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Education

July 2022 — **PhD, University of California, San Diego** in Physics
Thesis Title: *The Properties and Evolution of Star Forming Regions Over Cosmic Time*
Thesis Advisor: Prof. Shelley A. Wright

January 2020 — **C.Phil., University of California, San Diego** in Physics
Thesis Advisor: Prof. Shelley A. Wright

June 2016 — **B.S., California Polytechnic State University, San Luis Obispo** in Mechanical Engineering
Minors: Physics, Astronomy — Honors: *Cum Laude*

Research Experience

2022-present — **Brinson Prize Postdoctoral Fellow in Astronomical Instrumentation**, Carnegie Observatories, Pasadena

Magellan Infrared Multi-Object Spectrograph (MIRMOS):
Instrument Scientist & Subsystem Lead

- Coordinating between the science and various technical teams to ensure the design of this complex vacuum cryogenic instrument provides the necessary performance to meet or exceed the scientific requirements
- Overseeing development of Assembly, Integration, and Testing (AIT) plan for the full instrument and subsystems
- Leading development of slicer style integral field unit (IFU) and atmospheric dispersion corrector (ADC): performing optical design and analysis; coordinating vendor selection and contracts; coordinating mechanical engineering effort and system requirements; developing requirements and structure for necessary data reduction and analysis software
- Responsible for developing and updating the Nearby Galaxies key science case
- Overseeing documentation repository to ensure version history is maintained and required documentation is generated

Local Volume Mapper (SDSS-V): Working Group Chair

- Leading pilot study of stellar feedback in the largest SMC star forming region to determine the effective modes of feedback and develop tools to apply on the full LVM sample (MW plane and Magellanic Clouds)
- Leading bi-weekly telecons to discuss and coordinate ongoing science projects and analysis tasks within the collaboration
- Organized early science targets for commissioning and demonstration of performance
- Member of science and instrument team for proposed follow up survey of all nearby dwarf galaxies

Research Experience (continued)

2016-2022 — **Graduate Student Researcher**, Physics Department / Center for Astrophysics and Space Sciences (CASS), University of California, San Diego
Advisor: Prof. Shelley A. Wright

- **Observations of Star-forming Regions**
  - Studied the evolution of galaxies and star formation through Keck Observatory Integral Field Spectrograph observations (KCWI and OSIRIS) of the gaseous regions which have undergone recent star formation
  - Led observing proposals, plannning and data reduction/analysis using a combination of public pipelines and custom routines (primarily Python based, secondarily IDL)
  - Studied the ionization states and kinematics of these regions, the impact of star formation feedback, and the evolution of star forming regions over time
- ***Liger* Imager and IFS**
  - Completed design of the filter wheels, pupil wheel, and detector focus stage with associated stress and deflection analysis, and obtained preliminary quotes
  - Coordinated with team members in other specialties (e.g, optical design, electrical) to ensure requirements are met and interfaces will be functional
  - Contributed to major funding proposals including obtaining quotes, generating photo-realistic part models, and text
- **Panoramic SETI**
  - Assisted with development of prototype telescope module design for an all-sky SETI observatory. Designed lens mounting and module baffling
  - Worked on characterization of near-infrared discrete amplification photon detector and integration with existing readout electronics

2014 – 2016 — **Student Researcher**, Physics Department, California Polytechnic State University, San Luis Obispo
Advisor: Prof. Vardha N. Bennert

- **Local Active Galactic Nuclei (AGN)**
  - Used emission-line spectra of active galaxies to gain insight into the AGN phenomenon (particularly the FeII emissions, Hβ emission line variability, and mass scaling relations)
  - Assisted new students in fitting spectra and programming in IDL by creating a detailed guide to fitting a range of AGN spectra as well as direct mentoring of new students

Teaching & Mentoring

Courses

Winter 2019 — **TA: Galaxies and Quasars (Physics 163)** at UC San Diego
- Led discussion sections with additional lecture material and example problems
- Developed additional example problem sets for exam preparation and a guide to writing a term paper

Fall 2016 — **TA: Electricity and Magnetism Laboratory (Physics 1BL)** at UC San Diego
- Led three lab sections, including administering quizzes, conducting brief lectures, and guiding experiments

Fall 2013 — **TA: General Chemistry for Physical Science and Engineering** at Cal Poly, SLO
- Assisted with laboratory experiments and grading lab reports

Teaching & Mentoring (continued)

Workshops

Summers 2023-25 — **Carnegie Astrophysics Summer Student Internship (CASSI)**
- Taught workshops on programming with Python, data visualization, scientific writing, and applying to graduate school for student interns
- Developed a new, hands-on instrumentation workshop to add to the programs' complement of educational activities

2021 — **AstroTech Instructor**
- Co-developed and led inquiry based activity teaching basic optics as introduction to instrumentation workshop for early career scientists
- Facilitated additional optics activity teaching image formation and operation of lab equipment
- Participated in career panel for summer school participants

2018 — **Professional Development Program**
- Worked with a team of three scientists to develop an inquiry based activity for summer undergraduate researchers at UCSD using telescope simulators to teach research skills and key astronomical concepts (e.g., angular resolution)
- As preparation, participated in an intensive 5-day workshop on inquiry based learning, inclusive teamwork, and facilitation techniques

Mentoring

July 2024-25 — **Astronomy Mentoring Program for Upcoming Postdocs (AMP-UP)**
- Mentoring 2 graduate students to help them navigate the job market with an emphasis on the postdoctoral fellowship application process
- The program aims to increase the availability of peer to peer mentoring beyond the institutions which already host a significant number of fellows

May/June 2023 — **Advancing Inclusive Mentoring Program**
- Completed training program including 12+ hours of content and discussion about positive and inclusive mentoring practices.

Summer 2023 — **Carnegie Astrophysics Summer Student Internship (CASSI)**
- Worked with a summer intern on a project to determine the mechanical precision required to position key optical components of MIRMOS
- Required guiding them through the basics of optics, tolerance analysis in Zemax, fitting data in python, and communicating results in written and oral formats

Awards & Fellowships

Sept. 2022 - present — **Brinson Prize Fellowship**, Carnegie Observatories / The Brinson Foundation
2022 — **Doxsey Travel Prize**, American Astronomical Society
2020 — **Student Observing Support**, National Radio Astronomy Observatories (NRAO)
2017 — **Summer Research Fellowship**, University of California, San Diego
2016 — **Physics Excellence Award**, University of California, San Diego
2014 — **President's Honor List**, California Polytechnic State University, San Luis Obispo
2011 — **Cal Poly Engineering Scholarship**, California Polytechnic State University, San Luis Obispo

Service & Outreach

Department Service

August 2023-25

Carnegie Observatories Lunch Seminar Committee

- Committee responsible for organizing weekly lunch seminars by: soliciting speaker nominations, selecting speakers, scheduling talks, and coordinating hosts

Sept. 2023 - June 2025

Carnegie Observatories Postdoc Representative

- Liaison between postdocs and Observatories leadership responsible for organizing regular meetings with both groups, coordinating other postdoc roles, and organizing postdoc events
- Worked with staff to develop a new mentoring program for the postdocs to increase interaction with more staff members

Astronomy Community Service

NSF Review Panel

- Invited participant on NSF Merit Review Panel (specific program and dates of panel are confidential)
- Responsible for grading proposals, writing reviews, and making funding recommendations to program director

Science Organizing Committee Chair – 2025 LVM Science Workshop

- Organized scientific program and funding awards for travel

Time Allocation Committee – LVM Open Tile Call 2025

Manuscript Referee – AAS Journals

Outreach

2022-present

Carnegie Observatories Public Events

- Led various tours, talks, and demonstrations for school visits and Observatories Open House

April 2024

Perot Museum / Carnegie Science Eclipse partnership

- Traveled to Dallas for a week of eclipse related education leading up to the 2024 total solar eclipse
- Talked to hundreds of students at local schools and community members at museum events; gave a public talk on eclipse science; emceed an eclipse viewing event to guide safe viewing and provide scientific background in real time

2019-2022

Cosmic Tours Portable Planetarium co-coordinator

- Co-organized the UCSD OIR Lab's portable planetarium program, Cosmic Tours, bringing a ∼25ft diameter inflatable planetarium to K-12 schools and events in San Diego County to provide an exciting astronomy education experiencing
- Coordinated event requests and scheduling presenters, trained new volunteers, and organized team meetings in addition to giving planetarium shows
- Led the creation of a virtual planetarium program to provide an engaging learning experience for students during COVID-19

Presentations

Talks

September 29, 2025 — **Carnegie Science Day**
Studying Stellar Feedback with LVM

June 3, 2025 — **SDSS-V Collaboration Meeting**
Studying Stellar Feedback with LVM: SMC HII Region N66

May 6, 2025 — **Magellan Science Meeting**
The Magellan InfraRed Multi-Object Spectrograph (MIRMOS)

November 18, 2024 — **Carnegie Science Day**
Magellan InfraRed Multi-Object Spectrograph (MIRMOS)

October 23, 2024 — **New Young Researchers in Instrumentation for Astronomy**
A Novel Freeform Slicer IFU for the Magellan InfraRed Multi-Object Spectrograph (MIRMOS)

August 9, 2024 — **CASSI Research Talk Series**
Designing Instruments for the World's Largest Telescopes

June 5, 2024 — **SDSS-V Collaboration Meeting**
Invited Talk: The Local Volume Mapper (LVM) 101

April 7, 2024 — **Public Talk @ Marriot Dallas/Addison Quorum**
The Science of Eclipses

October 26, 2023 — **Surveying the Milky Way: The Universe in Our Own Backyard**
The SDSS-V Local Volume Mapper

July 17, 2023 — **New Views on Feedback and the Baryon Cycle**
Studying Kinematics and Feedback in Local Group H II *Regions*

June 29, 2023 — **CASSI Research Talk Series**
Combining Observations & Instrumentation

June 15, 2022 — **The 240th American Astronomical Society Meeting**
The Properties and Evolution of Star Forming Regions Over Cosmic Time

February 19, 2019 — **Lorentz Center Meeting: Formation of Stars and Massive Clusters in Dwarf Galaxies over Cosmic Time**
The Size-Luminosity Scaling Relations of Local and Distant Star Forming Regions

January 31, 2019 — **Extremely Big Eyes on the Early Universe, UCLA**
Shedding Light on the Size-Luminosity Scaling Relations of Local and Distant Star Forming Regions

January 7, 2019 — **The 233rd American Astronomical Society Meeting**
IC-10 3D: An IFS Survey of H II *Regions in Local Starburst Galaxy IC-10*

Posters

July 16-21, 2024 — **SPIE: Astronomical Telescopes + Instrumentation**
A novel freeform slicer IFU for the Magellan InfraRed Multi-Object Spectrograph (MIRMOS)

July 17-22, 2022 — **SPIE: Astronomical Telescopes + Instrumentation**
Liger at Keck Observatory: Imager Detector and IFS Pick-off Mirror Assembly

September 9-10, 2021 — **Keck Science Meeting**
Kinematics and Feedback of H II *Regions in the Dwarf Starburst IC 10*

December 14-18, 2020 — **SPIE: Astronomical Telescopes + Instrumentation**
Liger for Next Generation Keck AO: Filter Wheel and Pupil Design

September 24-25, 2020 — **Keck Science Meeting**
IC-10 3D: Properties of H II *regions in Nearby Starburst Galaxy IC-10*

September 20-21, 2019 — **Keck Science Meeting**
IC-10 3D: An IFS Survey of H II *Regions in Local Starburst Galaxy IC-10 with KCWI*

Presentations (continued)

June 11, 2018 — **SPIE: Astronomical Telescopes + Instrumentation**
Panoramic optical and near-infrared SETI instrument: prototype design and testing

First Author Publications

For a complete list see ADS

Journal Articles

1. **Cosens, M.**, Wright, S. A., Sandstrom, K., Armus, L., Murray, N., Runco, J. N., Sabhlok, S., & Wiley, J. (2024). Oxygen Abundance Throughout the Dwarf Starburst Galaxy IC 10. *AJ*, *168*(6), arXiv 2409.09020, 250. https://doi.org/10.3847/1538-3881/ad7f3c
2. **Cosens, M.**, Wright, S. A., Murray, N., Armus, L., Sandstrom, K., Do, T., Larson, K., Martinez, G., Sabhlok, S., Vayner, A., & Wiley, J. (2022). Kinematics and Feedback in H II Regions in the Dwarf Starburst Galaxy IC 10. *ApJ*, *929*(1), arXiv 2202.04098, 74. https://doi.org/10.3847/1538-4357/ac52f3
3. **Cosens, M.**, Wright, S. A., Mieda, E., Murray, N., Armus, L., Do, T., Larkin, J. E., Larson, K., Martinez, G., Walth, G., & Vayner, A. (2018). Size-Luminosity Scaling Relations of Local and Distant Star-forming Regions. *ApJ*, *869*(1), arXiv 1810.10494, 11. https://doi.org/10.3847/1538-4357/aaeb8f

Conference Proceedings

1. **Cosens, M.**, Konidaris, N. P., Rudie, G. C., Newman, A. B., Killion, G., Aslan, L., Barkhouser, R., Bianco, A., Birk, C., Brady, J., Frangiamore, M., Hare, T., Hope, S. C., Kelson, D. D., Lanz, A., Ramrez, S., Smee, S. A., Vanella, A., & Williams, J. E. (2024). A novel freeform slicer IFU for the Magellan Infrared Multi-Object Spectrograph (MIRMOS) (J. J. Bryant, K. Motohara, & J. R. D. Vernet, Eds.). In J. J. Bryant, K. Motohara, & J. R. D. Vernet (Eds.), *Ground-based and airborne instrumentation for astronomy x*. https://doi.org/10.1117/12.3019277
2. **Cosens, M.**, Wright, S. A., Brown, A., Fitzgerald, M., Johnson, C., Jones, T., Kassis, M., Kress, E., Kupke, R., Larkin, J. E., Magnone, K., McGurk, R., Rundquist, N.-E., Sohn, J. M., Wang, E., Wiley, J., & Yeh, S. (2022). Liger at Keck Observatory: image detector and IFS pick-off mirror assembly (C. J. Evans, J. J. Bryant, & K. Motohara, Eds.). In C. J. Evans, J. J. Bryant, & K. Motohara (Eds.), *Ground-based and airborne instrumentation for astronomy ix*. https://doi.org/10.1117/12.2630219
3. **Cosens, M.**, Wright, S. A., Arriaga, P., Brown, A., Fitzgerald, M., Jones, T., Kassis, M., Kress, E., Kupke, R., Larkin, J. E., Lyke, J., Wang, E., Wiley, J., & Yeh, S. (2020). Liger for next-generation Keck AO: filter wheel and pupil design (C. J. Evans, J. J. Bryant, & K. Motohara, Eds.). In C. J. Evans, J. J. Bryant, & K. Motohara (Eds.), *Ground-based and airborne instrumentation for astronomy viii*. https://doi.org/10.1117/12.2561837
4. **Cosens, M.**, Maire, J., Wright, S. A., Antonio, F., Aronson, M., Chaim-Weismann, S. A., Drake, F. D., Horowitz, P., Howard, A. W., Raffanti, R., Siemion, A. P. V., Stone, R. P. S., Treffers, R. R., Uttamchandani, A., & Werthimer, D. (2018). Panoramic optical and near-infrared SETI instrument: prototype design and testing (C. J. Evans, L. Simard, & H. Takami, Eds.). In C. J. Evans, L. Simard, & H. Takami (Eds.), *Ground-based and airborne instrumentation for astronomy vii*. https://doi.org/10.1117/12.2314252