Kamran R. J. **Bogue**

MPhys, AFHEA | PhD Researcher

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Profile

PhD Researcher at the Jodrell Bank Centre for Astrophysics, working on magnetic fields, star formation in galaxies, and the interstellar medium in the local universe, with a focus on galaxy-scale simulations using high powered computing systems. Actively engaged in teaching, science communication, and social initiatives.

Research Experience

Jodrell Bank Centre for Astrophysics, University of Manchester

Manchester, England

PhD Student — *2020 - Present*

- Focus on understanding the role of magnetic fields in star formation and in controlling the large-scale dynamics of the ISM.
- Ran high-resolution, three-dimensional, Arepo simulations of isolated galaxies to investigate how a dynamo-generated field shapes the alignment of dense structures in the ISM and their subsequent star formation. Studied the differences between hydrodynamic and magnetohydrodynamic models.
- Required editing of the Arepo source code itself, understanding, utilising version control, and submitting jobs to the COSMA supercomputer.
- Became a member of the ECOGAL collaboration, which seeks to link the various physical size scales of a galaxy. Indeed, at Manchester I've needed to work effectively individually, as well as in small groups and large research collaborations.
- Developed custom analysis pipelines to automatically generate visualisations, calculate key parameters, and output graphs for single snapshots and time evolution.
- Looking toward analysis of the alignment of the magnetic field structures with atomic and molecular hydrogen gas with Histogram of Relative Orientations and Histogram of Gradients analysis tools.

Institut für Theoretische Astrophysik, Universität Heidelberg

Heidelberg, Germany

Visiting Scholar — *2022*

- Funded by both ITA and the Alan Turing Scheme to complete an eight week research placement at the University of Heidelberg.
- Worked closely with Dr Robin Tress and Prof Ralf Klessen to develop a cloud analysis pipeline to extract and investigate the properties of molecular cloud structures that form in my own simulations.
- Engaged in group discussion and learned from academics who had directly authored sub-grid modules of the Arepo code that I utilise in my models.

Cardiff University

Cardiff, Wales

Masters Student — *2018 - 2020*

- Worked on two research projects; firstly in my third year with Dr Nicolas Peretto and secondly in my fourth year with Dr Sarah Ragan.
- With Dr Nicolas Peretto I worked with column density maps constructed from Herschel 160µm and 250µm data in combination with 8µm Spitzer data. The column density maps were used to identify 196 star forming clouds in the galactic plane, for each of which an age was estimated based on their 'Infrared Darkness Parameter', a metric between 0 and 1 that I assigned the clouds. This metric quantified what fraction of their area was below a given brightness at 8µm. The goal of the project was to look for evidence of either a quasi-static star formation process or conversely a rapid and dynamic process.
- With Dr Sarah Ragan, I studied spectral line data to study the dynamics of star forming filaments in IRDC18223. Specifically, N2H+ was studied using the gaussian decomposition technique SCOUSE. To disentangle the effects of different forces on the filament, I developed a simple gravity-only 1D model of IRDC18223 to illustrate what internal motions could be explained purely by gravitational forces.

International Centre for Radio Astronomy Research, University of Western Australia

Perth, Australia

Summer Student — *2019*

- Funded by both Cardiff University and the International Centre for Radio Astronomy Research (ICRAR). Completed research at the University of Western Australia (UWA) under Dr Claudia Urbina and Dr Aaron Robotham.
- Worked with ProFit and EAGLE simulation data with the aim of quantifying how justified certain comparisons between galaxy properties obtained from observations are.
- Had to learn a new programming language from scratch. Placement was so successful that Cardiff and UWA set up a summer exchange programme to send three students from Cardiff to Perth every year.

Education

University of Manchester

Manchester, England

PhD Astronomy and Astrophysics — *2020 - Present*

Cardiff University

Cardiff, Wales

MPhys Physics with Astronomy (First Class Honors) — *2016 - 2020*

Awards & Funding

Royal Astronomical Society Best Poster Award, National Astronomy Meeting, Cardiff *2023*
Associate Fellow of the Higher Education Academy, University of Manchester *2022*
Alan Turing Scheme Funding, Host Institution; Heidelberg University (ITA) *2022*
Cardiff Global Opportunities Funding, Host Institution; University of Western Australia (ICRAR) *2019*
Mentor Consultant Certificate, Cardiff University *2019*
Vera Rubin Award for Community Engagement, Cardiff University *2018*
Student Mentor Advanced Certificate, Cardiff University *2018*

Teaching & Outreach

Teaching

University of Manchester — Manchester, England

Graduate Teaching Assistant *2020 - 2022*

- Taught two second year undergraduate lab experiments, 'Galactic Hydrogen' and 'Cepheid Variables'. Typically I would teach three pairs of students for one experiment and three pairs for the other, twelve students total each week.
- Taught in seven hour teaching days once a week for three weeks per cohort of students. There were three cohorts per semester. One other demonstrator would also be in the lab teaching twelve other students. We managed our own groups with no senior staff.
- Assessed the students in an interview after the experiments had concluded. Also marked lab reports from a variety of experiments at the end of each semester.
- Received outstanding feedback from students. The second-year lab tutored stated that I received some of the most positive student feedback among any demonstrator during the five years that they held their. Student scored me 4.45 out of 5 when asked whether they enjoyed my experiments, compared to 3.6 for all second year demonstrators. When asked if I was a helpful demonstrator, students gave an average mark of 4.95 compared to 4.2 for all second year demonstrators.

The Brilliant Club Scholars Programme — Manchester, England

PhD Tutor *2020 - 2022*

- Designed my own course entitled 'How to Make a Star; The Astrophysics of the Interstellar Medium'. This was a course designed to be taught in seven sessions, once a week, to key stage 4 students.
- The course concluded with a final assignment which I marked. Then had final one-to-one feedback sessions with the students. I taught two classes of six students each.
- The Brilliant Club is an award-winning university access charity supporting less advantaged students to access the most competitive universities and succeed at those institutions. I independently decided to apply for and accept this position particularly because of the mission and values of the charity.
- Advertised the charity and my work with them to other PhD students to encourage others to take part.

Cardiff University — Cardiff, Wales

Demonstrator *2019*

- Paid demonstrating work for two Year 1 classes, 'Mechanics and Matter' and 'Mathematical Methods for Physicists', answering questions and working through problems with the students.

Outreach

Bluedot Festival — Cheshire, England

JBCA Stall Exhibitor *2023*

- Bluedot is the music, science and culture festival held annually at the Jodrell Bank Observatory. Volunteered with other postgraduate students at the JBCA stand, doing astrophysics demonstrations with the public and answering their questions.

Common Wealth Theatre — Leeds, England

Science Expert *2023*

- Worked on the 'Off The Curriculum' project, teaching primary school students. Answered questions and developed their understanding such that they could then work with an artist to create an art piece on the given topic, using the knowledge they had gained.

University of Manchester Physics Outreach — Manchester, England

Podcast Guest *2022*

- Interviewed on my research for British Science Week by the University of Manchester Physcis Outreach team.

The Jodcast — Manchester, England

Host, Newsreader, and Interviewer *2020 - 2022*

- The Jodcast is the Jodrell Bank astronomy podcast. Featured in multiple Jodcast episodes in various roles.

Cardiff University Astronomy Society — Cardiff, Wales

Social Secretary *2017 - 2018*

- Organised and co-hosted stargazing trips to the Brecon Beacons.

Science Made Simple, Universe in the Classroom — Wales

STARS Ambassador — *2016 - 2017*

- Visited primary schools across Wales to deliver workshops to school children on space and astronomy. Gave presentations and delivered demonstrations.

Professional Roles

EquiTea Co-Founder and Student Lead, Jodrell Bank Centre for Astrophysics — *2021 - Present*

Postgraduate Committee Member (Internal Seminar Organiser), Jodrell Bank Centre for Astrophysics — *2020 - 2021*

Freelance Science Writer, Gair Rhydd, Techniquest — *2018 - 2019*

Science Communicator, Techniquest Science Museum — *2017 - 2019*

Student Mentor & Mentor Consultant, Cardiff University — *2017 - 2019*

Talks & Posters

Talks

The Impact of Magnetic Fields on the Formation and Evolution of Molecular Clouds — Lyon, France

STAR@Lyon, Contributed Talk — *2023*

Posters

National Astronomy Meeting, Cardiff, Wales — *2023*

Olympian Symposium, Katerini, Greece — *2023*

From Stars To Galaxies II, Gothenburg, Sweden — *2022*

National Astronomy Meeting, Coventry, England — *2022*

National Astronomy Meeting, Bath, England (Virtual) — *2021*

Publications

Refereed

Galaxy And Mass Assembly (GAMA): assimilation of KiDS into the GAMA database — MNRAS

Sabine Bellstedt, Simon P. Driver, Aaron S. G. Robotham, Luke J. M. Davies, Kamran R. J. Bogue, Robin H. W. Cook, Abdolhosein Hashemizadeh, Soheil Koushan, Edward N. Taylor, Jessica E. Thorne , Ryan J. Turner 1 and Angus H. Wright — *2020*

Monthly Notices of the Royal Astronomical Society, Volume 496, Issue 3, August 2020, Pages 3235–3256

`https://doi.org/10.1093/mnras/staa1466`

Submitted

Self-consistent modelling of the Milky Way structure using live potentials — MNRAS

Eva Durán-Camacho, Ana Duarte-Cabral, Alex R. Pettitt, Robin G. Tress, Paul C. Clark, Ralf S. Klessen, Kamran R. J. Bogue, Rowan J. Smith, and Mattia C. Sormani — *2023*

In Prep

Differences in the Global Properties of an Isolated Galaxy With and Without Magnetic Fields

Kamran R. J. Bogue, Rowan J. Smith, Robin G. Tress, Mordecai Mark Mac-Low, and Ralf S. Klessen — *2023*