Oliver C. Gorton

Figure 1: *PhD student in computational science (the nuclear physics kind)*

I use scientific computing to study the structure and properties of atomic nuclei. This has lead me to work on a number of different topics in nuclear structure and reaction theory, quantum chemistry, quantum information theory, and machine learning. All of my work involves the application of high performance computing (HPC) to quantum many-body physics.

Education

- **PhD Computational Science**, expected 2023 - Joint Doctoral Program with UC Irvine and San Diego State University
- **MS Physics**, 2018 - San Diego State University
- **BA Physics**, 2016 - University of California, Berkeley

Publications

1. **Cross sections for neutron-induced reactions from surrogate data: revisiting the Weisskopf-Ewing approximation for (n,n') and (n,2n) reactions**, O. Gorton and J. E. Escher, submitted to Phys. Rev. C. Pre-print available arXiv:2102.03452.
2. **Measurements of proton capture in the A=100-110 mass region: Constraints of the 111In(gamma,p)/(gamma,n) branching point relevant to the gamma-process**, O. Olivas-Gomez, A. Simon, O. Gorton, J. E. Escher et al., Published November 2020 Phys. Rev. C, 102, 055806.
3. **Neutron capture cross sections from surrogate reaction data and theory: connecting the pieces with a Markov-Chain Monte Carlo approach**, O. Gorton and J. E. Escher, CNR*18 Proceedings. Preprint available arXiv:1905:03055. Published September 2020 Spring Proceedings in Physics.
4. **Efficient Modeling of Nuclei Through Coupling of Proton and Neutron Wavefunctions**, O. Gorton, Advisor: C. Johnson, Masters Thesis (2018) San Diego State University, 2018.

Research Positions

1. **Graduate Research Assistant**, SDSU Research Foundation with Calvin Johnson, 2019 - present
   - Developed software and theory to describe atomic nuclei using the nuclear shell model and computaional science
2. **Glenn T. Seaborg Institute (GTSI) Summer Intern**, Seaborg Institute, LLNL, Summer 2021
3. **High Energy Density Physics Intern**, Lawrence Livermore National Laboratory, Summer 2018, 2019, and 2020

- Developed Python code to do MCMC parameter estimation for statistical nuclear reaction codes in order to combine surrogate data and theory
- Employed code for sensitivity studies assessing approximations in the surrogate reactions method
- Modified and ran four Hauser-Feshbach model codes

4. **Graduate Student**, UC Irvine, Department of Chemistry with Filipp Furche, Fall 2019 and Spring 2020.
    - Collaborated to develop formalism for Nuclear-Electronic Orbital method using time-dependent density functional theory

Professional

- Served as a referee for Physical Review C
- Experience writing proposals for DOE, NNSA, and other funding sources
- **Graduate Teaching Associate**, San Diego State Univeristy, Department of Physics, during 2016 - 2020.
  - Independently led lectures and exams for introductory-level physics lab courses
  - Modernized the manual for Physics 182A/195L Laboratory for online deployment in Spring 2020

Training

- FRIB-TA Summer School: A practical walk through formal scattering theory, 2021
  - Course resources
  - Connecting bound states, resonances, and scattering states in exotic nuclei and beyond
- Agile Development Practices and Tools: A Guided Tour, 2020
  - Sustainable Horizons Institute introduction to agile software development
  - Collaborative source control using git, GitHub, and git workflows
- Technical Writing Workshop, 2019
  - LLNL PLS Directorate sponsored two-part writing class
  - Session 1: Structuring your research paper
  - Session 2: Clear, accurate, concise writing

Code

- Major projects: Modern Fortran, Python, Bash
- Minor tasks: C++, openMP, MPI, Mathematica, MATLAB, R

Wigner

A library of functions for computation of Wigner 3-j, 6-j and 9-j symbols, written in modern Fortran.

- Repository
- Docs

DMFortFactor

A fast Fortran code for WIMP-nucleus form factors and differential event rate spectra. Written in modern Fortan with an optional Python interface. Parallel execution with OpenMP.

- Repository
- Docs

PNISM

Proton-neutron interacting shell model code. Not yet released.

MCIT

Monte Carlo Inference Tool for Hauser-Feshbach statistical nuclear reaction codes. Not yet released.

Awards

- *Recently awarded 3-year proposal* LLNL, WCI, Academic Collaboration Team (ACT) University Program
- Graduate S-STEM Scholarship, 2018-2020

Talks

1. **DMFortFactor: A Fast and Accessible for Computing WIMP-Nucleus-Scattering Event-Rates**, O. Gorton, C. Johnson, C. Jiao, talk given at DNP21 APS Conference (October 2021).
2. **Better MCMC for Nuclear Data using emcee and B-DJINN**, O. C. Gorton, J. E. Escher, K. O. Bergstrom, M. K. Kruse, talk given at LLNL Summer Slam 2021.
3. **Nuclear Physics for WIMPs**, O. Gorton and C. W. Johnson, talk given at SDSU SIAM Student Chapter Summer Colloquium Series, Friday July 2, 2021.
4. **Cross subsections for neutron reactions from surrogate measurements: Revisiting the Weisskopf-Ewing approximation**, O. Gorton and J. E. Escher, DNP20 APS Conference (October 2020).
5. **Can we get rid of the theorists?**, O. Gorton and J. E. Escher, LLNL Summer Slam talk (August 2020).
6. **Big Picture and Background for Nuclear-Electronic Orbital (NEO) Approach: Calculating Mixed Nucleon-Electron Wave Functions**, O. Gorton, progress talk presented for the Furche Group, Chemistry Department, UC Irvine (March 2020).
7. **Indirect measurements of nuclear cross subsections: tempering experimental results with theory**, O. Gorton and J. E. Escher, HEDP Exit Talk (September 2019).
8. **Sensitivity Study of the Surrogate Method**, O. Gorton and J. E. Escher, poster presented at LLNL Student Poster Symposium (August 2019).
9. **Temperature and Entropy in the Nuclear Shell Model**, O. Gorton and C. W. Johnson, poster presented at SDSU ACCESS event (April 2019).
10. **Proton Neutron Interacting Shell Model: Order of Magnitude Reduction for Medium Mass Nuclei**, O. Gorton and C. Johnson, poster presentated at SDSU annual research symposium (March 2019).
11. **Neutron capture cross subsections from surrogate reaction data and theory: connecting the pieces with a Markov-Chain Monte Carlo approach**, O. Gorton and J. E. Escher, poster presented at CNR18, September 2018.
12. **A Markov Chain Monte Carlo Tool for Hauser-Feshbach Codes**, O. Gorton and J.E. Escher, HEDP Exit Talk (August 2018).

Climbing

In my free time I enjoy rock climbing.

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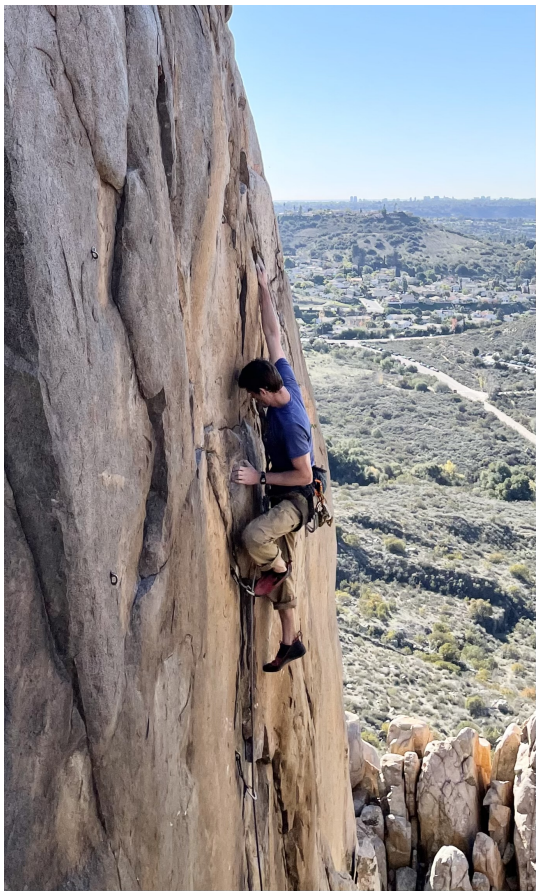

Figure 2: Oliver climbing a wall