

JOURNÉES SF2A 2022  
S13: GRAVITATIONAL-WAVE ASTRONOMY AND  
MULTI-MESSENGER ASTROPHYSICS

**Title:**

Impact of Binary Stellar Evolution on the Population of Binary Neutron Stars: a Parameter Study

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**Abstract (for a talk):**

The detection of Binary Neutron Star (BNS) mergers in the second and third observing runs of the LIGO-Virgo gravitational-wave (GW) interferometers has allowed to set new constraints on the BNS merger rate in the local Universe, and to probe the merging neutron stars' properties at coalescence. In this work, we use population synthesis models to study the impact of several features of binary stellar evolution of massive stars on the BNS systems produced, focusing on stellar winds, the common envelope phase and supernovae-induced kicks. We show how the uncertainties in the underlying physics of these processes affect the predicted BNS formation efficiency and the properties (separation, eccentricities) of these systems at birth. Coupled with star formation history prescriptions, these turn into merger rate predictions. Better constraints on BNS merger rates expected with the next observing runs of GW interferometers will therefore help constrain the parameter space of binary stellar evolution.