Andrew C. Loheac

EDUCATION

University of North Carolina at Chapel Hill   2014 - present
Doctor of Philosophy in Physics   Chapel Hill, NC
Research Advisor: Prof. Joaquín E. Drut
Dissertation: Techniques to Address the Sign Problem in Non-Relativistic Quantum Thermodynamics

University of North Carolina at Chapel Hill   2014-2017
Master of Science in Physics   Chapel Hill, NC
Research Advisor: Prof. Joaquín E. Drut

Rochester Institute of Technology   2010 - 2014
Bachelor of Science in Physics, *summa cum laude* (GPA: 4.00)   Rochester, NY
Minor in Computer Science
Senior Thesis Advisor: Prof. Michael Pierce
Senior Thesis: Investigation of O_2 Interactions with the Au(001) Single Crystal Facet

RESEARCH EXPERIENCE

Graduate Research Assistant   July 2014 - present
Dept. of Physics and Astronomy, University of North Carolina, Chapel Hill, NC
Advisor: Prof. Joaquín Drut

- Currently studying thermodynamics of polarized and unpolarized one- and three-dimensional Fermi gases in weakly to strongly coupled regimes across large temperature scales using a variety of analytic and numerical techniques.

- Developing new high-order perturbative expansion techniques for studying the properties of interacting quantum matter.

- Leading development of *Scimitar*, an application developed in Python which is designed for the management and submission of large numerical simulation jobs that explore vast parameter spaces.

Undergraduate Researcher   April 2013 - June 2014
X-Ray and Surface Science Laboratory
School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY
Advisor: Prof. Michael S. Pierce

- Studied CO and O_2 interactions and surface reconstructions on the Au(001) single crystal facet using X-ray diffraction techniques.

- Conducted experiments at the Advanced Photon Source at Argonne National Laboratory in November 2013 (worked at beamline 33-BM characterizing the Au(001) surface reconstruction) and June 2014 (worked at beamline 8-ID applying X-ray photon correlation spectroscopy methods).

Computational Astronomy and Physics REU Program   May 2013 - August 2013
Dept. of Physics and Astronomy, University of North Carolina, Chapel Hill, NC
Advisors: Prof. Joaquín E. Drut, Dr. Eric R. Anderson

- Studied the high temperature thermodynamics of one-dimensional systems of strongly coupled fermions through the calculation of a high-order virial expansion using a quantum Monte Carlo method.

Undergraduate Researcher   January 2011 - January 2013
Laboratory for Complex Systems and Granular Materials

School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY
Advisor: Prof. Scott V. Franklin

- Developed parallelized molecular dynamics simulations for modeling the rheology of geometrically cohesive granular materials using spherocylinder-based geometries under Nvidia's CUDA C++ platform.

PUBLICATIONS

8. Lukas Rammelmüller, <u>Andrew C. Loheac</u>, Joaquín E. Drut, and Jens Braun. *Finite-temperature equation of state of polarized fermions at unitarity.* Phys. Rev. Lett **121**, 173001 (2018).

7. <u>Andrew C. Loheac</u>, Jens Braun and Joaquín E. Drut. *Polarized fermions in one dimension: density and polarization from complex Langevin calculations, perturbation theory, and the virial expansion.* Phys. Rev. D **98**, 054507 (2018).

6. <u>Andrew C. Loheac</u> and Joaquín E. Drut. *Third-order perturbative lattice and complex Langevin analyses of the finite-temperature equation of state of nonrelativistic fermions in one dimension.* Phys. Rev. D **95**, 094502 (2017).

5. M. D. Hoffman, <u>A. C. Loheac</u>, W. J. Porter, and J. E. Drut. *Thermodynamics of one-dimensional SU(4) and SU(6) fermions with attractive interactions.* Phys. Rev. A **95**, 033602 (2016).

4. <u>Andrew Loheac</u>, Andi Barbour, Vladimir Komanicky, Chenhui Zhu, John Collini, Anthony Ruffino, Yihua Liu, Hoydoo You, and Michael S. Pierce. *Interaction of Molecular Oxygen with Hexagonally Reconstructed Au (001) Surface.* The Journal of Physical Chemistry C **120** (40), 23001 (2016).

3. <u>Andrew C. Loheac</u>, Jens Braun, Joaquín E. Drut, and Dietrich Roscher. *Thermal equation of state of polarized fermions in one dimension via complex chemical potentials.* Physical Review A **92**, 063609 (2015).

2. L. Rammelmüller, W. J. Porter, <u>A. C. Loheac</u>, and J. E. Drut. *Few-fermion systems in one dimension: Ground- and excited-state energies and contacts.* Physical Review A **92**, 013631 (2015).

1. M. D. Hoffman, P. D. Javernick, <u>A. C. Loheac</u>, W. J. Porter, E. R. Anderson, and J. E. Drut. *Universality in one-dimensional fermions at finite temperature: Density, pressure, compressibility, and contact.* Physical Review A **91**, 033618 (2015).

PRESENTATIONS AND POSTERS

11. SAS Institute Deep Learning Symposium, "Deep learning quantum matter", co-presented with Joaquín E. Drut. September 28, 2018.

10. Univ. of Washington Institute for Nuclear Theory Workshop, "Thermodynamics of non-relativistic matter from complex Langevin in one and two dimensions". August 1, 2018.

9. The 35th International Symposium on Lattice Field Theory, "Equation of state of non-relativistic matter from automated perturbation theory and complex Langevin". June 22, 2017. [EPJ Web Conf. **175**, 03007 (2018)]

8. March 2014 American Physical Society Meeting, "The Physical Character of the Au (001) Surface Reconstruction in the Presence of CO and O_2". March 5, 2014.

7. 8th Undergraduate Research Day and Open House, Syracuse University, "Thermodynamics of Strongly Coupled Matter". November 9, 2013.

6. RIT School of Physics and Astronomy Colloquium Series, "Thermodynamics of Strongly Coupled Matter". September 17, 2013.

5. Computational Astronomy and Physics REU Program Presentations, "Thermodynamics of Strongly Coupled Matter". July 31, 2013.

4. North Carolina Museum of Natural Sciences Public Outreach Presentation, "Fermions: A Different Kind of Matter". July 6, 2013.

3. Joint Poster Session of the NCSU and UNC Computational Astronomy and Physics REU Programs, "Thermodynamics of Strongly Coupled Matter". June 28, 2013.

2. RIT 2012 Summer Undergraduate Research Symposium, "High performance simulation of sheared staple rheology using CUDA C++". August 10, 2012.

1. RIT 2011 Summer Undergraduate Research Symposium, "Geometry vs. motility: flocking in self-propelled triangular organisms". August 12, 2011.

FELLOWSHIPS AND AWARDS

- UNC Dissertation Completion Fellowship *($18,000 + tuition)*   April 2018
- NSF 2014 Graduate Research Fellowship   Jun 2014 - present
  ($34,000 + full tuition/yr for 3 years)
- RIT School of Physics and Astronomy Research Scholar   May 2014
- RIT Outstanding Undergraduate Scholar Award   Dec 2013
- RIT Physics Faculty and Alumni Endowed Scholarship *($1,500)*   May 2013
- RIT Presidential Scholarship *($13,000/yr)*   Sep 2010 - May 2014
- New York State Board of Regents Scholarship   Sep 2010 - May 2014
  for Academic Excellence *($1,500/yr)*
- RIT Honors Program *($1,000/yr)*   Sep 2010 - May 2014

CREDENTIALS

CompTIA A+ IT Technician Certification   Sep 2008

COMPUTER SKILLS

Programming Languages: C++, Python, Mathematica, MATLAB.
Libraries and Frameworks: SciPy, NumPy, GNU Scientific Library, Boost, wxPython, CUDA, Armadillo, Keras/TensorFlow, OpenMP, OpenACC.