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### **The Backlit Universe: How Distant Quasars Illuminate the Large Scale Structure**

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The Lyman- $\alpha$  forest is a series of absorption features in the spectra of distant quasars, blue-ward of the Lyman- $\alpha$  emission line. These features arise as the light from the quasar is absorbed by the intervening neutral hydrogen. This gives one-dimensional information about the fluctuations in the neutral hydrogen density along the line of sight to the quasar. When spectra of many quasars are combined, it allows one to build a three-dimensional image of the fluctuations in the neutral hydrogen density and thus infer the corresponding fluctuations in the matter density. This makes the Lyman- $\alpha$  forest a unique probe of the distant Universe, opening a novel window on understanding dark energy, dark matter, neutrino properties and inflation. Using the 14,000 quasars from the first year data, the BOSS experiment has detected, for the first time, three-dimensional correlations in the Lyman-alpha forest fluctuations to cosmological distances. The signal has the expected amplitude and redshift-space distortions and we find no evidence for overwhelming instrumental or astrophysical contamination. The BOSS experiment was projected to measure the distance to the redshift of  $z \sim 2.5$  with a better than 2% precision through detection of baryonic acoustic signature in the flux correlations. The present results give these forecasts new credibility.