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Massive stars as progenitors of merging black hole binaries

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The recent detection of gravitational waves has proven the existence of massive stellar black hole binaries (BHBs), but the formation channels of BHBs are still an open question. Population-synthesis codes are one of the most powerful tools to investigate the origin of BHBs. In this talk, I describe my new code MOBSE, which is an updated version of the widely used binary population synthesis code, BSE (Hurley et al. 2002). In MOBSE, I have included the most recent models of star evolution, wind mass-loss and core-collapse supernovae, which are the key ingredients to determine the fate of massive stars. Based on the results of MOBSE, I show that only massive metal-poor stars ($Z < 0.002$) can be the progenitors of gravitational-wave events like GW150914. Finally, I show that most of the binary systems leading to the formation of BHBs pass through the common envelope phase.

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