1-2002

GEOL 102.01: Roadside Geology

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<table>
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<tr>
<th>Text pages</th>
<th>Topic and highlights</th>
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<tbody>
<tr>
<td>x-xi</td>
<td>* mya = million years ago</td>
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<tr>
<td></td>
<td>ss = sandstone, sh = shale, ls = limestone</td>
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<td>* see these pages for geological time scale that we will use all semester</td>
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1-12  **1. Precambrian Era** 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. Precambrian Era - Proterozoic (Belt) rocks (1500-1000 mya)**
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. Paleozoic Era (600-245 mya)**
First abundant animals, sea invades Idaho and Montana from west; Flathead sandstone, then shale, limestone; shallow seas.

41-50 **4. Late Paleozoic**: 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 **5. Mesozoic Era (245-65 mya)**
Pangaea begins to split up; Atlantic Ocean begins to open; spreading and plate collision. Josephine ophiolite (slice of old ocean floor).

5a. **Kootenay Arc** 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.

71-84 **6. Jurassic time**: Landing Intermountain terranes microcontinent (170 mya), killing the oceanic trench so the trench jumps west.

85-108 **7. Cretaceous time**: 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)
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| 115-134 | **8. The Idaho batholith granite**: (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. |
| 135-149 | **9. The overthrust belt**: (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. |
| 151-160 | **10. Catastrophe 65 mya**:  
Mass extinction of animal life. |
| 161-174 | **11. Fort Union formation**: more coal swamps.  
**More terranes** added on west: Olympic Peninsula and Oregon Coast Range.  
Slicing up the North Cascades. |
| 183-196 | **13. Eocene volcanic range in central Oregon and Washington**:  
Challis volcano in central Idaho and a big dike swarm extending into southwestern Montana. |
| 197-213 | **14. Peculiar igneous rocks in central Montana**:  
| 215-232 | **15. Blue Mountains continue rotating northwest about 50 mya.**  
Old ocean floor is pushed up to form the coastal hills.  
Western Cascades (13-17 mya).  
**First long dry spell**: John Day, Renova, and White River Oligocene beds.  
Valleys fill; mudflows, volcanic ash. |
| 233-254 | **16. Horrible catastrophe in southeastern Oregon 17 mya.**  
Impact, a lava-lake volcano; immense floods of basalt lava; lava source.  
Columnar joints, entablature, and counting lava flows. |
| 255-266 | **17. Red soils, white lake beds, the climatic side effects** and their causes.  
Basin and Range country: a cause, beginning, structure, faults, and earthquakes. |
| 267-276 | **18. Snake River Plain: a continental hotspot track (13-0 mya)**:  
Rhyolite capped by basalt; Craters of the Moon – recent lava flows, their source. |
| 277-282 | 18a. **Yellowstone Volcano** (1.8 mya): a brooding monster; consequences of a new eruption. |
| 283-293 | **19. Columbia Plateau folds**:  
Brothers fault zone; Olympic-Wallowa lineament (15-0 mya).  
Olympic Mountains: rising from ocean floor. |

*** TENTATIVE TIMING OF FIRST MIDTERM ***

*** TENTATIVE TIMING OF SECOND MIDTERM ***
| 307-324 | **21. The High Cascades (12-0 mya)** | Lava and ash, mudflows; which volcanoes are active? |
| 325-350 | **22. Pleistocene time (2-0 mya)** | 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. Mountain glaciers (2-0 mya)** | Glaciated peaks and valleys; Regional ice on the northern high plains (15,000 years ago), lakes, displaced streams. |
| 361-374 | **24. Western regional ice (15,000 years ago)** | Puget sound, Okanogan Valley, Purcell trench, Flathead Valley. |
| 375-390 | **25 Lake Bonneville and a flood (15,000 years ago)** | Glacial lake Missoula floods: shorelines, dam, channeled scablands of Washington. |
| 403-407 | **27. The future:** | 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.