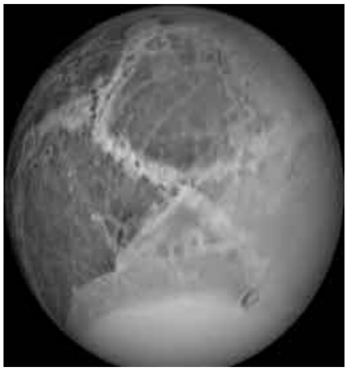
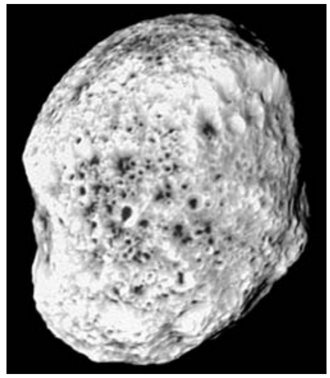
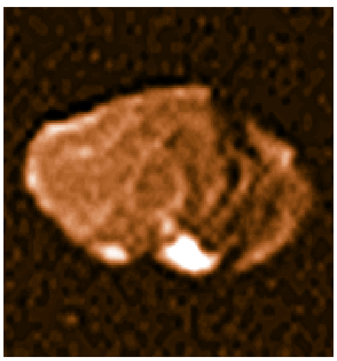
Why are many astronomical bodies round? Here is an activity in which you use astronomical photographs of various solar system bodies, and determine how big a body has to be before it starts to look round. Can you figure out what it is that makes a body round?



The images show the shapes of various astronomical bodies, and their sizes: Dione (560 km), Hyperion (205 x 130 km), Tethys (530 km), Amalthea (130 x 85 km), Ida (56 x 24 km), Phobos (14 x 11 km).

Question 1) How would you define the roundness of a body?

Question 2) How would you use your definition of roundness to order these objects from less round to round?

Question 3) Can you create from your definition a number that represents the roundness of the object?

Question 4) On a plot, can you compare the number you defined in Question 3 with the average size of the body?

Question 5) Can you use your plot to estimate the minimum size that a body has to be in order for it to be noticeably round? Does it depend on whether the body is mostly made of ice, or mostly of rock?

The images show the shapes of various astronomical bodies, and their sizes: Dione (560 km), Hyperion (205 x 130 km), Tethys (530 km), Amalthea (130 x 85 km), Ida (56 x 24 km), Phobos (14 x 11 km).

Question 1) How would you define the roundness of a body? **Answer: Students may explore such possibilities as the difference between the longest and shortest dimension of the object; the ratio of the longest to the shortest diameter; or other numerical possibilities.**

Question 2) How would you use your definition of roundness to order these objects from less round to round? **Answer. The order should look something like Ida, Amalthea, Hyperion, Phobos, Tethys and Dione.**

Question 3) Can you create from your definition a number that represents the roundness of the object? **Answer: If we select the ratio of the major to minor axis length, for example, we would get Dione = 1.0; Hyperion = 1.6; Tethys=1.0; Amalthea=1.5; Ida = 2.3 and Phobos = 1.3**

Question 4) On a plot, can you compare the number you defined in Question 3 with the average size of the body? **Answer: See plot below for the numerical definition selected in Question 3. We have used the average size of each irregular body defined as (L + S)/2. so Hyperion = (205+130)/2 = 167 km; Amalthea = (130+85)/2 = 107 km; Ida = (56+24)/2 = 40 km; Phobos = (14+11)/2 = 13 km.**

Question 5) Can you use your plot to estimate the minimum size that a body has to be in order for it to be noticeably round? Does it depend on whether the body is mostly made of ice, or mostly of rock? Answer: By connecting a smooth curve through the points (you can do this by eye), the data suggests that a body becomes noticeably round when it is at a size between 200-400 km. Students can obtain pictures of other bodies in the solar system and see if they can fill-in the plot better with small moons of the outer planets, asteroids (Ceres, etc) or even comet nuclei. Note, inner solar system bodies are mostly rock. Outer solar system bodies are mostly ice, so students might notice that by labeling the points as 'rocky bodies' or 'icy bodies' that they may see two different trends because ice is more pliable than rock. Students should investigate what the size (mass) has to do with roundness, and see that larger bodies have more gravity to deform their substance with.