. Recall Colorado Plateau, and Rocky Mountain NP
 - ii. Upper crust (volcanics) is eroded and exposes the deeper crust
 - Batholith and the rocks it intruded (accreted terrain)

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- The intruded rocks are metamorphosed by contact with the intrusion
 - These are called Roof Pendants because they 'hang' over the top of the batholith
 - c. Tallest Mountain in Conterminous US: Mt. Whitney – 14,494'
 - 2. Basin and Range extension
 - a. Sierras are the uplifted edge of the basin and range
 - b. Tilted to the west
 - 3. San Andreas faulting dices the Sierra Nevada a little – separating CA portions from Baja portions.
- D. Geomorphology (shape of the land)
- 1. Large dome structures (probably) from combination of
 - a. Exfoliation during uplift = sheeting
 - b. Spheroidal weathering (chemical weathering focused at corners) of batholith
 - c. Joints cut the domes and allow mass wasting (e.g. Half-Dome)
 - 2. U-shaped valleys from glacial erosion
 - 3. V-shaped valleys from rivers cutting canyons since glaciation
- III. Huge Sequoia Trees
- A. Few in Yosemite, Many in Sequoia and Kings Canyon
 - Sequoia and Kings Canyon geology is same as Yosemite – they are only a few miles apart and all three are in the Sierra Nevada Mountains
 - B. Sequoia Trees
 - 1. Very old – 3-4000 years old
 - 2. Very Tall – tallest is ~275'
 - Enough wood added each year to grow and average 60' tree!