東北大学　宇宙創成物理学国際共同大学院プログラム

GP-PU (Graduate Program on Physics for the Universe）Seminar

“A synthesized view of the dark matter nature arising from observations of the faintest galaxies”

by Victor H. Robles (Yale University)

Time and Date: 15:30-17:30, July 13th, 2022

Place: Room 745, Science Complex B H03 (hybrid)

Registration:"https://us02web.zoom.us/meeting/register/tZErce6oqT8uEtFKEQQLBr5sK7YGwSdPZCzt”

Abstract

Unprecedented discoveries of increasingly fainter galaxies in our Universe over the past decade, offer a new lens into the range of formation pathways available for galaxies and the structure of the invisible (dark) matter that accounts for about 85% of the total mass budget in our Universe. In parallel, state-of-the-art cosmological simulations studying galaxy formation have revealed tantalizing, complementary constraints to the nature of dark matter. I will describe how, taken in conjunction, astronomical data and cosmological simulations can be combined to advance our current understanding of dark matter and galaxy evolution.

Drawing from empirical relationship between the galaxy stellar mass and dark matter mass, I will focus on the interface between galaxy formation and dark matter. I will discuss how faint galaxies, including those near and far from the Milky Way, provide evidence of the incompleteness of our standard cosmological paradigm. I will also show that cosmological hydrodynamics simulations of low mass galaxies under different dark matter cosmologies and identical star formation models from the well-known FIRE project can constrain the dark matter mass and its self-interaction using observations of faint galaxies in our own galaxy. Then, I will highlight how observational constraints on the evolution of the first galaxies that formed in the early universe provide complementary information regarding the dark matter intrinsic properties. I will conclude with the prospects for future constraints on the nature of dark matter using a combination of cutting-edge cosmological simulations and modern instruments such as Gaia, LSST, JWST, and the Roman Space Telescope.

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