

Andrey Vayner

Center for Astrophysics and Space Sciences
University of California, San Diego
9500 Gilman Dr, La Jolla, CA 92093
Citizenship: Canadian
Email: avayner [at] ucsd.edu

RESEARCH INTERESTS High-Redshift Universe, Galaxy Formation & Evolution, Active Galactic Nuclei (AGN), Quasars, AGN Feedback, Adaptive Optics, High Contrast Imaging, Radio Interferometry.

EDUCATION Ph.D. Physics, 2015-present (expected completion: Summer 2019)
Advisor: Shelley A. Wright
Thesis: Quasar hosts unveiled by high angular resolution techniques
University of California, San Diego

M.Sc. Astronomy & Astrophysics, 2013-2015
Advisors: Paola Rodriguez-Hidalgo, Shelley A. Wright
Research projects: 1) Constraining the Causes of Dramatic Variability in Newly Emerged Quasar Outflows & 2) Multi-Wavelength Observations of Radio Loud AGN
University of Toronto, Ontario, Canada

H.B.Sc. high distinction Physics & Astronomy w/ Minor in Mathematics, 2009-2013
Advisor: Shelley A. Wright
Thesis: "Resolving Host Galaxies of $z \sim 2$ Quasars using Adaptive Optics and Integral Field Spectroscopy"
University of Toronto, Ontario, Canada

HONORS AND AWARDS The Royal Astronomical Society of Canada Gold Medal, 2013
Dunlap Institute for Astronomy & Astrophysics Graduate Student Scholarship, 2013
Professor C.A Chant Scholarship for Astronomy, 2012
Natural Science and Engineering Research Council of Canada (NSERC) Undergraduate Student Research Award, 2012

RESEARCH EXPERIENCE *Graduate Student Researcher* 2015-Present
Department of Physics, UC San Diego

- Using laser guide star adaptive optics observation in combination with integral field spectroscopy to resolve host galaxies of distant quasars, to study the co-evolution of supermassive black holes and the galaxies that harbour them.
- Constraining molecular gas reservoirs of distant quasar host galaxies through CO spectroscopy with Atacama Large Millimeter/Submillimeter Array (ALMA)

Graduate Student Researcher 2012-2015
Department of Astronomy & Astrophysics, University of Toronto

- Using high-resolution optical spectroscopy of high-redshifts quasars to monitor the origin and evolution of winds from the vicinity of the black hole.
- Multiwavelength observations of radio-loud quasars with VLA, HST, Chandra, Herschel, SDSS. Constructing sample for follow up observations with laser guide

star adaptive optics and integral field spectroscopy.

Summer undergraduate research assistant Summers 2012-2013
Dunlap Institute for Astronomy and Astrophysics, University of Toronto

- Resolving Host Galaxies of $z \sim 2$ Quasars using Adaptive Optics and Integral Field Spectroscopy
- Reduced and analyzed data from the Keck & Gemini telescopes. Wrote routines for PSF subtraction to disentangle the bright unresolved quasar emission from the faint underlying host galaxy.

**REFEREED
PUBLICATIONS**

Lockhart, K. E. and Do, T. and Larkin, J. E. and Boehle, A. and Campbell, R. D. and Chappell, S. and Chu, D. and Ciurlo, A. and Cosens, M. and Fitzgerald, M. P. and Ghez, A. and Lu, J. R. and Lyke, J. E. and Mieda, E. and Rudy, A. R. and **Vayner, A.** and Walth, G. and Wright, S. A. “*Characterizing and Improving the Data Reduction Pipeline for the Keck OSIRIS Integral Field Spectrograph*”, 2018, AJ, accepted, arXiv: 1812.02053

Cosens, M. Wright, S. A., Mieda, E., Murray, N., Armus, L., Do, T., Larkin, J. E., Larson, K., Martinez, G., Walth, G., **Vayner, A.** “*Size-Luminosity Scaling Relations of Local and Distant Star Forming Regions*”, 2018, ApJ, 869, 11

Vayner, A., Wright, S. A., Murray, N., Armus, L., Larkin, J. E., Mieda, E. “*Galactic Scale Feedback Observed in the 3C 298 Quasar Host Galaxy*”, 2017, ApJ, 851, 126

Vayner, A., Wright, S. A., Do, T., Larkin, J., Armus, L., Gallagher, S. C. “*Providing stringent star formation rate limits of $z \sim 2$ QSO host galaxies at high angular resolution*”, 2016, ApJ, 821, 64

**NON-
REFEREED
PUBLICATIONS**

Ragland, S., Dupuy, T. J., Jolissaint, L., Wizinowich, P. L., Lu, J. R., van Dam, M. A., Berriman, G. B., Best, W., Gelino, C. R., Ghez, A. M., Liu, M. C., Mader, J. A., **Vayner A.**, Witzel, G., Wright, S. A. “*Status of point spread function determination for Keck adaptive optics*”, 2018, SPIE, 10703, 13

Vayner, A., Wright, S., Murray, N. W., Armus, L., Larkin, J. E. “*QUART: Quasar hosts Unveiled by high Angular Resolution Techniques*”, 2016, American Astronomical Society 228th Meeting, 400.02

Vayner, A., Wright, S., Do, T., & Larkin, J.E. “*Resolving Host Galaxies of $z=2$ Quasars Using Adaptive Optics and Integral Field Spectroscopy*”, poster, 2013, American Astronomical Society 221st Meeting, 339.30

**TEACHING &
PUBLIC
OUTREACH**

University of California, San Diego
Teaching Assistant PHYS 164: Observational Astrophysics Winter 2017, 2018
Leading tutorials, marking, telescope observing sessions Fall 2018

Professional Development Program, UC Santa Cruz Winter-Spring 2017

As part of the Professional Development Program, I attended the Institute for Scientist & Engineer Educators (ISEE) inquiry and design institute, where I led a team to design an inquiry-based activity for summer undergraduate researchers. Students focused on the STEM practice of designing and carrying out investigations. The content of the two-day activity focused on statistics and signal to noise ratio calculation with an introduction to future astronomical observatories.

University of Toronto

Teaching Assistant AST101: The Sun and its Neighbours Fall 2013-2015
Leading tutorials, planetarium operator & marking

Teaching Assistant AST201: Stars and Galaxies Winter 2014
Leading tutorials, planetarium operator & marking

Teaching Assistant PMU199: Great Astronomical Issues Winter 2015
Assisting students with astronomical observations using remote telescopes

Free Monthly Astronomy Public Tours 2013-2015
Media Relations Director: overlook monthly advertisements, prepare posters and website graphics, communicate with advertisers and send monthly newsletters to the public.

Free Monthly Astronomy Public Tours 2012-2013
Telescope operator: 8", 10" and 16" telescope guide for public observing.

Sidewalk Astronomy Summers 2013 and 2014
Assisted in operating solar telescopes for observing sessions once a week during lunch hour in downtown Toronto.

Physics undergraduate mentoring program 2013-2014
Mentored senior undergraduate physics & astronomy student

Astronomy graduate student mentorship program 2015-2016
Organized and ran mentorship program for incoming astronomy graduate students

Successful Telescope Proposals

Atacama Large Millimeter/Submillimeter Array (ALMA), PI, Cycle 2
60.88 minutes observed - *Probing The Star Burst Phase of Quasar Host Galaxies*

Atacama Large Millimeter/Submillimeter Array (ALMA), PI, Cycle 3
79 minutes observed - *Unique high resolution & multi-wavelength study of a $z=1.4$ quasar host galaxy*

Atacama Large Millimeter/Submillimeter Array (ALMA), PI, Cycle 5
Approved for 18 hours (Grade B) - *Searching for feedback with 3D multi-phase interstellar medium study in $z\sim 2$ quasar host galaxies*

W.M Keck Observatory (OSIRIS-LGS), CoI, 2015-2017
9.5 nights total - *Resolving Star Formation and Nebular Line Ratios in Host Galaxies of High-Redshift Quasars*

W.M Keck Observatory (KCWI), CoI, 2017-2018
4.5 night - *Resolving distant quasar host galaxies and their environments*

Observing Experience

W.M Keck Observatory:
Keck I (OSIRIS-LGS/NGS): 15.5 nights
Keck II (NIRC2-LGS/NGS): 2.5 nights
Keck II (KCWI): 6 nights

Lick Observatory:
Nickel: 2 nights

**Data Experience
& Skills**

Instrument Data reduction & Analysis:

W.M Keck Observatory: OSIRIS, NIRC2, LRIS, KCWI

Gemini: NIFS

ALMA: Experience reducing mm interferometric data with CASA

Chandra Space Observatory: CIAO, ChaRT, MARX

Extensive analysis of optical and near-infrared spectroscopic data. Experience with mid/far-infrared photometry and SEDs

Languages & Software:

Python, IDL, LaTeX

Working Groups:

Member, OSIRIS data reduction pipeline team

2014-present

Member, Keck PSF-R commissioning science team

2016-present

**SEMINARS &
INVITED TALKS**

UC Irvine, Astronomy Seminar, October 2018, Irvine, California, "*Quasar host galaxies and their environments with multi-wavelength 3D spectroscopy*"

Carnegie Observatories, Lunch Talk, October 2018, Pasadena, California, "*Quasar host galaxies and their environments with multi-wavelength 3D spectroscopy*"

UC Berkeley, Lunch Talk, October 2018, Berkeley, California, "*Quasar hosts Unveiled by high Angular Resolution Techniques*"

UC Los Angeles, Astronomy Seminar, November 2017, Los Angeles, California, "*Quasar hosts Unveiled by high Angular Resolution Techniques*"

California Institute of Technology Astronomy Tea Talk, November 2017, Pasadena, California, "*Quasar hosts Unveiled by high Angular Resolution Techniques*"

**CONFERENCE
TALKS AND
POSTERS**

Talk, Center for Adaptive Optics Fall Retreat, November 2018, Lake Arrowhead, California, "*Challenges for flux calibrating AO-assisted integral field spectroscopy observations*"

Poster, Keck Science Meeting, 2018, Caltech, California, "*OSIRIS and KCWI reveal feeding and feedback in distant Quasar Host Galaxies*"

Talk, Center for Adaptive Optics Fall Retreat, October 2017, Lake Arrowhead, California, "*Quasar host galaxies and point spread function reconstruction*"

Talk, Keck Science Meeting, 2017, Santa Cruz, California, "*Quasar hosts Unveiled by high Angular Resolution Techniques (QUART)*"

Poster, Keck Science Meeting, 2016, Caltech, California, "*Resolving distant quasar host galaxies with high angular resolution techniques*"

Poster, Mapping the Pathways of Galaxy Transformation Across Time and Space, 2016, Catalina Island, California, "*Resolving distant quasar host galaxies with high angular resolution techniques*"

Talk, American Astronomical Society 228th Meeting, 2016, San Diego, California, "*QUART: Quasar hosts Unveiled by high Angular Resolution Techniques*"

Poster, Powerful AGN conference, 2014, Port Douglas, Queensland, Australia, "*Pro-*

viding stringent star formation rate limits of $z \sim 2$ QSO host galaxies at high angular resolution”

Talk, Canadian Astronomical Society Annual General Meeting, 2014, Quebec City, Quebec, Canada, “*Constraining the Causes of Dramatic Variability in Newly Emerged Quasar Outflows*”

Poster, American Astronomical Society 221st Meeting, 2013, Long Beach, California
“*Resolving Host Galaxies of $z=2$ Quasars Using Adaptive Optics and Integral Field Spectroscopy*”

Membership & Services

Thirty Meter Telescope (TMT) Infrared Imaging Spectrograph (IRIS)
Science Team Junior Member 2018 - present
Graduate Student Representative, Dunlap Institute Management Committee 2014
American Astronomical Society, Junior member 2013 - Present

Media coverage

Newsweek magazine, “Supermassive black hole hiding at the heart of a galaxy changes the whole neighborhood”, December 21, 2017.
www.newsweek.com/supermassive-black-hole-finally-caught-influencing-stars-across-its-galaxy-755271

Engadget, “Supermassive black holes may control galaxy formation”,
December 21, 2017
<https://www.engadget.com/2017/12/21/quasars-may-control-galaxy-formation/>

Big Island Now, “Study Suggests Black Holes can Control Galaxy Formation”
December 24, 2017
www.bigislandnow.com/2017/12/24/study-shows-black-holes-may-control-creation-of-galaxies/