

29 March 2017, 2pm  
(Ingram Lecture Theatre) [Justin Read](#)  
[\(University of Surrey\)](#)

Astrophysical probes  
of dark matter

Dark matter makes up most of the mass of the Universe but remains mysterious. I discuss recent progress in constraining its properties by measuring its distribution in the Universe from tiny dwarf galaxies to giant galaxy clusters. The latest results favour a cold, collisionless particle that must lie beyond the standard model of particle physics. Yet this “standard model” faces a host of apparent problems on small scales. Why are galactic rotation curves so flat? Why do they rise less steeply than simple models predict? Why is there an apparent “acceleration scale” at which the effect of dark matter appears? Why does the Milky Way have so few companion galaxies? I show that all of these problems are naturally solved if dark matter is “heated up” during galaxy formation. I show how such dark matter heating emerges naturally in the latest state-of-the-art numerical simulations, and I present direct evidence for it from nearby dwarf galaxies that orbit the Milky Way. These results provide some of the most compelling evidence for particulate dark matter to date.