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Elemental Abundances in Old Stars & Damped Lyman-Alpha Systems

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Introduction to Joint Discussion 15: Elemental Abundances in Old Stars and Damped Lyman-alpha Systems

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Different chemical elements are manufactured by stars of different masses and at different stages of evolution. The way that relative element abundances change with the overall metallicity is not only the empirical basis on which our knowledge of nucleosynthetic yields rests. Such measurements also provide vital clues to the origin of different stellar populations in the Milky Way Galaxy; to the star formation histories of nearby galaxies; and, as recognized most recently, to the nature of galaxies at high redshift seen in absorption against background quasars, such as the damped Lyman-alpha systems (DLAs).

Efficient high-resolution spectrographs on the new generation of 8-10 m class telescopes, such as HIRES on Keck I, UVES on the VLT, and HDS on the Subaru telescope, are producing stellar and DLA spectra of unprecedented quality in the visible and near UV region. Many research groups throughout the world are pursuing ongoing surveys of metal-poor stars and DLAs. This wealth of new data is advancing fast our knowledge of elemental abundances in a variety of astrophysical environments, both local and at high redshift, and providing new information on such fundamental problems as nucleosynthesis of the elements, chemical evolution of galaxies, formation of the first stars and galaxies, and the nature of the damped Lyman-alpha systems.

Astronomers working with stellar and DLA spectra share many common interests and face similar difficulties in the analysis and interpretation of their results. Examples are the derivation of reliable abundances from the observed spectra, the determination of elemental abundances as a function of stellar age and redshift, and the impact of the new data on current theories of nucleosynthesis and galaxy formation and evolution. And yet up to now there have been only limited opportunities for the Galactic and extragalactic communities to meet in a joint discussion. The IAU General Assembly in Sydney provided an ideal and most timely occasion for such a joint discussion. The following proceedings contain the invited review talks presented at JD15 and abstracts of contributed papers and posters.