

# Perrine Pepiot

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## Professional Address

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## Education

2004 – 2008	Ph.D. <i>Mechanical Engineering, Stanford University</i>
2002 – 2003	Master of Science <i>Mechanical Engineering, Stanford University</i>
2000 – 2003	Master of Science <i>Aeronautics &amp; Astronautics, French Engineering School for Aeronautics &amp; Space (SU-PAERO – ENSAE), Toulouse, France</i>

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## Professional Experience

2011 –	Assistant Professor <i>Sibley School of Mechanical &amp; Aerospace Engineering, Cornell University</i>
06/2012	Visiting Professor <i>Complexe de Recherche Interprofessionnel en Aérothermochimie (CORIA, CNRS Laboratory), Rouen, France</i>
2009 – 2011	Research Scientist <i>National Bio-energy Center, National Renewable Energy Laboratory, CO</i>
2008 – 2009	Post-Doctoral Scholar <i>National Bio-energy Center, National Renewable Energy Laboratory, CO</i>
2008	Post-Doctoral Scholar <i>Mechanical Engineering, Stanford University</i>
2003 – 2008	Graduate Research Assistant <i>Center for Turbulence Research, Mechanical Engineering, Stanford University</i>
2000 – 2002	Undergraduate Research Assistant <i>Aeronautics &amp; Astronautics, French Engineering School for Aeronautics &amp; Space (SU-PAERO), Toulouse, France</i>

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## Honors & Awards

2014	John Swanson '61 ME in honor of his mother, Dorothy G. Swanson Excellence in Teaching Award <i>Cornell University, NY</i>
2013	James M. and Marsh D. McCormick Excellence in Advising Award <i>Cornell University, NY</i>
2010	OASCRS Visualization Award (shared with K. Gruchalla and O. Desjardins) <i>DOE SciDAC Conference</i>
2009	Prandtl Award for Excellence in Aerodynamics <i>SUPAERO – ENSAE, Toulouse, France</i>

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## Submitted Journal Articles

1. NARAYANASWAMY, K., PEPIOT, P. (2016) Simulation-driven formulation of transportation fuel surrogates, *Combust. Th. Modell.*, under review.
2. GRUSELLE, C., MOUREAU, V., LARTIGUE, G., D'ANGELO, Y., PEPIOT, P., RAVET, F. (2016) Flame kernel expansion modeling in a stratified mixture. part 1: laminar case, *Combust. Theory Mod-ell.*, under review.
3. GRUSELLE, C., MOUREAU, V., LARTIGUE, G., D'ANGELO, Y., PEPIOT, P., RAVET, F. (2016) Flame kernel expansion modeling in a stratified mixture. part 2: turbulent case, *Combust. Theory Mod-ell.*, under review.

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## Refereed Journal Articles

1. LAURENT, C., FREWIN, F., PEPIOT, P. (2016) A novel atom tracking algorithm for the analysis of complex chemical kinetic networks, *Combust. Flame.*, in press.
2. NARAYANASWAMY, K., PITSCH, H., PEPIOT, P. (2016) A component library framework for deriving kinetic mechanisms for multi-component fuel surrogates: Application for jet fuel surrogates, *Combust. Flame*, 165:288 – 309.
3. XU, Y., KERESZTES, I., CONDO Jr., A. M., PHILLIPS, D., PEPIOT, P., AVEDISIAN, C. T. (2016) Spherically symmetric burning characteristics of algae-derived renewable diesel, conventional #2 diesel, and their mixtures, *Fuel*, 167:295 – 305.
4. LIANG Y., POPE, S. B., PEPIOT, P. (2015) An adaptive methodology for the efficient implementation of combustion chemistry in particle PDF methods, *Combust. Flame*, 162:3236 – 3253.
5. MEHTA, M., FOX, R. O., PEPIOT, P. (2015) Reduced Chemical Kinetics for the Modeling of TiO<sub>2</sub> Nanoparticle Synthesis in Flame Reactors, *Ind. Eng. Chem. Res.*, 54:5407 – 5415.
6. NARAYANASWAMY, K., PITSCH, H., PEPIOT, P. (2015) A chemical mechanism for low to high temperature oxidation of methylcyclohexane as a component of transportation fuel surrogates, *Combust. Flame*, 162:1193 – 1213.
7. CAPECELATRO, J. S., PEPIOT, P., DESJARDINS, O. (2015) Numerical investigation and modeling of reacting gas-solid flows in the presence of clusters, *Chem. Eng. Sci.*, 122:403 – 415.
8. CAPECELATRO, J. S., PEPIOT, P., DESJARDINS, O. (2014) Numerical characterization and modeling of particle clustering in wall-bounded vertical risers, *Chem. Eng. J.*, 245:295 – 310.
9. NARAYANASWAMY, K., PEPIOT, P., PITSCH, H., (2014) A chemical mechanism for low to high temperature oxidation of n-dodecane as a component of transportation fuel surrogates, *Combust. Flame*, 161:866 – 884.
10. PEPIOT, P., DESJARDINS, O. (2011) Numerical analysis of the dynamics of two- and three-dimensional fluidized bed reactors using an Euler-Lagrange approach, *Powder Tech.*, 220:104 – 121.
11. BALDWIN, R., MAGRINI-BLAIR, K., NIMLOS, M. R., PEPIOT, P., DONOHUE, B., PHILIP, S. (2012) Current research on thermo-chemical conversion of biomass at the national renewable energy laboratory, *App. Cat. B: Env.*, 115 – 116:320 – 329.
12. GASTON, K. R., JARVIS, M. W., SMITH, K. M., PEPIOT, P., FREDERICK, W. J., NIMLOS, M. R. (2011) Biomass pyrolysis and gasification of varying particle sizes in a fluidized bed reactor, *Ener. Fuel*, 25:3747 – 3757.

13. PEPIOT, P., DIBBLE, C., FOUST, T. (2010) Computational Fluid Dynamic Modeling of Biomass Gasification, in Computational Modeling in Lignocellulosic Biofuel Production. Nimlos, M. *et al.*, Editors, *ACS Symposium Series*; American Chemical Society: Washington, DC.
14. BLANQUART, G., PEPIOT, P., PITTSCH, H., (2009) Chemical mechanism for high temperature combustion of engine relevant fuels with emphasis on soot precursors, *Combust. Flame*, 156:588 – 607.
15. JERZEMBECK, S., PETERS, N., PEPIOT, P., PITTSCH, H., (2009) Laminar burning velocities at high pressure for primary reference fuels and gasoline: Experimental and numerical investigation, *Combust. Flame*, 156:292 – 301.
16. PEPIOT, P., PITTSCH, H., (2008) An efficient error-propagation-based reduction method for large chemical kinetic mechanisms. *Combust. Flame*, 154:67 – 81.
17. PEPIOT, P., MALHOTRA, R., KIRBY, A. R., A. L. BOEHMAN, PITTSCH, H. (2008) Experimental study and structural group analysis for soot reduction tendency of oxygenated fuels, *Combust. Flame*, 154:191 – 205.
18. PEPIOT, P., PITTSCH, H. (2008) A chemical lumping method for the reduction of large chemical kinetic mechanisms, *Combust. Th. Model.*, 12:1089 – 1108.

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## Non Peer-Reviewed Publications & Technical Reports

1. PEPIOT, P., DESJARDINS, O. (2010) Direct numerical simulation of dense particle-laden flows using a conservative immersed boundary technique, *Proceedings of the CTR Summer Program*, Center for Turbulence Research, NASA Ames/Stanford Univ.
2. PEPIOT, P., NIMLOS, M. R. (2009) Lagrangian model of a 4-inch fluidized bed reactor. NREL Technical Report.

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## Other Products

### YARC

*Characteristics:* YARC is a suite of chemistry analysis and reduction tools for the development of specialized low-order chemical kinetic models for CFD applications. YARC features a large range of modules and capabilities, including the DRGEP (Directed Relation Graph with Error Propagation) model reduction technique. YARC's most important characteristic is its fully automatic nature, allowing non-chemical experts to quickly and efficiently generate compact chemical models tailored to their specific simulation needs, typically in the form of code snippets directly compatible with CFD software.

*Authors:* Development of the YARC chemistry reduction software was started by P. Pepiot at Stanford in 2005, then continued at Cornell. To maximize impact on the combustion community, she is now leading an international effort to establish and maintain a community-supported YARC development platform.

*User base:* YARC is available to the international scientific community upon simple request. It is currently used by a number of groups in both industries, universities and research laboratories.

*Webpage:* <http://pepiot.mae.cornell.edu/yarc.html>

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### **Invited Lectures & Presentations**

05/2016	Special seminar, CERFACS, Toulouse, France
11/2015	Energy Seminar I series, Chemical and Biomolecular Engineering, Cornell University
05/2015	Invited lecture, 1st Oxyflame Retreat, Duisburg, Germany
04/2015	Invited Seminar, Iowa State University
01/2015	Chemical and Biomolecular Engineering seminar, Cornell University
06/2014	Invited seminars, CERFACS, Toulouse, France
03/2014	Invited seminar, GE Global Research, Niskayuna, NY
03/2014	Scientific Computing and Numerics (SCAN) Seminar, Cornell University
06/2013	Invited seminar, CORIA Laboratory, Rouen, France
04/2013	Department of Mechanical and Aerospace Engineering seminar, Princeton University
12/2012	Department of Fire Protection Engineering seminar, University of Maryland
06/2012	Invited seminar, EM2C Laboratory, Ecole Centrale, Paris, France
06/2012	Invited seminar, ENSIC - Laboratoire Réactions et Génie des Procédés, Nancy, France
06/2012	Invited seminar, CORIA Laboratory, Rouen, France
05/2012	Invited Lecture, New Perspectives for Laminar Burning Velocity Workshop, Rouen, France
11/2011	Keynote lecture, Simulation of Multiphase Flows in Gasification and Combustion, ERCOF-TAC Workshop, Dresden, Germany
04/2011	Mechanical Engineering seminar, University of Illinois at Urbana-Champaign
10/2011	MAE Colloquium, Cornell University
09/2011	Mechanical Engineering seminar, Colorado School of Mines

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### **Recent Conference Proceedings & Presentations**

1. GOYAL, H., PEPIOT, P. (2016) Numerical investigation of the role of clustering during oxygen-carrier regeneration in Chemical Looping Combustion, 68th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
2. LIANG, Y., NEWALE, A., POPE, S. B., PEPIOT, P. (2016) Performance assessment of a pre-partitioned adaptive chemistry approach in large-eddy simulation of turbulent flames, 68th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR.
3. PEPIOT, P. (2016) Investigating the role of flow dynamics on biomass thermochemical conversion using High Performance Computing, Pyro 2016, Nancy, France.
4. LIANG, Y., NEWALE, A., POPE, S. B., PEPIOT, P. (2016) LES/PDF simulation of a methane turbulent flame using a combined pre-partitioned adaptive chemistry/ISAT methodology, Proceedings of the Eastern States Section of the Combustion Institute, Princeton, NJ.
5. GOYAL, H., PEPIOT, P. (2016) A reduced kinetic model for secondary reactions of biomass gasification, Proceedings of the Eastern States Section of the Combustion Institute, Princeton, NJ.
6. XU, Y., DONG, M., KERESZTES, I., PEPIOT, P., AVEDISIAN, C. T. (2015) The droplet burning characteristics of algae-derived renewable diesel, conventional #2 diesel, and their mixtures, ASME 2015 International Mechanical Engineering Congress & Exposition, Houston, TX.

7. PEPIOT, P., POPE, S. B. (2015) Investigation of Non-premixed Turbulent Combustion, 35th Annual Combustion Research Meeting, U.S. Department of Energy – Office of Basic Energy Sciences, Potomac, MD.
8. GOYAL, H., PEPIOT, P. (2015) Integrating Intra-Particle Processes in Large Scale Simulation of Biomass Thermochemical Conversion, Proceedings of the 9th US National Combustion Meeting, Cincinnati, OH.
9. LAURENT, C., FREWIN, C., PEPIOT, P. (2015) Numerical tracers to investigate soot formation in multi-component fuel combustion, Proceedings of the 9th US National Combustion Meeting, Cincinnati, OH.
10. LIANG, Y., POPE, S. B., PEPIOT, P. (2015) An adaptive methodology for the efficient implementation of detailed chemistry in simulations of turbulent non-premixed combustion, Proceedings of the 9th US National Combustion Meeting, Cincinnati, OH.
11. FELDEN, A., CUENOT, B., RIBER, E., PEPIOT, P. (2015) Analytical schemes in combustion, SIAM 15th Conference on Numerical Combustion, Avignon, France.
12. LIANG, Y., POPE, S. B., PEPIOT, P. (2015) An Adaptive strategy for the efficient implementation of complex chemistry in turbulent flame simulations, SIAM 15th Conference on Numerical Combustion, Avignon, France.
13. PEPIOT, P. (2015) Biomass Thermochemical Conversion: Topical Review and Discussion, Coal and Biomass Conversion Workshop, Avignon, France.
14. BACKER, L., PEPIOT, P. (2014) Numerical investigation of spray ignition of a multi-component fuel surrogate, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA.
15. NARAYANASWAMY, K., PEPIOT, P. (2014) Structure of a laminar triple flame of a jet fuel surrogate, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA.
16. LIANG, Y., HIREMATH, V., POPE, S. B., PEPIOT, P. (2014) An adaptive methodology for the efficient implementation of detailed chemistry in simulations of turbulent non-premixed combustion (Poster presentation), Thirty-fifth Symposium of the Combustion Institute, San Francisco, CA.
17. MALHOTRA, K. N., NIMLOS, M. R., PEPIOT, P. (2013) A novel approach for the development of global kinetic models for biomass gasification. Proceedings of 8th US National Combustion Meeting, Park City, UT.
18. LIANG, Y., HIREMATH, V., POPE, S. B., PEPIOT, P. (2013) An adaptive methodology for the efficient implementation of detailed chemistry in simulations of turbulent non-premixed combustion. Proceedings of 8th US National Combustion Meeting, Park City, UT.
19. K. NARAYANASWAMY, K., PEPIOT, P., PITSCH, H. (2013) Jet fuels and Fischer-Tropsch fuels: Surrogate definition and chemical kinetic modeling. Proceedings of 8th US National Combustion Meeting, Park City, Utah.
20. BRADY, P., DESJARDINS, O., PEPIOT, P. (2013) A sharp, robust, and conservative geometric immersed boundary technique for moving boundaries, 66th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA.
21. PEPIOT, P., MALHOTRA, K., CIESIELSKI, P. N., GROUT, R., NIMLOS, M. R. (2013) Reduced-Order Kinetics for the Simulation of Biomass Pyrolysis at High Temperature in Fluidized Bed Reactors, AIChE Annual Meeting San Francisco, CA.
22. CAPECELATRO, J. S., DESJARDINS, O., PEPIOT, P., JARVIS, M., FOUST, T. D. (2013) Numerical Investigation of Multiphase Dynamic Effects in Catalytic Upgrading of Biomass Pyrolysis Vapor, AIChE Annual Meeting San Francisco, CA.

23. LIANG, Y., HIEMATH, V., POPE, S. B., PEPIOT, P. (2013) A Combined Adaptive Chemistry and Tabulation Strategy for the Efficient Implementation of Detailed Combustion Chemistry, 4th International Workshop on Model Reduction for Reactive Flows, San Francisco, CA.
24. GRUSELLE, C., LARTIGUE, G., PEPIOT, P., MOUREAU, V., D'ANGELO, Y. (2013) Investigation of Flame Kernel Expansion in a Stratified Mixture Using DNS, SIAM International Conference on Numerical Combustion, San Antonio, TX.
25. GRUSELLE, C., LARTIGUE, G., PEPIOT, P., MOUREAU, V., D'ANGELO, Y. (2012) Numerical simulation of turbulent stratified flame propagation in a closed vessel, APS-DFD Annual Meeting, San Diego, CA.
26. MALHOTRA, K., NIMLOS, M. R., GROUT, R., PEPIOT, P. (2012) Impact of feed injection strategies on fluidization dynamics for biomass thermochemical conversion, ACS National Meeting, Philadelphia, PA.
27. LIANG, Y., HIEMATH, V., POPE, S. B., PEPIOT, P. (2012) An adaptive methodology for the efficient implementation of detailed chemistry in simulations of turbulent non-premixed combustion (Poster presentation), Thirty-four Symposium of the Combustion Institute, Warsaw, Poland.
28. PEPIOT, P. (2012) Automatic chemistry reduction techniques and reduced model validation - Common practice and perspectives, New Perspectives for Laminar Burning Velocities Workshop, CORIA, France.
29. PEPIOT, P. (2011) Biomass thermochemical conversion to biofuels: The High Performance Computing approach, CCR/DOE High Performance Computing Workshop, Rockville, MD.
30. CAPECELATRO, J., DESJARDINS, O., PEPIOT, P. (2011) Large-scale simulations of realistic fluidized bed reactors using novel numerical methods, 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD.
31. PEPIOT, P., CAPECELATRO, J., DESJARDINS, O. (2011) Effect of particle devolatilization on bed dynamics during biomass thermochemical conversion, 64th Annual Meeting of the APS Division of Fluid Dynamics, Baltimore, MD.
32. MEHTA, M., PEPIOT, P., and FOX, R. O. (2011) Reduction and Analysis of Detailed Kinetics for Modeling TiO<sub>2</sub> Nanoparticle Synthesis in Flame Reactors, International Conference on Chemical Kinetics, MIT.

### Teaching Activities - Cornell University

Fall	2016	Introduction to Aeronautics	MAE 3050
Spring	2016	Numerical Combustion	MAE 6430
Fall	2015	Introduction to Aeronautics	MAE 3050
Spring	2015	Turbulence and Turbulent Flows	MAE 6310
		Foundations of Fluid Mechanics II ( <i>Turbulence module</i> )	MAE 6020
Fall	2014	Introduction to Aeronautics	MAE 3050
Spring	2014	Numerical Combustion	MAE 6430
Fall	2013	Introduction to Aeronautics	MAE 3050
		MAE Colloquium	MAE 7999
Spring	2013	Turbulence and Turbulent Flows	MAE 6310
Fall	2012	Introduction to Aeronautics	MAE 3050
		Engineering Seminar	ENGRG 1050
Fall	2011	Introduction to Aeronautics	MAE 3050

## Graduate Activities

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### Graduate Field Memberships

Mechanical Engineering  
Aerospace Engineering  
Computational Science & Engineering  
Chemical Engineering  
Applied Mathematics (pending)

### Current Ph.D. Students

Youwen Liang	<i>started in 2011, Graduation expected Dec. 2016</i>
Lara Baker (NSF Graduate Fellow)	<i>started in 2013, A-exam in Fall 2016</i>
Himanshu Goyal	<i>started in 2013, A-exam in Fall 2016</i>
Ashish Newale	<i>started in 2015, Q-exam passed</i>

### Post-Doctoral Researchers

12/2013 – 05/2015    Krithika Narayanaswamy (now faculty at IIT Madras, India)

### Master of Science Students

08/2014 – 12/2015	Christopher Frewin <i>A novel atom tracking algorithm for the analysis of complex chemical kinetic networks: Application to soot precursors formation in multicomponent fuel combustion</i>
08/2011 – 06/2013	Kara Malhotra <i>Detailed modeling of biomass thermochemical conversion</i>

### Undergraduate Students

05/2015 – 08/2015	Mason Montgomery (Cornell ELI recipient)
01/2015 – 05/2015	Nicholas Gray (Cornell ELI recipient)
08/2014 – 12/2014	Rehan Kaluarachchi, Daniel Escobar, Kristopher Yoo
05/2012 – 08/2012	André Bergeron (Cornell ELI recipient)
01/2012 – 05/2012	Neil Sen

### Visiting Students

08/2014 – 06/2015	Charl�lie Laurent (M.S. student from ENS Cachan, France)
08/2012 – 12/2012	Catherine Gruselle (Ph.D. student under Dr. V. Moureau at CORIA, Rouen, France)

### Thesis Committee Membership

*Cornell University:* Paula Doubrawa, Ranjith Tirunagari, Yuhao Xu, Bo Yang, Xialing Zhang  
*CORIA, Rouen, France:* Catherine Gruselle (2013)  
*CERFACS, Toulouse, France:* Thomas Jaravel (2016)

## Professional Societies

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### Membership

The Combustion Institute, the American Institute of Aeronautics & Astronautics (AIAA), the American Physical Society (APS), the American Institute for Chemical Engineering (AIChE), the American Society of Mechanical Engineers (ASME).

### Service

- 2016 – Elected at-large member of the Executive Board,  
*Eastern State Section of the Combustion Institute (ESSCI)*
- 2015 – Organizing committee member and session coordinator  
*Coal and Biomass Conversion Workshop series*

### Proposal Reviewer Service

NSF-CBET – Combustion and Fire Systems; DOE – Basic Energy Sciences; U.S.-Israel Bi-national Science Foundation; Natural Sciences and Engineering Research Council of Canada.

### Journal Reviewer Service

Advanced Powder Technology; Chemical Engineering Science; Combustion and Flame; Combustion Science and Technology; Combustion Symposium; Combustion Theory and Modelling; Flow, Turbulence and Combustion; Fuel; Geophysical Research Letters; Industrial Biotechnology; Industrial & Engineering Chemistry Research; International Journal of Chemical Kinetics; Powder Technology; Progress in Energy and Combustion Science.

## Departmental & University Service

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- 2016 – Cornell Institute for Computational Science and Engineering, Executive Board
- 2016 – Maths-Engineering Liaison Committee
- 2015 – Teszia Student Dance Troupe Faculty Advisor
- 2015, 2016 MAE Student Awards Committee
- 2015 Panelist, “The Future of Technology in Education and Research”, plenary session, IT@Cornell Community Conference
- 2014 – 2016 Undergraduate Planning Committee
- 2014 – Cornell AIAA Student Chapter Advisor
- 2012 – 2013 Cornell MAE Colloquium Committee
- 2012 – 2013 Secretary of the Cornell MAE Faculty
- 2012 – 2013 First-Year Engineering Advisor (20 students)
- 2012 Lecturer, Cornell Engineering Pre-freshman Summer Program
- 2011 – 2014 Cornell MAE Graduate Admission Committee