COLORADO MOUNTAINS

North, Middle, South Park
Mountains
Colorado Plateau
San Luis Valley
Plains

Graphic created by Eduardo Iturrate at Research Systems, Inc.
Boulder Area Stratigraphy

Be able to reproduce this figure on test!
BASEMENT ROCK

- Emplaced 1.4-1.7 Gy
- Crystalline rock
- Black Canyon of the Gunnison: 1.7 Gy dark gneiss cut through by lighter 1.4 Gy granite and pegmatite
- Underlies most of present day Colorado Rockies
GREAT UNCOMFORMITY

- An uncomformity is when formations of different ages lay on top of each other
- Another way to say this is that part of the geologic record is missing
- From 1.2 Gy to 500 My the geologic record is missing
TROPICAL SEAS RETURN

- 500 to 330 My
- Sawatch sandstone from beach sands (near Glenwood Springs)
- Leadville limestone deposited
- Missing in Boulder area
FRONTRANGIA: 300 My

- Ancestral mountain range
- 35 miles west of Boulder.
- Streams carried eroded sand and pebbles from the Ancestral Rockies, dumping the material in wide deposits of gravel.
- These debris would later become the Flatirons!
FOUNTAIN FORMATION: 270 My

- Arkose sandstone, gravel deposits
- Sharp, angular points
- Iron oxidation, red color
- Good climbing
- Remnants of FrontRange
- Little transport
- Flatirons, Red Rocks park, Roxborough State Park
LYONS FORMATION: 250 My

- 220’ thick
- Well-sorted, fine sand
- Old sand dunes
- Main building material for CU-Boulder
- Sea began to creep in from the east
- Arid to west
LYKINS FORMATION: 240 My

- Red color, soft, consisting mostly of shale, sandstone, and siltstone.
- 675’ thick,
- Broad, flat floodplains
Entrada Sandstone: 150 My

- A desert environment with widespread sand dunes once again
- 30’ thick
- Cross-bedded
- Much more developed (thicker) around Moab
MORRISON FORMATION: 140 My

- Broad, swampy lowlands, floodplains
- Lake and stream deposits, mostly clays, Volcanic ash, Wild colors
- Massive amounts of dinosaur fossils; has been described as a bone yard.
MORRISON DINOSAURS A HOAX

• Fossils from the DNM quarry represent a water-transported and processed assemblage, not an in situ ecosystem.

• The "mass accumulation" of dinosaur bones at DNM, a sort of trademark feature for the Morrison Formation in the American West, represents a mystery that lacks satisfactory explanation.

• Clams, snails, and dismembered dinosaurs within the same deposit demonstrate a watery catastrophe. (Noah’s ark flood?)

• http://www.icr.org/pubs/imp/imp-370.htm
DAKOTA FORMATION: 135 My

- shoreline of the Cretaceous Western Interior Seaway, massive sea to the east
- Lots of dinosaur tracks, but few fossils
- Mostly sandstones, some shales, 320’ thick
- First hogback (resistent ridge)
marked by several advances and retreats of the sea.

The deposits associated with these episodes of marine flooding consist of shale, sandstone, limestone, and some beds of coal.

The environments suggested by the rocks include the deep sea, sandy beaches, and coast swamps.

Names applied to the various formations are (from oldest to youngest): the Benton Shale, Niobrara Limestone, Pierre Shale, Fox Hills Sandstone, and the Laramie Formation. Together these formations total over 10,000 feet of sediment.
PIERRE SHALE

- Up to 9,000’ thick
- Deposited by an inland sea
- Lots of dinosaurs, such as this pterodactyl
- City of Boulder built on Pierre Shale
70 My

- 70 million years ago, the sea slowly withdrew to the northeast.
- It left behind vast swamps, from which the coals of the Laramie Formation formed.
- Explains natural gas deposits in Denver Basin
- The withdrawal of the sea took about 10 to 15 million years.
LARAMIDE OROGENY

- 70-40 My ago
- High angle thrust faults, Reverse fault
- Uplift of Precambrian basement
- Deformation of overlying Paleozoic & Mesozoic sedimentary rocks, eg Fountain Formation, Lyons Formation
Colorado Mineral Belt

- Emplaced during Laramide Orogeny and during volcanism immediately afterward
- Hydrothermal emplacements caused formations of mineral veins
- Almost all mineral at high elevation
SAN JUAN VOLCANICS

- Ash-flow eruptions in the SW corner of state about 30 My
- Silverton Caldera
- Formation of San Juan mountains
EPIEROGENIC UPLIFT

- 28 My to present
- Broad, regional uplift with little tilting
- 10 My really kicked into gear
- Still continuing
THE BIG DOME

• Uplifted all of western and central Colorado
• Reason so many 14’er
• Dome is centered under near Leadville
• Center of 14’ers
• Antecedent rivers invigorated: Black Canyon, Gore River, Roaring Fork, Royal Gorge
• Rivers flow in radial pattern from dome: North Platte, Colorado to west, Arkansas to south, South Platte to east
RIO GRANDE RIFT

- Also 28 My-present
- Runs south-north
- Cuts across previous faults
- Forms San Luis Valley, Arkansas River graben
- Continues on to Wyoming
- Still growing
- May connect in future to the Gulf of California
PLEISTOCENE ICE AGE

- 1.5 My to 12,000 yrs
- Glaciated down to about 8,000’ elevation
- Glacial erosion shaped modern mountains