CSU PHYSICS COLLOQUIUM

"Metamorphosis: New views of supernovae and progenitors"

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120 Engineering (Hammond Auditorium)

Abstract

The stellar explosions known as supernovae are not simply brilliant signposts marking the transition from one stage of the stellar life cycle to the next. They hold clues to the very nature of massive stars, trigger (or disrupt) nearby star formation, affect the interstellar media and chemical evolution of their host galaxies, and serve as standard candles that trace the expansion history of the universe. But understanding these crucial roles requires understanding the complex geometrical nature of supernovae and the stellar systems that give rise to them.

Polarization of light encodes geometrical information about unresolved scattering regions, and thus provides a unique tool for analyzing the 3-D structures of stars and supernovae surrounded by circumstellar material. In supernovae, time-dependent spectropolarimetric signatures reveal physical phenomena such as complex velocity structures, changing illumination patterns, and asymmetric morphologies within the ejecta and surrounding material. On the other side of the transformation, spectropolarimetric studies of the massive Wolf-Rayet binary stars thought to be the progenitors of the most energetic supernovae reveal the structure of the colliding winds within these binaries and yield clues to their dramatic mass loss and potential fates. I will present recent observational and computational advances in the spectropolarimetric study of both supernovae and massive binaries and discuss how they are leading us to a fuller understanding of this process of stellar metamorphosis.

Biography

I earned my Ph.D. in Astronomy from the University of Wisconsin and held a National Science Foundation Astronomy & Astrophysics Postdoctoral Fellowship at UC Berkeley before joining the faculty at DU. My research interests focus on the late stages of massive stellar evolution, in particular on the role of binary stars in shaping supernova explosions. I use a combination of observational spectropolarimetry and 3-D computational modeling to explore these research questions. I also see my roles as an educator and mentor as a vital part of my scholarship. In all these arenas, I work to expand opportunities and remove barriers to participation in physics and astronomy for people from historically underrepresented groups.