Live Fast Die Young: The Evolution of Massive Stars towards their Death

Selma de Mink, Einstein Carnegie-Princeton Fellow, Carnegie Observatories

==

Massive stars are rare and short-lived. Nevertheless, through their extreme brightness, strong outflows and powerful explosions, they heat and stir their surroundings, drive outflows on galactic scales, and are responsible for the main production the heavy elements in the Universe. Because of their large impact, evolutionary models of massive stars are an essential ingredient for a wide variety of astrophysical problems.

New insight —in particular concerning the importance of binarity and rotation— is raising severe questions about the validity of the widely-used classic stellar models. I will discuss advances on the modeling side as well as ongoing surveys that are providing for the first time large and homogenous data sets, including stars with estimated masses up to a few hundred solar masses. I will show examples of the potentially drastic effects on the properties of both stars (brightness, color, ionizing flux, chemical yields, X-rays etc.) as well as their final fate as core-collapse and pair-instability supernovae and gamma-ray bursts.

The theoretical and observational developments in this field call for a critical reconsideration of our understanding of the role that massive stars play in the Universe as Cosmic Engines, i.e. through their chemical, mechanical and radiative feedback, as Cosmic Probes, i.e. as tracers of starformation nearby and at high redshift, and in the variety of Cosmic Transients they produce.

==