699 Midterm Progress Report: Summary

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Project Goal (Max ~75 words)

Using a mix of photometric and spectroscopic data, I will construct galaxy stellar mass functions (SMFs) in the Hyperion proto-supercluster at z~2.5. By comparing the shape of the SMF in regions of varying overdensity in Hyperion, as well as the SMF of field galaxies at similar redshift, I can deduce the relationship between the evolution of the SMF and the overdensity of a cluster.

Objectives and Status

List the project objectives and their status in the table below. As appropriate, indicate the role that you have in each objective and its dependencies, e.g., where the data comes from, who does the reductions, what collaborations exist, etc.

Objective	Status	Path to completion
1. Examine HST grism data to get additional spectroscopic redshifts	Done	Visually inspect >2500 HST slitless grism spectra for quality of redshift fit and compare with existing SED fits. Meet with other members of collaboration to compare quality flags
2. Construct separate SMFs for the entirety of Hyperion and a sample of field galaxies at a similar redshift	In progress	Use pre-existing 3D maps (dimensions of RA, Dec, and redshift) of overdensity in the region of Hyperion to assign cluster membership based on overdensity. Create separate SMFs for cluster members and non-members
3. Construct SMFs for different overdensities within Hyperion	In Progress	Hyperion has 7 distinct overdensity peaks within the cluster. By using the newly acquired spectroscopic redshifts (see objective 1) along with existing data, I can build SMFs for varying overdensities in Hyperion. By comparing the SMF shapes, we can then conclude how galaxy evolution in the cluster is related to cluster environment
4. Test completeness of SMFs and biases in analysis	Not Started	To accurately understand the SMFs, I need to understand the completeness of the galaxy sample I'm working with (e.g., mass completeness). I also need to understand errors in the redshift measurements, galaxy stellar mass measurements via previous SED fitting (which is dependent on redshift), and overdensity maps. This could involve developing Monte Carlo routines to sample the given probability distributions of the relevant parameters
5. Begin writing a paper	Not Started	I'll begin writing a 699 report which will serve as a draft for a publication

Assessment and Prognosis (Max ~150 words)

Provide a brief description about the overall state of the project and the expected outcome by the due date relative to the original proposal. As appropriate, also describe the publication plan, i.e., anticipated paper(s) and timeline, as well as your expected role/contributions.

Be sure to discuss any problems you are having or foresee, or any significant changes that have occurred since the original proposal.

The majority of my research effort thus far has been visual inspection of a large number of HST slitless grism spectra (~2800 spectra in total) to examine the quality of the spectra, the quality of the redshift fit, and the quality of the SED fit to supplemental photometric data. This has been done in conjunction with other members of the ORELSE collaboration (including Finn Giddings and Roy Gal). This data will then be compiled into a catalog and published in a paper (hopefully towards the end of this summer), for which I will be a co-author. The redshifts are a key part of my project and will be used in a variety of other projects in the collaboration. Through this, I've also learned a lot about important emission features in these galaxies and the process of SED fitting and photometric redshift estimation. We expected this to be completed last month, but due to the complexity of the data, it took a bit longer than anticipated. However, I have already begun work on the SMF computations, which will leverage some of the cluster membership and Monte Carlo routines developed by Finn Giddings in his 699-1. With classes ending, I expect to have the first pass at this completed by the end of May, as envisaged in the original timeline. The goal is to be very close to finishing a publication by the end of the 699-1 timeline, which I will be the first author on.

Timeline

Provide a brief timeline of remaining work with intervals of one month (or shorter). E.g.,

- May: Build an initial SMF for the entirety of Hyperion, and a separate SMF for the sample of field galaxies. Then, identify the overdensity of the region each galaxy is located in and build SMFs for galaxy samples in different overdensity bins within Hyperion
- June: Finish building the SMFs and begin analyzing the limits of the analysis of galaxy evolution. This will mainly involve understanding the errors associated with galaxy redshifts, masses, and location (which corresponds to overdensity).
- July: Finish error analysis and begin writing the final report/publication
- August: Finish writing the report, make presentation, and leave contingency time

Remember to allot time to write up your work and to leave some contingency time at the end, as things always take longer than expected.