Thomas MacDonald

Employment

June 2020– **Postdoctoral Research Fellow**, *UNSW (School of Physics)*, Sydney, Australia

Postdoctoral research on exciton spin physics and logic operations, relevant to next-generation solar panels and some forms of quantum computing. This work combined experimental measurements, mathematical modelling (analytical model-building and numerical evaluation in Python), and theoretical proposals for logic and computing with excitons.

- Independently managed a research theme within the larger group.
- Performed experimental studies (electron spin resonance) of excitonic materials.
- Built analytical models to relate experimental observables to underlying physical processes, using mathematical skills in calculus, linear algebra, and matrix operations.
- Programmed processing routines (Python, Matlab) for data analysis and model fitting.
- High performance computing on local and national computing clusters (NCI Gadi, UNSW Katana).
- Wrote research papers for publication (MS Word, LaTeX).
- Communicated technical concepts with data visualisation and high-quality figures (Python matplotlib, Adobe Illustrator).
- Presented work at national and international research conferences, communicating complex technical concepts to educated but non-specialist audiences.
- Supervised research students by providing mentoring, technical assistance and oversight, manuscript editing in preparation for publication.
- Built interdisciplinary collaboration by translating chemistry, physics, and materials science.
- Successfully transitioned from a PhD in Chemistry to research in Physics, developing needed skills and knowledge through self-directed learning.

2015–2018 **Technical assistant**, *NMR Facility, Mark Wainright Analytical Centre, UNSW Sydney*

Wrote training material and documents supporting an application for national standards accreditation.

Education

2016–2020 **PhD in Chemistry**, *UNSW*, Sydney, Australia

Research on directing the movement of molecules in solution. These included control of molecules with light, molecular logic, emergence of complex systems from simple interactions. Thesis available.

- Granted **UNSW Dean's Award for an Outstanding PhD Thesis**, awarded to candidates that "*...produce a thesis that requires only minimal corrections, receives outstanding and/or excellent levels of achievement for all examination criteria, and [...] is in the top 10% of PhD theses*".
- Research funded through award of competitive **RTP Scholarship**.
- Developed new experimental techniques and data analyses in physical chemistry.
- Built mathematical models for chemical interactions, programmed numerical simulations (Python), and used experimental data to fit and understand intermolecular processes.
- Wrote papers for publication in peer-reviewed scientific journals.
- Managed own projects independently while contributing to group objectives.

2018, April - August **Research Exchange**, *University of Groningen*, Groningen, Netherlands

Research on new molecular devices with Prof. Ben Feringa, 2016 Nobel Laureate in Chemistry.

2011–2014 **Bachelor of Science (Honours in Chemistry)**, *University of Sydney*, Sydney, Australia

First Class Honours. Other courses include Physics, Mathematics, Engineering, Linguistics.

Projects and Personal Interests

Remote sensing Interest in open-source intelligence, remote sensing, satellite imagery. See here for a short write-up on using publicly-available satellite radar imagery to map an earthquake in Albania.

Research Publications and Presentations

Research papers are listed on my Google Scholar profile and can be provided on request. Conference presentations are listed at tscmacdonald.github.io/presentations/, with selected talks and posters available to download.

References

References can be provided upon request.

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tscmacdonald