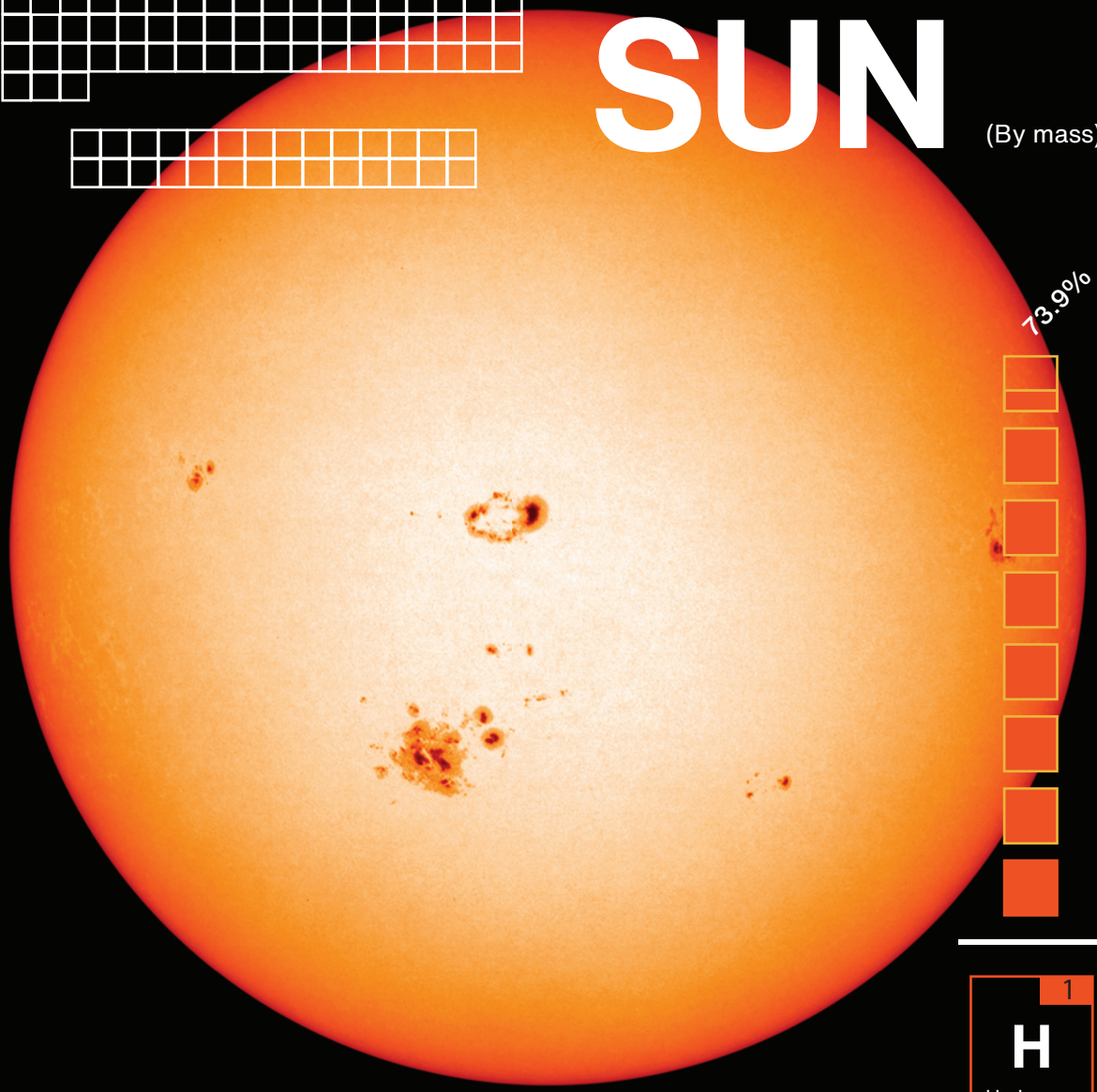
TOP 5 ELEMENTS ON THE PHOTOSPHERE ("SURFACE") OF THE SUN

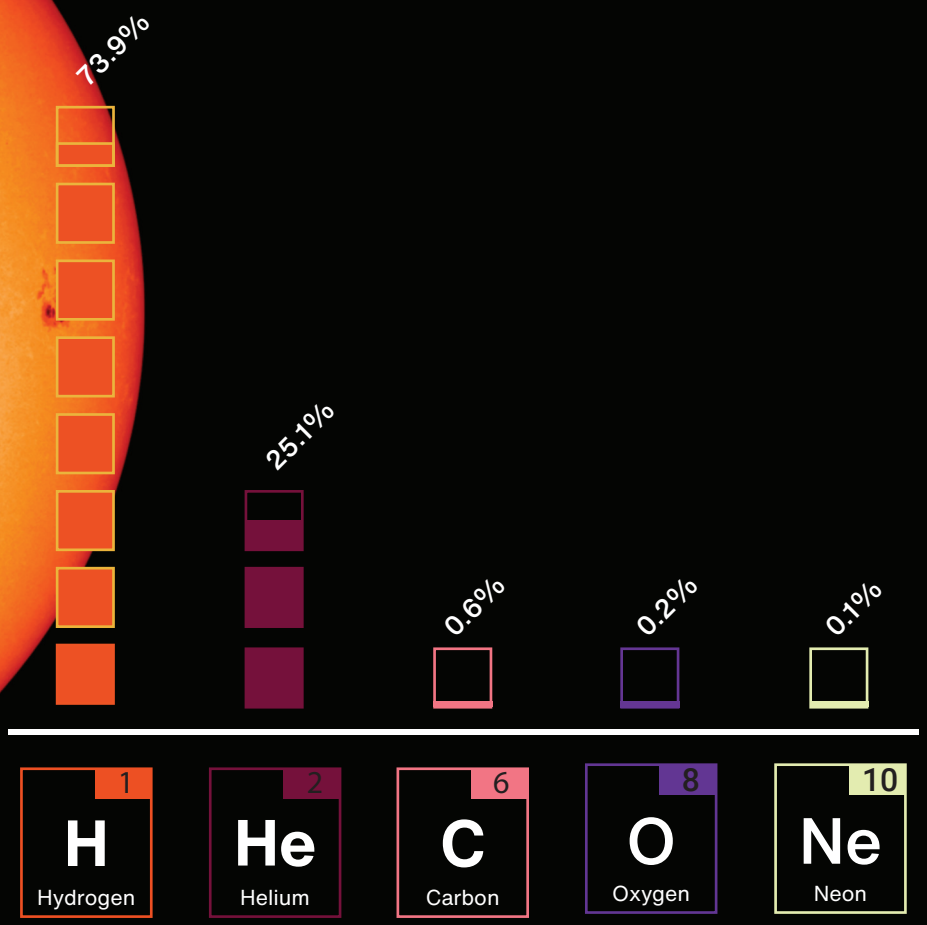
(By mass)

LUNAR AND PLANETARY INSTITUTE

2019 IYPT

International Year of the Periodic Table of Chemical Elements

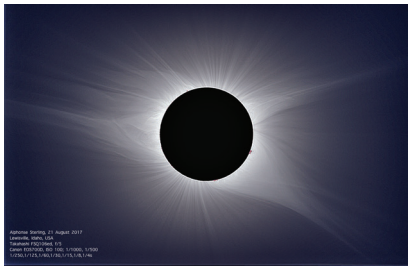




Credit: SOHO (ESA & NASA)

Source: Asplund et al. (2009). Annual Review of Astronomy & Astrophysics, Vol. 47.

THE SUN



The total solar eclipse of 2017 showing the wispy outermost part of the solar atmosphere, the corona, and at the lower right edge of the eclipsing Moon, reddish prominences of the chromosphere. Photo courtesy of Dr. Alphonse Sterling, NASA/MSFC.

The Sun has no solid surface, but a layer of the Sun called the photosphere is referred to as a "surface." Visible light from the photosphere provides daylight for planet Earth. The photosphere is also the layer where sunspots are found. Photospheric temperatures are about 6000°C, but sunspots are about 2/3 that value (~4,000°C), which is why they appear dark. Above the photosphere is the chromosphere, where the temperature is a rather surprising 20,000°C; surprising because usually when moving farther from an energy source, the temperature goes down (think of a camp fire). At this higher temperature, hydrogen emits reddish light called hydrogen-alpha or H-α. This happens because the hydrogen atom is easily ionized at chromospheric temperatures, but the hydrogen proton quickly captures a free electron into a higher energy state. About half the time, when the electron drops to a lower energy state, the hydrogen atom emits a H-α photon. The H-α-emitting chromosphere was first observed during a total solar eclipse as a reddish ring at the edge of the eclipsing Moon; also seen were magnetic loops of plasma called prominences. The strange temperature increase continues into the highest layer of the solar atmosphere, the corona, where temperatures reach millions of degrees. Helium, the second most abundant element of the photosphere, was first discovered in the corona during the total eclipse of 1868. Named for Helios, the Greek God of the Sun, the element was identified on Earth in 1882 by Luigi Palmieri in gases from Mount Vesuvius.

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

MITZI ADAMS

NASA Marshall Space Flight Center

Mitzi Adams is a solar scientist at NASA's Marshall Space Flight Center (MSFC). Here she studies the magnetic field of the Sun and how it affects the upper layers of the solar atmosphere – the chromosphere and corona. Ms. Adams, a daughter of Atlanta, earned a Bachelor of Science degree in physics with a mathematics minor from Georgia State University. In 1988 NASA/MSFC and the University of Alabama in Huntsville, Alabama made her an "offer she couldn't refuse." Ms. Adams earned a Master of Science degree in physics and began work at NASA/MSFC. With a professional interest in sunspot magnetic fields and coronal bright points, friends have labelled her a "solar dermatologist." However, Ms. Adams' research interests also extend to coronal jets and flare prediction using data from the Earth-orbiting Solar Dynamics Observatory (SDO). Coronal jets occur more frequently than solar flares and coronal mass ejections. Studying these phenomena help scientists understand the processes that lead to larger eruptions responsible for space weather. Understanding space weather and predicting geomagnetic storms is important for the protection of humans and technological assets in space, as well as the power grid on Earth. Frequently involved in educational outreach activities, Mitzi has presented multiple astronomy programs in the planetarium of the Von Braun Astronomical Society (Huntsville). Other outreach activities include leading the public in safely viewing solar eclipses and transits of Mercury and Venus. To augment her educational presentations, Ms. Adams seeks innovative material in unusual places. While few people travel alone, she has often been seen alone and in large groups in the wilds of Peru, northern Chile, Romania, Zambia, Guatemala, and southern Italy.

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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