

# Cody L. Petrie - Curriculum Vitae

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## Education

- PhD Physics (Expected), Arizona State University. Expected graduation date: August 2019.
- INT Program INT-18-2b: Advances in Monte Carlo Techniques for Many-Body Quantum Systems, July-August 2018.
- XSEDE HPC Workshop: Summer Boot Camp, June 2018.
- M.S. Physics, Arizona State University, August 2017.
- TALENT Summer School on Nuclear Quantum Monte Carlo Methods, July 2016.
- B.S. Physics, Brigham Young University, August 2014.
  - Minor: Astronomy

## Research Experience

### **Quantum Monte Carlo for Nuclear Systems (ASU and LANL):** August 2014 - Present

- I am currently using Quantum Monte Carlo methods to solve many-body problems in nuclear physics. I have added quadratic spin-isospin dependent correlations to the trial wave function which has improved statistical errors and energy estimates. I am currently working on additional improvements to the trial wave function. These improved correlations have the greatest effect on systems of many nucleons. I am also currently using these improved wave functions to investigate particle clustering in neutron matter, a phenomenon that occurs in the crust of neutron stars. This research is being done at ASU and in conjunction with collaborators at Los Alamos National Laboratory.

### **Coupling of Nano Systems with Electromagnetic Fields (ASU):** January 2015 - April 2015

- I used the Finite Difference Time Domain method to calculate the interaction coupling between nano particles such as Ag islands or spheres with surface plasmons on a Si substrate. This was done as part of a research rotation during my second semester at ASU.

### **HIV Incidence Estimation (LANL):** May 2012 - July 2012

- I computationally estimated HIV incidence based on serological data of diagnosed cases. I used a combination of survey and Bayesian statistics. This research was part of a summer Science Undergraduate Laboratory Internship (SULI) through the DOE during the summer of 2013.

### **Experimental/Computational Extreme Ultraviolet (EUV) Optics (BYU):** March 2011 - August 2014

- I used geometrical optics, physical optics and direct calculations using Maxwell's equations to calculate reflection from thin film surfaces. These calculations were compared to reflection measurements that I took of EUV light from thin film surfaces of varying roughness. Comparing the calculated reflectances from surfaces with various roughnesses to the measured reflectances I was able to estimate the roughness of the thin films.

## Grants & Awards

- Nominated as a College of Liberal Arts and Sciences Student Leader at ASU, 2018.
- Outstanding Graduate Student Presentation Award at 4CS APS meeting, 2018.
- Nominated as a College of Liberal Arts and Sciences Student Leader at ASU, 2017.
- Department of Physics, Wally Stoelzel Fellowship at ASU, Fall 2017.
- Summer University Graduate Fellowship at ASU, Summer 2015.
- Department of Physics Graduate Fellowship at ASU, Fall 2014.
- Office of Research and Creative Activities Grant at BYU, Academic year of 2013-2014.

## Computational Experience

### *Languages*

Fortran (including MPI and some OpenMP and OpenACC)  
Python  
C++  
Matlab  
Mathematica  
R

### *Operating Systems*

Linux  
Windows  
Mac

## Teaching Experience

I have experience doing **online** physics courses as well as labs, lectures, and combined lecture-lab courses.

**Teaching Assistant:** General Physics Laboratory 1 (non-calculus based, online format), May 2018-June 2018, ASU.

**Teaching Assistant:** University Physics Laboratory 1 (calculus based, online format), August 2018-December 2018, ASU.

**Teaching Assistant:** General Physics Laboratory 1 (non-calculus based, online format), August 2018-October 2018, ASU.

**Teaching Assistant:** General Physics Laboratory 1 (non-calculus based, online format), May 2017-June 2017, ASU.

**Adjunct Faculty:** University Physics I: Mechanics (calculus based, lecture+lab combination), August 2017-December 2017, Mesa Community College.

**Instructor:** Clubes de Ciencia México: Frank Wilczek course, July 2017.

**Teaching Assistant:** University Physics Laboratory 1 (calculus based, online format), January 2017-December 2017, ASU.

**Teaching Assistant:** General Physics Laboratory 1 (non-calculus based, online format), January 2017-March 2017, August 2017-October 2017, ASU.

**Teaching Assistant:** Introduction to Physics (non-calculus based), August 2016-December 2016, ASU.

**Teaching Assistant:** General Physics Laboratory 2 (non-calculus based), January 2016-April 2016, ASU.

**Teaching Assistant:** University Physics Laboratory 2 (calculus based), August 2015-December 2015, ASU.

**Teaching Assistant:** University Physics Laboratory 1 (calculus based), August 2014-April 2015, ASU.

**Physics Tutor:** Tutor for both calculus and non-calculus based classes on waves, optics, thermodynamics, special relativity, and electricity and magnetism, Jan-Apr 2014, BYU.

**Teaching Assistant:** Introduction to Analog and Digital Circuits, Sep-Dec 2013, BYU.

**Teaching Assistant:** Classical Mechanics, Sep-Dec 2013, BYU.

**Teaching Assistant:** Introduction to Waves, Optics, and Thermodynamics (Physics Major Section), Jan-Apr 2013, BYU.

**Teaching Assistant:** Introduction to Electricity and Magnetism, Sep-Dec 2012, BYU.

## Publications

1. D. Lonardoni, S. Gandolfi, J. E. Lynn, **C. Petrie**, J. Carlson, K. E. Schmidt, A. Schwenk. Auxiliary field diffusion Monte Carlo calculations of light and medium-mass nuclei with local chiral interactions. *Phys. Rev. C*, 97 (4), 044318 (2018).
2. Ethan Obie Romero-Severson, **Cody L. Petrie**, Edward Ionides, Jan Albert, Thomas Leitner. Trends of HIV-1 incidence with credible intervals in Sweden 2002-09 reconstructed using a dynamic model of within-patient IgG growth. *Int. J. Epidemiol.*, 2015, Vol. 0, No. 0.
3. **Cody L. Petrie**, Joshua Marx, David Squires, R. Steven Turley. Determining thin-film roughness with extreme ultraviolet reflection. *J. Utah Acad. Sci. Arts Letts.*, 92, 239-255 (2015).
4. **Cody L. Petrie**, Determining thin film roughness with EUV reflection, Brigham Young University (2014), Senior Thesis.
5. Quintin Nethercott, **Cody L. Petrie**, R. Steven Turley. Non-specular reflection in the extreme ultraviolet. *J. Utah Acad. Sci. Arts Letts.*, 89, 181-193 (2012).

## Talks and Posters

1. "Alpha particle formation in neutron star crusts with an improved trial wave function for nuclear Quantum Monte Carlo," **Cody L. Petrie**, Kevin Schmidt. Annual Meeting of the Four Corners Section of the APS, Salt Lake City Utah, October 13, 2018.
2. "Improved Trial Wave Functions for Nuclear Quantum Monte Carlo," **Cody L. Petrie**. INT Program INT-18-2b, Seattle Washington, August 8, 2018.
3. "Determining Thin Film Roughness with Extreme Ultraviolet Reflection," **Cody L. Petrie**, R. Steven Turley. Utah Academy of Sciences, Arts and Letters, St. George Utah, April 11, 2014.
4. "Determining Thin Film Roughness with Extreme Ultraviolet Reflection," **Cody L. Petrie**. BYU Student Research Conference, Provo Utah, March 15, 2014
5. "Using EUV Reflection to Understand Thin Film Surfaces," **Cody L. Petrie**, R. Steven Turley. Utah Academy of Sciences, Arts and Letters, Orem Utah, April 12, 2013.
6. "Using EUV Reflection to Understand Thin Film Surfaces," **Cody L. Petrie**. BYU Student Research Conference, Provo Utah, March 9, 2013
7. "Determining Thin Film Roughness with Extreme Ultraviolet Light," **Cody L. Petrie**, R. Steven Turley. Annual Meeting of the Four Corners Section of the APS, Socorro New Mexico, October 26, 2012.

8. “Nonspecular reflectance in the extreme ultraviolet,” Quintin Nethercott, **Cody L. Petrie**, R. Steven Turley. Utah Academy of Sciences, Arts and Letters, Logan Utah, April 13, 2012.
9. “Improving thin film thickness uniformity,” Jordan Bell, **Cody L. Petrie**. BYU Student Research Conference, Provo Utah, March 12, 2012