Introductory Astronomy

Week 3: Solar System(s)

Clip 7: Our Moon

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We've Been There!

- 12 humans have visited the Moon
- Brought back samples
- Left experiments
- What have we learned?

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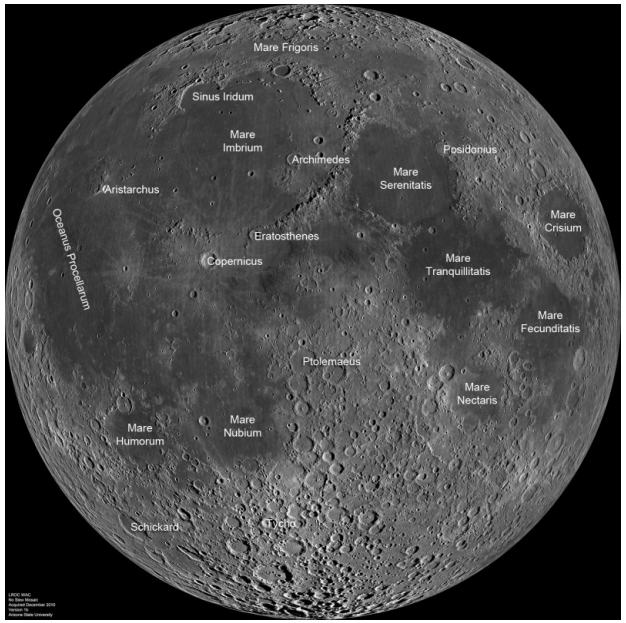
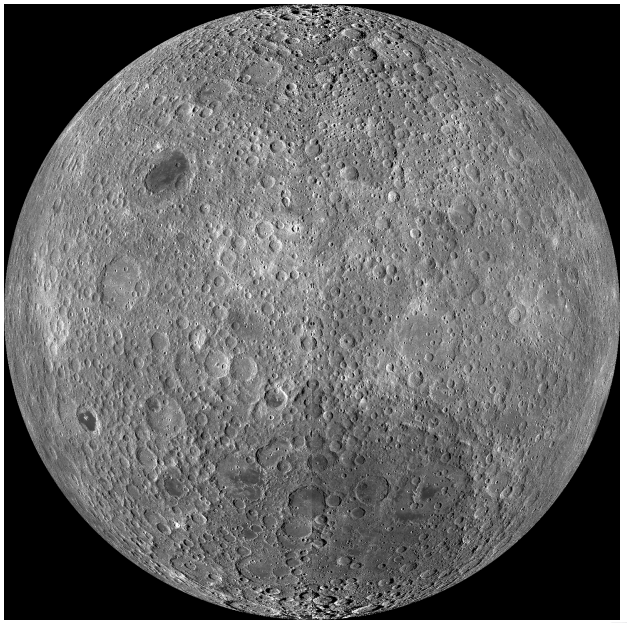
What we see

Nearside: Maria, Craters



Farside: Craters, no Maria



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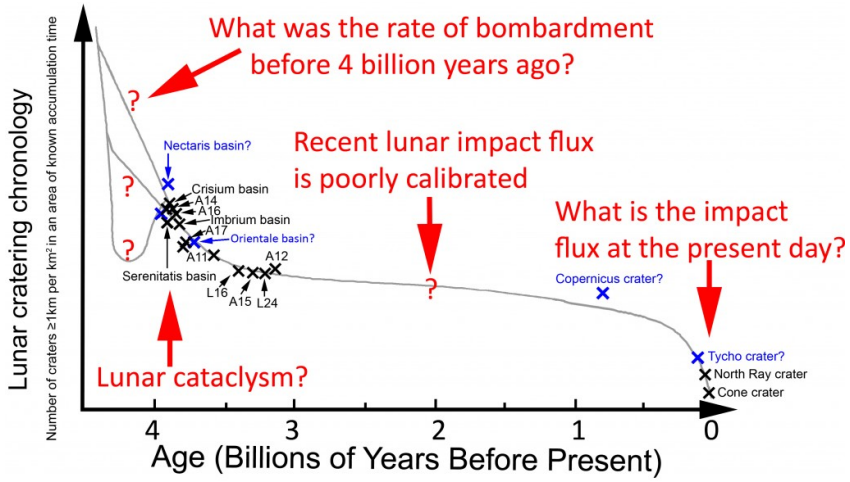
Surface

- Craters created by impacts
- Maria are lava plains often filling old craters
- Rilles and Graben result from shrinking of interior
- No current volcanism. Small planets cool faster
- (Almost) No atmosphere. Molecules photodissociated by UV and lost to space
- Temperature 370K day 100K night
- No water. Ice in crater shadows 35K
- Crust is old weathered by impacts to regolith
- Lunar surface is a museum of history

History

- Combining crater dating with radiometric dating of lunar samples and meteorites leads to history of bombardment rates



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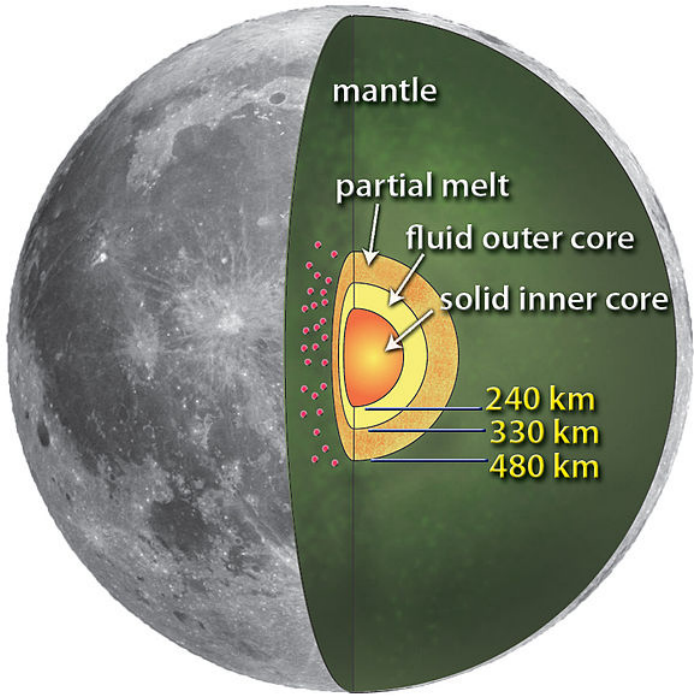
Inside

- Chemical differentiation produced core mantle
- Lunar core is small
- Moonquakes caused by Earth's tidal forces
- No geodynamo



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Where did Moon Come From?

- Mineral Composition of Moon very close to Earth minus core
- Large satellite compared to Earth
- Orbit tilt anomalously large
- Likely produced in giant impact early in Earth history
- Moon formed from iron-poor debris $R \sim 23,000\,\mathrm{km}$
- Earth left with 5h day
- Tidal effects slow Earth, boost Moon away

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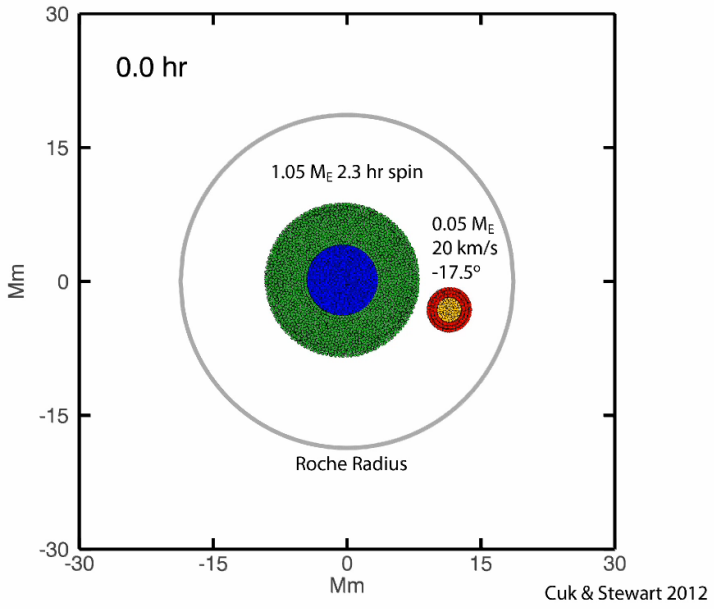
Recent Simulations



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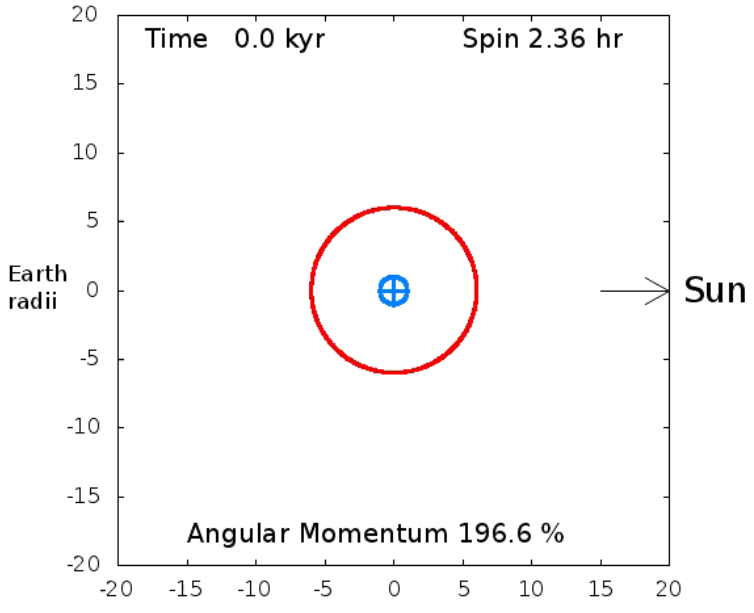

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Credits

- Lunar Images: NASA http://www.hq.nasa.gov/alsj/a11/images11.html#Mag40
- Lunar Impact Rates: MoonZoo/K. Joy http://blog.moonzoo.org/2011/02/21/big-bangs-in-the-solar-system/
- Moon Formation Simulations: S. Stewart http://www.fas.harvard.edu/~planets/sstewart/Moon.html