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The Influence of Binary Evolution on the Nucleosynthesis of AGB Stars

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Stars that evolve through the asymptotic giant branch (AGB) are vital to the chemical evolution of the universe as they produce a significant portion of the carbon, nitrogen, and elements heavier than iron. Most models studying the evolution and nucleosynthesis of AGB stars focus on single stars. However, at least half of these stars exist with a binary companion. In this study, we use the binary population synthesis code binary_c to investigate the influence of binary evolution on an AGB star's ability to contribute to the chemical enrichment of the universe. We simulate a stellar population of stars born with mass 0.8-8.5$M_{\odot}$ of varying binary fraction at solar metallicity. For a binary fraction of 0.7, we find a 15% decrease in the overall ejected carbon and a ~20% decrease in the ejected barium compared to our population of only single stars. Additionally, we compare our results to the Galactic planetary nebulae NGC3242 and NGC6537, which are difficult to fit with single-star models. Our binary models find reasonable agreement, with mismatches likely due to our assumptions of the initial abundances. Future work will extend this study to lower metallicities, allowing us to compare our results to a wider range of observations and gain a more complete picture of the influence of binary evolution on the stellar nucleosynthesis of AGB stars.

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