Dr. Jack Birkin

Postdoctoral Research Associate - Mitchell Institute for Fundamental Physics and Astronomy - Texas A&M University
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EDUCATION

PhD Astrophysics | Durham University, UK
Oct 2018 – Aug 2022 | with Prof. Ian Smail and Prof. Mark Swinbank

- Thesis title: "The dynamics and ISM properties of high-redshift dusty star-forming galaxies"

MPhys Physics and Astronomy | Durham University, UK
Oct 2014 – Jun 2018 | First Class Honours

RESEARCH POSITIONS

Postdoctoral Research Associate | Texas A&M University, TX, USA
Nov 2022 – Present | with Prof. Justin Spilker

RESEARCH INTERESTS

Galaxy evolution | High-redshift galaxies | Galaxy dynamics | Molecular gas properties of galaxies

My main area of research interest is in the formation and evolution of dust-obscured star-forming galaxies (DSFGs) at $z \sim 2$–5. These sources are typically forming stars at rates of 100–1000 $M_{\odot} yr^{-1}$ and are believed to contribute significantly to the star-formation rate density at the peak of cosmic star formation ("Cosmic Noon"), making them important laboratories for testing prescriptions of star formation. I have used data from ALMA and NOEMA to study the molecular gas content of these sources, and I am currently leading a KMOS large programme aiming to study their dynamics and triggering mechanisms. Additionally, I am a member of the TEMPLATES collaboration, an Early Release Science program with JWST, for which I work primarily with NIRSpec IFU data. I have written four first-author papers, and co-authored fifteen.

PUBLICATIONS

4 First Author, 19 Total, 447 Citations, H-index = 10

1. "TEMPLATES: Direct Abundance Constraints for Two Lensed Lyman-Break Galaxies" Welch, Olivier, Hutchison et al. ApJ submitted arXiv:2401.13046 (2024)
2. "TEMPLATES: A Robust Outlier Rejection Method for JWST/NIRSpec Integral Field Spectroscopy" Hutchison, Welch, Rigby et al. PASP submitted arXiv:2312.08959 (2023)
3. "JWST Early Release Science Program TEMPLATES: Targeting Extremely Magnified Panchromatic Lensed Arcs and their Extended Star formation" Rigby, Vieira, Phadke et al. ApJ submitted arXiv:2312.12518 (2023)
4. "The kinematics of massive high-redshift dusty star-forming galaxies" Amvrosiadis, Wardlow, Birkin et al. MNRAS submitted arXiv:2312.08959 (2023)
5. "The ALMA-CRISTAL survey: Widespread dust-obscured star formation in typical star-forming galaxies at z = 4–6" Mitsuhashi, Tadaki, Ikeda et al. A&A submitted arXiv:2311.17671 (2023)
6. **"JWST's TEMPLATES for Star Formation: The First Resolved Gas-Phase Metallicity Maps of Dust-Obscured Star-Forming Galaxies at $z \sim 4$" Birkin, Hutchison, Welch et al. ApJ, 958, 64 (2023)**
7. "TEMPLATES: Characterization of a Merger in the Dusty Lensing SPT0418-47 System" Cathey, Gonzalez, Lower et al. ApJ submitted arXiv:2307.10115 (2023)
8. "Spatial variations in aromatic hydrocarbon emission in a dust-rich galaxy" Spilker, Phadke, Aravena et al. Nature, 618, 708 (2023)

9. "VLA Legacy Survey of Molecular Gas in Massive Star-forming Galaxies at High Redshift" Frias Castillo, Hodge, Rybak et al. ApJ, 945, 128 (2023)
10. **"KAOSS: turbulent, but disc-like kinematics in dust-obscured star-forming galaxies at $z \sim$1.3-2.6" Birkin, Smail, Swinbank et al. MNRAS submitted arXiv:2301.05720 (2023)**
11. "The JCMT SCUBA-2 Survey of the James Webb Space Telescope North Ecliptic Pole Time-Domain Field" Hyun, Im, Smail et al. ApJS, 264, 19 (2023)
12. "An ALMA survey of the SCUBA-2 Cosmology Legacy Survey UKIDSS/UDS field: halo masses for submillimetre galaxies" Stach, Smail, Amvrosiadis et al. MNRAS, 504, 172 (2021)
13. "An ALMA survey of the S2CLS UDS field: optically invisible submillimetre galaxies" Smail, Dudzeviciute, Stach et al. MNRAS, 502, 3426 (2021)
14. **"An ALMA/NOEMA survey of the molecular gas properties of high-redshift star-forming galaxies" Birkin, Weiss, Wardlow et al. MNRAS, 501, 3926 (2021)**
15. "FIR-luminous [C II] Emitters in the ALMA-SCUBA-2 COSMOS Survey (AS2COSMOS): The Nature of Submillimeter Galaxies in a 10 Comoving Megaparsec-scale Structure at z $\sim$ 4.6" Mitsuhashi, Matsuda, Smail et al. ApJ, 907, 122 (2021)
16. "An ALMA survey of the brightest sub-millimetre sources in the SCUBA-2-COSMOS field" Simpson, Smail, Dudzeviciute et al. MNRAS, 495, 3409 (2020)
17. "An ALMA survey of the SCUBA-2 CLS UDS field: physical properties of 707 sub-millimetre galaxies" Dudzeviciute, Smail, Swinbank et al. MNRAS, 494, 3828 (2020)
18. "SCUBA-2 Ultra Deep Imaging EAO Survey (Studies). III. Multiwavelength Properties, Luminosity Functions, and Preliminary Source Catalog of 450 μm Selected Galaxies" Lim, Wang, Smail et al. ApJ, 889, 80 (2020)
19. **"Reconstructing the baryon acoustic oscillations using biased tracers" Birkin, Li, Cautun Shi et al. MNRAS, 483, 5267 (2019)**

AWARDS

ALMA Ambassador 2024
10000 USD

OBSERVING EXPERIENCE

James Clerk Maxwell Telescope (JCMT) | SCUBA-2
Project ID M19AP048: A Missing Population of Strongly Star-Forming Galaxies at z>3? | March 2019 | 5 nights
Project ID M16AL006: STUDIES: SCUBA-2 ULTRA Deep Imaging EAO Survey | March 2019 | 4 nights
Observed at the JCMT on Mauna Kea, learned how to reduce JCMT data with the ORAC-DR pipeline. Worked with three different support astronomers during the observing runs.

Australia Telescope Compact Array (ATCA)
Project ID C3181: COALAS: CO ATCA Legacy Archive of Star-Forming Galaxies | October 2019 | 6 nights
For one night I was assisted by a support astronomer but for the remaining five I was solely responsible for carrying out the observations.

SUCCESSFUL PROPOSALS

PI:
The interstellar medium properties of the brightest sub-millimetre galaxies in COSMOS | ID W19CT 2019 | NOEMA 37.5 hours

A large blind survey of CO and [CI] in COSMOS dusty star-forming galaxies | ID W20DE 2020 | NOEMA 63 hours

A CO/[CI] survey of high-redshift star-forming galaxies | ID S21CQ

2021 | NOEMA 54 hours

Co-I:
A missing population of strongly star-forming galaxies at z >3 ? | ID M19AP048
2019 | JCMT 32 hours | PI: I. Smail

Completing the SCUBA-2 observations of the JWST/GTO Time Domain Survey Field | ID M19BP031
2019 | JCMT 13 hours | PI: I. Smail

KAOSS: A large KMOS redshift survey of ALMA-identified submillimetre galaxies in UDS, COSMOS and GOODS-S/ECDFS | ID 1103.A-0182
2019 | KMOS 245 hours | PI: I. Smail

Cold molecular gas content of dusty starbursts at z = 4 | ID C3382
2020 | ATCA 118 hours | PI: H. Dannerbauer

A SCUBA-2 search for the reversal in the star-formation-density relation in distant clusters | ID M20BP042
2020 | JCMT 5.8 hours | PI: I. Smail

A survey for atomic carbon and CO at z $\sim$ 4 | ID W20DN
2020 | NOEMA 40 hours | PI: A. Weiss

A legacy library of molecular gas at high redshift | ID VLA/21A-254
2020 | VLA 116 hours | PI: J. Hodge

[CI] as a molecular gas tracer in star forming galaxies at high redshift | ID 2021.1.01342.S
2021 | ALMA 10 hours | PI: M. Frias Castillo

Using cold-dust-selected samples from SCUBA-2 to trace the growth of cluster galaxies out to z $\sim$ 2 | ID M21BP030
2021 | JCMT 24 hours | PI: I. Smail

You (Don't?) Spin Me Round: Resolving Disk Formation in High-Redshift Dusty Starburst Galaxies | ID 3743
2023 | JWST 41 hours | PI: J. Spilker

TALKS, CONFERENCES AND WORKSHOPS

Below is a list of talks at international/national conferences and internal seminars that I have given, and also a number of workshops that I have attended.

10th IRAM Millimeter Interferometry School | October 2018 | Grenoble, France | Summer School

CASA workshop | November 2018 | Durham, UK | Workshop

15th Durham-Edinburgh eXtragalactic workshop | January 2019 | Edinburgh, UK | Talk

Durham Friday Lunchtime Astronomy Talk | May 2019 | Durham, UK | Talk

16th Durham-Edinburgh eXtragalactic workshop | January 2020 | Durham, UK | Talk

Durham Friday Lunchtime Astronomy Talk | January 2020 | Durham, UK | Talk

Durham Friday Lunchtime Astronomy Talk | November 2020 | Online | Talk

17th Durham-Edinburgh eXtragalactic workshop | January 2021 | Online | Talk

European Astronomical Society meeting | June 2021 | Online | Poster Talk

National Astronomy Meeting | July 2021 | Online | Talk

18th Durham-Edinburgh eXtragalactic workshop | January 2022 | Online | Talk

Texas A&M Astrosymposium | August 2022 | Online | Talk

Texas A&M Astronomy Seminar | January 2023 | College Station, TX | Talk

Texas A&M Exgal meeting | April 2023 | College Station, TX | Talk

Texas A&M Joint Nuclear-Astro seminar | April 2023 | College Station, TX | Talk

DAWN Caketalk | June 2023 | Online | Talk

Texas A&M Astrosymposium | August 2023 | College Station, TX | Talk

Resolving the Extragalactic Universe with ALMA and JWST | November 2023 | Tokyo, Japan | Talk

SKILLS

Astronomical Tools
ESOREX • MAGPHYS • CASA • GILDAS • TOPCAT • ds9 • GAIA • GALFIT

Programming languages
Python (main) • R • C • FORTRAN (basic) • bash

Software Skills
Linux • Mac OS • Windows • LaTeX • Microsoft Office • LibreOffice

TEACHING AND OTHER WORK

Other responsibilities I have had which have contributed to my personal/academic development:

Durham University Open Day Ambassador | 2016-2018

Undergraduate workshop demonstrator (Stars and Galaxies course) | 2019-2021

Organiser of journal club for first-year PhD students | 2020

18th Durham-Edinburgh eXtragalactic workshop Local Organising Committee | January 2022

Texas A&M GLASS "How to get a postdoc" panel member | March 2023

Texas A&M Astronomy Postdoc Mentor | Current

Texas A&M Astronomy Postdoc President | July 2023-Present

ApJ reviewer | Current

A&A reviewer | Current