

Matthew Evans

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energy storage · ab initio calculations
crystal structure databases · open science & software

EDUCATION

- 2016– **PhD Physics**, *Theory of Condensed Matter Group*, University of Cambridge.
2015–2016 **MPhil Scientific Computing**, University of Cambridge, *Pass with distinction*.
2011–2015 **MPhys Physics with Theoretical Physics**, University of Manchester, *First Class (Hons)*.

EXPERIENCE

- 2016–2020 **Crystal structure prediction for next-generation energy storage applications**
PhD with Dr Andrew Morris (*University of Cambridge/University of Birmingham*)
Discovery and computational characterisation of high-capacity conversion anodes for Li-, Na- and K-ion batteries. Author of two open-source Python packages: database approaches for high-throughput calculations and materials design with [matador](#) and crystal structure prediction with [ilustrado](#). Contributed to the [CASTEP](#) and [OptaDOS](#) codes. Active member of the [OPTIMADE consortium](#) for materials database interoperability and author and maintainer of [optimade-python-tools](#) package and [odbx](#) implementation.
- 2019 **Visiting Researcher**
Department of Applied Physics, Aalto University
Received HPC-Europa funding to visit the group of Prof Adam Foster for 7 weeks, with computational resources provided by the Finnish IT center for science (CSC).
- 2019 **Scientific Software Developer**
Internship Enthought Inc., Cambridge
Worked on the open source, Horizon 2020 [FORCE project](#), with a focus on adding functionality to the workflow manager for multi-criteria optimisations, including developing a Bayesian optimisation plugin. Helped develop Cython bindings for the ACADO toolkit.
- 2014, 2015 **Interactions of quantised vortices in superfluid helium**
UG with Dr Paul Walmsley & Prof Andrei Golov (*University of Manchester*)
- 2014–2015 **Electronic structure of defects in graphene superlattices**
MPhys with Prof Francisco Guinea (*University of Manchester*)
- 2013 **Hard sphere packing of nanotube-encapsulated fullerenes**
UG with Dr Ho-Kei Chan & Prof Elena Besley (*University of Nottingham*)

COMPUTING

Exposure: **Daily**, Intermittent, *Occasional*.

Languages	Python , Fortran, Cython, C++	Databases	MongoDB , SQL
DFT	CASTEP , Quantum Espresso, GPAW	Packages	NumPy , SciPy , matplotlib , scikit-learn
Tools	git , vim , Docker	Practices	Test-driven development , CI

(TEACHING + SERVICE)

- 2018– Reviewed manuscripts for *Scientific Reports*
- 2016– Active member of TCM sysadmin team, Cavendish Laboratory
- 2019 Demonstrator: Part II Computational Physics, Cavendish Laboratory
 - Demonstrated scientific Python to beginners in weekly labs.
 - Wrote and delivered a tutorial on the basics of [version control with Git](#).
- 2016–2018 Supervisor: 2x Part IB Electromagnetism, Dynamics and Thermodynamics, Selwyn College
 - Small group teaching, providing detailed feedback on assigned problems.
- 2016–2019 Demonstrator: 3x Part IB Introduction to Computing (C++), Cavendish Laboratory
- 2016– Demonstrator: 4x at annual CASTEP workshop, University of Oxford
- 2017 Volunteer: 2nd Conference of Research Software Engineers, University of Manchester
- 2016–2017 Volunteer: Key Stage 2 Code Club, Ridgefield Primary School, Cambridge
- 2012–2015 Tutor: GCSE Maths & Key Stage 2 Programming for [The Tutor Trust](#), Manchester
 - Provided tuition to small groups and ‘looked after children’ across 15 schools.
 - Helped lead a successful pilot to teach primary school children programming using Scratch.

(AWARDS + HONOURS)

- 2019 HPC-Europa 3 funding to visit Aalto University for 7 weeks and associated computing time.
- 2018 Tier-2 HPC Resource Allocation: PI on project awarded 4 MCPUh, *Crystal structure prediction for next-generation solar absorbers*, **M. L. Evans**, D. O. Scanlon and A. J. Morris.
HPC Midlands+ Substantial Project: awarded 1.3 MCPUh for *High-throughput materials discovery for energy applications*, **M. L. Evans** and A. J. Morris.
- 2017 Tier-2 HPC Resource Allocation: Co-investigator on project awarded 4 MCPUh, *Ab initio structure prediction for next-generation battery materials*, B. Karasulu, **M. L. Evans** and A. J. Morris.
- 2015 Tesella Prize for Software, University of Manchester, for the most effective use of software in a final year physics project.
- 2013, 2014 Undergraduate research bursary for two summers as an undergraduate, totalling £4200.
- 2011–2015 Means-tested and merit based scholarship to study at the University of Manchester, worth £12,000.

SELECTED PRESENTATIONS

- 2015– Presented posters and talks at 20 conferences and workshops both nationally and internationally. Selected works can be found on my [personal website](#).
- 2019 Contributed talk: *Phosphorus anodes for potassium-ion batteries: insights from crystal structure prediction*, EMRS Spring 2019, Nice, France
Invited talk: *matador & OPTIMADE*, CECAM Workshop, Open Databases Integration for Materials Design 2019, EPFL, Switzerland
- 2018 Contributed talk: *Sn-P anodes for potassium-ion batteries: insights from crystal structure prediction*, SMARTER6 Conference, Ljubljana, Slovenia
Invited talk: *matador: databases and crystal structure prediction* ([slides](#)), CECAM Workshop, Open Databases Integration for Materials Design 2018, EPFL, Switzerland
- 2017 Invited talk: *Crystal structure prediction for next-generation battery anodes* ([slides](#)), Solid State Seminar Series, University of Cambridge

PUBLICATIONS

Status: in preparation, **preprint**, published.

7. **Evans, M. L.** *et al.* Phosphorus anodes for K-ion batteries: insights from *ab initio* structure prediction. (*in preparation*), (2020).
6. **Evans, M. L.** matador: database and analysis software for high-throughput atomistic calculations. (*in preparation*), (2020).
5. Harper, A. F., **Evans, M. L.** & Morris, A. J. Novel Phases of Copper Phosphides from Computational Structure Searches, (2020). arXiv: 2005.05375.
4. Harper, A. F., **Evans, M. L.**, Darby, J. P., Karasulu, B., Koçer, C. P., Nelson, J. R. & Morris, A. J. *Ab initio* structure prediction methods for battery materials: A review of recent computational efforts to predict the atomic level structure and bonding in materials for rechargeable batteries. *Johnson Matthey Technology Review* **64**, 103–118, (2020). DOI:[10.1595/205651320X15742491027978](https://doi.org/10.1595/205651320X15742491027978).
3. Mayo, M., Darby, J. P., **Evans, M. L.**, Nelson, J. R. & Morris, A. J. Correction to Structure Prediction of Li–Sn and Li–Sb Intermetallics for Lithium-Ion Batteries Anodes. *Chem. Mater.*, (2018). DOI:[10.1021/acs.chemmater.8b02803](https://doi.org/10.1021/acs.chemmater.8b02803).
2. Marbella, L. E., **Evans, M. L.**, Groh, M. F., Nelson, J., Griffith, K. J., Morris, A. J. & Grey, C. P. (De)Sodiation via Helical Phosphorus Intermediates in High Capacity Anodes for Sodium-ion Batteries. *J. Am. Chem. Soc.* **140**, 7994–8004, (2018). DOI:[10.1021/jacs.8b04183](https://doi.org/10.1021/jacs.8b04183).
1. Zhu, T., **Evans, M. L.**, Brown, R. A., Walmsley, P. M. & Golov, A. I. Interactions between unidirectional quantized vortex rings. *Phys. Rev. Fluids* **1**, 044502, (2016). DOI:[10.1103/PhysRevFluids.1.044502](https://doi.org/10.1103/PhysRevFluids.1.044502). arXiv:[1603.04313](https://arxiv.org/abs/1603.04313).

REFEREES

References available on request.