

# PAUL DAVID RONNEY

## **RESEARCH INTERESTS**

Combustion, micro-scale power generation and propulsion, biophysics, turbulence, internal combustion engines and control systems, low-gravity phenomena, radiative transfer.

## **PROFESSIONAL EXPERIENCE**

6/00 - present: Professor, Department of Aerospace and Mechanical Engineering, University of Southern California, Los Angeles, CA. Associate Chair 8/2015 – present.

2/96 - 12/97: Payload Specialist Astronaut (Alternate) - trained for Spacelab mission MSL-1, (launched as STS-83 4/4/97 - 4/8/97, re-flew as STS-94 on 7/1/97 - 7/16/97) to conduct combustion, fluids, and materials science experiments. Served as crew communicator for experiment operations during both missions.

9/94 - 5/00: Associate Professor, Department of Aerospace and Mechanical Engineering, University of Southern California, Los Angeles, CA

9/93 - 8/94: Research Associate Professor, Department of Mechanical Engineering, University of Southern California, Los Angeles, CA

8/86 - 8/93: Assistant Professor, Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ.

11/85 - 4/86: Research Associate, Chemistry Division, U.S. Naval Research Laboratory, Washington, D.C.

9/83 - 10/85: National Research Council Resident Research Associate, NASA Lewis (Glenn) Research Center, Cleveland, OH.

8/78 - 9/79: Systems Integration Engineer, Ford Aerospace & Communications Corp., Newport Beach, CA.

## **HONORS , AWARDS, PROFESSIONAL ACTIVITIES**

Fellow, Combustion Institute

Fellow, American Society of Mechanical Engineers

Associate Fellow, American Institute of Aeronautics and Astronautics

Associate Editor, *Combustion Theory and Modelling* (1997 – present)

Member of editorial boards: *Energies* (2014 – present); *Micromachines* (2009 – present); *Progress in Energy and Combustion Science* (2002 – 2015), *Microgravity Science and Technology* (2001 – 2009); *Combustion and Flame* (2001 – 2007)

Program Co-Chair, 33<sup>rd</sup> International Symposium on Combustion, Beijing, China, August 2010

First-ever recipient of the Bernard Lewis Lectureship of the Combustion Institute, 2005.

Principal Investigator for Structure Of Flame Balls At Low Lewis-number (SOFBALL) space flight experiment on STS-83 (April 4-8, 1997), STS-94 (July 1-16, 1997) and STS-107 (January 16 – February 1, 2003) Space Shuttle missions.

Co-chair, colloquium on “New Concepts in Combustion Technology,” 29<sup>th</sup> and 30<sup>th</sup> International Symposium on Combustion, 2002 and 2004.

Member of NASA Office of Biological and Physical Research Scientific Advisory Council; Chair, Physical Sciences Subcommittee

Best poster award (out of 90), *Dynamics Days Europe 2003*, Palma de Majorca, Spain, Sept. 24-27, 2003

Institution of Mechanical Engineers (U.K.) Starley Premium Award, 1994 (for the best paper published in the *Journal of Automobile Engineering*, 1994).

Princeton Engineer's Council Excellence in Teaching Award, 1990.

National Science Foundation Presidential Young Investigator, 1987 - 1992

## **EDUCATION**

9/79 - 3/83 Massachusetts Institute of Technology, Cambridge, MA

Sc.D. in Aeronautics and Astronautics, March 1983; DuPont Fellowship, Upham Fellowship

9/78 - 6/79 California Institute of Technology, Pasadena, CA

M.S. in Aeronautics, June 1979; Guggenheim Fellowship

9/77 - 6/78 University of California, Berkeley, CA

B.S. in Mechanical Engineering, June 1978; Tau Beta Pi, Pi Tau Sigma, Phi Beta Kappa, Dean's List

9/74 - 6/77 University of California, Irvine, CA, Mechanical Engineering major

## **PUBLICATIONS**

### **Book Chapters (4)**

Ronney, P. D., "Heat-Recirculating Combustors," Chapter 10 in *Microscale Combustion and Power Generation* (Y. Ju, C. Cadou and K. Maruta, Eds.), Momentum Press LLC, New York, 2015, pp. 287-320.

Ronney, P. D., "Combustion Phenomena at Microgravity," Chapter 12 in: *Physics of Fluids in Microgravity* (R. Monti, Ed.), Gordon and Breach, Reading, U.K., 2002, pp. 371-431.

Ronney, P. D., "Premixed-Gas Flames," in: *Microgravity Combustion: Fires in Free Fall* (H. Ross, Ed.), Academic Press, London, U.K., 2001, pp. 35-82.

Ronney, P. D., "Some Open Issues in Premixed Turbulent Combustion," in: Modeling in Combustion Science (J. D. Buckmaster and T. Takeno, Eds.), Lecture Notes In Physics, Vol. 449, Springer-Verlag, Berlin, 1995, pp. 3-22.

### **Refereed Journal Publications (77) (undergraduate students underlined)**

Zhou, Z., Applebaum, S. S., Ronney, P. D., "Effect of Stoichiometric Mixture Fraction on Nonpremixed H<sub>2</sub>-O<sub>2</sub>-N<sub>2</sub> Edge-flames" submitted to *Proceedings of the Combustion Institute* (2017).

Clayton, D. B., Cha, M. S., Ronney, P. D., "Propagation and Extinction of Premixed Edge-Flames," submitted to *Proceedings of the Combustion Institute* (2017).

Fernández-Galisteo, D., Kurdyumov, V. N., Ronney, P. D., "Analysis of premixed flame propagation between two closely spaced parallel plates," *Combustion and Flame* Vol. 190 pp. 133 - 145 (2018). (DOI: 10.1016/j.combustflame.2017.11.022).

Rhodes, B. L., Ronney, P. D., DeSain, J. D., "Hydrogen Peroxide Vapor Absorption Cross Section: A Flow Cell Study Using Laser Absorption in the Near Infrared," *Chemical Physics Letters*, Vol. 692, pp. 359-363 (2018) (DOI: 10.1016/j.cplett.2017.12.053).

Davani, A. A., Ronney, P. D., "A jet-stirred apparatus for turbulent combustion experiments," *Combustion and Flame*, Vol. 185, pp. 117 - 128 (2017). (DOI: 10.1016/j.combustflame.2017.07.009).

Song, H., Wang, P., Boles, R. S., Matinyan, D., Praphanphap, H., Piotrowicz, J., Ronney, P. D., "Effects of Mixture Fraction on Edge-flame Propagation Speeds," *Proceedings of the Combustion Institute*, Vol. 36, pp. 1403 - 1409 (2017). (DOI: 10.1016/j.proci.2016.07.042).

Wang, K., Zeng, P., Ahn, J., Ronney, P. D., "Thermal Transpiration Based Pumping and Power Generation Devices," *Journal of Thermal Science and Technology*, Vol. 8, No. 2, pp. 370-379 (2013). (DOI: 10.1299/jtst.8.370)

Chen, C.-H., Ronney, P. D., "Scale and geometry effects on heat-recirculating combustors," *Combustion Theory and Modelling*, Vol. 17, pp. 888-905 (2013) (DOI: 10.1080/13647830.2013.812807)

Zeng, P., Wang, K., Ahn, J., Ronney, P. D., "A self-sustaining thermal transpiration gas pump and SOFC power generation system," *Proceedings of the Combustion Institute*, Vol. 34, pp. 3327 - 3334 (2013). (DOI: 10.1016/j.proci.2012.06.168)

- Chen, C.-H., Ronney, P. D., “Three-dimensional Effects in Counterflow Heat-Recirculating Combustors,” *Proceedings of the Combustion Institute*, Vol. 33, pp. 3285-3291 (2011). (DOI: 10.1016/j.proci.2010.06.081)
- Ahn, J., Shao, Z., Ronney, P. D., Haile, S., “A Thermally Self-Sustaining Miniature Solid Oxide Fuel Cell,” *Journal of Fuel Cell Science and Technology*, Nov. 2009. (DOI: 10.1115/1.3081425)
- Daou, J., Al-Malki, F., Ronney, P. D., “Generalised Flame Balls,” *Combustion Theory and Modelling* Vol. 13, pp. 269 – 294 (2009). (DOI: 10.1080/13647830802596447).
- Cho, J.-H., Lee, J., Lin, J., Sanford, L. N., Richards, C. D., Richards, R. F., Ahn, J., Ronney, P. D., “Demonstration of an external combustion micro-heat engine,” *Proceedings of the Combustion Institute*, Vol. 32, pp. 3099-3105 (2009). (DOI: 10.1016/j.proci.2008.07.017)
- Kuo, C.-H., Ronney, P. D., “Numerical Modeling of Heat Recirculating Combustors,” *Proceedings of the Combustion Institute*, Vol. 31, pp. 3277-3284 (2007). (DOI: 10.1016/j.proci.2006.08.082)
- Son, Y., Zoucin, G., Ronney, P. D., Gokoglu, S. “Comparison of Carbon Dioxide and Helium as Fire Extinguishing Agents for Spacecraft” *Journal of ASTM International*, Vol. 3, No. 3, (2006). (DOI: 10.1520/JAI13564)
- Cha, M. S., Ronney, P. D., “Propagation rates of non-premixed edge-flames,” *Combustion and Flame*, Vol. 146, pp. 312 – 328 (2006). (DOI: 10.1016/j.combustflame.2006.02.010)
- Shao, Z., Haile, S., Ahn, J., Ronney, P. D., Zhan, Z., Barnett, S. A., “A thermally self-sustained micro Solid-Oxide Fuel Cell with high power density,” *Nature*, Vol. 435, pp. 795 – 798 (2005). (DOI: 10.1038/nature03673)
- Wang, F., Liu, J. B., Sinibaldi, J., Brophy, C., Kuthi, A., Jiang, C., Ronney, P. D., Gundersen, M. A., “Transient Plasma Ignition of Quiescent and Flowing Fuel Mixtures,” *IEEE Transactions on Plasma Science*, Vol. 33, pp. 844 – 849 (2005). (DOI: 10.1109/TPS.2005.845251)
- Liu, J. B., Wang, F., Li, G., Kuthi, A., Gutmark, E. J., Ronney, P. D., Gundersen, M. A., “Transient plasma ignition,” *IEEE Transactions on Plasma Science*, Vol. 33, pp. 326-327 (2005). (DOI: 10.1109/TPS.2005.845906)
- Ahn, J., Eastwood, C., Sitzki, L., Ronney, P. D., “Gas-phase and catalytic combustion in heat-recirculating burners,” *Proceedings of the Combustion Institute*, Vol. 30, pp. 2463-2472 (2005). (DOI: 10.1016/j.proci.2004.08.265)
- Ronney, P. D., “Analysis of non-adiabatic heat-recirculating combustors,” *Combustion and Flame*, Vol. 135, pp. 421-439 (2003). (DOI: 10.1016/j.combustflame.2003.07.003).
- Maruta, K., Takeda, K., Ahn, J., Borer, K., Sitzki, L., Ronney, P. D., Deutschman, O., “Extinction Limits of Catalytic Combustion in Microchannels,” *Proceedings of the Combustion Institute*, Vol. 29, pp. 957-963 (2002).
- Son, Y., Ronney, P. D., “Radiation-Driven Flame Spread Over Thermally-Thick Fuels in Quiescent Microgravity Environments,” *Proceedings of the Combustion Institute*, Vol. 29, pp. 2587-2594 (2002).
- Weinberg, F. J., Rowe, D. M., Min, G., Ronney, P. D., “On thermoelectric power conversion from heat recirculating combustion systems,” *Proceedings of the Combustion Institute*, Vol. 29, pp. 941-947 (2002).
- Kagan, L., Sivashinsky, G. I., Ronney, P. D., “Activation Energy Effect on Flame Propagation in Large-Scale Vortical Flows,” *Combustion Theory and Modelling*, Vol 6, pp. 479-485 (2002).
- Ji, C., Ronney, P. D., “Modeling of Engine Cyclic Variation by a Thermodynamic Model” in: *Spark Ignition and Compression Ignition Engine Modeling* (SP-1720), Society of Automotive Engineers, 2002. Also *SAE Paper 2002-01-2736* (2002).
- Honda, L. K. and Ronney, P. D., “Mechanisms of concurrent-flow flame spread over solid fuel beds,” *Proceedings of the Combustion Institute*, Vol. 28, pp. 2793-2801 (2000).
- Nayagam, V., Balasubramaniam, R., and Ronney, P. D., “Diffusion Flame-Holes,” *Combustion Theory and Modelling*, Vol. 3, pp. 727-742 (1999).

- Liu, J.-B. and Ronney, P. D., "Premixed Edge-Flames in Spatially Varying Straining Flows," *Combustion Science and Technology*, Vol. 144, pp. 21-46 (1999).
- Ronney, P. D., "Flame Structure Modification and Quenching By Turbulence," *Combustion Science and Technology* (Japanese edition), Vol. 6 (Supplement), pp. 53-76 (1999).
- Wu, M. S., Ronney, P. D., Colantonio, R. and VanZandt, D., "Detailed Numerical Simulation of Flame Ball Structure and Dynamics," *Combustion and Flame*, Vol. 116, pp. 387-397 (1999).
- Abid, M., Wu, M. S., Liu, J. B., Ronney, P. D., Ueki, M., K. Maruta, K., Kobayashi, H., Niioka, T. and VanZandt, D. M., "Experimental and Numerical Study of Flame Ball IR and UV Emissions," *Combustion and Flame*, Vol. 116, pp. 348-359 (1999).
- Vedarajan, T. G., Buckmaster, J. D. and Ronney, P. D., "Two-dimensional Failure Waves and Ignition Fronts in Premixed Combustion," *Twenty-Seventh International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1998, pp. 537-544.
- Wu, M.-S., Liu, J. B. and Ronney, P. D., "Numerical Simulation of Diluent Effects on Flame Ball Structure and Dynamics," *Twenty-Seventh International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1998, pp. 2543-2550.
- Ju, Y., Masuya, G. and Ronney, P. D., "Effects of Radiative Emission and Absorption on the Propagation and Extinction of Premixed Gas Flames" *Twenty-Seventh International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1998, pp. 2619-2626.
- Buckmaster, J. D. and Ronney, P. D., "Flame Ball Drift in the Presence of a Total Diffusive Heat Flux," *Twenty-Seventh International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1998, pp. 2603-2610.
- Ronney, P. D., "Understanding Combustion Processes Through Microgravity Research," *Twenty-Seventh International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1998, pp. 2485-2506 (**invited paper**).
- Ronney, P. D., Wu, M. S., Pearlman, H. G. and Weiland, K. J., "Experimental Study of Flame Balls in Space: Preliminary Results from STS-83," *ALAA Journal*, Vol. 36, pp. 1361-1368 (1998).
- Ronney, P. D., "Premixed Laminar and Turbulent Flames at Microgravity," *Space Forum*, Vol. 4, pp. 49-98 (1998).
- Aldredge, R. C., Vaezi, V. and Ronney, P. D., "Premixed-Gas Flame Propagation in Turbulent Taylor-Couette Flow," *Combustion and Flame*, Vol. 115, pp. 395-405 (1998).
- Honda, L. K. and Ronney, P. D., "Effects of Ambient Atmosphere on Flame Spread at Microgravity," *Combustion Science and Technology*, Vol. 133, pp. 267-291 (1998).
- Shay, M. L. and Ronney, P. D., "Nonpremixed Flames in Spatially-Varying Straining Flows," *Combustion and Flame*, Vol. 112, pp. 171-180 (1998).
- Liu, J. B., Ronney, P. D., "Modified Fourier Transform Method for Interferogram Fringe Pattern Analysis," *Applied Optics*, Vol. 36, pp. 6231 – 6241 (1997).
- Kim, J. S., Williams, F. A., Ronney, P. D., "Diffusional-Thermal Instability of Diffusion Flames," *Journal of Fluid Mechanics*, Vol. 327, pp. 273-302 (1996).
- Lim, E. H., McIlroy, A., Ronney, P. D., Syage, J. A., "Detailed Characterization of Minimum Ignition Energies of Combustible Gases Using Laser Ignition Sources," in: Transport Phenomena in Combustion (S. H. Chan, Ed.), Taylor and Francis, 1996, pp. 176-184.
- Shy, S. S., Jang, R. H., Ronney, P. D., "Laboratory Simulation of Flamelet and Distributed Models for Premixed Turbulent Combustion Using Aqueous Autocatalytic Reactions", *Combustion Science and Technology*, Vol. 113-114, pp. 329 – 340 (1996).
- Haslam, B. D., Ronney, P. D., "Fractal Properties of Propagating Fronts in a Strongly Stirred Fluid," *Physics of Fluids*, Vol. 7, pp. 1931-1937 (1995).

- Ronney, P. D., Haslam, B. D., Rhys, N. O., "Front Propagation Rates in Randomly Stirred Media," *Physical Review Letters*, Vol. 74, pp. 3804-3807 (1995).
- Lempert, W. R., Magee, K., Ronney, P. D., Gee, K. R., Haugland, R. P., "Flow Tagging Velocimetry In Incompressible Flow Using Photo-Activated Nonintrusive Tracking Of Molecular Motion (PHANTOMM)," *Experiments in Fluids*, Vol. 18, pp. 249-257 (1995).
- Ronney, P. D., Greenberg, J. B., Zhang, Y., Roegner, E. V., "Flame Spread Over Thin Solid Fuels in Partially Premixed Atmospheres," *Combustion and Flame*, Vol. 100, pp. 474-484 (1995).
- Zhu, J. Y., Ronney, P. D., "Simulation of Front Propagation at Large Non-dimensional Flow Disturbance Intensities," *Combustion Science and Technology*, Vol. 100, pp. 183-201 (1994).
- Pearlman, H. G., Ronney, P. D., "Near-Limit Behavior of High Lewis-Number Premixed Flames in Tubes at Normal and Low Gravity," *Physics of Fluids*, Vol. 6, pp. 4009-4018 (1994).
- Pearlman, H. G., Ronney, P. D., "Self-Organized Spiral and Circular Waves in Premixed Gas Flames," *Journal of Chemical Physics*, Vol. 101, pp. 2632-2633 (1994).
- Lozinski, D., Buckmaster, J. D., Ronney, P. D., "Absolute Flammability Limits and Flame Balls in Optically Thick Mixtures," *Combustion and Flame*, Vol. 97, pp. 301-316 (1994).
- Ronney, P. D., Whaling, K. N., Abbud-Madrid, A., Gatto, J. L., Pisowicz, V. L., "Stationary Premixed Flames in Spherical and Cylindrical Geometries," *ALAA Journal*, Vol. 32, pp. 569-577 (1994).
- Ronney, P. D., "Laser versus Conventional Ignition of Flames," *Optical Engineering*, Vol. 33, pp. 510-521 (1994).
- Ronney, P. D., Shoda, M., Waida, S. T., Durbin, E. J., "Throttleless Premixed-Charge Engines: Concept and Experiment," *Journal of Automobile Engineering, (Proceedings of the Institution of Mechanical Engineers, Part D)*, Vol. 208, pp. 13-24 (1994). **This paper received the 1994 Starley Premium Award from the Institution of Mechanical Engineers (U.K.), for the best paper published in the *Journal of Automobile Engineering* in 1994.**
- Abbud-Madrid, A., Ronney, P. D., "Premixed Flame Propagation in an Optically-Thick Gas," *ALAA Journal*, Vol. 31, pp. 2179-2181 (1993).
- Greenberg, J. B., Ronney, P. D., "Analysis of Lewis Number Effects in Flame Spread," *International Journal of Heat and Mass Transfer*, Vol. 36, pp. 315-323 (1993).
- Sloane, T. M., Ronney, P. D., "A Comparison of Ignition Phenomena Modelled with Detailed and Simplified Kinetics," *Combustion Science and Technology*, Vol. 88, pp. 1-13 (1993).
- Buckmaster, J. B., Gessman, R., Ronney, P. D., "The Three-Dimensional Dynamics of Flame Balls," *Twenty-Fourth International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1992, pp. 53-59.
- Chen, R. H., Mitchell, G. B., Ronney, P. D., "Diffusive-Thermal Instability and Flame Extinction in Non-Premixed Combustion," *Twenty-Fourth International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1992, pp. 213-221.
- Shy, S. S., Ronney, P. D., Buckley S. G., Yakhot, V., "Experimental Simulation of Premixed Turbulent Combustion Using Aqueous Autocatalytic Reactions," *Twenty-Fourth International Symposium on Combustion*, Combustion Institute, Pittsburgh, 1992, pp. 543-551.
- Ronney, P. D., Shoda, M., Waida, S. T., Westbrook, C. K., Pitz, W. J., "Knock Characteristics of Liquid and Gaseous Fuels in Lean Mixtures," *Transactions of the Society of Automotive Engineers*, Vol. 100, Part 4, pp. 557-568 (1992). Also *SAE Paper No. 912311*, 1991.
- Ronney, P. D., Yakhot, V., "Flame Broadening Effects on Premixed Turbulent Flame Speed," *Combustion Science and Technology*, Vol. 86, pp. 31-43 (1992).
- Zhang, Y., Ronney, P. D., Roegner, E., Greenberg, J. B., "Lewis Number Effects on Flame Spreading Over Thin Solid Fuels," *Combustion and Flame*, Vol. 90, pp. 71-83 (1992).

- Buckmaster, J. D., Joulin, G., Ronney, P. D., "Structure and Stability of Non-adiabatic Flame Balls: II. Effects of Far-Field Losses," *Combustion and Flame*, Vol. 84, pp. 411-422 (1991).
- Abbud-Madrid, A., Ronney, P. D., "Effects of Radiative and Diffusive Transport Processes on Premixed Flames Near Flammability Limits," *Twenty Third Symposium (International) on Combustion*, Combustion Institute, 1990, pp. 423-431.
- Farmer, J. N., Ronney, P. D., "A Numerical Study of Unsteady Nonadiabatic Flames," *Combustion Science and Technology*, Vol. 73, pp. 555-574 (1990).
- Ronney, P. D., "Near-Limit Flame Structures at Low Lewis Number," *Combustion and Flame*, Vol. 82, pp. 1-14 (1990).
- Buckmaster, J. D., Joulin, G., Ronney, P. D., "Effects of Heat Loss on the Structure and Stability of Flame Balls," *Combustion and Flame*, Vol. 79, pp. 381-392 (1990).
- Ronney, P.D., Sivashinsky, G.I., "A Theoretical Study of Propagation and Extinction of Nonsteady Spherical Flame Fronts," *SIAM Journal on Applied Mathematics*, Vol. 49, pp. 1029-1046 (1989).
- Ronney, P.D., "On the Mechanisms of Flame Propagation Limits and Extinction Processes at Microgravity," *Twenty Second Symposium (International) on Combustion*, Combustion Institute, 1988, pp. 1615-1623.
- Ronney, P.D., "Effect of Chemistry and Transport Properties on Near-Limit Flames at Microgravity," *Combustion Science and Technology*, Vol. 59, pp. 123-141 (1988).
- Ronney, P.D., "Effect of Gravity on Halocarbon Flame Retardant Effectiveness," *Acta Astronautica*, Vol. 12, pp. 915-921 (1985).
- Ronney, P.D., "Effect of Gravity on Laminar Premixed Gas Combustion II: Ignition and Extinction Phenomena," *Combustion and Flame*, Vol. 62, pp. 120-132 (1985).
- Ronney, P.D., Wachman, H. Y., "Effect of Gravity on Laminar Premixed Gas Combustion I: Flammability Limits and Burning Velocities," *Combustion and Flame*, Vol. 62, pp. 107-119 (1985).

### **Patents (7)**

- Ahn, J., Ronney, P. D., "Non-Propulsive Miniature Power Device Based on Solid Oxide Fuel Cell and Combustion-Driven Thermal Transpiration Pump," U. S. Patent No. 9,196,916, November 24, 2015.
- Hsu, Y., Sapir, I., Ronney, P. D., Snyder, G. J., "Micro-combustion power system with dual path counter-flow system," U. S. Patent No. 8,614,392, December 24, 2013.
- Raphael, D., Ronney, P. D., "Detection and Suppression of Airway / Drape Fires During Surgical Procedures," U. S. Patent No. 8,505,533, August 13, 2013.
- Haile, S., Ronney, P. D., Shao, Z., "Power generator and method for forming the same," U. S. Patent No. 7,247,402, July 24, 2007.
- Cohen, A., Ronney, P. D., Frodis, U., Sitzki, L, Meiburg, E., Wussow, S., "Microcombustor and combustion-based thermoelectric microgenerator," U. S. Patent No. 6,951,456, Oct. 4, 2005 (continuation of patent No. 6,613,972).
- Cohen, A., Ronney, P. D., Frodis, U., Sitzki, L, Meiburg, E., Wussow, S., "Microcombustor and combustion-based thermoelectric microgenerator," U. S. Patent No. 6,613,972, Sept. 2, 2003.
- Durbin, E. J., Ronney, P. D., "Method and Apparatus For Force or Torque Control of a Combustion Engine," U.S. Patent No. 5,184,592, Feb. 9, 1993.

### **Invited Conference Presentations (38)**

- "A New Jet-Stirred Apparatus for Turbulent Flame and Chemical Kinetics Experiments," KAUST Research Conference on New Combustion Concepts, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia, March 6 - 8, 2017.

- “Heat Recirculating Combustors: How Lean Can We Burn? And How Small?” 2016 International Workshop on Micro Power & Energy Systems, Guangzhou Institute of Energy Conversion, Guangzhou, China, October 29-30, 2016.
- “Transient Plasma Ignition for Internal Combustion Engines,” 23<sup>rd</sup> National Conference on IC Engines and Combustion, Dec. 13 - 16, 2013, Surat, India.
- “Microscale Power Generation and Propulsion: It’s not the same as big devices made smaller,” AIAA Aerospace Sciences Meeting, Nashville, TN, January 11, 2012.
- “Micropower generation using fuels: An environmentally friendly alternative to batteries for portable power,” International Symposium on Green Technology, Kun-Shan University, Tainan, Taiwan, Nov. 5 – 6, 2009.
- “Recent Developments in Micropower Generation Using Hydrocarbon Fuel,” International Center of Excellence of Flow Dynamics, Sendai, Japan, Sept. 26 – 28, 2007.
- “Recent Developments in Micropower Generation Using Hydrocarbon Fuels,” 2<sup>nd</sup> ASME Energy Nanotechnology International Conference, Sept. 5 – 7, 2007, Santa Clara, CA
- “Microscale Power Generation and Propulsion: It’s not the same as big devices made smaller,” Korea Institute of Machinery and Materials, June 5, 2007.
- “Thermal transpiration in nanoporous materials: Prospects for micropower generation and propulsion,” Chungnam National University Micro/Nano Mechatronics Workshop, Daejeon, Korea, June 7, 2007
- “Hydrocarbon-fueled internal combustion engines: the worst form of vehicle propulsion, except for all the other forms,” Alternative Futures for the Automobile, May 23-24, 2007, Los Angeles, CA.
- “Turbulent combustion of lean hydrogen-air mixtures: what we need to know but still don’t,” NSF Workshop on Research Frontiers for Combustion in the Hydrogen Economy, Arlington, VA, March 9-10, 2006.
- Bernard Lewis Lectureship of the Combustion Institute** – presented 8 different invited 1-hour lectures to various educational and research institutions in Taiwan, Sept. 2005.
- “Some innovative applications of combustion science and technology,” Fall Technical Meeting, Combustion Institute, Western States Section, Oct. 17-18, 2005, Stanford, CA.
- “Excess Enthalpy Combustion for Microscale Power Generation,” 2<sup>nd</sup> *Zeldovich Memorial International Conference on Combustion and Detonation*, Moscow, Russia, September 2004.
- “Fuel-flexible single-chamber solid oxide fuel cells,” *DARPA Workshop on Fuel-Flexible Sustainable Microscale Power Sources*, Vail, CO, September 2004.
- “Swiss-roll thermal management systems,” *DARPA workshop on Thermal Management for Micro- and Meso-power Systems*, Chicago, IL, May 2004.
- “Thermal and Chemical Cells,” *Electric Power in Vivo Workshop and Symposium*, Los Angeles, CA, February 2004.
- “Effect of Gravity on Combustion Processes,” *Congrès Français de Mécanique*, Nice, France, Sept. 1 – 4, 2003.
- “Flame balls: Recent experimental and computational results,” *Gordon Conference on Gravitational Effects in Physico-Chemical Systems*, July 27 – 31, 2003, New London, CT.
- “Premixed-gas flames at microgravity,” *First International Symposium on Microgravity Research & Applications in Physical Sciences and Biotechnology*, Sorrento, Italy, September 10 – 14, 2000.
- “Combustion research: from earth to outer space and back,” *Environmental Molecular Sciences Symposia and First EMSL User Meeting*, Richland, Washington, July 21-24, 1999.
- “Diffusive and hydrodynamic instabilities of flames,” *Symposium on Chemical Waves, Fronts and Patterns*, Fall National Meeting, American Chemical Society, New Orleans, LA, Aug. 22-26, 1999.

“Understanding Combustion Processes Through Microgravity Research: Recent Advances and Future Challenges,” *Gordon Conference on Gravitational Effects in Physico-Chemical Systems*, June 27 – July 2, 1999, Henniker, New Hampshire.

“Instabilities and Dynamics of Front Propagation in Narrow Channels,” *Gordon Conference on Oscillations and Dynamic Instabilities in Chemical Systems*, June 6-11, 1999, Barga, Italy.

“Dynamics of Front Propagation in Narrow Channels,” *Modeling of Reactive Fronts: At the Interface of Mathematics, Physics and Chemistry*, April 19 – 21, 1999, Lyon, France.

“Understanding Combustion Processes Through Microgravity Research,” plenary lecture, 27<sup>th</sup> International Symposium on Combustion, Boulder, CO, August 2 – 7, 1998.

“Structure Modification and Quenching of Premixed Gas Flames by Turbulence,” Japan Conference on Premixed Turbulent Combustion, Tokyo, Japan, November 17, 1997.

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- X. Ma, S. Shen, J. Wongwiwat, J. Gross, P. D. Ronney, "Flame propagation in narrow channels at varying Lewis number," Fall Technical Meeting, Combustion Institute, Western States Section, Laramie, WY, October 1 - 2, 2017.
- J. Wongwiwat, P. Bhuripanyo, V. McCloyn, P. D. Ronney, "Hydrocarbon-fueled electrical power generator with no moving parts," Fall Technical Meeting, Combustion Institute, Western States Section, Laramie, WY, October 1 - 2, 2017.
- A. A. Davani, P. D. Ronney, "A new jet-stirred reactor for chemical kinetics experiments," Fall Technical Meeting, Combustion Institute, Western States Section, Laramie, WY, October 1 - 2, 2017.
- Z. Zhou, P. D. Ronney, "Effect of stoichiometric mixture fraction on hydrogen edge-flames in a counter-flow burner," Fall Technical Meeting, Combustion Institute, Western States Section, Laramie, WY, October 1 - 2, 2017.
- A. A. Davani, P. D. Ronney, "A new jet-stirred reactor for chemical kinetics investigations," 10<sup>th</sup> U.S. National Combustion Meeting, Combustion Institute, April 24 - 26, 2017, College Park, MD.
- S. Shen, X. Ma, J. Wongwiwat, J. Gross, P. Ronney, "Flame propagation in narrow channels at varying Lewis numbers," 10<sup>th</sup> U.S. National Combustion Meeting, Combustion Institute, April 24 - 26, 2017, College Park, MD.
- J. Wongwiwat, P. D. Ronney, "Catalytic combustion driven thermal transpiration pump for self- sustaining power generation devices," 10<sup>th</sup> U.S. National Combustion Meeting, Combustion Institute, April 24 - 26, 2017, College Park, MD.
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- Liu, J. B. and Ronney, P. D., "Premixed Edge-Flames in Spatially-Varying Straining Flows," Spring Technical Meeting, joint U. S. Sections, Combustion Institute, Washington, D.C., March 15-17, 1999.
- Abid, M., Sharif, J. and Ronney, P. D., "Propagating Fronts in Hele-Shaw Cells: Effects of Buoyancy and Thermal Expansion," Spring Technical Meeting, Combustion Institute, Western States Section, Berkeley, CA, March 23-24, 1998.
- Sharif, J., Abid, M. and Ronney, P. D., "Mechanisms of Premixed Gas Flame Propagation in Quasi-2D Channels," Fall Technical Meeting, Combustion Institute, Western States Section, Diamond Bar, CA, October 23-24, 1997.
- Honda, L. and Ronney, P. D., "Effects of Atmospheric Composition on Flame Spread at Microgravity," Fall Technical Meeting, Combustion Institute, Western States Section, Diamond Bar, CA, October 23-24, 1997.
- Abid, M. and Ronney, P. D., "Propagation Rates of Buoyant Chemical Fronts in Aqueous Solution," Fall Technical Meeting, Combustion Institute, Western States Section, University of Southern California, Los Angeles, CA, October 28-29, 1996.
- Sharif, J. and Ronney, P. D., "Premixed Gas Flame Propagation in a Hele-Shaw Cell," Fall Technical Meeting, Combustion Institute, Western States Section, University of Southern California, Los Angeles, CA, October 28-29, 1996.
- Liu, J. B., Ronney, P. D., "Interferometry System for  $\mu\text{g}$  Combustion Experiments," Fall Technical Meeting, Combustion Institute, Western States Section, University of Southern California, Los Angeles, CA, October 28-29, 1996.
- Lim, E. H., McIlroy, A., Ronney, P. D., Syage, J. A., "Effect of Spark Kernel Dynamics on Minimum Ignition Energies of Combustible Gases," Fall Technical Meeting, Combustion Institute, Western States Section, University of Southern California, Los Angeles, CA, October 28-29, 1996.
- Zhu, J.-Y. and Ronney, P. D., "Numerical Simulation of Buoyant Chemical Front Propagation in Hele-Shaw Flow," 6<sup>th</sup> SIAM Conference on Numerical Combustion, March 4-6, 1996, New Orleans, LA.
- Ronney, P. D., "Dynamics and Pattern Formation in Propagating Chemical Fronts in Buoyant and Turbulent Flows," 15<sup>th</sup> Dynamics Days Texas, Houston, TX, Jan. 3-6, 1996.
- Fortmeyer, J. M. and Ronney, P. D., "Radiatively-Driven Flow in Gases," 48<sup>th</sup> Annual Meeting, Division of Fluid Dynamics, American Physical Society, Irvine, CA, November 19-21, 1995.
- Honda, L. and Ronney, P. D., "Mechanisms of Concurrent-Flow Flame Spread Over Solid Fuels," Fall Technical Meeting, Combustion Institute, Western States Section, Stanford, CA, October 30-31, 1995.
- Liu, J. B., Ronney, P. D., "Robust Interferometer System for Drop Tower Experiments," SPIE International Symposium on Optical Science, Engineering, and Instrumentation, July 9-14, 1995, San Diego, CA.
- Delichatsios, M. A., Ronney, P. D., "Horizontal and Lateral Flame Spread on Solids: Closure and Diffusional Lewis Number Effects," Fall Technical Meeting, Combustion Institute, Eastern States Section, Dec. 5-7, 1994, Clearwater Beach, FL.

Ronney, P. D., Greenberg, J. B., Zhang, Y., Roegner, E. V., "Control of Fire Spread Through Ambient Atmosphere Effects," 34<sup>th</sup> Israel Conference on Aerospace Sciences, Feb. 16-17, 1994, Tel-Aviv, Israel.

Wang, Q., Ronney, P. D., "Mechanisms of Flame Propagation Limits in Vertical Tubes," Spring Technical Meeting, Combustion Institute, Eastern/Central States Section, March 15-17, 1993, New Orleans, LA.

### **Recent invited academic seminars**

University of Minnesota, November 5, 2014

University of California, San Diego, April 18, 2014

Indian Institute of Technology at Madras, Chennai, India December 20, 2013

Indian Institute of Science at Bangalore, Bangalore, India, December 19, 2013

Indian Institute of Technology at Bombay, Mumbai, India, December 17, 2013

University of California, San Diego, August 20, 2013

Syracuse University, April 6, 2012

National Cheng-Kung University, Kaohsiung, Taiwan, March 14, 2012.

National Central University, Jhongli, Taiwan, March 13, 2012

University of California, Los Angeles, February 4, 2011

Louisiana State University, November 5, 2010

University of California, Irvine, October 25, 2010

University of California, San Diego, October 11, 2010

University of California, Riverside, April 3, 2009

Purdue University, Dec. 10, 2009

University of California, San Diego, August 18, 2009

University of Notre Dame, October 16, 2007

Seoul National University, Seoul, Korea, June 8, 2007

Chungnam National University, Daejeon, Korea, June 5, 2007

Korea Institute of Machinery and Materials, June 5, 2007

Korea Advanced Institute of Science and Technology, Daejeon, Korea, June 4, 2007



## Ph.D. Students

Name	Year	Thesis Title	Status or Current Employer / Position
Mohamed Abid	1999	Instabilities of Propagating Quasi-2D Gaseous Flames and Chemical Fronts in Narrow Channels	Project manager, <a href="#">Jet Propulsion Laboratory</a> , Pasadena
Linton Honda	2001	Effects of Convection and Radiation on Flame Spread Over Solid Fuel Beds	Project manager, Boeing Inc., El Segundo, CA
Youngjin Son	2004	Transport and Chemical Effects on Flame Spread over Thick Solid Fuel Beds in Microgravity and Earth Gravity Environments	Engineer, Hyundai Corp., Korea
Jeongmin Ahn	2005	An Experimental Study of Catalytic and Non-Catalytic Reaction in Heat Recirculating Reactors and Applications to Power Generation	Associate Professor (tenured), <a href="#">Syracuse University</a>
James Kuo	2006	Numerical Modeling of Non-adiabatic Heat Recirculating Combustors	Associate Professor, National <a href="#">Kaohsiung University of Applied Science</a> , Taiwan
David Clayton	2007	Experimental Investigation of the Propagation and Extinction of Edge-Flames	Technical staff member, <a href="#">Exponent Inc.</a> , Los Angeles, CA
Seungro Lee	2008	High-Sensitivity Multidimensional Photobleaching Velocimetry	Postdoc, <a href="#">Inha University</a> , Incheon, Korea
Chien-Hua Chen	2011	Experimental and Numerical Study of Swiss-roll Combustors and Their Application in Gas Mask System	Technical staff member, <a href="#">ACT Inc.</a> , Lancaster, PA
Ashkan Davani	2018 (expected)	Modeling of jet-stirred reactors for chemical kinetics and turbulent flame experiments	Passed qualifying exam
Eugene Kong	2018 (expected)	Direct Hydrocarbon PEM Fuel Cells	Passed qualifying exam
Si Shen	2018 (expected)	Premixed-gas flame propagation in Hele-Shaw cells	Passed screening exam
Jakrapop Wongwiwat	2019 (expected)	Thermal transpiration based pumping and power generation	Passed screening exam
Brandie Rhodes	2020 (expected)	Thermal transpiration based micropropulsion for space applications	Passed qualifying exam
Zhenghong Zhou	2022 (expected)	Experimental studies of jet-stirred reactors for chemical kinetics and turbulent flame experiments	
Yang Shi	2023 (expected)	Catalytic combustion driven Shape Memory Alloy engine for robotic insect propulsion	

## UNIVERSITY AND PROFESSIONAL SERVICE

### **Courses taught**

#### USC:

AME 101 (Introduction to Mechanical Engineering and Graphics) – Fall 2005, Fall 2006, Fall 2007, Fall 2008, Fall 2009, Fall 2010 (2 sections), Fall 2011 (2 sections), Fall 2013 (2 sections); Fall 2014 (2 sections), Fall 2015 (2 sections), Fall 2016 (2 sections), Fall 2017 (2 sections)  
AME 331 (Heat Transfer) – Spring 2004, Spring 2005, Spring 2006  
AME 436 (Energy & Propulsion) – Spring 2004, Spring 2005, Spring 2006, Spring 2008, Spring 2009, Spring 2010, Spring 2011, Spring 2012, Spring 2013, Spring 2015, Spring 2016  
AME 513 (Principles of Combustion) – Fall 2012 (graduate course)  
AME 514 (Applications of Combustion) – Fall 2004, Fall 2006, Fall 2008, Spring 2011, Spring 2013, Spring 2015 (graduate course), Spring 2017  
AME 517 (Radiation heat transfer) – Fall 2003, Fall 2009 (graduate course)  
ME 310 (Thermodynamics I) – Fall 1993, Fall 1994  
ME 331 (Heat Transfer) – Spring 1994, Spring 2000, Spring 2002, Spring 2003  
ME 406 (Automotive engines) – Spring 1995, Spring 1996, Spring 1998, Spring 1999, Spring 2002  
ME 430 (Thermal systems design) – Fall 1997  
ME 436 (Energy and Propulsion) – Fall 1998, Fall 1999, Fall 2000, Fall 2001, Spring 2003  
ME 599 (Special topics in combustion) – Fall 1995, Fall 2002 (graduate course)

#### Princeton:

MAE 435 (Special Topics, Propulsion) – Fall 1986  
MAE 221 (Thermodynamics) – Spring 1987, Spring 1988, Spring 1989  
MAE 427 (Mobile Power Plants {includes automotive engines, gas turbines and rockets}) – Fall 1987, Fall 1988, Fall 1989\*, Fall 1990, Fall 1991, Fall 1992  
MAE 594 (Combustion) – Spring 1990, Spring 1991, Spring 1992, Spring 1993 (graduate course)

\*Received Princeton Engineering Council Excellence in Teaching Award for this class.

### **Micro-seminars taught (for incoming USC freshmen)**

“Internal Combustion Engines: the worst form of vehicle propulsion, except for all the other forms,”  
USC, August 18 – 19, 2016; August 20 – 21, 2015; August 21 – 22, 2014; August 22 – 23, 2013;  
August 23 – 24, 2012; August 18 – 19, 2011; August 19 – 20, 2010; August 20 – 21, 2009

### **USC Center for Excellence in Research – faculty mentoring seminars**

“Writing Compelling NSF Proposals,” September 21, 2013; September 18, 2014; September 30, 2015;  
September 15, 2016

### **Committees**

#### Conference Service

Organizer, Gallery of Fluid Motion videos, American Physical Society Division of Fluid Dynamics annual meeting, Long Beach, CA, Nov. 21 – 23, 2010.

### Invited Panelist

1<sup>st</sup> National Energy Symposium, Los Angeles, CA, June 15, 2006  
2<sup>nd</sup> National Energy Symposium, Sacramento, CA., Sept. 12, 2006  
3<sup>rd</sup> National Energy Symposium, Washington, DC., Dec. 7, 2006

### National Advisory Boards

Member, University Space Research Association Microgravity Science Council, 2000 – 2004.

### Professional Society Service

Board Member, Combustion Institute, Western States Section (1996 – present)  
Local Chair/Organizer, Spring Technical Meeting, Combustion Institute, University of Southern California, Los Angeles, CA, March 17 – 18, 2008

### University of Southern California

Future Energy and Fuels and Initiative (2005 – 2006)  
General Education Committee (1998-2000)

### Viterbi School of Engineering, USC

Ph.D. Council (2015 – 2017)  
Committee on Appointments, Promotions and Tenure (1998-2000; 2012 – present; Chair 2013)  
Engineering Faculty Council, Member (2011 – 2013, 2015, 2017 - 2019); Secretary (2012 – 2013, 2017 - 2018)  
Division of Engineering Education, Member (2009-2011)  
Chair, Instructional Laboratory Assessment Committee (2001-2003)  
Research Committee (1999-2001)

### Department of Aerospace and Mechanical Engineering, USC

Pi Tau Sigma faculty advisor (1999 – present)  
Awards Committee (2013 – present)  
Merit Review Committee (2014 – 2016)  
Faculty Search Committee (2012 – 2014)  
Ph.D. Admissions Committee (2012 – 2014)  
Students for the Exploration and Development of Space (SEDS) faculty advisor (Advising students building experiments that flew on the NASA KC-135 microgravity research aircraft) (2006 – 2008; 2011 – 2012)  
Salary Committee (1994-95)  
Seminar Committee (1995-96)  
Freshman Advisor (1997-99)

### Princeton University

Committee on Undergraduate Life 1987-88

Department of Mechanical and Aerospace Engineering, Princeton University

ASME Faculty Advisor (1986-89)  
Seminar Committee (1987-1993)  
Freshman Advisor (1987-1992)  
Junior Class Advisor (1987-1991)  
Senior Class Advisor (1987-1992)  
Undergraduate Committee (1987-1992)

**Reviewer for manuscripts submitted to**

AIAA Journal  
AIAA Journal of Propulsion and Power  
American Chemical Society Books  
Applied Energy  
Applied Mechanics Reviews  
Archivum Combustionis  
ASME Journal of Heat Transfer  
Cambridge University Press  
Chaos  
Chemical Engineering Journal  
Combustion Science and Technology  
Combustion Theory and Modelling  
Combustion and Flame  
Experiments in Fluids  
Experimental Thermal and Fluid Science  
Fire Safety Journal  
Fuel  
Industrial and Engineering Chemistry Research  
International Colloquium on the Dynamics of Explosions and Reactive Systems  
International Journal of Hydrogen Energy  
Journal of Applied Physics  
Journal of Fluid Mechanics  
Proceedings of the Royal Society of London  
Progress in Energy and Combustion Science  
Micromachines  
Microscale Thermophysical Engineering  
Microgravity Science and Technology  
National Research Council COBASE program  
Nature  
Physical Review Letters  
Physical Review E  
Physical Review Applied  
Physics of Fluids  
PowerMEMS conferences  
Proceedings of the Combustion Institute  
Scientific Reports  
SIAM Journal of Applied Mathematics  
Springer-Verlag Publishers

## **Reviewer for proposals submitted to**

French National Research Agency (l'Agence Nationale de la Recherche)  
METRANS  
National Science Foundation  
National Aeronautics and Space Administration  
Petroleum Research Foundation  
Research Grant Council of Hong Kong  
State of California Energy Innovations Small Grant Program  
Swiss National Science Foundation  
U. S. Air Force Office of Scientific Research  
U. S. Army Research Office  
U. S. Advanced Research Projects Agency - Energy (ARPA-E)  
U. S. Department of Energy  
U. S. Office of Naval Research  
U. S. State Department International Science and Technology Center  
U.S. Civilian Research and Development Foundation  
USC Center for Interdisciplinary Research

## **Honorary Societies**

Phi Beta Kappa (Liberal arts)  
Tau Beta Pi (Engineering)  
Pi Tau Sigma (Mechanical engineering)

## **Professional Societies**

Combustion Institute (Fellow)  
American Society of Mechanical Engineers (Fellow)  
American Institute of Aeronautics and Astronautics (Associate Fellow)

## **Consulting**

Liner LLP – automotive engineering intellectual property  
Federal Trade Commission – technical evaluation of claims made by a fuel additive manufacturer  
Wavetech Industries, Los Angeles, CA – internal combustion engine design  
Bingo Industries, Grand Junction, CO – combustion and heat transfer for electronic cigarettes  
Mardirossian & Associates, Inc., Los Angeles, CA – fire analysis  
Kelly, Sutter and Kendrick, P. C., Houston, TX – combustion and explosion analysis  
Irvine Sensors, Inc., Irvine, CA – microscale combustion and power generation  
Sigma-K Corp. – biomass fueled furnaces  
RTI International – microscale combustion and power generation  
MEMGen Corp., Torrance, CA – microscale combustion and power generation  
Alstom Corp., Hartford CT – laser ignition  
Greenrun Engine Co. – natural-gas engine development  
General Atomics, San Diego, CA; Flammability and deflagration hazards of CAMDS DFS (Chemical Agent Munitions Disposal System, Deactivation Furnace System)