CLARA BAYLEY

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+49 (0) 1573 0977701

ACADEMIC RECORD

04/22-Present Max Planck Institute for Meteorology, Climate Physics Department, Hamburg

- PhD implementing a superdroplet model for cloud microphysics

10/17-06/21 University of Cambridge, Robinson College
First Class Honours in Natural Sciences (BA and MSc), specialising in Physics

- Awarded Microsoft Research Prize for Master's project, graded 91.6%
- Awarded Mathers Prize in Physical Natural Sciences for academic merit throughout Master's degree
- Awarded College Scholarship in first year, re-awarded throughout Bachelors
- Awarded College Prize in first year
- First year: Class 1. Physics, Mathematics, Chemistry, Earth Science
- Second year: Class 2.1. Physics & Earth Science
- Third year (no classing in Covid-19) Coursework: Computing 80.0%, Computing Project 75.4%, Theoretical Physics 68.0%, Research Review 72.5%
- Master's year: Class 1. Relevant modules: Physics of the Earth, Exoplanets, and Climate Change and the Carbon Cycle

09/15-07/17 Alleyn's School, London

- 4 A*s in Double Maths, Physics and Chemistry at A Level
- Wallis Further Mathematics Prize, Hartley Science Prize, and Alleyn's Chemistry Prize
- Merit in British Physics Olympiad A2 challenge, Gold UKMT Senior Mathematical Olympiad medal
- Gold Award in the Cambridge Chemistry Challenge, in the top 4% nationally
- Awarded Academic Scholarship on entry

SCIENTIFIC RESEARCH PLACEMENTS

Universität zu Köln: Astrophysics Computational Modelling Placement (2021-2022)

- Funded research project into synthetic CO emission lines based on supercomputer simulations using MHD FLASH code
- Used remote servers, Linux OS and Unix command line to do radiative transfer post-processing
- Investigated effect of magnetic field strength and resolution on CO distriubion, emission intensity and line ratios using Python

Master's Research: Wave Breaking in Non-linear Higher Order Spectral Ocean Wave Models (2021)

- Computational research project designing and implementing a mechanism for wave breaking
- Awarded Microsoft Research Prize "for the most novel scientific results relying on the use of computers"
- Created Python code to solve partial differential equations using higher order spectral method
- Researched models for wave breaking, then designed and coded an original method to model energy dissipation and redistribution across frequencies when wave breaking occurs in deep water
- Understood non-trivial coupled non-linear partial differential equations describing the boundary conditions and dynamical equations for surface waves
- Translated previous C++ code into Python and vectorized entire model
- Utilised efficient computational methods, diverse application of the Fast Fourier Transform (FFT), different plotting methods and extensive knowledge of integration techniques in Python
- Confident use of UNIX command line and wrote 5,000 word report using LaTeX

Imperial College London Space and Atmospheric Physics: Climate Physics Placement (2020)

- Funded summer research internship at Imperial College London in the Space and Atmospheric Physics Group, joint with the Leverhulme Centre for Wildfire Research
- Used Python to analyse data from ensembles of coupled atmosphere-ocean simulations in the latest generation UKESM1 earth system model run on Met-Office supercomputers
- Investigated small amplitude, noisy signals on regional scale amongst chaotic behaviour in 27 seasonally varying global climate simulations

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- Identified statistically significant changes to variables such as precipitation, temperature, sea surface temperature anomalies and the Oceanic Nino Index due to wildfire impacts on radiative forcing
- Used Unix command line, Linux OS, and an SSH to access and analyse very large data files (>8TB)
- Successfully researched the effect of wildfire emissions on El Nino climate patterns. Results submitted for publication (2023)

Chalmers Astrophysics & Space Science Summer (CASSUM) research fellowship (2021)

- Funded research project into inside-out planet formation from proto-planetary discs
- Coded in Python to analyse 3D MHD Athena++ simulations run on supercomputers
- Used C++ and UNIX command line to set-up and run lower resolution simulations on own computer
- Investigated and characterised MRI induced turbulence in inner proto-planetary disc
- Studied formation and stabilisation of pressure maximum at turbulent zone's boundary
- Tracked dynamical evolution of 3mm and 10mm sized pebbles throughout simulations. Compared theoretical predictions with simulated properties of pebble accumulation at pressure maximum
- Presented results at CASSUM-VICO 2021 Symposium

Mullard Space Science Laboratory: Black Hole Astrophysics Placement (2019)

- Summer research placement at Mullard Space Science Laboratory (MSSL) on emission from black hole accretion discs. Part funded by Robinson College Research Grant
- Coded in Python to plot results of photon geodesic and radiative transfer equations solved using FORTRAN to investigate photon orbits and black hole structure
- Used Unix command line and an SSH. Setup virtual computer with Linux OS to write and run code
- In depth analysis of K-alpha iron line spectra and the effect of a black hole's mass, spin and inclination angle on the modelled spectra. Self-taught introduction to General Relativity
- Culminated in a 5,000 word report in LaTeX summarising the results

BACHELORS' PROJECTS AND EARTH SCIENCE FIELDWORK

Computational Project on N-Body Galaxy Collision Simulations (2020)

- First class grade for 3,000 word report written with LaTeX explaining computational work on simulations of the trajectories of >50,000 test mass stars and 2 heavy galactic nuclei colliding
- Analysed numerical accuracy and behaviour of different integration techniques including RK45, DOP853 and Radau and the stiffness of differential equations in Python
- Created fast and effective vectorized method to solve ODEs using Python

Research Review on Short-Lived Radioactive Isotopes during Solar System Formation (2020)

- First class result for research review into the existence of 26Al and 60Fe isotopes in meteorites during the formation of the solar system. Wrote 3,000 word report summarising ongoing research and discussed the most popular theories for the isotopes' origin

Earth Science Fieldwork (2017-2019)

- Optional fieldwork trips to Isle of Arran, Cornwall and Sedbergh to investigate geology of regions. Won prize for best group presentation on Arran's geological history

CO-CURRICULAR INTERESTS AND SKILLS

Science

- Amateur astronomer and member of Cambridge University Astronomical Society (2019-present)
- Participated in the 2019 Conference for Undergraduate Women in Physics (2019)
- Co-chaired a panel discussion at Cambridge about women in STEM (2018)

Additional

- Foreign Languages: German (conversational), Deutsch Intensivkurs at Humboldt University (2019)
- Sport: kung fu (president of club and silver medallist), hockey and football teams (2012-present)
- Cello: grade 7, octet and orchestra at school (2002-present)
- Gardening Society: founder and head of the Robinson College Gardening Society (2018-2020)