

Sohan Ghodla

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Key words: Dark matter, Black holes, Gravitational waves

EDUCATION

- | | |
|---------------------|--|
| Dec 2020 - May 2024 | University of Auckland, New Zealand
Ph.D. in Physic (Defending in <i>Jan 2025</i>)
Thesis: Impact of companion and surroundings on stars and black holes. |
| Mar 2019 - Feb 2020 | University of Auckland, New Zealand
Masters in Physics
Thesis: Constraining the supernova remnant mass spectrum using Gravitational waves. |
| Jul 2014 - Nov 2018 | University of Auckland, New Zealand
BSc: In Physics & Mathematics and PGDip in Physics
Thesis: The Kibble Zurek Mechanism |

ACADEMIC POSITIONS

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|----------------------|---|
| Jan 2025 - May 2025 | Space Telescope Science Institute, USA
Visiting Postdoctoral Research Fellow |
| Sep 2024 - present | Colgate University, USA
Postdoctoral Research Fellow |
| July 2024 - Aug 2024 | University of Auckland, New Zealand
Postdoctoral Research Fellow |

PUBLICATIONS - 7 FIRST AUTHOR INCLUDING 2 SINGLE AUTHOR

- [1] **S. Ghodla.** *Galactic and extragalactic probe of dark matter with LISA's binary black holes.* [arXiv 2410.15562](#), Accepted with minor changes; JCAP, 2024.
- [2] **S. Ghodla.** *The effect of the interstellar medium on LVK's black holes.* *Monthly Notices of the Royal Astronomical Society*, 532(1):439–450, 2024.
- [3] **S. Ghodla** and J. J. Eldridge. *The effect of stellar rotation on black hole mass and spin.* *Monthly Notices of the Royal Astronomical Society*, 534(3):1868–1888, 2024.
- [4] **S. Ghodla** and J. J. Eldridge. *Sustained super-Eddington accretion around neutron stars & black holes.* *Monthly Notices of the Royal Astronomical Society*, 523(2):1711–1717, August 2023.
- [5] **S. Ghodla**, R. Easter, M. M. Briel, and J. J. Eldridge. *Observational implications of cosmologically coupled black holes.* *The Open Journal of Astrophysics*, 6:25, July 2023.
- [6] **S. Ghodla**, J. J. Eldridge, E. R. Stanway, and H. F. Stevance. *Evaluating chemically homogeneous evolution in stellar binaries: electromagnetic implications - ionizing photons, SLSN-I, GRB, Ic-BL.* *Monthly Notices of the Royal Astronomical Society*, 518(1):860–877, November 2022.
- [7] **S. Ghodla**, W. G. J. van Zeist, J. J. Eldridge, H. F. Stevance, and E. R. Stanway. *Forward modelling the O3(a+b) GW transient mass distributions with BPASS by varying compact remnant mass and SNe kick prescriptions.* *MNRAS*, 511(1):1201–1209, March 2022.

PUBLICATIONS AS NTH AUTHOR

- [8] S. Richards, J. J. Eldridge, **S. Ghodla**, and M. Briel. [The variable evolution of accretor stars in binary systems due to accretion of increasingly helium-rich material](#), 2024, *Submitted to MNRAS*.
- [9] H. F. Stevance, **S. Ghodla**, S. Richards, J. J. Eldridge, M. M. Briel, and P. Tang. [VFTS 243 as predicted by the BPASS fiducial models](#). MNRAS, February 2023.

RESEARCH TALKS

Invited

Jan 2025	(Upcoming) Space Telescope Science Institute	Baltimore, USA
Dec 2024	Cosmic Origins, Flatiron Institute	NY, USA
Mar 2024	THEA Seminar	Columbia University, USA
Mar 2024	Informal talk given to the Gravitational Wave group	Flatiron Institute, USA
Mar 2024	Friday Afternoon Research Talk	Liverpool John Moores University, UK
Mar 2024	Black board pizza talk	Columbia University USA
Feb 2023	Astrophysics Seminar [Link]	University of Helsinki, Finland

Contributed

Jan 2025	American Astronomical Society	Baltimore, USA
Jun 2024	Astronomical Society of Australia Annual Scientific Meeting	Australia
Jun 2024	Cosmology from Home	Global, Online
Apr 2024	American Physical Society	California, USA
Feb 2024	Talk at the NZ gravity workshop	Auckland University of Technology, NZ
Nov 2022	Supernovae in Gravitational Wave era [Link]	Swinburne University, Australia
Aug 2022	Supernova remnants and their Progenitors (online) [Link]	Harvard & Smithsonian, USA
Jun 2022	Astronomical Society of Australia - (online)	University of Tasmania, Australia
Nov 2021	Provisional year presentation	University of Auckland, NZ
Jul 2021	New Zealand Institute of Physics	Wellington, New Zealand
Oct 2020	Population Synthesis & Compact objects group	Monash University Melbourne, Australia
May 2020	MSc colloquium - (online)	University of Auckland, New Zealand

PUBLIC TALKS & OUTREACH

Dec 2023	Invited talk on <i>Black holes & dark energy</i> , Auckland Astronomical Society, NZ .
Jun 2023	Invited talk <i>Black holes, dark energy & Gravitational waves</i> at Hibiscus Coast Astronomical Society, NZ .
Mar 2023	Invited public talk on <i>What leads to super-energetic supernovae & supermassive black holes?</i> at the Hamilton astronomical society, NZ .
Jul 2021 - Oct 2021	Three outreach events at Kowhai Intermediate School, NZ . Co-organized and designed engaging presentations and hands-on demonstrations under the theme -“Where do we come from?”.
Jun 2019 & Apr 2020	Participated in representing the University of Auckland Physics at the MOTAT science fair.

SCHOLARSHIPS & RECOGNITION

University of Auckland doctoral scholarship, 3.5 years: \$116k (NZD).

Featured in American Physical Society April Press Event, April 2023.

American Physical Society travel award \$500 (USD).

Recognized for outstanding Physics Tutoring, 2023.

Featured in the [Royal Society of New Zealand's](#) 2022 annual report for a series of successful school outreach.

TEACHING

Sep 2024 - present	Guest lecturer, Physics 105 - Mechanics	Colgate University, USA
Sep 2024 - present	Instructor for 2nd year Electromagnetism Lab	Colgate University, USA
Jun 2024	<u>Invited</u> to codesign content and TA at the MESA workshop.	University of Sydney
Jul 2022 - Aug 2024	Tutor & Mentor - Physics help room for Māori and Pacific students (year 1 to 4)	
Feb 2023 - Jul 2023	Tutor - Physics 102 - Basic concepts in Physics - <i>gave tutorials twice a week and ran help room session once a week.</i>	University of Auckland
Jul 2022 - Nov 2022	Tutor - Physics 203: Relativity and Quantum Mechanics - <i>gave tutorials once a week and graded assignments & tutorials.</i>	
	Tutor - <i>Drop in helproom for all 1st year courses.</i>	University of Auckland
Feb 2022 - Jun 2022	TA Physics 202 - <i>Classical Mechanics and Thermodynamics</i> - graded assignments. Lab demonstrator - <i>Introduction to Astrophysics</i>	University of Auckland
Jul 2021 - Nov 2021	TA <i>Electromagnetism, 2nd year</i> - graded and provided solutions for assignments. Lab demonstrator - Physics 100 - <i>Introduction to Astrophysics</i>	
Feb 2021 - Jun 2021	TA Physics 202 - <i>Classical Mechanics and Thermodynamics</i> - graded assignments. Lab demonstrator - Physics 100 - <i>Introduction to Astrophysics</i>	

ADVISING

Sep 2024 - present	Primary mentor: Rafael Sanchez Lazaro Undergraduate, Topic: <i>Effect of wave dark matter on black hole shadow.</i>	
Sep 2024 - present	Co-mentor: Gabriel Pickard, Undergraduate, Topic: <i>Simulating Dark matter powered stars in MESA</i>	
Aug 2023 - Feb 2024	Co-mentored: Adib Mowaz, Master's Topic: <i>Neutron Star - White Dwarf merger.</i>	

WORKSHOPS ATTENDED

Feb 2023	Summer School on Gravitational Waves.	University of Auckland, NZ
Dec 2022	Gravitational Wave Physics & Astronomy workshop.	Monash University, Australia
Aug 2021	Modules for experiments in Astrophysics (MESA) workshop.	UC Santa Barbara, USA
Jan 2020	NZMRI summer school ; Mathematical aspects of General Relativity.	Victoria University Wellington, NZ
Dec 2018	Statistical Mechanics & Condensed Matter workshop.	University of Auckland, NZ

CONTRIBUTED JOURNAL CLUBS & POSTERS

Aug 2024	Poster - IAU General Assembly 2024 (virtual)	Capetown, South Africa
Apr 2024	Poster - American Physical Society.	California, USA
Feb 2021 - present	Given 19+ talks at Astro & Cosmology Journal club.	University of Auckland, NZ
May 2023 - present	Given 3+ talks at the NZ gravity Journal club.	New Zealand collaboration
Sep 2023	Poster - Graduate research showcase. (<i>finalist</i>)	University of Auckland, NZ
Dec 2022	Poster - Gravitational Wave Physics & Astronomy workshop.	Monash University
Nov 2021	Poster - Graduate research showcase.	University of Auckland, NZ
Dec 2018	Poster - Statistical Mechanics & Condensed Matter workshop	University of Auckland, NZ

MISCELLANEOUS SERVICE

Journal referee for the *Monthly Notices of the Royal Astronomical Society* (MNRAS)

Journal referee for the *Astrophysical Journal* (ApJ)
Journal referee for the *Astronomy & Astrophysics Journal* (A&A)
Session chair at the APS - Numerical advancements in Particle Astrophysics.
Session chair at the APS - Gravitational waves.
Session chair at the APS - General Physics.
Host of Astrophysics & Cosmology journal club from Jun 2021 - Nov 2023 (organized 80+ talks).
Organizer and primary contributor to Astro reading group 2021-2022.
Contributor to [Physics Stack Exchange](#) (top 10% overall, 46k+ people reached).

CODING SKILLS

<i>Astrophysical codes</i>	Proficiency in BPASS - Developed routines for TUI - a satellite code of the BPASS suite & used in 2 publications. Proficiency in MESA - a software suite used for modeling a range of phenomena is stellar & compact binary astrophysics- Created models for use in 2 publications.
<i>Computing languages</i>	Proficiency in FORTRAN - primary language of TUI and MESA. Proficiency in PYTHON - primary language for data analysis and plotting in all my work. Proficiency in SAGE (a free equivalent of MATHEMATICA) - used SAGE Manifolds in 1 paper. Proficiency in MATHEMATICA - working knowledge. Proficiency in Slurm - used in 5 papers to schedule jobs on high-performance computers.

REFERENCES

Prof. J.J. Eldridge (PhD Supervisor)
Department of Physics,
University of Auckland, New Zealand
Email: j.eldridge@auckland.ac.nz

Prof. Elizabeth Stanway (Collaborator)
Department of Physics,
University of Warwick, United Kingdom
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Prof. Richard Easther (Collaborator)
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Asst. Prof. Cosmin Ilie (Postdoc Mentor)
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Colgate University, United States of America
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