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Probing Fundamental Physics of the Universe with Stellar Explosions

Friday 29 August 2025 10:00 (30 minutes)

Supernovae come into two main subclasses, with one from core collapse expsloion of massive stars and the other one from thermonuclear explosion of white dwarfs in binary system. The former, dubbed as core-collapse supernovae (CCSNe), carries fundamental physics involved in evolution and explosions of massive stars such as neutrino, gravitational wave, and shock breakout. Whereas the latter, dubbed as thermonuclear supernoave (SNe Ia), allows constraints on cosmic expansion rate and nature of dark energy. In this talk, I will review the progress in our understanding of both CCSNe and SNe Ia and their implications for some fundamental physics. In particular, recent successful detections of extremely early emission immediately after the explosion of some CCSNe provide direct evidence for the mechanism of jet-driven, aspherical explosion. Moreover, the tension found in the measurement of cosmic expansion rate (i.e., Hubble constant) from SNe Ia relative to the result from early universe probes requires a comprehesive understanding of SN Ia physics, which will be highlighted in the talk as well.

Collaboration you are representing

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