Department of Physics and Materials Science

SEMINAR

Stellar Feedback in Galaxies: From the Dense Interstellar Medium to Circumgalactic Gas

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Abstract: Galaxy formation is broadly a competition between two effects: gravity, which collapses material down to smaller scales; and "feedback", which injects energy from these small scales to eject material out to larger scales. Modelling the impact of energy released by massive stars ("stellar feedback") has long been a "holy grail" problem of numerical studies of galaxy formation. Numerous approaches have been proposed over the decades, and the field has in general made steady progress since the first attempts to model dissipational galaxy formation with simulations. Despite this progress, there still remains tremendous uncertainty on both the underlying physics of stellar feedback, and how this physics can be captured in "sub-grid" models. Further complicating this problem is the degeneracy issue that can arise when very different models produce comparable results, within observational uncertainties. In this talk, I will show how new approaches in applying observational insight and a careful examination of the underlying physical processes involved in stellar feedback can improve our understanding of galaxy formation. With these new approaches, we can better understand the "baryon cycle" of galaxies, which connects the gas within and around galaxies to the stars they contain. I conclude with a cautionary discussion on the uncertainties that underlie our simulation models, and what it really means to "simulate" an astrophysical system.

Bio: Dr. Keller joined the Department of Physics and Materials Science at the University of Memphis as an Assistant Professor in 2022. Prior to joining the UofM, Dr. Keller worked as a postdoctoral researcher and Alexander von Humboldt fellow at the Universität Heidelberg. He obtained his PhD in Physics at McMaster University in 2017, and his BSc in Physics and Computer Science from the University of Calgary in 2011. His research interests lie at the intersection of galaxy formation, cosmology, and simulations.

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