

Evolution of Metals in Galaxies: Clues from the Damped Lyman-alpha Absorbers

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Abstract Absorption lines in quasar spectra provide a unique tool to trace the evolution of galaxies. The damped Lyman-alpha (DLA) absorbers enable us to directly measure the abundances of elements in galaxies at redshifts $0 < z < 5$, and hence probe the chemical evolution of galaxies over $> 90\%$ of the age of the Universe. Although cosmic chemical evolution models predict the global metallicity of galaxies to increase with time, it is not clear whether DLAs actually show such a trend. One of the main problems is the small number of measurements, especially at $z < 1.5$. We describe results of our statistical analyses of existing DLA abundance data to address the question of metallicity evolution. We also describe results of two spectroscopic surveys we are currently performing to measure element abundances in DLAs at $0.1 < z < 1.5$. These include an ultraviolet survey with the Hubble Space Telescope and an optical survey with the Multiple Mirror Telescope. These studies are helping to determine the shape of the cosmic metallicity-redshift relation to a much higher accuracy than available so far.