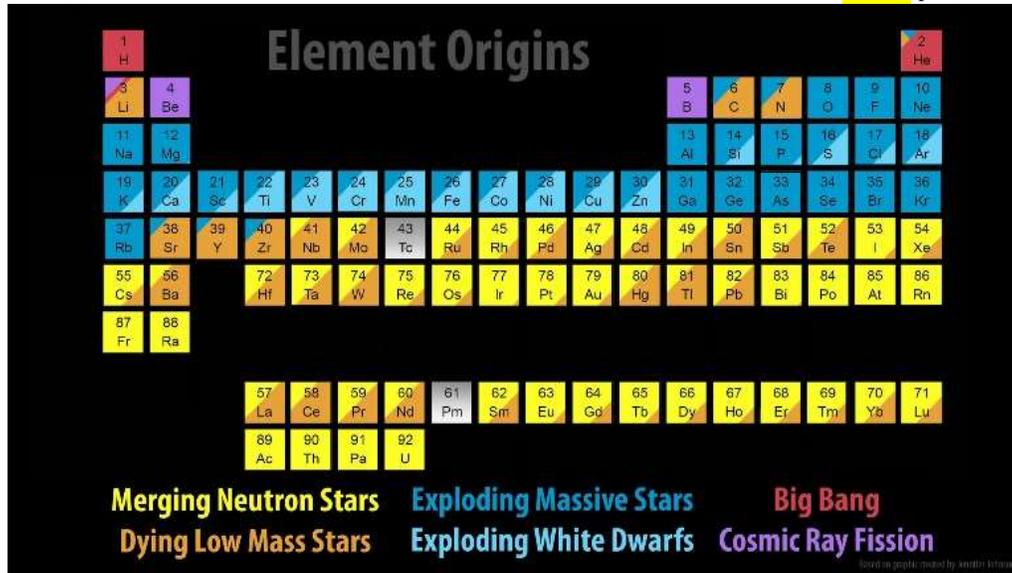


The Universe – Its Biogeochemical and Natural Evolution

March 8, 2026 1:49 PM Ver. © Norris Whiston Canada 2026 Earlton, N. S. See [NS Wild Flora](#). **Yellow** precedes special links.



Credit Dr. Jennifer Johnson, Ohio State <https://www.astronomy.com/science/astronomers-tally-all-the-gold-in-our-galaxy/>

In 1869, a Russian chemist, Dmitri Mendeleev 1834-1907, recognized that certain elements behaved chemically the same way and organized them into a chart, the periodic table. **A VIDEO 5:25** gives the cool story of Dmitri's life and his creation. Mendeleev even predicted elements and their properties that hadn't been discovered by that time, **VIDEO 4:24**

In 2014, American Chemical Society and American Association of Chemistry Teachers **produced** a **VIDEO 4:16** of how those elements were created. In a 2017 **VIDEO 1:07:44**, Dr. Jennifer Johnson, Ohio State, explained the tools used to get that data and described our Milky Way galaxy. **Another** 2017 **VIDEO 7:12** on stellar evolution can be followed here or read [here](#). In 2019, Dr. Johnson in *Science* **explained** and illustrated how the 'stuff' of the universe keeps changing.

(red) Initially, **13.8 bya, 15 minutes after the Big Bang (BB)**, 3 elements, hydrogen, helium, and lithium, were created. Helium and lithium were made within the first massive hydrogen stars. Hydrogen still powers our [sun](#).

(purple) **100 million years (myr) after BB**, slightly heavier elements, beryllium, boron, and some more lithium were created when those earliest elements were bombarded by charged particles called cosmic rays, still in play today.

(blue-green) **100 myr also after BB**, many elements were created from implosions and explosions during the death of massive stars. They were very big stars in big galaxies, a few galaxies of which the James Webb Space Telescope analyzed in 2024, NASA **VIDEO 8:14**. Ca and Mg would power plants and rocks to remove gobs of the greenhouse gas CO₂ from the atmosphere. In plants, Mg assisted life, making carbohydrates releasing O₂. N would be used in enzymes, and N with P would be crucial to DNA. K would aid cell nerve transmission. At least 16 elements **are essential** for plants.

(yellow) **200 myr after BB**, heavier elements came from the intense heat of merging **neutron** stars **VIDEO 1:21**.

(light blue) After a super long wait, **8 billion years (byr) after BB**, larger amounts of certain elements were created by explosions of white dwarfs. Life is made of star dust.

(tan) Also **8 byr after BB**, more and additional elements were created by explosions of low mass stars.

By **5.8 bya**, the universe was set with huge quantities of life's necessary ingredients. The process continues.

By **4.567 bya**, a **solar system's** elements, with high ²⁶Al and low ⁶⁰Fe, show it formed from a supernova of **a short-lived Wolf-Rayet star**, the hottest of all stars & 40-50 times the sun's size. Scientists found planets formed **early**, from the heavier elements and in a relatively **short time**, based on isotopes of molybdenum in our meteorites, which appeared in Earth's early mantle. Many volatile elements are found in our solar system's **outer areas**. **4.4 bya**, a Mars-sized planet, Theia, hit Earth, **sterilized** the Earth, and **created** the Moon. **4.4 bya**, Earth's **crust evolved**, grew the **magnetic field**, and mixed and **weathered**. Later, as Earth moved away from the sun, much of Earth's former high CO₂ was soaked up **by magnesium rock** and the **oceans**. **Acetylene** shielded UV rays. **3.8 bya**, earth was ready - **seeded** from **comets** and special meteorites. **Earth's volatile** elements finally stuck and potential life could evolve from its earlier primitive days.

Remember, unlike plants and fungi, animals don't have special [acids](#) on their feet or hands to weather the above elements from rock; they don't have specific [enzymes](#) within to process those elements for their and their ecosystems' use; they haven't nitrogen-fixing bacteria living within them to modify atmospheric nitrous oxide; and they aren't green with magnesium to turn atmospheric CO₂ and water into carbohydrates and oxygen. We have to face the fact that the world is collaborative and relies on trees, plants & fungi to access earth's minerals, to hold water, to filter **and scrub the air, to supply oxygen and carbohydrates, and to control greenhouse gases, temperature, drought, and floods. Plants have a far more crucial use than what is being suggested now by various industries and ill-advised governments.**