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The Loneliest Galaxies in the Universe: A GAMA and GalaxyZoo Study on Void Galaxy Morphology

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ABSTRACT

The large-scale structure (LSS) of the universe is comprised of galaxy filaments, tendrils, and voids. The majority of the universe's volume is taken up by these voids, which exist as underdense, but not empty, regions. The galaxies found inside voids are void galaxies and expected to be some of the most isolated objects in the universe. However, their standard morphology remains poorly studied. This study, using the Galaxy and Mass Assembly (GAMA) survey and Galaxy Zoo's survey, aims to remedy this. To do so, survey results from GAMA have been plotted using the Sérsic index (n) to form an analysis about morphology, while data from Galaxy Zoo's crowdsourced study supplies a second analysis. For completeness purposes, we only include void galaxies identified by Alpaslan et al. 2014 with a redshift (z) between .08 and .215 and stellar mass (M*) between 109.35 and 1011.5. We then utilize Kolmogorov-Smirnov (KS) testing for significance. As a result, we conclude that, as supported by previous literature, most void galaxies have a disky morphology with Sérsic index $n<2$. KS testing proves that we have significant differences between the two samples for the following categories: features present in GalaxyZoo, rounded bulges in edge-on disks, and no bulge in edge-on disks. Future studies may include an investigation into mergers, void galaxy quenching, or finding a bridge relation between the size of voids and the properties of galaxies that reside inside them.