

Physics colloquium

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Simulating the Milky Way

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Abstract: Within the cosmic web, galaxies like our own Milky Way form as hydrogen gas flows in along cosmic filaments into dark-matter halos. This gas fuels the formation of stars, while the resultant feedback from stars drives strong outflows of gas. Understanding this complex interplay between cosmic inflows and feedback-driven outflows is one of the most significant topics in astrophysics, and it requires a new generation of supercomputer simulations that can achieve high dynamic range to resolve the scales of stars within a cosmological setting. I will describe our massively parallelized cosmological simulations, run on the country's largest supercomputers, that model the physics of galaxy formation at unprecedented resolution. I will discuss new insight into the formation of our Milky Way galaxy, including the faint "dwarf" galaxies observed around it. These low-mass galaxies trace structure formation on the smallest cosmological scales and have presented the most significant challenges to the cold dark matter (CDM) paradigm. I will describe how these new generations of simulations are allowing us to shed light on dark matter.

Bio: Andrew Wetzel earned his B.S. in physics at Harvey Mudd College and his Ph.D. in astrophysics from the University of California, Berkeley. He subsequently pursued postdoctoral research at Yale University, Caltech, and the Carnegie Observatories. He currently is an assistant professor of physics at the University of California, Davis. His research focuses on theoretical/computational astrophysics and cosmology, in particular, understanding the formation and dark matter content of our own Milky Way galaxy. As a computational astrophysicist, he runs massively parallel simulations on the world's largest supercomputers to model the physics of galaxy formation, and he uses these simulations as theoretical laboratories to rigorously test models of galaxy formation, stellar dynamics, and the cold dark matter paradigm.