

# Curriculum Vitæ

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## Research Interests

Chemically reacting flows.  
Radiative heat transfer in combustion.  
Aerosol-dynamics-based soot modeling.  
Interaction of turbulence, chemistry, soot, and radiation.  
Atmospheric soot.

## Education

2014	Ph. D., Mechanical Engineering with Graduate Minor in Computational Science The Pennsylvania State University, University Park, PA. USA. 16802
2004	M. Tech, Thermal, Energy and Environmental Engineering Indian Institute of Technology, Kharagpur, INDIA. 721302
2004	B. Tech (Hons), Mechanical Engineering Indian Institute of Technology, Kharagpur, INDIA. 721302

## Academic Positions

August, 2016 –	<b>Assistant Professor</b> Department of Mechanical Engineering, Marquette University, Milwaukee, WI. Research area: Chemically reacting flows, aerosol-dynamics-based soot modeling, radiative heat transfer in combustion, atmospheric soot, and interaction of turbulence, chemistry, soot, and radiation. Teaching responsibilities: Fundamentals of Heat Transfer and other energy-system-related courses
2014 – 2016	<b>Postdoctoral Scholar</b> PI: Prof. Michael Modest, University of California, Merced CA. Responsibilities: Multiphase radiation modeling in combustion systems

## Past Research Experiences

2014–2016	Multiphase radiation modeling in combustion systems Postdoctoral research, PI: Prof. Michael Modest, University of California, Merced. <ul style="list-style-type: none"><li>• Accurate modeling of multiphase radiative transfer in spray combustion.</li><li>• Comparison of radiative solvers in high-pressure combustion systems.</li></ul>
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2007–2014	Aerosol-dynamics-based soot modeling in flames <ul style="list-style-type: none"> <li>• Detailed modeling of formation and growth of soot in laboratory flames.</li> <li>• Systematic study of various aerosol-dynamic-based detailed models and chemical mechanisms for soot formation and growth.</li> <li>• Interaction of turbulence, chemistry, and radiation in presence of soot in chemically reacting flows using transported particle density function method.</li> </ul>
2009–2013	High-fidelity direct numerical simulations of turbulent combustion with soot and radiation <ul style="list-style-type: none"> <li>• Multi-institutional collaboration for massively parallel petascale computations.</li> <li>• Implementation of a high-fidelity method for moment of soot formation and growth in massively parallel DNS code.</li> <li>• Systematic study of soot physics in turbulent DNS.</li> </ul>
2003–2004	Studies on flashing-driven natural circulation loops <ul style="list-style-type: none"> <li>• Mathematical modeling and simulation of two-phase flow in flashing driven natural circulation loop using homogeneous flow and drift-flux model.</li> </ul>

### Publications: Peer-reviewed Journals

2017	Development of a multiphase photon Monte Carlo method for spray combustion and its application in high-pressure conditions. <b>Somesh P. Roy</b> , Jian Cai, and Michael F. Modest. Accepted, International Journal of Heat and Mass Transfer.
2017	Effect of Multiphase Radiation on Coal Combustion in a Pulverized Coal Jet Flame. Bifen Wu, <b>Somesh P. Roy</b> , Xinyu Zhao, and Michael F. Modest. Journal of Quantitative Spectroscopy and Radiative Transfer. 197 (2017) 154-165
2016	A Comparison of Specularly Reflective Boundary Conditions and Rotationally Invariant Formulations for Discrete Ordinate Methods in Axisymmetric Geometries. Jian Cai, <b>Somesh P. Roy</b> , and Michael F. Modest. Journal of Quantitative Spectroscopy and Radiative Transfer. 182 (2016), 75-86.
2016	A Systematic Comparison of Detailed Soot Models and Gas-phase Chemical Mechanisms in Laminar Premixed Flames. <b>Somesh P. Roy</b> and D. C. Haworth. Combustion Science and Technology. 188 (2016) 1021-1053.
2015	Development of High Order $P_N$ Models for Radiative Heat Transfer in Special Geometries and Boundary Conditions. W. Ge, M. F. Modest, <b>S. P. Roy</b> . Journal of Quantitative Spectroscopy and Radiative Transfer. 172 (2015) 98-109.
2015	Dynamics of Flow–Soot Interaction in Wrinkled Nonpremixed Ethylene-Air Flames. P. G. Arias, V. R. Lecoustre, <b>S. P. Roy</b> , D. C. Haworth, H. G. Im, A. Trouvé. Combustion Theory and Modeling. 19 (2015), 568-586.
2014	Implementation of High Order Spherical Harmonics Methods for Radiative Heat Transfer on OpenFOAM. W. Ge, R. Marquez, M. F. Modest, <b>S. P. Roy</b> . Journal of Heat Transfer. 137 (2014), 052701.
2014	Development of High Fidelity Soot Aerosol Dynamics Models using Method of Moments with Interpolative Closure. <b>S. P. Roy</b> , P. G. Arias, V. R. Lecoustre, D. C. Haworth, H. G. Im, A. Trouvé. Aerosol Science and Technology. 48 (2014), 379-391.

- 2014 | Direct Numerical Simulations of Non-premixed Ethylene-Air Flames: Local Flame Extinction Criterion. V. R. Lecoustre, P. G. Arias, **S. P. Roy**, H. G. Im, T. F. Lu, D. C. Haworth, A. Trouvé. *Combustion and Flame*. 161 (2014), 2933-2950

### Publications: Peer-reviewed Conference Proceedings

- June, 2017 | Monte Carlo Simulation for Radiative Transfer in a High-pressure Industrial Gas Turbine Combustion Chamber. T. Ren, M. F. Modest, **S. Roy**. ASME 2017 Summer Heat Transfer Conference, SHTC - 2017. Bellevue, WA, USA.
- May, 2017 | Application of High-order Spherical Harmonics Methods for Radiative Transfer in Simulation of a Turbulent Jet Flame. W. Ge, T. Ren, M. F. Modest, **S. Roy**, and D. C. Haworth. 7<sup>th</sup> ICHMT International Symposium on Advances in Computational Heat Transfer. Napoli, Italy.
- June, 2016 | Multiphase Radiative Heat Transfer Calculations in High-pressure Spray Combustion. **S. P. Roy**, W. Ge, J. Cai, and M. F. Modest. 8<sup>th</sup> International Symposium on Radiative Transfer, RAD-16. Cappadocia, Turkey.
- June, 2016 | Monte Carlo Modeling of Radiative Transfer in a Pulverized Coal Jet Flame. B. Wu, **S. P. Roy**, M.F. Modest, and X. Zhao. 8<sup>th</sup> International Symposium on Radiative Transfer, RAD-16. Cappadocia, Turkey.
- May, 2015 | Photon Monte Carlo Method for Radiation Calculations in Spray Combustion. **S. P. Roy**, J. Cai, and M. F. Modest. 6<sup>th</sup> ICHMT International Symposium on Advances in Computational Heat Transfer. Piscataway, NJ, USA.
- May, 2015 | Computational Cost and Accuracy Comparison of Radiation Solvers with Emphasis on Combustion Simulations. **S. P. Roy**, J. Cai, W. Ge, and M. F. Modest. 6<sup>th</sup> ICHMT International Symposium on Advances in Computational Heat Transfer. Piscataway, NJ, USA.

### Other Conferences

- April, 2017 | Improvements to Photon Monte Carlo Radiation Solver for Combustion Simulations **S. Roy**, S. Weise, A. Gupta, M. Modest, C. Hasse, D. Haworth The 16<sup>th</sup> International Conference on Numerical Combustion, Society for Industrial and Applied Mathematics. Orlando, USA.
- April, 2017 | Soot and Spectral Radiation Modeling for a High-Pressure Turbulent Spray Flame. S. Ferreyro Fernandez, , C. Paul, A. Sircar, A. Imren, D. C. Haworth, **S. Roy**, M. F. Modest. 10<sup>th</sup> U. S. National Combustion Meeting. College Park, MD, USA.
- April, 2017 | Modelling Radiative Heat Transfer and Turbulence-Radiation Interactions in Engines. C. Paul, A. Sircar, S. Ferreyro-Fernandez, A. Imren, D.C. Haworth, **S. Roy**, W. Ge, M.F. Modest. 10<sup>th</sup> U. S. National Combustion Meeting. College Park, MD, USA.
- April, 2017 | Soot and Spectral Radiation Modeling in ECN Spray A and in Engines. D.C. Haworth, S. Ferreryo-Fernandez, C. Paul, A. Sircar, A. Imren, **S.P Roy**, W. Ge, M.F. Modest. International Multidimensional Engine Modeling Users Group Meeting at the SAE Congress, Detroit, MI, USA.

- April, 2017 Radiative Heat Transfer Modelling in a Heavy-Duty Diesel Engine. C. Paul, A. Sircar, S. Ferreyro-Fernandez, A. Imren, D.C. Haworth, **S. Roy**, W. Ge, M.F. Modest. 16<sup>th</sup> International Conference on Numerical Combustion, SIAM. Orlando, FL, USA.
- April, 2017 Turbulence Radiation Coupling in Boundary Layers of Heavy-duty Diesel Engines. A. Sircar, C. Paul, S. Ferreyro-Fernandez, A. Imren, D.C. Haworth, **S. Roy**, W. Ge, M.F. Modest. 16<sup>th</sup> International Conference on Numerical Combustion, SIAM. Orlando, FL, USA.
- March, 2016 Radiative Heat Transfer and Turbulence-Radiation Interactions in a Heavy-Duty Diesel Engine. C. Paul, A. Sircar, A. Imren, S. Ferreyro-Fernandez, **S.P Roy**, W. Ge, D.C. Haworth, M.F. Modest. 2016 Spring Technical Meeting of Eastern States Section of the Combustion Institute. Princeton, NJ, USA.
- May, 2015 Radiative Heat Transfer Under Engine-Relevant Conditions. **S. P. Roy**, J. Cai, W. Ge, S. Ferreyro-Fernandez, A. Sircar, D.C. Haworth and M.F. Modest. 9<sup>th</sup> U.S. National Combustion Meeting. Cincinnati, USA.
- April 2015 Modeling Radiative Heat Transfer in Engines. D.C. Haworth, **S.P Roy**, J. Cai, A. Sircar, A. Imren, M.F. Modest. International Multidimensional Engine Modeling Users Group Meeting at the SAE Congress, Detroit, MI
- Nov, 2013 A Study of Turbulence-Chemistry-Soot-Radiation Interaction in Luminous Turbulent Jet Flames. **Somesh P. Roy** and D. C. Haworth. 66<sup>th</sup> Annual Meeting of the American Physical Society–Division of Fluid Dynamics. Pittsburgh, USA.
- August, 2013 Computational Diagnostics of Wrinkled Nonpremixed Flame Extinction at Different Pressures. V. R. Lecoustre, P. G. Arias, **S. P. Roy**, H. G. Im, T. F. Lu, D. C. Haworth, A. Trouvé. 7<sup>th</sup> International Symposium on Scale Modeling (ISSM7). Hirosaki, Japan.
- June, 2013 High-Fidelity Simulations of Sooting Diffusion Flames Using the Method of Moments with Interpolative Closure. P.G. Arias, **S. Roy**, V. Lecoustre, H.G. Im, D. Haworth, A. Trouvé, Z. Luo, T. F. Lu. 6<sup>th</sup> European Combustion Meeting. Lund, Sweden.
- May, 2013 Direct Numerical Simulations of Diffusion Flame Extinction at Different Pressures. Vivien R. Lecoustre, Paul G. Arias, **Somesh Roy**, Z. Luo, Dan C. Haworth, Hong G. Im, Tianfeng F. Lu, Arnaud Trouvé. 8<sup>th</sup> U.S. National Combustion Meeting. Salt Lake City, USA.
- April, 2013 An Assessment of Gas-Phase Mechanisms in Sooting Laminar Premixed Ethylene Flames using a Discrete Sectional Method. **Somesh P. Roy** and D. C. Haworth. 14<sup>th</sup> International Conference on Numerical Combustion, Society for Industrial and Applied Mathematics. San Antonio, USA.
- April, 2013 A Computational Study of Turbulent Nonpremixed Sooting Flames using a High Order Method of Moments. P.G. Arias, V.R. Lecoustre, **S. Roy**, W. Wang, Z. Luo, D.C. Haworth, H.G. Im, T.F. Lu, K.L. Ma, R. Sankaran, A. Trouvé. 14<sup>th</sup> International Conference on Numerical Combustion, Society for Industrial and Applied Mathematics. San Antonio, USA.
- April, 2013 Simulations of Axisymmetric Coflow Laminar Diffusion Flames. A. Dasgupta, **S.P. Roy**, and D.C. Haworth. 14<sup>th</sup> International Conference on Numerical Combustion, Society for Industrial and Applied Mathematics. San Antonio, USA.

March 2011	An Assessment of Gas-Phase Mechanisms in Sooting Laminar Premixed Ethylene Flames using a Discrete Sectional Method. <b>Somesh P. Roy</b> and D. C. Haworth. 7 <sup>th</sup> U.S. National Combustion Meeting. Atlanta, USA.
March, 2011	Direct Numerical Simulation of Temporally Evolving Luminous Jet Flames with Detailed Fuel and Soot Chemistry. P.G. Arias, V.R. Lecoustre, <b>S. Roy</b> , W. Wang, Z. Luo, D.C. Haworth, H.G. Im, T.F. Lu, K.L. Ma, R. Sankaran, A. Trouvé. 7 <sup>th</sup> U.S. National Combustion Meeting. Atlanta, USA.
May, 2009	Soot Modeling in Laminar Flames using a Discrete Sectional Method. <b>Somesh P. Roy</b> , R. S. Mehta, and D. C. Haworth. 6 <sup>th</sup> U.S. National Combustion Meeting. Ann Arbor, USA.

### Professional Service

Session Chair	16 <sup>th</sup> International Conference on Numerical Combustion, SIAM, Orlando, FL, USA. April, 2017
	8 <sup>th</sup> International Symposium on Radiative Transfer, RAD-16, Cappdocia, Turkey. June 2016
Reviewer (Conference Proceedings)	7 <sup>th</sup> ICHMT International Symposium on Advances in Computational Heat Transfer. Napoli, Italy. May 2017
	8 <sup>th</sup> International Symposium on Radiative Transfer, RAD-16, Cappdocia, Turkey. June 2016
	6 <sup>th</sup> ICHMT International Symposium on Advances in Computational Heat Transfer. Piscataway, NJ, USA. May 2015
Reviewer (Journals)	Aerosol Science and Technology Combustion and Flame Combustion Science and Technology Fire Safety Journal Fuel Fuel Processing Technology Journal of Heat Transfer Journal of Quantitative and Spectroscopy Radiative Transfer International Journal of Thermal Sciences