**Assignment 5**

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I choose topic A, C, E and the paragraphs below explain why these topics are interesting and what's the controversy.

## topic A: Cold dark matter is incompatible with structure on galactic scales

Cold dark matter (CDM) is believed one of the main ingredients of the universe based on many observational evidence. But CDM is far from understood, for there exit many interesting unsolved problems, which indicate that CDM is incompatible with structure on galactic scales.

One important problem is the core/cusp problem. Observations indicate a core model and an approximately constant dark matter density in tne inner parts of galaxies while simulations indicate a cusp model and steep power-law-like behaviour.

The missing satellite problem is that simulation predicts that massive galaxies be sorrounded by large numbers of dark matter dominated satellite halos while the observations of dwarf galaxies orbiting the Milky Way show large discrepency compared with prediction.

These interesting controversies may be resolved by high quality observations and more self-consistent astrophysical models in the future.

## topic C: The stellar initial mass function is not universal

Initial mass function (IMF) that refers to the frequency distribution of stellar masses per unit mass play a central role in many areas of astrophysics. But there is an interesting key question that whether the stellar IMF is universal to be solved. Some people hold the idea that IMF is universal because its simple and there is no evidence systematic dependency of the IMF on gas or star density and so on. Others argue that it's extremely difficult to imagine that the observed complexity of star formation results in a universal IMF and the uncertainties in empirical IMF estimates may be so large. Besides, steeper IMFs are found in more massive systems according to observation. Therefore, this is a interesting controversy and can be solved by more observations.

## topic E: AGN feedback is the main process that quenches massive galaxies and keeps them quenched.

The exponential cut-off at the bright end of the galaxy luminosity function predicated by ​cosmology indicates that there should be some processes that quench massive galaxies and keep them quenched. But those processes are far from understood. Some people believe that AGN feedback is important for quenching star formation in the remnant of mergers by prevent gas cooling and drive powerful winds based on simulation. However, Others find that SAMBA bursts and gravititional heating process through the release of potential energy from infalling stellar clumps will also help required quenching. This is an interesting controversy to be solved by more accurate physics model and simulation in the future.