

# Mark Kellenberger

PhD

North Vancouver, BC, Canada

[mark.kellenberger@outlook.com](mailto:mark.kellenberger@outlook.com)

[Personal Website](#)

[Linkedin](#)

[ResearchGate](#)

## Summary

Setting audacious goals (which I affectionately refer to as “evil plans”) motivates me to take on challenges that confront the edge of my abilities, where the only path forward is to go over the edge and use the experience to develop new skills and build resilience.

I am passionate about the protection of people and the planet. This has informed my research direction in the areas of sustainable energy systems and safety. The considerable scope of my research and my wide range of interests gives me a strong base to thoroughly investigate any research topic.

## Research interests

Detonation; combustion; deflagration-to-detonation transition; fire and explosion safety; high-speed imaging; shock waves; hydrogen energy; energy storage; sustainable energy; scientific computing hardware and network infrastructure; design and construction of experimental facilities.

## Education

2021 PhD in Mechanical Engineering, Queen’s University  
2012 MAsc in Mechanical Engineering, Queen’s University  
2010 BSc in Mechanical Engineering, Queen’s University

## Experience

2010-Present **High-Speed Flow Physics Researcher**

*Explosion Physics and Prevention Laboratory  
Queen's University – Kingston, Canada*

Held positions as a master's researcher and doctoral researcher primarily performing experimental research of high-speed reactive flows for the purposes of personnel and property protection. Particular focus was given to hydrogen combustion and safety.

- Designed and built innovative shock tube and detonation channel facilities with optical access for high-speed schlieren imaging and pressure data acquisition
- Developed novel experimental method to obtain simultaneous schlieren and soot foil records of combustion waves allowing for 3D reconstruction of complex wave behaviour
- Pioneered use of carbonaceous aerosol particles as a flow tracer in high-temperature reactive flows
- Conducted high-speed flow experiments including setup, data collection, analysis, and interpretation of results
- Collected experimental testing results for external consulting contracts focussed on blast injury prevention and industrial processes
- Trained and mentored younger graduate students and visiting researchers
- Managed, built, and maintained laboratory group computer systems for experimental research and numerical simulations
- Performed shock reflection simulations using OpenFOAM
- Wrote calculation and data analysis routines using MATLAB and Bash shell scripts
- Collaborated with international researcher to build successful Planar Laser Induced Fluorescence (PLIF) system under tight time constraints
- Published nine articles in top-tier scientific journals and presented work at international conferences

2015-Present **Project Consultant**

*Self-employed  
North Vancouver, Canada and Kingston, Canada*

I provide expertise in the fields of residential construction and information technology.

Select projects:

- Design and construction of potable water storage and purification system meeting Public Health Ontario standards
- Design and construction of below-grade DWV and ejection system meeting Ontario Building Code
- Design and ongoing support of residential networks including deployment of firewall and storage appliances for backup and remote access

2010-2018

**University Teaching**

*Department of Mechanical and Materials Engineering  
Queen's University – Kingston, Canada*

Held positions as teaching fellow (primary instructor) and teaching assistant, principally in the area of thermal fluids, with primary emphasis on laboratory-based learning.

- Responsible for online and in-person course content and delivery as a Teaching Fellow
- Managed faculty members, technical staff, and teaching assistants
- Responded to student emails regarding administrative and technical matters
- Developed policy and procedure recommendations for the use of anti-plagiarism software based on implementation experience
- Transitioned course assignment submissions to online-only, increasing flexibility for students and teaching assistants
- Improved and consolidated course materials for consistent course delivery year-to-year
- Led laboratory sessions, conducted tutorials, gave lectures, graded, held office hours, and compiled final marks as a Teaching Assistant

2015-2016

**Vice President Graduate**

*Society of Graduate and Professional Students  
Queen's University – Kingston, Canada*

Elected Vice President of the Board of Directors of non-profit student society with a \$2,000,000 annual budget, representing approximately 4000 graduate students.

- Undertook risk and insurance audit that identified gaps in coverage strategy and took steps to remedy issues
- Collaborated with executive team to draft, debate, and establish new bylaws and policies
- Managed peer-to-peer support and mentorship program including hiring, training programs, and strategic direction
- Negotiated new agreement with University for funding of peer-to-peer program based on student feedback
- Audited in-house printing service and implemented new pricing model to increase revenue
- Represented graduate students on University athletics budget committee responsible for setting \$11,000,000 annual budget
- Interviewed and hired permanent staff as well as student positions
- Discussed and provided feedback to senior university administration regarding major capital projects
- Managed IT and website including purchase decisions and moved organization from on-premise hosting to Microsoft 365 cloud system

2008-2018

**Real Estate Rental Manager**

*Self-employed*

*Guelph, Canada and Kingston, Canada*

Improved, managed, and maintained two owner-occupied residential rental properties for students.

- Managed all utilities and billing
- Undertook major renovations in accordance with residential building codes
- Advertised for and interviewed prospective tenants
- Drafted and implemented rental contracts

2011-2012

**Assistant Coach - Varsity Swimming**

*Athletic and Recreation  
Queen's University – Kingston, Canada*

Appointed by Athletics and Recreation as Assistant Coach of the Varsity Swim Team, primarily responsible for strength training. This followed five years of competing on the team, three of which I served as a team captain.

- Presented proposal for mutually-beneficial partnership between University and local swim club leading to collaboration and resource-sharing
- Facilitated swim clinics for local high school swim team by liaising with University and high school administrators with the aim of encourage team learning and development at a young age
- Evaluated and monitored the progress of athletes throughout the year by maintaining records of personal best performances and helping athletes set goals to surpass them

2010

**Summer Research Assistant**

*Explosion Physics and Prevention Laboratory  
Queen's University – Kingston, Canada*

Worked to examine high-speed combustion behaviour of hydrogen and methane in porous media beds.

- Constructed LabVIEW program to synchronize and trigger data collection for reactive flow experiments through the use of high-speed piezoelectric pressure sensors and ionization probes
- Integrated new high-speed camera into schlieren imaging system
- Analyzed data and composed plots of results to communicate findings
- Developed experimental and safety procedures in a new environment for a variety of experiments

## Technical skills

- Significant machine shop and fabrication experience
- Knowledge of construction methods, including residential building standards for structure, plumbing, and electrical
- Extensive computer hardware, networking, and systems support experience including deployment of storage and firewall appliances for backup and remote access
- Experience with a wide range of software packages in the context of scientific research and education including:
  - Lightroom
  - Illustrator
  - Photoshop
  - MATLAB
  - SolidEdge
  - LabView
  - TecPlot
  - ParaView
  - LaTeX
  - OpenFOAM

## Interests

- Sports and health: swimming (competitive swimmer for 15 years), running, cycling, soccer
- Technology: server hardware, sports tech, home automation, electronics
- Design and construction: home renovation, woodworking, furniture building
- Energy and environment: grid-scale storage, carbon-free sources, hydrogen energy

## Honours & awards

|           |  |
|-----------|--|
| 2012-2018 | Conference Travel Award, Department of Mechanical and Materials Engineering  |
| 2016      | Dean's Award, Queen's University School of Graduate Studies                  |
| 2010-2016 | Queen's Graduate Award, Queen's University School of Graduate Studies        |
| 2014      | Canadian Section Student Paper Award, Combustion Institute: Canadian Section |
| 2009-2011 | CIS Academic All-Canadian, Canadian Inter-University Sport (CIS)             |

## Service

|           |   |
|-----------|---|
| 2018      | Department Head Selection Committee, Department of Mechanical and Materials Engineering |
| 2015-2016 | Vice President Graduate, Society of Graduate and Professional Students                  |
| 2015-2016 | Senate Advisory Research Committee, Queen's University                                  |
| 2015-2016 | Graduate Studies Executive Council, School of Graduate Studies                          |
| 2015-2016 | Information Technology Services Student Advisory Committee, Queen's University          |
| 2015-2016 | University Council on Athletics and Recreation, Queen's University                      |
| 2015-2016 | Graduate Student Life Advisory Group, School of Graduate Studies                        |

2015-2016 Teaching and Learning Space Planning Committee, Queen's University  
 2015-2016 Manager, Graduate Student Advisor Program, Society of Graduate and Professional Students  
 2015 Award for Excellence in Graduate Student Supervision Adjudication Committee, School of Graduate Studies  
 2015 Education Technology Award Adjudication Committee, Queen's University  
 2011-2012 Assistant Coach, Varsity Swimming, Queen's University Athletics and Recreation  
 2008-2011 Team Captain, Varsity Swimming, Queen's University Athletics and Recreation

## Publications & talks

### JOURNAL ARTICLES

- 2020 Li, Q., Kellenberger, M., Ciccarelli, G., (2020) "Geometric influence on the propagation of the quasi-detonations in a stoichiometric H<sub>2</sub>-O<sub>2</sub> mixture," *Fuel*, vol. 269, p. 117396. DOI: [10.1016/j.fuel.2020.117396](https://doi.org/10.1016/j.fuel.2020.117396)
- 2020 Kellenberger, M., Ciccarelli, G., (2020) "Single-head detonation propagation in a partially obstructed channel," *Combustion and Flame*, vol. 215, pp. 283–294. DOI: [10.1016/j.combustflame.2020.01.032](https://doi.org/10.1016/j.combustflame.2020.01.032)
- 2020 Kellenberger, M., Ciccarelli, G., (2020) "Three-dimensional behaviour of quasi-detonations," *Combustion and Flame*, vol. 215, pp. 145–156. DOI: [10.1016/j.combustflame.2020.01.027](https://doi.org/10.1016/j.combustflame.2020.01.027)
- 2018 Kellenberger, M., Ciccarelli, G., (2018) "Advancements on the propagation mechanism of a detonation wave in an obstructed channel," *Combustion and Flame*, vol. 191, pp. 195–209. DOI: [10.1016/j.combustflame.2017.12.023](https://doi.org/10.1016/j.combustflame.2017.12.023)
- 2017 Boeck, L.R., Kellenberger, M., Rainsford, G., Ciccarelli, G., (2017) "Simultaneous OH-PLIF and schlieren imaging of flame acceleration in an obstacle-laden channel," *Proceedings of the Combustion Institute*, vol. 36, no. 2, pp. 2807–2814. DOI: [10.1016/j.proci.2016.06.096](https://doi.org/10.1016/j.proci.2016.06.096)
- 2017 Kellenberger, M., Ciccarelli, G., (2017) "Simultaneous schlieren photography and soot foil in the study of detonation phenomena," *Experiments in Fluids*, vol. 58, no. 10, p. 138. DOI: [10.1016/j.proci.2016.06.096](https://doi.org/10.1016/j.proci.2016.06.096)
- 2015 Kellenberger, M., Ciccarelli, G., (2015) "Propagation mechanisms of supersonic combustion waves," *Proceedings of the Combustion Institute*, vol. 35, no. 2, pp. 2109–2116. DOI: [10.1016/j.proci.2014.08.002](https://doi.org/10.1016/j.proci.2014.08.002)
- 2013 Kellenberger, M., Johansen, C., Ciccarelli, G., Zhang, F., (2013) "Dense particle cloud dispersion by a shock wave," *Shock Waves*, vol. 23, no. 5, pp. 415–430. DOI: [10.1007/s00193-013-0432-0](https://doi.org/10.1007/s00193-013-0432-0)
- 2013 Ciccarelli, G., Johansen, C., and Kellenberger, M., (2013) "High-speed flames and DDT in very rough-walled channels," *Combustion and Flame*, vol. 160, no. 1, pp. 204–211. DOI: [10.1016/j.combustflame.2012.08.009](https://doi.org/10.1016/j.combustflame.2012.08.009)

### WORKS IN PROGRESS

- 2021 Kellenberger, M., Ciccarelli, G., (2021) "Estimating experimental post-reflected shock conditions in a quasi-detonation propagation using a two-dimensional numerical model." In progress.

## THESES

- 2021 Kellenberger, M., (2021) "Supersonic combustion wave propagation in an obstructed volume of hydrogen," PhD Thesis, Queen's University, Canada. URL: <https://qspace.library.queensu.ca/handle/1974/28735>
- 2012 Kellenberger, M., (2012) "Dense particle cloud dispersion by a shock wave," Master's Thesis, Queen's University, Canada. URL: <https://qspace.library.queensu.ca/handle/1974/7504>
- 2010 Kellenberger, M., (2010) "Experimental investigation of shock-induced dispersion of an alumina particle cloud," Undergraduate Thesis, Queen's University, Canada.

## REFEREED CONFERENCE PROCEEDINGS

- 2019 Li, Q., Kellenberger, M., Wang, C., Lu, S., Ciccarelli, G., (2019) "Change in Quasi-detonation Wave Propagation Mechanism with Obstacle Blockage," *Proceedings of the 27th International Colloquium on the Dynamics of Explosions and Reactive Systems*, paper 91, Beijing, China.
- 2018 Li, Q., Kellenberger, M., Ciccarelli, G., (2018) "Geometric influence on the propagation of quasi-detonations," *Proceedings of the Combustion Institute Canadian Section (CI/CS) Spring Technical Meeting*, Toronto, Canada.
- 2018 Kellenberger, M., Ciccarelli, G., (2018) "The investigation of detonation phenomenon using simultaneous schlieren photography and soot foil," *Proceedings of the 19th International Symposium on the Application of Laser and Imaging Techniques to Fluid Mechanics*, Lisbon, Portugal.
- 2017 Kellenberger, M., Ciccarelli, G., (2017) "Single-head detonation propagation in a partially obstructed square channel," *Proceedings of the 26th International Colloquium on the Dynamics of Explosions and Reactive Systems*, paper 1135, Boston, USA.
- 2017 Kellenberger, M., Ciccarelli, G., (2017) "Single-head detonation propagation in a partially obstructed square channel," *Proceedings of the Combustion Institute Canadian Section (CI/CS) Spring Technical Meeting*, Montreal, Canada.
- 2016 Boeck, L.R., Kellenberger, M., Rainsford, G., Ciccarelli, G., (2016) "Simultaneous OH-PLIF and schlieren imaging of flame acceleration in an obstacle-laden channel," *Proceedings of the 36th International Symposium on Combustion*, Seoul, Korea.
- 2016 Kellenberger, M., Ciccarelli, G., (2016) "Discontinuous detonation propagation of stoichiometric hydrogen-oxygen mixtures in a partially obstructed square channel," *Proceedings of the Combustion Institute Canadian Section (CI/CS) Spring Technical Meeting*, Waterloo, Canada.
- 2015 Kellenberger, M., Ciccarelli, G., (2015) "Investigation of quasi-detonation propagation using simultaneous soot foil and schlieren photography," *Proceedings of the 25th International Colloquium on the Dynamics of Explosions and Reactive Systems*, paper 279, Leeds, UK.
- 2014 Kellenberger, M., Ciccarelli, G., (2014) "Propagation mechanisms of supersonic combustion waves," *Proceedings of the 35th International Symposium on Combustion*, San Francisco, USA.
- 2014 Kellenberger, M., Ciccarelli, G., (2014) "Propagation mechanisms of supersonic combustion waves," *Proceedings of the Combustion Institute Canadian Section (CI/CS) Spring Technical Meeting*, Windsor, Canada.
- 2013 MacLean, J., Kellenberger, M., Ciccarelli, G., (2013) "Shock ignition of n-heptane," *Proceedings of the Combustion Institute Canadian Section (CI/CS) Spring Technical Meeting*, Quebec, Canada.
- 2012 Kellenberger, M., Pinos, T., Ciccarelli, G., Johansen, C., (2012) "Influence of channel width on flame acceleration", *Proceedings of the Combustion Institute Canadian Section (CI/CS) Spring Technical Meeting*, Toronto, Canada.
- 2012 Johansen, C., Kellenberger, M., Pinos, T., Ciccarelli, G., (2012) "Flame acceleration in narrow

channels with obstacles,” *Proceedings of the 20th Annual Conference of the CFD Society of Canada*, Canmore, Canada.

2011 Kellenberger, M., Johansen, C., Ciccarelli, G., Zhang, F., (2011) “Dense particle cloud dispersion by a shock wave,” *Proceedings of the 28th International Symposium on Shock Waves*, Manchester, UK.

2011 Ciccarelli, G., Johansen, C., and Kellenberger, M., (2011) “Role of transverse shock waves on DDT in a very rough-walled channel,” *Proceedings of the 23rd International Colloquium on the Dynamics of Explosions and Reactive Systems*, paper 74, Irvine, USA.

#### NON-REFEREED CONTRIBUTIONS

2014 Khakbazzaboli, M., Kellenberger, M., Ciccarelli, G., (2014) “Numerical modeling of supersonic combustion wave propagation in an obstructed channel”, *Proceedings of the 35th International Symposium on Combustion*, San Francisco, USA. Work-in-progress poster.

2012 Pinos, T., Kellenberger, M., Ciccarelli, G., (2012) “Flame acceleration in an obstacle laden narrow channel”, *Proceedings of the 34th International Symposium on Combustion*, Warsaw, Poland. Work-in-progress poster.

#### WORKSHOPS

2014 “Explosion physics and high-speed photography”, Shad Valley 2014, Kingston, Canada.

## Teaching

#### TEACHING FELLOWSHIPS

*Primary instructor responsible for course delivery*

2018 MECH 399 Mechanical Engineering Laboratory II, 214 Students (Winter 2018)

2018 MECH 397 Materials Engineering Laboratory II, 20 Students (Winter 2018)

#### TEACHING ASSISTANTSHIPS

*Assistant instructor with partial course responsibility*

2011-2018 APSC 161 Engineering Graphics (Fall 2011, Winter 2018).

2017 MECH 398 Mechanical Engineering Laboratory I – Engineering Practice and Professionalism (Fall 2017)

2011-2017 MECH 399 Mechanical Engineering Laboratory II – Stirling Engine (Winter 2011, Winter 2012, Winter 2017)

2013-2016 MECH 435 Internal Combustion Engines (Winter 2013, Winter 2014, Winter 2015, Winter 2016, Fall 2016)

2012-2015 MECH 230 Thermodynamics I (Fall 2012, Fall 2014, Fall 2015)

2010-2013 MECH 398 Mechanical Engineering Laboratory I – Refrigeration (Fall 2010, Fall 2011, Fall 2013)



2012 MECH 321 Solid Mechanics II (Fall 2012)  
2010 MECH 420 Vibrations (Fall 2010)