

Re-Creating the Conditions Necessary for the Building Blocks of Life

Amino acids make up proteins that drive the chemical gears of life. Scientists at NASA's Goddard Space Flight Center investigated how these molecules form in the dust around young stars, and how they are altered by being included into larger bodies like comets and asteroids.

Scientists explored how the molecules may have formed by simulating a mini-cosmic evolution in the lab. They make ices like those found in dust clouds, blasted them with radiation, and then exposed the material to water and heat to replicate the conditions inside asteroids.

Amino acids created in laboratory interstellar ices, and their proportions, stayed constant regardless of asteroid conditions. This implies that amines and amino acids can stay intact as they migrate from the interstellar cloud to an asteroid. However, each molecule reacted differently to asteroid-like conditions depending on different heating. This showed that while a single interstellar cloud may produce the same kinds of amino acids around many young planetary systems, the conditions in which they get amalgamated into larger bodies can change the chemistry significantly. Planetary systems from the same cloud may have very different chemistry.



The Pillars of Creation (Webb image), part of an active star-forming region, in which chemical building blocks of life may have formed and processed inside asteroids. Inset: Vial with yellow residue left over after particle irradiation of simulated interstellar ice at NASA Goddard.

<https://www.nasa.gov/feature/goddard/2023/nasa-scientists-study-life-origins-by-simulating-a-mini-cosmic-evolution>

<https://pubs.acs.org/doi/full/10.1021/acsearthspacechem.2c00274>