Stellar Forensics with the Most Powerful Explosions in the Universe

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Supernovae (SNe) and Long-duration Gamma-ray Bursts (GRBs) are exploding stars and constitute the most powerful explosions in the universe. Since they are visible over large cosmological distances, release elements heavier than Helium, and leave behind extreme remnants such as black holes, they are fascinating objects, as well as crucial tools for many areas of astrophysics, including cosmology.

However, for many years the fundamental question of which stellar systems give rise to which kinds of explosions has remained outstanding, for both Type Ia SNe used for cosmology as well as for Superluminous SNe and long-duration GRBs that must originate from special kinds of massive stars. I will discuss the exciting recent progress that we have made on this question in key areas by publishing and thoroughly analyzing the largest data sets in the world. I will conclude with an outlook on how the most promising venues of research - using the existing and upcoming innovative large time-domain surveys - will shed new light on the diverse deaths of stars.

Maryam Modjaz is an Associate Professor of Physics at NYU and on sabbatical at the Center for Computational Astrophysics for 2018-2019. Her research addresses forefront problems in stellar death astrophysics and time-domain astronomy, which include Gamma-Ray Bursts and different kinds of Supernovae, which are amongst the most powerful explosions in the Universe. She received her Ph.D. from Harvard University in 2007 and a B.S. from the University of California at Berkeley in 2000, where she also worked as a Miller Fellow from 2007-2010. In 2010-2011 she was a Hubble Fellow at Columbia University. The recipient of Harvard University’s Fireman Prize for an outstanding PhD dissertation, her work has been featured on NPR, in Astronomy Now, and in a feature article in UC Berkeley’s “California” magazine. She was featured in the Apple ad for iphone7 & iwatch2 in Sept 2016 in her capacity as NYU professor of physics.