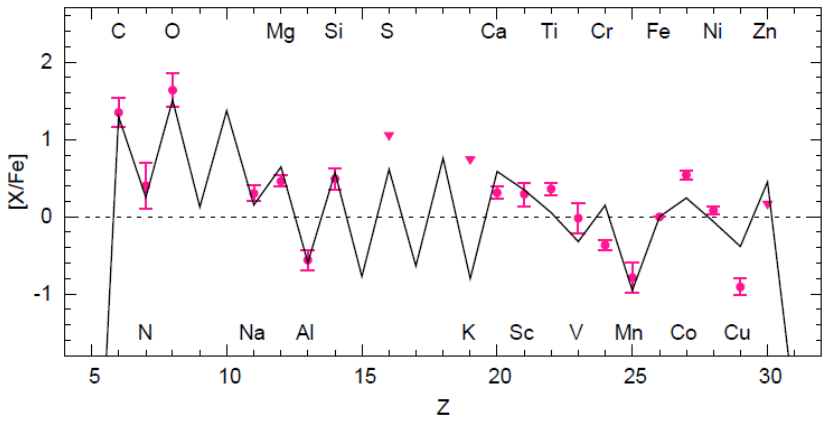
# Joint Institute for Nuclear Astrophysics

## An Update on BD+44:493, a CEMP-no Star Formed from First-Generation Stellar Nucleosynthesis ?

During the course of follow-up high-resolution observations of metal-poor stars from SDSS/SEGUE with the Subaru 8m telescope, JINA researchers and colleagues obtained a high-resolution spectrum of the bright star BD+44:493. This star turned out to be quite a surprise, as the new spectrum established that this is *the most metal-deficient star yet discovered brighter than 12$^{th}$ magnitude ([Fe/H] = -3.8)* . A new, even higher-resolution and higher S/N spectrum has now been obtained for BD+44:493.

The distinctive elemental abundance pattern indicates that the star may be associated with ejecta from a so-called "faint supernova", where extensive mixing and fallback of processed material may have occurred. **Such stars are thought to be among the very first to have formed in the early Universe.**

This star, which also exhibits strong over-abundances of carbon ([C/Fe] = +1.3) and oxygen ([O/Fe] = +1.6), does *not* exhibit a large abundance of s-process elements, such as Ba, that would be expected if its progenitor were related to the late-stage evolution of an Asymptotic Giant Branch star, as do most carbon-enhanced stars. Instead, it fits the profile of a so-called CEMP-no star (a carbon-enhanced metal-poor star that does not exhibit neutron-capture elements). In fact the derived upper limit on the heavy element lead (Pb) appears to rule out production of neutron-capture elements by the s-process.




*Comparison between the observed elemental abundance pattern of BD+44:493 (filled circles) and a theoretical individual "faint supernova" undergoing mixing and fallback. Note the low abundance of nitrogen (N), which distinguishes this pattern from other progenitors in the early Universe.*

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**Publication:** Ito, H. et al. (2013), ApJ, in press