

Why is the moon leaving us?

June 10 2014, by Fraser Cain



Earth's Moon. Credit: James Lennie.

We had a good run, us and the Moon. Grab your special edition NASA space tissues because today we're embarking on a tale of orbital companionship, childhood sweethearts and heartache.

You could say we came from the same part of town. A long time ago the Mars-sized object Theia, collided with the Earth and the Moon was

formed out of the debris from the collision.

We grew up together. Counting from the very beginning, this relationship has lasted for 4.5 billion years. We had some good times. Some bad times. Gravitationally linked, arm in arm, inside our solar family sedan traversing the galaxy.

[SNARK:We even still like to go "exploring" the Moon's "surface" once in a while]

But now, tragedy. The Moon, OUR Moon, is moving on to brighter horizons. We used to be much closer when we were younger and time seemed to fly by much faster. In fact, 620 million years ago, a day was only 21 hours long. Now they've dragged out to 24 hours and they're just getting longer, and the Moon is already at a average distance of 384,400 km. It almost feels too far away.

If we think back far enough to when we were kids, there was a time when a day was just 2 – 3 hours long, and the Moon was much closer. It seemed like we did everything together back then. But just like people, massive hunks of rock and materials flying through space change, and their relationships change as well.

Our therapist told us it wasn't a good idea to get caught up on minutiae, but we've done some sciencing using the retroreflector experiments placed by Apollo astronauts, and it looks as though the Moon has always had one foot out the door.

Today it's drifting away at 1-2 cm/year. Such heartache! We just thought it seemed like the days were longer, but it's not just an emotional effect of seeing our longtime friend leaving us, there's a real physical change happening. Our days are getting 1/500th of a second longer every century.

I can't help but blame myself. If only we knew why. Did the Moon find someone new? Someone more attractive? Was it that trollop Venus, the hottest planet in the whole solar system? It's really just a natural progression. It's nature. It's gravity and tidal forces.

And no, that's not a metaphor. The Earth and the Moon pull at each other with their gravity. Their shapes get distorted and the pull of this tidal force creates a bulge. The Earth has a bulge facing towards the Moon, and the Moon has a more significant bulge towards the Earth.

[SNARK:We're pointing our bulges at each other.]

These bulges act like handles for gravity, which slows down their rotation. The process allowed the Earth's gravity to slow the Moon to a stop billions of years ago. The Moon is still working on the Earth to change its ways, but it'll be a long time before we become tidally locked to the Moon.



A series of photos combined to show the rise of the July 22, 2013 'super' full moon over the Rocky Mountains, shot near Vail, Colorado, at 10,000ft above sea level in the White River National Forest. Moon images are approximately 200 seconds apart. Credit: Cory Schmitz

[SNARK:We're not giving up our motorcycle or our unsavory friends any time soon..]

This slowing rotation means energy is lost by the Earth. This energy is transferred to the Moon which is speeding up, and as we've talked about in previous episodes the faster something orbits, the further and further it's becomes from the object it's orbiting.

Will it ever end? We're so attached, it seems like it'll take forever to figure out who's stuff belongs to who and who gets the dog. Fear not, there is an end in sight. 50 billion years from now, 45 billion years after the Sun has grown weary of our shenanigans and become a red giant, when the days have slowed to be 45 hours long, the Moon will consider itself all moved into its brand new apartment ready to start its new life.

What about the neighbors down the street? How are the other orbital relationships faring. I know there's a lot of poly-[moon](#)-amory taking place out there in the Solar System. We're not the only ones with Moons tidally locked. There's Phobos and Deimos to Mars, many of the moons of Jupiter and Saturn are, and Pluto and Charon are even tidally locked to each other, forever. Now's that's real commitment. So, in the end. The lesson here is people and planets change. The Moon just needs its space, but it still wants to be friends.

What do you think? If you were writing a space opera about the Earth

and the Moon break-up, what was it that finally came between them?
Tell us in the comments below.

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