

# Daniel Gruss

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**Summary** Research, software development, and modeling of electron transport in nanoscale devices

## Research Experience

### Materials and Device Simulation

**Center for Nanoscale Science and Technology, NIST** Summer 2015 – Present  
Faculty Assistant, UMD/CNST Cooperative Research Program

**Oregon State University** Winter 2011 – Present

- Developed and implemented scalable algorithms for electronic transport simulation in nanoscale devices
- Designed and built analysis, processing, and visualization tools for data management
- Set the foundation for simulation of sequencing and single molecule detection with electronic currents
- Established a novel, STM-inspired approach for probing many-body systems in cold-atom optical lattices

PhD Advisor: Michael Zwolak

## Education

**Oregon State University** Fall 2010 – Present  
*College of Science, Doctor of Philosophy Physics*

Overall 4.00/4.00 Graduate GPA, Expected graduation June 2016

**Oregon State University** Winter 2007 – Spring 2010  
*College of Science, H.B.S. Computational Physics, Physics (Applied Option), Engineering Physics*

Overall 3.98/4.00 GPA over 275 credit hours, Summa Cum Laude, Computer Science Minor

## Technical Skills

**Simulation of nanoscale devices:** system modeling, linear algebra, non-linear differential equations, numerical integration, algorithm design, complexity and error management, performance and efficiency profiling

- python: 5+ years experience for research-grade computing, including Numpy, SciPy, Matplotlib, IPython
- C/C++: 8 years experience, 4+ years in numerical simulation context
- Daily work with linux, bash shell, git/github version control
- T<sub>E</sub>X/L<sup>A</sup>T<sub>E</sub>X expertise for scientific and mathematical typesetting
- Mathematica: 6 years experience in a research context
- Experience with Blender and Adobe Illustrator/Inkscape for scientific visualization, diagrams
- 4 years academic coursework experience with Java, HTML/CSS/Javascript, C/C++
- Experience with numerical research with MATLAB, Julia, R, Intel Math Kernel Library
- User-level work with high performance computing cluster/queueing systems (PBS, SLURM), AWS spot instances for numerical simulation, MPI parallelization of C/C++ programs, ScaLAPACK
- Research and teaching experience with density functional theory packages VASP and Wien2k

## Journal Publications

1. “Energy-Resolved Atomic Scanning Probe,” **Daniel Gruss**, Chih-Chun Chien, Massimiliano Di Ventra, and Michael Zwolak, in preparation (2016)
2. “Landauer’s formula with finite-time relaxation: Kramers’ crossover in electronic transport,” **Daniel Gruss**, Kirill Velizhanin, and Michael Zwolak, *Sci. Rep.* **6**, 24514 (2016).
3. “Interaction-induced conducting-nonconducting transition of ultra-cold atoms in 1D optical lattices,” Chih-Chun Chien, **Daniel Gruss**, Massimiliano Di Ventra, and Michael Zwolak, *New J. Phys.* **15** 063026 (2013)

## Presentations

1. Landauer’s formula with finite-time relaxation: Kramers’ crossover in electronic transport, Daniel Gruss, Kirill Velizhanin, and Michael Zwolak, APS March Meeting, Baltimore, MD (2016)
2. Characterizing a conducting-to-nonconducting transition in an inhomogeneous Hubbard model out of equilibrium via tDMRG simulations, Daniel Gruss, Chih-Chun Chien, Massimiliano Di Ventra, and Michael Zwolak, APS March Meeting, Denver, CO (2014)
3. Interaction-induced transport of ultra-cold atoms in 1D optical lattices, Daniel Gruss, Chih-Chun Chien, Massimiliano Di Ventra, and Michael Zwolak, APS March Meeting, Baltimore, MD (2013)
4. Interaction-induced transport of ultra-cold atoms in 1D optical lattices - Sigma Xi Columbia-Willamette Chapter - Student Research Symposium, Portland (2013)

## Awards, Memberships, Scientific Visits

OSU College of Science Student Travel Fund awardee	(2013, 2014)
Sponsored research visits to Los Alamos National Laboratory	(2012, 2013)
Sigma Xi Grant-in-Aid of Research “Entanglement and correlations in transport: From nanoscale electronics to cold atoms”	(2013)
Peter Fontana Outstanding Teaching Assistant Award for Excellence in Teaching Physics	(2013)

## Additional Experience

### Teaching Assistant, Oregon State University

Fall 2010 – Spring 2015

- Teaching assistant for a broad range of physics courses: general physics with and without calculus, Upper division programs, online-based astronomy sequence, and graduate level solid state physics
- Duties included supervising laboratory session, leading recitation sections, exam/assignment grading, and teaching computational methods

### Optical Tweezer Holography, Oregon State University

Summer 2008 – Fall 2010

- Supported research in laser-based micro-particle trapping using spatial light modulating holography
- Created software for trap control, precision position and force measurement, and automated data analysis

Thesis: Applied Computing Techniques for Holographic Optical Tweezers (2010), Advisor: David McIntyre