Michael Hutcheon

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Current position

2018-2021 PhD student, University of Cambridge
Group: Theoretical condensed matter physics
Supervisor: Prof. Richard Needs email: rn11@cam.ac.uk

Areas of research

Density functional theory for superconductors, crystal structure prediction, many-body quantum Monte Carlo, nuclear vibrations in crystals.

Grants

Resource Allocation Panel (RAP): Open access to Tier-2 (Spring 2019) 3 million CPU hours for *Predicting the crystal structure and superconducting properties of hydrides under high pressure*; Co-invstigator.

Publications

- *Stochastic nodal surfaces in quantum Monte Carlo calculations.*, Michael Hutcheon, Phys. Rev. E 102, 042105 (2020)
- *Predicting novel superconducting hydrides using machine learning approaches.*, Michael Hutcheon, Alice Shipley and Richard Needs, Phys. Rev. B 101, 144505 (2020)
- *Stability and superconductivity of lanthanum and yttrium decahydrides.*, Alice Shipley, Michael Hutcheon, Mark Johnson, Chris Pickard and Richard Needs, Phys. Rev. B 101, 224511 (2020)
- *Structural and vibrational properties of Lithium under ambient conditions within density-functional theory*, Michael Hutcheon and Richard Needs, Phys. Rev. B 99, 014111 (2019)

Talks

Run DMC: diffusion Monte Carlo theory and practice. Cambridge, Nov 2018.
Exchange-diffusion Monte Carlo: asymptotically exact solutions to the fermion sign problem. Cambridge, October 2019.

Teaching

Taught supervisions in the mathematics for the physical sciences tripos at Cambridge for the duration of my PhD.

Education

2017-2018 **University of Cambridge** *MPhil, Masters in the philosophy of Scientific Computing (distinction)*
Masters dissertation: *Accurate studies of the energetics of crystals using density-functional theory methods and diffusion quantum Monte Carlo methods*
2013-2017 **University of Oxford** *MPhys, Masters in Physics (1^{st} class)*
Masters dissertation: *Photon induced decoherence of a Transmon superconducting charge qubit*

Awards

Placed 8^{th}/88 in cohort
2017 Mary Somerville prize for academic merit in 4^{th} year finals
2016 Brazell Scholarship in Physics for academic merit in 3^{rd} year finals

2015 Maria and Tina Bentivoglio Scholarship in Physics for academic merit in 2nd year finals
Departmental commendations for laboratory work in both 2nd and 3rd year

2009-2013 **Wootton upper school**

Qualifications
A-Levels: Maths A*, Physics A*, Perspectives on Science A*, Further Maths A, Chemistry A
AS-Levels: Applied Science A, Biology A
GCSEs: 4A*, 10A

Employment history

2013-2019 **Farm Worker**, *Colben Ltd.*
Worked during the harvest at my family farm over each summer. Mainly transporting/monitoring moisture levels of grain and maintaining/repairing farm equipment.

2016 **Summer internship**, *STFC - Rutherford Appleton labs*
8 week placement. Designed, implemented and tested several algorithms for interaction vertex reconstruction intended for the proposed 2025 upgrade of the CMS detector at CERN.

2012 **Summer internship**, *Cranfield University*
Created a computer model of a Siemens SGT-8000H industrial gas turbine engine using the university's TURBOMATCH framework. Presented results at exhibition at Hertfordshire university.

Computing experience

My PhD focuses on computational physics and high-performance computing. Extensive experience programming in C++, C#, FORTRAN and python (~1000's of hours) both for scientific and non-scientific purposes. Proficient at full-stack web development; PHP, Javascript, HTML and CSS.

Interests

Programming
I have been building video games in my spare time for several years, mostly using C# and C++. Along the way I use a lot of 3D modelling software, game engines, photoshop etc.

Rowing
Captain of Somerville mens boatclub in my 2nd year at Oxford, president in my 3rd and social sec in my 4th. Rowed for Somerville mens 1st boat at Oxford and am rowing in Hughes Hall mens 1st boat in Cambridge. Organised and taken part in dozens of regattas and training camps.

Music
Countless hours spend recording and producing music of many genres; playing guitar, piano and drums. Examples can be found on my webpage.