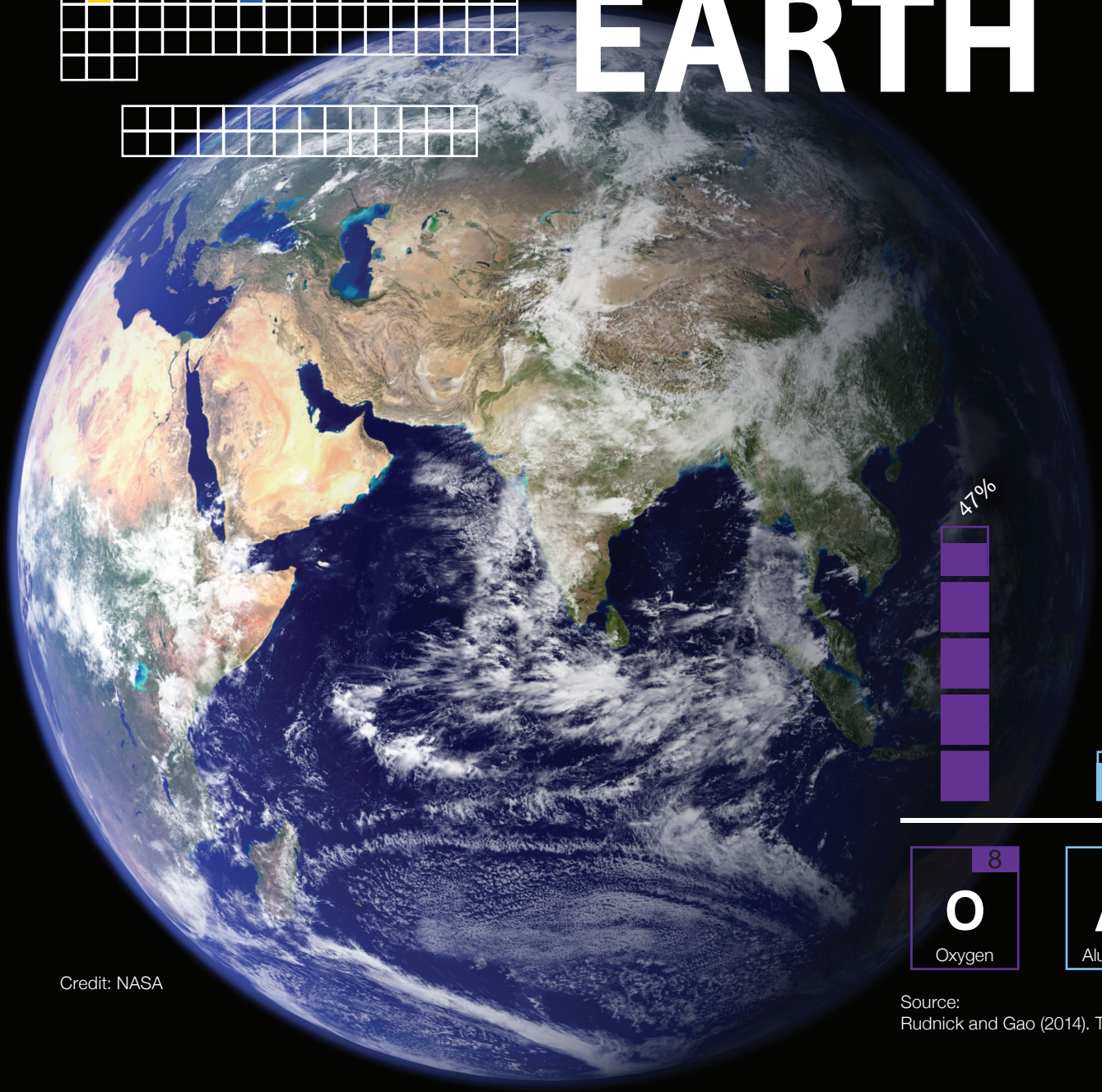
TOP 5 ELEMENTS IN THE UPPER CONTINENTAL CRUST OF EARTH

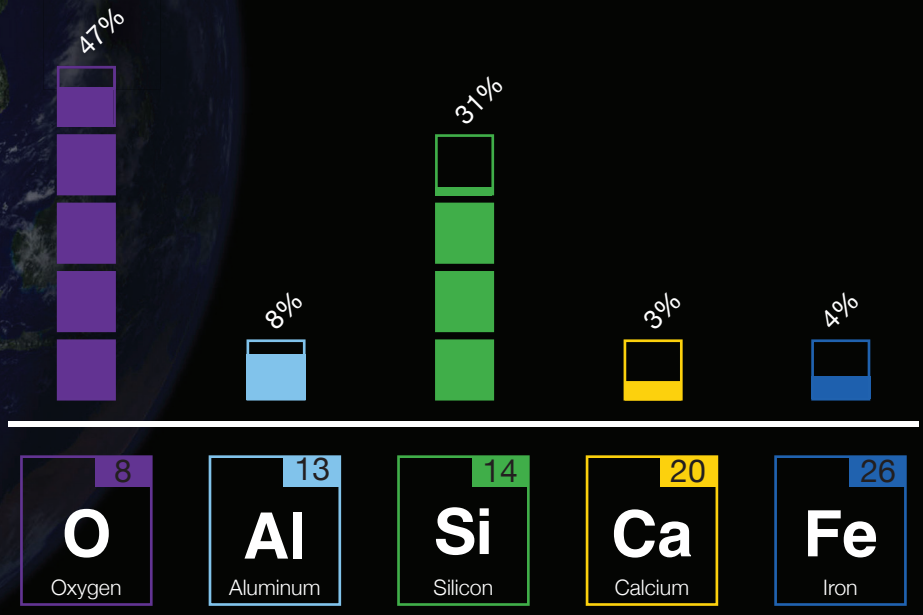
LUNAR AND PLANETARY INSTITUTE

2019 IYPT

International Year of the Periodic Table of Chemical Elements



Credit: NASA



Source:
Rudnick and Gao (2014). Treatise on geochemistry (2nd ed., Vol. 4), Boston, MA: Elsevier.

EARTH

Earth is unique in our solar system in having continental crust. It has long been recognized (as early as 1888) that the continental crust has an average composition similar to the igneous rock andesite, thus enriched in silicon but depleted in magnesium, iron, and calcium compared to basaltic rocks. This poses a dilemma for understanding the origin of the continental crust, because when Earth's mantle melts, it generates basalt. Mantles are characteristic of Earth, Mars, and Venus and developed in a relatively early stage of planet formation. The first crust is therefore expected to be derived from mantle melting (e.g., basalt). While the crust on Mars and Venus is principally composed of basaltic rocks, Earth's continental crust shows a large variety of rock compositions. Thus, one must conclude that the continental crust on Earth is a product of complex processes including melting, melt mixing, and the return of materials (recycling) to Earth's mantle. Most of these processes require the operation of plate tectonics, so formation of the continental crust is widely regarded to be the by-product of a tectonically active environment. In addition to plate tectonics, the presence of water is considered to facilitate the formation of silica-rich (felsic) rocks, and may also have a role in development of plate tectonics. As studies continue into the formation processes of the continental crust, another question also being pursued by geoscientists is how long plate tectonics have operated on Earth and how the process started.

Mt. Hood (Oregon, USA) is an archetypal subduction zone volcano that can erupt abundant amounts of andesite. Credit: Roberta Rudnick.

United Nations Educational, Scientific and Cultural Organization

2019 IYPT International Year of the Periodic Table of Chemical Elements

The year 2019 marks the 150th anniversary of Dmitry 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

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Roberta L. Rudnick is a Professor in the Department of Earth Science at the University of California, Santa Barbara (UCSB). Prior to joining the UCSB faculty in 2016, she held professorial appointments at the University of Maryland and at Harvard University. Rudnick received her Ph.D. from the Australian National University in 1988, after which she was an Alexander von Humboldt Fellow at the Max-Planck Institute für Chemie in Mainz, West Germany, and a Research Fellow at the Research School of Earth Sciences at the Australian National University. Her research focuses on the origin and evolution of the continents, including the underlying mantle lithosphere, as well as lithium isotope geochemistry. Rudnick has served on the National Research Council committee on Grand Research Questions in Earth Science. She has been a counselor for the Mineralogical Society of America, served on the Board of Directors of the Geochemical Society, served for 10 years as an Editor-in-Chief of Chemical Geology and as the editor for the volume The Crust, in both editions of the Treatise on Geochemistry. She is currently the president of the Geochemical Society. Rudnick received the N. L. Bowen Award from the American Geophysical Union and the Dana Medal from the Mineralogical Society of America. She is a fellow of the American Association for the Advancement of Science, the American Geophysical Union, the Geological Society of America, the Geochemical Society, the European Association of Geochemistry, and the Mineralogical Society of America, and has been a distinguished lecturer for the latter society. She is a member of the American Academy of Arts and Sciences and the U.S. National Academy of Sciences, and is a foreign member of the Chinese Academy of Sciences.

LPI

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