

# Daniel Barter

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## Employment

- **Lawrence Berkeley National Laboratory.** November 2020 - . Postdoctoral Fellow in the Applied Energy Materials Group. Working on short time scale simulations of metal ion batteries.
- **Mercury Technologies.** April 2020 - August 2020. Software Engineer. Added many features to the backend web server. Diagnosed and fixed a race condition which was causing hundreds of errors per minute to go unlogged.
- **University of California, Santa Barbara.** September 2019 - March 2020. Lecturer and Postdoctoral Fellow. Course coordinator for [Calculus 4](#).
- **Australian National University.** February 2018 - August 2019. Postdoctoral fellow. Worked on constructing new exactly solvable quantum field theories using tools from algebraic topology and low dimensional category theory.
- **University of Sydney.** August 2017 - January 2018. Postdoctoral researcher in Physics. Learned quantum field theory by interacting with researchers in condensed matter physics and quantum information theory.
- **University of Michigan.** September 2012 - May 2016. Graduate student instructor for calculus 1, 2 and 3. Taught classes with 20-30 students, three times a week. Held office hours. Helped students use Mathematica. Graded homework/exams.
- **University of Sydney.** March 2011 - June 2012. Tutor for calculus 1 and 2. Supervised problem sessions and graded homework/exams.

## Education

- PhD, Mathematics, University of Michigan. September 2012 - May 2017. Specialized in representation theory. Thesis: [Some Remarks about the Interaction between Quantum Algebra and Representation Stability](#).
- B.Sc with First Class Honours and University Medal, Pure Mathematics, University of Sydney. March 2008 - December 2011.

## Software

- **C++** : Language of choice for programs which need to run fast. [RNMC](#) is the largest C++ program I have built. Good debugging skills. Some of my favourite libraries and tools: sqlite, gsl, openMPI, valgrind, gdb, gprof.
- **Python** : Scripting language of choice. [HiPRGen](#) is the largest python program I have built. My favourite way to use python is embedding it into a C++ program. Comfortable with core parts of the python scientific computing ecosystem: numpy, scipy, matplotlib, jax.
- **Haskell** : Language of choice for writing quick web servers, compilers and interpreters. Very comfortable with all the core abstractions and the C FFI.
- **Nix** : Package manager of choice. Nix Lets me say with certainty that my software will run on any computer connected to the internet. Check out my [NixOS configuration](#) which

specifies all my Linux machines, from laptops to a desktop with an Nvidia GPU that is able to use the official Nvidia drivers for scientific computing and vfiu passthrough for windows virtualization.

## Papers

- [doi:10.26434/chemrxiv-2022-n236n](https://doi.org/10.26434/chemrxiv-2022-n236n). Towards a Mechanistic Model of Solid-Electrolyte Interphase Formation and Evolution in Lithium-ion Batteries. Joint work with Evan Spotte-Smith, Ronald Kam and others.
- [doi:10.26434/chemrxiv-2021-c2gp3](https://doi.org/10.26434/chemrxiv-2021-c2gp3). Predictive stochastic analysis of massive filter-based electrochemical reaction networks. Joint work with Evan Spotte-Smith, Sam Blau and others.
- [arXiv:2110.03644](https://arxiv.org/abs/2110.03644). Computing associators of endomorphism fusion categories. Joint with Jacob Bridgeman and Ramona Wolf.
- [arXiv:1907.06692](https://arxiv.org/abs/1907.06692). Computing data for Levin-Wen with defects. Joint with Jacob Bridgeman. **Published** in Quantum.
- [arXiv:1901.08069](https://arxiv.org/abs/1901.08069). Computing Defects Associated to Bounded Domain Wall Structures: The  $\mathbf{Vec}(\mathbb{Z}/p\mathbb{Z})$  case. Joint with Jacob Bridgeman. **Published** in Journal of Physics A.
- [arXiv:1810.09469](https://arxiv.org/abs/1810.09469). Fusing Binary Interface Defects in Topological Phases: The  $\mathbf{Vec}(\mathbb{Z}/p\mathbb{Z})$  case. Joint with Jacob Bridgeman and Corey Jones. **Published** in Journal of Mathematical Physics.
- [arXiv:1806.01279](https://arxiv.org/abs/1806.01279). Domain walls in topological phases and the Brauer-Picard ring for  $\mathbf{Vec}(\mathbb{Z}/p\mathbb{Z})$ . Joint with Jacob Bridgeman and Corey Jones. **Published** in Communications in Mathematical Physics.
- [arXiv:1706.03645](https://arxiv.org/abs/1706.03645). Deligne categories and representations of the infinite symmetric group. Joint with Inna Entova-Aizenbud and Thorsten Heidersdorf. **Published** in Advances in Mathematics.
- [arXiv:1611.00071](https://arxiv.org/abs/1611.00071). Eigenvalues of rotations and braids in spherical fusion categories. Joint with Corey Jones and Henry Tucker. **Published** in Journal of Algebra.
- [arXiv:1610.05204](https://arxiv.org/abs/1610.05204). Computing the minimal model for the quantum symmetric algebra.
- [arXiv:1610.05248](https://arxiv.org/abs/1610.05248). A remark about 6j symbols and young semi-normal form.
- [arXiv:1509.04228](https://arxiv.org/abs/1509.04228). Noetherianity and rooted trees.