Jason Shingirai Makechemu

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Education

2023 – current **Lancaster University - Astrophysics PhD**
Currently working on using machine learning to classify AGN host morphologies in large, multi-wavelength, JWST surveys. Supervised by Dr. Brooke Simmons

2020 – 2023 **Aberystwyth University - Astrophysics BSc (Hons) 1:1**
Bachelor Thesis: Inferring Behavioural Properties of the Solar Atmosphere and Earth's Atmosphere Due to Disturbances in the Geomagnetic Field. Supervised by Dr. Heather McCreadie. I graduated with a first-class Honours degree.

Experience

April 2024 - **Vice-President – Zimbabwean Astronomical Society**

- Developing astronomy outreach and education programmes for Zimbabwean institutions
- Organising seminars, workshops, and classes for STEM education within Zimbabwean institutions.

June – August 2023 **Astrophysics Research Assistant - Measuring the ability of molecular gas to form into stars via the Toomre Q instability parameter.**
Oxford University Department of Astrophysics, Supervisor: Dr. Thomas Williams.

- Calculating the Toomre Q parameter in gas rich quiescent galaxies to determine if the Toomre Q stability criterion is sufficient to determine the ability of molecular gas to form into stars.
- A research paper detailing the findings is currently underway.

June - August 2022 **Summer Research Internship - Simulation of a supernova undergoing strong gravitational lensing.**
L'Institut de Physique Théorique (IPhT) CEA Paris-Saclay, Supervisor: Dr. Natalie Hogg

- Simulated multiple images of the evolution of a Type-Ia Supernovae, and how it would appear having undergone strong gravitational lensing.
- Produced a report detailing the mathematical and computational methods used, and the analysis that went into my project, and what could be improved if there were more time.

June - August 2022 **Online Course – Complexity Explorer Origins of Life.**
Santa Fe Institute, Lead Instructors: Dr. Sarah Maurer, Dr. Chris Kempes

- Examined the chemical, geological, physical, and biological principles that give insights into origins of life research.
- Produced a peer reviewed assignment on astrobiology, how the presence of certain molecules, atoms, or ions may indicate biosignatures in exoplanetary atmospheres.

June - July 2021 **Summer Research Project - Lunar Impact Flash Detection.**
Aberystwyth University Department of Physics, Supervisor: Dr. Tony Cook

- Performed extensive observations, and data analysis and with ALFI, and Microsoft Excel to distinguish between what may be genuine Lunar impact flashes, and false positives such as cosmic rays or mountain peaks.
- Produced a report detailing the methods and analysis that went into the project.

Talks and Posters

11th – 12th Jan 2024 – **Durham-Edinburgh eXtragalactic Workshop (DEX) | Durham, United Kingdom**
Talk **-** Deep-learning classifications of galaxy morphologies in large JWST surveys.

8th – 12th Jul 2024 – **AGN Across Continents | Durham, United Kingdom**
Talk **-** Deep-learning classifications of galaxy morphologies in large JWST surveys.

6th – 15th Aug 2024 – **IAU General Assembly | Cape Town, South Africa**
Talk **-** Deep-learning classifications of galaxy morphologies in large JWST surveys.

Publications

First Author – **Makechemu, et al. 2024, MNRAS:** Evaluating the Role of the Toomre Q Parameter in the Gas Stability of Early-Type Galaxies. [in prep.]
Makechemu, et al. 2024, MNRAS: Galaxy-Zoo JWST: Quantified Visual Morphologies of *a number* of galaxies at $0.5 < z < 4$ from volunteers and deep learning. [in prep.]

Co-Author – **Walmsley, et al. 2024, European Conference on Computer Vision (ECCV), 10605:** Scaling Laws for Galaxy Models. [submitted]
Mantha, et al. 2024, Citizen Science Theory and Practice: SC: AI: Through the Citizen Scientists' Eyes: Insights into using Citizen Science with Machine Learning for effective identification of unknown-unknowns in Big Data [submitted]

Observing Experience

9th – 14th Oct 2023 – **Roque de los Muchachos Observatory | La Palma, Spain**
Took calibration frames and spent 5 nights taking spectroscopic observations of Hα, D_n4000, and [OIII] in nearby, mostly barred, spiral galaxies. These observations will be used to determine star formation rates within and outside galactic bars for the different galaxies that were observed.

Awards and Prizes

June 2022	**Turing Grant** UK government's programme to provide funding for international research opportunities. Used when attending my research internship from June – August 2022.	£960
September 2022	**Peter Hancock Scholarship** Aberystwyth University grant. This was partly used to fund graduate school applications, tools needed for my BSc Research, and living costs.	£4400
May 2024	**IAU Grant** Grant to subsidise my expensed to attend the IAU General Assembly in Cape Town South Africa to present my research.	€800

Skills

Digital and Technical: Python, Topcat, Microsoft Office Suite, LaTeX, HTML, CSS

Languages: Shona – intermediate | Arabic – intermediate | English - Fluent

Other: Competitive tennis for 9 years and jiu jitsu for 1 | self-taught piano | self-teaching Arabic, Amharic, and Shona

Outreach

March 2022	**Institute of Physics and Aberystwyth University outreach event** Held a presentation on what exoplanets are, and the search for life in the universe, this was aimed towards secondary school children.
Jan - Nov 2022	**Independent Social Media Science Communication** Creating videos on various topics in astronomy, physics, and planetary science towards a public audience in the form of 60 – 90 second videos on TikTok (@jsmakechemu). And longer format videos on my YouTube channel.

Collaborations

Galaxy-Zoo
COSMOS

Professional Memberships

Institute of Physics (IOP)
Royal Astronomical Society (RAS)