Leah Fulmer

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Education

Doctor of Philosophy in Astronomy — **September 2018 - Present**
University of Washington — **Seattle, WA**

Graduate Research Assistant
Advisors: Dr. Daniela Huppenkothen and Prof. Mario Juric

Graduate Teaching Assistant
Instructors: Prof. Oliver Fraser and Prof. Nicole Kelly

Bachelor of Science in Astronomy/Physics and Spanish — **September 2013 - May 2017**
University of Wisconsin-Madison — **Madison, WI**

University of Chile and Pontifical Catholic University of Chile — February 2016 - August 2016
Council on International Educational Exchange Study Abroad — Santiago, Chile

Undergraduate Research Assistant
Advisor: Prof. John S. Gallagher, III

Graduated with Academic Distinction, Honors in the Major, and 3.82 / 4.00 Cumulative Grade Point Average

Research Positions and Fellowships

Achievement Rewards for College Scientists Fellowship — September 2018 - June 2021
ARCS Foundation, Inc. — Seattle, WA

Data Reduction Specialist Position — October 2017 - July 2018
National Optical Astronomy Observatory — Tucson, AZ
Research Advisors: Dr. Stephanie Juneau and Dr. Mark Dickinson
NOAO Data Lab Advisors: Dr. Stephanie Juneau and Dr. Knut Olsen

Space Astronomy Summer Program Internship — June - August 2017
Space Telescope Science Institute — Baltimore, MD
Advisor: Dr. Mark Giuliano

Dorrit Hoffleit Undergraduate Research Scholarship — June - August 2015
Yale University — New Haven, CT
Advisors: Prof. Jeff Kenney and Prof. Louise Edwards

Publications

View publications through the Astrophysics Data System

[1] *Testing massive star evolution, star-formation history, and feedback at low metallicity: Photometric analysis of OB stars in the SMC Wing* **Fulmer, L.**; Gallagher, J. S.; Hamann, W. -R.; Oskinova, L. M.; Ramachandran, V., 2019, A&A, accepted. View data and analysis through GitHub.

[2] *Testing massive star evolution, star-formation history, and feedback at low metallicity: Spectroscopic analysis of OB stars in the SMC Wing* Ramachandran, V.; Hamann, W. -R.; Oskinova, L. M.; Gallagher, J. S.; Hainich, R.; Shenar, T.; Sander, A. A. C.; Todt, H.; **Fulmer, L.**, 2019, A&A, 625, 104.

[3] *Overview of the DESI Legacy Imaging Surveys* Arjun, D. et al. including **Fulmer, L.**, 2019, AJ, 157, 168.

[4] *NGC 5523: An isolated product of soft galaxy mergers?* **Fulmer, L.**; Gallagher, J. S.; Kotulla, R., 2017, A&A, 598, 119.

Honors & Awards, Selected

- Jacobsen Fund Travel Grant : *University of Washington Department of Astronomy* 2018
- AAS Education and Professional Development Mini-Grant : *American Astronomical Society* 2018
- Achievement Rewards for College Scientists Fellowship : *ARCS Foundation, Inc.* 2018
- Chambliss Astronomy Achievement Award Honorable Mention : *American Astronomical Society* 2018
- Doherty Award for Excellence in Astronomy : *UW-Madison Department of Astronomy* 2017
- Jay C. Halls Scholarship : *UW-Madison College of Letters & Science* 2016
- Hilldale Undergraduate Research Fellowship : *UW-Madison* 2016
- WSGC Undergraduate Research Fellowship : *Wisconsin Space Grant Consortium* 2016
- WSGC Undergraduate Scholarship : *Wisconsin Space Grant Consortium* 2016
- Fay Ajzenberg-Selove Award : *UW-Madison Department of Physics* 2016

Conferences, Presentations, and Workshops

- .Astronomy11 2019
  Selected Speaker : Conference : Toronto, Canada
- "Testing Massive Star Evolution, Star Formation History, and Feedback at Low Metallicity" 2019
  Talk : UW Astronomy Department Journal Club : Seattle, WA
- Zwicky Transient Facility Machine Learning Workshop 2019
  Participant : Workshop : Seattle, WA
- Zwicky Transient Facility Summer School 2018
  Participant : Summer School : Pasadena, CA
- "The NOAO Data Lab: Scientific Applications with Gaia Data Release 2" 2018
  Tutorial : NOAO Data Lab Tucson Tutorial : Tucson, AZ
- Dark Energy Spectroscopic Instrument Collaboration Meeting 2018
  Participant : Conference : Tucson, AZ
- "The NOAO Data Lab: Overview, Applications, Future" 2018
  Talk : Dark Energy Camera Community Science Workshop : Tucson, AZ
- "Getting Started with the NOAO Data Lab" 2018
  Selected Unconference Session : Python in Astronomy Conference : New York, NY
- "Skyscrapers in a Desert: Observing Ongoing, Active Star Formation in the SMC Wing" 2018
  Talk : "Science @ 10" : Tucson, AZ
- "Skyscrapers in a Desert: Observing Ongoing, Active Star Formation in the SMC Wing" 2018
  Poster : 231th AAS Meeting : Washington, D.C.
- La Serena School for Data Science 2017
  Selected Participant : Interdisciplinary Summer School : La Serena, Chile
- "A Dynamic Visualization Tool for the Analysis of SPIKE Scheduling Constraints" (55:15 - 1:04:35) 2017
  Talk : Space Telescope Science Institute Summer Program Symposium : Baltimore, MD
- "Stellar Evolution of the Star Cluster NGC 602 and its Surroundings in the Low-Density SMC Wing" 2017
  Talk : UW-Madison Senior Honors Thesis Symposium : Madison, WI
- "Stellar Evolution of the Star Cluster NGC 602 and its Surroundings in the Low-Density SMC Wing" 2017
  Talk : UW-Madison Undergraduate Research Symposium : Madison, WI
- "Stellar Evolution of NGC 602 and Massive Star Formation in the Low-Density SMC Wing" 2017
  Poster : 229th AAS Meeting : Grapevine, TX
- "Investigating Physical Properties of the Magellanic Bridge via Submillimeter Emission " 2016
  Talk : University of Valparaíso : Valparaíso, Chile

- "Physical Properties and Submillimeter Excess in Low Metallicity Clouds in the Magellanic Bridge" 2016
  Talk : University of Chile Workshop for Astronomy Students : Santiago, Chile
- "SED Fitting of Virgo Cluster Galaxies and Evidence for Enhanced Star Formation Due to Accretion" 2016
  Poster : 227th AAS Meeting : Kissimmee, FL
- "NGC 5523: An Isolated Product of Soft Galaxy Mergers?" 2015
  Talk : WIYN 3.5m Telescope Board of Directors Meeting : Madison, WI
- "NGC 5523: An Isolated Product of Soft Galaxy Mergers?" 2015
  Poster : 225th AAS Meeting : Seattle, WA

Service to the Community

Within the Field:

- "Networking" in Astronomy : .Astronomy11 2019
  What if professional "networking" could be an experience that made us feel known, valued, and connected?
- Site Visit Team : American Astronomical Society 2019
  Evaluate the climate within astronomy departments for marginalized people, offer paths for improvement
- Know Your Power Special Session : Space Telescope Science Institute, 233rd AAS Meeting 2019
  Discussed the distribution of power throughout the academic ecosystem in order to bolster greater inclusion
- How to Build & Publish a Website Workshop : 233rd AAS Meeting 2019
  Outlined crucial web development skills to meet professional and academic needs in the digital age
- AstroSites : Published Webpage 2018
  Designed a tutorial for professional website development, including a template and conceptual introduction
- Astronomy Career Options : UW Pre-Major in Astronomy Program 2018
  Outlined the skill set and career options available to post-baccalaureate physics and astronomy majors
- Summer Research Opportunities : UW Pre-Major in Astronomy Program 2018
  Introduced undergraduate students to the opportunities and application process for summer research
- Questions to Ask when Considering a Graduate Program : AstroBetter Wiki Publication 2018
  Consolidated a comprehensive list of questions that prospective students are advised to ask graduate programs
- How to Land a Post-Baccalaureate Research Experience : AstroBetter Wiki Publication 2018
  Lead an effort to collect resources on how post-baccalaureate scholars find research positions in astronomy
- Creating Inclusive Environments in Astronomy : UW-Madison 2016
  Presented key concepts for promoting equity within the Astronomy Department (privilege, microaggressions)
- Women of Wisconsin Strengthening Astronomy : UW-Madison 2015 - 2017
  Empowered women pursuing astronomy and other STEM fields through peer mentorship and outreach events

Outreach:

- How Astronomy's Most Intriguing Discoveries Happen by Accident : Astronomy on Tap Seattle 2019
  Discussed historical connections between groundbreaking instrumentation and their unexpected discoveries
- Data-Driven Astronomy in the 2020s and Beyond : Astronomy on Tap Tucson, Seattle 2018
  Described how new types of data lead to new ways of solving problems and new ways of asking questions
- Seeking Out Mentors and Surviving Disappointment : Podcast Interview 2018
  Shared my experiences building mentor relationships, communicating goals, and practicing self-compassion
- Teen Astronomy Café Program : NOAO 2017
  Co-wrote and co-lead a Jupyter Notebook activity regarding spectroscopy, redshift, and large-scale structure
- Expanding Your Horizons Conference : UW-Madison 2016
  Engaged middle school-age girls in a discussion about infrared light and the importance of infrared telescopes

Research Experience

University of Washington, Department of Astronomy **September 2018 - Present**
Graduate Research Assistant Seattle, WA
Advisors: Dr. Daniela Huppenkothen and Prof. Mario Juric

- Given the advent of time domain surveys (e.g. Zwicky Transient Facility, Large Synoptic Survey Telescope), astronomers must find a way to efficiently access valuable data products from among billions of observations.
- My research explores unsupervised classification of time series data, with particular focus on anomaly detection. Data Source: Photometric LSST Astronomical Time-Series Classification Challenge (PLAsTiCC).
- **Technical Skills: Python** (advanced), machine learning with unsupervised classification, neural networks.

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

September 2016 - Present:

- Massive stellar populations within the low density, low metallicity Small Magellanic Cloud offer insight regarding the necessary conditions for stellar birth and the influence of metallicity throughout their evolution.
- Our photometric study of massive stars within the SMC Wing revealed a stochastic mode of star formation, suggesting the presence of molecular clouds within the slowly expanding supergiant ionized shell SMC-SGS 1.
- **Technical Skills: Python** (intermediate), stellar photometry (IRAF Daophot), stellar evolution analysis.

January 2014 - October 2016:

- Isolated galaxies are often considered to evolve with little influence from galactic mergers; however, NGC 5523 offers evidence for significant interactions with neighboring dwarf galaxies in the intermediate past.
- Our analysis of the asymmetrical components within NGC 5523 constrained the timescales and masses of potential non-disruptive mergers between it and former companions, a narrative of "isolation by annexation".
- **Technical Skills: IRAF** (intermediate), galactic photometry (IRAF Apphot, Ellipse, GALFIT).

National Optical Astronomy Observatory **October 2017 - July 2018**
Data Reduction Specialist Tucson, AZ
Research Advisors: Dr. Stephanie Juneau, Dr. Mark Dickinson
NOAO Data Lab Advisors: Dr. Stephanie Juneau, Dr. Knut Olsen

Extragalactic Research:

- By investigating how galactic star formation rates evolve with environmental conditions, we may understand the physical causes responsible for the decline of the cosmic star formation history (e.g. "cosmic high noon").
- My reduction of galactic, multi-object spectroscopic data produced a catalog of redshift measurements for our population (Data Source: Visible Imaging Multi-Object Spectrograph, ESO Very Large Telescope).
- **Technical Skills: Python** (intermediate), spectroscopic data reduction, galactic redshift analysis.

NOAO Data Lab:

- Data Lab empowers astronomers to access, explore, visualize, and analyze the largest data sets observed with NOAO telescopes, and provides analysis tools through familiar and dynamic Jupyter Notebooks.
- My initial development of Python software for spectral visualization and analysis, as well as original public-facing scientific and technical tutorials, enhanced the functionality and versatility of the Data Lab.
- **Technical Skills: Python** (intermediate), systems engineering, tutorial synthesis and communication.

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

- Dynamic visualization tools for the efficient analysis of Hubble Space Telescope and James Webb Space Telescope scheduling constraints ultimately streamline the process of space-based data acquisition.

- My tool combined lightweight (computationally inexpensive), interactive (zooming, scrolling), and independent (creating a stand-alone web page) functionality for optimized use and communication among users.
- **Technical Skills: LISP** (intermediate), **JavaScript** (intermediate), **HTML** (beginner), software development, user communication and collaboration, simultaneous integration of multiple programming languages.

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

- Characterizing the size, temperature, luminosity, mass, and other physical properties of molecular clouds within the Magellanic Bridge allows us to probe stellar evolution under low-metallicity conditions.
- My analysis of molecular cloud sub-millimeter CO emission, observed with multiple telescopes, constrained such properties (Data Source: Atacama Large Millimeter Array, Atacama Pathfinder Experiment).
- **Technical Skills: Class** (intermediate), **CASA** (beginner), radio observation and data analysis.

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

- Systematic trends in the star formation rates of Virgo Cluster galaxies offer insight as to the collective evolution of galaxies within clusters and highlight potentially significant stages of infalling galaxy evolution.
- Our observation of similar HI abundances, evidence for accretion, and cluster location among galaxies of 10^9-10^{10} $M_\odot$ and high specific star formation rates suggested a stage of HI accretion among infalling galaxies.
- **Technical Skills: IDL** (intermediate), spectral energy distribution modeling (Magphys).

Observing Experience

- Mayall 4m Telescope : *Mosaic-3* : Kitt Peak National Observatory : 5 nights 2017, 2018
- Atacama Pathfinder Experiment : *SHeFI* : Llano de Chajnantor Observatory : 6 nights 2016
- WIYN 3.5m Telescope : *HEXPAK, ODI* : Kitt Peak National Observatory : 6 nights 2015

Societies

- American Astronomical Society Graduate Student Member 2018 - 2022
- Iron Cross Society : *Recognizing significant leadership and service at UW-Madison* 2016
- Phi Beta Kappa 2016

References

Dr. Daniela Huppenkothen
University of Washington
DIRAC Institute
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Dr. Stephanie Juneau
National Optical Astronomy Observatory
Contact: juneau@noao.edu

Dr. John S. (Jay) Gallagher, III
University of Wisconsin-Madison
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Dr. Jeffrey (Jeff) Kenney
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