

STELLAR ABUNDANCES, THE FORMATION OF THE HEAVY ELEMENTS AND THE AGE OF THE GALAXY

Prof. John J. Cowan, University of Oklahoma

Wednesday, October 31 ❖ 4:00 P.M. ❖ 118 NSH

Refreshments at 3:30 P.M. in 202 NSH

Abundance observations (using both ground-based telescopes and the Hubble Space Telescope) indicate the presence of heavy, rapid-neutron capture (i.e., r-process) elements in old Galactic halo and globular cluster stars. These observations provide insight into the nature of the earliest generations of stars in the Galaxy and the Universe—the progenitors of the halo stars—responsible for neutron-capture synthesis of the heavy elements. Abundance comparisons among the r-process-rich halo stars show that the heaviest neutron-capture elements (e.g., barium, europium, gold and above) are consistent with a (scaled) Solar System r-process abundance distribution, while the lighter neutron-capture elements (e.g., strontium and silver) do not conform to the solar pattern. These comparisons suggest the possibility of multiple synthesis mechanisms in stars, where most of the elements in nature are made. The stellar abundances also provide insight into Galactic chemical evolution. Finally, the detection of thorium and uranium in halo and globular cluster stars offers an independent age-dating technique that can put lower limits on the age of the Galaxy, and hence the Universe.