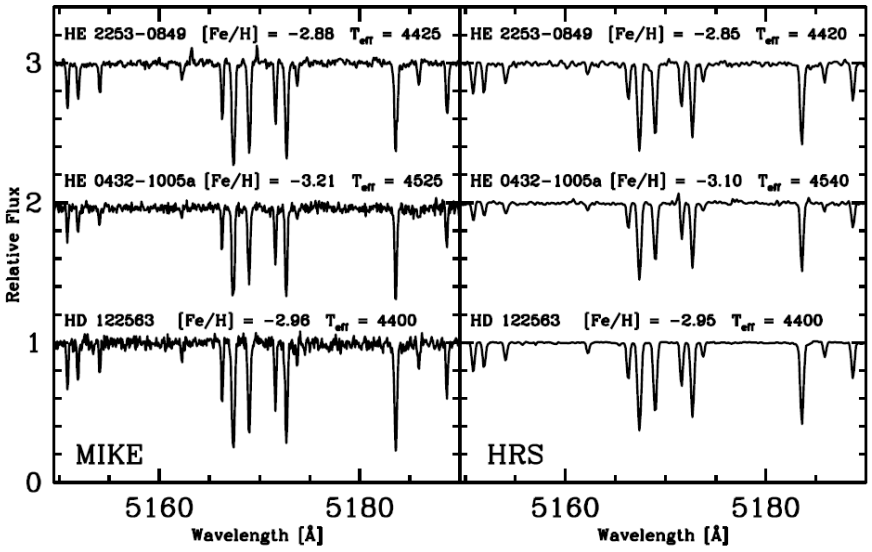
The Chemical Abundances in the Stellar Halo (CASH) Project

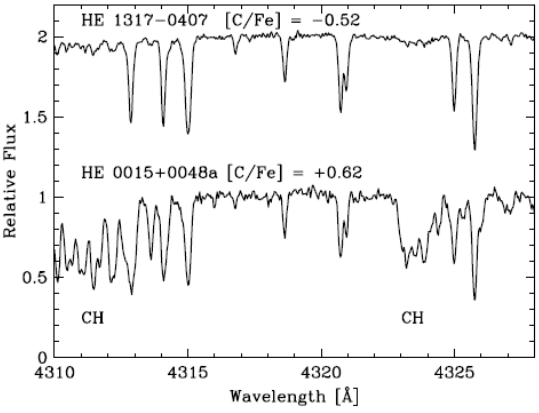
JINA researchers and colleagues have released the first of a series of papers reporting on a multi-year project to obtain moderately high-resolution spectroscopic follow-up for over 500 very and extremely metal-poor stars in the halo system of the Milky Way, obtained with the High Resolution Spectrograph on the Hobby-Eberly Telescope.

This paper, led buy former JINA undergraduate student (and present PhD candidate at the University of Texas) Julie Krugler Hollek, reports on the development and validation of an automated software system capable of deriving accurate stellar parameters and elemental abundances for on the order of 15-20 elements per star for the entire CASH data set.

The 16 stars in this pilot study span a metallicity range from [Fe/H] from −2.9 to −3.9, including four new stars with [Fe/H] < −3.7. We find four stars to be carbon-enhanced metal-poor stars, confirming the trend of increasing [C/Fe] abundance ratios with decreasing metallicity.



Example high-resolution spectroscopy for three cooler stars from the CASH pilot sample. The left panels show spectra obtained at resolving power R ~ 35,000, using the MIKE spectrograph on the Magellan 6.5m telescope. The right panels show spectra of the same stars, obtained at resolving power R ~ 15,000 with the HRS on the Hobby-Eberly Telescope. Although not quite as detailed as the MIKE spectra, the HRS spectra are more than adequate for carrying out abundance analyses, and can be obtained for a much larger sample in a given amount of time.



Example spectra of two stars with [Fe/H] < -3.0, but with differing abundances of carbon. The upper spectrum shows a stars with a sub-solar carbon-to-iron ratio, while the lower spectrum shows a star with a much higher, super-solar [C/Fe] ratio. With the larger full sample of spectra from CASH, precision determinations of the frequency and level of carbon enhancement in the halo system will be obtained.

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