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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*

Employment History

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

- **Instrument Scientist & Subsystem Lead** - Magellan Infrared Multi-Object Spectrograph (MIRMOS)
  - Performing simulations of instrument performance for design trade studies and requirements verification
  - Coordinating between science and technical teams to ensure design provides necessary performance to meet or exceed requirements
  - Leading development of slicer style integral field unit (IFU): performing optical design and analysis; coordinating vendor selection and contracts – including prototype units; coordinating mechanical engineering effort and system requirements; developing requirements and structure for necessary data reduction and analysis software
  - Leading development of independent atmospheric dispersion corrector (ADC): performing final optical design and analysis; coordinating vendor selection and contract for procurement of optics; coordinating engineering effort and system requirements
- **Working Group Chair** - Local Volume Mapper (SDSS-V)
  - Organized proposed early science targets for commissioning and demonstration of instrument performance
  - Led bi-weekly telecons to discuss and coordinate ongoing science projects and analysis tasks

Employment History (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 of the gaseous regions which have undergone recent star formation.
  - Reduced and analyzed observations using combination of public pipelines and packages and custom routines (primarily Python based, secondarily IDL)
  - Studied the ionization states and kinematics of these regions, the impact of star formation on the host galaxy, and the evolution of star forming regions over time. (see Publications 1, 9)
- ***Liger* Imager and IFS**
  - Completed preliminary design of the filter wheels, pupil wheel, and detector focus stage with associated stress and deflection analysis, and obtained preliminary quotes. Final design in progress.
  - Coordinated with team members in other specialties (e.g, optical design, electrical) to ensure requirements 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

Fall 2016, Winter 2019 — **Teaching Assistant** Physics Department, University of California, San Diego

- Physics 1BL: Electricity and Magnetism Laboratory
- Physics 163: Galaxies and Quasars

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 using and modifying a series of IDL scripts to fit a range of AGN spectra as well as direct mentoring of new students.
  - Participated in observations with the Lick 3-m Shane telescope as part of a long-term reverberation mapping campaign (LAMP)

Employment History (continued)

Fall 2013 — **Teaching Assistant** Department of Chemistry and Biochemistry, California Polytechnic State University, San Luis Obispo

- CHEM 124: General Chemistry for Physical Science and Engineering

Skills

Programming	Python (incl. pandas, astropy, MCMC with PyStan, multiprocessing), IDL, MATLAB, LaTeX, git (GitHub, Bitbucket)
3D Modeling	SolidWorks (incl. PDM & PhotoView360)
Optical Design	Zemax OpticsStudio
Web Dev	HTML, CSS
Misc.	Academic research, teaching, team management, science and technical writing

Miscellaneous Experience

Awards and Fellowships

September 2022 - **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

Mentoring

July 2024-present — **Astronomy Mentoring Program for Upcoming Postdocs (AMP-UP)**

- Mentoring 2 graduate students to help them navigate the postdoctoral fellowship application process
- The program aims to increase the availability of this kind of mentoring beyond the institutions which already host a significant number of fellows

May/June 2023 — **Advancing Inclusive Mentoring Program**

- Completed the Advancing Inclusive Mentoring Program. This research mentor training program provides 12+ hours of content and discussion about positive and inclusive mentoring practices.

Miscellaneous Experience (continued)

Summer 2023/2024

Carnegie Astrophysics Summer Student Internship (CASSI)

- Taught workshops on programming with Python, data visualization, scientific writing, and applying to graduate school for student interns (2023/2024)
- Worked with a summer intern on a project to determine the mechanical precision required to position key optical components of MIRMOS (2023)

Department Service

August 2023 - present

Carnegie Observatories Lunch Seminar Committee

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

September 2023 - present

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

Astronomy Community Service

NSF Review Panel

- Invited participant on NSF Merit Review Panel (specific program and dates of panel are confidential)

Manuscript Referee – AAS Journals

Outreach

April 2024

Perot Museum / Carnegie Science Eclipse partnership

- Travelled 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

Miscellaneous Experience (continued)

2019-2022 **Cosmic Tours 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

2021 **AstroTech Instructor**

- Co-developed and lead 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

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

Presentations

Talks

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

June 5, 2024 **SDSS-V Collaboration Meeting**
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, Healesville, Australia**
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

Presentations (continued)

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, 2022 — **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*

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

First Author Publications

Complete list available on 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, accepted*. https://doi.org/10.48550/arXiv.2409.09020

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., Ramirez, S., Smee, S. A., Vanella, A., & Williams, J. E. (2024). A novel freeform slicer IFU for the Magellan Infrared Multi-Object Spectrograph (MIRMOS), In *Ground-based and airborne instrumentation for astronomy x*, SPIE. 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, In *Ground-based and airborne instrumentation for astronomy ix*, SPIE.
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, In *Ground-based and airborne instrumentation for astronomy viii*, SPIE.
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., Uttamchand ani, A., & Werthimer, D. (2018). Panoramic optical and near-infrared SETI instrument: prototype design and testing, In *Ground-based and airborne instrumentation for astronomy vii*, SPIE.
https://doi.org/10.1117/12.2314252