

Linus Thummel

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September 25, 2026

Education

PhD in Astronomy, University of Edinburgh

Edinburgh, UK

SUPERVISED BY **ALKISTIS POURTSIDOU** AND **BENJAMIN BOSE**

2022 - 2026

- PhD thesis: 'Exploring Modified Gravity Theories with Machine Learning'
- Developing a classifier for modified gravity theories and dark energy theories based on a Bayesian Neural Network
- Utilizing generative Gaussian Processes and Symbolic Regression to explore the space of Horndeski theories
- Implementing modified gravity codes into Euclid's inference pipeline as a member of Euclid's theory group

Research visit to the University of Waterloo/ Perimeter Institute

Waterloo, Canada

SUPERVISED BY **WILL PERCIVAL**

2026

- 3-month research visit working on modified gravity constraints from Stage-IV surveys
- Funded by the Mitacs Globalink Research Award for research collaborations with Canada

MSc Physics with extended research, Imperial College London

London, UK

SUPERVISED BY **JONATHAN PRITCHARD**

2020 - 2022

- Overall mark 78.80 (Distinction)
- Master thesis 'Topology of the 21cm signal during the Epoch of Reionization and the Cosmic Dawn'
- Investigating and modelling the topology during phase transitions of the 21 cm signal
- Constructing persistent homology filtrations to compute Betti numbers for field-level analysis

BSc Physics, Technical University Dresden

Dresden, Germany

- Bachelor's thesis: 'Boltzmann Theory for Charge Carriers and Excitons in Organic Semiconductors', thesis grade 1.0 (first-class) 2016 - 2020
- Final grade 1.1 (first-class)

Research placement at the Oskar Klein Centre for Cosmology

Stockholm, Sweden

STOCKHOLM UNIVERSITY, SUPERVISED BY **JENS JASCHE**

2020

- Programming a numerical CMB lensing simulator for three-dimensional matter distributions
- Cross-correlating the projected cosmic weak lensing signal of SDSS data with the Planck CMB lensing signal

BSc Chemistry, Technical University Dresden

Dresden, Germany

- Bachelor's thesis: 'Spectroelectrochemical Investigations of Twodimensional CdSe-Nanostructures', thesis grade 1.0 (first-class) 2014 - 2018
- Final grade 1.1 (first-class)

Student research assistant at the Chair of Physical Chemistry

- Constructing and testing Potential-Modulated Absorption Spectroscopy (EMAS) for semiconductor platelets
- Synthesising and preparing semiconductor samples in an airlock glovebox

Professional Experience

JPL Postdoctoral Fellow

Pasadena CA, US

CALTECH/ NASA

2026-present

- researcher in the cosmology section of the space science group

Publications

Stable islands of weak gravity

LINUS THUMMEL, BENJAMIN BOSE, ALKISTIS POURTSIDOU

2025

- <https://arxiv.org/abs/2508.05729> – published in JCAP
- Identifying theories with suppression of linear growth of structure in Horndeski Gravity
- Constructing a parameter-free pipeline using generative Gaussian Processes to include phenomenological trends

Classifying modified gravity and dark energy theories with Bayesian neural networks: massive neutrinos, baryonic feedback, and the theoretical error

LINUS THUMMEL, BENJAMIN BOSE, ALKISTIS POURTSIDOU, LUCAS LOMBRISER

2024

- <http://arxiv.org/abs/2403.16949> – published in MNRAS
- Building a Bayesian Neural Network to classify matter power spectra for dark energy and modified gravity theories
- Code is available at <https://github.com/cosmicLinux/BaCoN-II>

Spin-conserving Boltzmann theory for carriers and excitons in organic semiconductors

CHARLOTTE BÄCKER, LINUS THUMMEL, CARSTEN TIMM

2022

- <https://arxiv.org/abs/2108.02030> – published in Phys. Rev. Research
- Main author of part II: ‘spin conserving kinetic equations’
- Developing an analytical framework to describe the non-equilibrium dynamics of particles with non-zero spin in organic semiconductors

Conference Contributions and Invited Talks

- Aug 2026 **COSMO26 conference**, Talk ‘Addressing Cosmological Tensions with ML-Guided Modified-Gravity Searches’ *Leiden, NL*
- Sep 2025 **DESC beyond- Λ CDM telecon**, Invited talk ‘Stable Islands of Weak Gravity’ *online*
- Jun 2025 **COLOURS workshop**, Talk ‘Suppressing the Growth of Structure with Modified Gravity Theories’ *Orsay, France*
- Apr 2025 **UK Cosmo Meeting**, Talk ‘Weak Gravity from Horndeski theories’ *Nottingham, UK*
- Feb 2025 **Applied Maths Seminar Newcastle**, Invited talk: ‘Glitches in the Force? Searching for Signs of Exotic Gravity with Machine Learning’ *Newcastle, UK*
- Jan 2025 **DEX Workshop**, Spotlight talk ‘Modified Gravity Theories that Suppress Growth’ *Newcastle, UK*
- Apr 2025 **UK Cosmo Meeting**, Talk ‘Testing Beyond- Λ CDM Cosmologies with Machine Learning’ *Kings College, UK*
- Jun 2024 **Summer School on Cosmology**, Poster ‘Testing Beyond- Λ CDM Models with Neural Networks’ *Trieste, Italy*
- May 2024 **COSMO21 Conference**, Poster prize for ‘Detecting Modified Gravity with Neural Networks’ *Chania, Greece*
- Jan 2024 **DEX (Extragalactic) Workshop**, Talk prize for ‘Detecting Modified Gravity with Machine Learning’ *Durham, UK*
- Aug 2023 **Carl-Zeiss-Stiftung Summer School**, Leading a workshop on Explainable AI (XAI) methods in the section on ‘Scientific Machine Learning for Astrophysics’ *Heidelberg, Germany*

Teaching Experience

General Relativity

TEACHING ASSISTANT

2024-2025

- Guiding the weekly tutorials and discussion sessions for master students
- Explaining the mathematical concepts of GR and their physical implementation

Advanced Cosmology

HEAD TEACHING ASSISTANT

2023-2024

- Leading the problem class for approx. 20 master students
- Discuss topics ranging from inflation theories to structure formation

Introductory Astrophysics

TEACHING ASSISTANT

2023

- Supervising workshop groups and assessing their progress
- IT-responsible to set up the multimedia workshops

Discovering Astronomy

TEACHING ASSISTANT

2022

- Supporting 1st-year students in problem classes
- Marking of the weekly student assessment

University Functions

Chairman of the Large-Scale-Structure journal club

University of Edinburgh

- Organising and chairing the cosmology journal club at the Institute for Astrophysics
- Contacting and hosting external speakers

2023-2024

PhD student representative

University of Edinburgh

- Representing the students of the Institute for Astronomy at the Postgraduate Research Meetings of the School of Physics
- Communicating and advising student’s concerns at the PhD forum

2024-2025

Commitee member of the ‘Fellwanderers’ hiking society

- Organising and leading hiking and mountaineering trips for up to 110 students
- Inspecting and managing the universities mountaineering equipment

Imperial College London
2021-2022

Outreach Activities

Exhibitor at the Summer Science Exhibition

London
2026

- Presenting the science goals of the Euclid telescope at at the Royal Society to a wide audience
- over 10,000 visitors attended the full exhibition

Public astronomy evening lecture

Edinburgh
2025

- Presenting a one-hour evening lecture as part of the program ‘Astronomy for All’ at the Royal Observatory Edinburgh
- Explaining Dark Energy and modified gravity to the wider public in the talk ‘Did Einstein get gravity wrong?’

Seminar speaker at amateur astronomical societies

Scotland
2024-2025

- Giving one-hour evening lectures on gravity theories to a broad non-academic audience
- Presenting ‘One equation to rule them all: What can space teach us about fundamental physics?’
- Invited by the Astronomical Society of Glasgow, Airdrie Astronomical society and Dundee Astronomical Society

Tour guide of science walking tours

Edinburgh
2025

- Developing a physics-themed historical walking tour of Edinburgh
- Leading public walking tours as part of the Edinburgh Science Festival

3-Minute-Thesis competitor

Edinburgh
2025

- Winner of the school-of-physics round of the 3MT-competition
- Presenting a 3-minute-summary of my PhD project to a non-expert audience

Observatory Open Days

Edinburgh
2023-2025

- Presenting the research of the Royal Observatory to the wider public
- Running themed activities and live experiments for children and adults

Funding & Awards

2026	Research Award , Mitacs Globalink Research Award supporting research collaborations with Canada	Waterloo, Canada
2025	Talk Prize , for the best talk at the Physics Highland conference	Scotland
2024	Poster Prize , for the best poster at the COSMO21 conference	Chania, Greece
2024	Talk Prize , for the best short talk at the DEX-XX meeting	Durham, UK
2021-23	Scholarship , Funding from the German Academic Scholarship Foundation for international studies	United Kingdom
2019-23	Scholarship , Funded member of the German Academic Scholarship Foundation	Germany
2017-18	Scholarship , AUGUST-WILHELM-VON-HOFMANN-Funding awarded by the German Chemical Society	Germany
2014	Award , KARL-VON-FRISCH-award by the German Life Science Association	Germany

Languages and Skills

Software	Python, Mathematica, Git, HPC computing, OpenMP/MPI, C++
Machine Learning	Neural Networks (TensorFlow), Gaussian Processes, Symbolic Regression
Languages	German (native), English (fluent), French (basic)