

# Investigating Chemical Evolution: Supernova Dust Destruction and Non-equilibrium Ionization Chemistry

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From the moment the first star ended its life in a catastrophic supernova explosion, metals have been "polluting" the Universe. With each successive star and collective generations of stars, the Universe has experienced a rich and complex history of chemical evolution. Numerical simulations are a powerful tool for understanding this evolution across a wide range of phenomena. I have leveraged such simulations to probe two distinct facets of chemical evolution: dust destruction in supernova remnants and non-equilibrium ionization properties of the intergalactic medium. Understanding the survival rate of freshly formed dust in supernova ejecta is important for interpreting observations of high-redshift galactic dust masses and resolving the true ionization structure of the intergalactic medium should help to shine light on the "missing baryon" problem.