

JASON M LARKIN

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CAREER OVERVIEW

I learn quickly and seek complex problems. I specialize in multi-scale / physics modeling and prediction with varying levels of complexity (i.e., "back of the envelope" versus computationally-intensive simulation). I have extensive experience performing research and development in diverse fields and collaborating in multi-disciplinary teams across the globe. I have delivered the results of my research through publication and public speaking. I am seeking a position to utilize and increase my knowledge of complex modeling and research.

EXPERIENCE

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

- **Spiral:** toolchain creates automatically-optimized and formally-verified kernels for **Cyber-Physical Systems**.
- Research and development across "**Full-stack**" of software and hardware (high-performance, embedded, and cloud computing) with a focus on delivering **Agile** solutions in a **Continuous Integration** environment:
 - **Software Configuration Management** (SCM): git, Github, JIRA, Jenkins.
 - **Virtual Machines** (VMs) on **Amazon Web Services** (AWS).
 - **WebIDE:** Docker, nginx, nodejs, mongodb.
 - Integration of Spiral with: Matlab/Simulink/Mex, Python/Cython, ROS, Webots, KeyMaeraX, Mathematica.
- **High-Assurance Cyber Military Systems (HACMS, DARPA)**
 - Spiral-generated HCOL kernels for robot motion planning, navigation control (PID controller, Kalman filter, Euler integration), sensor fusion, and spoof/anomaly detection.
 - Physical targets: Black-i Landshark, American Built Automobile, SMACCM Quadcopter.
 - Large/diverse collaboration team (HRL, SRI, CMU, MIT, Princeton, UIUC, UPenn).
- **Department of Energy (DOE) Small Business Innovation Research (SBIR)**
 - Co-wrote SBIR DOE Grant proposal.
 - Consultation on thermal, fluid and nuclear physics.
- **SpiralFFT for National Center for Supercomputing (NCSA) Blue Waters**
 - Improve petascale performance of Hybrid MPI / OpenMP FFT over FFTW and P3DFFT.
 - Engagement with science teams for analysis of **Pseudo Spectral Methods** for modeling turbulence.
- **Power Efficiency Revolution for Embedded Computing Technologies (PERFECT, DARPA)**
 - Development of virtualized environment for **Verilog** simulations to support novel HAMLeT architecture.

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 design and fabricate components of optical microscopes and laboratory automation controls.

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 (8):** statistical analysis · nonlinear optimization · numerical methods · molecular/electron structure · nanoscale transport phenomena
- **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 (12):** turbulence · chaos and nonlinear phenomena · complexity and information theory · quantum and statistical physics
- **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 CAM and human machining.

SKILLS (DESCENDING ORDER)

- **Complex Modeling**
 - **Condensed Matter Physics:** molecular dynamics, quantum physics (chemistry, field), solid-state physics, thermal physics, nanoscale transport, statistical mechanics.
 - **Engineering:** fluid dynamics (turbulence, microfluidics, biological), continuum mechanics (solid mechanics, kinematics, elasticity).
 - **Complex Systems: chaotic and nonlinear systems** (turbulence, many-body systems), **robotics** (motion planning, navigation control), **genetics** (Markov models).
- **Publication and Public Speaking**
 - **Publication:** Journal Publication (11), Book Chapter (2)
 - **Public Speaking:** Conference Presentation (18), Invited Presentation (10)

- **Computation**

- **Languages (Lines of Code):** Matlab (20000), Python (10000), Perl (1000), JavaScript (4500), Java (1000), C++/C (4500), Fortran (1000). **Misc:** L^AT_EX, Markdown, HTML, XML, JSON, CSS
- **Development:** SCM (svn, git, Jenkins). **Compilers/Compilation:** GNU, Intel C/C++, Visual Studio, MinGW, Cython, Mex, Ant, make, cmake, catkin_make, MSBuild, Maven, Mex, Cython. **Integrated Environments:** Visual Studio, Eclipse, Matlab/Simulink, ROS. **Documentation:** Doxygen, JSDoc, lex/flex.
- **High-Performance Computing:** Linux cluster administration/computing, MPI / OpenMP, SSE/AVX vectorization.
- **Deployment:** Amazon Web Services EC2, Virtualization (VirtualBox, VMWare), Docker.
- **Operating Systems:** Linux/Unix: (Ubuntu, Red Hat, CentOS, Mac), Windows XP, 7, 8, Server.
- **General Computing:** Microsoft Office, Libre/Open Office, GIMP.
- **Hardware:** optics/lasers, DI/DO AI/AO interfaces, simple automation, machining, circuitry, simple robotics control.
- **Open-Source Development:** Github, GULP, LAMMPS, ROS, arXiv.

PROJECTS

- **Quantum Mechanics-Driven Prediction of Nanostructure Thermal Conductivity:** investigator under the AFOSR with collaborators at Carnegie Mellon and University of Pittsburgh, performing calculations on the DOD's HPCMP.
- **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 and Mahesh M. Bandi at OIST.
- **disorder:** a comprehensive repository of open-source code and data from my PhD thesis.
- **ntpy:** created this open-source collaborative effort between members of NTPL and University of Toronto.
- **Advised on 4 projects leading to publication:** K.D. Parrish, S.C. Huberman, A. Jain, S. Stefanus.
- **Phase Change Materials MD potentials:** fit quantum energy hypersurfaces using nonlinear optimization, simulated annealing, and genetic algorithms.
- **pylitrev:** uses Python Natural Language Toolkit (NLP) to provide insight into published work.

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).

PRESENTATIONS (SELECTED, 18 TOTAL)

- "SpiralFFT for Blue Waters", J. Larkin (speaker), T. Popovici, M. Franusich, F. Franchetti, NCSA Blue Waters Symposium for Petascale Science and Beyond May 10-13, 2015
- "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.

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.

MEMBERSHIPS

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