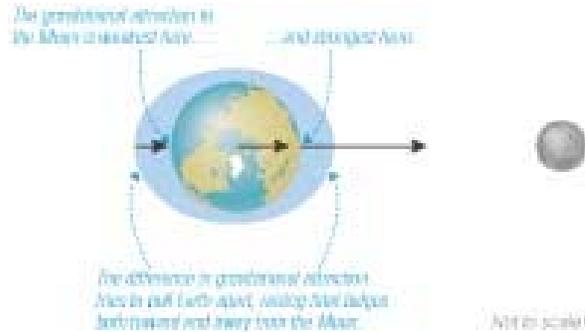


SYNCHRONOUS ROTATION

Gravity (see definition below) attracts objects toward each other. The strength of gravity is the same on both objects,



although the further two objects are from one another, the less gravitational attraction they have. Let's look at the Earth and Moon. The strength of gravity is strongest on the side of Earth closest to the Moon, and weakest on the side farthest from the Moon. The

difference in the force of attraction stretches the Earth and creates tidal bulges on the sides closest to and farthest from the Moon. Since the Earth is rotating, any location on the planet will pass through each bulge once every day. These are the two daily high tides. Low tides occur at the midpoints between the bulges, which is why we see a low tide in between each high tide.

The tidal friction created by the stretching and squeezing of Earth has another effect. **Synchronous rotation** is a natural consequence of **tidal friction**. The Moon has tidal bulges similar to those on Earth. It is thought that the Moon once rotated much faster than it does today. The friction created by the stretching and squeezing of the Moon caused the Moon's rate of rotation to slow down until its rotational period was the same as its orbital period. At this point there is no more tidal friction, the rate of rotation stabilizes and the Moon is locked in synchronous rotation with Earth.

Universal law of gravitation: The law expressing the force of gravity (F_g) between two objects, given by the formula

$$F_g = G \frac{M_1 M_2}{r^2}, \quad (G = 6.67 * 10^{-11} \frac{m^3}{kg * s^2})$$

Synchronous rotation: Describes the rotation of an object that always shows the same face to an object that it is orbiting because its rotation period and orbital period are equal.

Tidal friction: Friction within an object that is caused by a tidal force.