Virtual Joint Nuclear and Astrophysics Seminar

- When: Friday March 26th at 12:00 PM CST
- Where: ZOOM link: https://tamu.zoom.us/j/93502613243
- Speakers: Hyo-In Park and Erika Holmbeck

Intensity of a weak 519-keV γ ray following β decay of the superallowed emitter ^{34}Ar determined via the ^{33}S(p,γ)^{34}Cl reaction
By Hyo-In Park from Cyclotron Institute, Texas A&M University

The predominant branch in the β decay of ^{34}Ar is the superallowed 0+ —> 0+ transition to the ground state of ^{34}Cl. To determine its important branching ratio, one must first establish the ratios for the competing Gamow-Teller branches based on the measured intensities of γ rays subsequently emitted from the excited states they populate in ^{34}Cl. The strongest of these branches populates the 1+ state at 666 keV in ^{34}Cl, which has three possible γ-decay paths. My presentation focuses on the measurement of the decay of this state produced via the ^{33}S(p,γ)^{34}Cl reaction. The measured intensity of the 519-keV γ ray path is determined to be 1.46(19) % relative to that of the 666-keV path. This result is critical to new precise measurements of the superallowed decay of ^{34}Ar contributing meaningfully to the determination of V_{ud}, the up-down quark-mixing element of the Cabibbo-Kobayashi-Maskawa matrix.

Heavy Element Nucleosynthesis in the Era of Multi-messenger Astronomy
By Erika Holmbeck from Rochester University

Heavy elements like silver, gold, and uranium can attribute at least some of their origin to nucleosynthesis by rapid neutron-capture (the r-process). The presence of these heavy elements in nature---found not only in the Solar System, but also in very old, chemically simple stars---is evidence that this r-process must occur astrophysically. In the dawn of multi-messenger astronomy, compact object mergers prove to be at least one promising host of the r-process, but it is unclear whether mergers are the dominant source of heavy elements in the Milky Way. Studying the nature and extent of heavy-element production by compact object mergers involves understanding the r-process all the way from the microscopic nuclear physics to the macroscopic astrophysics. In this talk, I will discuss the interplay between multi-messenger signals, nuclear physics, and stellar spectroscopy when it comes to uncovering the origin of the heaviest elements on the periodic table.