Alexander **Rawlings**

Theoretical Extragalactic Astrophysics

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♥ Helsinki, Finland i Australian Citizen i ORCID: 0000-0003-1807-6321

I am a doctoral candidate in theoretical extragalactic astrophysics at the University of Helsinki, Finland. I am modelling gas-free simulations of massive galaxy mergers to constrain the merger timescale of supermassive black hole binary systems. The simulations are conceptualised with observations in mind, providing physically-motivated models which bring us a step closer to understanding the distribution of supermassive black hole binary systems in the observed universe.



Professional Experience

Doctoral Candidate, University of Helsinki, Helsinki, Finland Present Sep 2021 > Design and analysis of gas-free merger simulations with realistic initial conditions > Orbit modelling > Reference: Prof. Peter Johansson · peter.johansson@helsinki.fi Python C/C++ Feb 2021 Research Assistant, University of Helsinki, Helsinki, Finland Sep 2020 > Design and analysis of galaxy merger simulations to investigate the stalling of supermassive black hole binary systems at parsec scales > Reference: Prof. Peter Johansson • peter.johansson@helsinki.fi Python C/C++ Nov 2019 Research Scholar, Sydney Institute for Astronomy, Sydney, Australia Jan 2019 > Determine the relationship between galaxy ellipticity and the spin parameter λ_R > Academic writing > Reference: Dr. Caroline Foster · caroline.foster@sydney.edu.au R bash Jun 2019 Research Assistant, University of Southern Queensland, Toowoomba, Australia Dec 2018 with Observatoire de Paris > Creation of parameter lists for all stars within the BRITEpol survey by script programming for literature searching > Reference: Assoc. Prof. Stephen Marsden • stephen.marsden@usq.edu.au SQL R

Dec 2018 Feb 2014

Research Assistant, University of Southern Queensland, Toowoomba, Australia with James Cook University

- > Analysis and collection of UV data, including the calibration and use of UV and IR detectors to determine correlation between solar UV and solar IR exposure
- > Analysis of trends and modelling of results
- > Modelling of climate trends
- > Reference: Dr. Nathan Downs · nathan.downs@usq.edu.au MATLAB



- 2023 Reviving stochasticity: uncertainty in SMBH binary eccentricity is unavoidable MNRAS vol. 526 pp. 2688-2695
- 2023 KETJU resolving small-scale supermassive black hole dynamics in GADGET-4 MNRAS vol. $524~\rm pp.~4062\text{-}4082$
- 2022 Modelling the accretion and feedback of supermassive black hole binaries in gas-rich galaxy mergers MNRAS vol. 520 pp. 4463-4489
- 2022 Signatures of the Many Supermassive Black Hole Mergers in a Cosmologically Forming Massive Early-Type Galaxy ApJ vol. 929 pp. 167-176
- 2020 The SAMI Galaxy Survey: Rules of Behaviour for Spin-Ellipticity Radial Tracks in Galaxies MNRAS vol. 491 pp. 324-343
- 2019 Seasonal Minimum and Maximum Solar Ultraviolet Exposure Measurements of Classroom Teachers Residing in Tropical North Queensland, Australia Photochem Photobiol vol. 95, pp. 1083-1093



Present | Doctoral Researcher, School of Particle Physics and Universe Sciences, University of Helsinki, Helsinki, Finland

Sep 2021

- > Design and analysis of gas-free merger simulations with realistic initial conditions
- > Orbit modelling
- > Personal development courses

May 2021 | Master's of Particle Physics and Astrophysical Sciences, University of Helsinki, Helsinki, Finland

Sep 2019

- \rightarrow GPA: 4.85/5.00
- > Thesis: The Final Parsec Problem in Massive Early-Type Galaxies
- > Studies: Galactic dynamics and evolution, observational astronomy, general relativity, radiative transfer, and Monte Carlo methods.

Nov 2018 | Bachelor of Science (Physical Sciences), University of Southern Queensland, Toowoomba, Australia

Feb 2016

- > GPA: 6.96/7.00
- > Thesis: Insights into Stellar Dynamo Evolution: the Young Sun HD 106506
- > Studies: Astronomical sciences, statistics, and programming.

Jan 2018 | Exchange Studies, University of Zürich, Zürich, Switzerland

Aug 2017

> Studies: Computational astrophysics (N-body simulations and smoothed particle hydrodynamics), mathematical methods for physics, and astrobiology

Funding and Awards

- 2021 UH Research Foundation Doctoral Researcher University of Helsinki
- 2019 Fully-Paid Tuition and Study Grant University of Helsinki
- 2019 Denison Research Scholar University of Sydney
- 2016 Chancellor's Scholarship University of Southern Queensland



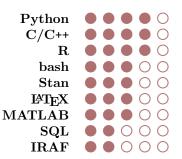
Communication

- > Confident and apt public speaker
- > Concise, professional academic writing
- > Effective group communicator

Languages

- > English (native)
- > German (basic)
- > Finnish (basic)

⟨/> Programming Languages



+ Specific Interests

- > Galactic dynamics
- > Galaxy formation & evolution
- > Supermassive black hole dynamics
- > Computational astrophysics
- > Bayesian Statistics
- > Hierarchical Modelling

TEACHING AND MENTORING

2021–Present University of Helsinki: Graduate course assistant (astrophysics & statistics)

2019–2020 University of Helsinki: English language assistant

2017–2018 University of Southern Queensland: Undergraduate course assistant (physics)

2017–2019 Private Tutor

66 REFERENCES

Prof. Peter Johansson

Department of Physics
UNIVERSITY OF HELSINKI

Opeter.johansson@helsinki.fi

Dr. Caroline Foster

Sydney Institute for Astronomy UNIVERSITY OF SYDNEY @caroline.foster@sydney.edu.au

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