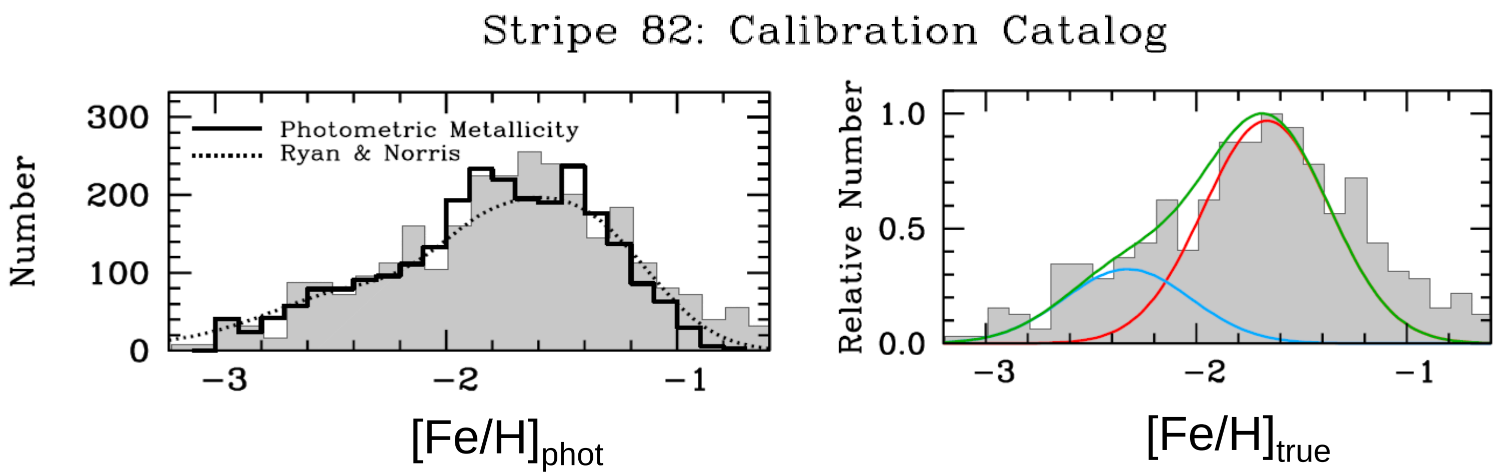
The First "Fair" Metallicity Distribution Function of the Galactic Halo from SDSS



The stellar metallicity distribution function (MDF) of the Galactic halo has long proven a challenge to measure, in particular due to the selection biases which have been applied in order to obtain a sufficiently large sample of metal-poor stars. JINA researchers and their colleagues have now devised a method to recover this information based on an accurate new calibration of *ugriz* photometry from SDSS. They estimate distances and metallicities for individual main-sequence stars in the multiply scanned SDSS Stripe 82, at heliocentric distances in the range 5 - 8 kpc and Galactic latitude |b| > 35^{o}, and find that the in-situ photometric metallicity distribution has a shape that matches that of the kinematically-selected local halo stars from Ryan & Norris (1991) – see left panel above.

Their investigation also indicates that stars with retrograde rotation in the rest frame of the Galaxy are generally more metal poor than those exhibiting prograde rotation, which is consistent with earlier arguments by Carollo et al. that the **halo system comprises at least two spatially overlapping components with differing metallicity, kinematics, and spatial distributions**. When the observed metallicity distribution is deconvolved using two Gaussian components with peaks at [Fe/H] ~ -1.7 (red line) and [Fe/H ~ -2.3 (blue line), the metal-poor component accounts for ~20% - 35% of the entire halo population in this distance range – see right panel above.

Previous work (for the past 40 years) has always assumed that the MDF of the halo could be described by a simple chemical evolution model ; however, the suggestive metallicity-kinematic correlation contradicts the basic assumption in this model that the Milky Way halo consists primarily of a single stellar population.

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