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Nuclear astrophysics of stellar explosions and neutron stars, and new opportunities at FRIB@MSU

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The physics of radioactive isotopes plays a key role in the reaction sequences occurring naturally in stellar explosions and accreting neutron stars. It needs to be understood in order to understand the origin of the elements, and to interpret neutron star observations in terms of the properties of dense nuclear matter. Astronomical observations have identified new signatures of the nuclear processes, and in some cases new processes have been discovered. Significant progress has also been made in recent years in identifying the critical elements in these reaction sequences. New experimental devices and techniques have been developed at current radioactive beam accelerator facilities, and some experiments have provided critical data that have improved astrophysical models. I will review some of the recent developments at the intersection of the physics of radioactive nuclei and astrophysics, give some example from recent experiments at the Michigan State University's NSCL, and present an outlook into the future, where new facilities such as FRIB will be able to pin down most of the relevant nuclear physics.