Notre Dame Science
Department of Physics

EVOLUTION OR SELECTION: THE X-RAY PROPERTIES OF DISTANT OPTICALLY-SELECTED CLUSTERS OF GALAXIES

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By virtue of their size, galaxy clusters can be used to place important constraints on cosmological parameters. In particular, charting the evolution of the cluster mass function provides us with vital information on the progression of large-scale structure formation over time. The masses of clusters, however, are often inferred from observables such as gas temperature or X-ray luminosity, which can be influenced by non-gravitational processes that affect cluster baryons, such as energy injection (heating) and radiative cooling. In addition, many high-redshift cluster surveys select samples based on baryon observables such as gas density. Recent correlations between temperature, luminosity, and total cluster mass indicate significant discrepancies between cluster observations and theoretical expectations. Therefore understanding changes in cluster properties with redshift is of crucial importance to surveys that intend to use the evolution of the cluster population as a proxy for cosmic evolution, and ultimately for the determination of cosmological parameters. The results of our X-ray investigation of 13 high-redshift ($0.6 < z < 1.1$) optically-selected clusters suggest that the central entropy of these objects has been elevated by processes such as pre-heating, mergers, and episodic AGN outbursts, and that their ratio of gas mass to total gravitating mass is systematically lower than that found in lower-redshift X-ray selected clusters. To determine whether these effects are primarily associated with selection or evolution, we have designed a comparison sample of moderate-z ($0.2 < z < 0.6$) optically-selected clusters, all of which have recently been observed by Chandra and/or Suzaku. Here we present our final results from these observations, and discuss their relevance to cluster surveys which rely on the assumption of constant gas mass fraction to detect clusters and/or determine their masses.

Astrophysics Seminar

All interested persons are cordially invited to attend.