

A quarter of Sun-like stars cannibalize the planets that orbit them

How rare are planetary systems like our Solar System? A study on stars similar to the Sun reveals that a significant fraction of their planetary systems undergo a very dynamical past culminating with the fall of planets into the central star. In contrast, our quiet Solar System has preserved its planets on nearly circular orbits, which has certainly favoured the flourishing of life on Earth.

One of the most interesting discoveries over the short history of exoplanet science is that although planetary systems are common in the Galaxy, many of them are in many ways quite different from the Solar System. This diversity is the result of severe dynamical processes that have imposed significant reconfigurations of planetary systems architectures. In most dynamical systems, part of the planetary material may also have fallen into the hosting star.

An international team of astronomers led by Lorenzo Spina (INAF-Padua, Italy) has identified signatures of planet engulfment events from the chemical composition of Sun-like stars in binary systems. The two stellar components of a binary system are formed from the same gas and therefore should be chemically identical. However, when a planet falls into one of the two stars, it is dissolved in the stellar outer layer and it can modify the stellar chemical composition, with rocky-forming elements resulting more abundant than what they would be otherwise.

This innovative study has established that a quarter of Sun-like stars eat their own planets. These findings represent a generational breakthrough in stellar astrophysics and exoplanet exploration as they indicate that a significant fraction of planetary systems underwent a very dynamical past, unlike our quiet Solar System which has preserved an orderly architecture with planets on nearly circular orbits.

Regardless the technology at our disposal, with millions of nearby Sun-like stars, the search for Earth-like planets will always look like the proverbial "needle in a haystack". However, this results also opens to the possibility of using chemical abundances to identify stars that are more likely to host true analogues of our Solar System.

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