

# Can Supernovae Blast Eliminate Alien Civilizations?

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Why can't we see alien civilizations in this vast universe? This is an age-old question known as the Fermi paradox, which still has no answer today. In a simulation-based study conducted by Zackrisson et al (2015), a Kardashev type-III alien colony could control 50% of the Milky Way (MW) galaxy within 25 Myr when it originated in our solar system. Similar research conducted by Wright et.al (2021) also provides results that the transition from Kardashev type-II to Kardashev type-III alien colonies in the MW galaxy can occur quickly due to assistance from the rotation of stars in the galaxy. However, these two studies still cannot answer why in the real world we still cannot see aliens. Therefore, we try to resolve the Fermi paradox using some astrophysical events, namely supernovae (SN) as an example. SN is chosen as a representative of astrophysical events that can eliminate aliens due to the emission of high-energy particles during their explosion. In this study, we tried to simulate the effect of SN explosions on the transition of Kardashev type-II alien colonies into Kardashev type-III colonies. Based on our results, the presence of supernovae in the MW galaxy is not strong enough to affect the transition of alien colonies in the MW galaxy. Because 50% of the MW galaxy is colonized in 35 Myr and in accordance with the typical time scale of alien colonization in Sagan & Newman (1980) despite the SN explosion. These results are also in line with the research arguments by Burns & Parsons (2022). This is because the star formation rate in the MW galaxy is very low. However, if alien colonies attempt to invade Ultra-Luminous InfraRed Galaxies (ULIRGs), the time for aliens to colonize 50% of ULIRGs is delayed due to the high rate of star formation.

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