Planetary Geology

Geology Colloquium
Dr. Peter Sak, Dickinson College
Interseismic Coupling, Quaternary Uplift Rates, and Fore Arc Deformation along the Costa Rican Segment of the Middle American Trench

Thursday 4/26
345 snacks, 400 talk
310 White Hall

Tucker County Research Assistants
• Beau Downing & Kory Konsoer taking group out at 10:00 on Monday
Light Web Based Reading Assignment for today:


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**Sun**

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**Relative Size of All 9 Planets**

[Image: http://btc.montana.edu/CERES/html/PlanetSizes/images/solars0.gif]
Characteristics of Planets in Our Solar System

<table>
<thead>
<tr>
<th>Terrestrial Planets</th>
<th>Jovian Planets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>Venus</td>
</tr>
<tr>
<td>Diam.</td>
<td>0.38</td>
</tr>
<tr>
<td>Mass</td>
<td>0.06</td>
</tr>
<tr>
<td>Density</td>
<td>5.42</td>
</tr>
<tr>
<td>Moons</td>
<td>0</td>
</tr>
<tr>
<td>Rings</td>
<td>no</td>
</tr>
<tr>
<td>Craters</td>
<td>many</td>
</tr>
</tbody>
</table>

Oldest Mineral: 4.4 BY
Oldest Rock: 3.8 BY
Oldest Ocean: ~200 MY
Oldest Landforms: <50 MY??

What will be the last evidence of human beings?

Last Evidence of Humankind
Left on the Lunar Surface
Major Landforms Types:
- Impact Craters (Breccia)
- Mare (Basalt)
- Highlands (Anorthosite = Gabbro)

Lunar Surface
- Highlands: 4.0-4.4 BY
- Mare: 3.1-3.8 BY
- Rill = Collapsed Lava Tube
- Impact Craters

Impact Craters
- Ejecta
Large Lunar Impact Crater

Central Upland

Rim

Ejecta Blanket

Generic Terrestrial Planet History

• Accretion
• Rapid Contraction, Heating, Outgassing
  – Magma Ocean ~100,000,000 years
  – Slow Contraction, Heat Loss
  – Fractionation into Crust, Mantle, Core
    (Continued Impacts-Breccias)
• Partial Melting, Volcanoes, Plate Tectonics
  – Larger Planets: Active Longer

Mercury
Venus

Sister Planets?
Not!

Two Views of Venus
Visual
RADAR
Venus Topography

Akna Mountains
Folded Mountain Belt?
200 km X 125 km

Artemis Corona
Possible Subduction Zone & Magmatic Arc
2000 km diameter
6 vertical km chasma to rim
Maat Mons volcano & Lava Flow

Venus Landscape on an Impossibly "Clear" Day

Domes Near Alpha Regio

25 km diam.
750 m high

http://www.astronomical.org/planets/jpeg/ven/pancakes.jpg
Map of Martian Impact Craters
>100 km Diameter

Martian Surface Ages

Amazonian
0-1.8 by

Noachian
3.85-4.8 by

Hesperian
1.8-3.85 by
Cratered Highlands

Same Image, But Rotated to Show Shadow Effect

Mass Wasting
Olympus Mons
Solar System's Largest Volcano
Basaltic? Shield Volcano

Polar "Ice" Sheet

Map of Channels
Dendritic Channels

Martian Meanders

JSK: Debris Flow or Avalanche Tracks Feeding Debris Cones that Lap Over Megaripples

Next Slide: Source Info & Discussion by Malin Science Center
This is a Mars Global Surveyor (MGS) Mars Orbiter Camera (MOC) narrow angle image of gullies carved into debris on the south-facing wall of Nirgal Vallis, an ancient martian valley. The gullies were conduits for sediment that has accumulated at a point where each channel met the valley floor. The aprons of debris are superposed upon the large ripple-like dunes, suggesting that the gullies are younger than these bedforms. Gullies such as these might have been formed by a liquid, such as water, seeping from the layered bedrock exposed in the valley wall, or perhaps by mass movement of the smooth-surfaced debris that covers much of the lower two-thirds of the valley wall. Image is located near 28.6°S, 41.5°W, and covers an area 3 km (1.9 mi) across, illuminated by sunlight from the upper left.