

## Celebrating 20 years of Swift Discoveries



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# Where has all the r-process gone? An Exploration of the Capacity for Swift GRB-Kilonovae to Enrich their Host Galaxies

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In its 20 years, Swift has provided fundamental clues towards understanding the source(s) of heavy “r-process” elements ( $A > 130$ ; e.g., gold, platinum, uranium) in the Universe. Indeed, with Swift’s precise burst localization capabilities, 11 GRBs have been associated with probable kilonovae (KNe), the transients produced from neutron star (NS) mergers powered by the radioactive decay of r-process elements. These discoveries, along with the KN associated with GW-detected NS merger 170817, have secured NS mergers as the only observed source of r-process in the Universe. However, it remains unknown how much r-process from NS mergers is incorporated into star-forming gas to produce r-process enhanced stars: a vital piece of information as nearly all other predictions of the amount of r-process mass in the Universe are estimated from stellar r-process abundances. In this talk, I discuss how merger location and host galaxy properties influence the capacity for an environment to be enriched. Using a population of 86 Swift-detected, merger-driven GRBs ( $z < 3$ ) with confident host galaxy associations and a diverse range of host stellar population properties, I present a novel analysis to quantify the timescale of these events to enrich their hosts and the amount of newly-formed stellar mass in their hosts that procures r-process material. I probe how much r-process is likely “lost”, never being reincorporated in to stars, and whether NS mergers can be the dominant source of observed r-process elements in the Universe. I conclude with emphasizing how continued Swift discoveries will lend deeper insight into the possible channels of r-process in the Universe.

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