

Steven Gough-Kelly

MSC. (BY RESEARCH), BSc. (HONS), FRAS, MINSTP · PHD CANDIDATE · GALAXY DYNAMICS

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My primary research is studying the formation of Box/Peanut bulges in barred galaxies by comparing isolated and cosmological simulations to observations of external galaxies and the Milky Way. Recent work has focused on exploring the kinematics of differently aged populations in the bar/bulge of such galaxies as indicators for evolutionary histories.

Education

Jeremiah Horrocks Institute, University of Central Lancashire

Preston, UK

PHD GALAXY DYNAMICS

2020 - present

- Thesis Title: Kinematic Fractionation of the Stellar Populations in Barred Galaxies
- Advisor: Prof. Victor P. Debattista
- Awarded *Moses Holden Studentship*

Jeremiah Horrocks Institute, University of Central Lancashire

Preston, UK

MSC (BY RESEARCH) ASTROPHYSICS

2018 - 2019

- Thesis Title: Proper Motions of Bulge Stars
- Advisor: Prof. Victor P. Debattista

University of Central Lancashire

Preston, UK

BSc (HONS) ASTROPHYSICS

2015 - 2018

- Dissertation Title: Evolution of Orbits That Support a Nuclear Disc
- Advisor: Prof. Victor P. Debattista
- Awarded School Prize for Best Third Year Astrophysics Project

Publications

ORCID: 0000-0003-4799-5079

PUBLISHED

Street, R. A., **Gough-Kelly, S.**, Lam, C., Varela, A., Makler, M., Bachelet, E., Lu, J. R., Abrams, N., Pusack, A., Terry, S., Di Stefano, R., Tsapras, Y., Hundertmark, M. P. G., Grand, R. J. J., Daylan, T., Sobeck, J., 2023, **Maximizing science return by coordinating the survey strategies of Roman with Rubin, and other major facilities**, *arXiv*, astro-ph.IM, doi:10.48550/arXiv.2306.13792

Gough-Kelly S., Debattista V. P., Clarkson W. I., Gonzalez O. A., Anderson S. R., Gennaro M., Calamida A., Sahu, K. C., 2022, **Predicted trends in Milky Way bulge proper motion rotation curves: future prospects for HST and LSST**, *MNRAS*, 509, 4, 4829–4848. doi:10.1093/mnras/stab3192

SUBMITTED

Anderson S. R., **Gough-Kelly S.**, Debattista V. P., Du M., Erwin P., Cuomo V., Caruana J., Hernquist L., Vogelsberger M. (2023), **The interplay between accretion, galaxy downsizing and the formation of box/peanut bulges in TNG50**, *arXiv*, astro-ph.GA, doi:10.48550/arXiv.2302.12788, *MNRAS submitted*.

IN PREP

Gough-Kelly S., Anderson S. R., Debattista V. P., Du M. (2023) **Kinematic Fractionation in TNG50 Barred Galaxies** Expected Submission: September 2023.

Buttitta C., Debattista V. P., Corsini E., Aguerri J. A. L., Amarante J. A. S., Anderson S. R., Beraldo e Silva L., Caruana J., Cuomo V., Fiteni K., **Gough-Kelly S.**, Morelli L., Pizzella A. (2023) **Photometric and kinematic comparison of NGC 4277 with N-body simulations**

San Martin Fernandez L. M., **Gough-Kelly S.**, Debattista V. P. Gonzalez O. A., Lazar I., Rojas-Arriagada A., Beraldo e Silva L. (2023) ***Disentangling Vertex Deviation in the Milky Way Bulge***

Fiteni K., Caruana J., Amarante J. A. S., Debattista V. P., Beraldo e Silva L., **Gough-Kelly S.**, Anderson S. R., Eyer L., Cuomo V. (2023) ***Probing the Edge of the Galactic Disc***

VARIA

Maunder M., O'Brien Á., Reid J., Bowman D. M., Richards F., **Gough-Kelly S.**, 2022, ***Generation Covid***, *Astronomy & Geophysics* (RAS), 63, 3.22. doi:10.1093/astrogeo/atac037

Presentations

INVITED TALKS

- 2023 ***Simulating the Internal Evolution of Barred Galaxies***, Loebman Lab UC Merced, CA, USA.
- 2023 ***The Next Generation of Barred Galaxies***, TAPIR Caltech, CA, USA.
- 2022 ***The Next Generation of Barred Galaxies***, University of Nottingham, UK.
- 2022 ***Galaxy Evolution in the Era of Gaia and IllustrisTNG***, Preston and District Astronomical Society, UK.
- 2021 ***What the $H \in \subset \kappa?$: A Dyslexic Researcher's Review of Accessibility***, Association of Learned and Professional Society Publishers - University Press Redux, UK.
- 2020 ***Modelling the Milky Way in the Era of Gaia***, California State University Fresno, CA.

CONTRIBUTED TALKS

- 2023 ***Modelling the Internal Evolution of Barred Galaxies***, AAS DDA 54th Annual Meeting, Virtual
- 2023 ***Modelling the Internal Evolution of Barred Galaxies***, UCLan Postgraduate Research Conference, UK
- 2022 ***Predicted trends in Milky Way bulge proper motion rotation curves: future prospects for HST and LSST***, LSST@Europe4, Italy.
- 2022 ***Cosmic Peanuts - Kinematic Fractionation in TNG50 B/P Galaxies***, N-Body Workshop, Flatiron Institute, NY.
- 2022 ***Cosmic Peanuts - Galaxy Dynamics in the Era of IllustrisTNG***, Jeremiah Horrocks Institute CARD Talks, UK.
- 2021 ***Age Dissection of Milky Way Bulge Kinematics***, N-Body Shop Excellence Conference, Virtual.
- 2021 ***Cosmic Peanuts - Kinematic Fractionation in the Era of IllustrisTNG***, Jeremiah Horrocks Institute CARD Talks, UK.
- 2020 ***Separation of Bulge Kinematics***, Jeremiah Horrocks Institute CARD Talks, UK.
- 2019 ***Proper Motions of Bulge Stars***, Jeremiah Horrocks Institute CARD Talks, UK.

PUBLIC TALKS

- 2023 ***2-Space 2-Gay***, UCLan Students' Union, UK.
- 2022 ***Space is Gay***, UCLan Students' Union, UK.
- 2021 ***What the $H \in \subset \kappa?$: A Dyslexic Researcher's Review of Accessibility***, Cambridge University Press, UK.

POSTERS

- 2023 ***Predicted trends in Milky Way bulge proper motion rotation curves: future prospects for HST and LSST***, AAS241 Seattle, WA, USA

Conferences & Workshops Organisation

DDA54

AAS DIVISION FOR DYNAMICAL ASTRONOMY

Virtual

2023

- **Slack Chair:** Special Session: Accessibility and Inclusivity in the Dynamics Community
- **Oral Presentation:** *Modelling the Internal Evolution of Barred Galaxies*

AAS241

AMERICAN ASTRONOMICAL SOCIETY

Seattle Convention Center, USA

2023

- **Session Chair:** Simulating Stars and Gas in Galaxies
- **iPoster Presentation:** *Predicted trends in Milky Way bulge proper motion rotation curves: future prospects for HST and LSST*

National Astronomy Meeting

ROYAL ASTRONOMICAL SOCIETY

University of Warwick, UK

2022

- **Organizer:** Early Career Researchers Parallel Session
- **Chair & Organizer:** Early Careers Networking Town Hall
- **Poster Presentation:** *Predicted trends in Milky Way bulge proper motion rotation curves: future prospects for HST and LSST*

Understanding Galaxy Evolution Using Simulations (Workshop)

GALACTIC FIDELITY SEMINAR SERIES

Virtual

2021

- **Presenter:** Exercises on Understanding Galaxy Evolution Using Simulations
- Created and presented solutions to workshop activities on manipulating and analyzing galaxy simulations.

Introduction to \LaTeX (Workshop)

UCLAN PHYSICS SOCIETY

UCLan, UK

2018

- **Presenter:** Development and presentation of an introductory course on \LaTeX for scientific report writing and publication.

Teaching Experience

UNDERGRADUATE COURSES

Over five years of experience as a Teaching Assistant and marker for undergraduate courses in physics, astronomy, scientific computing and practical laboratory classes, including remote classes. Tasks have included setting up equipment, grading, formative feedback on assignments, mentoring projects, radiation supervision and improving/developing experiments. Group teaching of practical skills, presentation giving and report writing.

- 2022-2023 **Foundations of Applied Physics**, Foundation Degree
- fall 2022 **Practical Physics 1 - Programming and Experimental Physics**, Year 1 Undergraduate
- 2021-2022 **The Milky Way**, Year 2 Undergraduate
- 2020-2021 **Practical Physics2 - Computing and Experimental Physics**, Year 2 Undergraduate
- 2020-2021 **Cosmology and Galaxies**, Year 3 Undergraduate
- 2020-2021 **Galaxies Beyond the Milky Way**, Year 2 Undergraduate
- 2019-2020 **The Milky Way**, Year 2 Undergraduate
- 2018-2020 **Year 2 Laboratory**, Year 2 Undergraduate

UCLan, UK

HIGH-SCHOOL

Teach Physics Internship

LANCASTER GIRLS GRAMMAR SCHOOL, UK

Ogden Trust, UK

2017

Selected for a competitive internship through the Ogden Trust as a funded teaching assistant at Lancaster Girls Grammar School (UK) to inspire young students to study physics. Tasks included marking, lesson planning, delivery of national curriculum lessons and targeted physics career workshops.

Mentorship

Maria A.

UNDERGRADUATE

Introduction to galaxy dynamics using simulations with Python programming and data visualizations for a dissertation project.

University of Malta

2022-2023

Luis M. S. M. F.

POSTGRADUATE (MSc BY RESEARCH)

Introduction to galaxy dynamics and the Milky Way using simulations for a dissertation project.

UCLan, UK

2021-2022

William R.

UNDERGRADUATE

Demonstrating the Moses Holden Telescope (UCLan) and image data reduction. Supervised and assisted multi-band imaging of asteroids. Their dissertation project won the school prize for the best research project.

UCLan, UK

2019-2020

Awards, Fellowships, & Grants

2023	Oral Presentation 3rd Prize , UCLan Postgraduate Research Conference	£ 300 / \$ 390
2023	Travel Funds , Jeremiah Horrocks Institute, University of Central Lancashire	£ 3000 / \$ 3900
2022	RAS Grants , Royal Astronomical Society, UK	£ 500 / \$ 650
2022	Conference Fund , Jeremiah Horrocks Institute, University of Central Lancashire	£ 500 / \$ 650
2020	Moses Holden Studentship (Ph.D.) , Jeremiah Horrocks Institute, University of Central Lancashire	
2019	Alumni Fund , Ogden Trust, UK	£ 900 / \$ 1200
2017	UCLan Through the Ages Grant , University of Central Lancashire Students' Union	£ 200 / \$ 260
2017	Research Internship , Ogden Trust, UK	£ 1800 / \$ 2300
2017	Teach Physics Internship , Ogden Trust, UK	£ 1500 / \$ 2000
2016	Science Demonstration Development Fund , University of Central Lancashire	£ 200 / \$ 260
2016	Research Internship , Ogden Trust, UK	£ 1500 / \$ 2000
2014	School Physicist of the Year (Oldham Sixth Form College) , Ogden Trust, UK	

Observing Experience

Moses Holden Telescope

20 NIGHTS OF OBSERVING EXPERIENCE

Observing deep-sky and variable targets for undergraduate laboratory experiments and demonstrating the 0.7 m Planewave CDK700 Telescope to students.

UCLan, UK

2018-2020

Moses Holden Telescope

5 NIGHTS OF OBSERVING SUPERVISION

Supervising and supporting the multi-band imaging the passage of a nearby asteroid 37 Fides, to determine the spectral energy distribution for an undergraduate dissertation.

UCLan, UK

winter 2019

Moses Holden Telescope

5 NIGHTS COMMISSIONING OBSERVATIONS

Support in building the telescope pointing model by manually aligning targets with the World Coordinate System of the telescope.

UCLan, UK

winter 2016

Training

Python Programming

Online

SOLOLEARN

Certificates: Python for Beginners, Python Intermediate, Python Core, Python Data Structures, Python for Data Science

Machine Learning

Online

DiRAC

2021

DiRAC Virtual AI-athon: This course provided a practical, and hands-on introduction to the concepts, methods, and toolkits for applying machine learning to fundamental scientific problems.

Outreach & Engagement

Teen Tech: Lancashire

UCLan, UK

JEREMIAH HORROCKS INSTITUTE

2023

Developed and facilitated a bespoke activity of exploring the 'Cosmic Fingerprints' of elements in the spectra of celestial objects, as part of the Teen Tech festival.

Virtual Planetarium Shows

UCLan, UK

JEREMIAH HORROCKS INSTITUTE

2020-2021

Planetarium Shows to assist Guides groups with obtaining the Brownies Space badge developed alongside the Royal Astronomical Society. As a joint effort from four JHI academics, we delivered 60 planetarium shows reaching a total of 1 233 girl guides.

Museum of the Moon Exhibition

Harris Museum, UK

JEREMIAH HORROCKS INSTITUTE

2019

The Museum of the Moon is a touring art installation by Luke Jerram. The JHI supported an extended exhibition of the NASA Apollo Missions as well as provided walking tours of the exhibits. I developed the presenter notes and delivered many of the tours.

Engagement Ambassador / Workshop Facilitator

UCLan, UK

UCLAN/RI YOUNG SCIENTIST CENTRE

2016-present

Facilitation of workshops for high-school classes specializing in 3D Futures, Mission Mars, Life on Mars, Solar System, and Cosmetic Chemistry. Consultation on the development of new physics workshops. Young Scientist Centre Science Demo Competition annual participant and winner in 2016 and 2023.

Alston Observatory

UCLan, UK

JEREMIAH HORROCKS INSTITUTE

2015-present

Public and community observing evening and visits. Tours of the observatory sites and talks on astronomy. Development of bespoke planetarium talks and activities.

Lancashire Science Festival

UCLan, UK

JEREMIAH HORROCKS INSTITUTE

2015-present

Exhibitor and developer of the Jeremiah Horrocks Institute stand at the public event which attracts over 5 000 visitors annually.

Cyprus Science Festival

UCLan Cyprus

JEREMIAH HORROCKS INSTITUTE

2016

Development and delivery of an exoplanets activity as well as supporting several other physics activities catering to multiple nationalities and ability levels.

Touching Space

UCLAN PHYSICS SOCIETY

Development of astrophysical audio activity and presenter for an event targeted at individuals who have a visual impairment.

UCLan, UK

2016

Service & Leadership

- 2020- **Royal Astronomical Society Early Career Network**, Vice Chair (current), Membership Officer (20/22)
- 2023 **UK Parliament: Voice of the Future**, Royal Astronomical Society Delegate
- 2016- **UCLan/Ri Young Scientist Centre**, Engagement Ambassador
- 2016-2020 **STEM Learning**, STEM Ambassador
- 2017-2019 **University of Central Lancashire Students' Union**, Chair of Students' Council
- 2017-2018 **Institute of Physics - Lancashire and Cumbria Branch**, Student Representative
- 2016-2023 **UCLan Physics Society**, Treasurer (22/23), President (17/18), Secretary (16/17)

Professional Memberships

Fellow of the Royal Astronomical Society, UK (*FRAS*)
Graduate Member of the American Astronomical Society
Member of the Institute of Physics, UK (*MInstP*)
Junior Member of the European Astronomical Society
Ogden Trust Alumni, UK

Junior Associate of LSST:UK (Galaxies; Stars, Milky Way and Local Volume Science Collaboration)
N-body Shop Member