PHYSICS AND ASTRONOMY
COLLOQUIUM

Dr. Philip Hopkins

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"Star Formation, Black Holes, and Feedback in Galaxy Formation"

Abstract

Many of the most fundamental unsolved questions in star and galaxy formation revolve around star formation and "feedback" from both massive stars and accretion onto super-massive black holes. This occurs in a chaotic, highly nonlinear system dominated by super-sonic turbulence and gravity. Yet, despite this complexity, there is remarkable regularity observed in many properties. I'll present new models which attempt to realistically model the diverse physics of the interstellar medium, star formation, and feedback from stellar radiation pressure, supernovae, and photo-ionization, and their interplay with feedback from luminous quasars. These mechanisms lead to 'self-regulated' galaxy and star formation, in which global correlations such as the Schmidt-Kennicutt law, the black hole-host galaxy correlations, and the global inefficiency of star formation emerge naturally. I'll discuss how, within galaxies, feedback regulates the structure of the interstellar medium, and how many observed properties of the ISM, star formation, and galaxies can be understood as a fundamental consequence of super-sonic turbulence in a rapidly cooling, self-gravitating medium. But feedback also produces galactic super-winds that can dramatically alter the cosmological evolution of galaxies, their behavior in galaxy mergers, and structure of the inter-galactic medium. I'll highlight how a combination of improved theoretical models and observations can elucidate the physics driving these winds and their role in phenomena on an enormous range of spatial scales.

Wednesday, February 13, 2013
3:30 p.m.
Bob Wright Centre
Room A104