Sabrina Lyn Cales

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Current Position

Yale University: Joint Yale University - Universidad de Concepcion ALMA Postdoctoral Fellow — 2014-*Current*

Project: *Caught in a Cosmic Tango: ALMA Spies the Interplay Between Dual AGN in Merger Remnant Galaxies*

Mentors: Meg Urry, Ezequiel Treister

Education

Ph.D. Physics, University of Wyoming — August 2012
Thesis: *Understanding Post-starburst Quasars*
Advisor: Professor Mike Brotherton

M.S. Physics, University of Wyoming — May 2011

B.A. Physics with Math Minor, University of California at Riverside — June 2005
Thesis: *Luminosity Distribution for Broad Absorption Line QSOs*
Advisor: Gabriela Canalizo

Science Interests

AGN environments, AGN host galaxies, Merger driven black hole and galaxy growth, Stochastic black hole accretion

Honors and Awards

Joint Yale University – Universidad de Concepcion ALMA Postdoctoral Fellowship — 2012-2015

NSF GK-12 Graduate Education Fellowship, *$60,000* — 2007-2008, 2011-2012

NASA Earth and Space Science Fellowship, *$90,000* — 2008-2011

Summer Research Experience for Winston-Salem State University Students, Mentor, *$2,500* — 2011

Dean's Fellow Summer Internship, University of California at Riverside, *$3,000* — 2004

Publications and Talks

- Three papers as main author in refereed journals, two papers submitted, two manuscripts.
- Fourteen papers in refereed journals, three papers submitted to MNRAS, one paper submitted to ApJ.
- A full publication list is attached.
- Seven invited talks and seminars.

Memberships

American Astronomical Society, Full Member

Research Experience

University of Wyoming, NASA Earth and Space Science Fellow and Research Assistant — 2005-2012

University of California at Riverside, Undergraduate Researcher — 2004

Observing Experience and Recent Proposals

Atacama Large Millimeter/submillimeter Array (ALMA), *Chile* — 5 hours
- Title: *Caught in a Cosmic Tango: ALMA Spies the Interplay Between Dual AGN in Merger Remnant Galaxies*
- Role: Technical Lead

European Southern Observatory, Very Large Telescope, *Chile* — 16 hours
- Title: *Evolution of the Stars and the Interstellar Medium in Confirmed Dual AGN*
- Role: Principal Investigator

Gemini Observatory, *Chile* — 20 hours
- Title: *Rest-Frame Optical Properties of a Complete Sample of Luminous Quasars: Correcting Mass Biases*
- Role: Principal Investigator

Magellan Baade at Las Campanas, *Chile* — 9 nights
- Title: *Between Active Galactic Nuclei and their Host Galaxies: A Magellan/IMACS-IFU Pilot Study*
- Role: Principal Investigator

- Title: *Caught in a Cosmic Tango: A Magellan IMACS-IFU Study of Dual Active Galactic Nuclei*
- Role: Principal Investigator

- Title: *Significantly Improving Black Hole Mass Estimates for High-Redshift Quasars*
- Role: Principal Investigator

- Title: *The $M_{BH} - \sigma_*$ Relation: Black Hole Masses of NLS1s from 0.2 < z < 0.4*
- Role: Observer

Cerro Tololo Inter-American Observatory, *Chile* — 6 nights
- Title: *Local Volume Legacy Optical Data Project*
- Role: Principal Investigator

Kitt Peak National Observatory, *Arizona* — 4 nights
- Title: *Characterizing the Post-Starburst Quasar Population and their Companion*
- Role: Observations

Infrared Telescope Facility, *Hawaii* — 3 nights
- Title: *Near-Infrared Imaging of Post-Starburst Quasars: Host Galaxies and Interactions*
- Role: Observations

Teaching Experience

NSF GK-12 Science Education Fellow, *University of Wyoming* — 2007-2008, 2011-2012
- Duties: Science, technology, engineering and mathematics curriculum developments, implementation and administration throughout Wyoming GK-12 classrooms.

Adjunct Faculty: Intermediate Algebra, *Laramie County Community College* — 2010
- Duties: Prepared syllabus, lecture, wrote/gave exams, held in-class study sessions, maintained online course management platform.

Tutor: Physics at Night, *University of Wyoming* — 2005-2012
- Duties: Advised physics students in problem setup, mathematical concepts and conceptual visualization.

Instructor: Survey of Astronomy, *University of Wyoming* — 2009
- Duties: Developed curriculum for lecture/lab, held office hours, maintain online platform for course administration/curriculum management.

Languages and Computer Experience

Spoken: Spanish, immersion proficiency

Software: Minitab, IRAF (CL scripting), TeX/LaTeX.

Programming: Python, R, SQL, IDL, Cl scripting (IRAF), C++, Fortran, PERL, HTML, Shell scripting, Supermongo

Research Talks and Colloquia

The Pennsylvania State University, Astronomy Lunch 2014
Title: *Understanding Post-starburst Quasars*

Harvard-Smithsonian Center for Astrophysics: NERQUAM Meeting, 2014
Title: *Caught in a Cosmic Tango: Merger Triggered Supermassive Black Hole Activity*

Yale University, Yale Center for Astronomy and Astrophysics: YODA Lunch Talk, 2014
Title: *Caught in a Cosmic Tango: Merger Triggered Supermassive Black Hole Activity*

Termas del Corazon, Chile: SOCHIAS Meeting, 2014
Title: *Quasar Host Galaxies that Harbor Post-Starburst Stellar Populations*

Washington DC: 223rd AAS Meeting, 2014
Title: *The Role AGN Play in the Evolution of Quasars Host Galaxies with Spectral Signatures of Post-Starburst Stellar Populations*

Santa Cruz, Chile: EMBIGGEN Meeting, 2013
Title: *Caught in a Cosmic Tango: Merger Triggered Supermassive Black Holes Activity*

University of Concepcion: Astro Pizza Lunch, 2012
Title: *Understanding Post-starburst Quasars*

University of Wyoming: Prospective Students Research Talk, 2005-2012
Title: *Studying the Phenomenon of Post-Starburst Quasars and Galaxy Evolution: Perfectly Quaint or Primarily Quotidian?*

Workshops and Other Training

Software Carpentry Bootcamp, *Yale University* 2014

Atacama Large Millimeter/submillimeter Array (*ALMA*) Data Reduction Workshop, *Universidad de Católica* 2012

E-volution Workshop: Innovations in Learning Environments, *University of Wyoming* 2011

Science Posse Teacher Workshop, *University of Wyoming* 2008, 2011

Spitzer Space Telescope Data Reduction Workshop, *Caltech* 2008

Summer School in Statistics for Astronomers, *The Penn State University* 2007

Students

Field Rogers, Undergraduate, *Yale University* 2014
Project: *Full Spectral Modeling of the Neighbors of Post-Starburst Quasars*
Role: Mentor

Paula Calderon, PhD Student, *Universidad de Concepcion* 2013-Current
Project: *Galaxy Zoo Mergers*
Role: Coadvised with Ezequiel Treister

Scarlet Saez, Master's Student, *Universidad de Concepcion* 2013-2014
Project: *Stellar Population Ages of X-ray Selected AGN*
Role: Coadvised with Ezequiel Treister

Alicia McClain, Undergraduate, *University of Wyoming-Wyoming Space Grant* 2009
Project: *Spectral Energy Distributions of Post-Starburst Quasars*
Role: Mentor

Outreach Events

- Over 50 classroom and outreach events reaching 1,613 students and participants.
- Developed and implemented inquiry-based curriculum and labs for K-12 students as an NSF GK-12 Graduate Science Education Fellow (Science Posse) for school visits and summer camps.
- Extensive experience at the K-12 level, coordinating and delivering interdisciplinary STEM labs and curriculum in a collaborative setting (Astrocamp, Women in Science conferences, Science Fair, and Science Posse activities).
- Administrative experience at Science Posse Teacher Workshops, bringing new STEM teaching approaches and techniques to K-12 teachers.
- Knowledge of current science education research and program assessment practices.

Conferences/Workshops Implemented and Coordinated

Yale Center for Astronomy and Astrophysics Undergraduate Student Research Bootcamp, *Yale University* 2014

Teton Science Summer Camp Science Posse Student Workshop, *Teton Science School, Wyoming* 2011

India Science Posse Student Workshop, *Tibetan-in-Exile Communities, India* 2008

Science Posse Student Workshop, *University of Wyoming* 2008

Refereed Publications

Main Author

1. "Post-Starburst Quasars: Bridging the Gap Between Post-Starburst Galaxies and Quasars", **Sabrina L. Cales**; Michael S. Brotherton; 2015, MNRAS, revision post minor comments
2. "The Discovery of the First "Changing Look" Quasar: New Insights into the Physics & Phenomenology of AGN", Stephanie M. LaMassa, **Sabrina L. Cales**, Edward C. Moran, Adam Myers, Michael Eracleous, Timothy M. Heckman, Luigi Gallo, C. Megan Urry, 2014arXiv1412.2136L
3. "Catching Quenching Galaxies: The Nature of the WISE Infrared Transition Zone", Alatalo, Katherine; **Sabrina L. Cales**; Philip Appleton; Lisa Kewley; Mark Lacy; Ute Lisenfeld; Kristina Nyland; Jeffrey A. Rich; et al. 2014, ApJL, 794, 13
4. "The Properties of Post-starburst Quasars Based on Optical Spectroscopy", **Cales, Sabrina L.**; Brotherton, Michael S.; Shang, Zhaohui; Runnoe, Jessie C.; DiPompeo, Michael A.; Bennert, Vardha Nicola; Canalizo, Gabriela; Hiner, Kyle D.; Stoll, R.; Ganguly, Rajib; Diamond-Stanic, Aleksandar, 2013, ApJ, 762, 90
5. "Hubble Space Telescope Imaging of 29 Post-Starburst Quasars", **Cales, S. L.**; Brotherton, M. S.; Shang, Zhaohui; Bennert, Vardha Nicola; Canalizo, G.; Stoll, R.; Ganguly, R.; Vanden Berk, D.; Paul, C.; Diamond-Stanic, A. 2011, ApJ, 741, 106

Contributing Author

1. "P-MaNGA Galaxies: Emission Lines Properties - Gas Ionisation and Chemical Abundances from prototype observations", F. Belfiore; R. Maiolino; M. Bershady; G. Blanc; M. Bothwell; K. Bundy; **S. L. Cales**; et al. 2014, MNRAS, 2014arXiv1410.7781B
2. "P-MaNGA: Full spectral fitting and stellar population maps from prototype observations", David M. Wilkinson; Claudia Maraston; Daniel Thomas; Lodovico Coccato; Rita Tojeiro; Michele Cappellari; Francesco Belfiore; Matthew Bershady; Mike Blanton; Kevin Bundy; Brian Cherinka; **Sabrina Cales**; et al. 2014, MNRAS, submitted
3. "MaNGA Prototype Data Analysis: Gradients in recent star formation histories as diagnostics for galaxy growth and death", Cheng Li; Enci Wang; Lin Lin; Matthew A. Bershady; Kevin Bundy; Christy A. Tremonti; Ting Xiao; Renbin Yan; Dmitry Bizyaev; Michael Blanton; **Sabrina Cales**; et al. 2014, MNRAS, submitted
4. "Suppression of Star Formation in NGC 1266", Alatalo, K.; Lacy, M.; Lanz, L.; Bitsakis, T.; Appleton, P. N.; Nyland, K.; **Cales, S. L.**; et al. 2014, 2014arXiv1410.4556A, accepted to ApJ
5. "Future mmVLBI Research with ALMA: A European vision", Tilanus, R. P. J.; and 158 coauthors including **Cales, S. L.,** 2014arXiv1406.4650T
6. "NGC 1266 as a Local Candidate for Rapid Cessation of Star Formation", Alatalo, Katherine; Nyland, Kristina; Graves, Genevieve; Deustua, Susana and **Cales, Sabrina L.;** et al., 2014, ApJ, 780, 186

7. "Mid-infrared Spectral Properties of Post-starburst Quasars", Wei, Peng; Shang, Zhaohui; Brotherton, Michael S.; **Cales, Sabrina L.**; Hines, Dean C.; Dale, Daniel A.; Ganguly, Rajib; Canalizo, Gabriela, 2013, ApJ, 772, 28
8. "The rest-frame ultraviolet properties of radio-loud broad absorption line quasars", DiPompeo, M. A.; Brotherton, M. S.; **Cales, S. L.**; Runnoe, J. C. 2012, MNRAS, 427, 1135
9. "Black-hole-Bulge Relationship of Post-starburst Quasars at z ~ 0.3", Hiner, Kyle D.; Canalizo, Gabriela; Wold, Margrethe; Brotherton, Michael S.; **Cales, Sabrina L.** 2012, ApJ, 756, 162
10. "The Next Generation Atlas of Quasar Spectral Energy Distributions from Radio to X-Rays", Shang, Zhaohui; Brotherton, Michael S.; Wills, Beverley J.; Wills, D.; **Cales, Sabrina L.**; Dale, Daniel A.; Green, Richard F.; Runnoe, Jessie C.; Nemmen, Rodrigo S.; Gallagher, Sarah C.; Ganguly, Rajib; Hines, Dean C.; Kelly, Benjamin J.; Kriss, Gerard A.; Li, Jun; Tang, Baitian; Xie, Yanxia, 2011, ApJS, 196, 2
11. "The Connection Between a Lyman Limit System, a Very Strong O VI Absorber, and Galaxies at z ~ 0.203", Lehner, N.; Prochaska, J. X.; Kobulnicky, H. A.; Cooksey, K. L.; Howk, J. C.; Williger, G. M.; **Cales, S. L.**, 2009, ApJ, 694, 734
12. "Quasar Outflows and Physical Properties", Ganguly, Rajib; Brotherton, Michael S.; **Cales, Sabrina**; Scoggins, Brian; Shang, Zhaohui; Vestergaard, Marianne, 2007, ApJ, 665, 990, "Quasar Outflows and Physical Properties"

Abstracts

Sloan Digital Sky Survey III/IV Collaborator Meeting, Poster, *Park City, Utah* 2014

Poster Title: *The Properties of Post-Starburst Quasars Based on Optical Spectroscopy*

NERQUAM Meeting, Talk, *Harvard-Smithsonian Center for Astrophysics* 2014

Talk Title: *Caught in a Cosmic Tango: Merger Triggered Supermassive Black Hole Activity*

SOCHIAS Chilean National Astronomy Conference, Talk, *Termas de Corazon, Chile* 2014

Talk Title: *Quasar Host Galaxies that Harbor Post-Starburst Stellar Populations*

AAS 223st Meeting, Talk, *Washington D.C* 2014

Talk Title: *The Role AGN Play in the Evolution of Quasars Host Galaxies with Spectral Signatures of Post-Starburst Stellar Populations*

EMBIGGEN Anillo Group Meeting, Talk, *Santa Cruz, Chile* 2013

Talk Title: *Caught in a Cosmic Tango: Merger Triggered Supermassive Black Holes Activity*

KITP Conference: Massive Black Holes, Poster, *Santa Barbara, CA* 2013

Poster Title: *The Properties of Post-Starburst Quasars Based on Optical Spectroscopy*

The First Year of ALMA Science, Poster, *Puerto Varas, Chile* 2012

Poster Title: *The Properties of Post-Starburst Quasars Based on Optical Spectroscopy*

AAS 213th Meeting, Poster, *Long Beach, CA* 2009

Poster Title: *HST/ACS Snapshot Imaging of 29 Post-Starburst Quasars*

AAS 210th Meeting, Poster, *Hilo, Hi* 2007

Poster Title: *The Environments of Post-Starburst Quasars*

AAS 205th Meeting, Poster, *San Diego, CA* 2004

Poster Title: *Luminosity Distribution for Broad Absorption Line QSOs*

References

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