

Samuel Lai

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Statement

I am an astrophysics researcher specialising in accretion onto compact objects. By combining high performance computing simulations of accretion discs with high quality spectroscopic observations, I develop novel ways of understanding the diversity of observable phenomena. My goal is to study multiwavelength data of ultraluminous black holes in the early universe to understand their cosmic history, how they continue to grow, and how they affect their host galaxies/environment.

Education

March 2021 – Present	Australian National University, Australia Research School of Astronomy & Astrophysics Website: https://www.anu.edu.au/ <ul style="list-style-type: none">Astrophysics PhD
Sept 2018 – Nov 2019	University College London, United Kingdom Department of Physics & Astronomy Website: https://www.ucl.ac.uk <ul style="list-style-type: none">Astrophysics MScDistinction, 87.85/100.00
Sept 2014 – June 2018	University of California – Los Angeles, United States College of Letters and Science Website: https://www.ucla.edu <ul style="list-style-type: none">Astrophysics BScMagna Cum Laude, 3.87/4.00 GPA

Research

Sept 2020 – Present	High-Redshift Ultraluminous Quasi-Stellar Objects Mentor(s): Dr. Christopher Onken, A/Prof. Christian Wolf, and Dr. Fuyan Bian
Nov 2015 – Sept 2020	Contaminated White Dwarfs with Infrared Excess Mentor(s): Dr. Siyi Xu (许偲艺), assistant astronomer at Gemini Observatory
Oct 2018 – Nov 2019	Emission from Black Hole Event Horizon Mentor(s): Dr. Ziri Younsi and Prof. Kinwah Wu Thesis Title: <i>Black Hole Jet Simulation and Images</i>
Jul 2017 – June 2018	Harmonic Analysis of Gravitational Wave Power in Binary System Simulation of Stochastically Driven Coupled Oscillator Grid Mentor(s): Prof. Kenneth Young, Emeritus Professor at CUHK Thesis Title: <i>Gravitational waves from a binary system: A detailed analysis of orbital decay</i>
Apr 2017 – Aug 2018	Galactic Morphology by Surface Brightness and Isophotal Contours Mentor(s): Dr. Michael Rich, research astronomer at UCLA

Relevant Work Experience

July 2022 – Present	Australian National University , RSAA Publications Officer ANU 2.3m Time Allocation Committee Website: https://rsaa.anu.edu.au/research/publications
Aug – Oct 2021	European Southern Observatory , PhD Studentship Programme Website: https://www.eso.org/
Jan – June 2020	Gemini Observatory , Short-term Research Scholar Website: https://www.gemini.edu/
June – Aug 2013	Cluster Technology Limited , Software Trainee Website: https://www.clustertech.com <ul style="list-style-type: none">Project Management Team
June – Aug 2012	<ul style="list-style-type: none">Software Development Team

Selected Publications

2023	Characterising SMSS J2157–3602, the most luminous known quasar, with accretion disc models Authors: Samuel Lai , Christian Wolf, Christopher A Onken, Fuyan Bian <i>Monthly Notices of the Royal Astronomical Society</i> ALIBRICQS: The All-sky BRIght, Complete Quasar Survey Authors: Christopher A Onken, Christian Wolf, Wei Jeat Hon, Samuel Lai , Patrick Tisserand, Rachel Webster <i>Publications of the Astronomical Society of Australia</i>
2022	Chemical Abundance of $z \sim 6$ quasar broad-line regions in the XQR-30 sample Authors: Samuel Lai , Fuyan Bian, Christopher A Onken, Christian Wolf, Chiara Mazzucchelli, Eduardo Banados, Manuela Bischetti, Sarah E I Bosman, George Becker, Guido Cupani, Valentina D’Odorico, Anna-Christina Eilers, Xiaohui Fan, Emanuele Paolo Farina, Masafusa Onoue, Jan-Torge Schindler, Fabian Walter, Feige Wang, Jinyi Yang, Yongda Zhu <i>Monthly Notices of the Royal Astronomical Society</i> Discovery of the most luminous quasar of the last 9 Gyr Authors: Christopher A Onken, Samuel Lai , Christian Wolf, Adrian B Lucy, Wei Jeat Hon, Patrick Tisserand, Jennifer L Sokolowski, Gerardo J M Luna, Rajeev Manick, Xiaohui Fan, Fuyan Bian <i>Publications of the Astronomical Society of Australia</i>

- 2021 **Infrared Excesses around Bright White Dwarfs from Gaia and unWISE. II.**
 Authors: **Samuel Lai**, Erik Dennihy, Siyi Xu, Atsuko Nitta, Scot Kleinman, S.K. Leggett, Amy Bonsor, Simon Hodgkin, Alberto Rebassa-Mansergas, Laura K. Rogers
Astrophysical Journal
- 2020 **Five New Post-main-sequence Debris Disks with Gaseous Emission**
 Authors: Erik Dennihy, Siyi Xu, **Samuel Lai**, Amy Bonsor, J.C. Clemens, Patrick Dufour, Boris T. Gansicke, Nicola Pietro Gentile Fusillo, Francois Hardy, R.J. Hegedus, J.J. Hermes, B.C. Kaiser, Markus Kissler-Patig, Beth Klein, Christopher J. Manser, Joshua S. Reding
Astrophysical Journal
- Infrared Excesses around Bright White Dwarfs from Gaia and unWISE. I.**
 Authors: Siyi Xu, **Samuel Lai**, Erik Dennihy
Astrophysical Journal

Grants, Awards, and Prizes

2023	RSAA Travel Grant	Australian National University
	• \$1,200, Destination: Sydney	
	RSAA Travel Grant	Australian National University
	• \$168, Destination: Kioloa	
	Observation Proposal	European Southern Observatory
	• European Southern Observatory/X-shooter: 0.3h	
2022	Community Science Meeting Travel Support	GMTO Corporation
	• \$1,615, Destination: United States	
	RSAA Travel Grant	Australian National University
	• \$3,620, Destination: United States	
	RSAA Travel Grant	Australian National University
	• \$1,920, Destination: Siding Spring Observatory	
	RSAA Travel Grant	Australian National University
	• \$1,400, Destination: Tasmania	
	Observation Proposal	European Southern Observatory
	• European Southern Observatory/X-shooter: 16.4h	
	Observation Proposal	National Optical Infrared Laboratory
	• Southern Astrophysical Research Telescope/TripleSpec4.1: 5 nights	
2021	Mt. Stromlo Student Seminars – Best Science Talk	Australian National University
	Observation Proposal	European Southern Observatory
	• European Southern Observatory/X-shooter: 21.5h	
	Observation Proposal	National Optical Infrared Laboratory
	• Southern Astrophysical Research Telescope/TripleSpec4.1: 4 nights	
2020	University Research Scholarship	Australian National University
	• \$34,000/annum, 3.5 years	
	HDR Fee Remission Merit Scholarship	Australian National University
	• Full tuition, 4 years	
	RSAA Supplementary Scholarship	Australian National University
	• \$5,000/annum, 3 years	
	President's PhD Scholarship	Imperial College London
	• Full tuition, \$26,420/annum, 3.5 years, not accepted	
	Croucher Scholarship	The Croucher Foundation
	• Full tuition, \$30,300/annum, 3 years, not accepted	
	Observation Proposal	National Optical Infrared Laboratory
	• Gemini Observatory: NIRI/Flamingos2: 24.8h	
2019	Harrie Massey Prize – Best Overall Astrophysics MSc	University College London
	• \$150	
	Mathematical and Physical Sciences Dean's Commendation	University College London
	MSc with Distinction	University College London
2018	BSc – Magna Cum Laude	University of California – Los Angeles
	Dean's List	University of California – Los Angeles
2017	Dean's List	University of California – Los Angeles
2016	Dean's List	University of California – Los Angeles
2015	Dean's List	University of California – Los Angeles
2014	Dean's List	University of California – Los Angeles
	Intermural Tennis Championship – Silver	International Schools Sports Federation
	Musicianship Service Award	International Christian School
2012	Outstanding Musician Award	International Christian School
	Intermural Tennis Championship – Bronze	International Schools Sports Federation

Teaching and Outreach

2023	ASTR3002/ASTR6002 – Galaxies and Cosmology Course
	ESO Studentship
	Student: Yanina Bonilla Lopez
	ASTR3005 – Astrophysics Research Course

- Student: Ashley Hai Tung Tan
ANU 2.3m Telescope Training
- Student: Neelesh Amrutha
- 2022 ANU 2.3m Telescope Training
Students: Jemma Pilosof, Cassidy Grae Mihalenko
ASTR3005 – Astrophysics Research Course
Student: Zachary Steyn
ASTR3002/ASTR6002 – Galaxies and Cosmology Course
J1144-4308 NPR Radio Interview
<https://www.nprillinois.org/2022-06-16/scientists-unexpectedly-discover-the-fastest-growing-black-hole>
J1144-4308 Discovery
e.g. <https://cosmosmagazine.com/space/fastest-growing-black-hole-anu/>
- 2020 Journey through the Universe 2020 – Gemini Observatory
JWST Proposal Workshop
ICS Alumni Newsletter
- 2019 ICS High School Astronomy Club
ICS High School Chemistry

Actively-Maintained Public Codes

- 2023 **PyQSpecFit: Python-based Quasar Spectral Fit Code**
Authors: **Samuel Lai**
Purpose: Sensibly model emission features in rest-frame optical and ultraviolet quasar spectra.
GitHub/Zenodo
- BADFit: Black hole Accretion Disc Fitting Code**
Authors: **Samuel Lai**
Purpose: Model the large-scale multi-wavelength quasar spectral energy distribution with ray-traced thin and slim accretion disc synthetic spectra in order to constrain black hole properties.
GitHub/Zenodo

Talks/Presentations

July 2023	Sydney, Australia	Astronomical Society of Australia (ASA) Annual Science Meeting
June 2023	Hong Kong	Astrophysical Black Holes: A Rapidly Moving Field ¹
March 2023	Canberra, Australia	RSAA Journal Club
September 2022	Online	Gemini Observatory Journal Club
September 2022	Tucson, Arizona	University of Arizona Extragalactic Group
September 2022	Tucson, Arizona	Steward / NOIRLab Galaxy Group
September 2022	Sedona, Arizona	Giant Magellan Telescope Community Science Meeting
March 2022	Online	XQR-30 WP3
July 2022	Canberra, Australia	PhD Thesis Presentation
July 2022	Tasmania, Australia	Astronomical Society of Australia (ASA) Annual Science Meeting
February 2022	Online	European Southern Observatory TMT
November 2021	Online	Mt. Stromlo Student Seminars
September 2019	London, United Kingdom	MSc Thesis Defense

¹ Could not attend