UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 17, 2019 Mary Gates Hall

Online Proceedings

POSTER SESSION 1

Balcony, Easel 87

11:00 AM to 1:00 PM

The Role of Cosmic Rays and Magnetic Fields in Galaxy Evolution

Daven M. (D) Cocroft, Senior, Physics: Comprehensive Physics, Psychology, Astronomy
McNair Scholar
Mentor: Thomas Quinn, Astronomy
Mentor: Iryna Butsky, Astronomy

Magnetic fields (MFs) and cosmic rays (CRs) are decidely important aspects of galactic disk and halo evolution, however, their precise roles are not yet completely understood. While there are many simulations studying galactic evolution, few have deeply explored the exact impact of CRs and MFs in the evolutionary process. The current goal of our research is to learn more about how CRs and MFs contribute to the evolutionary process by looking at how MFs grow and change in the circumgalactic medium (CGM) under the influences of CRs. Using a suite of simulated, isolated disk galaxies, we investigated the role of CRs in MF growth and galaxy evolution by comparing different galactic models, each possessing slightly varied CR physics. We present the role of CR transport on the geometry, strength, and growth rate of MFs in these simulated galactic halos.

SESSION 2K

OUR COMPLEX UNIVERSE: PLANETS, STARS, BLACK HOLES, AND GALAXIES

Session Moderator: Jessica Werk, Astronomy

MGH 284

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Ram Pressure Stripping and Tail Structures of Jellyfish Galaxies

Daniel Ryan Piacitelli, Sophomore, Pre-Sciences
Mentor: Iryna Butsky, Astronomy
Mentor: Thomas Quinn, Astronomy

Galaxy clusters are collections of galaxies that form the largest gravitationally bound structures in the universe. Because these galaxies are clustered together, they undergo a wide variety of processes and operate under a multitude of mechanics, differing from non-clustered galaxies, like our own Milky Way. One such example is ram pressure stripping. A galaxy that falls through the hot and dense Intracluster Medium (the space between clustered galaxies) is subject to a ”wind” force that can strip it of its gas, usually producing a long gaseous tail emanating from the galaxies causing it to be dubbed a Jellyfish Galaxy. This phenomenon can be incredibly impactful as it can ”quench” star formation in the galaxy or, in other words, it can cause the galaxy to “die.” A galaxy is considered quenched when it has insufficient gas to form stars, and it is still not well understood why some galaxies become quenched and others do not. Learning more about this process can inform us on the life cycle of both the galaxies themselves and the cluster as a whole. We used the RomulusC simulation data, run on the NSF Blue Waters Supercomputer, which simulated a large galaxy cluster in high resolution. This simulation has allowed astronomers to study ram pressure stripping in a realistic setting for the first time. Comparing the results of this simulation to observations will supplement our understanding of galaxy clusters and the movement of matter in these colossal and highly dynamic systems.