Matthew Frederick Campbell, Ph.D., P.E.

Curriculum Vitae

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GOOGLE SCHOLAR PROFILE

https://scholar.google.com/citations?user=vF-weg0AAAAJ

EDUCATION/CERTIFICATION

2014. **Ph.D.** Mechanical Engineering. Stanford University.

2014. **P.E.** Professional Engineering Licensure #M37097 (Mechanical Engineering) in California.

2010. **M.S.** Mechanical Engineering. Stanford University.

2008. **B.S.E.** Mechanical Engineering and Materials Science. Duke University.
Magna Cum Laude with Distinction.

2008. **Certificate** Markets and Management Studies. Duke University.

PROFESSIONAL APPOINTMENTS/EMPLOYMENT

2019-present. Postdoctoral Researcher. Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania.

2017-2019. Engineer and Educator. Sigay Kauyagan, Inc., Mindanao State University, General Santos City, Republic of the Philippines.

2014-2016. Postdoctoral Appointee. Combustion Research Facility, Sandia National Laboratories, Livermore, CA.

PUBLICATIONS

Refereed Journal Articles

1. 2020. **Matthew F. Campbell**, Thomas J. Celenza, Felix Schmitt, Jared W. Schwede, and Igor Bargatin. *Progress toward high power output in thermionic energy converters.* Advanced Science. DOI: 10.1002/advs.202003812.
2. 2020. Mohsen Azadi, George A. Popov, Zhipeng Lu, Andy G. Eskenazi, Avery Ji Won Bang, **Matthew F. Campbell**, Howard Hu, and Igor Bargatin. *Controlled sun powered near-space flight enabled by nanostructured thin films*. Science Advances (accepted).
3. 2020. **Matthew F. Campbell**, Mohsen Azadi, Zhipeng Lu, Andy G. Eskenazi, Akshat Jain, Ji Won Bang, Philip G. Sieg, George A. Popov, Samuel M. Nicaise, Kyana C. Van Houten, Felix Schmitt, Jared W. Schwede, and Igor Bargatin. *Nanostructured spacers for thermionic and thermophotovoltaic energy converters*. Journal of Microelectromechanical Systems. 29:5 (2020) 637-644.
4. 2020. Mohsen Azadi, Zhipeng Lu, George A. Popov, Christopher H. Stanczak, Andy G. Eskenazi, Pratik Ponnarassery, John Cortes, **Matthew F. Campbell**, and Igor Bargatin. *Demonstration of atmospheric-pressure radiometer with nanocardboard vanes*. Journal of Microelectromechanical Systems. 29:5 (2020) 811-817.
5. 2020. Wujoon Cha, **Matthew F. Campbell**, George A. Popov, Christopher H. Stanczak, Anna K. Estep, Edward B. Steager, Cynthia R. Sung, Mark H. Yim, and Igor Bargatin. *Microfabricated foldable wings for centimeter-scale microflyers*. Journal of Microelectromechanical Systems. 29:5 (2020) 1127-1129.
6. 2018. **Matthew F. Campbell**, Shengkai Wang, David F. Davidson, and Ronald K. Hanson. *Shock tube study of normal heptane first-stage ignition near 3.5 atm.* Combustion and Flame 198:0 (2018) 376-392.
7. 2017. **M. F. Campbell**, P. E. Schrader, A. L. Catalano, K. O. Johansson, G. A. Bohlin, N. K. Richards-Henderson, C. J. Kliewer, and H. A. Michelsen. *A small porous-plug burner for studies of combustion chemistry and soot formation*. Review of Scientific Instruments 88:12 (2017) 125106.
8. 2017. **Matthew F. Campbell**, Kyle G. Owen, David F. Davidson, and Ronald K. Hanson. *Dependence of calculated post-shock thermodynamic variables on vibrational equilibrium and input uncertainty*. Journal of Thermophysics and Heat Transfer 31:3 (2017) 586-608.
9. 2017. K. Olof Johansson, Tyler Dillstrom, Paolo Elvati, **Matthew F. Campbell**, Paul E. Schrader, Denisia M. Popolan-Vaida, Nicole K. Richards-Henderson, Kevin R. Wilson, Angela Violi, Hope A. Michelsen. *Radical–radical reactions, pyrene nucleation, and incipient soot formation in combustion.* Proceedings of the Combustion Institute 36:1 (2017) 799-806.
10. 2017. K. O. Johansson, F. El Gabaly, P. E. Schrader, **M. F. Campbell**, and H. A. Michelsen. *Evolution of maturity levels of the particle surface and bulk during soot growth and oxidation in a flame.* Aerosol Science and Technology 51:12 (2017) 1333-1344.
11. 2017. K. Olof Johansson, Judit Zádor, Paolo Elvati, **Matthew F. Campbell**, Paul E. Schrader, Nicole K. Richards-Henderson, Kevin R. Wilson, Angela Violi, and Hope A. Michelsen. *Critical*

assessment of photoionization efficiency measurements for characterization of soot-precursor species. The Journal of Physical Chemistry A 121:23 (2017) 4475-4485.

12. 2017. K. Olof Johansson, **Matthew F. Campbell**, Paolo Elvati, Paul E. Schrader, Judit Zádor, Nicole K. Richards-Henderson, Kevin R. Wilson, Angela Violi, and Hope A. Michelsen. *Photoionization efficiencies of five polycyclic aromatic hydrocarbons.* The Journal of Physical Chemistry A 121:23 (2017) 4447-4454.
13. 2016. **M. F. Campbell**, G. A. Bohlin, P. E. Schrader, R. P. Bambha, C. J. Kliewer, K. O. Johansson, and H. A. Michelsen. *Design and characterization of a linear Hencken-type burner*. Review of Scientific Instruments 87:11 (2016) 115114.
14. 2016. **M. F. Campbell**, D. R. Haylett, D. F. Davidson, and R. K. Hanson. *AEROFROSH: A shock condition calculator for multi-component-fuel aerosol-laden flows*. Shock Waves 26:4 (2016) 429-447.
15. 2016. **Matthew F. Campbell**, David F. Davidson, and Ronald K. Hanson. *Scaling relation for high-temperature biodiesel surrogate ignition delay times*. Fuel 164:0 (2016) 151-159.
16. 2016. K. Olof Johansson, Tyler Dillstrom, Matteo Monti, Farid El Gabaly, **Matthew F. Campbell**, Paul E. Schrader, Denisia M. Popolan-Vaida, Nicole K. Richards-Henderson, Kevin R. Wilson, Angela Violi, and Hope A. Michelsen. *Formation and emission of large furans and oxygenated hydrocarbons from flames*. Proceedings of the National Academy of Sciences of the United States of America 113:30 (2016) 8374-8379.
17. 2016. V. A. Troutman, C. L. Strand, **M. F. Campbell**, A. M. Tulgestke, V. A. Miller, D. F. Davidson, and R. K. Hanson. *High-speed OH* chemiluminescence imaging of ignition through a shock tube end-wall*. Applied Physics B: Lasers and Optics 122:3 (2016) 1-7.
18. 2015. **M. F. Campbell**, T. Parise, A. M. Tulgestke, R. M. Spearrin, D. F. Davidson, and R. K. Hanson. *Strategies for obtaining long constant-pressure test times in shock tubes*. Shock Waves 25:6 (2015) 651-665.
19. 2015. **Matthew F. Campbell**, Shengkai Wang, Christopher S. Goldenstein, R. Mitchell Spearrin, Andrew M. Tulgestke, Luke T. Zaczek, David F. Davidson, and Ronald K. Hanson. *Constrained reaction volume shock tube study of* n*-heptane oxidation: Ignition delay times and time-histories of multiple species and temperature*. Proceedings of the Combustion Institute 35:1 (2015) 231-239.
20. 2014. **Matthew F. Campbell**, Andrew M. Tulgestke, David F. Davidson, and Ronald K. Hanson. *A second-generation constrained reaction volume shock tube*. Review of Scientific Instruments 85:5 (2014) 055108.
21. 2014. **Matthew F. Campbell**, Keilan G. Freeman, David F. Davidson, and Ronald K. Hanson. *FTIR measurements of mid-IR absorption spectra of gaseous fatty acid methyl esters at T=25-500 °C*. Journal of Quantitative Spectroscopy & Radiative Transfer 145:0 (2014) 57-73.
22. 2014. **Matthew F. Campbell**, David F. Davidson, and Ronald K. Hanson. *Ignition delay times of very-low-vapor-pressure biodiesel surrogates behind reflected shock waves*. Fuel 126:0 (2014) 271-281.
23. 2013. **Matthew F. Campbell**, David F. Davidson, Ronald K. Hanson, and Charles K. Westbrook. *Ignition delay times of methyl oleate and methyl linoleate behind reflected shock waves*. Proceedings of the Combustion Institute 34:1 (2013) 419-425.

Manuscripts in Preparation

1. 2020. Wujoon Cha, Samuel M. Nicaise, Kathryn Hasz, Drew E. Lilley, Takaaki Sato, **Matthew F. Campbell**, Robert W. Carpick, and Igor Bargatin. *Hollow AFM cantilever with nanoscale wall thickness: Towards higher bandwidth in air.*
2. 2020. Hope A. Michelsen, **Matthew F. Campbell**, K. Olof Johansson, Ich C. Tran, Paul E. Schrader, Ray P. Bambha, Emre Cenker, Joshua A. Hammons, Eric Schaible, Chenhui Zhu, Alexander Hexemer, and Tony van Buuren. *Retrieving soot-particle sizes and morphologies from small-angle X-ray scattering measurements in a flame.*

Other Publications

1. 2013. Ronald K. Hanson, **Matthew F. Campbell**, Genny A. Pang, and Subith S. Vasu. *Non-equilibrium processes in high-temperature gases.* Revision of course reader.

GRANTS AND FELLOWSHIPS

Grants

1. 2020. University of Pennsylvania Undergraduate Research Mentoring (PURM) Program.
   Synopsis: Acquired summer research funding ($5500) and provided scientific mentoring for one undergraduate student.

Fellowships

2. 2010-2013. National Defense Science and Engineering Graduate (NDSEG) Fellowship. Stanford University.
3. 2009. (April – June). Dean's Office Fellowship. Stanford University.

CONFERENCE ACTIVITY/PARTICIPATION

Presentations

Presenter underlined

1. Hope A. Michelsen, Kevin R. Wilson, Tony Van Buuren, K. Olof Johansson, Paul E. Schrader, Farid El Gabaly, **Matthew F. Campbell**, Ray P. Bambha, Ich C. Tran, Joshua A. Hammons, Chenhui Zhu, Eric Schaible, Alexander Hexemer, Dimosthenis Sokaras, L. N. Dennis Nordlund, Thomas Kroll, Tsu-Chien Weng, Martin P. Head-Gordon, Josie Hendrix, Diptarka Hait, and Andrew L. Aquila. *Using X-ray tools to solve the mystery of soot formation*. 2019 Advance Light Source User Meeting. 1-3 October 2019. Berkeley, CA, USA.

2. Hope A. Michelsen, Kevin R. Wilson, Tony Van Buuren, K. Olof Johansson, Paul E. Schrader, Farid El Gabaly, **Matthew F. Campbell**, Ray P. Bambha, Ich C. Tran, Joshua A. Hammons, Chenhui Zhu, Eric Schaible, Alexander Hexemer, Dimosthenis Sokaras, L. N. Dennis Nordlund, Thomas Kroll, Tsu-Chien Weng, Martin P. Head-Gordon, Josie Hendrix, Diptarka Hait, and Andrew L. Aquila. *Using vacuum ultraviolet and X-ray tools to solve the mystery of soot formation*. 40th International Conference on Vacuum Ultraviolet and X-ray Physics. 1-5 July 2019. San Francisco, CA, USA.
3. 2016. K. Olof Johansson, Paul Schrader, **Matthew Campbell**, and Hope Michelsen. *Relating the LII signal to soot maturity via the absorption cross section dispersion exponent*. 7th International Workshop on Laser-Induced Incandescence. 19 - 22 June 2016. Lake Tahoe, CA, USA.
4. 2015. Valerie Troutman, Victor Miller, Christopher Strand, Andrew Tulgestke, **Matthew Campbell**, David Davidson, and Ronald Hanson. *High-speed OH* chemiluminescence imaging of ignition through a shock tube end-wall*. Paper No. M28.00003 68th Annual Meeting of the APS Division of Fluid Dynamics. 22 - 24 November 2015. Boston, MA, USA.
5. 2015. David Davidson, Andrew Tulgestke. Christopher Strand, **Matthew Campbell**, Shengkai Wang, and Ronald Hanson. (2015). *Rapid chemiluminescent imaging behind reflected shock waves*. Paper No. 180. 2017:313-316. 30th International Symposium on Shock Waves. 19 - 24 July 2015. Tel Aviv, Israel.
6. 2014. **Matthew Campbell**, Shengkai Wang, Christopher Goldenstein, Mitchell Spearrin, Andrew Tulgestke, Luke Zaczek, David Davidson, and Ronald Hanson. (2014). *Constrained reaction volume shock tube study of* n*-heptane oxidation: Ignition delay times and time-histories of multiple species and temperature*. Paper No. 2376. 35th International Symposium on Combustion. 3 - 8 August 2014. San Francisco, CA, USA.
7. 2013. **Matthew F. Campbell**, David F. Davidson, and Ronald K. Hanson. (2013). *Ignition delay times of very-low-vapor-pressure biodiesel surrogates behind reflected shock waves*. Paper No. 070RK-0008. 8th U.S. National Combustion Meeting. 19 - 22 May 2013. University of Utah, Utah, USA.
8. 2012. **Matthew F. Campbell**, David F. Davidson, Ronald K. Hanson, and Charles K. Westbrook. (2012). *Ignition delay times of methyl oleate and methyl linoleate behind reflected shock waves*. Paper No. D301. 34th International Symposium on Combustion. 30 July - 3 August 2012. Warsaw University of Technology, Poland.
9. 2011. **M. F. Campbell**, D. F. Davidson, and R. K. Hanson. (2011). *A second-generation aerosol shock tube and its use in studying ignition delay times of large biodiesel surrogates*. Paper No. 2463. 2012:517-522. 28th International Symposium on Shock Waves (ISSW). 17 - 22 July 2011. University of Manchester, UK.
10. 2011. **Matthew Campbell**, David Davidson, and Ronald Hanson. (2011). *Biodiesel ignition delay times.* Thermal and Fluid Sciences Affiliates and Sponsors Conference (TFSA). 2 - 4 February 2011. Stanford University, CA, USA.
11. 2009. Anna-Katrina Shedletsky, **Matthew Campbell**, and David Havskjold. (2009). *Embracing ambiguity: A perspective on student foresight engineering*. Paper No. DS 58-10. 2009:237-244. 17th International Conference on Engineering Design, ICED'09. 24 - 27 August 2009. Stanford University, CA, USA.

Posters

Presenter underlined

1. 2019. **Matthew Campbell**, Mohsen Azadi, Zhipeng Lu, Samuel Nicaise, Andy Eskenazi, Kyana Van Houten, Avery Jiwon Bang, Jared Schwede, and Igor Bargatin. *Achieving ultrahigh thermal resistance across micron-sized gaps*. 2019 Singh Center for Nanotechnology Users Meeting. 28 October 2019. Philadelphia, PA, USA.
2. 2019. Wujoon Cha, Thomas Celenza, George Popov, **Matthew Campbell**, Luke Kasper, Christopher Stanczak, Cynthia Sung, Igor Bargatin, and Mark Yim. *Lightweight micronscale foldable frames with polymer films*. 2019 Singh Center for Nanotechnology Users Meeting. 28 October 2019. Philadelphia, PA, USA.
3. 2019. Mohsen Azadi, John Cortes, Christopher Stanczak, Zhipeng Lu, George Popov, Andy Eskenazi, **Matthew Campbell**, and Igor Bargatin. *First time demonstration of Crookes radiometer at atmospheric pressure*. 2019 Singh Center for Nanotechnology Users Meeting. 28 October 2019. Philadelphia, PA, USA.
4. 2016. Olof Johansson, Tyler Dillstrom, **Matthew Campbell**, Matteo Monti, Farid El Gabaly, Paolo Elvati, Denisia Popolan-Vaida, Nicole Richards-Henderson, Paul Schrader, Kevin Wilson, Angela Violi, and Hope Michelsen. *Formation and emission of large furans and oxygenated hydrocarbon species from flames*. 3rd International Sooting Flame Workshop. 30 - 31 July 2016. Seoul, South Korea.
5. 2016. **Matthew Campbell**, Paul Schrader, Olof Johansson, Ich Tran, Chenhui Zhu, Eric Schaible, Polite Stewart, Jr., Alexander Hexemer, Tony van Buuren, Ray Bambha, and Hope Michelsen. *Towards understanding the relationship between LII, soot particle maturity, and minimum particle size detection limit*. 7th International Workshop on Laser-Induced Incandescence. 19 - 22 June 2016. Lake Tahoe, CA, USA.
6. 2015. **Matthew Campbell**, Ich Tran, Matteo Monti, Olof Johansson, Ray Bambha, Paul Schrader, Tony Van Buuren, Farid El Gabaly, Dimosthenis Sokaras, Dennis Nordlund, Tsu-Chien Weng, and Hope Michelsen. *X-ray-based diagnostics for studying soot formation, evolution, and oxidation*. 18th Gordon Research Conference and Seminar on Laser Diagnostics in Combustion. 9 - 14 August 2015. Waterville Valley, NH, USA.
7. 2009. David Havskjold, **Matthew Campbell**, and Anna-Katrina Shedletsky. *Dynamic space*. 32nd Annual Stanford University Opportunity Job Fair. 23 January 2009. Stanford University, CA, USA.

PATENTS

Provisional Patent Applications

4. 2020. Mohsen Azadi, Igor Bargatin, **Matthew Campbell**, Kyana Van Houten, Samuel Nicaise, and Jared Schwede. *Small gap device system and method of fabrication*.

TEACHING EXPERIENCE

Sigay Kauyagan, Inc. at Mindanao State University

1. 2018 (June – August). Tutorial instructor, *College Bound Program for Cultural Communities, Science Section.*
2. 2017-2018. Instructor for five-session mini-courses that I designed and taught: *Study Skills; Introduction to Octave and MATLAB; Scientific Writing; Mental Math Skills;* and *Basics of Baking.*

Stanford University

1. 2013 (January – March). Teaching assistant, *Non-Equilibrium Processes in High-Temperature Gases*.
2. 2011 (March). Laboratory instructor, *Optical Diagnostics and Spectroscopy Laboratory*.

Duke University

1. 2007 (January – May). Teaching assistant and laboratory instructor, *Data Analysis and Statistical Inference.*
2. 2005 (August – December). Teaching assistant and laboratory instructor, *Computer Methods in Engineering.*

RESEARCH EXPERIENCE

1. 2019-present. Postdoctoral Researcher. Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania. *Mentor*: Professor Igor Bargatin.
2. 2014-2016. Postdoctoral Appointee. Combustion Research Facility, Sandia National Laboratories, Livermore, CA. *Mentor*: Professor Hope A. Michelsen. (now faculty at University of Colorado)
3. 2009-2014. Research Assistant. Department of Mechanical Engineering, Stanford University. *Advisor*: Professor Ronald K. Hanson.

SERVICE TO PROFESSION

Evaluations

1. 2019. Reviewer. National Science Foundation Graduate Research Fellows Program (NSF GRFP) applications.
2. 2017. Reviewer. Department of Defense National Defense Science and Engineering Graduate (NDSEG) Fellowship applications.
3. 2009-2016; 2019-present. Alumni undergraduate admissions interviewer. Duke University.

Referee Service Performed

1. Combustion and Flame
2. Energy and Fuels
3. Fuel
4. Journal of Chemical Engineering and Materials Science
5. Journal of Renewable and Sustainable Energy
6. Journal of Sustainable Bioenergy Systems
7. Journal of the Brazilian Society of Mechanical Sciences and Engineering
8. Proceedings of the Combustion Institute
9. Shock Waves

DEPARTMENTAL/UNIVERSITY SERVICE

1. 2020. Member, Planning Committee for Nano Week 2020. University of Pennsylvania.
2. 2019. Participant, Workshops to construct new Values Statement for the University of Pennsylvania School of Engineering and Applied Sciences. University of Pennsylvania.
3. 2014-2016. Member, Recruiting Team. Sandia National Laboratories.
4. 2012-2014. Graduate Student Representative, Mechanical Engineering Building Renovation Design Committee. Stanford University.
5. 2012-2014. Member, Building Assessment Team (BAT). Stanford University.
6. 2012-2014. Member, Building Evacuation Response Team (BERT). Stanford University.
7. 2009-2016, 2019-present. Undergraduate Admissions Alumni Interviewer. Duke University.

OUTREACH/ENGAGEMENT

1. 2020 (9-13 June). Presenter. *Microwave ovens: Physics and experiments*. Nano Week 2020. Singh Center for Nanotechnology, University of Pennsylvania.
2. 2020 (27 June). Guest Lecturer. *Photophoretic levitation and thermionic energy conversion*. Summer Mentorship Program. University of Pennsylvania.
3. 2020 (March-May). Participant. University of Pennsylvania Hospital System COVID-19 Rapid Response Engineering Team, University of Pennsylvania.
4. 2017-2019. Engineer and Educator. Sigay Kauyagan, Inc., Mindanao State University, General Santos City, Republic of the Philippines.
5. 2012-2014. Science Experiment Station Leader. Vacation Bible School (VBS), Menlo Church, San Mateo, CA.
6. 2012-2013. Volunteer. Habitat for Humanity, San Mateo, CA.
7. 2012 (August). Volunteer working with children at risk for human trafficking. Agape International Missions, Phnom Penh, Cambodia.

DIVERSITY/ EQUITY/INCLUSION

1. 2020 (16 and 19 June). Organizer. Bargatin research group discussions on racism.
2. 2020 (10 June). Participant. Shut Down STEM Day.
3. 2017 (February)-2019 (April). Mentor, tutor, and teacher for underrepresented indigenous students with non-government organization Sigay Kauyagan, Inc. on the campus of Mindanao State University (General Santos City, Republic of the Philippines).

RELATED PROFESSIONAL SKILLS/CERTIFICATIONS

1. 2014. Passed Principles and Practice of Engineering (PE) Exam in California.
2. 2008. Passed Fundamentals of Engineering (FE) Exam in North Carolina.

NON-ACADEMIC WORK

1. 2017-2019. Engineer and Educator. Sigay Kauyagan, Inc., Mindanao State University, General Santos City, Republic of the Philippines.
2. 2009 (June – September). Growth and Capital Engineering Intern. Medtronic Surgical Solutions, Fort Worth, TX.
3. 2008 (July – September). Battery Manufacturing and Process Engineering Intern. Boston Scientific, Saint Paul, MN.
4. 2007 (May – August). Hybrid Circuit Manufacturing and Process Engineering Intern. Boston Scientific, Saint Paul, MN.

TEACHING AREAS/COURSES PREPARED TO TEACH

1. Combustion
2. Compressible flow
3. Computer methods in Engineering (Matlab/Octave)
4. Energy systems
5. Fluid mechanics
6. Heat and mass transfer
7. Mechanical and product design methodology
8. Micromanufacturing
9. Order of magnitude estimations in engineering
10. Physical gas dynamics
11. Reaction kinetics
12. Spectroscopy
13. Thermodynamics

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

1. 2015. Toastmasters International
2. 2014. American Chemical Society
3. 2012. Combustion Institute
4. 2008. Phi Beta Kappa Honor Society
5. 2007. Pi Tau Sigma Mechanical Engineering Honor Society
6. 2006. Tau Beta Pi Engineering Honor Society
7. 2004. American Society of Mechanical Engineers
8. 2002. National Honor Society of Secondary Schools

REFERENCES

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Department of Mechanical Engineering, University of Colorado Boulder
Formerly: Scientist at Sandia National Laboratories
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