Abstract for an Invited Paper
for the SES09 Meeting of
The American Physical Society

Challenges and recent results on the structure of r-process nuclei[1]

D.W. BARDAYAN, Oak Ridge National Lab

The astrophysical rapid neutron-capture process (r-process) has been recognized for a long time as the scenario responsible for the synthesis of approximately half of the nuclear species in nature, which are more massive than Fe. It requires environments with a high neutron density, where neutron captures are faster than beta decays even for neutron-rich unstable nuclei up to 15 to 30 units from stability. Unfortunately, almost nothing is known about the structure of the majority of the extremely neutron-rich nuclei involved in the reaction flow. The evolution of shell structure away from stability can have dramatics effects on the produced r-process abundances. Furthermore during freezeout, individual reactions near neutron closed-shell nuclei can also significantly affect the final abudances. Now with the development of exotic beam facilities such as the Holifield Radioactive Ion Beam Facility (HRIBF), measurements with accelerated beams of fission fragments are providing some of the first spectroscopic information on many r-process nuclei. I will review the measurements made at the HRIBF as well as describe future opportunities to greatly advance these studies.

[1]ORNL is managed by UT-Battelle, LLC, for the U.S. DOE under contract DE-AC05-00OR22725.