Week 7

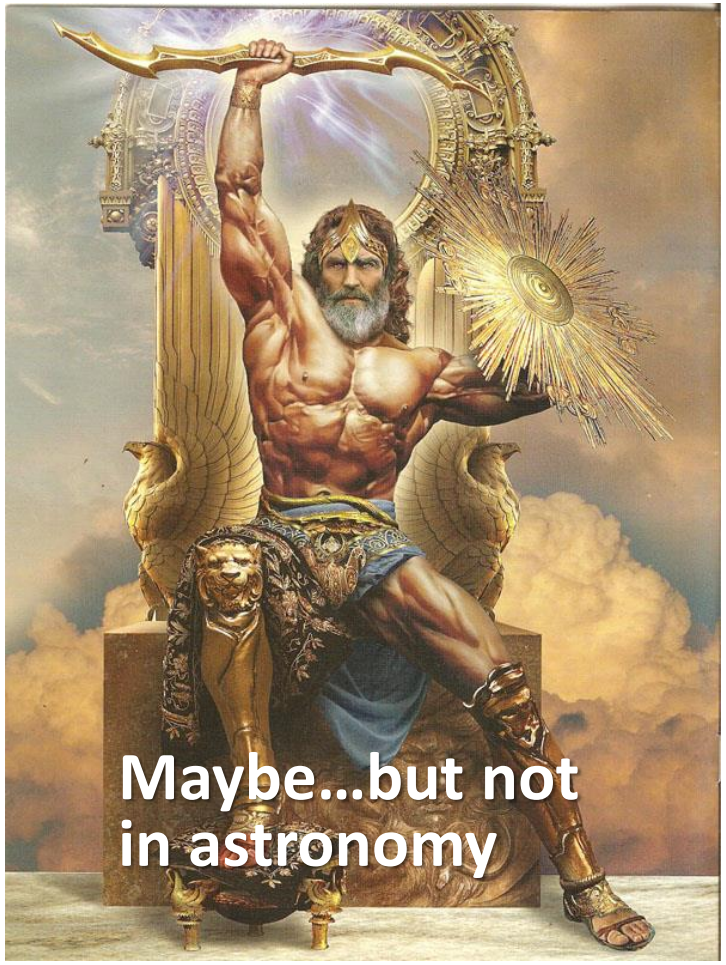
Oct. 31

Today

- A final look at exoplanets
  - What is the significance of “Hot Jupiters”
  - Unexpected applications of exoplanets to understanding late heavy bombardment and the crust of our Moon

Last week, we found Jupiter-sized planets orbiting very close (<0.1 AU) to their stars

Hot Jupiter



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Why was this particular finding significant?

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B. These gas giants are well inside the "frost line"
C. Jupiter-sized planets might be able to harbor life
D. Gas giants can't orbit fast enough to stay close to their stars

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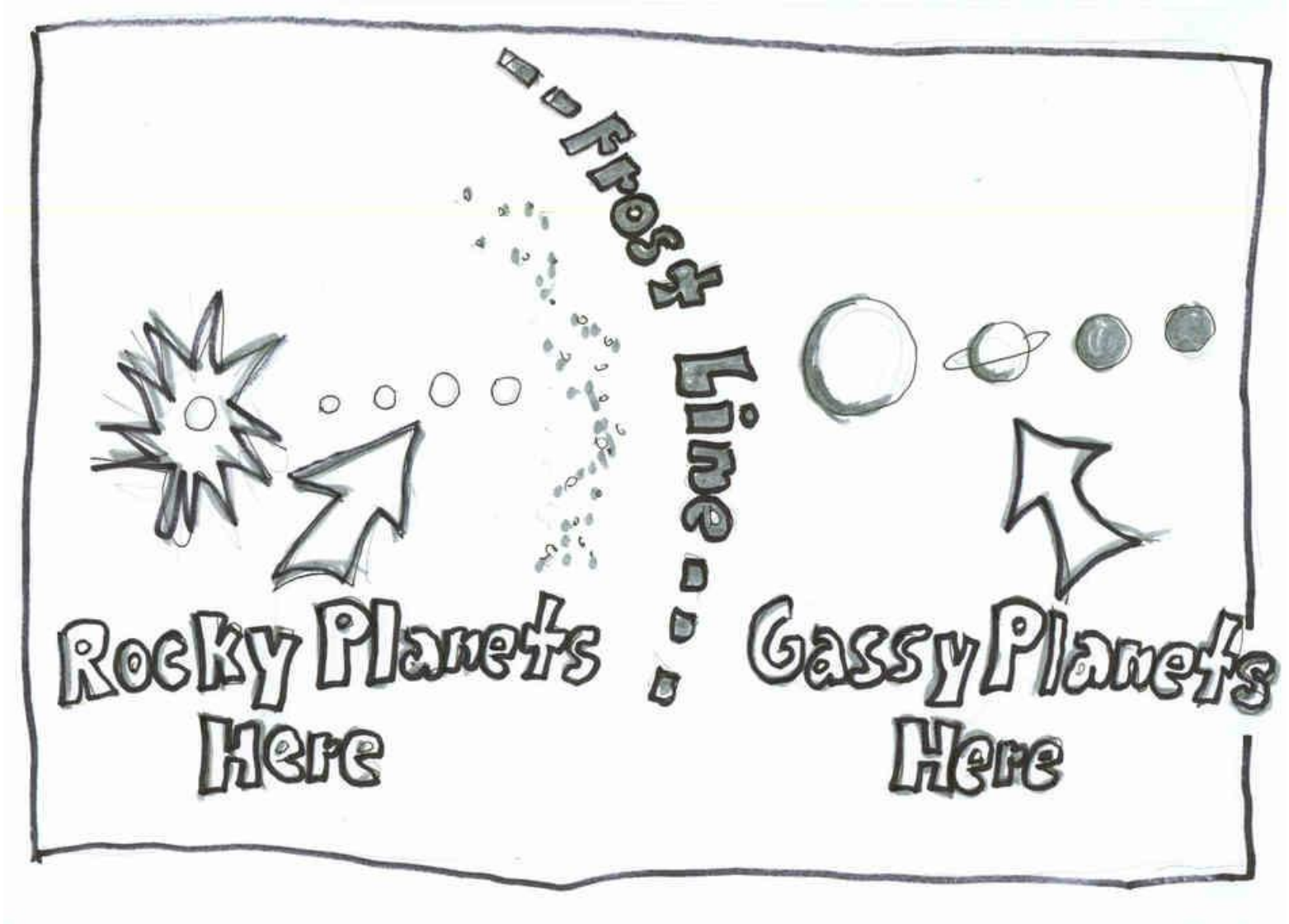

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How might we explain the presence of ‘Jupiters’ so close to their stars?

A. The frost line must be much closer to protostars than we previously thought
B. Our model of solar system formation is totally wrong
C. Planets must be able to migrate, changing their orbits from where they form
D. Gas giants must form from when many rocky planets coalesce

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Hot Jupiters show us that while rocky & gas giant planets probably form in different zones of the young solar system, they don't have to stay there: planets move around early in a solar system's life.

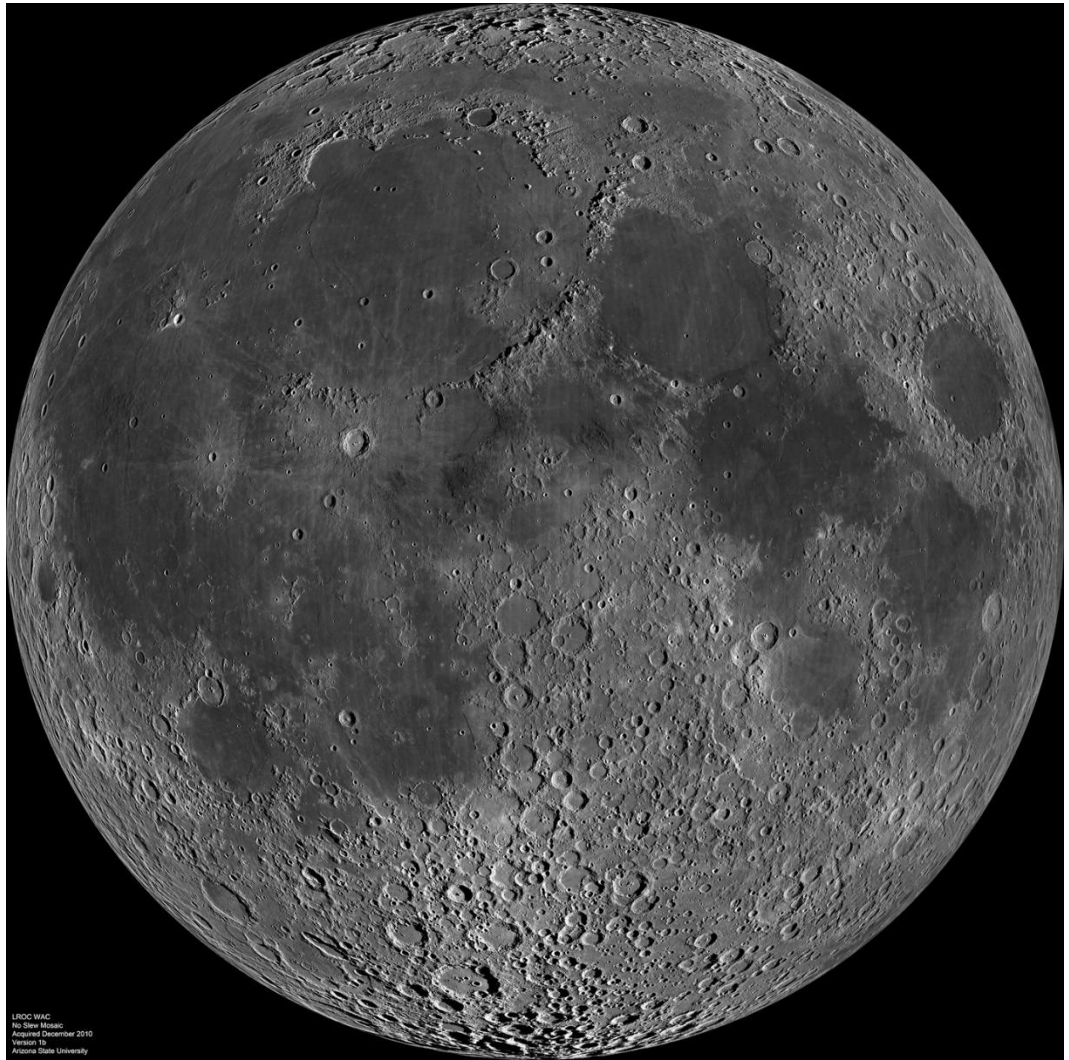
We now think planets in our own solar system migrated in their orbits early in the solar system's life

Example:

- Heavy cratering on Moon and other bodies happened after accretion and after their crusts cooled
  - ➢ *Period of "Late Heavy Bombardment"*

What drove LHB?

- *Neptune migrated toward the Kuiper belt, causing large influx of comets from outer solar system*
- *Migration of Jupiter caused orbital changes to asteroid belt*



Importance of planet migration

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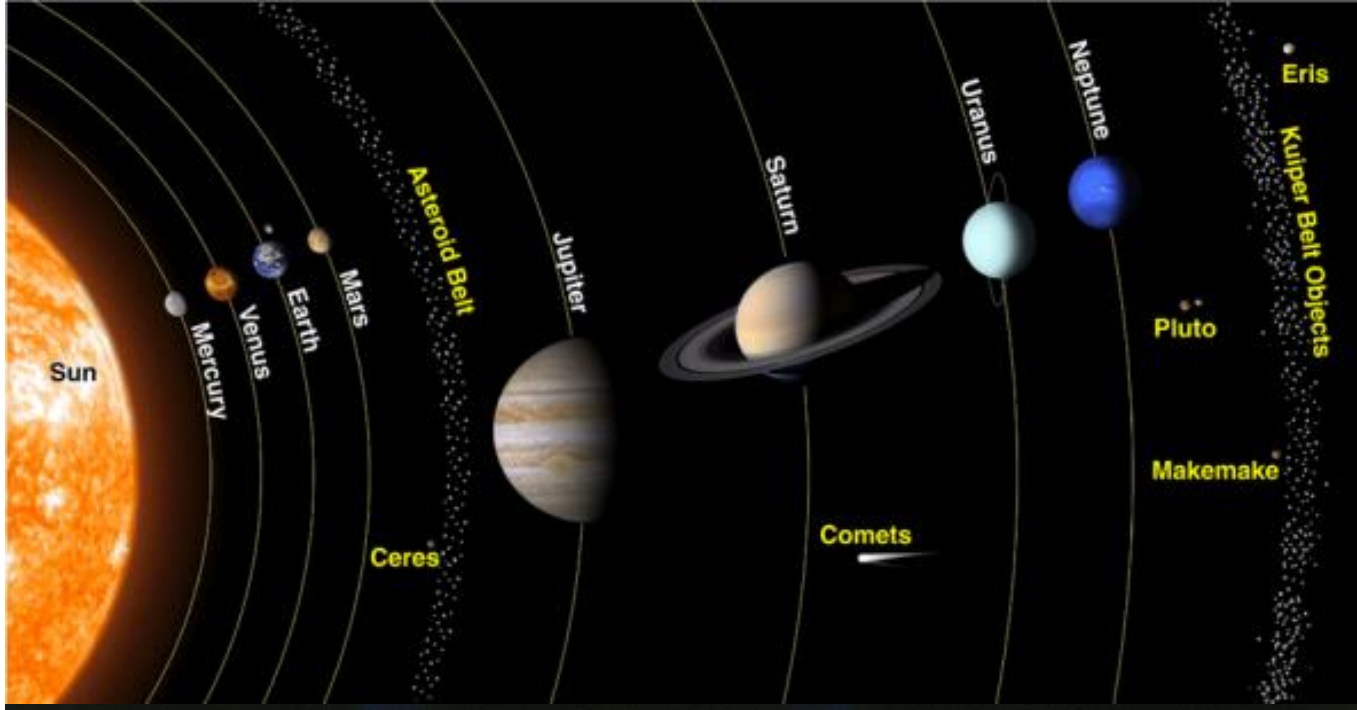

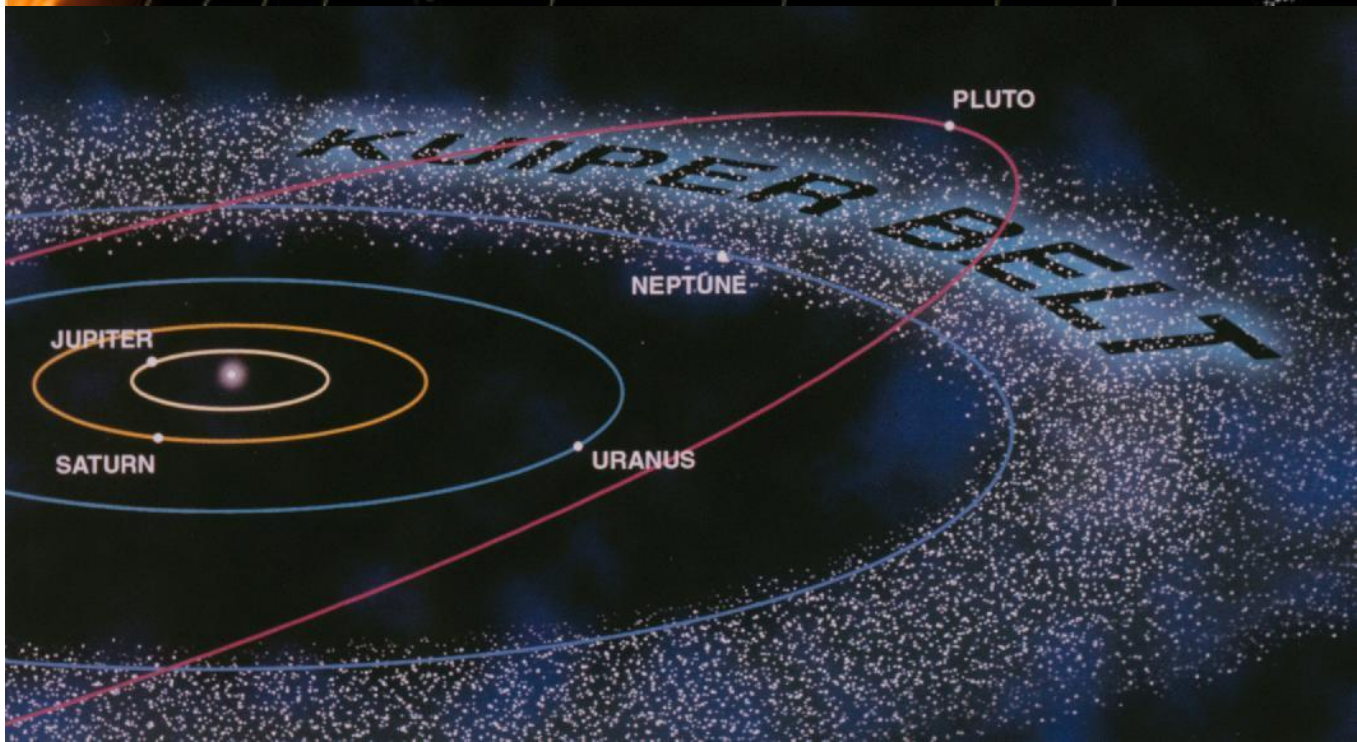

An unexpected application of Exoplanets

- Crust of the Moon from “How the Universe Works” video clip
- Thin crust on side of Moon pointing toward a hot Earth after Moon formed, similar to hot exoplanet facing star in close orbit