Jason M Larkin

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EDUCATION

Carnegie Mellon University, Pittsburgh, PA

Ph.D. Mechanical Engineering GPA: 3.9 **2009-2013**

Thesis: Thermal Modeling of Disordered Materials

- Explored molecular dynamics (**MD**) and lattice dynamics (**LD**) based methods for predicting thermal properties of disordered alloys, glasses, and organic/inorganic hybrids, confirming the phenomenological high-scatter limit.
- Predicted propagating modes in amorphous materials using large-scale models, comparing with recent experimental/theoretical predictions.
- Predicted the thermal properties of solar-energy material Fullerene-derived PCBM with the lowest thermal conductivity of a fully-dense solid, the origin of which is due to increased-scattering from the organic molecules.
- Performed ***ab initio*** calculations on phase-change materials (PCM) and fit classical interatomic potentials to study their thermal properties.

Advisor: Alan J.H. McGaughey

Coursework: molecular and electron structure simulation, nanoscale transport phenomena.

University of Pittsburgh, Pittsburgh, PA

M.S. Mechanical Engineering GPA: 3.7 **2007-2009**

Thesis: Statistics of Particle Concentrations in Free-Surface Turbulence

- Performed experiments using novel 2D and 3D flow configurations, optical lasers and lenses, high-speed photography, and automation.
- Showed the difference between inertial and viscous flow regimes of a 2D turbulent flow, which controls the concentration dynamics of passively-advected particulates in oceanic and atmospheric flow.

Advisor: Walter I. Goldburg

Coursework: quantum and statistical physics, chaos and nonlinear phenomena.

B.S. Mechanical Engineering GPA: 3.2 **2007-2009**

Research: modeling of novel flow chamber to study development of aneurysms.

- Used Finite Element Analysis (FEA) to design a model arterial bifurcation for *in vitro* study.

EXPERIENCE

Carnegie Mellon University

Teaching Assistant **–** 24-322: Heat Transfer **2010-2012**

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

University of Pittsburgh

Teaching Assistant **–** Advanced Fluid Mechanics **2008**

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

Lecturer **–** Physics **2007-2009**

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

Precision Therapeutics

Intern – Technology Development **2006-2007**

- Worked with team of software developers, information technology specialists, and laboratory equipment specialists.
- Computer-aided drafted and designed (**CADD**) components of optical microscopes and automation controls.
- Assisted in fabrication of microscope components and laboratory equipment.

SKILLS

Computing Languages: Matlab, Python, Latex, Shell, Fortran, C/C++, Java, Perl, Markdown, HTML

High-Performance Computing: linux/unix cluster administration/computing, parallel computation (MPI, OpenMP), mixed-language development, open-source development

General Computing: linux/unix, Windows, Microsoft Office, Mac OS

Modeling: atomistic simulation, quantum chemistry, nanoscale transport, statistical and non-linear systems, turbulent flow

Hardware: general computing hardware, linear optics, visible lasers, DI/DO AI/AO interfaces, simple automation, high-speed video capture, simple machining, simple circuitry

PROJECTS

Quantum Mechanics-Driven Prediction of Nanostructure Thermal Conductivity **2011-2013**

- Served as an investigator for this project under the Air Force Office of Scientific Research (**AFOSR**) with collaborators at Carnegie Mellon and the University of Pittsburgh, performing calculations on the Department of Defense's (**DOD**'s) High Performance Computing (**HPC**) system as part of the High Performance Computing Modernization Program (**HPCMP**).

ntpy **2012-Present**

- Created this open-source, collaborative effort between members of the Nanoscale Transport Phenomena Laboratory (**NTPL**) and the University of Toronto, hosted on Github.

disorder **2012-2013**

- A comprehensive repository of open-source code and data from my PhD thesis, hosted on Github.

GULP: General Utility Lattice Program **2012-2013**

- Worked with Julian D. Gale at the Nanochemistry Research Institute at Curtin University, Perth Australia to contribute several subroutines for predicting thermal properties.

PUBLICATIONS

- J.M. Larkin, A.J.H. McGaughey, "Origin of the Exceptionally Low Thermal Conductivity of Fullerene Derivative PCBM Films", *Phys. Rev. B* (in progress).

- J.M. Larkin, A.J.H. McGaughey, "Vibrational Mean Free Paths in Amorphous Systems", *Phys. Rev. B* (in progress).

- A.J.H. McGaughey and **J.M. Larkin**, "Predicting Phonon Properties from Equilibrium Molecular Dynamics Simulations", Advances in Heat Transfer Volume 17 (Academic Press, 2013).

- J.M. Larkin, A.J.H. McGaughey, "Predicting Alloy Vibrational Mode Properties using Lattice Dynamics Calculations, Molecular Dynamics Simulations, and the Virtual Crystal Approximation", *J. of App. Phys.* (in press).

- J. M. Larkin, A.D. Massicotte, J.E. Turney, C.H. Amon, A.J.H. McGaughey, "Comparison and Evaluation of Spectral Energy Methods for Predicting Phonon Properties", to appear in J. Comp. and Theo. Nano..

- S. Stefanus, **J. Larkin**, W. Goldburg, "A Search for Conformal Invariance in Compressible Two Dimensional Turbulence", *Phys. Fluids* **23** (2011) 105101 (appeared on cover).

- J. Larkin, W. Goldburg, M.M. Bandi, "Time-Evolution of a fractal distribution: Particle concentrations in free-surface turbulence", *Physica D* **239** 14 (2010) 1264-1268.

- J. Larkin, W. Goldburg, "Decorrelating a Compressible Turbulent Flow: an Experiment", *Phys. Rev. E* **82**, 016301 (2010).

- J. Larkin, M.M. Bandi, A. Pumir, W. Goldburg, "Power-law distributions of particle concentration in free-surface flows", *Phys. Rev. E* **80**, 066301 (2009).

PRESENTATIONS (15 TOTAL)

"Evaluation of the Virtual Crystal Approximation for Predicting Thermal Conductivity", **J.M. Larkin (speaker)**, A.J.H. McGaughey, presented at 2013 MRS Spring Meeting San Francisco, CA.

"Ordered and Disordered Contributions to Lattice Thermal Conductivity", **J.M. Larkin (speaker)**, A.J.H. McGaughey, presented at 2012 PHONONS Conference Ann Arbor, MI.

"Comparison of Spectral Energy Methods for Predicting Phonon Properties", **J.M. Larkin**, A.D. Massicotte, J.E. Turney, C.H. Amon, A.J.H. McGaughey (speaker), presented at 2012 ASME Micro/Nanoscale Heat & Mass Transfer International Conference Atlanta, GA (top 5 technical paper).

"Predicting Thermal Conductivity of Defected Systems using the Spectral Energy Density", **J. Larkin (speaker)**, A.J.H. McGaughey, 2011 MRS Fall Meeting Boston, MA.

"Predicting Thermal Conductivity of Defected Systems using the Spectral Energy Density", **J. Larkin (speaker)** 2011 Bennett Presentation (Award for Best Presentation).

"Statistics of Preferential Particle Concentration in Free-Surface Turbulence", **J. Larkin (speaker)**, M.M. Bandi, W. Goldburg, 2009 American Physical Society March Meeting Pittsburgh, PA.

"Turbulent Dynamics of a Hydraulic Jump in two dimensions: Soap Film Flow" **J. Larkin (speaker)**, W. Goldburg, T. Tran, P. Chakraborty, G. Goia, 2008 Meeting of the APS Division of Fluid Dynamics San Antonio, TX.

"The Generalized Fractal Dimensions of a 2-D Compressible Turbulence", **J. Larkin (speaker)**, M.M. Bandi, W. Goldburg, 2008 American Physical Society March Meeting New Orleans, LA.

AWARDS

- Northrop-Grumann Fellow, Carnegie Institute for Complex Engineered Systems (ICES) **2011**
- NSF Graduate Student Research Grant, University of Pittsburgh Dept. of Physics **2007-2009**

MEMBERSHIPS

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