

Why do we need leap years? Astrophysicists explain this month's extra date

February 21 2024



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This year is a leap year. Many people will know this means that February gets an extra day—a total of 29, as opposed to 28—but often do not know why. Space experts Dr. Minjae Kim and Dr. James McCormac shed light on the phenomenon.

Dr. Kim, a Research Fellow from the Department of Physics, University of Warwick, said, "Leap years play a crucial role in aligning our calendar with the Earth's orbit around the sun. The orbit, otherwise known as a tropical year, takes about 365.24 days to complete. This is slightly longer than our standard calendar year of 365 days."

"This extra quarter of a day each year may seem insignificant, but over time, it adds up, leading to a noticeable shift in our calendar."

"Without adjusting for this extra time, our calendar would gradually fall out of sync with the astronomical seasons, causing a significant drift over the years. Leap years, therefore, are essential to prevent this drift and maintain the alignment of our calendar with the Earth's journey around the sun."

"To counter this misalignment, the leap year system adds an extra day to the calendar every four years. This adjustment is made by extending February to 29 days. This seemingly simple solution of adding a day every four years is refined further in the Gregorian calendar, the most widely used calendar system today."

Leap years were incorporated as far back as the Roman times when a year was separated into 12 months (365 days).

Dr. James McCormac, researcher in Warwick's Astrophysics Group, added, "In the year 46 BC, Julius Cesar proposed the new Julian Calendar, which would add an additional day to the shortest month of the year (February) every four years in an attempt to allow for a predictable correction to the issue of the quarter day drift."

"However, this was actually a slight overcorrection to the problem. As the solar year was not exactly 365.25 days but was, in fact, slightly less at 365.2422 solar days, the Julian Calendar and the solar year were now drifting apart again, albeit much more slowly, at a rate of 11.2 minutes per year."

"By the late 1500s, this small overcorrection in the Julian calendar had accumulated to a drift of 13 days with respect to the solar year. Cue Pope Gregory XIII, the Pontifex Maximus of the Catholic church at the time. In 1582 he gave us the Gregorian calendar, which modified the Julian Calendar to account for the 11.2-minute drift. Many countries, including the UK, still use the Gregorian calendar today."

To improve upon the over-correction made by the Julian calendar, the Gregorian [calendar](#) skips three leap days every 400 years. This gives an average year of 365.2425 solar days which is much closer to the solar year of 365.2422 solar days.

Dr. Kim said, "Leap years beautifully illustrate how we have harmonized our constructed concept of time with the natural rhythm of the universe, maintaining a critical balance between human activities and the Earth's natural cycles."

Provided by University of Warwick

Citation: Why do we need leap years? Astrophysicists explain this month's extra date (2024,

February 21) retrieved 28 April 2024 from <https://phys.org/news/2024-02-years-astrophysicists-month-extra-date.html>

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