College of Natural Sciences & Mathematics
UNIVERSITY OF DENVER

Physics & Astronomy Colloquium

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Dr. Manisha Shrestha

Postdoctoral Research Associate,
Steward Observatory, University of Arizona

Using multimessenger observations to connect massive stars to their explosive ends

Massive stars and their spectacular end-of-life explosions have far-reaching implications for a broad range of astrophysics including the enrichment of the interstellar medium, the evolution of galaxies, the formation of compact objects, such as neutron stars and black holes, that produce gravitational waves, and the creation of rapid neutron capture (r-process) elements such as gold and platinum. Despite decades of research, our understanding of the final moments of the lives of massive stars is minimal. This is set to change as we enter the golden era of time-domain and multi-messenger astronomy. The number of new transients discovered each year is rapidly growing as new surveys deploy novel approaches to find young and interesting transients. Additionally, gravitational wave detections are combined with electromagnetic observations from space and ground-based telescopes, shedding light on their progenitor systems. In this talk, I will present an observational overview of the state of the field in i) the mass loss history of massive stars, ii) the variety of explosions and their progenitor systems, iii) the fate of compact objects produced from these explosions, and iv) the production of r-process elements. Looking into the future, I will talk about the facilities coming online soon (e.g., Rubin, Roman, ELT) and how they will transform the field in the long term.