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First Galaxies and Supermassive Black Holes Seeded by Primordial Black Holes

My presentation will discuss the role of Primordial Black Holes (PBHs) as a component of dark matter throughout cosmic history. I will specifically focus on PBH candidates in the solar mass range of approximately 10-100 $M_\odot$ and massive PBHs of $10^6 M_\odot$ as possible seeds for first galaxies and supermassive black holes (SMBHs). Our research utilizes N-body simulations with the GIZMO code and semi-analytical models to investigate the impact of PBHs. We find that stellar-mass PBHs, ranging from 10-100 $M_\odot$ and constituting a fraction of 10^{-4} to 0.1 of dark matter, subtly influence the formation of the universe's first stars by maintaining the standard model of star formation, while their accretion feedback shifts star formation to more massive halos. On the other hand, more massive PBHs, with masses of $10^6 M_\odot$, could seed massive halos and disrupt hierarchical structure formation by engulfing newly formed halos. In contrast to the effects of stellar-mass PBHs, our recent studies reveal that the narrative of early star formation is further complicated by initial perturbations and accretion feedback from these massive PBHs at very high redshifts.

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