Stars' chemistry could give away planetary presence

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Courtesy ESO
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A survey of stars with and without planets has turned up an easy way to detect which ones have them, astronomers have found: the stellar chemistry often gives it away.

Researchers said the finding not only could lead to big savings of money and time in future planetary searches, it also points to a solution to a longstanding riddle: why our Sun has much less of the element lithium than most other stars analyzed.

Instruments used in research that proposes a new way to find planets based on the lithium abundance in their star. At upper left is the European Southern Observatory's 3.6-meter telescope at La Silla mountain, Chile. At upper right is the telescope itself. Below is the attached High Accuracy Radial Velocity Planet Searcher, partly open so that some of the high-precision components inside can be seen. The instrument is designed to detect planets in orbit around stars by means of accurate velocity measurements.

It turns out this is "because it has planets," Garik Israelian of the Astrophysics Institute of the Canaries in Tenerife, Spain, lead author of a study on the findings published this week in the reseach journal *Nature*.

Low lithium levels have been noticed for decades in the Sun, and astronomers wondered why, Israelian said. Meanwhile, "For almost 10 years we have tried to find out what distinguishes stars with planetary systems from their barren cousins."

The two questions, it now seems, are interrelated.

The conclusions were based on an analysis of 500 stars, including 70 planet-hosting stars, that were studied with an instrument called a spectrograph attached to the European Southern Observatory's 3.6-meter telescope at La Silla mountain, Chile.

The astronomers looked in particular at Sun-like stars, almost a quarter of the whole sample. They found that the majority of stars hosting planets have less than 1 percent of the amount of lithium shown by most of the other stars.

It's believed that stars don't produce significant amounts of lithium on their own, but instead simply inherit some of the lithium formed at the birth of the universe. Most stars therefore have about the same amount of lithium, and it stays there, unless something happens to destroy it.

Planet-bearing stars, thus, have apparently "been very efficient at destroying the lithium," said research team member Nuno Santos of the Universidade de Porto, Portugal. "We can also prove that the reason for this lithium reduction is not related to any other property of the star, such as its age."

Astronomers can analyze the chemistry of a star based on the light it gives off.

Scientists aren't sure exactly why the presence of planets would provoke lithium destruction. "There are several ways in which a planet can disturb the internal motions of matter in its host star, thereby rearrange the distribution of the various chemical elements and possibly cause the destruction of lithium," said Michel Mayor of the Observatory of Geneva University, Switzerland, a participant in the research. The question needs further work, he added.

The European Southern Observatory, a project supported by 14 European countries, carries out an ambitious program focused on the design, construction and operation of powerful ground-based telescopes.