

Christopher W. Lautenberger, PhD, PE

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Current Positions

Principal Engineer, Reax Engineering, Inc. – Berkeley, CA

Instructor – Department of Fire Protection Engineering, California Polytechnic State University – San Luis Obispo

Education

BS – Mechanical Engineering, Worcester Polytechnic Institute, 2000

MS – Fire Protection Engineering, Worcester Polytechnic Institute, 2002

- Thesis topic: Computational fluid dynamics (CFD) modeling of flames

PhD – Mechanical Engineering, University of California, Berkeley, 2007

- Major field: Combustion
- Minor fields: Wildland Fire Science and Fluid Mechanics
- Dissertation topic: Computational modeling of solid-phase pyrolysis, combustion, and flammability

Professional Engineer Licensure

State of California, Licensed Professional Engineer # FP1676, Fire Protection Engineering

Fire Training

California State Fire Marshal – Fire Investigation IA

National Wildfire Coordinating Group (NWCG) – Introduction to Wildland Fire Behavior (S-190)

National Wildfire Coordinating Group (NWCG) – Intermediate Wildland Fire Behavior (S-290)

Overview

Chris Lautenberger received an MS in Fire Protection Engineering from Worcester Polytechnic Institute (WPI) with a thesis related to computational fluid dynamics modeling of fires, and a PhD in Mechanical Engineering (major area: Combustion) from the University of California at Berkeley with a dissertation related to materials' flammability and fire modeling. Before joining Reax Engineering, his work experience included fire litigation support as an independent consultant as well as building code consulting and performance-based design of fire and life safety systems at Arup Fire (San Francisco, CA) and Code Consultants, Inc. (St. Louis, MO). Dr. Lautenberger teaches a graduate course in Fire Dynamics in the Department of Fire Protection Engineering at California Polytechnic State University in San Luis Obispo. His research interests include materials' flammability and pyrolysis, ignition and flame spread, computer fire modeling, and fire development.

As a licensed Fire Protection Engineer, Dr. Lautenberger's work combines real-world Fire Protection Engineering experience, including knowledge of fire/building codes and related standards, with technical aspects of fire litigation and Fire Protection Engineering such as fire dynamics, combustion, heat transfer, fluid mechanics, thermodynamics, flammability, ignition, and fire spread. With 12+ years of experience applying fire models in support of scientific research, building design, and fire litigation, one of Lautenberger's areas of specialization is modeling of fires and related phenomena, including: smoke, heat, and toxic species generation and transport; sprinkler and smoke detector activation; turbulent flames; solid-phase pyrolysis/combustion processes; piloted and auto ignition of combustible solids; ignition of fuel beds by heated particles, sparks, and fire brands; and flame spread and fire growth.

Experience

8/08 – present

Reax Engineering Inc. Berkeley, CA *Founding Partner and Principal Engineer*

Representative activities:

- Fire protection engineering – design of fire and life safety systems, performance-based design
- Fire dynamics analyses – flames & plumes, flashover, glass breakage, etc.
- Forensic fire reconstruction, fire development modeling, wildland fire modeling
- Fire litigation support – theory, analysis, modeling, codes & standards, failure analysis
- Modeling of smoke detector activation, heat detector activation, and sprinkler activation
- Determination of time to untenability or incapacitation by smoke or heat
- Prediction of smoke and heat release rates
- Materials and product flammability assessment – ignition, burning, flame spread
- Material pyrolysis property estimation from small-scale fire test data
- Computational fluid dynamics, fire and smoke modeling, heat transfer analysis
- Sizing of smoke exhaust systems
- Fire inspections/origin and cause analyses

Selected recent and ongoing activities:

- Development of a comprehensive three-dimensional computational model for heat release and emissions from smoldering combustion
- Development of a generalized wildland fire propagation model to simulate ignition and spread potential for wildland fires
- Calculation of trajectories and potential for metallic particles allegedly generated by clashing between aluminum and copper conductors to ignite a wildland fire
- Analysis of burn incident allegedly involving unvented ethanol-fueled decorative fireplace
- Flammability assessment of acrylic baby blanket
- Analysis of ignition and initial spread of a wildland fire allegedly ignited by metallic particles generated by conductor clashing
- Origin determination for fatal alleged arson fire (Calcasieu Parish, Louisiana)
- Analysis of residential LPG explosion and alleged arson fire
- Analysis of Wildland Urban Interface fire hazards in proposed subdivision (St. Helena, CA)
- Peer review of performance-based structural fire engineering design at a large Casino
- Thermo-chemical analysis and heat transfer modeling of biomass torrefaction (low temperature pyrolysis) reactor
- Calculation of Light Rail Vehicle heat release rates in the San Francisco Central Subway using fire growth modeling and fire testing (San Francisco, CA)
- Development of code compliance and fire protection strategy for rack storage of flammable liquid/aerosol storage in multipurpose warehouse (Reno, NV)
- Calculation of trajectories, temperatures at landing, and propensity of metal particles for igniting a wildland fire (Woodland, CA)
- Fire modeling and sprinkler activation calculations for carpet warehouse fire (Oakland, CA)
- Analysis of Wildland Urban Interface (WUI) fire considerations for proposed subdivision and development of a request for alternate means of protection (Oakland, CA)
- Modeling smoke and heat detector activation to develop a request for alternate means of protection at a large theater (Cincinnati, OH)
- Analysis of wildland fires ignited by exhaust particles from a locomotive (Melbourne, Australia)
- Application of wind and wildland fire modeling to develop a California wildland fire threat map in conjunction with California Public Utilities Commission (CPUC) proceedings
- Detailed CFD modeling of fluid flow and heat transfer in a biochar reactor
- Fire reconstruction for fatal apartment fire: inter-apartment fire spread, time to smoke detector activation, identification of building code issues (Carrboro, NC)
- Origin determination for alleged arson fire (Modesto, CA)
- Analysis of fire code issues related to residential gas explosion (Las Vegas, NV)
- Fire modeling in fatal apartment fire: fire reconstruction, calculation of glass breakage and smoke detector activation times in apartment of origin and adjacent apartments (Salem, OR)

- Thermodynamic analysis of non-traditional methods for carbon capture and sequestration
 - Sizing the required atrium smoke exhaust rate in the new Student Union Building at San Jose State University (San Jose, CA)
 - Computational Fluid Dynamics (CFD) modeling of blast wave
 - Design of FM-200 clean agent fire suppression system for PG&E substation (San Mateo, CA)
 - Determination of fire origin in camper van fire
 - Fire modeling and reconstruction in single family home – determination of smoke detector activation time and conditions at activation (Los Angeles, CA)
 - Development of a model for ignition of HEPA filters by embers at the Hanford nuclear waste treatment plant (Richland, WA)
- 12/10 – present **California Polytechnic State University, San Luis Obispo** *Instructor*
- Fire Protection Engineering Instructor in Cal Poly’s new (Fall 2010) MS program
 - Teaching responsibilities include FPE 502 Fire Dynamics and FPE 504 Fire Modeling
- 12/07 – 2/11 **University of California, Berkeley** *Post Doctoral Researcher*
- Conducted research on NSF Grant 0730556, “Tackling CFD Modeling of Flame Spread on Practical Solid Combustibles”
 - Assessed predictive capabilities of Fire Dynamics Simulator (FDS) for simulating flame spread and fire growth in buildings
 - Modified subroutines to improve predictive capabilities of FDS for flame spread modeling
 - Developed pyrolysis model and material property estimation techniques needed to simulate the pyrolysis of real-world solid fuels
 - Developed computer model for ignition of fuel beds by hot particles and fire brands to predict ignition of fuel beds and initiation of spot fires
- 1/03 – 8/08 **Independent technical consultant for fire-related litigation and research** Berkeley, CA
- Provided litigation support services for several fire-related cases involving explosions, wildland fire behavior, ignition by embers, compartment/structure fires, and vehicle fires
 - Developed several FDS models in support of expert witness testimony, including fire growth, toxic species (carbon monoxide) production, and smoke detector activation
 - Critically analyzed FDS models developed by other experts to identify weaknesses
- 1/02 – 6/08 **Arup Fire** San Francisco, CA *Fire Protection Engineer*
- Assisted clients with fire safety design and achieving code compliance or performance-based solutions for hospitals, casinos, malls, libraries, schools, museums, airports, office buildings
 - Performed egress analyses to determine required exit capacity and estimate Required Safe Egress Time (RSET) in proposed buildings
 - Applied FDS to simulate smoke and heat transport from fires in proposed buildings to determine the available safe egress time (ASET)
 - Developed and programmed a CFAST-based Monte-Carlo fire simulator
 - Performed FDS simulations of flame spread and fire growth in a rail vehicle and used full-scale experimental data to calibrate the model
- 10/00 – 12/01 **FM Global Research** Norwood, MA
- Examined existing soot formation and oxidation models in the literature and used this research to postulate a new engineering soot model that is compatible with FDS
 - Worked with FM Global and NIST personnel to add this new model for soot formation and oxidation to FDS, and performed simulations of laminar and turbulent diffusion flames
- 5/00 – 8/00 **Code Consultants, Inc.** Saint Louis, MO
- Responsible for examining proposed building designs for compliance with relevant codes
 - Performed engineering analyses to support equivalencies

Dissertation and Thesis

- 1/03 – 12/07 **Ph. D. Dissertation** *University of California, Berkeley*
- Developed a pyrolysis/material decomposition model (Gpyro) to simulate the gasification, pyrolysis, and combustion of condensed-phase fuels
 - Developed a novel optimization technique that uses a genetic algorithm to extract the material pyrolysis properties needed for simulation of solid-phase pyrolysis from bench-scale fire tests
 - Performed FDS-based simulations of ignition, flame spread, and fire growth in normal and reduced gravity environments as part of a NASA-sponsored project
- 9/00 – 12/01 **MS Thesis** *Worcester Polytechnic Institute*
- Developed a novel model for soot formation/oxidation in non-premixed flames
 - Implemented model in FDS to calculate soot formation and flame radiation
- 8/98 – 5/99 **Major Qualifying Project (MQP)** *Worcester Polytechnic Institute*
- Developed an experimental program and ran several real-scale room/corner fire tests in WPI's room calorimeter to evaluate the flame spread characteristics of composite wall linings

Peer Reviewed Publications

1. Lautenberger, C., de Ris, J., Dembsey, N.A., Barnett, J.R. & Baum, H.R., "A Simplified Model for Soot Formation and Oxidation in CFD Simulation of Non-premixed Hydrocarbon Flames," *Fire Safety Journal* **40** 141-176 (2005).
2. Lautenberger, C., Zhou, Y.Y. & Fernandez-Pello, A.C., "Numerical Modeling of Convective Effects on Piloted Ignition of Composite Materials," *Combustion Science and Technology* **177** 1231-1252 (2005).
3. Lautenberger, C. & Fernandez-Pello, A.C., "Approximate Analytical Solutions for the Transient Mass Loss Rate and Piloted Ignition Time of a Radiatively Heated Solid in the High Heat Flux Limit," *Fire Safety Science* **8** 445-456 (2005).
4. Lautenberger, C., Rein, G. & Fernandez-Pello, A.C., "Application of a Genetic Algorithm to Estimate Material Properties for Fire Modeling from Bench-Scale Fire Test Data," *Fire Safety Journal* **41** 204-214 (2006).
5. Rein, G., Lautenberger, C., Fernandez-Pello, A.C., Torero, J.L. & Urban, D.L., "Application of Genetic Algorithms and Thermogravimetry to Determine the Kinetics of Polyurethane Foam in Smoldering Combustion," *Combustion and Flame* **146** 95-108 (2006).
6. Rich, D., Lautenberger, C., Torero, J.L., Quintiere, J.G. & Fernandez-Pello, C., "Mass Flux of Combustible Solids at Piloted Ignition," *Proceedings of the Combustion Institute* **31** 2653-2660 (2007).
7. Kwon, J.-W., Dembsey, N.A., & Lautenberger, C.W., "Evaluation of FDS v4: Upward Flame Spread," *Fire Technology* **43** 255-284 (2007).
8. Avila, M.B., Dembsey, N.A., Kim, M.E., Lautenberger, C., & Dore, C., "Fire Characteristics of Polyester FRP composites with Different Glass Contents," *Composites Research Journal* **2** 1-14 (2008).
9. Lautenberger, C., Kim, E., Dembsey, N. & Fernandez-Pello, C., "The Role of Decomposition Kinetics in Pyrolysis Modeling – Application to a Fire Retardant Polyester Composite," *Fire Safety Science* **9** 1201-1212 (2008).
10. Dodd, A.B., Lautenberger, C. & Fernandez-Pello, A.C., "Numerical Examination of Two-Dimensional Smolder Structure in Polyurethane Foam," *Proceedings of the Combustion Institute* **32** 2497-2504 (2009).
11. Lautenberger, C. & Fernandez-Pello, A.C., "Generalized Pyrolysis Model for Combustible Solids," *Fire Safety Journal* **44** 819-839 (2009).
12. Lautenberger, C. & Fernandez-Pello, A.C., "A Model for the Oxidative Pyrolysis of Wood," *Combustion and Flame* **156** 1503-1513 (2009).
13. Hadden, R., Scott, S., Lautenberger, C., & Fernandez-Pello, A.C., "Ignition of Combustible Fuel Beds by Hot Particles: an Experimental and Theoretical Study," *Fire Technology* **47** 341-355 (2011).
14. Fereres, S., Lautenberger, C., Fernandez-Pello, C., Urban, D.L., & Ruff, G.A., "Mass Loss Rate at Ignition in Reduced Pressure Environments," *Combustion and Flame* **158** 1301-1306 (2011).
15. Lautenberger, C. & Fernandez-Pello, C., "Optimization Algorithms for Material Pyrolysis Property Estimation," *Fire Safety Science*, in press (2011).
16. Dodd, A.B., Lautenberger, C., & Fernandez-Pello, A.C., "Computational Modeling of Smolder Combustion and Spontaneous Transition to Flaming," *Combustion and Flame*, in press (2011).

Book Chapters

1. Lautenberger, C., Torero, J.L. & Fernandez-Pello, A.C., "Understanding Materials Flammability," in *Flammability Testing of Materials Used in Construction, Transport and Mining*, Edited by V. Apte, Woodhead Publishing, Cambridge, UK pp. 1-21, 2006.
2. Lautenberger, C. & Fernandez-Pello, A.C., "Pyrolysis Modeling, Thermal Decomposition, and Transport Processes in Combustible Solids," in *Transport Phenomena in Fires*, Edited by M. Faghri and B. Sunden, WIT Press, Billerica, MA pp. 209-248, 2008.
3. Lautenberger, C. & Fernandez-Pello, A.C., "Spotting Ignition of fuel beds by firebrands," in *Computational Methods and Experimental Measurements XIV*, Edited by C.A. Brebbia and G.M. Carlomango, WIT Press, Billerica, MA pp. 603-612, 2009.
4. Lautenberger, C. & Hostikka, S., "Large Scale Fire Modeling," in *Flame Retardancy of Polymeric Materials*, Second Edition, Edited by C.A. Wilkie and A.B. Morgan, Marcel Dekker pp. 551 – 585, 2010.

Selected Conference Publications and Technical Reports

1. Beyler, C., Hunt, S., Lattimer, B., Iqbal, N., Lautenberger, C., Dembsey, N., Barnett, J., Janssens, M., & Dillon, S. "Prediction of ISO 9705 Room/Corner Test Results". United States Department of Transportation. United States Coast Guard Research and Development Center. Washington, DC. 1999.
2. Lautenberger, C., Stevanovic, A., Rich, D., & Torero, J., "Effect of Material Composition on Ignition Delay of Composites," *Composites 2003*, Anaheim CA, October 2003.
3. Lautenberger, C., Stevanovic, A., Rich, D., Torero, J. & Fernandez-Pello, A.C., "An Experimental and Theoretical Study on the Ignition Delay Time of Composite Materials," *Western States Section/The Combustion Institute*, Los Angeles CA, October 2003.
4. Rein, G., Lautenberger, C., Fernandez-Pello, A.C., Torero, J.L. & Urban, D.L., "Derivation of the Kinetics Parameters of Polyurethane Foam Using Genetic Algorithms," *Fourth Joint Meeting of the US Sections of the Combustion Institute*, Philadelphia PA, March 2005.
5. Rein, G., Lautenberger, C. & Fernandez-Pello, A.C., "On the Derivation of Polyurethane Kinetics Parameters Using Genetic Algorithms and its Application to Smoldering Combustion," *Fourth International Conference on Computational Heat and Mass Transfer*, Paris France, Vol. 1 pp. 578-584, May 2005.
6. Rein, G., Lautenberger, C. & Fernandez-Pello, A.C., "Using Genetic Algorithms to Derive the Parameters of Solid-Phase Combustion from Experiments," *20th International Colloquium on the Dynamics of Explosions and Reactive Systems*, Montreal, Canada, August 2005.
7. Rich, D., Lautenberger, C., McAllister, S. & Fernandez-Pello, A.C., "Microgravity Flame Spread Rates Over Samples of Polymer and Polymer/Glass Composites," *Western States Section/The Combustion Institute*, Boise ID, March 2006.
8. Coles, A., Wolski, A., Lautenberger, C.W., & Dembsey, N.A., "Building Code Requirements for Performance Based Designs and Fire Modeling", *Composites 2006*, St. Louis, MO, October 2006.
9. Lautenberger, C., McAllister, S., Rich, D., & Fernandez-Pello, C., "Modeling the Effect of Environmental Variables on Opposed-Flow Flame Spread Rates with FDS," *International Congress on Fire Safety in Tall Buildings*, Santander, Spain, October 2006.
10. McAllister, S., Rich, D., Lautenberger, C., & Fernandez-Pello, C., "Modeling Microgravity and Normal Gravity Opposed Flame Spread over Polymer/Glass Composites," *45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, January 2007, AIAA Paper 2007-740.
11. Lautenberger, C., McAllister, S., Rich, D., & Fernandez-Pello, C., "Effect of Environmental Variables on Flame Spread Rates in Microgravity," *45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, January 2007, AIAA Paper 2007-383.
12. Chatterjee, P., de Ris, J.L., & Lautenberger, C.W., "A General Combustion Model for Radiation Dominated Non-premixed Flames," *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, 2007.
13. McAllister, S., Rich, D., Lautenberger, C., Fernandez-Pello, C. & Yuan, Z.G., "Modeling Microgravity and Normal Gravity Flame Spread Rates over Samples of Polymer and Polymer/Glass Composites," *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, April 2007.
14. Lautenberger, C. & Fernandez-Pello, C., "A Generalized Pyrolysis Model for Combustible Solids," *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, April 2007.
15. Coles, A., Wolski, A., & Lautenberger, C., "Using Fire Dynamics Simulator for Fire Growth Modeling," *Interflam 2007*, London, UK, September 2007.
16. Dembsey, N., Avila, M., Kim, E., Lautenberger, C., & Dore, C., "Fire Characteristics of Polyester FRP Composites with Different Glass Contents," *Composites & Polycon 2007* Tampa, FL, October 2007.

17. Lautenberger, C. & Fernandez-Pello, A.C., "Modeling Ignition of Combustible Fuel Beds by Embers and Heated Particles," *Forest Fires 2008*, 2008.
18. Coles, A., Lautenberger, C., Wolski, A., Smits, B., & Wong, K., "Using Computer Fire Modeling to Reproduce and Predict FRP Composite Fire Performance," *Composites & Polycon 2009*, 2009.
19. Kim, E., Dembsey, N., & Lautenberger, C., "Parameter Estimation for Pyrolysis Modeling Applied to Polyester FRP Composites with Different Glass Contents," *Fire and Materials 2009*, 2009.
20. Lautenberger, C., Wong, W., Dembsey, N., Coles, A., & Fernandez-Pello, C., "Large-Scale Turbulent Flame Spread Modeling with FDS5 on Charring and Noncharring Materials," *Fire and Materials 2009*, 2009.
21. Coles, A., Wolski, A., & Lautenberger, C., "Predicting Design Fires in Rail Vehicles," *13th International Symposium on Aerodynamics and Ventilation of Vehicle Tunnels (ISAVVT 13)*, 2009.
22. Dodd, A.B., Lautenberger, C., & Fernandez-Pello, A.C. "Numerical Modeling of Smoldering Combustion and Transition to Flaming," *Sixth US National Combustion Meeting*, University of Michigan, Ann Arbor, MI, 2009.
23. Scott, S, Hadden, R., Fereres, S., Lautenberger, C., & Fernandez-Pello, A.C., "Ignition of Combustible Fuel Beds by Embers and Heated Particles," *Western States Section/The Combustion Institute*, Irvine, CA, October 2009.
24. Fereres, S., Lautenberger, C., Fernandez-Pello, C., Urban, D., & Ruff, G., "Effect of Ambient Pressure on Mass Loss Rate at Piloted Ignition," *Western States Section/The Combustion Institute*, Boulder, CO, March 2010.
25. Lautenberger, C., Wong, W.C., Coles, A., Dembsey, N., & Fernandez-Pello, C., "Comprehensive Data Set for Validation of Fire Growth Models: Experiments and Modeling," *Interflam 2010*, Nottingham, UK, July 2010.
26. Thiry, A., Suzanne, M., Bellivier, A., Bazin, H., Coppalle, A., & Lautenberger, C., "Different Approaches for Fire Source Modeling – Application to Arcueil Experiments," *Interflam 2010*, Nottingham, UK, July 2010.
27. Dodd, A., Lautenberger, C., Fernandez-Pello, C., & Putzeys, O., "Examination of the Spontaneous Transition from Smoldering to Flaming: Comparison of Simulations and Experiments," *Interflam 2010*, Nottingham, UK, July 2010.
28. Fereres, S., Lautenberger, C., Fernandez-Pello, C., Ruff, G., & Urban, D., "Modeling the effect of ambient variables on piloted ignition of solid combustible materials," *Seventh US National Combustion Meeting*, March 2011.
29. Matala, A., Lautenberger, C., & Hostikka, S., "Direct method for estimation of pyrolysis kinetics and comparison to existing methods," *Seventh US National Combustion Meeting*, March 2011.

Selected Presentations and Invited Lectures

1. "A Practical CFD Model for Soot Formation and Flame Radiation," *International Conference on Engineered Fire Protection Design*, San Francisco, CA, June 13, 2001.
2. "Effect of Material Composition on Ignition Delay of Composites," *Composites 2003 Convention and Trade Show*, Anaheim, CA, October 2, 2003.
3. "Experimental and Theoretical Study on Ignition Delay of Composites," *Western States Section of the Combustion Institute Fall 2003 Meeting*, Los Angeles, CA, October 20, 2003.
4. "Approximate Analytical Solutions for the Transient Mass Loss Rate and Piloted Ignition Time of a Radiatively Heated Solid in the High Heat Flux Limit," *The Eighth International Symposium on Fire Safety Science*, Beijing, China, September 20, 2005.
5. "Effect of Environmental Variables on Flame Spread Rates in Microgravity," *45th AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, January 8, 2007.
6. "Generalized Pyrolysis Model for Combustible Solids," *2007 Annual Fire Conference*, National Institute of Standards and Technology, Gaithersburg, MD, April 4, 2007.
7. "Generalized Pyrolysis Model for Combustible Solids," *5th International Seminar on Fire and Explosions Hazards*, Edinburgh, UK, April 24, 2007.
8. "Generalized Pyrolysis Model for Combustible Solids," FM Global Research, Norwood, MA, June 19, 2007 (invited seminar).
9. "Pyrolysis Modeling – What Level of Accuracy is Needed to Match Current Gas-Phase Accuracy?," *The Ninth International Symposium on Fire Safety Science*, Fire Spread Modeling Workshop, Karlsruhe, Germany, September 21, 2008 (invited presentation).
10. "Estimating Material Properties for Numerical Pyrolysis Modeling from Laboratory Experiments," *The Ninth International Symposium on Fire Safety Science*, Karlsruhe, Germany, September 21, 2008 (invited presentation).
11. "The Role of Decomposition Kinetics in Pyrolysis Modeling – Application to a Fire Retardant Polyester Composite," *The Ninth International Symposium on Fire Safety Science*, Karlsruhe, Germany, September 26, 2008.

12. "Fire Growth Modeling in Buildings – Where We Are and Where We Need to Be," IIE Seminar, University of Edinburgh, Edinburgh, UK, October 30, 2008 (invited seminar).
13. "Some Unsolved Problems in Fire Dynamics: The Needed Physics and Mathematics," *Mathematical Problems in Fire Safety Engineering Joint Workshop*, Edinburgh, UK, October 31, 2008 (invited seminar).
14. "Large-Scale Turbulent Flame Spread Modeling with FDS5 on Charring and Noncharring Materials," *Fire and Materials 2009*, San Francisco, CA, January 26, 2009.
15. "Fire Growth Modeling: Small-Scale Flammability Tests to Large Scale Fire Behavior," *ASTM E5 Research Review*, Vancouver, BC, June 15, 2009 (invited presentation).
16. "Optimization Algorithms for Material Pyrolysis Property Estimation," *The Tenth International Symposium on Fire Safety Science*, College Park, MD, June 21, 2011.

Publication and Presentation Awards

- Best Paper Overall at *Composites & Polycon 2007*, Tampa, FL, October 2007 for Dembsey, N. *et al.*, "Fire Characteristics of Polyester FRP Composites with Different Glass Contents," presented by N. Dembsey.
- Best paper (second prize) at the *Fifth International Seminar on Fire and Explosion Hazards*, Edinburgh, UK, April 2007 for Lautenberger, C. & Fernandez-Pello, C., "Generalized Pyrolysis Model for Simulating Charring, Intumescent, Smoldering, and Noncharring Gasification," presented by C. Lautenberger.
- 2011 International Association for Fire Safety Science Best Thesis Award (Americas Region) for 2007 PhD Dissertation entitled "Generalized Pyrolysis Model for Combustible Solids". This IAFSS award recognizes the best research dissertation at the PhD and Masters levels in the field of fire safety science and engineering that was completed between 2007 and 2010.
- International Association for Fire Safety Science Best Paper Award (honorable mention) for 2008 paper entitled "The Role of Decomposition Kinetics in Pyrolysis Modeling – Application to a Fire Retardant Polyester Composite," by Lautenberger, C., Kim, E., Dembsey, N. & Fernandez-Pello, C. [*Fire Safety Science* **9**: 1201-1212 (2008)].

Journal Referee / Peer Review

- *Advances in Engineering Software*
- *Combustion and Flame*
- *Combustion Science and Technology*
- *Energy & Fuels*
- *Experimental Thermal and Fluid Science*
- *Express Polymer Letters*
- *Fire and Materials*
- *Fire Safety Journal*
- *Fire Safety Science* (IAFSS Symposia)
- *Fire Technology*
- *International Journal of Computational Fluid Dynamics*
- *International Journal of Wildland Fire*
- *Journal of Fire Protection Engineering*
- *Proceedings of the Combustion Institute*

Conference Advisory Boards/Technical Committees

- Member of Scientific Advisory Board for *International Congress on Combustion and Fire Dynamics*, Santander, Spain, October 2010
- Member of Technical Program Committee (Compartment Fires) for the *Tenth International Symposium on Fire Safety Science* (IAFSS Symposium), College Park, MD, June 2011

Professional Societies

- Society of Fire Protection Engineers (SFPE)
- National Fire Protection Association (NFPA)
- International Association for Fire Safety Science (IAFSS)
- American Society for Testing and Materials (ASTM)