

Dr. Steve Buckley

General Manager, Applied Systems Business Unit, Ocean Insight
buckley_sg@live.com
+1-425-894-9241 (cell)



- 1995 **Ph.D.** University of California, Berkeley
Department of Mechanical Engineering
Advisors: Prof. Robert F. Sawyer, Prof. Catherine P. Koshland, Dr. Donald Lucas
Major field: Combustion; *Minor fields:* Air Pollution, Environmental Health Sci.
Dissertation: “Laser Detection of Toxic Metals in Combustion Systems”
- 1994 **M.S.** University of California, Berkeley
Department of Mechanical Engineering
- 1991 **B.S.** Princeton University, *cum laude*
Department of Mechanical and Aerospace Engineering

Passions include: Fusion of new technologies for process improvement, new directions in science, business development, and driving growth

Areas of expertise include: Spectroscopy, combustion and energy science, lasers, laser plasmas, optics, and nanoparticle science. Commercializing new technology, go-to-market strategy. I have published in journals across the physical sciences landscape. My recent passion has been technology business development, in helping to grow Photon Machines, Inc. into an *Inc.500* company, contributing to the rapid growth of the TSI LIBS business, co-founding Lightspeed Microscopy, Inc. and leading product development at Ocean Insight.

Commercial Experience

December 2020 – present, *General Manager, Applied Systems Business Unit, Ocean Optics, Inc.* (Ocean Insight)

- Leading new business unit, delivered 40% growth in FY2021
- Full P&L responsibility, executive team and board member
- Corporate Sustainability Lead

January 2019 – January 2021, *Vice President, Product Development & Eng., Ocean Optics, Inc.* (Ocean Insight)

- Integrated worldwide engineering between Orlando, Rochester, and Shanghai teams, managing 50+ people in 3 locations
- Set up robust NPD and communication process within engineering
- Delivered new products with expected value of 5% of revenue within the first year with robust pipeline, including commencing re-engineering core product lines.
- Grew in-house engineering project revenue by 4x between Q2 2019 and Q2 2020
- Developed standard commercial contracts and process for commercial team
- Executive Team and Board of Directors

August 2018 – November 2019, *Founding CEO (until Feb. 2020) and Board Member, Lightspeed Microscopy, Inc.*

- Licensed UW patents on 3-D pathology microscope design
- Organized team, developed strategy, and led initial successful angel and VC funding efforts
- Stepped back from CEO role for Ocean Optics position, left board so investor could take seat

November 2016 – January 2019 *CEO, Flash Photonics, Inc.*

- Sales and distribution of optical and spectroscopic components. www.flash-photonics.com
- Sold to Salvo Technologies, LLC.

September 2015 – present *President, Flash Analysis, LLC*

- Consulting on real-time instrumentation and software, including LIBS, Raman, and infrared spectroscopy

- August 2017 – February 2018 *Director, Instrument Systems*, Planetary Resources, Inc.
- Hired to substantially grow the instrument team for development of novel in-space remote and *in situ* sensors.
 - Managed 7 direct reports, led proposal-writing, organized work-streams, ultimately assisted with dissolution of the department after the Company missed a funding milestone.
- May 2012 – May 2016 *Director of Market Development – Spectroscopy*, TSI, Inc.
- Leading integration of Redmond LIBS team at TSI
 - Driving to meet sales and technology development targets for LIBS
 - Developing market strategy for spectroscopy
 - Industrial, handheld, and custom LIBS system development
- 2010 – 2012 *President and Director*, Photon Machines, Inc.
- Led LIBS business unit acquired by TSI, Inc., including engineering, sales, and marketing
 - Sold laser ablation business unit to Teledyne, Inc.
 - Acquired Spectrolaser® technology from Laser Analysis Technologies Pty., Ltd. (Australia)
 - Developed LIBS intellectual property portfolio
 - Earned distinction as one of 2011's fastest-growing private companies, on *Inc.500* list
- 2006 – 2010 *Founder, Director, and Vice President*, Photon Machines, Inc.
- Design and manufacture optical instruments for diagnostics and manufacturing processes
 - Organically grown sales of this startup to \$4M annually in less than 4 years.
- 2001-2003 *President, Advance Diagnostics, Inc.*
- Laser-Induced Breakdown Spectroscopy instrument design, software, and analysis
- 1997-1998 *Engineering and Development, Solo Energy Corporation*
- Assist with the development of business and technical plan for startup company.
 - Co-author of two patents, responsible for patent filing for Company.
 - Fundraising leading to over \$5M in equity invested, represented Company on a technical basis.

Academic Experience (On leave from UCSD from July 2007 – June 2009)

- 2/17 – present *Affiliate Associate Professor, Department of Mechanical Engineering, University of Washington*
- Lectured ME 522, *Thermodynamics*, for Prof. Phil Malte (4 weeks of class)
 - Product Development lectures in MAE 395 and Boston University ME 537
 - Co-Chair, OSA Applied Industrial Spectroscopy conference, 2020 and 2021.
 - Write regular *Lasers and Optics* column for *Spectroscopy* magazine
- 10/09 – 12/18 *Founder, President, Board Member, North American Society for Laser-Induced Breakdown Spectroscopy*
- Founded Society, wrote bylaws
 - Program Chair of NASLIBS 2013 conference at SCIX
 - Federation of Analytical Chemistry and Spectroscopy Societies Advisory Board 2011-2013.
 - President 2011-2013, Board Member 2013-2017
- 11/07 – 6/09 *Associate Professor, Department of NanoEngineering, University of California, San Diego*
- Core faculty in new, interdisciplinary department
- 7/06 – 6/09 *Associate Director, Center for Energy Research, University of California, San Diego*
- Approximately \$10M / year research center directed towards energy research, including combustion, renewables, and fusion as core strengths
- 7/05 – 6/09 *Associate Professor (tenured), Department of Mechanical and Aerospace Engineering, Center for Energy Research, University of California, San Diego*
- Administered more than \$6M in federal research grants over academic career

- Graduated 10 Ph.D. and 11 Masters students, plus numerous undergraduates in 10 years of academic career
- 7/03 – 6/05 *Assistant Professor, **Department of Mechanical and Aerospace Engineering, Center for Energy Research, University of California, San Diego***
- 3/99 – 6/03 *Assistant Professor, **Department of Mechanical Engineering, University of Maryland, College Park***
- 8/01 – 6/03 *Affiliate Faculty, **Department of Fire Protection Engineering, University of Maryland, College Park***
- 7/98 – 2/99 *Senior Member of Technical Staff, **Center for Exploratory Systems and Development, Sandia National Laboratories***
- 2/98 – 7/98 *Limited-Term Staff, **Combustion Research Facility, Sandia National Laboratories***
- 12/95 – 2/98 *Postdoctoral Research Associate, **Combustion Research Facility, Sandia National Laboratories***
- 12/91 – 11/95 *Graduate Research Assistant, **Combustion Chemistry and Diagnostics Laboratory, Lawrence Berkeley National Laboratory***
- 2/90 – 3/91 *Undergraduate Research Assistant, **Princeton University Combustion Laboratory***

Consultancies

TSI Incorporated 2016-2018
Defense Advanced Research Projects Agency (DARPA) 2006-2008
Thermo-Electron, Inc. (2005-2006)
Corning, Inc. (2000-2001)
Fire litigation consulting (2001-2002)

Fellowships, Prizes, and Awards

- 2011 Inc. 500 Fastest-Growing Private Companies in America
- 2001 *National Science Foundation Early Career Award*
- 2001 Office of Naval Research Young Investigator
- 1992-1993 Air and Waste Management Association Scholarship, 1st place award
- 1991 Princeton Univ. MAE Dike Award: Best Undergraduate Independent Work
- Sigma Xi (1991 induction)
- 1990 International Gas Turbine Institute Scholarship

Book Chapter

S.G. Buckley, “**LIBS for the Analysis of Chemical and Biological Hazards.**” Chapter 13 of *Laser Induced Breakdown Spectroscopy*, J.P. Singh, S.N. Thakur, editors, Elsevier Science B.V., 2007.

Refereed Research Publications (*author names in boldface indicate Buckley students*)

1. S.S. Shy, P.D. Ronney, S.G. Buckley, V.I. Yakhot, “**Experimental Simulation of Premixed Turbulent Combustion Using Aqueous Autocatalytic Reactions,**” *Proceedings of the Combustion Institute, Vol. 24*, (1992).
2. S.G. Buckley, C.S. McEnally, R.F. Sawyer, C.P. Koshland, and D. Lucas, “**Metal Emissions Monitoring Using Excimer Laser Fragmentation-Fluorescence Spectroscopy,**” *Combustion Science and Technology*, 118: 1-3, p. 171 (1996).

3. S.G. Buckley, C.P. Koshland, R.F. Sawyer, and D. Lucas, **“A Real-Time Monitor for Toxic Metal Emissions from Combustion Systems,”** *Proceedings of the Combustion Institute*, Vol. 26, pp 2455-2462 (1996).
4. S.G. Buckley, C. Damm, W.M. Vitovec, L.A. Sgro, R.F. Sawyer, C.P. Koshland, and D. Lucas, **“Ammonia Detection and Monitoring Using Fragmentation-Fluorescence,”** *Applied Optics*, 37:36, pp 8382 - 8391 (1998).
5. A.L. Robinson, S.G. Buckley, and L.L. Baxter, **“In Situ Measurements of the Thermal Conductivity of Ash Deposits,”** *Proceedings of the Combustion Institute*, Vol. 27, pp 1727-1735 (1998).
6. S.G. Buckley, A.L. Robinson, and L.L. Baxter, **“Energetics to Energy: Combustion and Environmental Considerations Surrounding the Reapplication of Energetic Materials as Boiler Fuels,”** *Proceedings of the Combustion Institute*, Vol. 27, pp. 1317-1325 (1998).
7. A.L. Robinson, H. Junker, S.G. Buckley, G. Sclipa, and L.L. Baxter, **“Interactions Between Coal and Biomass When Cofiring,”** *Proceedings of the Combustion Institute*, Vol. 27, pp 1351-1359 (1998).
8. S.G. Buckley, H.A. Johnsen, K.R. Hencken, and D.W. Hahn, **“Laser-Induced Breakdown Spectroscopy as a Continuous Emissions Monitor for Toxic Metals in Thermal Treatment Facilities,”** *Waste Management*, 20, pp 455-462 (2000).
9. S.G. Buckley, R. Moehrle, J. Lipkin, G. Mower, L.L. Baxter, **“Combustion Properties Relevant to Cofiring of Solid Rocket Motor Washout Material,”** 5th International Symposium on Special Topics in Chemical Propulsion: Combustion of Energetic Materials, Stressa, Italy, June 2000.
10. A.L. Robinson, S.G. Buckley, L.L. Baxter, **“Experimental Measurements of the Thermal Conductivity of Ash Deposits: Part 1. Measurement Technique,”** *Energy and Fuels*, 15 (1) pp 66-74 (2001).
11. A.L. Robinson, S.G. Buckley, N. Yang, L.L. Baxter, **“Experimental Measurements of the Thermal Conductivity of Ash Deposits: Part 2. Effects of Sintering and Deposit Microstructure,”** *Energy and Fuels*, 15 (1) pp 75-84 (2001).
12. M.M. Ohadi and S.G. Buckley, **“High Temperature Heat Exchangers and Microscale Combustion Systems: Applications to Thermal System Miniaturization,”** *Experimental Thermal and Fluid Science*, 25 (5) pp 207-217 (2001).
13. B.T. Fisher, H.A. Johnsen, S.G. Buckley, D.W. Hahn, **“Temporal Gating for the Optimization of Laser-Induced Breakdown Spectroscopy Detection and Analysis of Toxic Metals,”** *Applied Spectroscopy*, 55 (10) pp 1312-1319 (2001).
14. S.G. Buckley, R.F. Sawyer, C.P. Koshland, D. Lucas, **“Laser Measurements of Lead and Lead Particulate in Flames,”** *Combustion and Flame*, 128 (4) pp 435-446 (2002).
15. P. Sivanesan, J. Sirkis, Y. Murata, and S.G. Buckley, **“Optimal Wavelength Pair Selection and Accuracy Analysis of Dual Fiber Grating Sensors for Simultaneously Measuring Strain and Temperature,”** *Optical Engineering* 41 (10) pp 2456-2463 (2002).
16. F. Ferioli, P. Puzinauskas, and S.G. Buckley, **“Laser-Induced Breakdown Spectroscopy for On-Line Engine Equivalence Ratio Measurements,”** *Applied Spectroscopy* 57 (9) pp 1183-1189 (2003).
17. J. Hybl, G. Lithgow, and S.G. Buckley, **“Laser-Induced Breakdown Spectroscopy Detection of Biological Material,”** *Applied Spectroscopy* 57(10) pp 1207-1215 (2003).
18. S. Pandetti, and S.G. Buckley, **“Molten Salt Oxidation of Chlorobenzene,”** *Combustion Science and Technology* 176 (2): pp 257-276 (2004).

19. **M. Gharavi** and S.G. Buckley, “**A Single Diode Laser Sensor for Wide Range Temperature and H₂O Concentration Measurements,**” *Applied Spectroscopy* **58** (4) pp 468-473 (2004).
20. **G.A. Lithgow**, A.L. Robinson, and S.G. Buckley, “**Ambient Measurements of Metal-Containing PM 2.5 in an Urban Environment Using Laser-Induced Breakdown Spectroscopy,**” *Atmospheric Environment* **38** (20) pp 3319-3328 (2004).
21. **M. Gharavi** and S.G. Buckley, “**Diode Laser Absorption Spectroscopy Measurement of Line Strengths and Pressure Broadening Coefficients of the Methane 2ν₃ Band at Elevated Temperatures,**” *Journal of Molecular Spectroscopy* **229** pp 78-88 (2005).
22. S.G. Buckley, “**Laser-induced breakdown spectroscopy for toxic metal emission measurements: Experimental considerations and oxygen quenching,**” *Environmental Engineering Science* **22** (2) pp 195-204 (2005).
23. **S. Heatwole**, C.P. Cadou, and S.G. Buckley, “**In situ Infrared Diagnostics in a Silicon-Walled Microscale Combustion Reactor: Initial Measurements,**” *Combustion Science and Technology* **177** (8) pp 1449-1461 (2005).
24. **G. Lithgow** and S.G. Buckley, “**Effects of Focal Volume and Spatial Inhomogeneity on Uncertainty in Single-Aerosol Laser-Induced Breakdown Spectroscopy Measurements,**” *Applied Physics Letters* **87** (1), Art. No. 011501 (2005).
25. **G. Lithgow** and S.G. Buckley, “**Influence of Particle Location Within Plasma and Focal Volume on Precision of Single-Particle LIBS Measurements,**” *Spectrochimica Acta B* **60** (7-8) pp 1060-1069 (2005).
26. J.L. Consalvi, B. Porterie, M. Coutin, L. Audoin, C. Casselman, A. Rangwala, S.G. Buckley, J.L. Torero, “**Upward Propagation over PMMA: Theory, Experiment and Numerical Modeling,**” 8th International Symposium on Fire Safety Science, Beijing, China, Sept. 18-23, 2005.
27. **F. Ferioli** and S.G. Buckley, “**Measurements of Hydrocarbons using Laser-Induced Breakdown Spectroscopy,**” *Combustion and Flame*, **144** (3) 435-447 (2006).
28. **F. Ferioli**, S.G. Buckley, and P.V. Puzinauskas, “**Real Time Measurement of Equivalence Ratio using Laser-Induced Breakdown Spectroscopy,**” *International Journal of Engine Research* **7** (6) pp 447 – 457 (2006).
29. **A. Rangwala**, S.G. Buckley, and J.L. Torero, “**Upward Flame Spread on a Vertically-Oriented Fuel Surface: The Effect of Finite Width.**” *Proceedings of the Combustion Institute* **31** (2) pp 2607-2615 (2007).
30. **C. Dumitrescu**, P.V. Puzinauskas, S. Olcmen, S.G. Buckley, and A.P. Yalin, “**Fiber-Optic Spark Delivery for Gas-Phase Laser Induced Breakdown Spectroscopy,**” *Applied Spectroscopy* **61** pp 1338-1343 (2007).
31. **E.S. Simpson**, **G.A. Lithgow**, and S.G. Buckley, “**Three-dimensional distribution of signal from single monodisperse aerosol particles in a LIBS plasma: initial measurements,**” *Spectrochimica Acta B* **62** (12) pp 1460-1465 (2007).
32. **E.M. Kommer**, P.V. Puzinauskas, and S.G. Buckley, “**The fluid dynamics of a miniature dilution tunnel for internal combustion engine aerosol measurement**” *Experimental Thermal and Fluid Science* **32** (2) pp 475-488 (2007).
33. **Z.M. Ibrahim**, F.A. Williams, S.G. Buckley, and C.Z. Twardochleb “**An acoustic-energy method for estimating the onset of acoustic instabilities in premixed gas turbine combustors,**” *Journal of Engineering for Gas Turbines and Power* **130**, 051506 (2008).

34. **A.S. Rangwala, S.G. Buckley, J.L. Torero, “Verification of the constant *B*-number assumption while modeling flame spread,”** *Combustion and Flame* **152** (3) pp 401-414 (2008).
35. **S. Heatwole, A. Veeraragavan, C. P. Cadou, and S.G. Buckley, “In-situ Species and Temperature Measurements in a Millimeter-Scale Combustor,”** *Nanoscale and Microscale Thermophysical Engineering* **13** (1), pp 54-76 (2009).
36. C.B. Stipe, B.D. Hensley, J.L. Boersema, and S.G. Buckley, “**Laser-Induced Breakdown Spectroscopy of Steel: A Comparison of Univariate and Multivariate Calibration Methods,**” *Applied Spectroscopy* **64** (2), pp 154-160 (2010).
37. Y. Zhang, G. Xiong, S. Li, Z. Dong, S.G. Buckley, S.D. Tse, “**Novel Low-Intensity Phase-Selective Laser-Induced Breakdown Spectroscopy of TiO₂ Nanoparticle Aerosols During Flame Synthesis,**” *Combustion and Flame* **160** (3), pp 725-733 (2013).
38. G. Xiong, S. Li, Y. Zhang, S.G. Buckley, and S.D. Tse, “**Phase-Selective Laser-Induced Breakdown Spectroscopy of Nanoparticle Aerosols with Secondary Resonant Excitation During Flame Synthesis,**” *Journal of Analytical Atomic Spectroscopy* **31**, 482-491 (2016). DOI: 10.1039/C5JA00186B.
39. A.J.R. Bauer and S.G. Buckley, “**Focal Point Review: Novel Applications of Laser-Induced Breakdown Spectroscopy,**” *Applied Spectroscopy*, first published online Feb 15, 2017. DOI: 10:1177/0003702817691527.

Invited talks: Seminars and Conferences

1. “Real-Time Monitoring of Toxic Metals, Chlorinated Hydrocarbons, and Ammonia in Flames and Postcombustion Gases,” University of California, San Diego, February 13, 1997
2. “Laser Methods for Real-Time, In situ Measurements of Metals in Combustion Systems,” Naval Research Laboratory, Washington, D.C. April 19, 1999.
3. “Laser Methods for Real-Time, In situ Measurements of Metals in Combustion Systems,” National Institute of Standards, Gaithersburg, MD May 11, 1999.
4. “Implementation of Laser-Induced Breakdown Spectroscopy as a Continuous Emissions Monitor for Toxic Metals,” NASA Glenn Research Center / U.S. Army Vehicle Technology Directorate, September 20, 2000.
5. “Laser-Induced Breakdown Spectroscopy for Particulate Detection, Composition, and Sizing,” University of Wisconsin, Department of Mechanical Engineering, Engine Research Center, February 12, 2001.
6. “Rapid Elemental Analysis Using Laser-Induced Breakdown Spectroscopy,” Stevens Institute of Technology, Department of Chemical, Biochemical, and Materials Engineering, February 27, 2002.
7. “Multi-Media Diagnostics Using Laser-Induced Breakdown Spectroscopy (LIBS),” University of Maryland, Department of Chemical and Nuclear Engineering, March 19, 2002.
8. “Combustion and Environmental Analysis Using Laser-Induced Breakdown Spectroscopy (LIBS),” Rutgers University, Mechanical and Aerospace Engineering Department, April 3, 2002.
9. “Combustion and Environmental Analysis Using Laser-Induced Breakdown Spectroscopy (LIBS),” University of California, San Diego, November 22, 2002.
10. “Combustion and Environmental Analysis Using Laser-Induced Breakdown Spectroscopy (LIBS),” Stanford University, Palo Alto, CA, January 9, 2003.
11. “Emerging Techniques for Real-Time, Real-World Combustion Analysis,” Chemical Engineering Seminar Series, Brigham Young University, April 10, 2003.
12. “Combustion System Analysis Using Laser-Induced Breakdown Spectroscopy,” Paper 403, 22nd International Congress on Applications of Lasers and Electro-Optics, Jacksonville, FL, October 13-16, 2003.
13. “Optical Diagnostics for Microscale Combustion Experiments,” Aerospace and Mechanical Engineering Seminar Series, University of Southern California, Dec 3, 2003.

14. "Laser-Induced Breakdown Spectroscopy for the Measurement of Aerosol Particles," Advanced Energy Technology Group Seminar Series, March 18, 2004.
15. "Laser-Induced Breakdown Spectroscopy for the Measurement of Aerosol Particles," Mechanical Engineering Seminar, San Diego State University, April 1, 2004.
16. "Measurement of Gas-Phase Hydrocarbon Concentrations Using Laser-Induced Breakdown Spectroscopy," Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) Meeting, Portland, OR, October 5, 2004.
17. "Particulate Matter and Gas Composition Measurements using LIBS," Mechanical Engineering Department Seminar, U.C. Riverside, October 13, 2004.
18. "Laser-Induced Breakdown Spectroscopy for Detection of Biological Aerosols – Potential and Perspective," PITTCON 2005, Orlando FL, Feb. 27-Mar. 4, 2005.
19. "Particulate Matter and Gas Composition Measurements using Laser-Induced Breakdown Spectroscopy," Physical Optics Corp., Torrance, CA, April 12, 2005.
20. "Particulate Matter and Gas Composition Measurements Using Practical Optical Techniques," National Energy Technology Laboratory, Morgantown, WV, June 6, 2005.
21. "Optical Methods for the Detection of Biological and Chemical Agents," Brimrose Corp., Columbia, MD, August 3, 2005.
22. "Enhanced Detection of Aerosol Particles Using Laser-Induced Breakdown Spectroscopy," European and Mediterranean Symposium on Laser-Induced Breakdown Spectroscopy, Aachen, Germany, September 6-9, 2005.
23. "(Towards) Optimal Detection of Aerosol Particles Using Laser-Induced Breakdown Spectroscopy," PacificChem 2005, Honolulu, HI, Dec 15-20, 2005.
24. "Real-Time Optical Measurements in Practical Systems," Engineering the Automotive Future Workshop, University of Alabama, Tuscaloosa, AL, January 24-25, 2006.
25. "On-line Determination of Gas and Particulate Composition Using Laser-Induced Breakdown Spectroscopy," Eastern Analytical Symposium, Somerset, NJ, Nov 13-16, 2006.
26. "Environmental and Industrial Measurements with Practical Laser Diagnostics," University of Washington Energy Seminar, Seattle, WA Nov 28, 2007.
27. "Laser-Assisted Microwave Plasma Spectroscopy (LAMPS) Performance for Solid Sample Analysis," Federation of Analytical Chemistry and Spectroscopy Societies Annual Meeting, Louisville, KY, Oct. 2009.
28. "Development of LIBS for Industrial Process Control – Perspectives and Examples," International Federation Process Analytical Chemistry Conference, Baltimore, MD, Jan. 2010.
29. "Laser Induced Breakdown Spectroscopy of Steel: A Comparison of Univariate and Multivariate Calibration Methods," International Federation Process Analytical Chemistry Conference, Baltimore, MD, Jan. 2010.
30. "LIBS in Industry: Sparks Fly," Applied Industrial Optics Conference, Tuscon, AZ, June 2010.
31. "Aluminum Sorting and Quantification with LIBS," Applied and Industrial Optics Conference, Arlington, VA, June 2013.
32. "LIBS in the Laboratory and Beyond," Applied and Industrial Optics Conference, Seattle, WA, July 2014.
33. "Unleashed: Realizing the Promise of LIBS in the Analytical World," International Conference on Laser Induced Plasma Spectroscopy and Applications, Beijing China, September 2014.
34. "The Potential for LIBS in Geochemistry," Society for Process and Wireline Analysis, San Antonio, TX, October 2014.
35. "Process Measurement Applications with an Ultra-Compact Near-Infrared Spectrometer," International Federation of Process Analytical Chemistry, Bethesda, MD, March 2017.
36. "Food Safety Testing and Analysis Using Portable Spectroscopy," (with Marco Snickers), OSA Agri-Photonics Incubator, Washington DC, May 2019.
37. "Implementation of LIBS in Industrial Environments: Sorting out Good Applications," OSA Applied and Industrial Spectroscopy Conference, Washington DC, July 2019.

38. "Machine Learning in Practical Environments," (with Teresa Nieten), SciX 2019, Palm Springs, CA, October 2019
39. "Design and Development of Industrial Instrumentation," SciX 2019, Palm Springs, CA.
40. "Getting LIBS Results Outside the Laboratory: Lessons from the Field," SciX 2021, Providence, RI, September 2021.

Non-refereed Research Publications

Academic column: *Lasers and Optics* in *Spectroscopy* magazine, 2014 to present.

Conference papers: Dr. Buckley has approximately 50 conference papers, list available upon request.

Presentations: Dr. Buckley has made over 50 conference presentations without a submitted or reviewed paper. List available upon request.

Patents (8)

U.S. Patent # 6,085,829 "Regenerator type heat exchanger", July 11, 2000. With R. Mongia, P. Neuhaus, R. Dibble

U.S. Patent # 6,141,953 "Multi-shaft reheat turbine mechanism for generating power," November 7, 2000. With R. Mongia, R. Dibble, G. Touchton

U.S. Patent # 7,202,948 "LIBS system and method for engine exhaust monitoring," February 22, 2005. With Christopher S. Baldwin and Kyle Kratzsch.

U.S. Patent # 7,969,576-B1 "Optical sensing based on wavelength modulation spectroscopy," June 28, 2011. With Mohammadreza Gharavi and Marco Borchers.

U.S. Patent # 9,140,653 "Spark emission particle detector," September 22, 2015. With Gregg Lithgow.

U.S. Patent # 9,506,869 "Handheld laser-induced breakdown spectroscopy device," November 29, 2016. With Fred Quant, Kenneth Farmer, Phillip Tan, Christopher Stipe, Erik Stockinger, and Daniel Jensen.

U.S. Patent # 9,557,216 "High Speed Spectroscopic Sensor Assembly and System," January 31, 2017. With Kenneth Farmer and Darrick Niccum.

U.S. Patent #10,088,425 "Rapid Material Analysis Using LIBS Spectroscopy," October 2, 2018. With Darrick Niccum.

Teaching and Advising

Spring 2017 *University of Washington ME 522 / Thermodynamics* (1/3 with Phil Malte)

Spring 2007: *UCSD MAE 170 / Experimental Techniques* (with F. Beg)

Spring 2007: *UCSD ENG 100L / Team Engineering Laboratory*

Winter 2007: *UCSD MAE 207 / Advanced Energy Technologies (graduate)*

Winter 2007: *UCSD ENG 100L / Team Engineering Laboratory*

Fall 2005: *UCSD MAE 118a / Non-Nuclear Energy Technologies*

Fall 2006: *UCSD ENG 100L / Team Engineering Laboratory*

Spring 2006: *UCSD MAE 170 / Experimental Techniques* (with F. Beg)

Spring 2006: UCSD ENG 100L / Team Engineering Laboratory
Winter 2006: UCSD ENG 100L / Team Engineering Laboratory
Fall 2005: UCSD MAE 118a / Non-Nuclear Energy Technologies
Fall 2005: UCSD ENG 100L / Team Engineering Laboratory
Fall 2005: UCSD MAE 1 / Introduction to Mechanical Engineering
Spring 2005: UCSD MAE 170 / Experimental Techniques (with F. Beg)
Winter 2005: UCSD MAE 211 / Introduction to Combustion (graduate)
Fall 2004: UCSD MAE 118a / Non-Nuclear Energy Technologies
Fall 2004: UCSD MAE 1 / Introduction to Mechanical Engineering (with G. Tynan)
Spring 2004: UCSD MAE 170 / Experimental Techniques (with F. Beg and P. Bandaru)
Winter 2004: UCSD CENG / MAE 210A / Graduate Fluid Mechanics I (graduate)
Winter 2004: UCSD MAE 087 / Freshman Seminar: Energy Options for the 21st Century

University of Maryland ENES 221 / Dynamics: Fall 1999, Spring 2000, Spring 2001, Fall 2001
University of Maryland ENME 707 / Combustion and Reacting Flow: Fall 2000, Fall 2002
University of Maryland HONR 209F / Our Atmosphere (seminar): Spring 2002, Spring 2003

Short Courses

1. Miniaturization of Thermal Systems. CEEE Short course Spring 2000, Fall 2000, I taught a one-hour segment.
2. Risk Analysis of Fire Scenarios. University of Poitiers / Niort, FRANCE, January 17-20, 2000, with José Torero and Carol Smidts, UMCP.
3. Combustion Heat and Mass Balances, Combustion Basics Short Course, International Incineration and Thermal Treatment Technologies Conference, New Orleans, LA, May 13, 2002.
4. Combustion Fundamentals, Combustion Basics Short Course, International Incineration and Thermal Treatment Technologies Conference, Orlando, FL, May 12, 2003.
5. Combustion Fundamentals, Combustion Basics Short Course, International Incineration and Thermal Treatment Technologies Conference, Phoenix, AZ, May 10, 2004.
6. LIBS Applications Short Course, SciX Conference, Raleigh, NC, September 2010.
7. LIBS Fundamentals and Instrumentation, NASLIBS 2011 Conference, Clearwater, FL, July 12, 2011.

Advising: Research Direction

Undergraduate

1. Scott Heatwole (UMCP Class of 2003), Infrared Spectroscopy in Microscale systems.
2. Sam Krehnbrink (UMCP Class of 2003), Programming Control for Engineering Instruments.
3. Steven O'Hara (UMCP Class of 2004), Design of a Combustion-Driven Flow Reactor.
4. Tom Serra (UMCP Class of 2004), Fabrication of Fiber Bragg Gratings.
5. David Hoffman (UCSD Class of 2005), Design and Testing of a Novel Aerosol Spectrometer.
6. Geoff Rapoport (UCSD Class of 2005), Interfacing of Tunable Diode Laser Sensors for Combustion Control.
7. Christine Lao (UCSD Class of 2007), Tunable Diode Laser Measurements of CO and CO₂.
8. Halden Oxenbol (UCSD Class of 2007), Design of a Biofuel Burner.
9. Jason Harp (UCSD Class of 2007), A Robust Liquid Fuel Vaporizer.

10. Jimmy Kerins (UCSD Class of 2007), A Robust Liquid Fuel Vaporizer.

11. Michael Gollner (UCSD Class of 2007), Combustion of Biodiesel.

Masters

1. Sivashankar Pandetti, UMCP M.S. December 2002, “Thermal Treatment of Chlorobenzene using Molten Salt Oxidation.” Thesis / research advisor.

2. Jayakumar Patil, M.S. UMCP May 2003, “Development of a Laser-Induced Breakdown Spectroscopy Based Metal Monitor and Application to Molten Salt Oxidation.” Thesis / research advisor.

3. Eric Kommer, M.S. UMCP Fall 2003, “Variations of Engine Particulate Matter in a Miniature Dilution Tunnel.” Thesis / research advisor.

4. Travis Tempel, M.S. UMCP May 2004, “Investigation of Supersonic Mixing Using Laser-Induced Breakdown Spectroscopy.” Thesis / research advisor.

5. Scott Heatwole, B.S. / M.S. UMCP August 2004, “*In situ* Infrared Diagnostics for a Microscale Combustion Reactor.” Thesis / research co-advisor with Prof. Chris Cadou.

6. Kyle Kratzsch, M.S. UMCP M.S. Fall 2004, “Effects of Temperature and Aerosol Content on Laser-Induced Breakdown Spectroscopy Detection Limits.” Thesis / research advisor.

7. Ezra Chen, B.S. / M.S. UMCP Spring 2005, “Temperature Mapping of an Acoustically-Forced Laminar Diffusion Flame Using Planar Laser Rayleigh Scattering.” Thesis / research advisor.

8. Ariel Schuger, M.S. UCSD M.S. Spring 2005, “Diode Laser Measurement of H₂O, OH, and Temperature in a Premixed Methane and Air Flame through the Application of Wavelength Modulation Spectroscopy.” Thesis / research advisor.

9. Alex Zimmerman, UCSD M.S. Summer 2006, “Quantitative Study of Laser-Induced Breakdown Spectroscopy for Equivalence Ratio Measurement in Laminar Premixed Methane-Air Flames.” Thesis / research advisor.

10. Erin Simpson, UCSD M.S. Fall 2006, “Signal Enhancement in Laser Induced Breakdown Spectroscopy of Single-Particle Aerosol Samples.” Thesis / research advisor.

11. Marco Leon, M.S. UCSD Fall 2007, CO and NO Detection in High Pressure Combustion Systems at Elevated Temperatures.

12. Jeff Yin, UCSD M.S. Fall 2009, Laser-Induced Incandescence Measurements Compared with a Scanning Mobility Particle Sizer.

Doctoral

1. Martin Christiansen, UMBC Ph.D. Fall 2001, “Spectrometer with CMOS Demodulation of Fiber Optic Bragg Grating Sensors” – I co-advised this student with Prof. Koh of UMBC. Dissertation / Research advisor. Presently: Northrup Grumman

2. Ponniah Sivaneson, UMCP Ph.D. (Physics) Spring 2002, “Fiber Bragg Grating Sensor and Demodulation System for the Simultaneous Measurement of Temperature and Strain.” Dissertation / Research advisor. Presently: Physical Optics Corporation

3. Chris Baldwin, UMCP Ph.D. Fall 2003, “Distributed Sensing for Flexible Structures Using a Fiber Optic Sensor System.” Dissertation / Research advisor. Presently: Aither Engineering, Inc.

4. Mohammadreza Gharavi, UMCP Ph.D. Fall 2004, “Infrared Optical Sensor for Combustion Diagnostics Using Wavelength Modulation Spectroscopy.” Dissertation / research advisor. Presently: Petrochemical industry

5. Francesco Ferroli, UMCP Ph.D. Summer 2005, “Experimental Characterization of Laser-Induced Plasmas and Application to Gas Composition Measurements.” Dissertation / research advisor. Subsequent employment: Postdoctoral Researcher, TU Delft
6. Ali Rangwalla, UCSD Ph.D. Spring 2006, “Flame-Spread Analysis using a Variable B-Number.” Dissertation / research advisor. Presently: Assistant Professor, Worcester Polytechnic Institute
7. Gregg Lithgow, UCSD Ph.D. Spring 2007, Laser-Induced Breakdown Spectroscopy for Aerosol Measurement. Dissertation / research advisor. Subsequent: NRC Canada, Presently: Senior Scientist, Photon Machines, Inc.
8. Zuhair Ibrahim, UCSD Ph.D. start May 2004 / expected Spring 2007, Prediction and Mitigation of Oscillatory Instabilities in Lean Premixed Combustion. (Joint with Prof. Forman Williams) Dissertation / research advisor. Presently: Exponent, Inc.
10. Andrew Effenberger. UCSD Ph.D. (Chemistry) Fall 2009. Physics of Laser-Induced Breakdown Plasmas Relevant to Hazardous Material Detection. Dissertation / research advisor. Presently: Idaho National Engineering Laboratory

Post-doctoral / Research staff

1. Mickael Coutin, (2001-2002) Post-doctoral researcher, flame spread processes, joint with Prof. José Torero, Fire Protection Engineering.
2. Ponniah Sivanesan (January 2002 –May 2002) Post-doctoral researcher, optical sensors.
3. Warren Choi (June 2002 – July 2003) Programmer.
4. Bruce Thomas (July 2003 – June 2007) Laboratory technician.
5. Mohammadreza Gharavi (February 2005 – January 2007).

Independent Study, Tutorial, Post-doc, Internship Supervision.

European Diploma Student Projects

- Guillaume Lehnasch (University of Poitiers, Diploma Student, April – September 2000)
 Thomas Schmid (Technical University Mannheim, Diploma Student, April – September 2001)
 Aurelien Most (University of Poitiers, Diploma Student, April – September 2001)
 Marco Borchers (University of Munich, Diploma Student, November 2005 – June 2006)

Research Funding

Total project funding of approximately \$6M (as PI and Co-I) since 1999. Funding sources include the National Science Foundation, National Aeronautics and Space Administration, Office of Naval Research, Department of Energy, various Air Force and Navy Laboratories, and industry.

Title	Granting Agency	Amount of Total Award (including indirect costs)	Time period of contract/grant	Role, e.g. PI, co-investigator, project leader, etc
“Towards Simultaneous Single Particle Chemical and Optical Characterization: Development of a Multi-angle Optical Scattering Module for the Aerosol Time-of-Flight	U.S. Department of Energy SBIR	Approx \$100,000	June 2010 – March 2011	PI

Mass Spectrometer”				
“Design and Development of a Comprehensive Instrument for Measurement of Aerosol Size and Elemental Composition”	National Science Foundation SBIR	\$149,765	January – November 2010	PI
“Report Improvised Explosive Devices and Respond” (RIEDAR)	Defense Advanced Projects Research Agency (subcontract from Lockheed Martin)	\$275,000	February 2007 – September 2008	Co-Investigator, total contract ~\$13M
“In Situ Elemental Detection in Spent Fuel Reprocessing Facilities using Laser-Induced Breakdown Spectroscopy (LIBS)”	Idaho National Laboratory	\$180,000	February 2007 – September 2008	PI (100%)
“IT-E3Tools: Information Technology Engineering and Environmental Education Tools”	National Science Foundation	\$1,199,743	Dec 2006 – Dec 2009	Co-Investigator Buckley (UCSD) approximately 1/3 share PI: Jeanne Ferrante (Computer Science), Co-I Silvia Mah
“Flame-Induced Window Breakage”	Schirmer Engineering, Inc.	\$11,000 gift	June 2006	PI (100%)
“Studies of Combustion Instabilities”	Solar Turbines, Inc.	Various gifts totaling ~ \$200,000	June 2004 – June 2007	PI, (60%) with Forman Williams (40%)
“Development of Fiber-Optically Coupled Combustion and Flow Sensor for IC Engines and Other Severe Environments”	National Science Foundation	\$430,474	Aug. 2004 – July 2007	Co-Investigator Buckley (UCSD) \$100,000; PI Puzinauskas and Co-Investigator Olcmen \$330,474 (University of Alabama)
“Multiplexed Sensor for Synthesis Gas Composition and Temperature”	U.S. Department of Energy	\$199,746	Sept. 2004 – Sept. 2007	PI, 100%
“NER: Novel Aerosol Spectrometer for Size and Composition of Nanoparticles”	National Science Foundation	\$116,713	Aug. 2004 – July 2005	PI, 100%
“Ultra-fast combustion emissions and performance sensor”	Von Liebig Center, UCSD	\$50,000	Sept. 2004 – Feb. 2005	PI, 100%
“Wear Debris Measurements from a Gas Turbine using LIBS”	DoD Phase II SBIR and Maryland Industrial	\$280,000	August 2003 – July 2005	PI, \$280,000 represented the University of Maryland share

	Partnerships (with Systems Planning and Analysis, Inc.)			of this contract. I transferred the management of this grant to Prof. Michael Zachariah but continued to advise students supported hereunder.
“Maritime Harbor Safety”	Naval Surface Warfare Center, Indian Head	\$850,000	Dec 2002 – Dec 2004	Co-I, left this grant with Co-I Greg Jackson when I moved to UCSD
“Wear Debris Measurements from a Gas Turbine using LIBS”	DoD Phase I SBIR (with Systems Planning and Analysis, Inc.)	\$33,000	June 2002 – May 2003	PI, 100%
“Maritime Harbor Safety”	Naval Surface Warfare Center, Indian Head	\$237,500	Jan. 2002 – Sept. 2002	Co-PI (with PI Davinder Anand)
“Ship Structural health Monitoring Using Fiber Optic Sensing”	DoD Phase II SBIR Option (with Systems Planning and Analysis, Inc.)	\$50,000	Oct 2001 – March 2002	PI, with Co-PI B. Balachandran
“Environmental Measurements for the Confined Burn Facility”	Naval Surface Warfare Center, Indian Head Division	\$50,000 (w/\$25K ONR match)	Sept. 2001 – Sept. 2002	PI, 100%
“Particle and TRI Diagnostics for Navy Vehicles and Operations”	Office of Naval Research Young Investigator	\$342,500	May 2001 – April 2005	PI, 100% Note: This award remained at University of Maryland to fund students, Buckley was funded at UCSD by a subcontract.
“CAREER: Investigation of Laser-Induced Breakdown Spectroscopy of Analysis of Airborne Particulate Matter”	National Science Foundation	\$375,000	Feb. 2001 – Jan. 2005	PI, 100% Note: This award was originally at University of Maryland and was moved to UCSD.
“Laser-Induced Breakdown Spectroscopy for Measurement of Ambient Aerosols and Source Apportionment”	Department of Energy (subcontract to Carnegie Mellon)	\$176,097	Feb. 2001 – May 2004	PI, 100%

“Material Properties Governing Concurrent Flame Spread in Microgravity”	National Aeronautics and Space Administration Microgravity Combustion Program	\$400,000	Feb. 2001 – Jan. 2005	PI Buckley, 85%, Consultant Torero 15% Note: This award was moved from the University of Maryland to UCSD.
“Ship Structural Health Monitoring Using Fiber Optic Sensing”	DoD Phase I SBIR and Maryland Industrial Partnerships (with Systems Planning and Analysis, Inc.)	\$35,000	Oct. 2000 – Aug. 2001	PI, with Co-PI B. Balachandran
“Towed Array Shape Measurement using Fiber Bragg Gratings”	DoD Phase II SBIR and Maryland Industrial Partnerships (with Systems Planning and Analysis, Inc.)	\$80,000	Oct. 2000 – May 2002	Co-PI (with PI B. Balachandran)
“Assessment of Accuracy in Single-Species and Multiplexed Tunable Diode Laser Measurements in Practical Fire Scenarios”	National Institute of Standards and Technology Building Fire Research Grant	\$67,466	Oct. 2000 – Sept 2001	PI, 100%
“Molten Salt Oxidation – Reaction Chemistry and Environmental Verification”	Naval Surface Warfare Center, Indian Head Division	\$190,791	March 2000 – Sept 2001	PI, 100%
“Accuracy and Quantification of Tunable Diode Laser Measurements in Practical Fire Scenarios”	National Institute of Standards and Technology Building Fire Research Grant	\$83,396	Oct. 1999 – Sept 2000	PI, 100%
“LIBS and Energetic Materials Project Support”	Sandia National Laboratories	\$75,000	March 1999 – Sept 1999	PI, 100%

Reviewing Activities for Journals

I have reviewed for: *The Combustion Institute, Combustion Science and Technology, Applied Optics, Applied Spectroscopy, Optics Letters, Chemical Physics Letters, Spectrochimica Acta B, Applied Physics Letters, Journal of Optics A: Pure and Applied Optics, Journal of Aerosol Science, Combustion Theory and Modeling, Combustion and Flame, Atmospheric Environment, Journal of Applied Physics, Journal of Physics: D, Chemical Engineering Journal, Chemical Engineering Science,*

Scholarly commissions and advisory panels.

Program Advisory Committee, *International Conference on Incineration and Thermal Treatment Technologies*, (2002, 2003, 2004)

- Committee critically reviews papers for acceptance, organizes short courses, recruits exhibitors, oversees finances of this annual conference.

Technical Advisory Committee, International Conference on Laser Induced Plasma Spectroscopy and Applications (2002-present)

- Committee responsible for technical oversight and location of this biannual conference

Co-Chair, “21st Century LIBS” Symposium, *Pittcon 2006*, with Rick Russo and Peter Castle, ~ 120 attendees, 20 talks.

Conference Local Chair, *5th US Combustion Meeting*, San Diego, CA, March 2007

- Organized all aspects of schedule, food, lodging, entertainment, and arrangements for combustion meeting with 427 participants, 289 oral presentations in 8 parallel sessions, and 34 poster presentations.
- Obtained National Science Foundation, Army Research Office grants, as well as corporate sponsorships from Solar Turbines, Inc., General Atomics, Cambridge Press, Taylor and Francis, and Elsevier.

Optical Society of America – Co-Chair, Applied Industrial Spectroscopy Conference, June 2020 and July 2021.

- Led startup of a new conference for the Optical Society of America (now *Optica*)
- ~ 50 talks and ~ 200 participants in inaugural year

Offices and committee memberships held in professional organizations.

Optica – Sensing and Imaging Strategic Planning Committee for International Congress (2019 – present)

The Combustion Institute - Western States Section Board of Directors (2005 - 2009)

American Society of Mechanical Engineers – the Environmental Engineering Division, a 1,400 + (primary), 8,000 + (total) member division of ASME

Chair, Environmental Engineering Division (July 2002 – June 2003)

Vice Chair, Environmental Engineering Division (July 2001 – June 2002)

Secretary / Treasurer, Environmental Engineering Division (July 2004 – June 2005) – the executive committee asked me to rotate through this position as I had skipped over it earlier.

Executive Committee, July 2001 – June 2006

Chair, Air Pollution Control Committee (2000 - 2002)

- Committee addresses air pollution issues for industry, government, and academia. I helped to form this committee.

Chair, Inter-Council Committee on Federal R&D, EPA Task Force (2003)

Member, 2001-2002

- In 2001 and 2002, wrote both a short summary and a 6-page critique of the Federal EPA research and development budget. This is typically included in AAAS summaries and in ASME documents concerning the FY 2002 budget.

Member, Committee on Technical Planning (2002 – 2006)

- Council on Engineering Committee to develop and nurture ASME’s technical capabilities

Representative of ASME to Air and Waste Management Assoc. (2001 – 2004)

President, Princeton Student Chapter (1990-1991)