Jason M Larkin, MS, PhD

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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 have collaborated 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 - Present) ***Senior Research Engineer , Software Engineer***

- **Spiral**: toolchain creates automatically-optimized and formally-verified kernels for **Cyber-Physical Systems.**
- **"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**: (PID controller, Kalman filter, Euler integration, sensor fusion, 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 accepted **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)**
  - 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 on mathematics, bio-physics, turbulence, statistical and nonlinear phenomena.

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

- Worked with software developers and laboratory specialists.
- Used CAD to design and fabricate optical microscopes components and 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.
  - **Coursework (8)**: statistics · optimization · numerical methods · molecular/electron structure · nanoscale transport
- **University of Pittsburgh** Pittsburgh, PA MS Mechanical Engineering, 2009 GPA: 3.70/4.00
  - **Thesis**: Statistics of Particle Concentrations in Free-Surface Turbulence.
  - **Coursework (12)**: turbulence · chaos and nonlinearity · complexity and information · quantum and statistical physics
- **University of Pittsburgh** Pittsburgh, PA BS Mechanical Engineering, 2007 GPA: 3.20/4.00
  - **Research**: FEM design of model arterial bifurcation.
- **Steel Center AVTS** Jefferson Hills, PA CADD Certification, 2002 GPA: 3.80/4.00
  - **Coursework**: CAD using Autodesk's AutoCAD (15.6) and Inventor (5.3) with CAM.

Skills (descending order)

- **Complex Modeling**

  – **Condensed Matter Physics**: **quantum physics** (chemistry, statistical, field), **solid-state physics** (molecular dynamics , nanoscale transport, statistical mechanics).

  – **Engineering**: **fluids** (turbulence, microfluidics, biological), **continuum mechanics** (solid mechanics, kinematics, elasticity).

  – **Complex Systems**: **chaotic and nonlinear systems** (turbulence, many-body systems), **biological fluid dynamics** (arterial flow, viscoelasticty) **robotics** (motion planning, navigation control), **genetics** (sequencing, Markov models).

- **Publication and Public Speaking**: Journal Publication (11), Book Chapter (2), Conference Presentation (18).
- **"Full-Stack" Software Engineering**

  – **Languages (Lines of Code):** Matlab (20000), Python (10000), Perl (1000), JavaScript (4500), Java (1000), C++/C (4500), Fortran (1000). **Misc**: LaTeX, 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, automation, machining, circuitry, robotics control.
- **Open-Source Development:** Github, GULP, LAMMPS, ROS, arXiv.

Projects

- **Advised on 4 projects leading to publication**: K.D. Parrish, S.C. Huberman, A. Jain, S. Stefanus.
- **Collaborations**

  – **Quantum Mechanics-Driven Prediction of Nanostructure Thermal Conductivity:** investigator under the AFOSR 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 and Mahesh M. Bandi.

- **Open-Source Collaborations**

  – **disorder:** comprehensive repository of open-source code and data from PhD thesis.

  – **ntpy:** created open-source effort between NTPL and University of Toronto.

  – **pcm-potentials**: fit quantum energy hypersurfaces of phase change materials using nonlinear optimization.

  – **pylitrev**: uses Python Natural Language Toolkit (NLP) to provide insight into published work.

  – Complex Thermostatistics: **crowd-funded** collaboration with S. Swanson.

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.M. 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.M. Larkin (speaker)**, M. Bandi, W. Goldburg, 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.