# Probing Question: Why does the Earth rotate?

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We spend our lives on a spinning globe -- it takes only 24 hours to notice that, as night follows day and the cycle repeats. But what causes Earth to rotate on its axis?

The answer starts with the forces that formed our solar system.

A fledgling star gathers a disk of dust and gas around itself, said Kevin Luhman, an assistant professor of astronomy at Penn State. As things coalesce, the star's gravitational orbit sets that dust and gas to spinning. "Any clump that forms within that disk is going to naturally have some sort of rotation," Luhman said.

As the clump collapses on itself it starts spinning faster and faster because of something called conservation of angular momentum. Figure

skaters exploit this law when they bring their arms closer to their bodies to speed up their rate of spin, Luhman explained. Since gravity pulls inward from all directions equally, the amorphous clump, if massive enough, will eventually become a round planet. Inertia then keeps that planet spinning on its axis unless something occurs to disturb it. "The Earth keeps spinning because it was born spinning," Luhman said.

Different planets have different rates of rotation. Mercury, closest to the sun, is slowed by the sun's gravity, Luhman noted, making but a single rotation in the time it takes the Earth to rotate 58 times. Other factors affecting rotational speed include the rapidity of a planet's initial formation (faster collapse means more angular momentum conserved) and impacts from meteorites, which can slow down a planet or knock it off stride.

Earth's rotation, he added, is also affected by the tidal pull of the moon. Because of the moon, the spin of the Earth is slowing down at a rate of about 1 millisecond per year. The Earth spun around at a faster clip in the past, enough so that during the time of the dinosaurs a day was about 22 hours long.

In addition to slowing the Earth's rotation, the moon's tidal pull is causing the moon to slowly recede from the Earth, at a rate of about 1 millimeter per year. In the distant past, the moon was closer. "It would have appeared much larger in our sky than it does now," Luhman said.

Millions of years from now, he added, the cycle of a day on Earth will likely stretch to 25 or 26 hours. People will have to wait a little longer for the rising of the sun.

Source: By Mike Shelton, Research Penn State