Alice Eleanor Matthews

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Education

- **The University of Manchester** — Manchester, UK
  Master of Physics (MPhys); Overall 2:1, MPhys Project 81% — *Sep. 2015 - Jul. 2019*
- **Saint Bedes Sixth Form** — Redhill, UK
  A-Levels: Geography, Physics, Maths; A,B,B — *Sep. 2007 - Sep. 2014*

Publications

- A Faure, P Hily-Blant, C Rist, G Pineau des Forêts, A Matthews, D R Flower, 'The ortho-to-para ratio of water in interstellar clouds', Monthly Notices of the Royal Astronomical Society, Volume 487, Issue 3, August 2019, Pages 3392–3403. https://doi.org/10.1093/mnras/stz1531.

Research Experience

- **HI Intensity Mapping and Galaxy Simulations** — The University of Manchester
  Exploring HI intensity mapping parameters using the DRAGONS galaxy simulation — *Jul. 2020 - Current*
  - Manipulating and handling structured large data sets (1.6 million data points) using the Dark Ages Reionization and Galaxy Observables from Numerical Simulations Programme, (DRAGONS), obtaining the internship through independent networking.
  - Developed numerical methods and analytical tools implemented in Python and open source packages (Pandas, Numpy, Seaborne, Matplotlib, SciPy, Statistics) creating and handling clustered data structures to analyse and infer cosmological relations to HI with dark matter and galaxy evolution within low to high redshifts.
  - Gained experience using various numerical techniques in pandas and numpy such as linear regression, statistical approaches and working with pandas data structures, for example clustering the galaxy catalogue into smaller subsets depending on their mass and galaxy type and implementing theoretical equations into the analysis.
  - Produced results in a short deadline, through reading and research, having no prior experience in this field to gaining confidence working and building new skills independently in an isolated environment.
- **Junior Front-End Developer & Product Associate** — London, UK
  Fire Tech — *Oct. 2019 – Jul. 2020*
  - Developed new business model amid the coronavirus pandemic, transitioning from in-person camps to online courses within a couple of weeks, working directly with the COO, Director of Technology and Head of HR.
  - Created real-time data analytics dashboards and reports in Google Data Studio, analysing and manipulating data from tracking tools, web analytics, heat maps and campaigns.
  - Lead the homepage redesign project, researching and building solutions for improving user experience, creating designs and pitching this to the entire company including the CEO, utilising my ability to communicate to both technical and non-technical audiences.
  - Produced high quality responsive and mobile friendly design with good SEO and clean code for the wire frames implemented in HTML5, CSS, JavaScript and JQuery hosted on Wordpress. Worked alongside the back-end and DevOps engineers, to align the front-end code with the back-end. Improved overall conversions on the website and user experience.
  - Managed the products on the back-end of the website, working alongside the Head of Products to ensure the website was up to date with the latest releases. Developed technical documentation for these processes.
- **Masters Research Project: High Energy Particle Physics (81%)** — The University of Manchester
  Attempting a first observation of tau pairs produced via vector boson fusion. — *Sep. 2018 - Jun. 2019*
  - Produced statistically significant results using theoretical high energy particle physics concepts and processes, implementing them into the project methodology, data selection, reconstruction and treatment algorithms, using ROOT software for visualisation.
  - Using Big Data collected via Monte Carlo simulated and real data from the ATLAS detector at CERN, I developed data mining techniques implemented in object-oriented C++ and python using Scientific Linux operating system, to remove large quantities of data and to constrain channels of interest and control background, cutting events down from 3 billion to the order of 200 events.
  - Learned to approach challenging concepts and problems both collaboratively and as an individual, using both logic and initiative. I have learned discipline in handling uncomfortable situations through determination, patience and consistency.
  - Presented results in both written and oral presentations to publishable standard, reflected by my rewarded grades (oral: 90%, written: 80%).
  - As a collaborative effort, my skills in team working, leadership, project management and punctuation have significantly improved. This was achieved by active communication between both my lab partner and supervisor in organising meetings and presenting weekly reports. This ensured a successful and clear progression and understanding of all aspects of the project.

- **Astrochemistry and Radio-astronomy** Grenoble, France
  Institut de Planétologie et d'Astrophysique de Grenoble, Interstellar Department *Jun. 2018 - Sep. 2019*
  - Developed numerical methods implemented in Python and FORTRAN to analyse, investigate and visualise the ortho-to-para ratio of water (HHO-$H2O$), calculating important parameters in astrophysics using the University of Grenoble Alpes Astrochemical Network Simulation (UGAN).
  - Produced derivations of the cosmic ray ionisation rate and desorption of water on ice/gas-grains from first principles. This proof was included in the publication for this project. This experience taught me to be vigilant and thorough in my theoretical and mathematical analyses.
  - Investigated the evolution of molecular chemistry within pre-stellar regions, throughout various stages of core collapse and the effects of other physical parameters such as ionisation, electron capture, chemical abundances, magnetic fields and accounting for molecular cross-section and heavy nuclei on proton impact.
  - My personal and professional confidence vastly improved working abroad in both a new country and new area of physics, as well as with an international team.
- **Researcher and Observer** Veleta, Province of Granada, Spain
  IRAM 30m radio telescope *27/Aug. - 05/Sep. 2019*
  - Visited the 30m IRAM telescope in the Sierra Nevada as part of a side project during my time at IPAG. The visit was for a duration of 10 days to perform a survey of Nitrogen bearing species and their isotopic ratios in nearby star formation regions.
  - Performed a total of 36 solo observing hours on the IRAM 30 m telescope collecting spectra. Learned to point, calibrate, focus, perform on the fly observations and sky mappings, using GILDAS and Xephem software.
  - These methods were used to measure the quantum transitions of HCN and HNC and their isotopologues, in the L1512, L1512E and L183 dense cores, within the Taurus environment (L1498) using spectroscopy techniques.
  - I was introduced to the main principles used in radio-astronomy and spectroscopy.
  - Implemented methods such as background subtraction to avoid sky emission and receiver gain fluctuations. These included frequency switching as well pointing and re-focusing the beam using a secondary bright source along the line of sight of observing object in order to reduce noise.
  - Further developed my communication in an international team as well as learning a little Spanish.
- **Weapons Systems Simulation and Experimentation (WSSE) Intern** Bristol, UK
  MBDA *Jun. 2017 - Sep. 2017*
  - Developed and tested simulation environments implemented in C++ ensuring the hardware elements were compatible with the Virtual Battlefield Simulated environment and graphical user interface connecting networks. Wrote technical documentation, including fail-safe procedures under strict time management.
  - Invited to work as an exhibitor and technical support during the 10 day DSEI London 2017 event, responsible for giving simulation demonstrations to guests and other organisations, including governmental and military bodies, improving my communication and confidence immensely.
  - Expressed high enthusiasm, worked on multiple projects across different teams and developed project management and organisation skills. I was invited back for a further placement in 2018.

Additional Experience

Active Science Communicator Personal Projects
Blogger, Public Speaking, Outreach Events, Radio Host *Sep. 2016 - Current*

- **Astro Ally Blog:** I host a blog and social media accounts, to inspire the current and younger generation in STEM, education, as well as discuss ways to be more sustainable, environmentally friendly and healthy!
- **Outreach Events:** Collaborated in public speaking events with schools and organisations such as CERN, ScienceX, The Manchester Museum of Science and Industry and Bluedot festival outreach events.
- **Radio show host, Fuse FM:** Broadcasting the latest science news and recorded interviews with Professors Brian Cox, Tim O'Brien and others.
- **Tutor:** I have an experience in tutoring physics, maths and Python courses.

Interests, skills and other

- **Programming:**: Proficient in C++, Python, ROOT, Scientific Linux 6, Git, Microsoft Office, LaTeX.
  Intermediate in FORTRAN, HTML, CSS, PHP, Xephem, GILDAS/SIC, MATLAB
- **Activities**: Extreme and outdoor sports fanatic - active surfer, cyclist, hiker and climber! I even played ice hockey for the mixed Manchester Metros team!
- **Passionate Learner**: Currently undertaking courses to improve my data science and programming skills: *'Machine Learning'* by Stanford University and *'Object-Oriented Programming with Java'* by the University of Helsinki.
- **Hobbies**: Physics, fashion, food, friends, animals, culture and travel!