Dr. Rachael E. **Ainsworth**

Research Associate in Long Baseline Radio Interferometry | JBCA-ICE Open Science Champion

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Education

University of Dublin, Trinity College — *Dublin, Ireland*

Ph.D. in Astrophysics; Supervisors: Prof. Tom Ray (DIAS), Dr. Anna Scaife (JBCA) — *2017*

- Thesis: *Morphology and Time Evolution of Thermal Jets Associated with Low Mass Young Stars*
- Submitted: August 2014 – *Viva voce*: September 2016 – Awarded: April 2017

University of Tennessee — *Knoxville, TN, USA*

B.Sc. in Physics, Minor in Studio Art (Photography) — *2010*

- Overall GPA: 3.61/4.0, Honours: *cum laude*
- Activities and Societies: Central Program Council, Film Committee, The Campus Literary and Art Magazine: The Phoenix, The Society of Physics Students

Experience

Jodrell Bank Centre for Astrophysics (JBCA), University of Manchester — *Manchester, UK*

Research Associate — *June 2017 - present*

- Developing standardised software for calibrating dispersive delay corrections in long baseline interferometry, for low frequency radio telescopes such as LOFAR, as part of the H2020 RadioNET RINGS project.
- Conducting research to exploit the polarisation capabilities of the e–MERLIN telescope.
- Interferometry Centre for Excellence (ICE) Open Science Champion to promote, advocate and organise events relating to open science in astronomy.

Dublin Institute for Advanced Studies (DIAS) — *Dublin, Ireland*

Postdoctoral Research Fellow — *October 2014 - October 2016*

- Member of a team to develop novel processing and analytical techniques for terabytes of data from the International LOFAR Telescope to detect very faint radio sources with this next-generation instrument.
- Collaborated with Thüringer Landessternwarte in the use of LOFAR data to help understand the generation of outflows from young stars: achieved the first detection of a young stellar object (YSO) at 2 m (150 MHz).
- Member of the Communications Working Group to re-define the public communication strategy of DIAS through restructure of the website and social media developments.

Ph.D. Student; Supervisors: Prof. Tom Ray (DIAS), Dr. Anna Scaife (JBCA) — *November 2010 - September 2014*

- Led three projects performing systematic modelling of multi-wavelength, multi-scale datasets of protostellar jets from AMI, e–MERLIN & GMRT to disentangle competing radiation processes and investigate the jet launching mechanism.
- Involved in the commissioning of e–MERLIN, which included the reduction and analysis of legacy data (Thermal Jets, PEBBLeS) intermediate to the original MERLIN and the fully upgraded e–MERLIN.
- Published the first investigations of YSOs at metre wavelengths and pioneered to characterise this very long wavelength emission through follow-up observing campaigns on the GMRT and LOFAR.

University of Tennessee (UT) — *Knoxville, TN, USA*

Summer Research Fellow; Supervisor: Dr. Michael Guidry (UT) — *May 2009 - August 2009*

- Studied the explosion mechanism of Type Ia Supernovae through computational simulations using the FLASH code on the supercomputing facilities at Oak Ridge National Laboratory.

Undergraduate Student Researcher; Supervisor: Dr. Michael Guidry (UT) — *June 2008 - August 2008*

- Studied the interactions between colliding galaxies using computational simulations developed by the UT Astrophysics Group.

NASA Jet Propulsion Laboratory / California Institute of Technology (JPL/Caltech) — *Pasadena, CA, USA*

Undergraduate Student Research Program Intern; Supervisor: Dr. Raghvendra Sahai (JPL/Caltech) — *September 2008 - December 2008*

- Developed and applied a procedure for the reduction and calibration of near-infrared echelle spectroscopic data for (a) a sample of pre-planetary nebulae to look for the signatures of high-velocity outflows that shape the resulting planetary nebula, and (b) stellar interlopers: young stars with winds speeding through and interacting with dense interstellar clouds.

Publications

Refereed

8. C. P. Coughlan, **R. E. Ainsworth**, J. Eislöffel, M. Höft, A. Drabent, A. M. M. Scaife, T. P. Ray, et al., "A LOFAR Detection of the Low Mass Young Star T Tau at 149 MHz", *Astrophysical Journal*, 834, 206–213, 2017.
7. **R. E. Ainsworth**, C. P. Coughlan, D. A. Green, A. M. M. Scaife and T. P. Ray, "A GMRT survey of regions towards the Taurus molecular cloud at 323 and 608 MHz", *Monthly Notices of the Royal Astronomical Society*, 462, 2904–2917, 2016.
6. **R. E. Ainsworth**, A. M. M. Scaife, D. A. Green, C. P. Coughlan and T. P. Ray, "GMRT detections of low mass young stars at 323 and 608 MHz", *Monthly Notices of the Royal Astronomical Society*, 459, 1248–1258, 2016.
5. **R. E. Ainsworth**, A. M. M. Scaife, T. P. Ray, A. M. Taylor, D. A. Green and J. V. Buckle, "Tentative evidence for relativistic electrons generated by the jet of the young Sun-like star DG Tau," *Astrophysical Journal*, 792, L18–L22, 2014.
4. **R. E. Ainsworth**, T. P. Ray, A. M. M. Scaife, J. S. Greaves and R. J. Beswick, "Sub–arcsecond high sensitivity measurements of the DG Tau jet with e–MERLIN," *Monthly Notices of the Royal Astronomical Society*, 436, L64–L68, 2013.
3. **R. E. Ainsworth**, A. M. M. Scaife, T. P. Ray, et al., "AMI radio continuum observations of young stellar objects with known outflows," *Monthly Notices of the Royal Astronomical Society*, 423, 1089–1108, 2012.
2. A. M. M. Scaife, J. Hatchell, **R. E. Ainsworth**, et al., "AMI–LA radio continuum observations of Spitzer c2d small clouds and cores: Serpens region," *Monthly Notices of the Royal Astronomical Society*, 420, 1019–1033, 2012.
1. A. M. M. Scaife, J. V. Buckle, **R. E. Ainsworth**, et al., "Radio continuum observations of Class I protostellar disks in Taurus: constraining the greybody tail at centimetre wavelengths," *Monthly Notices of the Royal Astronomical Society*, 420, 3334–3343, 2012.

Unrefereed

2. **R. E. Ainsworth**, A. M. M. Scaife, T. P. Ray, D. A. Green and J. V. Buckle, "The Lowest Frequency Observations of YSOs with the GMRT", Protostars and Planets VI, Heidelberg, July 15-20, 2013. Poster #1H019.
1. R. Sahai, M. Claussen, M. Morris and **R. E. Ainsworth**, "Ballistic Stellar Interlopers producing Bow-Shocks in the Interstellar Medium", American Astronomical Society Meeting #213, *Bulletin of the American Astronomical Society*, 41, 465, 2009.

Press Releases

1. R. Sahai, M. Morris, M. Claussen and **R. E. Ainsworth**, "Hubble Finds Stars That 'Go Ballistic' ", NASA Jet Propulsion Laboratory, 7 January 2009. `https://www.jpl.nasa.gov/news/news.php?release=2009-002`

Presentations

Tea time talk, Jodrell Bank Observatory, Cheshire, UK 2016
The Accretion/Outflow Connection in YSOs Workshop, Contributed talk, ESA/ESTEC, Noordwijk, Netherlands 2015
Seminar, Thüringer Landessternwarte, Tautenburg, Germany 2015
Lunch talk, Leiden Observatory, Leiden, Netherlands 2014
e–MERLIN Science Meeting, Contributed talk, University of Manchester, Manchester, UK 2014
Postgraduate Seminar Series, Seminar, University of Dublin, Trinity College, Dublin, Ireland 2014
The Metrewavelength Sky Conference, Contributed talk, NCRA–TIFR, Pune, India 2013
Protostars and Planets VI, Poster, Heidelberg, Germany 2013
Radio Stars and Their Lives in the Galaxy Workshop, Contributed talk, MIT Haystack Observatory, MA, USA 2012
Astronomical Science Group of Ireland Spring Meeting, Contributed talk, Birr, Ireland 2012
Seminar, Dublin Institute for Advanced Studies, Dublin, Ireland 2012
National Astronomy Meeting of the Royal Astronomical Society, Poster, University of Manchester, Manchester, UK 2012
Seminar, University of Southampton, Southampton, UK 2011
Young European Radio Astronomers Conference, Contributed talk, University of Manchester, Manchester, UK 2011

Teaching

Supervisor for Transition Year Students (15-17 yo), Dublin Institute for Advanced Studies, Dublin, Ireland 2015 - 2017
Exam invigilator, University of Dublin, Trinity College, Dublin, Ireland 2013 - 2014
Physics Lab Demonstrating for Junior Freshman Engineering, University of Dublin, Trinity College, Dublin, Ireland 2012 - 2013

Observing Programmes

Co-I: e–MERLIN (PI: J. Greaves, CY5214, 330 hours), Planet-Earth Building Blocks - a Legacy e–MERLIN Survey.
Co-I: e–MERLIN (PI: J. Greaves, CY4211, 12 hours), What planets for DG Tau?: Observations of DG Tau at 21–24 GHz to investigate dust concentration in the circumstellar disk.
PI: VLA Cycle 2016A (16A-051, 6.5 hours), Confirming Cosmic Ray Production in a Protostellar Jet: Observations of DG Tau at C and X-band, C-config to measure the bow shock proper motion.
PI: LOFAR Cycle 5 (LC5_004, 8 hours), VLBI Investigations of a Protostellar Jet with LOFAR: Low-frequency, high-resolution observations of T Tau.
PI: VLA Cycle 2015A (15A-143, 2 hours), Cosmic Rays Generated in the Jet of a Young Sun-like Star?: Observations of DG Tau at S-band, A-config to confirm synchrotron nature of bow shock.
PI: VLA Cycle 2014A (14A-439, 14 hours), Polarisation Measurements of Protostellar Jets: Observations of 3 YSOs at L and S-band, A-config to detect linearly polarised emission.
PI: VLA Cycle 2014A (14A-457, 6 hours), Radio Continuum Observations of FU Orionis Stars: Observations of 4 FUors at X and Ku-band, A-config to detect individual ejection episodes.
Co-I: LOFAR Cycle 1 (PI: J. Eislöffel, LC1_001, 17 hours), Low Frequency Observations of Jets from Young Stars in Taurus: To follow up the low frequency GMRT observations at 150 MHz, confirm the emission mechanism at low frequency, and study outflow structure.
PI: GMRT Cycle 25 (25_072, 22 hours), Low Frequency Radio Emission from the Youngest Low Mass Protostars: To extend the GMRT pathfinder program to Class 0 objects at 325 and 610 MHz.
PI: GMRT Cycle 25 (25_066, 58 hours), Blind Survey of the NGC 1333 Star Forming Region at Low Frequencies: To perform a radio census of Class 0–III YSOs at 610 MHz.

High-Performance Computing Projects

Co-I: ICHEC 2016 (PI: C. Coughlan, dsast016b, class: B, 600000 CPU hours on Fionn), New Discoveries at Low Frequencies - Searching for Young Stellar Objects and Exoplanets with LOFAR, Irish Centre for High-Performance Computing.
PI: ICHEC 2015 (dsast014c, class: C, 6000 CPU hours on Fionn), Calibrating LOFAR Observations of Young Stellar Objects, Irish Centre for High-Performance Computing.

Honours & Awards

Ph.D. funding (4 years), Dublin Institute for Advanced Studies	2010
UT Chancellor's Honours Award for Extraordinary Professional Promise, University of Tennessee	2010
Summer Research Fellowship, University of Tennessee	2009
Undergraduate Student Research Program, National Aeronautics and Space Administration	2008
Phi Eta Sigma Freshman Honors Fraternity, University of Tennessee	2006

Outreach

Women in Physics Careers Panel, School of Physics & Astronomy, University of Manchester, UK	2017
Interviewed for the Jodcast podcast, Jodrell Bank Centre for Astrophysics, University of Manchester, UK	2017
Volunteer for SKA at Bluedot Festival, Jodrell Bank Observatory, Cheshire, UK	2017
Speaker on Public Open Nights, Dunsink Observatory, Dublin, Ireland	2011 - 2017
Judge, SciFest@School, Santa Sabina Sutton Secondary School, Sutton, Ireland	2017
Interviewed for The DeTECHtives TV show, Raidió Teilifís Éireann (RTÉ), Dublin, Ireland	2017
Volunteer, European Science Open Forum, Dublin Convention Centre, Dublin, Ireland	2012
Photographer, lecture by NASA Astronaut Shane Kimbrough, Dublin City University, Dublin, Ireland	2011
Photographer, "Exploring the Final Frontier: Fifty Years On" lecture with Russian Cosmonaut Mikhail Kornienko, Dublin City University, Dublin, Ireland	2011

Service

Referee, The Astrophysical Journal	2017

References

Prof. Anna Scaife, Jodrell Bank Centre for Astrophysics, University of Manchester, Manchester, UK ✉ anna.scaife@manchester.ac.uk
Prof. Tom Ray, School of Cosmic Physics, Dublin Institute for Advanced Studies, Dublin, Ireland ✉ tr@cp.dias.ie
Prof. Luke Drury, School of Cosmic Physics, Dublin Institute for Advanced Studies, Dublin, Ireland ✉ ld@cp.dias.ie
Dr. David Green, Cavendish Laboratory, University of Cambridge, Cambridge, UK ✉ dag@mrao.cam.ac.uk
Dr. Raghvendra Sahai, Jet Propulsion Laboratory/Caltech, Pasadena, CA, USA ✉ raghvendra.sahai@jpl.nasa.gov