

A star is born - and it may be the first

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A telescope image of HE 1327-2326, the star with the lowest levels of the element iron yet to be found by astronomers.

Image: Space Telescope Science Institute (STScI)
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(Inset) Magnum Telescope.

A new star that may be one of the first to have formed in the Universe has been discovered by an international team led by ANU researchers. The new star - which goes by the innocuous name HE 1327-2326 - is of enormous importance because it provides the crucial evidence of the time when the very first stars formed after the [Big Bang](#).

“This star’s a record breaker — it has the lowest levels of iron ever recorded in a star so far. This is of great importance because it indicates

HE 1327-2326 formed in the very early Universe,” team leader and astronomy PhD student, Ms Anna Frebel said.

In general, stars with a low iron abundance compared to the Earth’s sun are called ‘metal-poor’ stars.

“Elements such as iron are only synthesised in the course of the lifetime of stars during the evolution of the Universe,” Ms Frebel said.

“Thus, we believe HE 1327-2326 formed shortly after the Big Bang — it’s about twice as iron-poor as the previous record holder, HE 0107-5240, which was discovered in 2001 by ANU and German astronomers as part of the same survey.

“HE 1327-2326 will be used to trace the very early chemical enrichment history of the Universe as well as star formation processes and will challenge astronomers around the world — it’s a pretty exciting prospect.”

The researchers first observed HE 1327-2326 using the European Southern Observatory’s 3.6-metre telescope in Chile. High quality data taken later with Japan’s 8-metre Subaru telescope in Hawaii revealed HE 1327-2326’s extraordinarily low iron content.

The star was discovered in a sample of about 1800 ‘metal-poor’ stars that are being investigated as part of Ms Frebel’s PhD project and is detailed in the latest edition of Nature in the paper Nucleosynthetic signatures of the first stars.

Research collaborators included Professor John Norris from the Research School of Astronomy and Astrophysics, Dr Wako Aoki from the National Astronomical Observatories of Japan and Dr Norbert Christlieb from Hamburger Sternwarte in Germany, as well as other

researchers in Sweden, the US, the UK, Japan and Australia.

“HE 1327-2326 is a very unusual object in many ways for us astronomers,” Professor Norris, Ms Frebel’s supervisor, said. “Relative to its iron levels has abnormally high levels of several elements including carbon, nitrogen and strontium.

“Another very interesting and unusual observation is that no lithium could be detected in the relatively unevolved star. A yet unknown process must have led to depletion of that element.

“Stars that formed later in the history of the Universe tend to have more predictable ratios of these elements,” Professor Norris said.

Ms Frebel said there could be several scenarios that explain the unusual features of HE 1327-2326.

“An explanation could be that only one explosion of one of the first stars in the Universe happened, which led to pollution of the surrounding gas cloud with elements heavier than hydrogen, helium and lithium in which stars like HE 1327-2326 might have formed,” she said.

“However, it can not be excluded that HE 1327-2326 formed just after the Big Bang and there was little time for the iron content to develop and therefore is actually one of the ‘first stars’ itself — although as yet no genuine ‘first star’ has been found.”

Source: The Australian National University

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