University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

BRITTANY HOWARD

BSc (University of Michigan, 2017)

"A Comparison of the Effects of Local and Global Environment on Galaxy Evolution in Low Redshift Galaxy Clusters"

Department of Physics and Astronomy

Monday, December 16, 2019
1:00 P.M.
Elliott Building
Room 160

Supervisory Committee:
Dr. Luc Simard, Department of Physics and Astronomy, University of Victoria (Co-Supervisor)
Dr. Jon Willis, Department of Physics and Astronomy, University of Victoria (Co-Supervisor)

External Examiner:
Dr. Kenneth Rines, Physics and Astronomy, Western Washington University

Chair of Oral Examination:
Dr. Brian Thom, Department of Anthropology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Using the redMaPPer catalog of 21709 galaxy clusters and photometric information for 455946 galaxies from SDSS DR8, we study the effects of local and global environment on galaxy evolution within clusters in the redshift range $0.2 \leq z \leq 0.5$ and the richness range $20 \leq \lambda \leq 236$. We use cluster richness λ as a proxy for global environment and cluster-centric radius d_{BCG} to represent the local environment within clusters. We measure giant-to-dwarf ratio (GDR) which gives insight regarding the composition of the red sequence, and we measure red fraction which holds information about the rate at which galaxies falling into clusters cease to form new stars and build up the red sequence in a phenomenon called quenching. We observe that red fraction decreases with redshift, increases with λ, and decreases with d_{BCG}. GDR, meanwhile, decreases with redshift, does not vary significantly with λ, and decreases with d_{BCG}. All together, our results tell the story of clusters starting with bright, massive galaxies which accrete smaller and smaller galaxies over time. The galaxies are quickly quenched upon entering clusters environment. We observe that most quenching occurs on smaller richness scales than our data covers, and that by the time clusters have grown to the richnesses redMaPPer is sensitive to, ram pressure stripping is likely to be the dominant quenching mechanism.