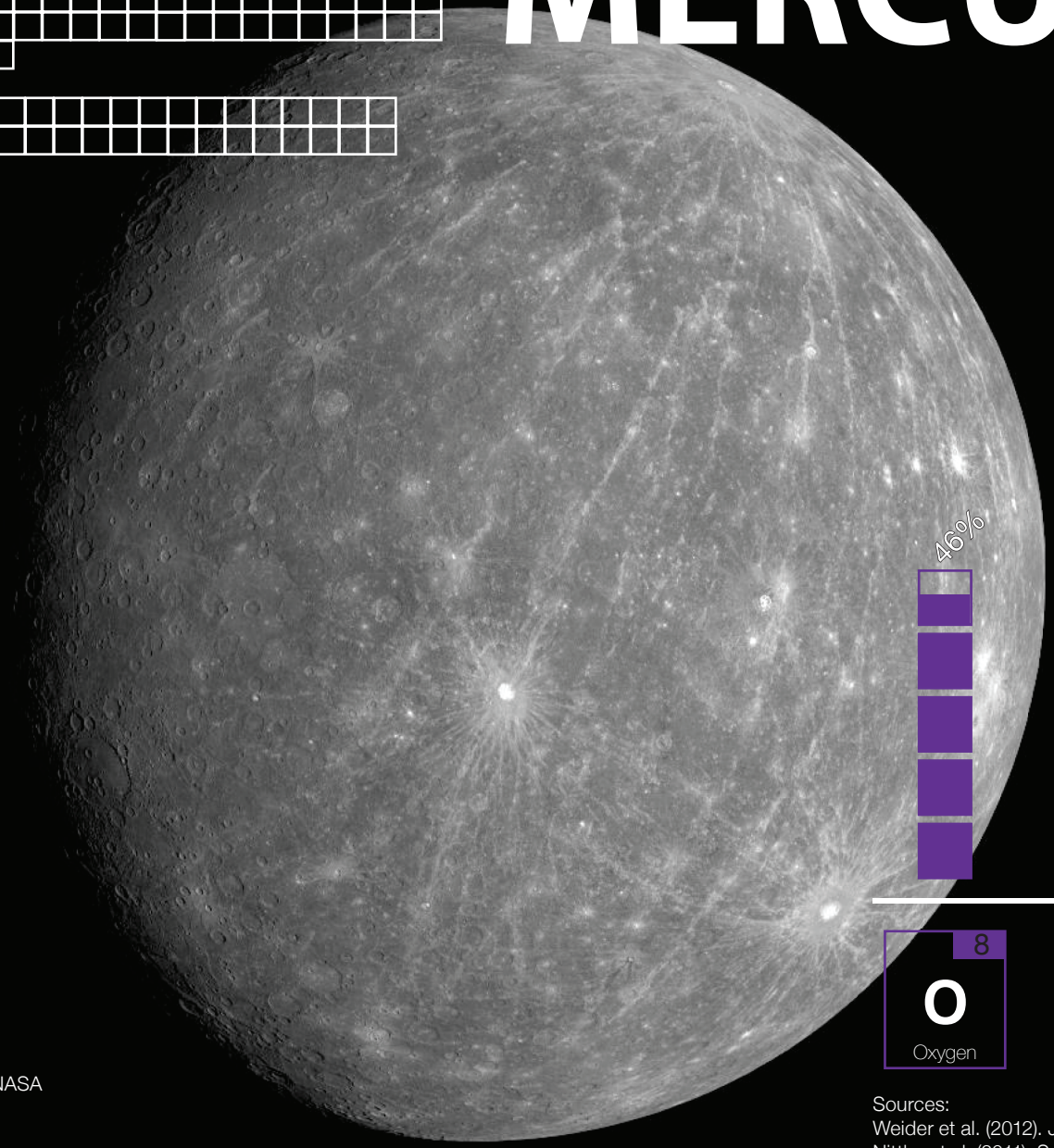
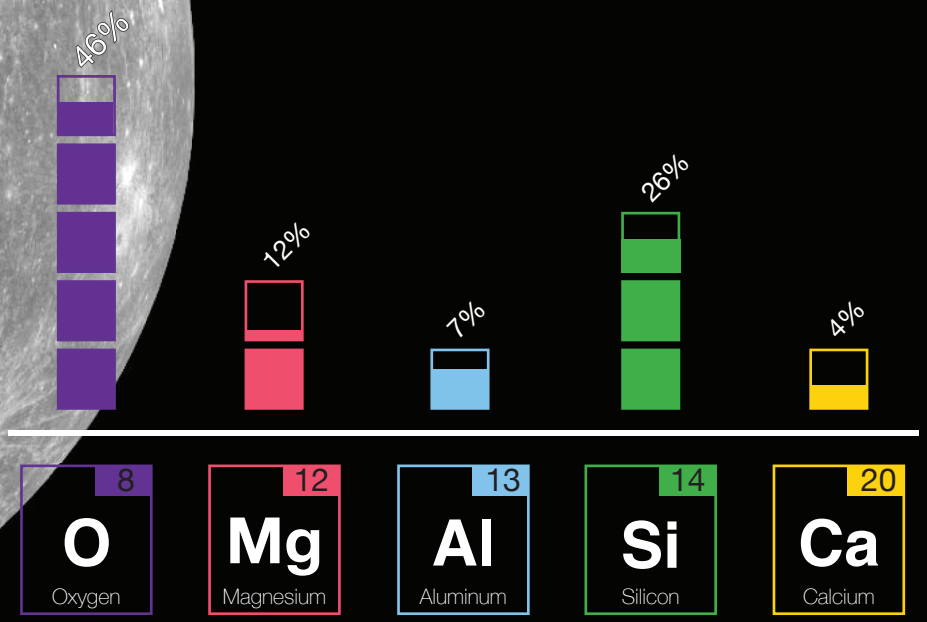
TOP 5 ELEMENTS ON THE SURFACE OF MERCURY

LUNAR AND PLANETARY INSTITUTE

2019 IYPT

International Year of the Periodic Table of Chemical Elements



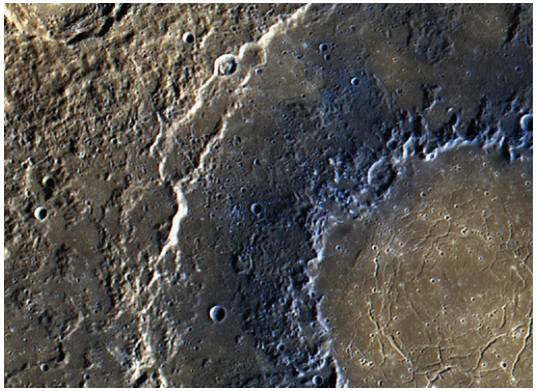


Credit: NASA

Sources:
Weider et al. (2012). Journal of Geophysical Research, Vol. 117.
Nittler et al. (2011). Science, Vol. 333.

MERCURY

Mercury is an end member among the rocky planets in our solar system in terms of is geochemical expression at the surface. Results from the MErcury Surface Space ENvironment GEochemistry and Ranging (MESSENGER) spacecraft indicated high levels of sulfur and low amounts of iron on the surface of the planet. These results suggest that there was much less oxygen present on Mercury during its formation than we see on other planetary bodies like the Moon or Mars. One of the unique and exotic features on Mercury is the composition of its primary crust, the first crust to form on the planet. When we look up at the Moon, we see dark material that is volcanic in origin, and bright, white material that is composed of the mineral plagioclase and is thought to be the primary crust of the Moon. As a planetary body cools and begins to crystallize (solidify), minerals that are heavier sink to the bottom (interior) and lighter minerals float to the top (crust/surface). On the Moon, plagioclase was lighter than the surrounding melt, causing it to float to the surface and form a primary, bright, plagioclase flotation crust. On Mercury, scientists believe a similar scenario happened, except it was graphite that floated to the top of this magma ocean and caused an overall darkening of its surface. Although most of this primary crust has been buried by later volcanic activity, scientists think remnants of this ancient carbon-rich crust are exposed at the edges of impact basins across Mercury's surface.



This image shows the 290-kilometer-wide Rachmaninoff basin on Mercury. The dark material between the inner and outer basin rings is thought to represent this ancient carbon-rich crust. Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institute of Washington.

United Nations Educational, Scientific and Cultural Organization

International Year of the Periodic Table of Chemical Elements

The year 2019 marks the 150th anniversary of Dmitri Mendeleev's development of the Periodic System and has been proclaimed the "International Year of the Periodic Table of Chemical Elements" (IYPT2019).

www.iypt2019.org

DR. KATHLEEN VANDER KAADEN

NASA Johnson Space Center

Dr. Kathleen Vander Kaaden is an experimental petrologist with Jacobs at NASA's Johnson Space Center in Houston, Texas. Her research interests broadly lie in the area of planetary science with an emphasis on geochemistry and experimental petrology. Her expertise is building planets in the laboratory (the tiniest of planets of course). Although Vander Kaaden's favorite planet to study is Mercury given its low abundance of oxygen and therefore unconventional behavior of elements, her research extends across all rocky bodies in the inner solar system including planets and asteroids. The bulk of Vander Kaaden's research is focused on understanding how rocky planetary bodies like Mercury, the Moon, and Mars separated into layers (differentiated) as they cooled and how they have evolved over time. To understand these processes, she typically uses spacecraft data to create synthetic materials matching various layers of a rocky planetary body (crust, mantle, core). These materials are then subjected to high temperatures and pressures in a series of experimental apparatuses in her laboratory to determine the fate of elements during planetary differentiation. In addition to her research, Vander Kaaden is extremely passionate about educating the next generation of STEM majors and fighting for better inclusivity in STEM fields. She has led an extensive education and public outreach program since starting graduate school in 2010. At NASA, Vander Kaaden has helped to organize/initiate and is the co-president of the group Supporting Women at NASA (SWAN), which is a female-populated organization working to empower fellow women scientists and engineers to reach their greatest potential while instilling the love of science and engineering into their local community.

LPI

Founded at the height of the Apollo program in 1968, the Lunar and Planetary Institute (LPI) is an intellectual leader in lunar and planetary science. LPI's mission is to advance understanding of the solar system by providing exceptional science, service, and inspiration to the world. The research carried out at LPI supports NASA's efforts to explore the solar system.

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