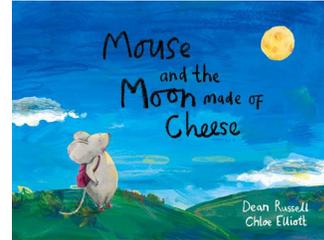


Arvind Borde

AST 9: Homework 10

1] The largest moon in the solar system is Ganymede, a moon of Jupiter. Its radius is slightly greater than the 0.4 times the radius of earth. How does that compare with the radii of the planets? (Is it bigger than any?)

2] You may have heard as a child that the moon is made of cheese, and you've probably been wondering all your lives, "Which cheese?" Two scientists set off to investigate. They published a paper in 1970 on their findings (Schreiber E, Anderson OL, *Properties and composition of lunar materials: Earth analogies*. Science. 1970 Jun 26;168(3939):1579-80). They sent sound waves ("seismic waves") through various materials. Here's some of what they found:



Seismic velocities (km/sec)

Earth rocks		Moon rocks		Cheese	
Granite	5.90	Moon basalt 1	1.84	Italian Romano	1.74
Earth basalt	5.80	Moon basalt 2	1.25	Vermont Cheddar	1.72
Sandstone	4.90	Near-surface	1.20	Wisconsin Muenster	1.57

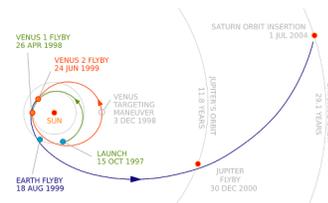
The seismic velocity is proportional to the density. Based on this,

- (a) Is the density of the moon closer to that of cheese or to that of earth rock?
- (b) Can you conclude from this that the moon might be made of cheese?
- (c) The moon rock results are based on samples collected by astronauts. Are they likely to tell us about the density nearer the surface of the moon or in its interior?
- (d) Can you think of a reason why surface lunar rocks might have lower density? (Hint: what is the moons surface constantly subjected to?)

3] On the right is a highly colorized photo of Saturn's rings. Do they seem continuous or do they seem to have gaps? If you see gaps, might they be spaces for something that Saturn has an abundance of? What?



4] We'd discussed the Cassini mission to Saturn in Week 7. Why did the spacecraft loop around the inner planets? Another satellite, Huygens, piggy-backed on Cassini, then separated near Saturn and landed on its moon, Titan. Why did it not land on Saturn directly?



5] Europa has some of the ingredients necessary to support life (water, oxygen). But we're still not sure it has one key ingredient (or set of ingredients). What's that?

6] Have we found life anywhere in the solar system?