Tuesday, November 9th, 11:30 am

Speaker: Andrew Pontzen

Institution: University College London

Title: A new approach to cosmological simulations

Abstract: The next generation of astronomical observatories bring a realistic prospect of paradigm-shifting constraints on the nature of dark matter and dark energy, both through deeper observations of large scale structure and by pushing to fainter surface brightness galaxies. I will discuss the unique computational challenges that producing simulations for this era pose. On the one hand we wish to simulate large volumes to gain representative samples of galaxies and to understand the cosmological implications of forthcoming survey data from e.g. LSST. On the other, we also want to maintain very high resolution to resolve highly non-linear astrophysical processes and internal kinematics for Gaia, MaNGA and the like. These two requirements result in a tension on how to best spend limited computer time. I will argue that a new approach to simulations, in which we use statistical models to tailor cosmological initial conditions for different questions, can help relieve this tension. I will mainly focus on recent applications to understanding the diversity of dwarf galaxies, and will also give a quicker overview of results for higher mass galaxies and large scale structure.