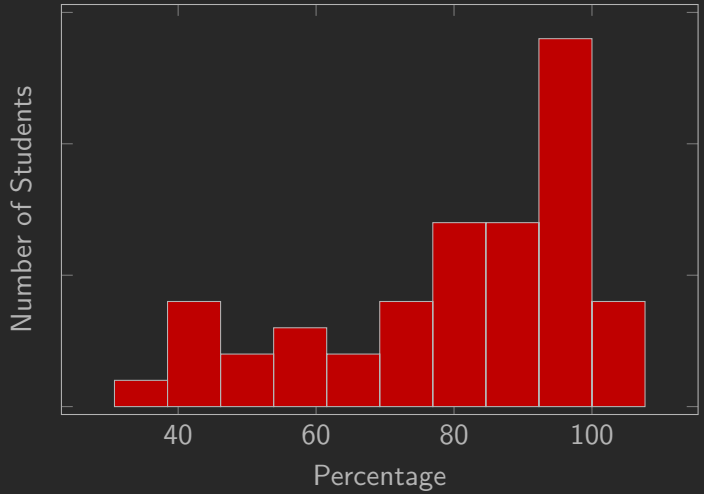
Announcements

- WebWorK due on Monday
- Lab Group B has lab on Monday
- A reminder:
  - Tests are only 10% of your class score
  - It is not the end of the world if you did poorly
    - It *is* probably an indication that you might want to consider switching up your study habits next time
- I'll aim to get new grade reports pushed out today or this weekend
- Poll: `rembold-class.ddns.net`

Test Results



- High: 108%
- Mean: 79%
- Median: 86%

Test Coverage

- We'll quickly go over the test.
- If you have concerns over your score, or find I made a mistake, please swing by my office and we can chat and fix things

Review Question!

Which of the 4 central planets shows the greatest signs of erosion despite having no liquid water?

A. Mercury: from fierce solar winds
B. Venus: from fast winds in its dense atmosphere
C. Mars: from old water?
D. Ceres: from astroidal winds

Review Question!

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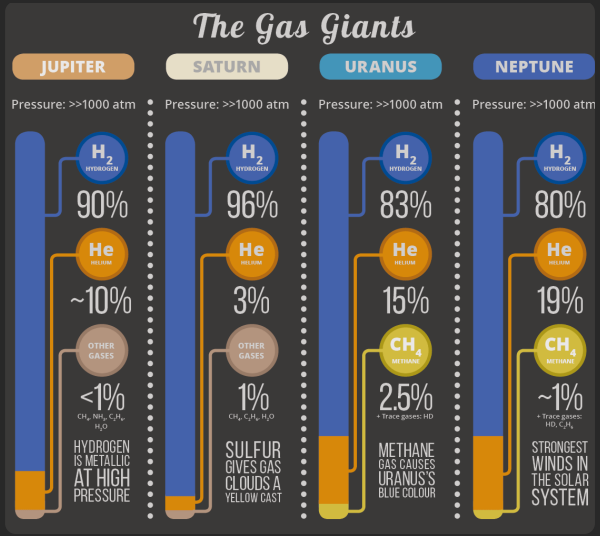
The Big Boys

- Time for the large gas planets!
- Jupiter, Saturn, Uranus and Neptune
- Topics that we want to hit on:
  - Composition
  - Storms
  - Moons
  - Rings!

The Outer Compositions

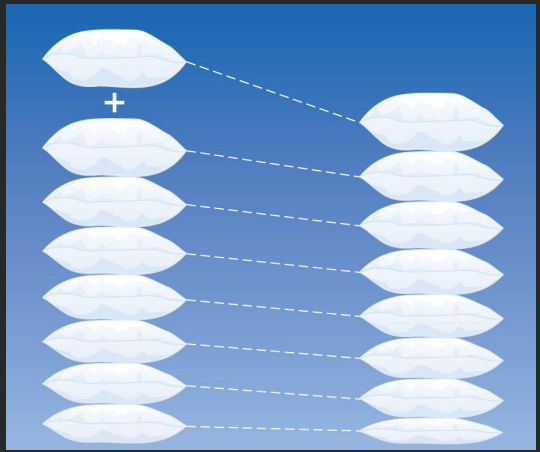


Rotation and Seasons

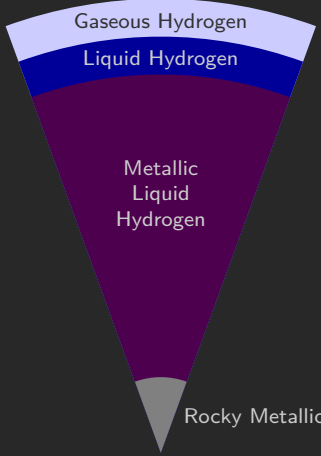
- Rotation rates determined from changes in magnetic field
  - Jupiter's day: 9.9 hours!
  - Saturn's day: 10.7 hours
  - Uranus's day: 17.2 hours
  - Neptune's day: 16.1 hours
- Seasons based on tilt
  - Jupiter: no tilt
  - Saturn and Neptune: about 28°
  - Uranus: tilted 98°!
    - Poles go through 42 years sunlight and 42 years of darkness!

Planetary Pillow Talk

- Jupiter and Saturn nearly same size and about twice as big as Uranus and Neptune
- Jupiter and Saturn have more Hydrogen and Helium than Uranus and Neptune
  - Uranus and Neptune had scarce pickings and hand-me-downs
- Why is Jupiter 3 times the mass but nearly the same size as Saturn?
  - Pillows!



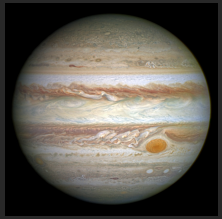
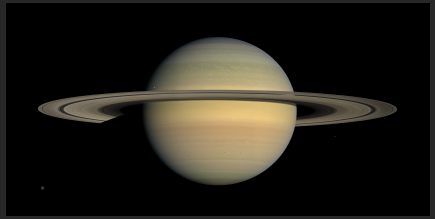
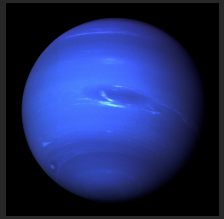
To the Center!



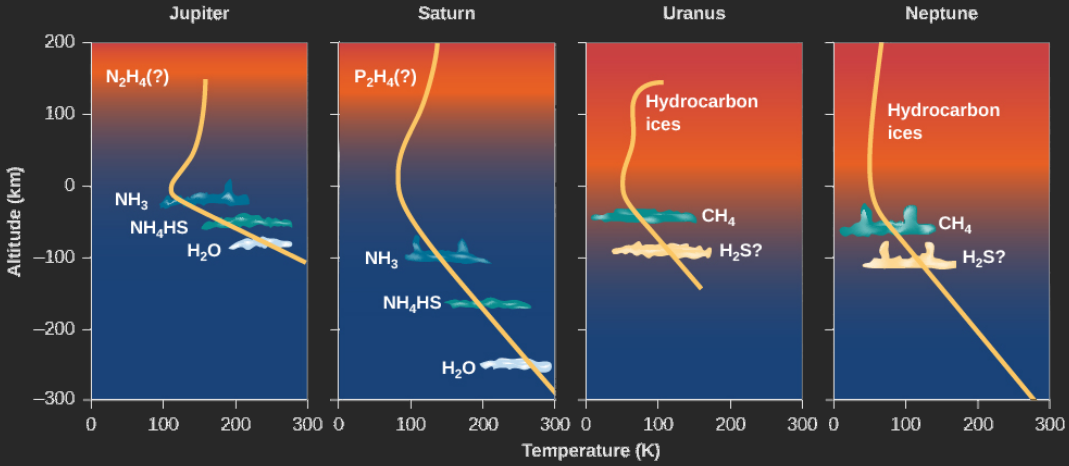
- Gas giants do have solid cores
  - Mostly rock, metal, and hydrogen compounds
  - Core still larger than the entire Earth
- Hydrogen gets compressed into crazy phases
  - Liquid metal goop

Clouds!

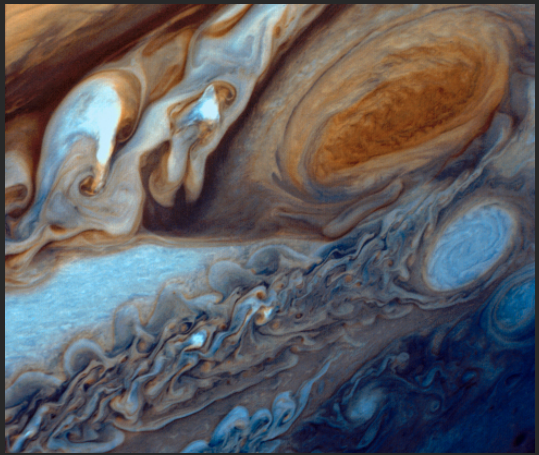
- Clouds form when molecules get cold enough to condense
- Planets are warmest near the core and cool as you move out
- Take Jupiter:
  - Water condenses lowest: White color
  - Ammonium Hydrosulfide condenses next: Red/Brown
  - Ammonia condenses last: Yellow/White
- Saturn similar, but deeper toward the core
- Uranus and Neptune condense methane into clouds
  - Absorbs red light = appears blue

Where the Clouds Lie



Tis a Stormy Season!



- Planetary rotation encourages winds
- Fast rotation strings clouds out into narrow bands
- The Great Red Spot
  - Particularly long-lived storm
  - Around a high pressure region
  - Has been slowly, but steadily, shrinking
- Neptune's "Great Dark Spot" faded after about 6 years
- Other outer planets have storms as well, but not generally as long-lived