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Insights Into Dark Matter From the Stellar Halos of Galaxies

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MSI Conference Room • 3550 University

Cosmological simulations can now make specific and detailed predictions for the shapes, masses, and substructure fractions in galactic dark matter halos that depend on the dark matter model assumed. Comparing these predictions to the observed mass distributions of galaxies should in principle lead to constraints on the nature of dark matter, but observable dynamical tracers can be scarce in regions where the dark matter distribution is best able to discriminate between models. One such region is the distant outskirts of galaxies, where the influence of baryonic matter on the dark matter halo is limited and the effect of dark substructures most prominent. New surveys of Milky Way stars like Gaia, alongside next-generation instruments and giant telescopes, are for the first time providing accurate positions, velocities, and abundances for large numbers of stars in faint tidal streams: remnants of tidally-disrupted satellite galaxies that trace out the mass distribution in the distant reaches of galaxy halos. I will show how state-of-the-art simulations play a crucial role in interpreting and analyzing this wealth of new information about stellar halos, and how stellar halo observations over the next decade will characterize the dark matter distribution in galaxies, test theories of the nature of dark matter, and illuminate the role of dark matter in galaxy formation.

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