

SPECTROSCOPIC DIVERSITY OF ASTROPHYSICAL TRANSIENTS

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Astrophysical transients are objects that change brightness on human-observable timescales, including events such as stellar explosions (supernovae, SNe) and the tidal disruption of stars by supermassive black holes (TDEs). These phenomena exhibit diverse spectroscopic signatures that reveal their physical mechanisms and environments. Searches and observations of transients are driven by their exceptional value for both astrophysical and cosmological studies. Most notably, Type Ia supernovae (SNe Ia), with their standardizable light curves, have been used as distance indicators, leading to the discovery that the expansion of the Universe is accelerating. TDEs offer a valuable probe into the otherwise dormant supermassive black holes at the centers of galaxies; their spectra are typically dominated by broad emission lines of hydrogen, helium, and occasionally high-ionization species. I will also discuss the emerging field of gravitationally lensed supernovae, which provide powerful astrophysical and cosmological insight. When a supernova is strongly lensed by a foreground galaxy or cluster, the light from the background explosion is magnified—enabling the detection of distant SNe that would otherwise remain undetected. These events can produce multiple images with time delays, allowing for spectroscopic studies of the same explosion at different phases and enabling time-delay cosmography—a method to constrain the Hubble constant independently from standard probes. I will conclude by anticipating what we can expect in the near future from upcoming wide-field surveys, such as those by the Vera C. Rubin Observatory and the Nancy Grace Roman Space Telescope.