

**BBC** *SEE SATURN'S RINGS BEFORE THEY TILT AWAY*

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# Sky at Night

THE UK'S BEST-SELLING ASTRONOMY MAGAZINE

## Prime time for the **PERSEIDS**

Why summer's best meteor shower  
promises a spectacular display

**SUPER  
BLUE MOON**

See two perigee full  
Moons this month  
Details inside

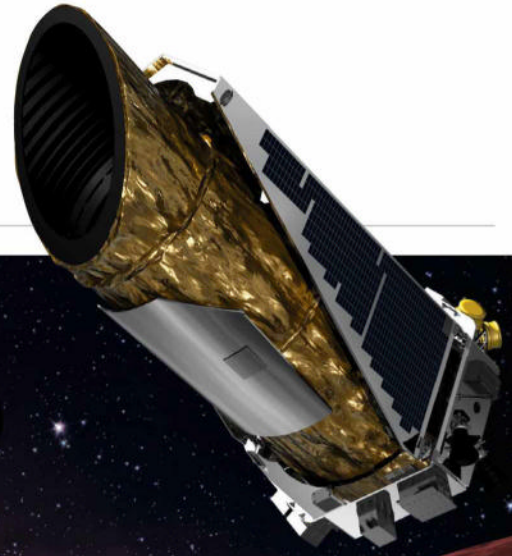
**10 SIGHTS TO MAKE YOU  
LOVE THE MOON AGAIN**

**GET READY FOR THE  
U.S. SOLAR ECLIPSES**

**THE WILDEST WEATHER  
IN THE SOLAR SYSTEM**

**ACTIVITY ON THE SUN: IS  
THE BEST YET TO COME?**

**IOPTRON'S COMPACT  
GO-TO MOUNT ON TEST**



ILLUSTRATION

▲ The planet-finding telescope died in 2018, but citizen scientists just found three missed worlds in data from its very last days

## Kepler's last planets found in archive data

The three worlds were detected when the now-defunct spacecraft was 'running on fumes'

**Of the 5,000** planets beyond our Solar System discovered so far, around half were found by NASA's Kepler Space Telescope. Now astronomers believe they have identified the last three planets the telescope ever uncovered.

Kepler launched in 2009, spending four years monitoring 150,000 stars, looking for the dip in brightness caused by a planet passing in front. In May 2013, however, the second of the spacecraft's four reaction wheels – which helped keep it steady – failed. The Kepler team eventually found another way to stabilise the craft and conducted the K2 observing campaign which ran until the telescope used up its fuel, officially retiring on 30 October 2018.

Kepler's last observation run was able to get one week of high-quality observations of 33,000 stars, followed by 10 days of

noisier measurements when the lack of fuel made the spacecraft's thrusters fire erratically. There was still enough data to identify potential planets and so the team passed the data through the same detection method they'd used to identify many other planets: a dedicated team of citizen scientists who combed through the light curves looking for transits.

"They can distinguish transits from other wacky things like a glitch in the instrument," says Andrew Vanderburg from MIT, who co-led the study. "That's helpful, especially when your data quality begins to suffer like it did in K2's last bit of data."

The citizen scientists examined the high-quality data, helping to identify three potential planets. For two of these – K2-416 b, which is 2.6 times the mass of

Earth and takes 13 days to orbit its star, and K2-217 b, a three-Earth-mass planet with a 6.5-day orbit – the team were able to identify another transit signal in the brief periods of reliable data in the final 10 days, thereby confirming them as planets. They could find no additional transit for the third candidate, EPIC 246251988 b, a Neptune-sized object orbiting once every 10 days, and so this will require further follow-up observations.

"We have found what are probably the last planets ever discovered by Kepler, in data taken while the spacecraft was literally running on fumes," says Vanderburg. "The planets themselves are not particularly unusual, but their atypical discovery and historical importance makes them interesting."

[www.nasa.gov/kepler](http://www.nasa.gov/kepler)