Leah Fulmer

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Education

University of Wisconsin-Madison — **Madison, WI**
Bachelor of Science — September 2013 - May 2017
Majors: Astronomy (Honors), Spanish — Graduated with Distinction
Minor: Physics — Cumulative GPA: 3.82/4.0

University of Chile, Pontifical Catholic University of Chile — **Santiago, Chile**
Council on International Educational Exchange Study Abroad — March 2016 - July 2016

Scientific Publications

[1] **Leah M. Fulmer**, John S. Gallagher, III, Wolf-Rainer Hamann, Lidia M. Oskinova, Varsha Ramachandran, *Skyscrapers in the Desert: Observing Ongoing, Active Star Formation in the Low-Density Wing of the Small Magellanic Cloud*, MNRAS, in preparation.

[2] **Leah M. Fulmer**, John S. Gallagher, III, Ralf Kotulla, *NGC 5523: An isolated product of soft galaxy mergers?*, 2017, A&A, 598, A119. Link to arXiv.

Honors, Awards, and Internships

- Chambliss Astronomy Achievement Award : *American Astronomical Society* : Honorable Mention 2018
- Doherty Award for Excellence in Astronomy : *UW-Madison Department of Astronomy* : Top 2 2017
- Space Astronomy Summer Program Acceptance : *Space Telescope Science Institute* : Top 3% 2017
- Jay C. Halls Scholarship : *UW-Madison College of Letters & Science* : $1k 2016
- Hilldale Undergraduate Research Fellowship : *UW-Madison* : $3k 2016
- WSGC Undergraduate Research Fellowship : *Wisconsin Space Grant Consortium* : $4k 2016
- WSGC Undergraduate Scholarship : *Wisconsin Space Grant Consortium* : $2k 2016
- Fay Ajzenberg-Selove Award : *UW-Madison Department of Physics* : $1k 2016
- University Book Store Academic Excellence Award : *UW-Madison* : $1k 2016
- IAP Study Abroad Scholarship : *UW-Madison International Academic Programs* : $3k 2015
- Dorrit Hoffleit Undergraduate Research Scholarship Acceptance : *Yale University* : Top 6% 2015
- Kemper K. Knapp Scholarship : *UW-Madison* : $7.5k 2013

Selected Presentations

Oral Presentations

- *A Dynamic Visualization Tool for the Analysis of SPIKE Scheduling Constraints*, 2017 STScI Space Astronomy Summer Program Symposium, August 2017, Baltimore, MD. Link to presentation [55:15 - 1:04:34].
- *Stellar Evolution of the Star Cluster NGC 602 and its Surroundings in the Low-Density Wing of the Small Magellanic Cloud*, Senior Honors Thesis Symposium & Undergraduate Research Symposium, April 2017, Madison, WI.
- *Investigating Physical Properties of the Magellanic Bridge via Submillimeter Emission*, Invited Luncheon Speaker, University of Valparaíso, August 2016, Valparaíso, Chile.
- *Physical Properties and Submillimeter Excess in Low Metallicity Clouds in the Magellanic Bridge*, Workshop for Astronomy Students, University of Chile, May 2016, Santiago, Chile.
- *NGC 5523: An Isolated Product of Soft Galaxy Mergers?*, WIYN 3.5m Telescope Board of Directors Meeting, University of Wisconsin - Madison, September 2015, Madison, WI.

Poster Presentations

- *Skyscrapers in a Desert: Observing Ongoing, Active Star Formation in the Low-Density Wing of the Small Magellanic Cloud*, 231^{st} AAS Meeting, January 2018, Washington, D.C.
- *Stellar Evolution of the Star Cluster NGC 602 and Massive Star Formation in the Low-Density Wing of the SMC*, 229^{th} AAS Meeting, January 2017, Grapevine, TX.
- *SED Fitting of Virgo Cluster Galaxies and Evidence for Enhanced Star Formation due to Accretion*, 227^{th} AAS Meeting, January 2016, Kissimmee, FL.
- *NGC 5523: An Isolated Product of Soft Galaxy Mergers?*, 225^{th} AAS Meeting, January 2015, Seattle, WA.

Professional Experience

National Optical Astronomy Observatory **Tucson, AZ**
Data Reduction Specialist October 2017 - Present
Research Advisors: Dr. Stephanie Juneau, Dr. Mark Dickinson
NOAO Data Lab Advisors: Dr. Stephanie Juneau, Dr. Knut Olsen

- Investigating how galactic star-formation rates evolve with redshift ($z < 1.5$), internal galactic properties, and environmental conditions for ∼400 Herschel-detected galaxies in order to understand the physical causes responsible for the decline of the cosmic star formation history.
- Performing multi-object spectrograph data reduction using an interactive graphical interface pipeline in order to produce a catalog of redshifts for our sample (Data Source: Visible Imaging Multi-Object Spectrograph, ESO Very Large Telescope).
- Employing the reduced spectra to develop Python-based tools for spectral visualization and analysis with the NOAO Data Lab (datalab.noao.edu), thus enhancing the versatility of the Data Lab as a data center.
- Creating public-facing scientific and technical tutorials that outline the functionality of the Data Lab archive.
- **Technical Skills: Python** (intermediate), multi-object spectroscopic data reduction and analysis, tutorial synthesis within a Jupyter Notebook environment.

Space Telescope Science Institute, Operations and Engineering Division **Baltimore, MD**
Space Astronomy Summer Program Intern June 2017 - August 2017
Advisor: Dr. Mark Giuliano

- Created a dynamic visualization tool for the efficient analysis of Hubble Space Telescope and James Webb Space Telescope scheduling constraints, ultimately streamlining the process of space-based data acquisition.
- Designed the tool to be lightweight (fast, computationally inexpensive), interactive (supporting zooming, scrolling, dynamic time information displays), and independent (producing a stand-alone web page) for optimized functionality and communication among users.
- Communicated closely with potential users and adapted the tool quickly to user feedback.
- Incorporated the tool into both the Hubble and James Webb SPIKE observation scheduling systems.
- **Technical Skills: LISP** (intermediate), **JavaScript** (intermediate), **HTML** (beginner), software development, user communication and collaboration, incorporation of wrappers.

University of Wisconsin-Madison, Department of Astronomy **Madison, WI**
Undergraduate Research Assistant January 2014 - Present
Advisor: Professor John (Jay) Gallagher, III

Ongoing:

- Investigated the stellar evolution of the star cluster NGC 602 and its surroundings in the Wing of the Small Magellanic Cloud, which curiously exhibit active star formation despite low ambient mass and gas densities.
- Revealed evidence for a significant star-forming event that occurred ∼30 Myr ago, creating $\sim 10^4$ $M_\odot$ of new stars and initiating a pattern of sequential star formation that continues into the present. Scientific article in preparation (Fulmer et. al., MNRAS, in preparation).

- Performed photometric, clustering, and spatial analyses of ∼1000 stars in this region that collectively support this scenario of sequential star formation (Data Source: Galaxy Evolution Explorer, ESO 1.54m Telescope, ESO Very Large Telescope).
- **Technical Skills: Python** (intermediate), stellar photometry (IRAF Daophot), source matching (TOPCAT), archival data extraction (MAST, VizieR), kernel density estimate clustering analysis.

Completed:

- Studied the evolution of the isolated galaxy NGC 5523, which demonstrates a paradoxical combination of global isolation (no massive companions) and asymmetrical features indicative of past interactions.
- Found that the asymmetrical features in NGC 5523 most likely arose from one or more non-disruptive mergers between it and former companion galaxies (Fulmer, Gallagher, & Kotulla, 2017, A&A, 598, A119).
- Performed multi-wavelength photometry on the various asymmetrical features within NGC 5523 (Data Source: Sloan Digital Sky Survey, Spitzer Space Telescope, WIYN 3.5m Telescope) in order to quantify the stellar masses, colors, and physical positions of those features within the host galaxy.
- **Technical Skills: IRAF** (intermediate), galactic photometry (IRAF Apphot, Ellipse, GALFIT), FITS imaging analysis (DS9), optical observation (WIYN).

University of Chile, Department of Astronomy **Santiago, Chile**
Undergraduate Research Assistant March 2016 - September 2016
Advisor: Professor Monica Rubio

- Characterized the size, temperature, luminosity and mass of molecular clouds within the Magellanic Bridge in order to probe stellar evolution under low-metallicity conditions.
- Analyzed sub-millimeter CO emission via Gaussian fit distribution modeling (Data Source: Atacama Large Millimeter Array, Atacama Pathfinder Experiment), then completed a comparative analysis between the resulting data sets to check for mutual reliability.
- **Technical Skills: Class** (intermediate), **CASA** (beginner), spectroscopic analysis (ALMA, APEX), radio observations (APEX), spectroscopic data reduction using a template reduction script (APEX).

Yale University, Department of Astronomy **New Haven, CT**
Dorrit Hoffleit Undergraduate Research Scholar June 2015 - July 2016
Advisor: Professor Jeffrey (Jeff) Kenney

- Studied systematic trends in the star formation rates of Virgo Cluster galaxies in order to explore fundamental processes in galaxy cluster evolution.
- Concluded that in the mass range 10^9-10^{10} $M_\odot$, the galaxies with the highest specific star formation rates were all HI-rich, subject to ongoing gas accretion, and located at the outskirts of the cluster, thus revealing HI accretion as a potentially significant stage of infalling galaxy evolution.
- Extracted archival multi-wavelength photometric data of 50 Virgo galaxies (Data Source: Sloan Digital Sky Survey, Two Micron All-Sky Survey, Spitzer Space Telescope, Herschel Space Observatory), then modeled the discrete observational data with theoretical spectral energy distributions (Modeling Program: Magphys).
- **Technical Skills: IDL** (intermediate), SED modeling (Magphys), archival data extraction and quality assurance (SDSS, 2MASS, SST, HSO).

Professional Training

La Serena School for Data Science **La Serena, Chile**
Selected Participant August 2017

- Participated in intensive lectures regarding fundamental techniques for data-driven science: linear and logistic regression, supervised and unsupervised classification, Bayesian statistics, Gaussian mixture models.
- Gained experience with key Python-based methods for machine learning and statistical analysis: decision trees, bagging, random forest, boosting techniques.
- Explored dynamic visualization tools for advanced photometric queries and analysis: Aladin, TOPCAT, Glue, the Virtual Observatory.

- Examined hardware-based systems for large data analysis and storage: high-performance computing, databases.
- Engaged in a collaborative project on the automatic classification of light curves: Accessed time series data from the Optical Gravitational Lensing Experiment (OGLE) On-line Photometric Databases, determined light curve features using the Feature Analysis for Time Series (FATS) library from the Harvard Institute for Applied Computational Science, extracted individual features for 45,000 light curves using a remote computer cluster and the Slurm Workload Manager, explored several clustering, visualization, and classification methods in the analysis of our data set (K-means, t-SNE, random forest).

Observing Experience

- Mayall 4m Telescope : *Mosaic-3* : Kitt Peak National Observatory — 5 nights
- Atacama Pathfinder Experiment (APEX) : *SHeFI* : Llano de Chajnantor Observatory — 6 nights
- WIYN 3.5m Telescope : *HEXPAK, ODI* : Kitt Peak National Observatory — 6 nights

Societies

- American Astronomical Society Junior Member — 2017
- Iron Cross Society : *Recognizing significant leadership and service at UW-Madison* — 2016
- Phi Beta Kappa — 2016

Inclusivity and Outreach

- Teen Astronomy Café Program : NOAO — December 2017
  Co-wrote and co-lead a Jupyter Notebook activity regarding spectroscopy, redshift, and large-scale structure.
- Town Hall on Racism : 229^{th} AAS Meeting — January 2017
  Participated in a discussion regarding experiences of racism and examples of systemic biases in Astronomy.
- Expanding Your Horizons Conference : UW-Madison — November 2016
  Engaged middle school-age girls in a discussion about infrared light and the importance of infrared telescopes.
- Astronomy Department Code of Conduct : UW-Madison — February 2016
  Offered undergraduate representation and feedback that would most effectively encourage a safe environment.
- "Creating Inclusive Environments in Astronomy" : UW-Madison — February 2016
  Presented key concepts for promoting equity within the Astronomy Department (privilege, microaggressions).
- Women of Wisconsin Strengthening Astronomy : UW-Madison — September 2015 - May 2017
  Empowered women pursuing Astronomy and other STEM fields through peer mentorship and outreach events.

Professional References

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