

**NEW INSIGHTS INTO NEUTRON-RICH NUCLEI  
FROM SPONTANEOUS AND PROTON-INDUCED FISSION:  
A CONNECTION TO EXPERIMENTS AT CARIBU**

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The process of spontaneous fission (SF) was discovered by Petrzhak and Flerov shortly after induced fission was discovered by Hahn and Strassman. Much effort has been carried out since then to determine the half-lives and mass distributions and other such SF properties. The first study to identify the prompt gamma-rays emitted from the SF fragments was performed by Bowman *et al.*, in 1964. SF studies have become a rich source of new insights into the nuclear structures of neutron-rich nuclei. Using gas catcher/RFQ to ionize SF fragments of  $^{252}\text{Cf}$  and then thermalize them to create neutron-rich rare isotope beams (RIBs), CARIBU/ATLAS is currently the only facility in the US to provide neutron-rich RIBs over a wide range of elements, with the closure of HRIBF at ORNL, especially in the refractory and rare-earth elements.

In the first part of my talk, I will present some results of high-spin studies in neutron-rich nuclei by investigating prompt gamma-rays emitted from the SF of  $^{252}\text{Cf}$  with Gammasphere. Next, I will discuss some lessons from beta-decay studies at HRIBF for low-energy decay spectroscopy. Then, I will give an introduction of ORISS, a compact time-of-flight, ultra high resolution isobar and isomer spectrometer and separator, and some off-line test results. Lastly, I will talk about a few experimental ideas which can be pursued at CARIBU/ATLAS.