LAU, Marie Wingyee **Curriculum Vitae**

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Research Interests
Quasar feedback; quasar host galaxy feeding; quasar/galaxy evolution; dust-reddened quasars; circumgalactic medium; UV, optical and near IR imaging spectroscopy

Teaching Interests
Undergraduate physics and astronomy; high school and public outreach; education technology

Academic Appointments and Education
University of California, Riverside, Winter 2023–present

- Assistant Project Scientist; Lecturer

University of California, Riverside, Fall 2018–Winter 2023

- Postdoctoral Scholar, supervised by Fred Hamann

University of California, Santa Cruz, Winter 2018–Summer 2018

- Interim Postdoctoral Scholar, supervised by Piero Madau and Alexie Leauthaud

University of California, Santa Cruz, Fall 2012–Fall 2017

- Ph.D. in Astronomy 2017, advised by J. Xavier Prochaska
- M.S. 2015

The Chinese University of Hong Kong, Fall 2008–Spring 2012

- B.Sc. Physics with honors
- Exchange programs with University of California, Santa Barbara, and Berkeley

Grants, Honors and Awards

- Hubble Space Telescope Cycle-29, title: Probing Feeding and Feedback in the Circumgalactic Medium of Quasars via Direct Detection of Inflows, ID: 16622, $178,202, Space Telescope Science Institute, 2021
- Funds for Astronomical Meetings: Outreach to Underrepresented Scientists (FAMOUS) travel grant, American Astronomical Society, 2020
- Hubble Space Telescope Cycle-25, title: Observing AGN Feedback Down-the-Barrel Using Associated Absorbers at $z \lesssim 1.5$, ID: 15034, $132,631, Space Telescope Science Institute, 2017
- Graduate Student Association Travel Grant, UC Santa Cruz, 2017
- Next Generation Telescope Science Institute (NEXSI) Fellowship, UC Santa Cruz, 2012
- Regents' Fellowship, UC Santa Cruz, 2012
- Student speech representative at scholarship presentation ceremony, The Chinese University of Hong Kong, 2012
- Nine scholarships totaling the full tuition for academic excellence and international exchanges, The Chinese University of Hong Kong, 2008–2012
- Summer Undergraduate Research Fellowship, California Institute of Technology, 2011

Telescope Proposals

- Co-Investigator of A Deep Survey for Redder/Fainter Extremely Red Quasars, awarded 4 nights at Keck Observatory Keck I/LRIS
- Co-Investigator of Extreme Quasar Feedback at the Peak of the Galaxy Formation Epoch, awarded 7 nights at Keck Observatory Keck I/OSIRIS
- Co-Investigator of Mapping the Extended Infall/Outflow Gas Around Extremely Red Quasars, awarded 3.5 nights at Keck Observatory Keck II/KCWI
- Co-Investigator of Nature of Mid-infrared Flares in Nearby Galaxies: Tidal Disruption Events or Turn-on AGN?, awarded 4 nights at Lick Observatory Shane/Kast
- Principal Investigator of A Potentially Transformative Approach to Cluster Cosmology, awarded 22 nights at Lick Observatory Shane/Kast
- Co-Investigator of Resolving the Small-scale Structure of the Circumgalactic Medium, awarded 9 nights at Keck Observatory Keck I/LRIS
- Principal Investigator of Late-time Optical Spectral Signatures of Tidal Disruption Candidates, awarded 22 nights at Lick Observatory Shane/Kast
- Co-Investigator of To Explore Emission Lines on Large Spatial Scales of Red Galaxies Hosting Intermediate-mass Black Holes, awarded 6 nights at Lick Observatory Shane/Kast
- Co-Investigator of The HI Gas of 2175 Å Absorbers, awarded 20 nights at Lick Observatory Shane/Kast
- Co-Investigator of Circumgalactic Medium Studies at $z \sim 2$ with Close Quasar Pairs, awarded 4 nights at Keck Observatory Keck II/ESI

Observing and/or Data Reduction Experiences

- Keck Observatory Keck I/LRIS; Keck I/MOSFIRE; Keck I/OSIRIS; Keck II/ESI, Keck II/KCWI
- Very Large Telescope UT2/XSHOOTER
- Large Binocular Telescope Observatory/LUCI
- Palomar Observatory 200-inch Hale/Cosmic Web Imager
- Lick Observatory Shane Kast; ShaneAO/ShARCS

Computational and Data Skills

- Languages: Python, IDL, Mathematica, C, Fortran, SQL, English, Chinese
- Software/tools: SExtractor, DS9, IRAF, PypeIt, SVN, Git, Vim, Jupyter, LaTeX
- Open-source contributions (GitHub): linetools (spectroscopy toolkit), specdb (spectral databases), XIDL (spectroscopy utilities)

Professional Services and Memberships

- Review panelist for USA National Science Foundation Astronomy and Astrophysics Grants and CAREER, 2024–present
- Member of the Physics Organization for Women and the Under-represented, UC Riverside, 2018–present
- Member of Thirty Meter Telescope International Science Development Team, 2018–present
- Member, student awards judge, and general meeting session chair and abstract sorter of the American Astronomical Society, 2017–present
- Time allocation committee for James Webb Space Telescope and Hubble Space Telescope, 2017–present
- Referee for The Astrophysical Journal and Monthly Notices of the Royal Astronomical Society, 2015–present

- Member of the UC Riverside team of the American Physical Society's IDEA network, 2020–2022
- Co-organizer of department colloquia and prospective student visits, UC Santa Cruz, 2017, 2015
- Supervisory council member and vice-president of Society of Physics Students of United College, The Chinese University of Hong Kong, 2009–2011

Student Mentoring and Outcomes

- Jarred Gillette (Doctoral, UC Riverside, 2018–2023, co-mentor): Characterizing powerful, young, dusty, "extremely red" quasars. Products: three American Astronomical Society meeting presentations, four co-authored peer-reviewed publications. Next step: Postdoc at Eureka Scientific.
- Greg Sallaberry (Undergraduate, UC Santa Cruz Lamat Program and senior thesis, 2018, lead mentor): Satellite fraction of galaxies at the highest stellar masses. Products: Senior thesis and Lamat poster fair. Next step: M.S. at Leiden University.
- Eric Cheng (High school, UC Santa Cruz Science Internship Program, 2016–2017, lead mentor): Surface chemical abundance variations of red giants in globular clusters. Products: end-of-program presentation day, Siemens competition entries, American Astronomical Society meeting presentation. Next step: B.S. at UC Berkeley.
- Brian Chen (High school, UC Santa Cruz Science Internship Program, 2016, lead mentor): Surface chemical abundance variations of red giants in globular clusters. Products: end-of-program presentation day, Siemens competition entry. Next step: B.A. at University of Pennsylvania.

Teaching and Outreach

- Approved Instructor for PHYS XR 50: Introduction to Applied Data Science, UC Riverside Extension, 2025–present
- Lecturer for PHYS 2B and PHYS 2C: General Physics, UC Riverside, 2023–present
- Invited planetarium talk titled Exploring Quasars at Orange Coast College Planetarium's Skylark Speaker Series, 2025
- Teaching Assistant for the California State Summer School for Mathematics and Science (COSMOS; led high school students on pre-scripted projects), 2017, 2016
- Teaching Assistant for PHYS 9B: Introduction to Research in Physics and Astrophysics (cooperative research and homework labs targeting first years and transfers); ASTR 2: Overview of the Universe; ASTR 6: The Space-Age Solar System; ASTR 1: Introduction to the Cosmos, UC Santa Cruz, 2012–2017
- On-call for Ask-An-Astronomer (answered questions from general public), UC Santa Cruz, 2014–2016
- Private tutor for low-income high school students in English and Mathematics, 2003–2008

Professional Development

- NCFDD Faculty Success webinars and bootcamps, institutional membership via UC Riverside, 2021–present
- Academy of Distinguished Teaching's Teaching Foundations Workshop Series, UC Riverside, 2025

Research Experiences Outside of Astronomy

- Climate change sensitivity evaluation from spaceborne instrument measurements, with Y. L. Yung at Caltech
- Determining cloud base and thickness from spaceborne imaging and lidar profiling, with Y. L. Yung and Dong L. Wu at Caltech and NASA Jet Propulsion Laboratory
- The occurence of high winds and gusts during Northeast monsoon in Hong Kong, with Hong Kong Observatory

- Mechanical vibration of thin plates (senior thesis), with Kenneth Young at The Chinese University of Hong Kong

Seminars and Conferences

- Invited talk at Physics and Astronomy Student Seminar, UC Riverside, 2025
- Invited talk at Galaxies Journal Club, Space Telescope Science Institute, 2025
- Invited talk at S. Borthakur's circumgalactic medium group meeting, Arizona State University, 2022
- Invited contribution at Fundamentals of Gaseous Halos Program, Kavli Institute for Theoretical Physics, 2021
- Invited contribution at Santa Cruz Galaxy Workshop, UC Santa Cruz, 2017
- Invited contribution at Inter[Stellar and Galactic] Medium Program of Studies Winter Writing Workshop, UC Santa Cruz, 2016
- Invited astronomy talk at Yuk L. Yung's atmospheric science group meeting, Caltech, 2014
- Invited contribution at Intergalactic Matters, Max Planck Institute for Astronomy, 2014
- 53 other contributed presentations at research institutions and conferences in USA, international, and remote locations

Media Coverage

- Dr. Marie Wingyee Lau sheds a light on Quasars to OCC students, April 2025, by Orange Coast College's Coast Report
- Thank-you Speech by Marie Wingyee Lau at the United College Scholarship Presentation Ceremony, Academic Year 2011-2012, April 2012, by The Chinese University of Hong Kong's United News

Journal, Software, and Data Publications

(* = mentee)

- Sabhlok, S., Wright, S. A., Vayner, A., Murray, N., Armus, L., Cosens, M., Wiley, J., Meyer, E., Reddy, K., & **Lau, M. W.**, 2025, The two component circumgalactic medium emission around $z \sim 2$ radio-loud quasars, submitted to The Astrophysical Journal
- Chen, Y.-C., Zakamska, N. L., Vayner, A., Neustadt, J. M. M., Wylezalek, M., Rupke, D. S. N., Veilleux, S., Bertemes, C., Ishikawa, Y., **Lau, M. W.**, Liu, W., & Perrin, M. D., 2025, JWST IFU observations uncover host galaxy continua in extremely red and obscured quasars, submitted to The Astrophysical Journal, arXiv:2506.12124
- Chen, C., He, Z., Yi, W., Ji, T., **Lau, M. W.**, & Ma, B., 2025, Tracking Outflow Using Line-Locking (TOLL). II. Large Line-locking Web Identified in Quasar J151352+085555, The Astrophysical Journal, Volume 980, Issue 1, pp. 28
- **Lau, M. W.**, Perrotta, S., Hamann, F., *Gillette, J., Rupke, D. S. N., Vayner, A., Zakamska, N. L., & Wylezalek, D., 2024, [OIII]λ5007 emissions in extremely red quasars (ERQs) are compact, Monthly Notices of the Royal Astronomical Society, Volume 532, Issue 2, pp. 2044
- ***Gillette, J., Hamann, F., **Lau, M. W.**, & Perrotta, S., 2024, Accurate Systemic Redshifts and Outflow Speeds for Extremely Red Quasars (ERQs), Monthly Notices of the Royal Astronomical Society, Volume 527, Issue 1, pp. 950
- ***Gillette, J., **Lau, M. W.**, Hamann, F., Perrotta, S., Rupke, D. S. N., Wylezalek, D., Zakamska, N. L., & Vayner, A., 2023, Compact and Quiescent Circumgalactic Medium and Lyα Halos around Extremely Red Quasars, Monthly Notices of the Royal Astronomical Society, Volume 526, Issue 2, pp. 2578
- **Lau, M. W.**, Prochaska, J. X., & Hennawi, J. F., 2023, Quasars Probing Quasars. IX. (QPQ9),

VizieR On-line Data Catalog: J/ApJ/857/126. Originally published in The Astrophysical Journal, 857, 126 (2018).

- **Lau, M. W.**, Hamann, F., *Gillette, J., Perrotta, S., Rupke, D. S. N., Wylezalek, D., & Zakamska, N. L., 2022, Probing the Inner Circumgalactic Medium and Quasar Illumination around the Reddest 'Extremely Red Quasar', Monthly Notices of the Royal Astronomical Society, Volume 515, Issue 2, pp. 1624
- Fu, H., Xue, R., Prochaska, J. X., Stockton, A., Ponnada, S., **Lau, M. W.**, Cooray, A., & Narayanan, D., 2021, A Long Stream of Metal-Poor Cool Gas Around A Massive Starburst Galaxy at z=2.67, The Astrophysical Journal, Volume 908, Issue 2, article id. 188
- Horne, K., De Rosa, G., Peterson, B. M., et al. including **Lau, M. W.**, 2021, Space Telescope and Optical Reverberation Mapping Project. IX. Velocity-Delay Maps for Broad Emission Lines in NGC 5548, The Astrophysical Journal, Volume 907, Issue 2, id. 76
- Kriss, G. A., De Rosa, G., Ely, J., et al. including **Lau, M. W.,** 2021, Space telescope RM project. VIII. NGC5548 HST sp., VizieR On-line Data Catalog: J/ApJ/881/153. Originally published in The Astrophysical Journal, 881, 153 (2019).
- Williams, P. R., Pancoast, A., Treu, T., et al. including **Lau, M. W.**, 2020, Space Telescope and Optical Reverberation Mapping Project. XII. Broad-Line Region Modeling of NGC 5548, The Astrophysical Journal, Volume 902, Issue 1, article id. 74
- Kriss, G. A., De Rosa, G., Ely, J., et al. including **Lau, M. W.**, 2019, Space Telescope and Optical Reverberation Mapping Project. VIII. Modeling the Ultraviolet Spectrum of the Seyfert 1 Galaxy NGC5548, The Astrophysical Journal, Volume 881, Issue 2, article id. 153
- Findlay, J. R., Prochaska, J. X., Hennawi, J. F., Fumagalli, M., Myers, A. D., Bartle, S., Chehade, B., DiPompeo, M. A., Shanks, T., **Lau, M. W.**, & Rubin, K. H. R., 2018, Quasars Probing Quasars. X. The Quasar Pair Spectral Database, The Astrophysical Journal Supplement Series, Volume 236, Issue 2, article id. 44
- **Lau, M. W.**, Prochaska, J. X., & Hennawi, J. F., 2018, Quasars Probing Quasars. IX. The Kinematics Of the Circumgalactic Medium Surrounding $z \sim 2$ Quasars, The Astrophysical Journal, Volume 857, Issue 2, article id. 126
- Boyajian, T., Alonso, R., Ammerman, A., et al. including **Lau, M. W.**, 2018, The First Post-Kepler Brightness Dips of KIC 8462852, The Astrophysical Journal Letters, Volume 853, Issue 1, article id. L8
- Bose, S., Dong, S., Pastorello, A., et al. including **Lau, M. W.**, 2018, Gaia17biu/SN 2017egm in NGC 3191: The Closest Hydrogen-poor Superluminous Supernova to Date Is in a "Normal", Massive, Metal-rich Spiral Galaxy, The Astrophysical Journal, Volume 853, Issue 1, article id. 57
- Prochaska, J. X., Tejos, N., Jnburchett, **Lau, M. W.**, Jhennawi, & O'Meara, J., 2017, specdb/specdb: First Release, Zenodo, available at https://zenodo.org/records/1069833
- Pei, L., Fausnaugh, M. M., Barth, A. J., et al. including **Lau, M. W.**, 2017, Space telescope RM project. V. NGC5548 sp. monitoring, VizieR On-line Data Catalog: J/ApJ/837/131. Originally published in The Astrophysical Journal, 837, 131 (2017).
- Mathur, S., Gupta, A., Page, K., et al. including **Lau, M. W.**, 2017, Space Telescope and Optical Reverberation Mapping Project. VII. Understanding the UV Anomaly in NGC 5548 with X-Ray Spectroscopy, 2017, The Astrophysical Journal, Volume 846, Issue 1, article id. 55
- Prochaska, J. X., **Lau, M. W.**, & Hennawi, J. F., 2017, Circumgalactic medium surrounding z∼2 quasars, VizieR On-line Data Catalog: J/ApJ/796/140. Originally published in The Astrophysical Journal, 796, 140 (2014).
- Pei, L., Fausnaugh, M. M., Barth, A. J., et al. including **Lau, M. W.**, 2017, Space Telescope and Optical Reverberation Mapping Project. V. Optical Spectroscopic campaign and Emission-line

Analysis for NGC 5548, The Astrophysical Journal, Volume 837, Issue 2, article id. 131

- **Lau, M. W.**, Prochaska, J. X., & Hennawi, J. F., 2016, Quasars Probing Quasars. VIII. The Physical Properties of the Cool Circumgalactic Medium Surrounding $z \sim 2$–3 Massive Galaxies Hosting Quasars, The Astrophysical Journal Supplement Series, Volume 226, Issue 2, article id. 25
- Cai, Z., Fan, X., Peirani, S., Bian, F., Frye, B., McGreer, I., Prochaska, J. X., **Lau, M. W.**, Tejos, N., Ho, S., & Schneider, D. P., 2016, MApping the Most Massive Overdensities Through Hydrogen (MAMMOTH) I: Methodology, The Astrophysical Journal, Volume 833, Issue 2, article id. 135
- Rubin, K. H. R., Hennawi, J. F., Prochaska, J. X., Simcoe, R. A., Myers, A., & **Lau, M. W.**, 2015, Dissecting the Gaseous Halos of $z \sim 2$ Damped Lyα Systems with Close Quasar Pairs, The Astrophysical Journal, Volume 808, Issue 1, article id. 38
- Prochaska, J. X., **Lau, M. W.**, & Hennawi, J. F., 2014, Quasars Probing Quasars. VII. The Pinnacle of the Cool Circumgalactic medium Surrounds Massive $z \sim 2$ Galaxies, The Astrophysical Journal, Volume 796, Issue 2, article id. 140
- Prochaska, J. X., Hennawi, J. F., Lee, K.-G., Cantalupo, S., Bovy, J., Djorgovski, S. G., Ellison, S. L., **Lau, M. W.**, Martin, C. L., Myers, A., Rubin, K. H. R., & Simcoe, R. A., 2013, Quasars Probing Quasars. VI. Excess HI Absorption within One Proper Mpc of $z \sim 2$ Quasars, The Astrophysical Journal, Volume 776, Issue 2, article id. 136
- Jiang, Y., Aumann, H. H, **Lau, M. W.**, & Yung Y. L., 2011, Climate Change Sensitivity Evaluation from AIRS and IRIS measurements, Proceedings of the SPIE, Volume 8153, id. 81531Z

Non-refereed Publications

- **Lau, M. W.**, Yung, Y. L., & Wu, Dong L., 2012, Determining Cloud Base and Thickness from Spaceborne Stereoscopic Imaging and Lidar Profiling Techniques, Caltech Undergraduate Research Journal, Volume 12, Issue 2, article id. 20

References

- Fred Hamann, University of California, Riverside, fhamann@ucr.edu
- J. Xavier Prochaska, University of California, Santa Cruz, xavier@ucolick.org
- Graeme Smith, University of California, Santa Cruz, graeme@ucolick.org
- Ward Beyermann, University of California, Riverside, beyerman@ucr.edu