

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



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## Low-mass primordial stars: i-process nucleosynthesis during core-flash proton ingestion episodes?

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Models of zero metallicity and extremely metal-poor stars show that they evolve differently to their more metal-rich counterparts. In particular they suffer violent proton-ingestion episodes (PIEs) that lead to extreme carbon enrichment at the surface. The fresh carbon has a fundamental effect on their further evolution, and can be transferred to binary companions, producing CEMP stars. As first suggested by Fujimoto et al. (1990), the carbon enrichment may also be accompanied by s-process products produced during the PIEs, thus making the stars intrinsic CEMP-s stars. More recent models have shown that the neutron densities can become high enough to trigger the i-process. In this talk I will describe the evolution of a primordial star from the main sequence through to the thermally-pulsing asymptotic branch phase, with a particular focus on our new calculations of the i-process nucleosynthesis that occurs during the core helium flash proton ingestion episode. I will also briefly present a summary of the evolutionary outcomes we have found in our grid of zero metallicity and extremely metal-poor models. We have calculated the nucleosynthetic yields for these stars, with the caveat that they suffer from many uncertainties.

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