Sophie Koudmani

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RESEARCH INTERESTS

Computational astrophysics; galaxy formation and evolution, dwarf galaxies; astrophysical black holes; active galactic nuclei at high redshifts; multi-messenger signatures

EMPLOYMENT

Junior Research Fellow — Oct 2021 – present
St Catharine's College, University of Cambridge, UK
Independent Research Fellowship
Host Department: Institute of Astronomy (IoA)

Flatiron Research Fellow — Aug 2022 – Dec 2023
Center for Computational Astrophysics (CCA), Flatiron Institute, USA
Independent Research Fellowship
Member of Galaxy Formation Group led by Dr Rachel Somerville

UROP Summer Research Scholar — Aug 2016 – Sep 2016
Imperial Centre for Inference and Cosmology (ICIC), Imperial College London, UK
Project Title: 'Inferring Ionization Maps from 21cm Maps of the Epoch of Reionization'
Supervisor: Dr Jonathan Pritchard

EDUCATION

PhD in Astronomy — 2017-21
IoA, University of Cambridge, UK
Thesis: 'Black Hole Feedback in New Regimes: Modelling Dwarf Galaxies with Active Galactic Nuclei'
Supervisors: Prof. Debora Sijacki and Prof. Martin Haehnelt

MPhys Physics (1st Class) — 2013-17
New College, University of Oxford, UK
MPhys Project: 'The HI Mass Function in the Horizon-AGN Simulation' (1st Class)
Supervisors: Prof. Adrianne Slyz and Prof. Julien Devriendt

HONOURS & AWARDS

Flatiron Research Fellowship, CCA, Flatiron Institute	2022
Junior Research Fellowship, St Catharine's College, Cambridge	2021
Paul Murdin Prize *(best paper by an IoA PhD student)*, IoA, Cambridge	2019
Fully-funded PhD Studentship, STFC	2017-21
UROP Research Scholarship, Imperial College London	2016
Commendation for Laboratory Practical Work, Oxford Physics Department	2016
Scholarship Prize, New College, Oxford	2015-17
Mathematics Abitur Prize, German Mathematical Society (DMV)	2013
Physics Abitur Prize, German Physical Society (DPG)	2013

SELECTED GRANTS & FUNDING

Kavli Workshop 'Massive Black Holes Across Cosmic Time', Kavli Foundation (**Co-Leader** w/ Übler)	2025
JWST Large Program, Cycle 3 (137.82 hrs), STScI, Co-I, PI: Übler	2024
CCA Workshop 'Black Holes on Broadway', Simons Foundation (**Co-Leader** w/ Rennehan)	2023
DiRAC Computing Grant (32.77 MCPUh), STFC, Co-I & **Sub-Project Leader**, PI: Sijacki	2023
DiRAC Computing Grant (2.99 MCPUh), STFC, **PI**, [DiRAC Science Highlight]	2021
DiRAC Computing Grant (35.72 MCPUh), STFC, Co-I & **Sub-Project Leader**, PI: Sijacki	2020
Conference Travel Support ($900), North American ALMA Science Center	2020
Conference Travel Grants (£700), Churchill College, Cambridge	2019, 2020
DiRAC Computing Grant (28.47 MCPUh), STFC, Co-I & **Sub-Project Leader**, PI: Sijacki	2018
Undergraduate Research Bursary (£1200), Royal Astronomical Society	2016

SELECTED TALKS

Selected Conference Talks (24 in total, 8 invited):

Invited, Ringberg Workshop on 'Computational Galaxy Formation', Ringberg, Germany	Oct 2024
Invited, YAGN24 Workshop, Università degli Studi dell'Insubria-Como, Italy	Sep 2024
Invited, Santa Cruz Workshop on Galaxy Formation, Santa Cruz, USA	Jul/Aug 2024
Contributed, Massive Black Holes in the First Billion Years, UCC, Cork, Ireland	Apr 2024
Invited, Sesto Workshop 'The Growth of Galaxies in the Early Universe', Sesto, Italy	Jan 2024
Contributed, EAS S12 'Breaking down the AGN frontiers', Krakow, Poland	Jul 2023
Invited, Learning the Universe Collaboration Meeting, Paris, France	Feb 2023
Invited Review, The Epoch of Galaxy Quenching, Cambridge, UK	Sep 2022
Invited, EAS S6 'Properties & impact of large-scale multiphase AGN outflows', Valencia, Spain	Jun 2022
Invited, Ringberg Workshop on 'Breakthroughs in Galaxy Formation', Ringberg, Germany	Apr 2022
Contributed, SAZERAC SIP: 'Models and Simulations of High-Redshift Galaxies' [virtual]	Oct 2021
Contributed, 'Galaxy Quenching and Transformation Throughout Cosmic Time', Aspen, USA	Feb 2020
Contributed, 'Small Galaxies, Cosmic Questions', Durham, UK	Jul 2019

Selected *Invited* Departmental Seminars & Colloquia (30 in total):

Cosmology/Extragalactic Seminar, UCL, London, UK	May 2024
CCA Lunch Seminar, Flatiron Institute, NYC, USA	Apr 2024
CTC Theory Seminar, University of Maryland, USA	Apr 2024
Hernquist Galaxy Formation Group Meeting, CfA, Harvard, USA	Dec 2023
Physics Colloquium, Montana State University, USA	Sep 2023
CIERA Theory Seminar, Northwestern University, USA	May 2023
Galread Seminar, Princeton University, USA	Oct 2022
Fellows' and Graduates' Seminar, St Catharine's College, Cambridge, UK	Mar 2022
Cosmology/Extragalactic Seminar [remote], UCL, London, UK	May 2021
Lunch Talk [remote], Carnegie Observatories, Pasadena, USA	Mar 2021
Theoretical Astrophysics Seminar [remote], ICS, Zurich, Switzerland	Oct 2020
Caltech Astronomy Tea Talk [remote], Caltech, Pasadena, USA	Oct 2020
MPIA Galaxy Coffee Seminar [remote], MPIA, Heidelberg, Germany	Jun 2020

STUDENT SUPERVISION

Graduate Students:

MPhil Project, Brian Jiang, KICC, University of Cambridge	2023-24
'Early black hole growth: observational evidence for super-Eddington?'	
MASt Project, Giulia Ortame, IoA, University of Cambridge	2023-24
'Unveiling Black Hole Accretion in Dwarf Galaxies'	

Undergraduate Students:

MSci (Part III) Project, Arjun Swarup, IoA, University of Cambridge	2023-24
'The complex interplay of stellar and AGN feedback in simulated galaxies'	
Summer Project, Kasar Profit, CCA, Flatiron Institute	2023
'Merging Supermassive Black Holes'	
MSci (Part III) Project, Guy Uong, IoA, University of Cambridge	2021-22
'Dynamical Friction on Supermassive Black Holes in Galaxy Formation Simulations'	

TEACHING

Substitute Lecturer, *University of Cambridge:*

Astrophysical Black Holes, 4th year (Part III) Astrophysics	2022

Teaching Supervisions & Drop-in Sessions, *University of Cambridge:*

Astrophysical Black Holes, 4th year (Part III) Astrophysics	2019, 2021
Astrophysical Fluid Dynamics, 3rd year (Part II) Astrophysics	2019
Mathematics, 1st year (Part IA) Natural Sciences	2017-18

Examinations, *University of Cambridge:*

Assessor for 'IoA Third Year PhD Thesis Review'	2022
Standards Assessor for Astrophysical Black Holes, 4th year (Part III) Astrophysics	2022
Marks Checker for Astrophysical Black Holes, 4th year (Part III) Astrophysics	2019, 2021, 2022

SERVICE

Conference Organiser:

LOC Co-Chair: 'Massive Black Holes Across Cosmic Time' conference hosted by KICC	2025
Co-Organiser: Kavli Focus Meeting 'Dark Matter in Astrophysical Laboratories'	2024
SOC/LOC Co-Chair: 'Black Holes on Broadway' conference hosted by Flatiron Institute	2023
Co-Organiser: NAM Session 'Linking simulations to observations to understand galaxy evolution'	2022
Co-Organiser: Kavli Focus Meeting 'Feedback in and around Galaxies'	2021
Co-Organiser: Conference for Undergraduate Women in Physics hosted by Oxford University	2016,17

Peer Reviewer:

Book Reviewer for *The Observatory*	2023
Reviewer for *Open Journal of Astrophysics* (OJAp)	2023-
Reviewer for *The Astrophysical Journal* (ApJ)	2022-
Reviewer for *Monthly Notices of the Royal Astronomical Society* (MNRAS)	2022-

Equality, Diversity and Inclusion:

Mentor for the National Society of Black Physicists (NSBP) Summer Research Programme	2023
IoA Self Assessment Team: Juno/Athena SWAN Gender Equality Awards	2020-22
IoA Equality, Diversity & Inclusion Committee	2018-22
Oxford Women in Physics Society: Undergraduate Representative & Mentoring Coordinator	2015-17
Oxford University Counselling Service: Trained Peer Supporter for New College	2014-17
New College JCR Committee: International Student Representative	2014-15

Outreach and Public Engagement:

Interview: *'Advances in our understanding of the Universe since 1473'*, St Catharine's College	2023
4 Outreach Talks at IoA and Churchill College	2018-22
Volunteer at Cambridge Science Festival, IoA	2018-19
Course Instructor at 'Greenlight for Girls' STEM Initiative	2017
Volunteer at Oxford Stargazing Events, Oxford Physics Department	2014-16

Other Departmental Activities:

IoA Computer Users Committee	2018-22
Black Hole Physics Student Discussion Group (Initiator & Organizer)	2019-21
New College Subject Representative for Physics	2014-15

COMPUTING SKILLS

Programming Languages: Python, C, BASH scripting
Tools/Packages: numpy, scipy, matplotlib, Git, MPI

HACKATHONS & WORKSHOPS

DiRAC Machine Learning Techniques for Science Workshop [virtual]	Nov/Dec 2021
HPE and NVIDIA Fundamentals of Deep Learning Workshop [virtual]	Sep 2021
DiRAC AMD GPU Hackathon [virtual]	Jan 2021
DiRAC AMD Hackathon [virtual]	Jul 2020
DiRAC ARM Mellanox Hackathon, Leicester, UK	Sep 2019
DiRAC Nvidia GPU Hackathon, Swansea, UK	Sep 2018
Amazon AWS Hackathon, Cambridge, UK	Oct 2017

PROFESSIONAL MEMBERSHIPS

International Collaborations:

'Renaissance' Collaboration, Member of AREPO Working Group	2024-
'Learning the Universe' Collaboration, Co-Chair of Black Hole Working Group	2022-
LISA Consortium, Member of Astrophysics Working Group	2021-

Learned Societies:

American Astronomical Society	2020-23
Royal Astronomical Society	2019-
Institute of Physics	2019-
Cambridge Philosophical Society	2019-
German Physical Society (DPG)	2013-

REFERENCES

Dr Rachel Somerville
Senior Research Scientist and Galaxy Formation Group Leader
Flatiron Institute, USA
Email: *rsomerville@flatironinstitute.org*

Prof. Debora Sijacki
Professor of Astrophysics and Cosmology
University of Cambridge, UK
Email: *deboras@ast.cam.ac.uk*

Prof. Adrianne Slyz
Associate Professor of Astrophysics
University of Oxford, UK
Email: *adrianne.slyz@physics.ox.ac.uk*

Prof. Martin Haehnelt
Professor of Astrophysics and Cosmology
University of Cambridge, UK
Email: *haehnelt@ast.cam.ac.uk*

PUBLICATIONS

7. Juodžbalis, I., Maiolino, R., Baker, W. M., Tacchella, S., Scholtz, J., D'Eugenio, F., Schneider, R., Trinca, A., Valiante, R., DeCoursey, C., Curti, M., Carniani, S., Chevallard, J., de Graaff, A., Arribas, S., Bennett, J. S., Bourne, M. A., Bunker, A. J., Charlot, S., Jiang, B., **Koudmani, S.**, Perna, M., Robertson, B., Sijacki, D., Übler, H., Williams, C. C., Willott, C., Witstok J. *'A dormant, overmassive black hole in the early Universe'*. Submitted to Nature, eprint arXiv:2403.03872

6. **Koudmani, S.**, Somerville, R. S., Sijacki, D., Bourne, M. A., Jiang, Y. and Profit, K. *'A unified accretion disc model for supermassive black holes in galaxy formation simulations: method and implementation'*. Submitted to MNRAS, eprint arXiv:2312.08428.

5. Bourne, M. A., Fiacconi, D., Sijacki D., Piotrowska, J. and **Koudmani, S.** *'Dynamics and spin alignment in massive, gravito-turbulent circumbinary discs around supermassive black hole binaries'*. Submitted to MNRAS, eprint arXiv:2311.17144.

4. **Koudmani, S.**, Sijacki, D. and Smith, M. C. *'Two can play at that game: constraining the role of supernova and AGN feedback in dwarf galaxies with cosmological zoom-in simulations'*. MNRAS (2022, 516 (2): 2112-2141).

3. Kristensen, M. T., Pimbblet, K. A., Gibson, B. K., Penny, S. J. and **Koudmani, S.** *'Merger Histories and Environments of Dwarf AGN in IllustrisTNG'*. ApJ (2021, 922 (2): 127, 19 pp.).

2. **Koudmani, S.**, Henden, N. A. and Sijacki, D. *'A little FABLE: exploring AGN feedback in dwarf galaxies with cosmological simulations'*. MNRAS (2021, 503 (3): 3568-3591).

1. **Koudmani, S.**, Sijacki, D., Bourne, M. A. and Smith, M. C. *'Fast and energetic AGN-driven outflows in simulated dwarf galaxies'*. MNRAS (2019, 484 (2): 2047-2066).

[ADS link for first-author publications]

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