

CAELAN B. LAPOINTE
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EDUCATION

Ph.D. Student, University of Colorado at Boulder

Department: Mechanical Engineering
Advisor: Dr. Peter Hamlington

B.S., Union College, Schenectady, NY

Major: Mechanical Engineering; Minor: Japanese
Mini-term abroad: Electricity Production and Environmental Management in New Zealand, Nov. 2012
Summa Cum Laude; Union Scholar (Honors program); Overall GPA 3.89

Undergraduate term abroad, Kansai Gaidai University, Hirakata, Japan, August–December 2013

Proficient in spoken and written Japanese

HONORS AND AWARDS

- NSF Graduate Research Fellowship Program (NSF GRFP) fellow, May 2017 – Present
- National Defense Science and Engineering Graduate Fellowship, May 2017 (declined for NSF GRFP)
- Union College Josephine Daggett Prize (prestigious award for conduct and character), May 2015
- Union College General Electric Energy Steinmetz Award, May 2015
- Union College John S. Hadala (1928) Endowed Book Prize, May 2014
- Union College Junior Academic Achievement Top 50, December 2013
- Union College Dean's List, 2012, 2013, 2014, 2015
- US Geological Survey Performance Award, August 2012

RESEARCH EXPERIENCE

Turbulence and Energy Systems Laboratory, University of Colorado, Boulder, January 2016 – Present

- Topic: *CFD Modeling and Optimization of Industrial Processes*

US Department of Energy Summer Research, June – August 2015

- Topic: *An Advanced Actuator Line Method for Wind Energy Applications and Beyond*

Senior Project in Mechanical Engineering, Union College, September 2014 – June 2015

- Topic: *Modeling Resin Infusion in Carbon Fiber Preforms*

US Department of Energy Summer Research, June – August 2014

- Topic: *Impact of Hydroelectric Generation on U.S. Grid*

Undergraduate Honors Research in Mechanical Engineering, Union College, January – May 2014

- Topic: *Numerical Investigation of Miniature Wind Energy Generation System Near Highways*

EMPLOYMENT

US Dept. of Energy, National Wind Technology Center, Boulder, Colorado, June – August 2015

Intern through Science Undergraduate Laboratory Internship (SULI) program

- Used the Simulator for Wind Farm Applications (SOWFA), a farm-scale model based on OpenFOAM, to update methods used in the Actuator Line Method for modeling turbine blades

Ener-G-Rotors, Schenectady, NY, October 2014 – June 2015

Consultant

- Worked on the development of a computational fluid dynamics model for product refinement

US Dept. of Energy, National Renewable Energy Laboratory, Golden, Colorado, June – August 2014

Intern through Science Undergraduate Laboratory Internship (SULI) program

- Investigated deployment of hydroelectric resource potential in U.S. energy grid pertaining to DOE hydropower vision initiative
- Utilized Regional Energy Deployment System (ReEDS) model to analyze effect of varying parameters on hydroelectric deployment and generation

USGS Maine Water Science Center, Augusta Maine, June – August 2013

Hydrologic Technician

- Collected stream-flow, water quality, and groundwater data for hydrologic monitoring programs
- Collected bridge survey data using electronic total station
- Processed survey data for use in floodplain mapping and developing statistical relationships of water discharge to water level

USGS Maine Water Science Center, Augusta Maine, June – August 2012

Hydrologic Technician

- Collected data on Maine's 2010 water use within agriculture, industry, and public and private water supply categories
- Analyzed data to estimate Maine's total water use for submission to the 2010 National Water Use Compilation

PEER-REVIEWED JOURNAL PUBLICATIONS

- 1) C. Lapointe, N. T. Wimer, J. F. Glausman, A. S. Makowiecki, J.W. Daily, G. B. Rieker, and P. E. Hamlington. Simulation of Turbulent Diffusion Flames using Adaptive Mesh Refinement in OpenFOAM. In preparation, 2019.
- 2) Jeffrey F. Glusman, Kyle E. Niemeyer, Amanda S. Makowiecki, Nicholas T. Wimer, Caelan Lapointe, Gregory B. Rieker, Peter E. Hamlington and John W. Daily. Reduced Gas-Phase Kinetic Models for Burning of Douglas Fir. *Frontiers in Mechanical Engineering*, 2019.
- 3) N. T. Wimer, M. S. Day, C. Lapointe, A. S. Makowiecki, J. F. Glusman, J. W. Daily, G. B. Rieker, and P. E. Hamlington. High-resolution numerical simulations of a large-scale helium plume using adaptive mesh refinement. *Fire Safety Journal*, Under review, 2019.
- 4) T. R. S. Hayden, N. Malarich, D. Petrykowski, S. Nigam, J. D. Christopher, C. Lapointe, N. T. Wimer, P. E. Hamlington, and G. B. Rieker. Characterization of the buoyant jet above a catalytic combustor using wavelength modulation spectroscopy. *Applied Physics B*, Under review, 2019.
- 5) T. R. S. Hayden, C. Lapointe, N. T. Wimer, J. D. Christopher, A. Upadhye, M. A. Strobel, P. E. Hamlington, and G. B. Rieker. Characterization of the buoyant jet above a catalytic combustor using wavelength modulation spectroscopy. *Combustion Science and Technology*, Under review, 2019.
- 6) T. Hayden, D. Petrykowski, A. Sanchez, S. Nigam, C. Lapointe, J. Christopher, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and G. Rieker. Characterization of OH, H₂O, and temperature profiles in industrial flame treatment systems interacting with polymer films. *Proceedings of the Combustion Institute* **37**, 1571-1578, 2019.
- 7) J. D. Christopher, C. Lapointe, N. T. Wimer, T. R. S. Hayden, I. Grooms, G. B. Rieker, and P. E. Hamlington. Parameter estimation for complex thermal-fluid flows using approximate Bayesian computation. *Physical Review Fluids*, **3**, 104602, 2018.
- 8) C. Lapointe and H. Gopalan. Numerical Investigation of Mini Wind Turbines Near Highways. *Journal of Solar Energy Engineering*, **138**(2), 024503, 2016.

CONFERENCE PROCEEDINGS

- 1) C. Lapointe, N. T. Wimer, J. F. Glausman, A. S. Makowiecki, J.W. Daily, G. B. Rieker, and P. E. Hamlington. Progress Towards High Fidelity Simulations of Large-Scale Fires. Proceedings of the 11th National U.S. Combustion Meeting, March 24-27 2019.
- 2) Jeffrey F. Glusman, Cory Rogers, Caelan B. Lapointe, Nicole Labbe, G. Barney Ellison, Peter Hamlington, and John W. Daily. Modeling a Micro-Reactor with Transonic Regions. Proceedings of the 11th National U.S. Combustion Meeting, March 24-27 2019.
- 3) M. Meehan, J. Christopher, C. Lapointe, and P. Hamlington. Coherent Feature Extraction in Turbulent Buoyant Jets Using Modal Decompositions. AIAA Paper, AIAA-2019-0323, 2019.
- 4) J. D. Christopher, D. Petrykowski, T. R. S. Hayden, C. Lapointe, N. T. Wimer, S. Nigam, I. Grooms, P. E. Hamlington, and G.B. Rieker. Parameter Estimation using Wavelength Modulation Spectroscopy Temperature Measurements and Approximate Bayesian Computation. In Light, Energy and the Environment 2018 (E2, FTS, HISE, SOLAR, SSL), OSA Technical Digest (Optical Society of America, 2018), paper EM3A.5, 2018.
- 5) J. Christopher, N. Wimer, T. Hayden, C. Lapointe, I. Grooms, G. Rieker, and P. Hamlington. Parameter Estimation for a Turbulent Buoyant Jet using Approximate Bayesian Computation. AIAA Paper, AIAA-2017-0531, 2017.
- 6) J. D. Christopher, C. Lapointe, N. T. Wimer, T. R. S. Hayden, I. Grooms, G. B. Rieker, and P. E. Hamlington. Parameter Estimation for a Turbulent Buoyant Jet with Rotating Cylinder Using Approximate Bayesian Computation. AIAA Paper, AIAA-2017-3629, 2017.
- 7) T. Hayden, N. Wimer, C. Lapointe, J. Christopher, A. Makowiecki, P. E. Hamlington, and G. Rieker. Characterization of the Output from a Catalytic Combustor Using Wavelength Modulation Spectroscopy. AIAA Paper, AIAA-2017-4424, 2017.
- 8) T. Hayden, N. Wimer, C. Lapointe, J. Christopher, S. Nigam, P. Hamlington, and G. B. Rieker. Wavelength Modulation Spectroscopy of OH Radical in an Industrial Flame. Light, Energy and the Environment, OSA Technical Digest (online) (Optical Society of America, 2017), Paper ETH2A.4, 2017.
- 9) T. Hayden, N. Wimer, C. Lapointe, J. Christopher, P. E. Hamlington, and G. Rieker. Characterization of a Jet Above a Catalytic Combustor Using Wavelength Modulation Spectroscopy. Proceedings of the 10th U.S. National Meeting on Combustion, 2017.
- 10) C. Lapointe, J. D. Christopher, N. T. Wimer, T. R. S. Hayden, G. B. Rieker, and P. E. Hamlington. Optimization for Internal Turbulent Compressible Flows Using Adjoints. AIAA Paper, AIAA-2017-4115, 2017.
- 11) N. T. Wimer, C. Lapointe, T. R. S. Hayden, J. D. Christopher, A. Y. Poludnenko, G. B. Rieker, and P. E. Hamlington. Near- and Far-Field Properties of High-Temperature Turbulent Buoyant Jets. AIAA Paper, AIAA-2017-4423, 2017.

CONFERENCE PRESENTATIONS

- 1) Caelan Lapointe, Nicholas Wimer, Marc Day, Amanda Makowiecki, Jeffrey Glusman, John Daily, Gregory Rieker, Peter Hamlington. "Efficient Simulation of Complex Fire Phenomena." Rocky Mountain Fluid Mechanics Research Symposium (2019).
- 2) Jeffrey F. Glusman, Kyle E. Niemeyer, Amanda S. Makowiecki, Nicholas T. Wimer, Caelan Lapointe, Gregory B. Rieker, Peter E. Hamlington and John W. Daily "Initial Verification of a Reduced Combustion Model of Douglas Fir." Rocky Mountain Fluid Mechanics Research Symposium (2019).
- 3) Caelan Lapointe, Nicholas Wimer, and Peter Hamlington. "Progress Towards Efficient Simulation of Large-Scale Fires." Bulletin of the American Physical Society (2018). (oral presentation)

- 4) Caelan Lapointe, Nicholas Wimer, and Peter Hamlington. " Fire Simulation using Adaptive Mesh Refinement." Rocky Mountain Fluid Mechanics Research Symposium, 2018. (oral presentation)
- 5) Nicholas T. Wimer, Caelan Lapointe, Marcus S. Day, Alexei Y. Poludnenko, Jeffrey F. Glusman, Amanda S. Makowiecki, John W. Daily, Gregory B. Rieker and Peter E. Hamlington "Numerical Simulations of Plume and Pool Fire Instabilities using Adaptive Mesh Refinement." American Physical Society Division of Fluid Dynamics Gallery of Fluid Motion (2018). (multimedia presentation)
- 6) Nicholas T. Wimer, Caelan Lapointe, Marcus S. Day, Alexei Y. Poludnenko, Jeffrey F. Glusman, Amanda S. Makowiecki, John W. Daily, Gregory B. Rieker and Peter E. Hamlington "Progress Towards Direct Numerical Simulations of Fire Using Adaptive Mesh Refinement." Proceedings of the Combustion Institute (2018). (poster)
- 7) Peter E. Hamlington, Caelan Lapointe, Nicholas T. Wimer, and Marc Day. "Progress Towards Direct Numerical Simulations of Fire Using Adaptive Mesh Refinement". 10th FM Global Open Source CFD Fire Modeling Workshop (2018). (oral presentation)
- 8) Lapointe, C., and Hamlington, P.E. "Optimization for Internal Turbulent Reacting Flows". Graduate Engineering Research and Recruitment Symposium, CU Boulder, 2018. (oral presentation)
- 9) Siddharth Nigam, Caelan Lapointe, Jason D. Christopher, Nicholas T. Wimer, Torrey R. S. Hayden, Gregory B. Rieker, and Peter E. Hamlington. "Sensitivity Analysis for an Open Catalytic Burner". Rocky Mountain Fluid Mechanics Research Symposium, 2017 (oral presentation)
- 10) Jason D. Christopher, Caelan Lapointe, Nicholas T. Wimer, Torrey R. S. Hayden, Siddharth Nigam, Ian Grooms, Gregory B. Rieker, and Peter E. Hamlington. Inlet Fuel Quantity Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation. Rocky Mountain Fluid Mechanics Research Symposium, 2017 (oral presentation)
- 11) Lapointe, C., Hamlington P. "Topology Optimization for Compressible Internal Flows". Rocky Mountain Fluid Mechanics Research Symposium, 2017 (oral presentation)
- 12) Caelan Lapointe, Jason D. Christopher, Nicholas T. Wimer, Torrey R. Hayden, Gregory B. Rieker, and Peter E. Hamlington. "Optimization for Internal Turbulent Compressible Flows Using Adjoints", 23rd AIAA Computational Fluid Dynamics Conference.
- 13) Nigam, Siddharth P., et al. "Flame Structure and Dynamics for an Array of Premixed Methane-Air Jets." Bulletin of the American Physical Society. 2017. (oral presentation)
- 14) Christopher, J., Wimer, N., Lapointe, C., Hayden, T., Grooms, I., Rieker, G., and Hamlington, P., "Parameter Estimation for a Pulsating Turbulent Buoyant Jet Using Approximate Bayesian Computation," Bulletin of the American Physical Society, vol. 62, 2017. (oral presentation)
- 15) Christopher, J. D., Wimer, N. T., Hayden, T. R., Lapointe, C., Grooms, I., Rieker, G. B., and Hamlington, P. E., "Parameter Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation," Bulletin of the American Physical Society, vol. 61, 2016. (oral presentation)
- 16) Wimer, N., Lapointe, C., Hayden, T., Christopher, J., Rieker, G., and Hamlington, P., "Effects of Exit Variability on Near-Field Statistics for Turbulent Buoyant Jets," Bulletin of the American Physical Society, vol. 61, 2016. (oral presentation)
- 17) Lapointe, Caelan, et al. "Scaling Analysis of Temperature Variability Between a Rotating Cylinder and a Turbulent Buoyant Jet." Bulletin of the American Physical Society 61 (2016). (oral presentation)
- 18) Lapointe, C, Hamlington P. "Turbulent Couette Flow in OpenFOAM". Rocky Mountain Fluid Mechanics Research Symposium, August 9, 2016 (oral presentation)
- 19) Lapointe, C, Churchfield, M. "An Advanced Actuator Line Method for Wind Energy Applications and Beyond". SULI Summer Research Expo, August 5, 2015 (poster)

- 20) Lapointe, C, Churchfield, M. “An Advanced Actuator Line Method for Wind Energy Applications and Beyond”. Rocky Mountain Fluid Mechanics Research Symposium, August 4, 2015 (poster)
- 21) Lapointe, C, Bucinell, R.B. “CFD Modeling of the Flow of Resin into a Carbon Fiber Preform”. Union College Steinmetz Symposium, May 8, 2015 (oral presentation)
- 22) Lapointe, C, Bucinell, R.B. “CFD Modeling of the Flow of Resin into a Carbon Fiber Preform”. ASME 2015 Student Professional Development Conference. April 17-18, 2015. Temple University, Philadelphia, PA (poster)
- 23) Lapointe, C. and Gopalan, H. “Numerical Investigation of Miniature Wind Energy Generation System Near Highways”. ASME 2014 International Mechanical Engineering Congress & Exposition, November 14-20, 2014, Montreal, Canada. (poster)
- 24) Lapointe, C. “Deployment of Hydroelectric Resource Potential”. SULI Summer Research Expo, August 6, 2014 (poster)
- 25) Lapointe, C, Gopalan, H. “Numerical Investigation of Miniature Wind Energy Generation System Near Highways”. Union College Mechanical Engineering Seminar, May 23, 2014 (oral presentation)
- 26) Lapointe, C, Gopalan, H. “Numerical Investigation of Miniature Wind Energy Generation System Near Highways”. Union College Steinmetz Symposium, May 9, 2014 (poster)

PROFICIENCY WITH

OpenFOAM, Paraview, MATLAB, Solidworks, Star CCM+, LATEX, Linux.

HONOR SOCIETIES

Tau Beta Pi Engineering Honor Society, Inducted October 2013
Pi Tau Sigma Mechanical Engineering Society, Inducted May 2014
Sigma Xi Scientific Research Honor Society, Inducted May 2014