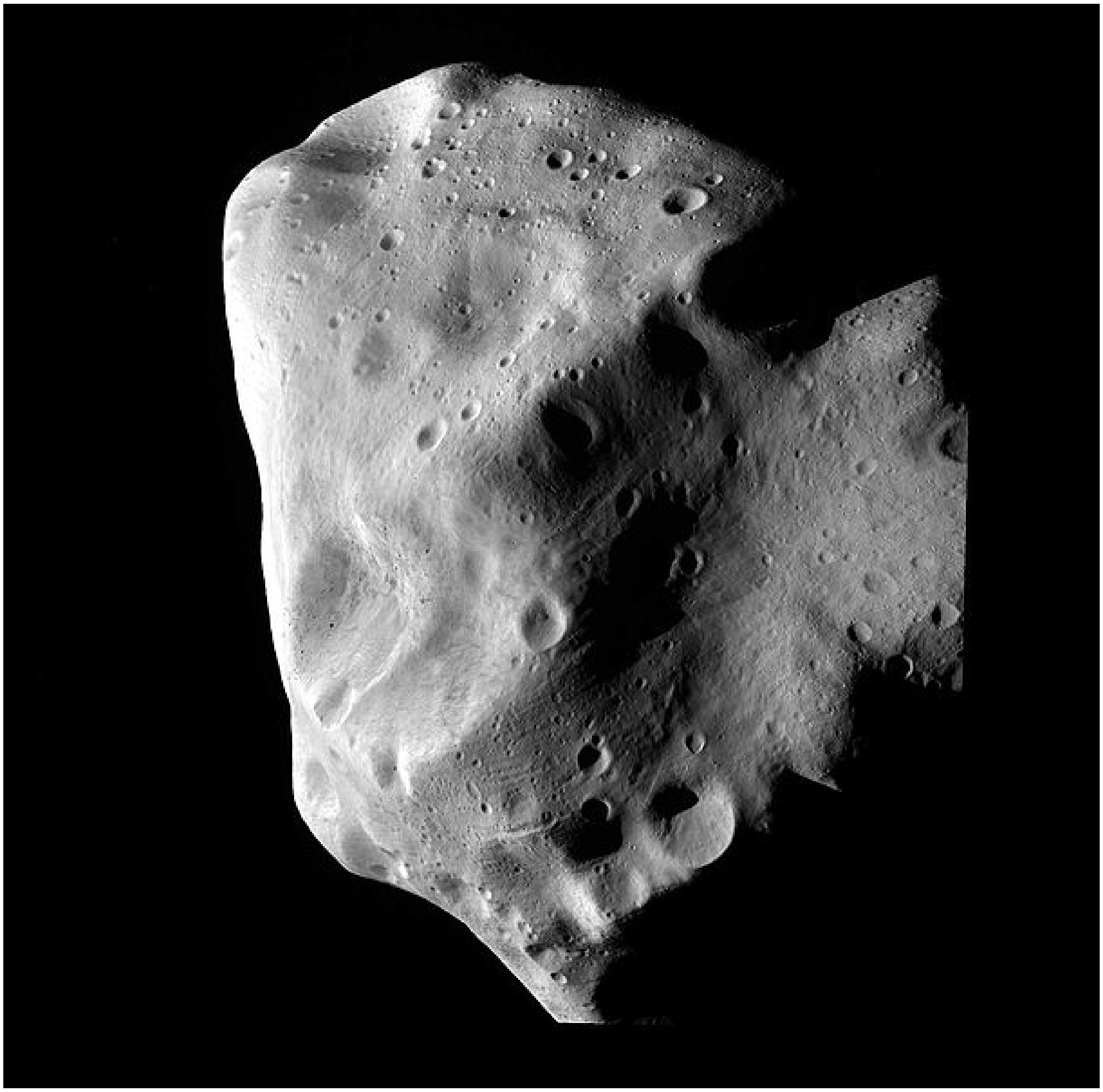

Problem 1 - What is the scale of this image in meters/mm if the width of the image is 130 kilometers?

Problem 2 - At a distance of 3,162 km, A) what was the angular diameter of this asteroid? B) Compared to the full moon viewed from Earth (0.5 degrees), how much larger was Lutetia?

Problem 3 - If the spacecraft traveled at a speed of 15 km/s on a path exactly tangent to the line connecting the center of the asteroid and spacecraft at closest approach, how long after closest approach would the asteroid have an angular diameter equal to the full moon?

Image credit: ESA 2010 MPS for OSIRIS Team MPS/UPD/LAM/IAA/RSSD/INTA/UPM/DASP/IDA. European Space Agency's Rosetta spacecraft, with NASA instruments aboard, flew past asteroid Lutetia on Saturday, July 10, 2010. Asteroid diameter about 130 km. This view is from a distance of 3,162 Km. The probe spent several hours shooting images of the irregular shaped space rock, circling more than 450 million km (280 million miles) out from the sun. The space agency says its OSIRIS camera was able to capture detail down to just a few dozen meters.

Problem 1 - What is the scale of this image in meters/mm if the width of the image is 130 kilometers?

Answer: 130 km / 152 mm = **855 meters/mm**.

Problem 2 - At a distance of 3,162 km, A) what was the angular diameter of this asteroid? B) Compared to the full moon viewed from Earth (0.5 degrees), how much larger was Lutetia?

Answer: A) $\tan(\theta) = 130/3162$ so θ = **2.3 degrees**.
B) Asteroid is 2.3/0.5 = **4.6 times** the diameter of the full moon.

Problem 3 - If the spacecraft traveled at a speed of 15 km/s on a path exactly tangent to the line connecting the center of the asteroid and spacecraft at closest approach, how long after closest approach would the asteroid have an angular diameter equal to the full moon?

Answer: To have an angular diameter of 0.5 degrees ,the spacecraft has to be 4.6 times farther away than at closest approach, or a distance of 4.6 x 3,162 = 14,545 km. From the Pythagorean theorem, the distance from the closest approach point is just d $= (14545^2 - 3162^2)^{1/2}$ = 14,197 km. To travel this distance takes T = 14197/15 = **946 seconds or 15.8 minutes.**