Mars for Earthlings

LESSON 4: Remote Sensing Mars

In-Class Activity 2

Remote Sensing_ REVISED: *MOLA Simulation* (*Note: This is a shorter version of the previous activity. Instructors may choose either version depending on time constraints.)

Since we ran out of time, we're simplifying your ping pong exercise to just 3 "topographies"- 1) a base datum (floor), 2) a medium level, and 3) your highest level.

For each topography level, you should have had several timings to ensure that you have a consistent value. Just report the averages here. Transfer data in shade boxes to Data Table III for another group to calculate.

Data Table I (D1 Baseline , datum),

Level	Distance Ball Traveled	Ave. Time (Seconds)	Velocity (distance/time)
Base			

Data Table II

Level	Time Average (secs)	Calculated Distance Ball (cms) Traveled = (velocity*average time)	Your known measured height of placed block topography (cm) (keep as your "answer")
2- med			
3- high			

------------------------------- *tear here to give Table III to blind student group* -------------------------------

Transfer the data shown by the shade areas so they can make the calculations.

Data Table III (share with other "blind" student group)

Group _______

Give the {D1} Ave Vel. =

*R Interval	Time Average (secs) of "topographies"	Original Distance Ball Traveled (Baseline From Data Table I) {D1}	Distance Ball Traveled = (velocity*average time) (cm) {D2}	Calculated Altitude (cm) {D1-D2=Altitude}
2- med				
3- high				

After you calculate the altitude of the "unknown" topography heights 2 & 3, **check your calculated altitude answers with your measured known values the group had actually measured (their far right column of Table II**).

If the calculated doesn't match the measured values, explain why the results might be so different:

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Part 4

The Laser Rangefinder aboard NEAR sends out a laser beam and "catches" it as it returns from being reflected by the surface of 433 Eros. The instrument records how long it takes the beam to reach the surface and bounce back. The scientists know how *fast* the beam is traveling; therefore, they can calculate how *far* it traveled. By measuring this time and multiplying by the velocity of the beam, they calculate how far the laser has traveled. They must then divide the distance the beam traveled in half.

1. Why did you not divide in half to find the distance to the object in *your* topography model?

Next, the scientist must compare this distance to a "baseline" distance we will call zero. On Earth, we might use sea level as the baseline. Another way to set the baselines is to start at the center of the planetary body being studied and draw a perfect circle as close to the surface of the body as possible. Using this baseline, the altitude compared to zero can be calculated and graphed. (Here on Earth, we often say that some point is a certain number of feet above or below sea level).

1. Why do we not use the term "sea level" for Mars and other planets?

2. You will now calculate the altitude of the points along your model. To do this subtract the distance the ball traveled at each interval (from Data Table II) from the distance the ball traveled in Step 1 (column B, Data Table I). The number you come up with will be zero or greater. Use Data Table III to do your calculations. The number in column B in this table should be the same for every interval. Remember, it is the baseline altitude and does not change.

*This exercise was adapted from NASA Goddard Space Flight Center (Education/Outreach): http://mola.gsfc.nasa.gov/pingpong.html