

CURRICULUM VITAE FOR JÚLIA SISK REYNÉS

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RESEARCH PROFILE

Postdoctoral research fellow focusing on strong gravitational lensing for astrometric determinations. I use multi-wavelength data of strongly lensed quasars to characterize offsets between the optical/radio and X-ray emission regions in AGN, and to find evidence for dual and binary AGN. Doctoral thesis exploited X-ray astronomy to probe fundamental physics, in particular, axion-like particles and black hole spin in AGN. Led several feasibility studies with future X-ray observatories, including *Athena* and *AXIS*. Interests include: (i) quasars, quasar pairs, and AGN jets, (ii) physics beyond the Standard Model, including axions and other dark matter candidates, (iii) accretion onto compact objects, and (iv) magnetic fields.

First author of three and co-author of one published journal articles. Co-author on an article in press, lead author on a paper in preparation, and first-author of one published proceedings article. Publications listed at the end of this document and on NASA/ADS.

EMPLOYMENT

Postdoctoral Research Fellow 09/2024 - Present
Center for Astrophysics (CfA) | Harvard & Smithsonian, Cambridge, MA
PI: Dr Daniel A. Schwartz (CfA).

EDUCATION

Ph.D in Astronomy 10/2020 - 07/2024
Institute of Astronomy, The University of Cambridge, Cambridge, UK
Fully-funded studentship from the Science and Technologies Facilities Council, UKRI.
Title: “Unveiling fundamental physics with high-resolution AGN X-ray spectroscopy” (Link to thesis).
Supervised by Prof Chris Reynolds (University of Maryland College Park, MD) and Dr James Matthews (University of Oxford, UK).

First Class Honours, MPhys (Hons) Physics (BSc + Masters’ in Physics) 2016 - 2020
The University of Manchester, Manchester, UK
Masters’ thesis focused on building analytic models of the thermal Sunyaev-Zel’dovich effect from universal cluster pressure profiles. Supervised by Prof Scott Kay.
Summer research intern in the Particle Physics Department in 2019. Carried out a project on direct dark matter searches at the *DarkSide-20k* facility under Profs Darren Price and Andrzej Szelc.

TECHNICAL SKILLS & LANGUAGES

Programming – Bash, Python (including `mpi`), `tcl`
High Energy Astrophysics – HEASoft, CIAO, (Py)XSPEC, ds9, SAOTrace
Numerical astrophysics & axions – Arepo (basic) & ALPRO
Languages – English, Catalan, Spanish

AWARDS, PRIZES & RECOGNITIONS

Sponsored attendance, Flatiron Summer School on numerical astrophysics 08/2023

Selected to attend a two-week summer school on numerical astrophysics by the *Center for Computational Astrophysics, Flatiron Institute, New York, NY*. Sponsored by the Simons Foundation.

Paul Murdin Prize for “the best published paper by a current student” 2022

Awarded by the *Institute of Astronomy, University of Cambridge, UK* for my first-author paper Sisk-Reynés et al. (2022), MNRAS, 510, 1.

Stellify Award for “outstanding extracurricular contributions” 2020

Honorary recognition by *The University of Manchester, UK* for contributions made from 2016 to 2020.

SUCCESSFUL TELESCOPE PROPOSALS

Co-I, Chandra General Observer Program, Cycle 26 (640 ks) 2024

Status: approved. PI: Dr Helen Russell (University of Nottingham, UK).

Co-I, Chandra Legacy Program on the Perseus Cluster (3 Ms) 2024

Status: December 2024 start. PI: Prof Andrew Fabian (University of Cambridge, UK).

MENTORING & TEACHING

◇ As a doctoral student at the *Institute of Astronomy (IoA), University of Cambridge, UK*:

Co-supervisor for Esin Gulbahar, undergraduate summer research intern 2022

Project: “An *XMM-Newton* + *NuSTAR* view of the broad-line radio galaxy 4C 74.26”.

Co-supervised with Prof Chris Reynolds and Dr Dominic Walton.

Undergraduate Supervisor for Emmanuel and Trinity Colleges 2021 - 2022

Led small-group teaching sessions to facilitate discussions on problem sheets and past paper questions.

- First-Year Mathematics, Natural Sciences - 6 students total, 4 hours/week, 20 weeks.
- Third-Year Astrophysical Fluid Dynamics - 3 students, 3 hours/week, 4 weeks.

◇ As an undergraduate student at the *University of Manchester, UK*

Teach First Insight Programme trainee, London & Southampton, UK 09/2019

Ogden Trust Teach Physics intern, Bury, Greater Manchester, UK 2017

Peer Assisted Study Sessions mentor for fifteen first-year Physics students 2017 - 2018

PRESENTATIONS

Selected invited presentations (14 since 2022)

◇ Topic: Using current and future X-ray observatories to probe axions (20 - 60 minutes).

NewAthena UK Science Community Meeting, *Edinburgh, UK* 09/2023

STROBE-X probe-class concept, cosmology subgroup, online 05/2023

AXIS probe-class concept, all collaboration members, online 03/2023

LEM probe-class concept, ISM Working Group, online 12/2022

Axion Journal Club, Stockholm University, *Stockholm, Sweden* 06/2024

High Energy Astrophysics Division, MPE, *Munich, Germany* 04/2024

KIPAC Tea Talk, KIPAC, Stanford University, Stanford, online 12/2023

◊ Topic: Seminar-style talks on my work on axions and black hole spin (30 - 60 minutes).

Seminar, NASA Goddard Space Flight Center, <i>Greenbelt, MD</i>	Upcoming
Seminar, High Energy Astrophysics Division, CfA, Cambridge, MA, online	03/2024
<i>Chandra</i> /HETG Working Group, MIT Kavli Institute, <i>Cambridge, MA</i>	10/2022
Special Seminar, High Energy Astrophysics Division, CfA, <i>Cambridge, MA</i>	10/2022
<i>Fermi</i> Working Group Journal Club, NASA Goddard Space Flight Center, <i>Greenbelt, MD</i>	10/2022
Astrophysics Seminar, University of Maryland, <i>College Park, MD</i>	10/2022

Selected contributed presentations (12 since 2022)

◊ Topic: Constraining axions and dark matter with X-ray astronomy (15 - 60 minutes).

“25 years of science with <i>Chandra</i> ” Workshop, <i>Boston, MA</i>	Upcoming
“Dark Matter in Astrophysical Laboratories” KICC Focus Meeting, <i>Cambridge, UK</i>	06/2024
“Recent Progress in Axion Theory and Experiment” Workshop, IPPP, <i>Durham, UK</i>	09/2022

◊ Topic: X-ray reflection spectroscopy and the spin of the colossal black hole in H1821+643 (15 minutes).

“Evidence for SMBH binaries” RAS Specialist Discussion Meeting, <i>London, UK</i>	04/2023
“UK New results in X-ray Astronomy” Conference, <i>Leicester, UK</i>	05/2022

PROFESSIONAL SERVICE

Proposal reviewing

<i>NICER</i> Peer Review Panel, Cycle 7	11/2024
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Conference organization

LOC, “IoA50: New Frontiers of Astronomy”, IoA, <i>Cambridge, UK</i>	07/2024
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Conference/meeting panel discussion

Panelist, “Dark Matter in Astrophysical Laboratories”, KICC, <i>Cambridge, UK</i>	06/2024
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Mission collaborations

Junior member, cosmology subgroup, <i>STROBE-X</i> probe-class concept	08/2023 - Present
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INSTITUTIONAL SERVICE

◊ As a postdoctoral researcher at the *CfA | Harvard & Smithsonian, MA*

Weekly High Energy Astrophysics Seminar organizer	11/2024 - Present
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◊ As a graduate student at the *Institute of Astronomy (IoA), University of Cambridge, UK*

Newnham College Seminar Speaker Series organizer	2022 - 2023
International Women’s Day lead organizer, IoA	2022 - 2023
Computer Users’ Committee, IoA, graduate representative	2022 - 2023
Prospective applicants’ Open Day, IoA, graduate ambassador	2021 - 2022
First-year graduate student Journal Club organizer, IoA	2021

◊ As an undergraduate and masters’ student at *The University of Manchester, UK*

Final-year Physics cohort representative	2019 - 2020
Nuclear & Particle Physics undergraduate society lead committee member	2017 - 2020

SELECTED OUTREACH & PUBLIC ENGAGEMENT

- Spanish-speaking Public Observatory Night, guest speaker, Cambridge, MA** Upcoming
- Invited spotlight article on axions for the RAS *Astronomy & Geophysics* magazine** 2024
- “The detergent particle”; *Sisk-Reynés, RAS A&G*, December 2024 issue.
- Invited public talk for the Lindemann Trust on black holes** 2023 - 2024
- At Magdalene College, *Cambridge*, for the Lindemann Science Day (160 schoolchildren per year).
- Press release on my axion work by the *Athena Community Office*** 05/2023
- Volunteer, Cambridge Science Festival *Cambridge, UK*** 03/2023
- Treasure Hunt on “Women in Astronomy at Cambridge”, lead organizer (200+ attendees).
- Press release on the spin of H1821+643 by the *Chandra Press Office*** 06/2022

SCIENTIFIC MEMBERSHIPS

- American Astronomical Society (AAS) – US
- AAS High Energy Astrophysics Division (HEAD) – US
- Institute of Physics (IoP) – UK

3 first-author and 1 co-author published peer-reviewed journal publications.

All publications available on NASA/ADS.

◇ Published journal papers as first author (most recent first):

1. “Physics Beyond the Standard Model with Future X-ray Observatories: Projected Constraints on Very-Light Axion-Like Particles with *Athena* and *AXIS*.”

Sisk-Reynés, J; Reynolds, C S; Parker M L; Matthews J H; Marsh D M C.
The Astrophysical Journal, 930, 1 (2023).

2. “Evidence for a moderate spin from X-ray reflection of the high-mass supermassive black hole in the cluster-hosted quasar H1821+643.”

Sisk-Reynés, J; Reynolds, C S; Matthews J H; Smith R N.
Monthly Notices of the Royal Astronomical Society, 514, 2 (2022).

3. “New constraints on light axion-like particles using *Chandra* transmission grating spectroscopy of the powerful cluster-hosted quasar H1821+643.”

Sisk-Reynés, J; Matthews J H; Reynolds, C S; Russell H R; Marsh D MC; Smith R N.
Monthly Notices of the Royal Astronomical Society, 510, 1 (2022).

◇ Published journal papers as co-author:

4. “How Do Magnetic Field Models Affect Astrophysical Limits on Light Axion-like Particles? An X-ray Case Study with NGC 1275.”

Matthews J H; Reynolds, C S; Marsh D M C; **Sisk-Reynés, J**; Rodman P E.
The Astrophysical Journal, 591, 1 (2022).

◇ Published peer-review proceedings:

5. “Current and Future constraints on Very-Light Axion-Like Particles from X-ray observations of cluster-hosted AGN.”

Sisk-Reynés, J; Reynolds, C S; Matthews J H.
Memorie della Società Astronomica Italiana, 2023; arXiv: 2304.08513.

◇ Journal papers in press:

6. “A Statistically Rigorous Approach to Ultralight Boson Constraints: a Statistically Rigorous Approach to Ultralight Boson Constraints”.

Hoof, S; Marsh, D J E; **Sisk-Reynés, J**; Matthews J H; Reynolds, C S.
Submitted to *Monthly Notices of the Royal Astronomical Society*; arXiv: 2406.10337.

◇ Public engagement articles:

7. “The detergent particle”: An X-ray astronomer’s journey to axions.

Sisk-Reynés, J.
Royal Astronomical Society’s *Astronomy & Geophysics*, December 2024 issue (Link).