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

of

RUTH DIGBY

BSc (University of Victoria, 2016)

“Dwarf Galaxy Star Formation Histories in Local Group Cosmological Simulations”

Department of Physics and Astronomy

Monday August 12, 2019
2:00 P.M.
Clearihue Building
Room B017

Supervisory Committee:
Dr. Julio Navarro, Department of Physics and Astronomy, University of Victoria (Supervisor)
Dr. Alan McConnachie, Department of Physics and Astronomy, UVic (Member)

External Examiner:
Dr. Evan Skillman, Department of Physics and Astronomy, University of Minnesota

Chair of Oral Examination:
Dr. Elena Pnevmonidou, Department of Germanic and Slavic Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Dwarf galaxies are powerful tools in the study of galactic evolution. As the most numerous galaxies in the universe, they probe a diverse range of environments: some exist in near-isolation, allowing us to study how a galaxy's evolution depends on its intrinsic properties. Others have been accreted by larger galaxies and show the impact of environmental processes such as tidal stripping. Because dwarf galaxies have shallow potential wells, these processes leave strong signatures in their star formation histories (SFHs).

We use state-of-the-art cosmological hydrodynamical simulations to study the evolution of dwarf galaxies in Local Group analogues. Their SFHs are remarkably diverse, but also show robust average trends with stellar mass and environment. Low-mass isolated dwarfs ($10^5 < M_*/M_\odot < 10^9$) form all of their stars in the first few Gyr, whereas their more massive counterparts have extended star formation histories, with many of the most massive dwarfs ($10^7 < M_*/M_\odot < 10^9$) continuing star formation until the present day. Satellite dwarfs exhibit similar trends at early and intermediate times, but with substantially suppressed star formation in the last $\sim 5$ Gyr, likely as a result of gas loss due to tidal and ram-pressure stripping after entering the haloes of their primaries.

These simple mass and environmental trends are in good agreement with the derived SFHs of Local Group dwarfs whose photometry reaches the oldest main sequence turnoff. SFHs of galaxies with less deep data show deviations from these trends, but this may be explained, at least in part, by the large galaxy-to-galaxy scatter, the limited sample size, and the large uncertainties of the inferred SFHs.