

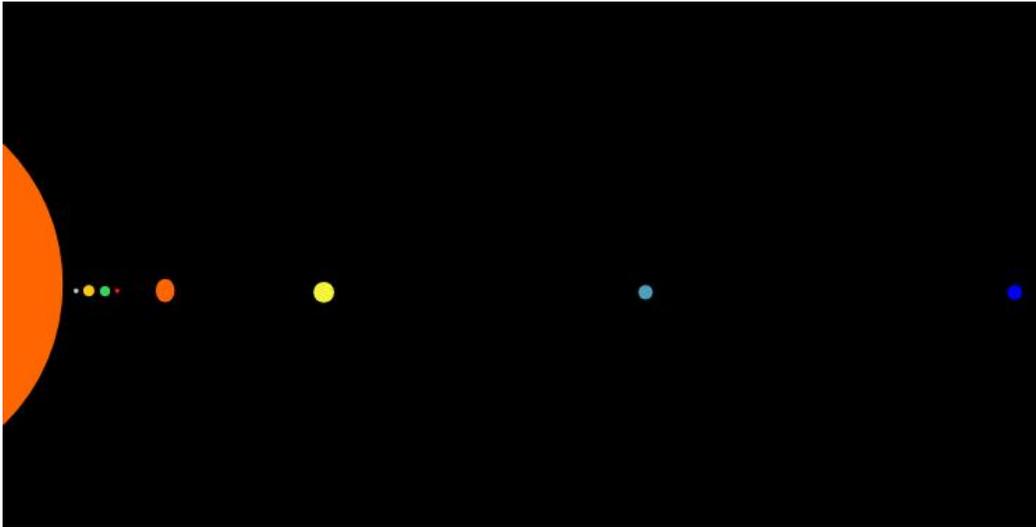
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PRELAB 2: THE “PLANET WALK” LAB

**For this prelab, you will have to travel around campus.
A Map of the Planet Walk is included on the next page.**



In this lab, you will become familiar with the UD Scale Model Solar System, for which you can find information and a map at:

http://www.bartol.udel.edu/~owocki/phys133/planet_walk.html

Note that the plaque for Earth was removed during reconstruction last year and has not yet been replaced; you will not be able to use this as one of the planet choices in the exercises below.

1. (4 points) *Determine the scale factor of the model:* The easiest way to do this is to determine the diameter of the model sun or a model planet, and then compare this to the actual diameter listed in your textbook (or other resource). The ratio of the actual size to this measured scale-model size gives the “scale factor” of the model. You’ll need this scale factor in the later parts of the lab.

Plaque object(s) used to measure the scaled size (ex. Sun, Jupiter, etc.):

Measured Diameter: _____

True Diameter: _____

2. (6 points) Pick two inner planets (Mercury, Venus, and Mars) and two outer planets (Jupiter, Saturn, Uranus, and Neptune). Walk from one inner planet to the other, then walk from one outer planet to the other. Count your paces while doing this, and also keep careful track of the time it takes to walk between each planet pair. (*Hint: try using the “stopwatch” on your watch or cell phone, or another similar time-keeping method.*)

Two inner planets:

Number of paces between the two inner planets:

Time between inner planets:

Two outer planets:

Number of paces between the two outer planets:

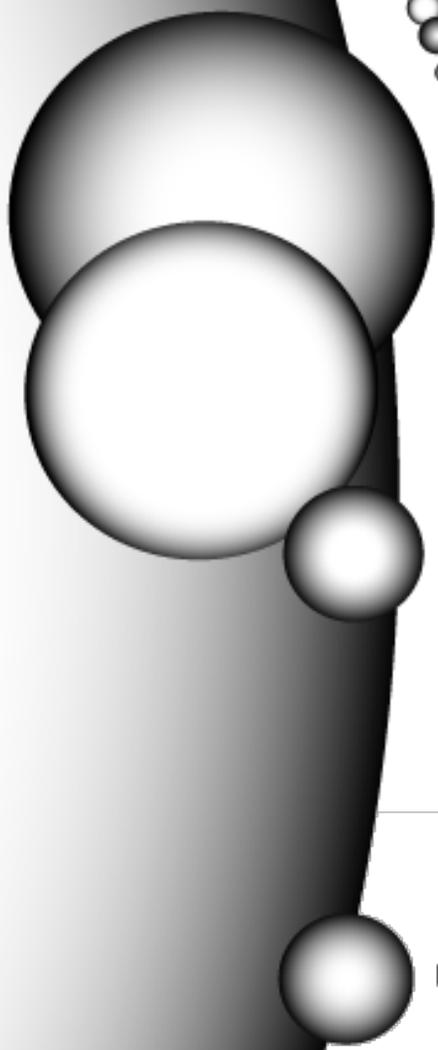
Time between outer planets:

This lab was developed from Dr. Stanley Owocki’s “Planet Walk” homework assignment. Picture Credits: Prelab: Burnett, Liam, and Duncan Lloyd. “The Solar System.” *Callander Primary School*. Schools.ik.org: Internet Kid Ltd., n.d. Web. 14 Sept. 2015. <http://www.callanderprimaryschool.ik.org/p_The_Solar_System.ikml> Lab: “Planets to Scale.” *Planets to Scale*. The I AM Family of Light, 2005. Web. 14 Sept. 2015. <<http://www.theiamfamilyoflight.com/planets.shtml>>.

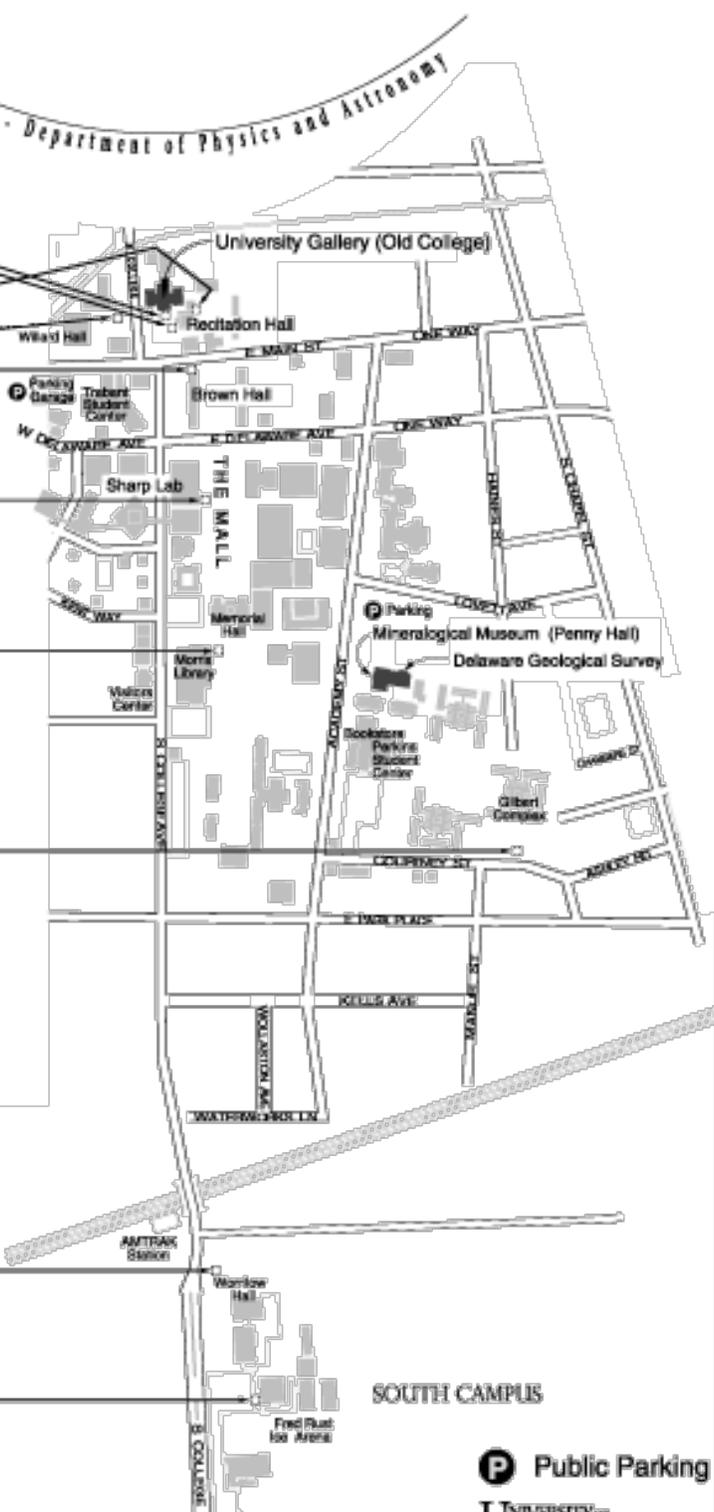
University Gallery and Mineralogical Museum - Department of Physics and Astronomy

Planet Walk

University of Delaware Scale Model Solar System



- Sun
- Mercury
- Venus
- Earth
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune
- Pluto

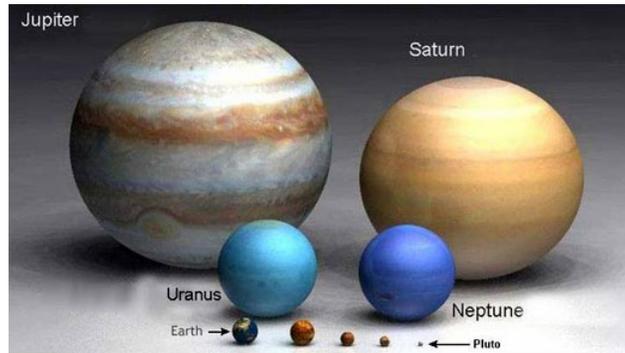


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LAB 2 LAB AND WORKSHEET: THE “PLANET WALK” LAB



For this lab, you'll turn in your prelabs at the **end** of lab section. At the beginning of lab, show your prelab to your TA so that (s)he can mark it complete.

Perform the following analysis using the data from both your and your partner's prelabs.

1. (2 points) Calculate the scale factor of your models using the following equation:

$$\text{Scale Factor} = \frac{\text{True Diameter}}{\text{Measured Diameter}}$$

2. (2 points) *Measure your pace:* Take a meter stick into the hallway and lay it flat on the ground. Starting with your toe at “0 m”, walk ten paces forward and have your partner measure the distance you've traveled. Record this distance (in meters!) in the space below, then trade places and measure the length of your partner's pace:

Pace length, Partner 1: _____

Pace length, Partner 2: _____

3. (2 points) Compute the campus distance (in meters) between the two inner planets and between the two outer planets. This can be done by determining how long your pace is, and then multiplying that distance by the number of paces between the two planets.

Campus distance between inner planets, Partner 1: _____

Campus distance between outer planets, Partner 1: _____

Campus distance between inner planets, Partner 2: _____

Campus distance between outer planets, Partner 2: _____

4. (2 points) What do you notice about the distances between the inner vs. outer planets?

5. (2 points) *Conversion to actual distance:* Multiply the distances by the scale factor you calculated above to determine how far apart the planets would be in the actual Solar System. Give your answers **in both km and AU**. (Note: this will likely be a bit larger than the minimum distance between these planets in their orbits, since your walk was likely not direct and because the model planets are not perfectly aligned).

Actual distance between inner planets, Partner 1: _____

Actual distance between outer planets, Partner 1: _____

Actual distance between inner planets, Partner 2: _____

Actual distance between outer planets, Partner 2: _____

6. (2 points) Compare each of the actual distances above to the differences between average orbital distances from the sun (ex. as given in Appendix E.2 of your textbook).

7. (2 points) Determine both your average campus walk speed (**in m/s**) and the associated solar system speed (**in km/s**) for both the inner and outer planets. Remember, speed = distance / time. Do this for both partners' data.

8. (2 points) Compare your four solar system speeds with the speed of light. What do you notice? Why do you think that is?

9. (4 points) Use Microsoft Excel to create a graph of the distance of the planets from the Sun vs. the planets (that is, put distance away from the Sun on the y-axis and the names of the planets on the x-axis). You may use the tables at

<http://nssdc.gsfc.nasa.gov/planetary/factsheet/>

to help (look for the “distance from Sun” row). Use AU as your unit of distance, and use a Log scale on the y-axis. When you are finished, print your Excel graph and attach it to the back of this lab. The following equation may be of some use:

$$1 \text{ AU} = 1.5 \times 10^8 \text{ km}$$

Planet	Distance (km)	Distance (AU)
Mercury		
Venus		
Earth		
Mars		
Jupiter		
Saturn		
Uranus		
Neptune		