

# JASON M LARKIN

jasonlarkin84@gmail.com • <http://jasonlarkin.github.io> • **Note:** Red are hyperlinks in digital copy

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## CAREER OVERVIEW AND OBJECTIVE

I have extensive experience performing experimental and numerical studies in condensed matter physics with an emphasis on nanoscale transport, fluid dynamics, and nonlinear analysis. My interests include complex systems modeling, multi-language development for applications in high-performance parallel computing, and open-source collaboration to improve the way research is performed and results are disseminated.

## EDUCATION

**Carnegie Mellon University** Pittsburgh, PA • PhD Mechanical Engineering, 2013 GPA: 3.85/4.00

**Thesis:** **Vibrational Mode Properties of Disordered Solids from High-Performance Atomistic Simulations and Calculations.** Numerically investigated thermal properties of crystal alloys, glasses, and organic materials using classical and *ab initio*-based atomistic techniques.

**Coursework:** molecular/electron structure · nanoscale transport phenomena · numerical methods

**University of Pittsburgh** Pittsburgh, PA • MS Mechanical Engineering, 2009 GPA: 3.70/4.00

**Thesis:** **Statistics of Particle Concentrations in Free-Surface Turbulence.** Performed experiments using novel 2D and 3D flow configurations to study turbulence as a nonlinear dynamical system.

**Coursework:** quantum and statistical physics · turbulence · chaos and nonlinear phenomena

**University of Pittsburgh** Pittsburgh, PA • BS Mechanical Engineering, 2007 GPA: 3.20/4.00

**Research:** Used **FEM** to design a model arterial bifurcation for *in vivo* study.

**Steel Center AVTS** Jefferson Hills, PA • **CADD** Certification, 2002 GPA: 3.80/4.00

**Coursework:** Trained in **CAD** using Autodesk's **AutoCAD** (15.6) and **Inventor** (5.3) to produce machined products by **CAM** and human machining.

## EXPERIENCE

**SpiralGen, Inc.** (2013-) **Software Engineer**

**Spiral:** tool to create automatically optimized/platform-tuned digital signal processing and numerical kernels.

- Used integration work for **DARPA** projects (**HACMS**, **PERFECT**) to help create commercial version of the **Spiral** tool.
  - Designed and developed **Jenkins CI** environment for build/testing.
  - Helped develop **NSIS** installer for **Spiral** tool and integration with **Jenkins CI**.
  - Developed help to **Spiral**'s documentation using **Doxygen**.
  - Created native (C/C++/Fortran) and interpreted (**Cython** and **Mex**) example implementations of **Spiral**-generated code.
  - Helped develop **HCOL** implementations of robot control kernels (**PID**, **Euler**) for **HACMS** project.
- **HACMS:** **DARPA** project to create technology for the construction of high-assurance cyber-physical systems.
  - Integrated and tested **Spiral**-generated, high-assurance code with simulated **Webots** and physical **Black-i Landshark** robots using **ROS**.
  - Developed integrated **Pentagon demo** for **HACMS** using **ROS**, **Webots**, and **TkInter**.
  - Developed an automated and virtualized **ROS** test system for the **Spiral**-generated robot controller kernels.
  - Collaborated with a large/diverse team of labs (**HRL**, **SRI**) and universities (**CMU**, **MIT**, **Princeton**, **UIUC**, **UPenn**).
- **PERFECT:** **DARPA** project to seek revolutionary approaches and to research and develop the technologies and techniques to provide the power efficiency required to enable embedded computing systems.
  - Helped develop an installable version of the **Spiral** tool with an **Eclipse** plug-in to generate platform-optimized **FFTs**.

**Carnegie Mellon University** (2010-2012) **Teaching Assistant-Heat Transfer**

- Topics in conduction, convection, and radiation. Supervised recitations and substituted for lectures.

**University of Pittsburgh** (2008) **Teaching Assistant-Advanced Fluid Mechanics**

- Topics in viscous flow, boundary layer theory, and scale similarity.

**University of Pittsburgh** (2007-2009) **Lecturer-Physics**

- Lectured to students and faculty on mathematics, bio-physics, turbulence, statistical and nonlinear phenomena.

**Precision Therapeutics** (2006-2007) **Intern-Technology Development**

- Worked with team of software developers and laboratory equipment specialists.
- Used **CAD** to fabricate components of optical microscopes and laboratory automation controls.

## SKILLS

- **Computing Languages:** Matlab, Python, C/C++, Fortran, Java,  $\LaTeX$ , Shell, Perl, Markdown, HTML, CSS mixed-language development (**Cython**, **Mex**).
- **Software Development:** **SCM** (**svn**, **git**, **Jenkins**), **make/cmake**, **Visual Studio/MSBuild**, **Eclipse**, **NSIS**, **Doxygen**.
- **Compilers/Compilation:** **GNU**, **Intel C/C++**, **Visual Studio**, **MinGW**, **Cython**, **Mex**, **Ant**.
- **High-Performance Computing:** **Linux/Unix cluster administration/computing**, parallel computation (**MPI**, **OpenMP**), **SSE/AVX** vectorization.
- **Cloud Computing:** **Amazon Web Services**, **Cloud9**, Virtualization (**VirtualBox**, **VMWare**).

- **General Computing:** Linux/Unix OS (Ubuntu, Red Hat, CentOS, Mac), Windows OS, Microsoft Office, Libre/Open Office, [GIMP](#).
- **Open-Source Development:** [Github](#), [GULP](#), [LAMMPS](#), [ROS](#), [arXiv](#).
- **Modeling:** atomistic simulation, quantum chemistry, nanoscale transport, statistical and nonlinear analysis, computational fluid dynamics.
- **Hardware:** optics/lasers, DI/DO AI/AO interfaces, simple automation, machining, circuitry, simple robotics control.

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## PROJECTS

- **Quantum Mechanics-Driven Prediction of Nanostructure Thermal Conductivity:** served as investigator under the [AFOSR](#) with collaborators at Carnegie Mellon and University of Pittsburgh, performing calculations on the [DOD's HPCMP](#).
- **disorder:** a comprehensive repository of open-source code and data from my PhD thesis, hosted on [Github](#).
- **ntpy:** created this open-source collaborative effort between members of [NTPL](#) and [University of Toronto](#).
- **GULP:** international collaboration with [Julian Gale](#) at the [Nanochemistry Research Institute](#) at [Curtin University](#).
- **Statistics of Free-Surface Turbulence:** international collaboration with [Alain Pumir](#) at [ENS Lyon](#), France.

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## PUBLICATIONS (SELECTED, 11 TOTAL)

- "Origin of the Exceptionally Low Thermal Conductivity of Fullerene Derivative PCBM Films", ([in progress](#)).
- "Decorrelating a Compressible Turbulent Flow: an Experiment", [Physical Review E 82, 016301 \(2010\)](#).

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## PRESENTATIONS (SELECTED, 15 TOTAL)

- "Evaluation of the Virtual Crystal Approximation for Predicting Thermal Conductivity", J.M. Larkin (speaker), A.J.H. McGaughey, [2013 MRS Spring Meeting](#) San Francisco, CA.
- "The Generalized Fractal Dimensions of a 2-D Compressible Turbulence", J. Larkin (speaker), M. Bandi, W. Goldberg, [2008 American Physical Society March Meeting](#) New Orleans, LA.

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## HONORS

- [2012 ASME MHNMT International Summer Heat Transfer Conference](#) Top 5 Technical Paper
- [2011 Bennett Conference Best Presentation](#)
- [2011 ICES Northrop-Gruman Fellow](#)
- 2007-2009 NSF Graduate Student Research Grant University of Pittsburgh Department of Physics.

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## MEMBERSHIPS

- American Physical Society · American Society of Mechanical Engineers · Materials Research Society · Society of Industrial and Applied Mathematics · DOD High Performance Computing Modernization Program