Maren C. Cosens, PhD

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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** - 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
- **Integral Field Unit (IFU) Lead** - MIRMOS
  - Completed preliminary design of slicer IFU optics
  - Began coordination with vendors for final design of IFU optics and housing
- **Working Group Chair** - Local Volume Mapper (SDSS-V)
  - Organized proposed early science targets for commissioning and demonstration of instrument performance

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

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.

Summer 2023 — **Carnegie Astrophysics Summer Student Internship (CASSI)**

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

Department Service

August 2023 - **Carnegie Lunch Seminar Committee**

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

Miscellaneous Experience (continued)

September 2023 - **Postdoc Representative**

Outreach

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

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

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

Presentations (continued)

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 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

Research Publications

Journal Articles

1. **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

2. Vayner, A., Zakamska, N. L., Riffel, R. A., Alexandroff, R., **Cosens**, **M.**, Hamann, F., Perrotta, S., Rupke, D. S. N., Bergmann, T. S., Veilleux, S., Walth, G., Wright, S., & Wylezalek, D. (2021). Powerful winds in high-redshift obscured and red quasars. *MNRAS*, *504*(3), arXiv 2101.04688, 4445–4459. https://doi.org/10.1093/mnras/stab1176

3. Vayner, A., Wright, S. A., Murray, N., Armus, L., Boehle, A., **Cosens**, **M.**, Larkin, J. E., Mieda, E., & Walth, G. (2021). A Spatially Resolved Survey of Distant Quasar Host Galaxies. II. Photoionization and Kinematics of the ISM. *ApJ*, *910*(1), arXiv 2101.08291, 44. https://doi.org/10.3847/1538-4357/abddc1

4. Lockhart, K. E., Do, T., Larkin, J. E., Boehle, A., Campbell, R. D., Chappell, S., Chu, D., Ciurlo, A., **Cosens**, **M.**, Fitzgerald, M. P., Ghez, A., Lu, J. R., Lyke, J. E., Mieda, E., Rudy, A. R., Vayner, A., Walth, G., & Wright, S. A. (2019). Characterizing and Improving the Data Reduction Pipeline for the Keck OSIRIS Integral Field Spectrograph. *AJ*, *157*(2), arXiv 1812.02053, 75. https://doi.org/10.3847/1538-3881/aaf64e

5. **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

6. Bennert, V. N., Loveland, D., Donohue, E., **Cosens**, **M.**, Lewis, S., Komossa, S., Treu, T., Malkan, M. A., Milgram, N., Flatland, K., Auger, M. W., Park, D., & Lazarova, M. S. (2018). Studying the [O III]λ5007 Å emission-line width in a sample of 80 local active galaxies: a surrogate for σ. *MNRAS*, *481*(1), arXiv 1808.04821, 138–152. https://doi.org/10.1093/mnras/sty2236

7. Zheng, W., Filippenko, A. V., Mauerhan, J., Graham, M. L., Yuk, H., Hosseinzadeh, G., Silverman, J. M., Rui, L., Arbour, R., Foley, R. J., Abolfathi, B., Abramson, L. E., Arcavi, I., Barth, A. J., Bennert, V. N., Brandel, A. P., Cooper, M. C., **Cosens**, **M.**, Fillingham, S. P., … Wang, X. (2017). Discovery and

Follow-up Observations of the Young Type Ia Supernova 2016coj. *ApJ*, *841*arXiv 1611.09438, 64. https://doi.org/10.3847/1538-4357/aa6dfa

8. Runco, J. N., **Cosens**, **M.**, Bennert, V. N., Scott, B., Komossa, S., Malkan, M. A., Lazarova, M. S., Auger, M. W., Treu, T., & Park, D. (2016). Broad Hβ Emission-line Variability in a Sample of 102 Local Active Galaxies. *ApJ*, *821*arXiv 1603.00035, 33. https://doi.org/10.3847/0004-637X/821/1/33

9. Bennert, V. N., Treu, T., Auger, M. W., **Cosens**, **M.**, Park, D., Rosen, R., Harris, C. E., Malkan, M. A., & Woo, J.-H. (2015). A Local Baseline of the Black Hole Mass Scaling Relations for Active Galaxies. III.The M_{BH} - σ Relation. *ApJ*, *809*arXiv 1409.4428, 20. https://doi.org/10.1088/0004-637X/809/1/20

Conference Proceedings

1. **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: Imager Detector and IFS Pick-off Mirror Assembly, In *Proceedings of the SPIE*.

2. Walth, G., Surya, A., Rundquist, N.-E., Wright, S. A., **Cosens**, **M.**, Vayner, A., Oh, E., Llamas, J. A., Skidmore, W., Chisholm, E. M., & Larkin, J. E. (2021). The Infrared Imaging Spectrograph (IRIS) for TMT: exposure time calculator for IRIS, In *Proceedings of the SPIE*. https://doi.org/10.1117/12.2563029

3. Brown, A. M., Aronson, M. L., Wright, S. A., Maire, J., **Cosens**, **M.**, Wiley, J. H., Antonio, F., Horowitz, P., Raffanti, R., Werthimer, D., & Wei, L. (2020). Panoramic SETI: Overall mechanical system design, In *Proceedings of the SPIE*. https://doi.org/10.1117/12.2562985

4. **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 *Proceedings of the SPIE*. https://doi.org/10.1117/12.2561837

5. Wiley, J., Mathur, K., Brown, A., Wright, S., **Cosens**, **M.**, Maire, J., Fitzgerald, M., Jones, T., Kassis, M., Kress, E., Kupke, R., Larkin, J. E., Lyke, J., Wang, E., & Yeh, S. (2020). Liger for next-generation Keck adaptive optics: opto-mechanical dewar for imaging camera and slicer, In *Proceedings of the SPIE*. https://doi.org/10.1117/12.2563028

6. Li, S., Maire, J., **Cosens**, **M.**, & Wright, S. A. (2019). Detector characterization of a near-infrared discrete avalanche photodiode 5×5 array for astrophysical observations, In *Proceedings of the SPIE*. https://doi.org/10.1117/12.2519207

7. **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 *Proceedings of the SPIE*. https://doi.org/10.1117/12.2314252

8. Maire, J., Wright, S. A., **Cosens**, **M.**, Antonio, F. P., Aronson, M. L., Chaim-Weismann, S. A., Drake, F. D., Horowitz, P., Howard, A. W., Marcy, G. 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: optical and structural design concepts, In *Proceedings of the SPIE*. https://doi.org/10.1117/12.2314444

9. Wright, S. A., Horowitz, P., Maire, J., Werthimer, D., Antonio, F., Aronson, M., Chaim-Weismann, S., **Cosens**, **M.**, Drake, F. D., Howard, A. W., Marcy, G. W., Raffanti, R., Siemion, A. P. V., Stone, R. P. S., Treffers, R. R., & Uttamchandani, A. (2018). Panoramic optical and near-infrared SETI instrument: overall specifications and science program, In *Proceedings of the SPIE*. https://doi.org/10.1117/12.2314268