Leap second 2016: Why this New Year's Eve will have an extra second

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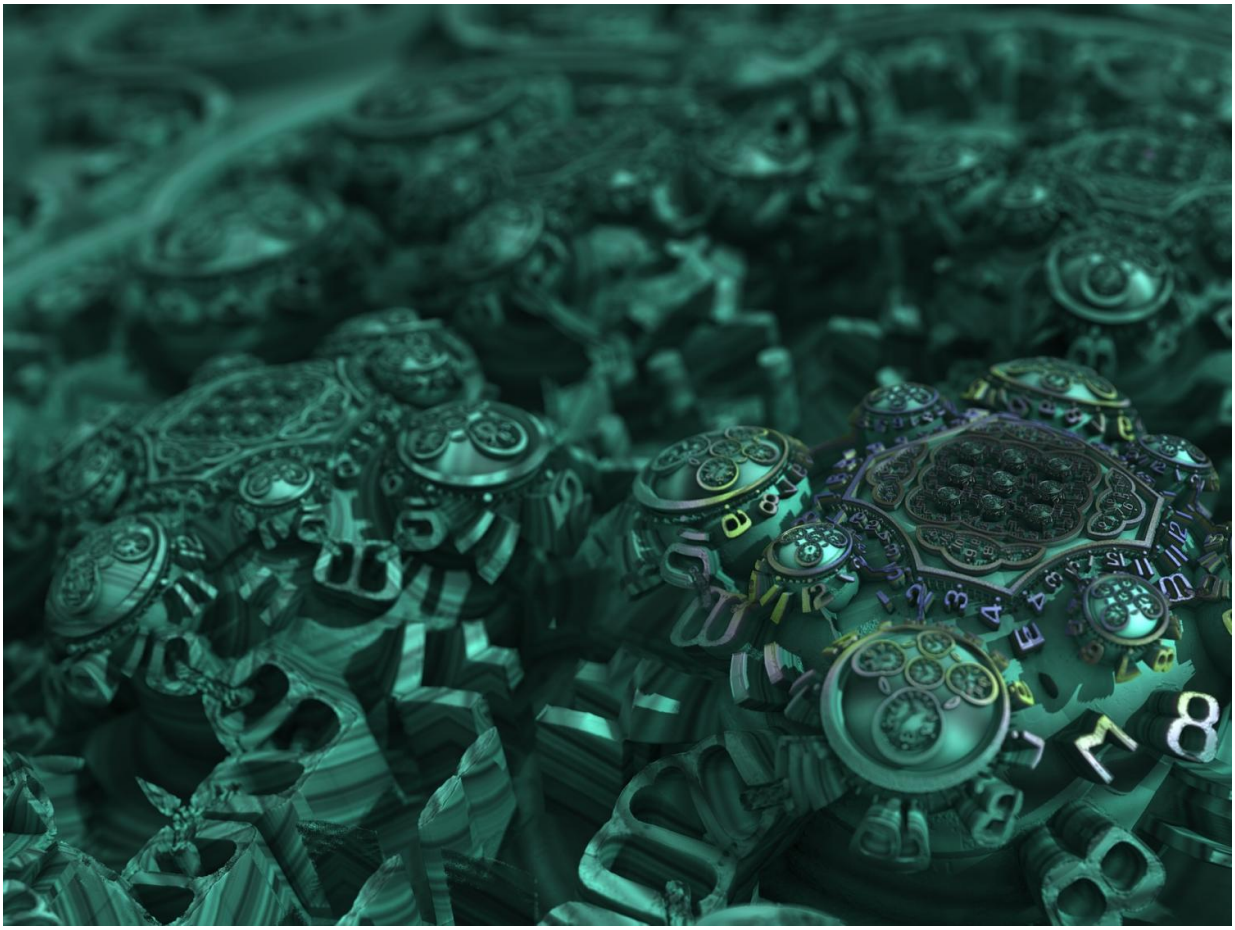

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The year 2017 isn't coming as soon as you think. In fact, it will be

exactly one second late.

On Dec. 31, 2016, the international time keeping community will tack an additional second, known as a leap second, on to the last minute of the year.

As midnight approaches, the official atomic clocks that keep Universal Coordinated Time will mark the time as 23h 59m 59s, followed by the leap second 23h 59m 60s. Jan 1 will continue as usual, beginning with 0h 0m 0s.

Unlike leap years, leap seconds are not a regular occurrence. Instead, they are decreed by the International Earth Rotation and Reference Systems Service, or IERS, in Paris, which measures the Earth's rotation and compares it with the time kept by atomic clocks.

You may not realize it, but in our modern society we are governed by two types of time.

The first, known as astronomical time, is based on how long it takes Earth to make one complete spin on its axis. Through most of human history this type of time was measured by the rising and setting of the sun. Today, however, scientists keep track of it by aiming a network of radio telescopes at a distant quasar.

Atomic time, on the other hand, defines a second as exactly 9,192,631,770 oscillations of a cesium-133 atom. This is what determines the time that displays on a computer or cellphone.

But these two types of time do not always line up.

In part, that's because the Earth does not keep perfect time.

Duncan Agnew, a geophysicist at Scripps Institution of Oceanography in San Diego, explains that movements within the Earth's liquid core can cause the spin rate of our planet to speed up or slow down.

And the U.S. Naval Observatory reports that over the last 40 years the Earth has generally run slow compared with atomic time, at an average of 1.5 to 2 milliseconds per day.

To keep the two types of time from veering too far away from each other, the IERS calls for a leap second whenever it appears there will be more than a 0.9 second difference between astronomical time and atomic time.

Since 1972, there have been 26 leap seconds added in intervals varying between six months and seven years.

For the record, the IERS could also say that a second should be subtracted from atomic time, but so far that has never been necessary.

Although it's no big deal for most of us to adjust to an additional atomic second in our year, it is a much bigger pain for people who run computer networks. In the past, tech companies like Google, Reddit and LinkedIn have all run into problems because of the addition of a leap second.

Therefore, the future of the leap second is being hotly debated.

After all, even if the difference between astronomical time and atomic time grew by one second every year, in 100 years the gap would be only less than two minutes. In 1,000 years, it would be off only by less than 17 minutes.

But for now at least the leap second stands. And although the second before midnight Universal Coordinated Time technically corresponds to

3:59:59 p.m. Pacific Standard Time, you might still consider marking the occasion of the extra second on Dec. 31 by adding a zero to your traditional New Year's countdown like this:

"... three, two, one, zero." And then "Happy New Year!"