Steven Gough-Kelly

PhD · MSc (By Research) · BSc (Hons) · MInstP · FRAS ·

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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 - 2024*

- 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

Work Experience

Westholme School *Blackburn, UK*

Senior Science Technician *Jan 2024 - Present*

- Plan, prepare and facilitate science experiments across the school for all three sciences.
- Audit science equipment and facilities.
- Successful implementation of new request and inventory software.
- Implement safe working practices.

University of Central Lancashire *Preston, UK*

Market Insights Data Analyst *Jul 2023 - Feb 2024*

- Develop custom pipeline and workflow for data.
- Deploy custom dashboards for inquiry.
- Consult with the wider team on improvements and new metrics.

Publications

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Published

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***, *MNRAS*,doi:10.1093/mnras/stad3271

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

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***

In Prep

Gough-Kelly S., Anderson S. R., Debattista V. P., Du M. (2024) ***Kinematic Moments of the Stellar Populations in Barred Galaxies***

San Martin Fernandez L. M., **Gough-Kelly S.**, Debattista V. P. Gonzalez O. A., Lazar I., Rojas-Arriagada A., Beraldo e Silva L. (2024) ***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. (2024) ***Probing the Edge of the Galactic Disc***

Prudil Z., Kunder A., Beraldo e Silva L., **Gough-Kelly S.**, Rejkuba M., Anderson S. R., Koch-Hansen A. J. (2024) ***The Galactic Bulge exploration III.: RR Lyrae stars as traces of the Galactic bar - 3D & 5D analysis, extinction variation***

Varia

Gough-Kelly S., Street, R. A., (2022), ***Roman with Rubin***, *Astronomy & Geophysics* (RAS), 64, 5.12. doi:10.1093/astrogeo/atad043

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 $H\epsilon \subset \kappa$? : 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

2024 ***Colours and Sounds of Space***, Westholme School, UK.
2023 ***2-Space 2-Gay***, UCLan Students' Union, UK.
2022 ***Space is Gay***, UCLan Students' Union, UK.
2021 ***What the $H\epsilon \subset \kappa$? : 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 *Virtual*
AAS Division for Dynamical Astronomy *2023*
- **Slack Chair:** Special Session: Accessibility and Inclusivity in the Dynamics Community
- **Oral Presentation:** *Modelling the Internal Evolution of Barred Galaxies*

AAS241 *Seattle Convention Center, USA*
American Astronomical Society *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 *University of Warwick, UK*

Royal Astronomical Society *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) *Virtual*

Galactic Fidelity Seminar Series *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, UK*

UCLan Physics Society *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	*UCLan, UK*
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	

High-School

Teacher of Physics *Blackburn, UK*

Westholme School, UK *winter 2023*

Taught physics for four weeks to students aged 11 to 18, including exam classes.

Teach Physics Internship *Ogden Trust, UK*

Lancaster Girls Grammar School, 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

Ben M. *UCLan, UK*
UNDERGRADUATE *2023-2024*
Introduction to galaxy dynamics using simulations with Python programming. Analysis of the TNG50 simulation using large-scale computing.

Maria A. *University of Malta*
UNDERGRADUATE *2022-2023*
Introduction to galaxy dynamics using simulations with Python programming and data visualizations for a dissertation project.

Luis M. S. M. F. *UCLan, UK*
POSTGRADUATE (MSC BY RESEARCH) *2021-2022*
Introduction to galaxy dynamics and the Milky Way using simulations for a dissertation project.

William R. *UCLan, UK*
UNDERGRADUATE *2019-2020*
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.

Awards, Fellowships, & Grants

2023	**Ogden Outreach Award**, Ogden Trust, UK	*£ 25 / $ 30*
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 *UCLan, UK*
20 NIGHTS OF OBSERVING EXPERIENCE *2018-2020*
Observing deep-sky and variable targets for undergraduate laboratory experiments and demonstrating the 0.7 m Planewave CDK700 Telescope to students.

Moses Holden Telescope *UCLan, UK*
5 NIGHTS OF OBSERVING SUPERVISION *winter 2019*
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.

Moses Holden Telescope *UCLan, UK*

5 NIGHTS COMMISSIONING OBSERVATIONS *winter 2016*

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

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, UK*
UCLan Physics Society *2016*
Development of astrophysical audio activity and presenter for an event targeted at individuals who have a visual impairment.

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