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GEOL 102.01: Roadside Geology

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Geology 102 Roadside Geology Don Hyndman, office = SC 357
M, W, F @ 3:10 in SC 348
Text: *Northwest Exposures* by Dave Alt and Don Hyndman, 1995, Mountain Press.

Text pages <i>x-xi</i>	Topic and highlights <div style="text-align: right;">* mya = million years ago ss = sandstone, sh = shale, ls = limestone</div> <i>* see these pages for geological time scale that we will use all semester</i>
1-12	1. <u>Precambrian Era</u> Basement Rocks (pre-1600 mya) Location, age, the old continent – granites and gneisses formed deep in the crust, exposed by erosion; talc; Stillwater complex, chromium, platinum, and palladium.
13-28	2. <u>Precambrian Era - Proterozoic (Belt) rocks (1500-1000 mya)</u> The Precambrian world: carbon dioxide, water vapor, hot, greenhouse effect, Venus-like?, little oxygen, little wind, almost no limestone. Changing atmosphere, changing rocks with time. Circular continental basins; Belt basin deformed. Belt basin; Belt sediments deposited; rock types; thin layers, no animals, shallow water features. Stromatolites and formation of oxygen. Continental rifting and splitting off of Siberia or Australia from North America about 800 mya .
29-40	3. <u>Paleozoic Era (600-245 mya)</u> First abundant animals, sea invades Idaho and Montana from west; Flathead sandstone, then shale, limestone; shallow seas.
41-50	4. <u>Late Paleozoic</u>: Madison limestone, caves, Pennsylvanian sand dunes. Phosphoria formation and fertilizer. Pangaea assembled; red Permian deserts at the equator. Horrible Permian extinction of 95% of all animal life.
51-70 71-84	5. <u>Mesozoic Era (245-65 mya)</u> Pangaea begins to split up; Atlantic Ocean begins to open; spreading and plate collision. Josephine ophiolite (slice of old ocean floor). 5a. <u>Kootenay Arc</u> 200 mya; folds and granite. Early Rocky Mountains of 200-150 mya. Dry plains of central to eastern Montana; shallow sea to east. Dinosaurs, birds; warm, dry, sandy beaches, red mudflats.
	6. <u>Jurassic time</u>: Landing Intermountain terranes microcontinent (170 mya), killing the oceanic trench so the trench jumps west.
85-108	7. <u>Cretaceous time</u>: Collision of Blue Mountains/Seven Devils terranes 100 mya. Old continental margin: The Western Idaho mylonite zone. Arrival of the North Cascades terranes and the San Juan Islands. Then the Insular terrane, 90-100 mya. Old continental margin – the W. Idaho mylonite (110-90 mya) The Klamath Mountains move west: the Modoc basin forms.
109-114	(± Northern California)

115-134	<p>8. <u>The Idaho batholith granite:</u> (90-70 mya) Collapse of the early Rocky Mountains: deeply exposed rocks in the Rockies, shallow depth of exposure to the east; question of lubrication; rise of the unloaded Rockies; their original height. Boulder batholith granite and Elkhorn Mountains Volcanics; big copper mines.</p>
135-149	<p>9. <u>The overthrust belt:</u> (70-55 mya) Big slabs of rock move east over the plains; search for oil and gas. The world of late Cretaceous time; the shallow inland sea retreats east; sandy beaches; coal swamps. Dinosaurs roam the arid plains of Montana and Wyoming.</p>
	*** TENTATIVE TIMING OF FIRST MIDTERM ***
151-160	10. <u>Catastrophe 65 mya;</u> mass extinction of animal life.
161-174	<p>11. <u>Fort Union formation:</u> more coal swamps. More terranes added on west: Olympic Peninsula and Oregon Coast Range. Slicing up the North Cascades.</p>
175-182	12. <u>Metamorphic core complexes</u> (40-50 mya): Okanogan Range, Bitterroot Range. The crust stretches. The Blue Mountains begin to rotate northwest.
183-196	<p>13. <u>Eocene volcanic range in central Oregon and Washington.</u> Challis volcano in central Idaho and a big dike swarm extending into southwestern Montana.</p>
197-213	14. <u>Peculiar igneous rocks in central Montana:</u> volcanoes, radial dikes, laccoliths. Diamonds and sapphires in central Montana. New mountains in central Montana about 50 mya.
215-232	<p>15. <u>Blue Mountains continue rotating northwest about 50 mya.</u> Old ocean floor is pushed up to form the coastal hills. <u>Western Cascades</u> (13-17 mya). <u>First long dry spell:</u> John Day, Renova, and White River Oligocene beds. Valleys fill; mudflows, volcanic ash.</p>
233-254	<p>16. <u>Horrible catastrophe in southeastern Oregon 17 mya.</u> Impact, a lava-lake volcano; immense floods of basalt lava; lava source. Columnar joints, entablature, and counting lava flows.</p>
255-266	<p>17. <u>Red soils, white lake beds, the climatic side effects</u> and their causes. Basin and Range country: a cause, beginning, structure, faults, and earthquakes.</p>
267-276	<p>18. <u>Snake River Plain: a continental hotspot track (13-0 mya):</u> Rhyolite capped by basalt; Craters of the Moon – recent lava flows, their source.</p>
277-282	18a. <u>Yellowstone Volcano</u> (1.8 mya): a brooding monster; consequences of a new eruption.
283-293	<p>19. <u>Columbia Plateau folds;</u> Brothers fault zone; Olympic-Wallowa lineament (15-0 mya). Olympic Mountains: rising from ocean floor.</p>
294-298	Sheared western fringe: Puget Sound, Willamette Valley, rotated “magnets;” Northward drag of the Pacific Plate.
	*** TENTATIVE TIMING OF SECOND MIDTERM ***

299-306	20. <u>Second long dry spell (15-2 mya)</u>: High Plains gravel on an enormous desert plain – wheatfields; Pliocene gravel in western Montana. The Palouse Hills – wheatfields.
307-324	21. <u>The High Cascades (12-0 mya)</u> Lava and ash, mudflows; which volcanoes are active?
325-350	22. <u>Pleistocene time (2-0 mya)</u> Ice cover; two ice ages. The modern streams begin to flow: excavating the valleys. The high plains, Rocky Mountain streams, Lake Idaho and Hells Canyon. Columbia River and its tributaries (16-0 mya) Clinker hills on the high plains.
351-360	23. <u>Mountain glaciers (2-0 mya)</u> Glaciated peaks and valleys; Regional ice on the northern high plains (15,000 years ago), lakes, displaced streams.
361-374	24. <u>Western regional ice (15,000 years ago)</u> Puget sound, Okanogan Valley, Purcell trench, Flathead Valley.
375-390	25 <u>Lake Bonneville and a flood (15,000 years ago)</u> Glacial lake Missoula floods: shorelines, dam, channeled scablands of Washington.
391-401	26. <u>The Coast (10,000-0 years ago)</u> Rise of sea level; formation of estuaries, rocky cliffs, sandy beaches, dunes. Rising land, wave-cut benches, terraces. Missing earthquakes; future giant coastal earthquakes.
403-407	27. <u>The future</u>: The San Andreas fault, end of the High Cascades, a new Coast Range. Yellowstone hotspot, Snake River Plain, and Basin and Range.

Grading based on: Two midterm exams @ 25% each
Final exam (comprehensive) @ 50%

Important dates:

Jan. 30: Fee for late-registration begins.

Feb. 18: No class (UM holiday)

Feb. 15: Last day to pay fees or drop/add or receive partial refund for classes dropped.

Mar. 11: Last day to drop classes (no refunds) or change grading option.

Mar. 18-21: Spring Break

*May 13-17: Final Exam week.; **Final exam** 3:20-5:20pm, Wed. May 15.*