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Leap of imagination: how February 29 reminds us of our mysterious relationship with time and space

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If you find it intriguing that February 28 will be followed this week by February 29, rather than March 1 as it usually is, spare a thought for those alive in 1582. Back then, Thursday October 4 was followed by Friday October 15.

Ten whole days were snatched from the present when Pope Gregory XIII issued a papal bull to "restore" the calendar from discrepancies that had crept into the Julian calendar, introduced by Julius Caesar in 45 BCE.

The new Gregorian calendar returned the northern hemisphere's vernal equinox to its "proper" place, around March 21. (The equinox is when the Earth's axis is tilted neither toward nor away from the sun, and is used to determine the date of Easter.)

The Julian calendar had observed a leap year every four years, but this meant time had drifted out of alignment with the dates of celestial events and astronomical seasons.

In the Gregorian calendar, leap days were added only to years that were a multiple of four – like 2024 – with an exception for years that were evenly divisible by 100, but not 400 – like 1700.

Simply put, leap days exist because it doesn't take a neat 365 days for Earth to orbit the Sun. It takes 365.2422 days. Tracking the movement of celestial objects through space in an orderly pattern doesn't quite work, which is why we have February – time's great mop.

Father Time: statue of Pope Gregory XIII in Bologna, Italy. Getty Images

Time and space

This is just part of the history of how February – the shortest month, and originally the last month in the Roman calendar – came to have the job of absorbing those inconsistencies in the temporal calculations of the world's most commonly used calendar.

There is plenty of science, maths and astrophysics explaining the relationship between time and the planet we live on. But I like to think leap years and days offer something even more interesting to consider: why do we have calendars anyway?

And what have they got to do with how we understand the wonder and strangeness of our existence in the universe? Because calendars tell a story, not just about time, but also about space.

Our reckoning of time on Earth is through our spatial relationship to the Sun, Moon and stars. Time, and its place in our lives, sits somewhere between the scientific, the celestial and the spiritual.

Read more: Why does a leap year have 366 days?

It is notoriously slippery, subjective and experiential. It is also marked, tracked and determined in myriad ways across different cultures, from tropical to solar to lunar calendars.

It is the Sun that measures a day and gives us our first reference point for understanding time. But it is the Moon, as a major celestial body, that extends our perception of time. By stretching a span of one day into something longer, it offers us a chance for philosophical reflection.

The Sun (or its effect at least) is either present or not present. The Moon, however, goes through phases of transformation. It appears and disappears, changing shape and hinting that one night is not exactly like the one before or after.

The Moon also has a distinct rhythm that can be tracked and understood as a pattern, giving us another sense of duration. Time is just that – overlapping durations: instants, seconds, minutes, hours, days, weeks, months, years, decades, lifetimes, centuries, ages.


phases of a lunar eclipse against night sky

Rhythm of the night: the Moon is central to our perception of time passing. Getty Images

The elusive Moon

It is almost impossible to imagine how time might feel in the absence of all the tools and gadgets we use to track, control and corral it. But it's also hard to know what we might do in the absence of time as a unit of productivity – a measurable, dispensable resource.

The closest we might come is simply to imagine what life might feel like in the absence of the Moon. Each day would rise and fall, in a rhythm of its own, but without visible reference to anything else. Just endless shifts from light to dark.

Nights would be almost completely dark without the light of the Moon. Only stars at a much further distance would puncture the inky sky. The world around us would change – trees would grow, mammals would age and die, land masses would shift and change – but all would happen in an endless cycle of sunrise to sunset.

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The light from the Sun takes eight minutes to reach Earth, so the sunlight we see is always eight minutes in the past.

I remember sitting outside when I first learned this, and wondering what the temporal delay might be between me and other objects: a plum tree, trees at the end of the street, hills in the distance, light on the horizon when looking out over the ocean, stars in the night sky.

Moonlight, for reference, takes about 1.3 seconds to get to Earth. Light always travels at the same speed, it is entirely constant. The differing duration between how long it takes for sunlight or moonlight to reach the Earth is determined by the space in between.

Time on the other hand, is anything but constant. There are countless ways we characterise it. The mere fact we have so many calendars and ways of describing perceptual time hints at our inability to pin it down.

Calendars give us the impression we can, and have, made time predictable and understandable. Leap years, days and seconds serve as a periodic reminder that we haven't.