Dr. Rajika Kuruwita

CONTACT INFORMATION

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RESEARCH INTERESTS

Star formation, binary and multiple star systems, protoplanetary disks and planets in binary star systems, MHD simulations, software development.

EDUCATION

Australian National University, Canberra, Australia **February, 2015 - January, 2019**

PhD

- Thesis Topic: "The formation, evolution, and survivability of discs around young binary stars"
- Primary Supervisor: Associate Christoph Federrath
- Secondary Supervisor: Associate Professor Michael Ireland

Macquarie University, Sydney, Australia **February, 2010 - January, 2015**

MRes. Physics and Astronomy

- Thesis Topic: "Fallback disks and the end of the common envelope phase"
- Primary Supervisor: Professor Orsola De Marco
- Secondary Supervisor: Assistant Professor Jan Staff

BSc. Astronomy and Astrophysics

EMPLOYMENT HISTORY

University of Copenhagen, Copenhagen, Denmark
Post-doctorate researcher (European Union INTERACTIONS fellow) **April, 2019 - Present**
Research the formation of binary and multiple star systems via numerical simulations.

Australian National University, Canberra, Australia
Research Assistant **February, 2019 - April, 2019**
Research the formation of binary stars systems via simulations.
Outreach Assistant **December, 2015 - April, 2019**
Organise and run outreach observing and site tours for the public, school, scout and private groups, as well as design activities for the observatory visitor centre.

Macquarie University, Sydney, Australia
Laboratory Demonstrator **February, 2014 - January, 2015**
Taught lab experiments for undergraduate students. This also involved marking lab books.
Observatory and Planetarium Supervisor **February, 2010 - January, 2015**
Coordinated groups, created tours and presentations, operated observatory and planetarium.
Vacation Scholarship Researcher **December, 2012 - February, 2013**
Simulated light curves to understand the influence of exoplanets on the asteroseismological pulsation spectrum of stars.
Vacation Scholarship Researcher **January, 2012 - February, 2012**
Carried out research on nanowires using white light interferometry.

TELESCOPE TIME AWARDED

Australian National University 2.3m Telescope
- **PI**: Building a Census of Protoplanetary Disks in Binary Star Systems (4 nights)

- **PI**: Building a Census of Circumbinary Protoplanetary Disks (3 nights)
- **PI**: Building a Census of Circumbinary Protoplanetary Disks (6 nights)
- **PI**: Building a Census of Circumbinary Protoplanetary Disks (7 nights)

Talks

Early Phases of Star Formation ()Focus Group) **April, 2022**
Contributed Talk Ringberg, Germany
Journal Club **April, 2022**
Invited Talk Amsterdam, The Netherlands
Astronomy on Tap **August, 2021**
Invited Talk Copenhagen, Denmark
StarPlan Science days **June, 2021**
Contributed Talk Copenhagen, Denmark
Distorted Astrophysical Discs **May, 2021**
Contributed Talk Cambridge, UK
Transient Tuesday **March, 2021**
Invited Talk Copenhagen, Denmark
ESO Hypatia Collouium **February, 2021**
Contributed Talk Online
Ramses User Meeting **September, 2019**
Contributed Talk Copenhagen, Denmark
Annual Danish Astronomy Meeting **May, 2019**
Contributed Talk Nyborg, Denmark
Niels Bohr Institute **January, 2019**
Invited Talk Copenhagen, Denmark
Sutherland Astronomical Society Incorporated **September, 2018**
Invited Talk Sydney, Australia
Greenlight for Girls National Science Week **August, 2018**
Invited Talk Canberra, Australia
University of Tübingen **May, 2018**
Astronomy Seminar Tübingen, Germany
Heidelberg Institute for Theoretical Astrophysics **May, 2018**
Astronomy Seminar Heidelberg, Germany
Max Planck Institute for Astronomy **May, 2018**
Planet and Star Formation Seminar Heidelberg, Germany
Hamburg Observatory **May, 2018**
Astronomy Seminar Hamburg, Germany
Annual Scientific Meeting of the Astronomical Society of Australia June, 2018
Contributed Talk Melbourne, Australia
Planets in Perculiar Places **April, 2018**
Contributed Talk Sydney, Australia
International Women's Day Science in the Pub **March, 2018**
Invited Talk Canberra, Australia
12th ANITA Theory Workshop **February, 2018**
Contributed Talk Perth, Australia
Franco-Australian Astrobiology and Exoplanet School and Workshop December, 2017
Contributed Talk Canberra, Australia
Annual Scientific Meeting of the Astronomical Society of Australia July, 2017
Contributed Talk Canberra, Australia
11th ANITA Theory Workshop **February, 2017**
Contributed Talk Hobart, Australia
Mt Stromlo Students Seminars **December, 2016**
Contributed Talk (Awarded Best Theme Talk) Canberra, Australia
6th Australian Exoplanet Workshop **November, 2016**
Contributed Talk Melbourne, Australia
Star Formation **August, 2016**

Computational Astrophysics splinter session (Invited) Exeter, UK **Annual Scientific Meeting of the Astronomical Society of Australia** **July, 2016**
Contributed Talk Sydney, Australia
10th ANITA Theory Workshop **February, 2016**
Contributed Talk Melbourne, Australia
5th Australian Exoplanet Workshop **November, 2015**
Contributed Talk Sydney, Australia
9th ANITA Theory Workshop **February, 2015**
Contributed Talk Canberra, Australia

Awards and Honors

- 2021: Kvinder i Fysik (Danish Women in Physics) Prize 2021 Nominee
- 2020: European Union INTERACTIONS Fellowship
- 2017: Joan Duffield Research Supplementary Scholarship
- 2015: Australian Postgraduate Award
- 2013: Macquarie University Research Training Scholarship
- 2012: Vacation Scholarship (Macquarie University)
- 2011: Vacation Scholarship (Macquarie University)

Teaching and mentoring experience

Niels Bohr Institute Masters Students **August, 2021 - Present**
I am co-supervising two Masters student. One student is working on producing synthetic observations from my simulations and the other is building a pipeline using machine learning to fit synthetics observations to real observations of young protostars.

Niels Bohr Institute Bachelors projects **February-April, 2021**
I supervised three groups of students for their bachelors' projects where we modelled the interiors of exoplanets using polytropes.

Computational Astrophysics **November, 2019, 2020**
Gave post-graduate level lectures on computational astrophysics reviewing hydrodynamics and modelling shock waves.

Mt Stromlo Observatory Summer Research December, 2017 - February, 2018
Co-supervised Isabella Gerard (currently a graduate student at Monash University) on a research project on turbulent magnetic fields and star formation. I am co-author on the paper published from this project.

Mt Stromlo Observatory Winter School **June-July, 2017**
Advised undergraduate students Lara Cullinane and Patrick Armstrong (currently a graduate students at ANU), Joshua Ho and Lillian Guo in planning observations and writing telescope proposals.

Computer Skills

- Computing Languages: Python, Fortran and html
- Applications: LaTeX, `yt`, simulation codes `RAMSES`, `FLASH` and Enzo, analysis of hdf5 files from hydrodynamic simulations, reducing observational data in fits files, retrieving radial velocities.
- Operating Systems: Unix/Linux, Windows, and Mac.

Other Academic Services

- Reviewer for Monthly Notices of the Royal Astronomical Society
- Founded of Astronomy on Tap Copenhagen in 2020.
- Treasurer of Kvinder i Fysik (the Danish women in physics society) from 2019 to present.
- Contributed two popular science articles to the Sunday Space in the Canberra Times.
- Member of the Local Organising Committee for the 2017 Harley Wood Winter School and Annual Scientific Meeting of the Astronomical Society of Australia.
- Member of the Science Organising Committee for the 2016 Harley Wood Winter School.
- Chair of the Organising Committee for the 2016 Mt Stromlo Student Seminars.

Referee Details

- Associate Professor Troels Haugbølle, Center for Star and Planet formation, University of Copenhagen, Geology Museum, Øster Voldgade 5-7, 1350 København K, tel: +45 35 32 11 41, email: haugboel@nbi.ku.dk
- Dr Christoph Federrath, Research School of Astronomy and Astrophysics, Australian National University, Research School of Astronomy & Astrophysics, Mount Stromlo Observatory, Cotter Road, Weston Creek, ACT 2611, tel: +61 2 6125 0217, email: christoph.federrath@anu.edu.au
- Professor Jes Kristian Jørgensen, Center for Star and Planet formation, University of Copenhagen, Geology Museum, Øster Voldgade 5-7, 1350 København K, tel: +45 35 32 41 86, email: jeskj@nbi.ku.dk

Refereed Publications

Kuruwita et al., *The dependence of episodic accretion on eccentricity during the formation of binary stars*, 2020, Astronomy & Astrophysics, 641, A59
- Lead author, and conductor of research and analysis.

Kuruwita & Federrath, *The role of turbulence during the formation of circumbinary discs*, 2019, Monthly Notices of the Royal Astronomical Society, 486, 3647-3663
- Lead author, and conductor of research and analysis.

Kuruwita et al., *Multiplicity of disc-bearing stars in Upper Scorpius and Upper Centaurus-Lupus*, 2018, Monthly Notices of the Royal Astronomical Society, 480, 5099–5112

- Lead author, and conductor of research and analysis.
- Collected the majority of observations.

Kuruwita et al., *Binary star formation and the outflows from their discs*, 2017, Monthly Notices of the Royal Astronomical Society, 470, 1626-1641
- Lead author, and conductor of research and analysis.

Kuruwita et al., *Considerations on the role of fall-back discs in the final stages of the common envelope binary interaction*, 2016, Monthly Notices of the Royal Astronomical Society, 461, 486-496
- Lead author, and conductor of research and analysis.

Jørgensen, J. & **Kuruwita, R.** et al, *Binarity of a protostar affects the evolution of the disk and planets*, 2021, Nature, *Accepted*
- Lead the theoretical component of paper. Conducted analysis of simulations used for comparison with observations.

Gerrard et al., *The role of magnetic field structure in the launching of protostellar jets*, 2019, Monthly Notices of the Royal Astronomical Society, 485, 5532-5542
- Co-supervised Gerrard in running simulations and analysing them

Green et al., *Testing the binary trigger hypothesis in FUors*, 2016, The Astrophysical Journal, 830, 29
- Obtained observational data with Keck and commented on paper drafts.

Childress et al., *The ANU WiFeS SuperNovA Programme (AWSNAP)*, 2016, Publications of the Astronomical Society of Australia, 33, 29
- Obtained observational data with Australian National University 2.3m telescope.

Little et al., *Phase-stepping interferometry of GaAs nanowires: Determining nano-wire radius*, 2013, Applied Physical Letters, 103, 161107
- Obtained experimental data with white light interferometry of nanowires.