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Studying the r-process at FRIB and NSCL

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The astrophysical r-process is responsible for the synthesis of about half of the isotopes of the heavy elements. Despite its well-known role in nucleosythesis, the astrophysical site where it takes place has not been unambiguously determined. Efforts for the better understanding of this important process span across many fields, from astronomical observations of metal-poor stars, gravitational-wave studies, and modeling of the possible scenarios, to sensitivity studies, nuclear theory calculations and nuclear experiments. This talk will focus on some of the experimental challenges, recent advances and future plans to provide reliable nuclear input data for r-process calculations. n particular, recent results on nuclear structure studies around A=70 and implications for the r-process will be presented. In addition, the talk will discuss one of the important r-process inputs that is practically unconstrained by experiment, namely neutron capture reactions. The development of a new technique to experimentally constrain these important (n,γ) reaction rates will be presented. The relevant experiments were done at the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University using the γ-calorimeter SuN. Future plans for exciting new opportunities at FRIB will also be discussed.