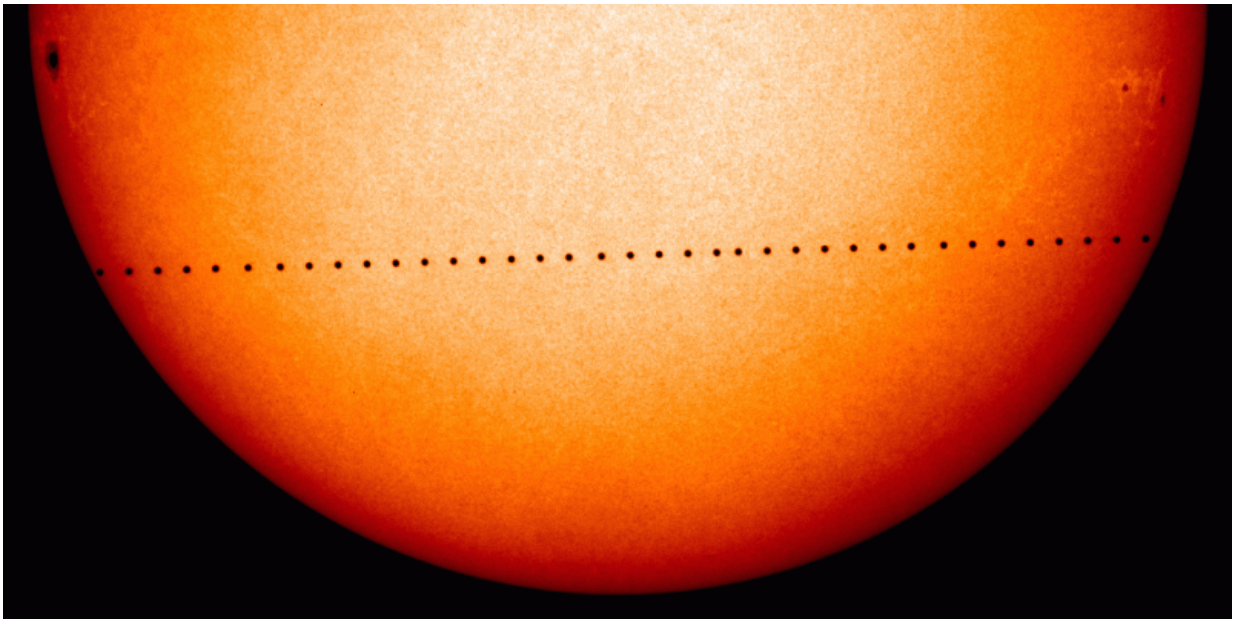
Mercury in transit

May 5 2016, by David Rothery, The Open University



A time-lapse sequence of images of Mercury crossing the face of the Sun as seen by the SOHO satellite on 8 November 2006. Credit: SOHO (ESA and NASA)

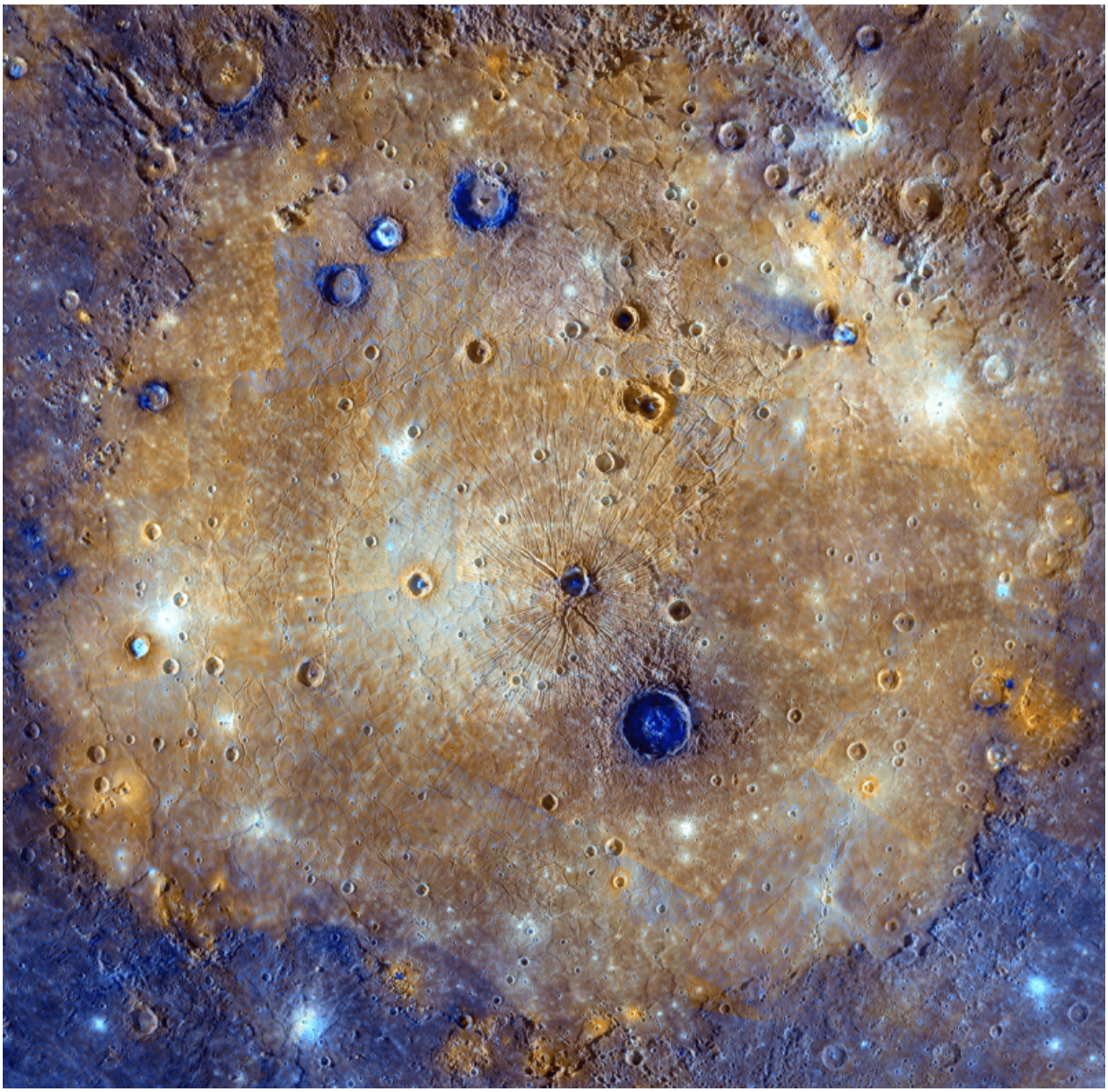
The solar system's smallest and most remarkable planet, Mercury, will cross the face of the sun on May 9 – offering a great opportunity for people in many places across the world to see it.

Mercury is a dark and enigmatic world, which bears the scars of a strangely long history of volcanic eruptions and tectonic activity. Its crust is unreasonably rich in elements that normally easily evaporate from the surface, such as sulphur, sodium and potassium. This is odd, as these are

the kind of substances that are most likely to have been lost during a hot and violent birth such as Mercury's.

Mercury scoots round the sun in only 88 days, overtaking the more sedately moving Earth every three or four months. Because Mercury's orbit is tilted at about seven degrees with respect to the Earth's, it passes directly between us and the sun (a transit) only when both it and the Earth are close to the points where their orbital planes intersect. This can happen only in early May or early November.

In every century there are only 13 or 14 transits of Mercury and you have to be on the right part of the globe if you want to watch a particular transit from beginning to end, which usually lasts for several hours. If it starts soon after sunset it is likely to be finished before dawn, meaning you won't catch any of it. However the May 9 afternoon transit is perfectly timed for viewing the entire thing from Europe and most of the Americas.



Mercuy's Caloris basin, seen in exaggerated colour. At 1,525km diameter this is the largest impact basin on the planet. Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

Mercury's transits are more common than those of Venus, which comes in a pair eight years apart then separated by intervals of more than a

century. The previous transit of Mercury (November 8, 2006) happened while the sun was below the horizon from Europe, India and anywhere in between, so many sky watchers are particularly keen to see this one for themselves. Interest has been heightened by the surprises revealed by NASA's recent MESSENGER mission, including that its earliest crust was made of graphite, unlike the other rocky planets.

Historic observations

The first planetary transit ever to be observed was in fact one of Mercury in 1631, when the French astronomer Pierre Gassendi saw it by using a telescope to project an image of the sun onto the wall of a darkened room. Eight years later Englishman Jeremiah Horrocks used the same technique when he became the first to see a transit of Venus. Projection was the only safe way to do it, because a telescope collects heat as well as light, and even today nobody should try to look at the sun through a telescope unless there is a purpose-built solar filter across the main aperture.

On November 7, 1677, Edmond Halley (he of comet fame) documented a transit of Mercury from the South Atlantic island of St Helena. It dawned on him that the slightly different perspective from vantage points in various parts of the globe would cause a transiting planet to take a slightly different track across the sun in each case. The most precise way to determine this would be to measure exactly how long the transit lasted as seen from each site, and the data could then be used to work out the distance between the Earth and the sun, which had not yet been satisfactorily achieved.

In fact Venus, being larger and closer to the Earth, gives a more precise measure, and thanks to Halley's insight French and British expeditions were mounted to various remote parts of the globe for its 1761 and 1769 transits. For example, the main impetus behind Captain Cook's first

round the world voyage was to observe the 1769 transit of Venus from Tahiti. A few months later he also observed a transit of Mercury while ashore in New Zealand, at a place that he named Mercury Bay.

There's little new science that we can get out of observing a transit of Mercury these days, but the European Space Agency is inviting schools to submit their transit timing observations to derive their own measurement of the Earth-sun distance.

Transit viewing

The May 9 transit will begin at 12:12 BST and end at 19:42 BST, which could hardly be more convenient for viewing from western Europe. Those in India will be able to watch for an hour or two before the sun sets whereas people on the east coast of North America will have to rise early to catch the start. However, people living in Japan and Australia will miss the whole thing.

The next transit of Mercury after this will be 12:35 to 18:04 GMT on November 11, 2019, but in the UK sunset happens well over an hour before the end. After that there's a long wait until November 2032.

Unlike Venus, Mercury is too small to see against the sun without magnification, and it can be dangerous to try due to the sun's glare. So my advice is to go to an organised transit viewing event – many astronomy clubs and universities are organising these. Another option is to view it online. The European Space Agency will be webstreaming live images from space (no clouds in the way) and from solar telescopes in Spain and Chile.

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