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Observations of neutron-capture elements in the first stars

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A considerable number of observational constraints on the nature of neutron-capture element production in the early Universe have been assembled over the past decade. For example, the neutron-capture element Sr has been detected in one of the lowest metallicity stars known, HE 1327-2326, with [Fe/H] = -5.7. While only upper limits on Sr and Ba are available for the handful of other stars known with [Fe/H] <-4.5, the presence of Sr in HE 1327-2326 indicates that at least one channel exists for the production of elements beyond the iron peak in the most metal-poor stars. Dedicated searches for highly r-process-enhanced stars (r-II stars; [r-element/Fe] >+1.0) have revealed a total of some 18 such objects, roughly one-third of which exhibit the so-called "actinide boost" phenomenon, with Th (and sometimes U) observed at levels that are significantly higher than expected for radioactive species that have existed for >12 Gyrs. The r-II stars occupy a relatively narrow range in metallicity, -3.3 <[Fe/H] <-2.8, which may be related to their astrophysical origin. Dedicated radial-velocity monitoring of a subset of the r-II stars has shown no preference for such stars to form as binary systems, indicating that the enhancement of their r-process elements most likely occurred due to pollution of their natal clouds. In order to better clarify the nature of the astrophysical site(s) of early neutron-capture production, and its relationship (if any) to the characteristic light-element pattern (e.g., of CNO) that is found for >40% of all stars with [Fe/H] <-3.5, new dedicated surveys are now being undertaken, which will be summarized in this talk.