

## The common envelope channel as test-bed for massive star evolution

The evolution of massive stars remains highly uncertain due to a number of poorly constrained factors such as internal mixing, angular momentum transport, mass loss rates, or effects of binarity. Detections of gravitational waves from BH binary mergers offer a unique opportunity to probe the evolution of a particular subset of massive stars: those that have (most likely) initiated and survived a common envelope phase in a binary with a BH companion. I will demonstrate how this condition narrows down the evolutionary stage and position in the HR diagram of the donor star at the point when it initiates the common envelope. By comparison with modern evolutionary tracks at different metallicities, I will showcase how those constraints can be a valuable test-bed for the evolution of massive stars in general, probing the efficiency of internal mixing, wind mass loss from extended supergiants evolving near their Eddington limit, and location of core-helium burning in the HR diagram. I will also discuss an overlooked aspect of the evolution of low-metallicity massive stars that could significantly limit any tidal spin-up during BH-WR stage.

**Primary author:** Mr KLENCKI, Jakub (Radboud University Nijmegen)

**Co-authors:** Dr ISTRATE, Alina (Radboud University Nijmegen); Prof. NELEMANS, Gijs (Radboud University Nijmegen); Dr POLS, Onno (Radboud University Nijmegen)

**Presenter:** Mr KLENCKI, Jakub (Radboud University Nijmegen)