ENOCH KO

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EDUCATION

MASt Theoretical Physics (Part III Mathematics) July 2026
St John's College, University of Cambridge *(expected)*

BSc Mathematics and Physics July 2024
University of Warwick – First Class Honours

PRE-PRINTS

1. "Renzo's rule revisited: A statistical study of galaxies' baryon-dark matter coupling" **Enoch Ko**, Tariq Yasin, Harry Desmond, Richard Stiskalek, Matt J. Jarvis. MNRAS submitted (2025). [arXiv: 2508.03569]

RESEARCH EXPERIENCE

Renzo's rule revisited: A statistical study of galaxies' baryon-dark matter coupling Jun 2024 – present
University of Oxford – Beecroft Institute for Particle Astrophysics and Cosmology

Supervisors: Dr Tariq Yasin, Dr Harry Desmond
(First-author paper submitted to MNRAS)

We provide a systematic analysis of a phenomenon known as **Renzo's rule**. Despite its validity being widely acknowledged, especially as supporting evidence for ΛCDM-alternative theories such as MOND, Renzo's rule is so far entirely informal, based largely on visual inspection of rotation curves.

Technical skills involved/learnt:

- **Bayesian inference**, statistical analysis, **dark matter modelling**, galaxy dynamics.
- In **Python**: MCMC, Gaussian processes, dynamic time warping; familiarity with **Linux**.

Search for CP Violation in $\Lambda_b \rightarrow pK\mu\mu$ Decays Oct 2023 – Jun 2024
University of Warwick – LHCb group

Supervisor: Dr Tom Blake
(Final report available upon request)

Using simulated events and Run II data from LHCb, we first extracted $\Lambda_b \rightarrow pK\mu\mu$ decays using machine learning tools in Python, then searched for potential **BSM CP-violation effects** by measuring the differences in Λ_b versus anti-Λ_b decays, taking into account detection and systematic errors.

Technical skills involved/learnt:

- **Data analysis**, simple statistical methods, weak interactions in the Standard Model.
- **Python**: Pandas arrays, **machine learning** tools such as XGBoost; simple usage of Linux.

Exploratory Study of A → H^+W^- decays in Type I 2HDM Jun – Sep 2023
University of Warwick – ATLAS group

Supervisor: Prof Bill Murray

Using simulated events from DELPHES and ATLAS, we applied machine learning techniques to study **signal-background discrimination** and mass regression in A → H+W- decays, a CP-violating process predicted by certain extensions to the Standard Model of particle physics (two-Higgs-doublet models).

Technical skills involved/learnt:

- **Machine learning** techniques such as deep neural networks and boosted decision trees.
- Event preparation and **data analysis** with **ROOT** (TMVA library), mainly in **C++**.

Growth and Investigation of Thin Epitaxial InBi Films Jul – Sep 2022
University of Warwick (Surface Group) & CY Cergy Paris University (ATTOLab)

Supervisors: Dr Gavin Bell, Prof Karol Hricovini

Using molecular beam epitaxy (MBE) at Warwick (with in-situ analyses), we attempted to grow a new quantum material, InBi in thin film epitaxial form, on a standard semiconductor InSb. We then analyzed electron band structures of cleaved bulk InBi with LEED and ARPES at ATTOLab, Paris.

Technical skills involved/learnt:

- First time creating and applying **Python** codes to modern research (e.g. vacuum calibration).
- Laboratory techniques for **surface growth and analysis** (UHV, MBE, RHEED, XPS, etc.).

HONOURS AND AWARDS

Undergraduate Research Scholarship 2023
Warwick Undergraduate Research Support Scheme

Awarded £1500 to conduct a summer research project 'Exploratory Study of A → H^+W^- Decays in Type I 2HDM' with the ATLAS group at the University of Warwick.

Academic Performance Scholarship 2023
Department of Physics, University of Warwick

Awarded £100 as a "top-up" for my 2023 URSS project (total £1600) on the basis of academic merit. The department also sponsored my visit to CERN for the 2023 ATLAS Physics Week.

Undergraduate Research Scholarship 2022
EUTOPIA Undergraduate Research Support Scheme (EUTOPIA European University 2050 grant)

Awarded €1500 to conduct a summer research project 'Growth and Investigation of Thin Epitaxial InBi Films', travelling between the University of Warwick and ATTOLab in Paris.

TALKS, TEACHING AND OUTREACH

Oxford Summer Student Symposium Aug 2024
Presenter – Subdepartment of Astrophysics, University of Oxford

ATLAS Group Meeting Sep 2023
Presenter – Department of Physics, University of Warwick

Physics Society Revision Lectures Apr 2023 – Jun 2024
Lecturer – Warwick Physics Society

- *Courses taught: PX436 General Relativity, PX3A2 Quantum Physics of Atoms, PX262 Quantum Mechanics and its Applications, PX267 Hamiltonian Mechanics.*
- *I've also typed up some self-study notes on PX3A3 Electrodynamics over the 2023 summer, which are now published on the Warwick Physics Society website (sec. 1-4).*

ICUR Public Engagement Showcase Evening Sep 2022
Student Presenter – University of Warwick

International Conference for Undergraduate Research Sep 2022
Spoken Presenter – Panel Session 23C: Materials and Innovative Manufacturing