Jessica Lok

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EDUCATION

2021–present **University of Cambridge, UK**, Natural Sciences Tripos MSci (expected to graduate July 2025)

Year 4: Astrophysics, Institute of Astronomy (IoA)

Courses: Astrophysical Fluid Dynamics, Astrophysical Disc Dynamics, Planetary System Dynamics, Solid Earth Geophysics, Solid Earth Fluid Dynamics

Year 3: Astrophysics, Class *II.i*, ranked 10th in cohort

Year 2: Class *I* overall: Mathematics (*I*), Physics (*I*), Solid Earth Sciences (*I*)
Awarded the Clough Scholarship

Year 1: Class *II* overall: Mathematics (*I*), Physics (*I*), Earth Sciences (*II.i*), Chemistry (*II.i*)

2014–21 **South Island School, Hong Kong.** IB Diploma, 44/45, *ESF Chairman's Awards for Excellence*

RESEARCH AND INDUSTRY EXPERIENCE

2024 Oct-present **Master's project: Modelling dust advection by protoplanetary disc winds.**
Supervisors: Prof Cathie Clarke, Dr Álvaro Ribas

- Derived equations for coupled gas and dust dynamics. Devised numerical integration schemes to solve for vertical velocity structures of dust of a given size and invert for density profiles.
- Will use MCFOST (radiative transfer code) to generate spectral energy distributions and scattered light images for an assumed grain size distribution.

2024 Jun-present

GitHub
Summary

Research internship, Space Plasma Physics group, QMUL. *Supervisor: Dr Heli Hietala*

- Investigated plasma waves generated by satellites in low Earth orbit. Calculated satellite conjunctions and deduced conjunction geometry from orbital element sets; processed spacecraft ephemeris and field data from the Cluster, MMS and CASSIOPE missions.
- Investigated JWST observations of proplyd bow shocks to deduce proplyd inclinations.
- Currently investigating VLF signals of radiation leakage from Starlink satellites.

2024 Jul-Aug **Seismic imaging (geophysics) internship at CGG/Viridien.**

- Project processing multi-azimuth towed-streamer seismic data. Pre-migration denoising of shot gathers using deconvolution in various domains with sparseness constraints.
- Presented PowerPoints of results to clients and acted on client feedback.

2023 Jul-Aug

Summary

Research internship specialising in SEM methods, CASP. *Supervisor: Dr Michael Flowerdew*

- Imaged and collected mineralogical and petrophysical data of candidate lithostratigraphic units for carbon storage; improved phase classification schemes for EDS data.
- Investigated fluvial sediment build-up to advise on flood management in the Fens: source inference from mineralogy; deduced tidal bores as the mechanism of upstream transport.

2022 August **Assistant in the Tosca Lab, Dept. Earth Sciences, Cambridge.** *Supervisor: Peter Methley*

Investigated amorphous Ca-Mg carbonate as precursor of dolomite formation. Designed system for synthesis; composition & structure verification via Raman spectroscopy & X-ray diffraction.

2022 July **Placement in Palaeoclimate group, British Antarctic Survey.** *Supervisor: Dr Dieter Tetzner*

- Processed Antarctic ice cores; analysed ice core meltwater and set up chemical standards.
- Ran Monte Carlo simulations on spatial distribution of collected particulate matter in meltwater filters to inform transect selection for future analysis.

FIELD EXPERIENCE

2023 Aug-Sep **Geological mapping project in the Barrême Basin, Alpes-de-Haute-Provence, France.**

6-week independent mapping project funded by The Lord Mayor's Trust, Worts Travelling Scholars Fund, CASP, and Fitzwilliam College Cambridge. 10 km^2 area covering the eastern margin of a Tertiary thrust-sheet-top basin bounded by Cretaceous carbonate units.

Field courses Isle of Skye (mapping), Cornwall & Dorset, Shropshire & Cumbria (mapping), Isle of Arran

COMPUTING EXPERIENCE (portfolio)

Python

github.com/ frozenglobe

- Data acquisition via HTTP requests from web services
- Parsing & processing JSON, CDF, HDF5, netCDF and FITS files
- Manipulation of Python lists, NumPy arrays, pandas dataframes and Xarrays
- Data visualisation with Matplotlib, Plotly and APLpy
- Datetime manipulation & conversion; coordinate conversions with SpacePy and AstroPy
- Numerical methods: root-finding, IVP solving, PDE solving, curve fitting & interpolation
- Orbit propagation with simplified perturbations models; FFTs; Monte Carlo simulations

Projects not already listed Modelled axisymmetric accretion disc for surface density profile, angular momentum transfer, and evolution of particle orbits. $\langle V/V_{max} \rangle$ test for quasars.

QGIS Mapping project basemaps; river bathymetry analysis.

Others LaTeX, Bash, Excel, Adobe Photoshop, Inkscape, Adobe Premiere Pro, Da Vinci Resolve.

TALKS AND PRESENTATIONS

2024 Sep "Searching for s/c-generated plasma waves with Cluster", QMUL Space Plasmas group

2024 Feb "Models of Pallasite Formation", Institute of Astronomy Undergraduate Journal Club

2024 Nov/Dec Internship experience & applications, CU Scientific Society & CU Women in Physics Society

EXTRACURRICULARS AND VOLUNTEER WORK

2024-25 **Secretary of the Cambridge University Hillwalking Club.**

Responsible for communications and day-to-day running of the Club. Plan and lead group hikes.

2022-24 **Secretary and Acting Chair (2023) of the Cambridge University Astronomical Society**.

Organised weekly academic talks; taught members to operate telescopes; hosted observation nights in local communities. Facilitated relations between members, the Committee & the IoA.

2023 Jan-May **STEM SMART mentor with Dept. Physics, Cambridge.**

Organised and led fortnightly mentor sessions with a group of ~20 Y12 students from underprivileged backgrounds, covering study & exam skills and university applications.

Other Telescope operation at IoA public open evenings. Volunteered with Cambridge Hands-On Science, demonstrating experiments to primary schools. Assisted with College admissions & open days.

Solo-hiked the West Highland Way, funded by Fitzwilliam College Cambridge.

CU Ceilidh Band, CU Korfball Club, Sedgwick Club (Cambridge Earth Sciences society).

Member of the Geological Society of London.

I am interested in applications of fluid and continuum mechanics to geophysical and astrophysical problems. Brought together by the common theme of planetary formation: (i) the dynamics of planetary interiors covering both short-term processes (e.g. melt migration) and long-term evolution (e.g. core solidification); (ii) the (magnetohydro)dynamics of protoplanetary discs. With a background in Astrophysics and solid Earth Science, I enjoy taking an interdisciplinary approach, as well as a mixture of pen-and-paper, numerical modelling, and data-driven approaches to my work.