

## The Role of Gas in Spiral Galaxies

I will talk about two important properties of gas in spiral galaxies. First, I use high resolution SPH simulations that treat the evolution of gas, stars, and dark matter self-consistently to study the dynamical coupling between the cold, dissipative gaseous component and the stellar component. I find that angular momentum transport from the gas to the stars inside of corotation leads to a roughly time-steady spiral structure in the stellar disk. To make this point clear, I contrast these results with otherwise identical simulations that do not include a cold gaseous component that is able to cool radiatively and dissipate energy, and find that spiral structure, when it is incipient, dies out more rapidly in simulations that do not include gas. These simulations use star formation prescriptions to convert gas into stars; the results hold for typical gas consumption time scales that are in accord with the Kennicutt-Schmidt relation. Secondly, we find that the responsive, yet forgetful gaseous component is an ideal tracer of interactions with dark-matter dominated dwarf galaxies. I will discuss recent work that allows us to infer the mass and location of galactic satellites and constraints on the dark matter halo from analysis of disturbances in outer HI disks. I will discuss the implications of this work for the missing satellites problem and other discrepancies between the CDM paradigm and observations.