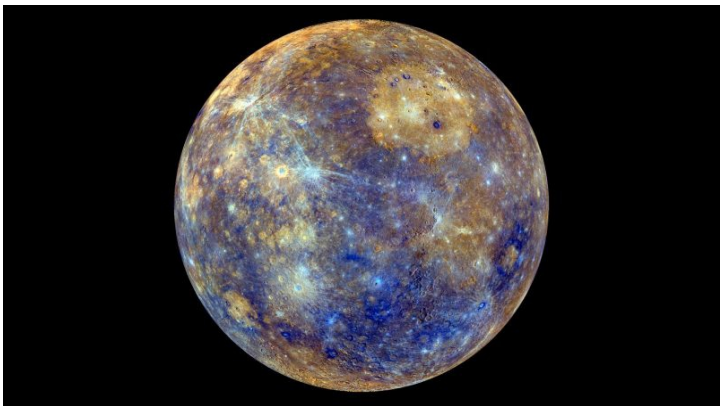
**MERCURY'S STRANGE CHEMISTRY**

Mercury is an odd little world, but new research is revealing some of its mysteries. Plus, the upcoming BepiColombo mission – a joint mission between Europe and Japan – will help scientists understand the planet's origin and evolution.



Mercury in false color, to visually enhance the chemical, mineralogical and physical differences between the rocks that make up Mercury's surface.

Mercury, the smallest terrestrial (rocky) planet and closest to the sun, is relatively close to Earth, yet there is much that we still don't know about it. Next month, the joint ESA-JAXA BepiColombo mission will be launched to this enigmatic world – but in the meantime, there are two new peer-reviewed studies that are helping to shed more light on Mercury's mysteries. The new findings were announced by Europlanet on September 18, 2018 and presented at the European Planetary Science Congress 2018 in Berlin by **Bastien Brugger** and **Thomas Ronnet**, both of whom are scientists at the University of Aix Marseille in France.

Scientists have known for some time that Mercury is rather strange – it is significantly smaller than the other terrestrial planets, it is very dense, it has an oversized molten core and it was formed under chemical conditions that determined it would contain much less oxidized material than the other rocky planets. Mercury even has ice deposits near its north pole, despite the fact that most of the surface is hot enough to melt lead. Because there is virtually no atmosphere to speak of, permanently shadowed areas can be as cold as -170° C. Brrr!

When thinking of Mercury's climate, it's good to recall that its axis of rotation is perpendicular to the plane in which it orbits the sun. In other words, Mercury has almost no axial tilt, compared to Earth's axial tilt of 23.4 degrees.

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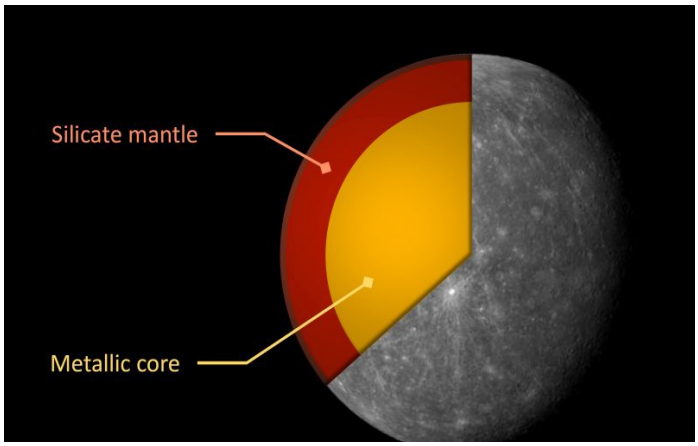


The interior structure of Mercury, based on current data.

The first study helps to explain why Mercury is so weird. The research, by a team at the University of Aix Marseille, shows that the planet may have formed very early in the solar system's history, from condensed vapour from planetesimals. There may also be more iron within Mercury's mantle than measurements of the surface had previously suggested.

**Earlier studies, thanks to the MESSENGER mission, had suggested that Mercury is very rich in iron, but also contains more sulphur than should have been available in the material from which the bulk of the solar system formed – another puzzle.** As explained by Ronnet:

> *We think that very early in the solar system, planetesimals in the innermost region of the solar system could have formed from reprocessed material that was vaporized due to the extreme temperature there and subsequently recondensed. In addition, we are able to rule out a scenario where Mercury formed from a pile-up of planetesimals coming from further out in the solar system since, in this case, Mercury would contain more oxidized material than we actually find.*

One of the most surprising discoveries on Mercury has been deposits of water ice at the north pole. On most of the surface, the temperature is hot enough to melt lead, but because there is virtually no atmosphere, permanently shadowed areas can be as cold as -170° C. Yellow regions in the composite image are ice deposits. Image via NASA.

Computer simulations of Mercury's interior, conducted by Brugger, and compared to gravity data gathered by the MESSENGER spacecraft, showed that Mercury has a dense mantle with substantial amounts of iron. BepiColombo will be Europe's first-ever mission to Mercury, and is a joint mission between the European Space Agency (ESA) and ESA and the Japan Aerospace Exploration Agency (JAXA),scheduled for October 19 launch. AK, with EarthSky and Wikipedia Notes