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Advances in Explosive Nuclear Astrophysics

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Breathtaking results from the Planck satellite mission and Hubble space telescope have highlighted the key role modern Astronomy is playing for our understanding of Big Bang Cosmology. However, not so widely publicized is the similar wealth of observational data now available on explosive stellar phenomena, such as X-ray bursts, novae and Supernovae. These astronomical events are responsible for the synthesis of almost all the chemical elements we find on Earth and observe in our Galaxy, as well as energy generation throughout the cosmos. Regrettably, understanding the latest collection of observational data is severely hindered by the current, large uncertainties in the underlying nuclear physics processes that drive such stellar scenarios.

In order to resolve this issue, it is becoming increasingly clear that there is a need to explore the unknown properties and reactions of nuclei away from the line of stability. Consequently, state-of-the-art radioactive beam facilities have become terrestrial laboratories for the reproduction of astrophysical reactions that occur in explosive stellar events. In this talk, both direct and indirect methods for studying key astrophysical reactions using radioactive beams will be discussed.

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