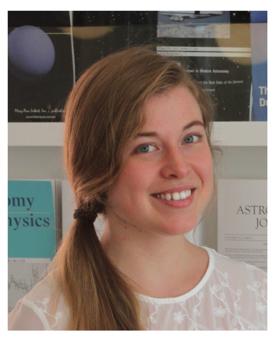

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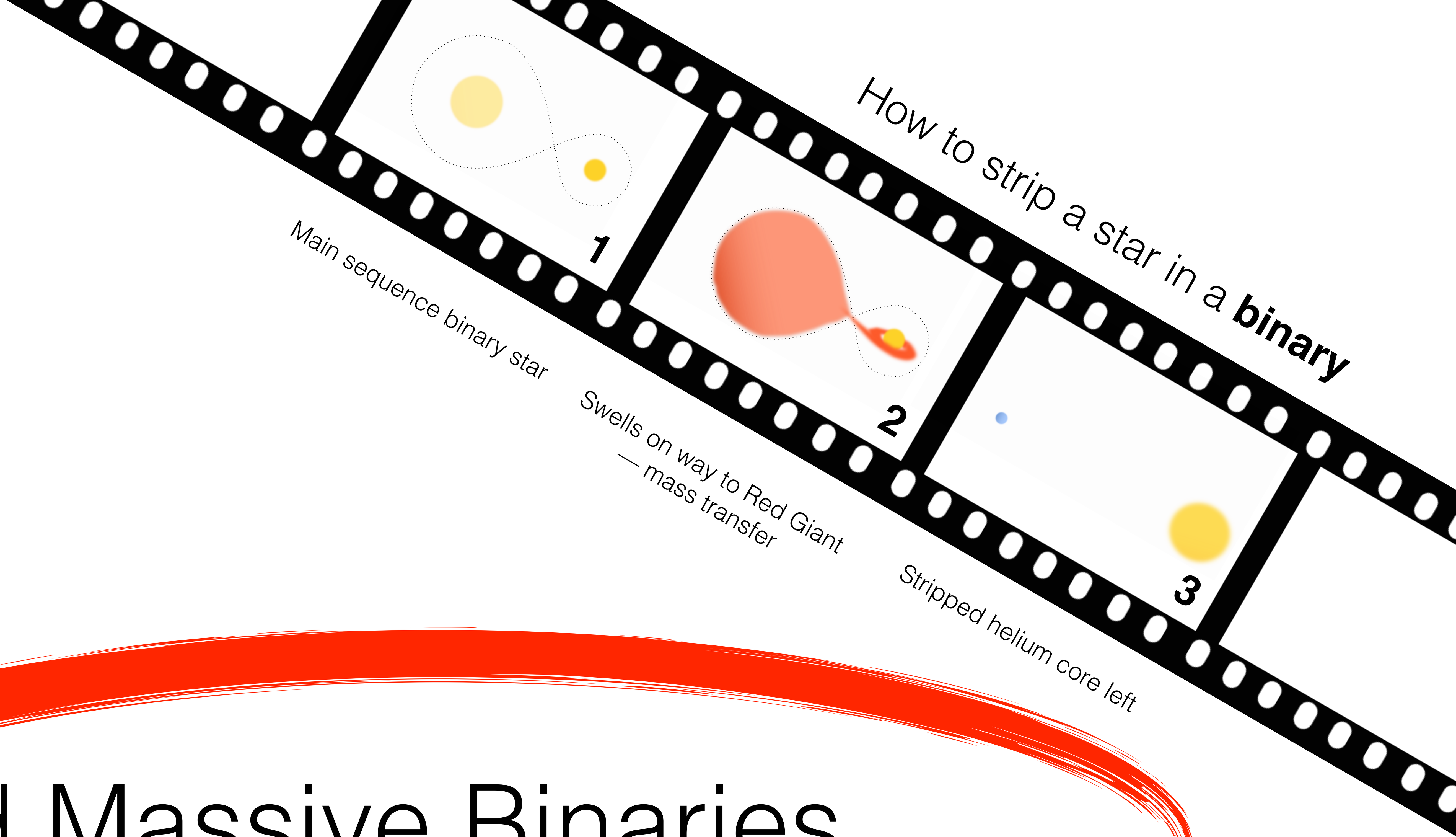

Did Massive Binaries contribute to the Epoch of Reionization?

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7 out of 10 massive stars are born in binaries

3 out of 10 massive stars are stripped in a binary

Sana et al. 2012, Science, 337, 444

Stripped stars are **HOT**

When in a binary, a star can lose its entire envelope through mass transfer to the companion star. The star swells and fills its Roche Lobe on the way to become Red Giant, allowing matter to flow over to the companion. Eventually the central, dense helium core is left exposed. The core is so hot that the radiation emitted can ionise hydrogen.

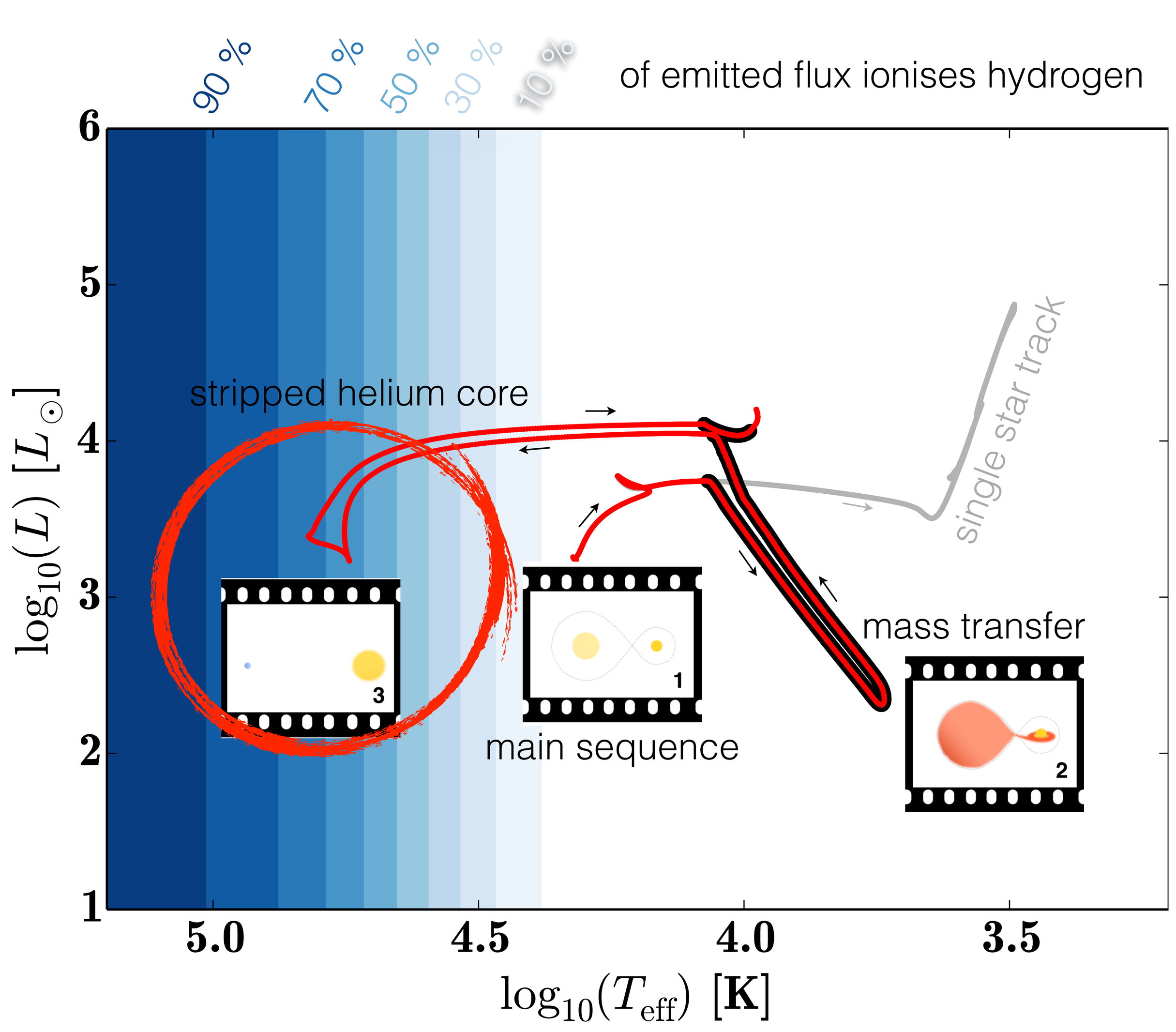

Figure: *Hertzsprung-Russell diagram showing the track of a single 7 $M_\odot$ star (gray) and a 7 $M_\odot$ donor in a binary system (red). On the way to become a Red Giant, the donor transfers mass to the companion star (background colour black) until the dense and hot helium core is exposed (encircled).*

Stripped stars come **LATE**

The fraction of ionising photons that can escape the birth cloud, the **escape fraction**, determines if a star can contribute to reionization of the intergalactic medium. Massive stars live for such short times that the surrounding gas shields the ionising radiation and typically only a few percent can escape[1]. The escape fraction for stripped helium cores is much higher as they emerge after the first supernovae have blown away the gas.

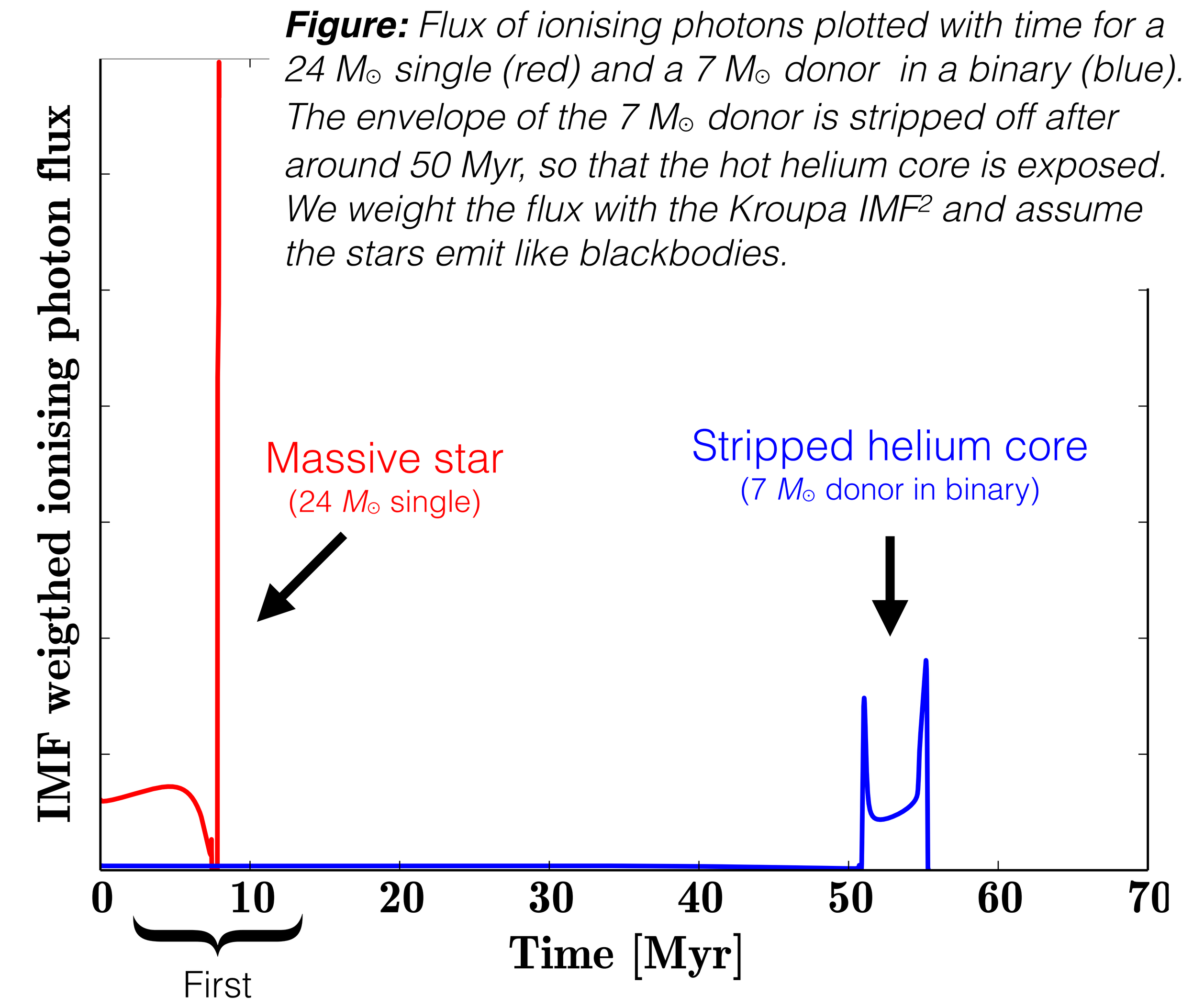

Figure: *Flux of ionising photons plotted with time for a 24 $M_\odot$ single (red) and a 7 $M_\odot$ donor in a binary (blue). The envelope of the 7 $M_\odot$ donor is stripped off after around 50 Myr, so that the hot helium core is exposed. We weight the flux with the Kroupa IMF[2] and assume the stars emit like blackbodies.*

[1] see e.g., Chen et al. (2007, ApJ, 667, 125)
[2] Kroupa et al. (1993, MNRAS, 262, 545)

In this work we model both single and binary stars with the stellar evolution code MESA.
(Paxton et al. 2011, ApJS, 192, 3; Paxton et al. 2013, ApJS, 208, 4)

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