2016 WILL HAVE A LEAP SECOND

Delay those New Year's plans. World timekeepers have announced they'll add a leap second just before midnight on December 31, 2016.

The extra second – or leap second, as it is called – is added to world clocks one second before midnight, UTC. The last leap second was added on June 30, 2015 just before midnight UTC.

The U.S. Naval Observatory announced on July 6, 2016 that a leap second will be added to official timekeeping on December 31, 2016.

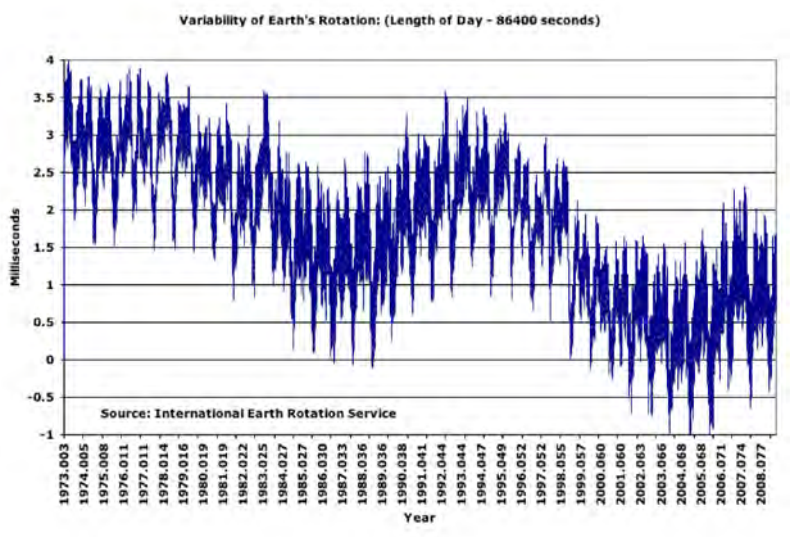
That means your day and year – and everyone's day and year – will officially be one second longer.

Our modern time scales were created by Muslim scholars in about 1000 AD. They replaced the old Ptolemaic/Roman system by subdividing the mean solar day into 24 equinoctial hours, each of which was subdivided sexagesimally, that is into the units of minute, second, third, fourth and fifth, creating the modern second as 1/60 of 1/60 of 1/24 = 1/86400 of the mean solar day. With this definition, the second was proposed in 1874 as the base unit of time in the CGS system of units.

The extra second is added to our official timekeeping mainly to keep our increasingly electronic world in sync. The most recent such leap second was added on June 30, 2015, and the one before that was June 30, 2012.

Why do we need a leap second? Isn't the length of our day set by the rotation of the Earth? A massive, constantly rotating body? Most of us today do assume that the Earth's rotation – its spin on its axis – is perfectly steady, the perfect time keeper. But this is a bit like the ancients who insisted that all motion in the heavens must be perfect, uniform and unvarying, After all, Heave is the place of perfection. We have since learned that the sun, moon, stars and planets parade daily across our sky because the Earth turns. And that the planets, the Moon and even the Earth do not move in perfect circular orbits. So, why should the Earth be a perfect time-keeper? In fact, compared to modern timekeeping methods such as atomic clocks, the Earth is a notoriously poor timepiece. Not only is Earth's spin slowing down, but it also is subject to effects that cannot even be predicted very well.

Ocean tides are one visible effect of what is causing Earth to slow down in its rotation. The gravitational gradient between the near and far side of the Earth facing the Moon (or the Sun), causes tidal stresses within the body of the Earth as it rotates, of which the ocean tides are just the most obvious result.



As our planet rotates, these tidal stresses cause the Earth to slow down, much like the brake on a rotating wheel. The Earth is slowing down, very slowly. But then, after one day is it 0.002 seconds. After two days it is 0.004 seconds. After three days it is 0.006 seconds and so on. After about a year and a half, the difference mounts to about 1 second. It is this difference that requires the addition of a leap second.

The situation is not quite that clear cut. For example, the Fukushima earthquake in 2011 caused displacements of portions of the Earth's crust that actually sped up the Earth's rotation by a few milliseconds. Furthermore, modern telecommunications relies heavily on precise timing, and the random addition of a leap second causes serious problems. Precision timing systems, like the global positioning system (GPS), do not use the leap second system, which causes further confusion. **So they're still thinking about it in the industry. They feel that the frequent addition of a "leap second" is too cumbersome and disruptive and a revision of the process is scheduled for sometime in 2023.** AK, with EarthSky Notes