



University
of Victoria

PHYSICS AND ASTRONOMY SEMINAR (In Person)

Dr. Megan Donahue & Dr. Mark Voit
Michigan State University

“X-ray Insights into the Connection between Quenching of Star Formation and Galaxy Stellar Velocity Dispersion”

Abstract

There is a surprisingly tight correlation between galaxies with quenched star formation and their central velocity dispersion, which also correlated with the central black hole's mass. Those correlations suggest that the central black hole is the culprit. However, radio and X-ray observations of these galaxies show that the black hole's considerable energy production can bypass the galaxy and thermalize at distances tens of kiloparsecs from the galaxies' stars. The circumgalactic medium (CGM) may therefore be what connects black hole feedback with quenching of star formation. The CGM can be difficult to observe, but X-ray observations have yielded important clues about the how black holes and the CGM are connected. We have proposed a "valve" model for that connection, whereby the black hole lifts the CGM, lowering the circumgalactic pressure and allowing two distinct states for the galaxy: a wind-dominated mode where winds from type Ia supernovae suppress gas cooling, and a precipitation-dominated mode where cool gas can rain from the hot CGM. This cold "multi-phase" gas can feed the black hole and trace amounts of star formation, completing and sustaining the feedback cycle that keeps a galaxy quenching. The central velocity dispersion - the observational signature of the central gravitational potential - may determine which state prevails in each galaxy. We will discuss what the X-ray observations have shown so far, and what future X-ray and UV observations may unlock.

We will offer ample time for a vigorous coffee-fueled group discussion, including colloquium speaker Mark Voit, after the presentation.

Thursday, March 9, 2023

11:30 a.m. PST

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