Galaxy Formation (M24)

N W Evans

This course describes our current state of knowledge of galaxy formation and evolution in a cold dark matter cosmology. We will start with structure formation in the non-linear regime, the formation and evolution of dark matter haloes and Press-Schechter theory. We will cover physical processes (shock heating, radiative cooling and star formation) as well as dynamical transformations (dynamical friction, tidal shocking, accretion and mergers) that are responsible for the shapes and properties of the galaxies we see today. We will end with a study of the formation and current day attributes of disk galaxies (Sersic profiles, thin and thick disks, stellar haloes) and elliptical galaxies (fast/slow rotators, major/minor mergers, Faber-Jackson relation). Recent discoveries on the structure of the Local Group and the Milky Way galaxy will be used as illustrative examples of formation processes throughout the course.

Prerequisites

This Part III course assumes that you have taken undergraduate courses in cosmology, relativity and dynamics.

Literature

1. J. Binney and S. Tremaine *Galactic Dynamics* 2nd edition, Princeton University Press, 2008
2. J. Bland-Hawthorn, K. Freeman *The Origin of the Galaxy and the Local Group*, Springer, 2014
3. A. Loeb *How Did the First Stars and Galaxies Form*, Princeton, 2010 (Background reading)
4. M. Longair, *Galaxy Formation* 2nd edition, Springer, 2008
5. H. Mo, F. van den Bosch and S. White, *Galaxy Formation and Evolution*, Cambridge Universitry Press, 2010
6. S. Phillips, *The Structure and Evolution of Galaxies*, Wiley, 2005
7. L. Sparke, J. Gallagher, *Galaxies in the Universe*, 2nd edition, Cambridge University Press, 2007 (Background reading)

Additional support

Four examples sheets will be provided and four associated examples classes will be given. There will be a one-hour revision class in the Easter Term.