

CEMP Stars as Probes of First-Star Nucleosynthesis, the IMF, and Galactic Assembly



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Observational Evidence for Aspherical Jet-Like Population III Supernova Explosion

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Theoretical investigations have long indicated that supernovae of the first stars would explode in an asymmetric fashion, mainly driven by their fast rotations. However, insufficient observational evidence has prevented in-depth studies. Ultra metal-poor stars ($[\text{Fe}/\text{H}] < -5$) encode information about their First progenitor star, such as the explosion mechanism, through the relative abundances of heavy elements like Cr, Co, and, most importantly, Zn. In this talk, I will report on the first detection and determination of a Zn abundance in the UV spectrum of the hyper metal-poor star, HE 1327-2326. Zn is found to be highly enhanced relative to Fe. I will show that this amount of Zn can only be produced in a high-entropy explosion environment, such as an aspherical supernova explosion with bipolar outflows. I will then reflect on the implications that such explosions of the First stars could have on our understanding of the chemical enrichment across the early universe, and formation of the second-generation of stars.

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