

CATHERINE PRESTON KOSHLAND

Vice Chancellor for Undergraduate Education
Wood-Calvert Professor of Engineering
Professor, Environmental Health Sciences and Professor, Energy and Resources
University of California, Berkeley

EDUCATION

1968-70 Smith College, Northampton, MA.

1970-72 Haverford College, Haverford, PA, B.A. Fine Arts, 1972

1977-78 Stanford University, M.S. Mechanical Engineering, 1978

1978-85 Stanford University, Ph.D. Mechanical Engineering, 1985

Thesis: Combustion of Monodisperse Hydrocarbon Fuel Droplet Clouds

Studied painting with Charles Stegeman and Chris Cairns, Haverford, PA (1972-73); studied at the New York Studio School of Painting, Drawing and Sculpture (1973-74); non-matriculated graduate student, Stanford University (1975-77)

PROFESSIONAL EXPERIENCE

1974-75 Management Assistant, GS-9, Energy Research and Development Administration, and Office of Coal Research, Dept. of Interior, Washington DC

1977-78 Technical Editor, Stanford Energy Report, Stanford Energy Institute, Stanford University

1980-84 Graduate Student Researcher, High Temperature Gasdynamics Laboratory, Stanford University

1984-85 Acting Assistant Professor, University of California, Berkeley

1985-92 Assistant Professor, University of California, Berkeley

1987-present Faculty Member, Center for Occupational and Environmental Health

1987-95 Affiliated Faculty Member, Energy and Resources Group

1992-97 Associate Professor of Environmental Health Sciences

1995-97 Associate Professor, Energy and Resources Group

1997-present Professor, Environmental Health Sciences, School of Public Health and Professor, Energy and Resources

1997-2005 Director, Berkeley Lead Campus Program, UC Toxic Substances Research & Teaching Program

1992-present Associate Director, UC Berkeley National Institute of Environmental Health Sciences (NIEHS) Superfund Basic Research Program

2004 –2009 Vice Provost for Academic Planning and Facilities

2009 – 2014 Vice Provost for Teaching, Learning, Academic Planning and Facilities

Direct reports include University of California Berkeley Extension; Summer Sessions, Study Abroad & Lifelong Learning; Educational Technology Services; Student Learning Center; Athletic Study Center and American Cultures. Cognizant Dean of New Initiative Centers which include Berkeley Nanosciences and Nanoengineering Institute (BNNI); Berkeley Center for New Media (BCNM); BLUM Center for Developing Economies; Center for Computational Biology (CCB); Center for Global Metropolitan Studies (CGM) and Haas Institute for a Fair and Inclusive Society (HIFIS). HIFIS has faculty clusters in Disability Studies; Diversity and Democracy; Diversity and Health Disparities; Economic Disparities; LGBTQ Citizenship; Race, Diversity and Educational Policy; and Religious Diversity.

2015-present Vice Chancellor for Undergraduate Education

Direct reports include University of California Berkeley Extension (until Feb, 2017); Summer Sessions, Study Abroad & Lifelong Learning; Research, Teaching and Learning; Student Learning Center; Athletic Study Center, Arts+Design, and American Cultures; Berkeley Connect, Berkeley Collegium (June 2019)

and Faculty Advisors for Digital Learning, Teaching and Learning and Faculty Assistant to Pre-Health, Pre-Med and STEM efforts

HONORS

- 1979-80 Energy Fellowship (DOE), Stanford University
- 1978 Member, Stanford University Science and Technology Delegation to The People's Republic of China
- 1995 Sigma Xi
- 1995-present Wood-Calvert Professor in Engineering
- 1999 Nineteenth Annual Steven Manly Memorial Lecturer, University of California, Santa Barbara
- 1999 Best Paper Award, Indoor Air Journal 1996-98, International Academy of Indoor Air Sciences (with J. Ten Brinke, S. Selvin, A.T. Hodgson, W. J. Fisk, M. J. Mendel and J.M. Daisey)
- 2001-2007 Editorial Board of Combustion, Science and Technology
- 2002-2003 Townsend Humanities Center Tenured Faculty Fellow
- 2004 Superfund Basic Research Program Distinguished Lecturer
- 2007 Honors Day Speaker, University of Vermont, College of Engineering and Mathematical Science
- 2009 Commencement speaker, Hong Kong Polytechnic University, Department of Civil and Structural Engineering
- 2013 Commencement speaker for Language and Literature Departments at the University of California, Berkeley

AWARDS

- 2013 Sarofim Award given by the 13th International Congress Combustion By-Products & their Health Effects, New Orleans, LA
- 2017 Kannerstein Award, Haverford College

PROFESSIONAL MEMBERSHIPS

- The Combustion Institute, since 1984
- The American Chemical Society, since 1990
- Board Member, the Reinvention Center, 2013-2017
- The Reinvention Collaborative, 2017-Present

Service as Vice Chancellor for Undergraduate Education (July 2014-present)

- Chair, Advising Council Executive Steering Committee
- Chair, Advising Council
- Chair, Budget Frame Implementation Project for 3-Year Pathways and Major Requirements (Dec 2015-Nov 2016)
- Chair for VCUE Equity, Inclusion and Diversity Efforts (commenced in 2014)
- Co-Chair, Golden Bear Orientation Steering Committee (commenced in August 2015 as Welcome Week Committee)
- Chair, SACUE – Student Advisory Council for Undergraduate Education
- Co-Chair, Chancellor's Undergraduate Initiative Committee (name retired in Dec 2015)
- Convener, CCD - Council of College Deans (Jan 2016-Present)
- Co-Chair, CCCPM - Committee on Classroom Policy and Management (2014-Present)
- Co-Chair, Enrollment Working Group (Aug 2015-2017)
- Co-Chair, Executive Steering Committee, Student Information Systems Replacement Project
- Executive Sponsor, Operational Excellence – Student Services Initiative (2014-2017)
- Co-Chair, Instructional Resilience Task Force (Spring 2020)

C.P. Koshland CV

Co-Chair, Mills College-Berkeley Task Force (Dec 2016-Present)
Co-Chair, University Athletics Board
Co-Chair, Undergraduate Experience Executive Steering Committee (November 2018-Present)
Co-Chair, Undergraduate Student Diversity Project Steering Committee (November 2018-Present)
University Advisory Board Member, edX Consortium (April 2016-present)
Member, UCBF Board of Trustees, UC Berkeley
Member, Chancellor's Cabinet
Member, COD - Council of Deans
Member, Executive COORD Board for Admissions, Financial Aid and Enrollment
Member, CMT - Crisis Management Team (2013-present)
Member, CUD, Council of Undergraduate Deans
Member, Finance Reform Common Goods Funding Working Group (October 2018 – February 2019)
Member, Long Range Development Plan Advisory Group (Sept 2019-present)
Member, Revenue Sharing & Common Goods (December 2018- May 2019)
Member, Hearst Museum Advisory Board (2015-2019)
Member, RTLTC - IT Strategic Committee and Co-Chair for Teaching & Learning and Research Governance Committee (2015-2018)
Member, Journalism and Media Studies Faculty Working Group (August 2018)
Member, L&S Advisory Board (March 2016 - present)
Member, Master Housing Plan Task Force (July-August 2016)
Member, Program Review Oversight Committee
Member, Strategic Plan Working Group for Identifying Optimal Enrollment Levels (January 2018-September 2018)
Member, VPDUE – Systemwide membership for Vice Provosts and Deans in Undergraduate Education (2016-present)
Chair, VPDUE – (Sept 2018 – Present)
Member, Women Builders of Berkeley (March 2019)
Member, Working Group on Incentives (Sept 2016)
Member, Working Group on Admissions Data (Dec 2016)
Campus Point, First Generation Faculty Campaign (2016-Present)
Ex Officio member, CEP – Committee on Educational Policy
Ex Officio Member, UGC – Undergraduate Council

Search Committees (since 2016)

- AVC for Development Search Committee, 2016
- VCSA Search Committee Meeting, 2018
- AVC Admissions Search Committee, 2018
- Athletic Director Search, 2018
- VP Graduate Studies/Dean of Graduate Division Search Committee, 2018
- Enterprise Applications Executive Director Search Committee, 2019
- BAMPFA Director and Chief Curator Search Committee, 2019

Committee work that has concluded or has been suspended (end date noted)

Chair, Advising Council Network Community
Chair, Long Range Enrollment Planning (Dec 2014)
Chair, New Enrollment Working Group (Aug 2016)
Chair, Online Course Evaluation Steering Committee (Feb 2015)
Chair, WASC Steering Committee (2013-2015)
Member, BECI Steering Committee (July 2016)
Member, BGCS - Berkeley Global Campus Steering Committee (2014-June 2016)

C.P. Koshland CV

Member, Capital Projects Committee (July 2015)
Member, Capital Renewal Committee (May 2015)
Member, Lower Sproul Program Committee (December 2014)
Member, Space Assignments and Capital Improvements Committee (April 2015)
Member, Search Committee for University Librarian (Nov 2014-Feb 2015)
Member, Budget Reform Sub Group (Sept 2014-May 2015)
Member, BRCOE - Berkeley Resource Center for Online Education (2016-2017)
Member, SCOE – Steering Committee for Online Education (formerly BRCOE Steering Committee) 2014-2017
Member, CARE/CAICFA - Compliance, Accountability, Risk and Ethics Committee and Committee on Audit, Internal Control and Financial Accountability (2015-2016)

Service as Vice Provost (2009-July 2014)

Chair, Advising Council Executive Steering Committee (2012-2014)
Chair, Advising Council (2013-2014)
Chair, Advising Council Network Community (2013-2014)
Chair, Advisory Committee on Long-range Enrollment Planning and Non-resident Tuition (2007)
Chair, Berkeley Diversity Research Initiative Working Group (2005-2012)
Chair, Berkeley Resource Center for Online Education (2012)
Chair, Berkeley Way Site (Community Health Campus) Program Committee (Jan 2009 – 2014)
Chair, BAM/PFA Program Committee
Chair, Campbell Hall Program Committee (2004 - 2014)
Chair, Climate Action Partnership (2006-2014)
Chair, Doe Annex Program Committee, (fall 2004-2006)
Chair, Durant Hall Program Committee, (2005- 2010)
Chair, East Asian Library Program Committee (2004-2007)
Chair, Hearst Gymnasium Project Program Committee (June 2005 – 2009)
Chair, Intercollegiate Athletics Master Plan (April 2013- 2014)
Chair, Jacobs Hall Program Committee Meeting (August 2013-June 2014)
Chair, Lower Sproul Program Committee (2007 – June 2014)
Chair, Moffitt Library Revitalization Program Committee (May 2009 – June 2014)
Chair, Online Course Evaluation Steering Committee (April 2009 – June 2014)
Chair, RFS Remediation Committee (2004-05)
Chair, SACUE – Student Advisory Council for Undergraduate Education (2011-2014)
Chair, Space Assignments and Capital Improvements Committee (SACI 2004-2014)
Chair, Surge Planning Committee (2004 – 2010)
Chair, WASC Steering Committee (2012-2014)
Chair, Warren Hall/Li-Ka Shing Program Committee (fall 2004-2010)
Co-Chair, Chancellors Task Force on Undergraduate Education
Co-Chair, Task Force on Professional Degree Fees (2004-2005)
Co-Chair, UC Berkeley Online Learning Summit. How Technology Impacts the Pedagogy and Economics of Residential Higher Education. March 7-8, 2014.
Co-Chair, University Athletics Board
Co-Chair, Working Group on Senate/Admin Review of Certificates (2005-2006)
Executive Sponsor, Operational Excellence – Student Services Initiative (2009 – 2014)
Steering Committee, Southeast Campus Academic Commons Project,
Program Committees for Law-Business and Memorial Stadium (2005 – 2012)
Member, BAM/PFA, Academic Advisory Committee (2005 – 2010)
Member, Berkeley Center for New Media (BCNM), Advisory Committee, (2007 – 2014)
Member, Berkeley Downtown Area Plan Internal Steering Committee (Sept 2005 –2009)

C.P. Koshland CV

Member, Berkeley Way Site (Community Health Campus) Steering Committee (March 2013-April 2014)
Member, BRCOE Executive Steering Committee (2012-2014)
Member, CITRIS Planning Groups (2004 – 2007)
Member, CCCPM - Committee on Classroom Policy and Management (2009 –2014)
Member, Chancellor's Cabinet (April 2004 –2014)
Member, Council of Deans (April 2004-2014)
Member, edX Consortium. (2013-2014)
Member of Executive Steering Committee, Student Information Systems Replacement Project (2012-2014)
Member, Institute for Urban and Regional Development (IURD) Advisory Committee (2004 – 2010)
Member, Institutional Data Management and Governance (2007-2013)
Member, Lower Sproul Plaza Planning Committee (2004 – 2007)
Member, QB3, CITRIS, Li-Ka Shing Committee to establish common governance (2007 – 2009)
Member, Real Estate Task Force (2004-2007)
Member, Search Committee for Director of Athletics (fall 2004)
Member, SIS Project Executive Steering Committee (2014-Present)
Member, Task Force on Memorial stadium Integrated project (fall 2004)
Member, UCB/LBNL Helios Energy Research Facility Program Committee ((2007-2009)
Member, Undergraduate Enrollment Task Force (2009-2011)

UNIVERSITY SERVICE (1993 -2004)

Deputy Division Head, Environmental Health Sciences, School of Public Health (1993-1994)
Chair, Search Committee, Environmental Health Sciences, Public Health (1993-1994)
Member, Energy and Resources Group Executive Committee (1993-present)
Committee on Undergraduate Scholarship and Honors (CUSH) (1993-2002)
President's Undergraduate Fellowships Subcommittee, Truman Award Subcommittee
President's Quinquennial Review Committee for the Statewide Air Pollution Research Center, UC Riverside (1993-1994)
Environmental Council Working Group (1993-1994)
Environmental Council Executive Committee (1994-1996)
Vice Chair (1994-96), Chair (1996-1998) Member, Advisory Committee, Environmental Engineering and Health Sciences Laboratory, School of Public Health and College of Engineering (1993-1999), Chair, (1994-1996)
Space Assignments and Capital Improvements Committee (SACI):
Naming of Buildings Sub-cmte (1994-2004) Chair (1996 –2004)
Division Head, Environmental Health Sciences, School of Public Health, (1994-1996)
Chair, Graduate Group, Environmental Health Sciences, (1994-1996)
Co-chair, Energy and Resources Group Curriculum Committee (1995-97, 1998-2000)
Member, Commitment to Equity Subcommittee, NCAA Certification Self-Study Committee (1996-1997)
Member, Commitment to Equity Committee, Department of Athletics (1997-2000)
Elected Member, Faculty Council, School of Public Health (1997-99) (2000-2002)
Committee on Undergraduate Scholarship and Honors (CUSH), Chair, (1998-2000)
Member, Advisory Committee, Center for Public Health Practice (1999-2002)
Co-Chair, Strategic Planning Committee, School of Public Health (1999-2002)
Chair, Energy and Resources Diversity committee (1999-2003)
Member, College of Engineering Environmental Engineering Committee (1999-2004)
Member at large (elected), Divisional Council, UCB Academic Senate (1999-Jan 2001)
Member, Commission on Undergraduate Education (1999-2000)
Sub-Committee Chair, Educational Enrichment
Member, Faculty Search committee, Energy and Resource (2000-01)

C.P. Koshland CV

Member, Near Term planning Committee (2000-2002)
Member, Strategic Planning Committee (2000-2002)
Member, Ad Hoc Advisory Committee to Review the Budget and Finance Plan for IARS (2000)
Member, Search Committee for Director of Athletics (2000-2001)
Member, Haas Scholars Committee (2000-2003)
Member, Advisory Committee for UCDC (2000-2002)
Member, ECPC-Executive Chancellor's Planning Committee (Jan 2001-present)
Member, CACIA - Chancellor's Advisory Committee on Intercollegiate Athletics (2001-2004)
Member, Executive Budget Committee (2001-2002)
Vice Chair, Academic Senate (Jan 2001-June 2001)
Member, Committee on academic planning and resource allocation (CAPRA) (Jan 2001-Aug 2002)
Member, Admissions Enrollment and Preparatory Education (AEPE) (Jan 2001-Aug 2002)
Member, Committee on Educational Policy (2001-2002)
Member, COORD Board (2001-2009)
Member, Chancellor's Advisory Policy Committee on Outreach (CAPCO) (2001-2004)
Member, Faculty Advisory Committee to the Lawrence Hall of Science (2001-2005)
Chair, Berkeley Division of the UC Academic Senate (2002-2003)
Ex Officio on all Senate Committees (2002-2003)
Member, Academic Council (UC Systemwide Senate) (2002-2003)
Member, Academic Assembly (UC Systemwide Senate) (2002-2003)
Member, Course Description Task Force (Systemwide Senate) (2002-2003)
Member, Executive Budget Steering Committee (2002-2003)
Co-Chair, USA Patriot Act Steering Committee (2002-2003)
Co-Chair GSI Teaching and Mentoring Task Force (2002-2003)
Member, Task force on Academic Program review (2002-2003)
Member, New Initiatives Review Committee (2002-2003)
Member, (2001-2004) Space Assignments and Capital Improvements Committee (SACI)

PUBLIC and COMMUNITY SERVICE (since 1993)

Member, Advisory Council, Bay Area Air Quality Management District, Representative for Colleges and Universities (1988- 94), Chair, (1991-92)
Co-Chair, Parent Evaluation Subcommittee for Western Association of Schools and Colleges (WASC) Accreditation Process, Menlo-Atherton High School, Atherton, CA (1992)
Member, Site Council Menlo-Atherton High School, Sequoia Union High School District, Atherton, CA (1993-95)
Member, Academy Council, California Academy of Sciences (1993-03)
Member, Technical Advisory Committee, American Lung Association of California (1997-98)
Parent volunteer, Hillview Middle School, Menlo Park, CA (1998-2001)
Parent volunteer, Menlo-Atherton High School, Atherton, CA (2001-2005)
Elected Trustee, BAM/PFA Board of Trustees, (2004 – present)
Member, BAM/PFA Architect Selection Committee (2005)
Member, BAM/PFA Architect Selection Committee (2010)
Elected Trustee, Board President, BAMPFA (August 2017-present)
Elected Trustee, BAMPFA Finance Committee (August 2017-present)

PROFESSIONAL ACTIVITIES (1993-present)

Program Subcommittees, Twentieth to Twenty-sixth Symposia (International) on Combustion (1984-2005)
Session Chair (1984), Invited Speaker, (1996)
Advisory Board, Chemical Education for Public Understanding Project (CEPUP). Lawrence Hall of Science, U. C. Berkeley, (1987-1996)

C.P. Koshland CV

Member, Executive Board, Western States Section of the Combustion Institute, (1987-96), ex officio (1996-05)

Founding member and member of Steering Committees, International Congress on Toxic Combustion Byproducts: First (1989), Second (1991), Third (1993), Fourth (1995), Congress Chair, Fifth Intl Congress, held at UC Berkeley (1997); Sixth (1999), Eighth (2003); Eleventh (2009); Session Organizer, Session 9: Health Effects of Combustion Pollutants in Developing Countries, Twelfth (2011).

Haverford College, Haverford, PA,

Board of Managers, Manager (Trustee), (1994-2014)

Vice-chair (1999-2005)

Co-chair (2005-2007)

Chair (2007-2012)

Co-Chair (2012- 2014)

Ex Officio on all committees (1999-2014)

Member, Property Committee (1994-1999)

Chair, Educational Affairs Committee (1997-2000)

Member, Nominations and Governance (1997-1999)

Campaign Executive Committee (2000-2004)

Member, Presidential Review Committee (2001-2014)

Member, Reaccreditation Review Committee, Middle States Commission on Higher Education Review (2009-2010)

Member, Board of Directors, the Combustion Institute, (1995-2006)

Secretary (1996-2006)

Member, the Executive Committee (1996-2006)

Member, Research Screening Committee, Air Resources Board, State of California (1999-2002)

Peer Reviewer, Air Resources Board, State of California (1999-2000)

UN World Energy Assessment Advisory Panel (1999-2000)

Member, External review panel, University of California, Riverside, Environmental Toxicology Graduate Program (1999-2000)

Member, Search committee for Department Head, Indoor Environment Department, Lawrence Berkeley National Laboratory (2000-2001)

Member, Bernard Lewis Scholarship Fund Committee (2000-2006)

Consultant, Industrial Ecology Subcommittee, EPA Science Advisory Board (2000-2001)

Consultant, Air Resources Board, California EPA (2000-2001)

Member, US EPA Science Advisory Board Integrated Human Exposure Committee, (Oct 2001-2003)

Editorial Board, *Combustion Science and Technology* (2001-2007)

Member, Stanford University School of Engineering Deans Advisory Council (2002-03)

Member, US EPA Science Advisory Board Environmental Engineering Committee (Oct 2003-2009)

Member, Smith College Engineering Program Academic Advisory Council (2004-2009)

Member, Advisory Committee for the Area of Strategic Development in Atmospheric and Urban Air Pollution Research, The Hong Kong Polytechnic University, Hong Kong (2004- 2009)

Member, Sandia National Lab Combustion Research Facility Advisory Board (2004- Feb 2008)

Member, Stanford University Department of Mechanical Engineering Advisory Board (2004-2015)

Member, Stanford University, Stanford Diversity Subcommittee

Member, University of Vermont, College of Engineering and Mathematical Sciences Board of Visitors (2005-2011)

Departmental Advisor, Hong Kong Polytech, Department of Civil and Structural Engineering (2009-2012)

Chair and Advisor, External Review Committee, Transdisciplinary Research Initiative, University of Vermont (2009-2010)

Member, External Review Committee, Lafayette College, (2011)

C.P. Koshland CV

*Joint Higher Education Advocacy Day, (2014). UC, CSU, and CCC leadership joined together for a day of intersegmental advocacy in Sacramento to pursue higher education and budgetary goals shared with the State of California.

*WASC Senior College and University Commission visit to USC Special Visit (November 2014)

*Steering Committee, 2014 Online Learning Summit, How Technology Impacts the Pedagogy and Economics of Residential Higher Education, hosted at UC Berkeley and organized with MIT, Harvard and Stanford

*Steering Committee, 2015 UC Systemwide Conference, UC Riverside

*Steering Committee, 2015 Online Learning Summit. Online Learning: Shaping the Future of Higher Education On and Off Campus, hosted at MIT/Harvard and organized with UC Berkeley and Stanford

*Chair, 2016 UC Systemwide Conference Predictive Analytics, UC Berkeley

*Steering Committee, 2016 Inventing the Future of Higher Education. Hosted at Stanford and organized with UC Berkeley, MIT and Harvard.

*Steering Committee, 2017 UC Systemwide Conference on Effective Actions for Improving Student Learning and Outcomes, UC Davis.

*Upcoming: Reviewer, Comprehensive Evaluation for the University of Michigan. Higher Learning Commission (HLC). March 23-24, 2020

PERSONAL DATA

73 Maple Leaf Way, Atherton CA 94027

Born May 11, 1950

Married to James M. Koshland

Three children, Sarah (Cal'99), Margrethe (Cal '02), and Jacob (Williams College, '09 and Berkeley Haas MBA '19)

ARCHIVAL PUBLICATIONS

*** new since July 2014**

1. Koshland C. P. and Bowman, C. T. (1984). Combustion of monodisperse droplet clouds in a reactive environment. The Twentieth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, PA.
2. Koshland, C. P. and Yost, M. (1987). Use of a spreadsheet in the design of an industrial ventilation system. Applied Industrial Hygiene, 29, 204-212.
3. Fisher, E. M., and Koshland, C. P., (1990). Numerical simulation of the thermal destruction of some chlorinated C₁ and C₂ hydrocarbons. Journal of the Air and Waste Management Association. 40, 10. pp.1384-1390.
4. Seeker, R.W. and Koshland, C. P. (1990) Combustion Byproduct Formation: An Overview. Special issue on toxic combustion byproducts. Edited by Seeker and Koshland. Combustion Science and Technology, 74, 1-6.
5. Fisher, E. M., Koshland, C. P., Hall, M.J. and Sawyer, R. F. and Lucas, D. (1990). Experimental and numerical study of the thermal destruction of C₂H₅Cl. The Twentythird Symposium (International) on Combustion. The Combustion Institute, Pittsburgh, PA., pp. 895-901.
6. Hall M. J., Lucas, D., and Koshland, C. P. (1991). Measuring chlorinated hydrocarbons in combustion using FTIR spectroscopy. Environmental Science and Technology, 25, pp. 260-267.
7. Koshland, C.P., Fisher, E., and Lucas, D. (1992). Thermal Destruction of Some C₁ and C₂ Chlorinated Hydrocarbons. Combustion Science and Technology 82, 1-6, p.49.
8. Koshland, C. P. and Thomson, M. (1992) An experimental comparison of the thermal destruction of gaseous and liquid 1,1,1-trichloroethane. Combustion, Science and Technology, 85, 1-6, pp. 471-482.
9. Fisher, E. M. and Koshland, C. P. (1992). Formation of Byproducts from 1,1,1-C₂H₃Cl₃ in the Post-Flame Zone of a Turbulent Combustor. Combustion, Science and Technology. 85, 1-6, pp. 318-325
10. Lucas, D., Koshland, C. P., McEnally, C. and Sawyer, R. F. (1992). Ethyl Chloride Detection Using Photofragmentation. Combustion, Science and Technology. 85, 1-6, pp. 271-281.
11. Fisher, E. M. and Koshland, C. P., (1992) Thermal Destruction of CH₃Cl under Lean Post-Flame Conditions. Combustion and Flame, 90, 2, pp. 185-195.
12. Koshland, C. P., Lucas, D., Higgins, B. and Sawyer, R. F. (1992). Measurement of Chlorinated Hydrocarbons Using In-Situ FTIR. The Twenty-fourth Symposium (International) on Combustion. The Combustion Institute, Pittsburgh, Pa.
13. Materna, B. and Koshland, C. P. (1992). Field Comparison of two carbon monoxide monitoring methods: colometric dosimeters and electrochemical data loggers Applied Industrial Hygiene.
14. Koshland, C. P., Lee, S. and Lucas, D. (1993) Enhanced destruction of CH₃Cl in Post-Flame Combustion Gases. Combustion and Flame, 92: pp 106-114.

15. Materna, B. L., Koshland, C. P. and Harrison, R. J. (1993). Carbon Monoxide Exposures in Wildland Firefighting: A Comparison of monitoring methods, Applied Occupational and Environmental Hygiene 8: pp. 479-487.
16. McEnally, C. S., Sawyer, R. F., Koshland, C. P. and Lucas, D. (1994). Sensitive *in situ* Detection of Chlorinated Hydrocarbons in Gas Mixtures. *Applied Optics* 33: 3977-3984.
17. Thomson, M. J., Lucas, D., Koshland, C. P., Sawyer, R. F., Wu, Y. and Bozzelli, J. W. (1994). An Experimental and Numerical Study of the High Temperature Oxidation of 1,1,1-Trichloroethane. *Combustion & Flame* 98:155-169.
18. Thomson, M. J., Higgins, B. S., Lucas, D., Koshland, C. P., and Sawyer, R. F. (1994). Phosgene Formation from 1,1,1-Trichloroethane Oxidation, *Combustion and Flame* 98: 350-360.
19. Lee, S, Koshland, C. P., Sawyer, R. F. and Lucas, D. (1994). Effects of Post-Flame Fuel Injection on the Destruction of Chlorinated Hydrocarbons, *Combust. Sci & Tech.* 101: 247-260.
20. McEnally, C. S., Sawyer, R. F., Koshland, C. P. and Lucas, D. (1994). In Situ Detection of Hazardous Waste. Twenty-fifth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, PA.
21. O'Rourke, D., Connelly, L. and Koshland, C. P. (1996) Industrial Ecology: A Critical Review. *International Journal of Environment Pollution (IJEP)*, Vol. 6, Nos 2/3, pp.89-112.
22. Vitovec, W., Koshland, C. P., Lucas, D., and Sawyer, R. F. (1996). The Destruction of Methylene Chloride in Lean Post-flame Conditions. *Combustion Science and Technology*. 116-117, pp. 153-166.
23. Buckley, S. G., Sawyer, R. F., Koshland, C. P. and Lucas, D. L. (1996). Metals Emissions Monitoring Using Excimer Laser Fragmentation Fluorescence Spectroscopy. *Combust. Sci. and Tech* : 118, pp. 169-188
24. Thomson, M., Lucas, D., Koshland, C. P., and Sawyer, R. F. (1996) Reducing Hazardous Waste Incinerator Emissions through Blending: A study of 1, 1, 1-trichloroethane Injection. *Hazardous Wastes and Hazardous Materials*. 13, 387-398.
25. Buckley, S. G., Koshland, C. P., Sawyer, R. F., and Lucas, D. (1996). A Real-time Monitor for Toxic Metal Emissions from Combustion Systems. *The Twenty-sixth Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh. 2455.
26. Koshland, C. P. (1996) Impacts and Control of Air Toxics. The Twenty-sixth Symposium (International) on Combustion. The Combustion Institute.
27. Hertwich, E. G, W. S. Pease and Koshland, C. P. (1997) Evaluating the Environmental Impact of Products and Production Processes - A comparison of six methods. *Science of the Total Environment* 196, 13-29.
28. Connolly, L. and Koshland, C. P. (1996) Two aspects of consumption: using an exergy-based measure of degradation to advance the theory and implementation of industrial ecology. *Resource, Conservation and Recycling* 19: 199-217.
29. Thomson, M., Koshland, C. P. and Lucas, D. (1997) A Health Based Decision Making Tool for Waste Destruction. *Environmental Engineering Science*. 14: 163-174.

30. Buckley, S. G., Damm, C. J., Vitovec, W. M., Sgro, L.A., Sawyer, R. F., Koshland, C. P. and Lucas, D. L. (1998) Ammonia Detection and Monitoring Using Photofragmentation Fluorescence. *Applied Optics*. 37: 8382-8391.
31. Ten Brinke, J. Selvin, S., Hodgson, A. T., Fisk, W. J., Mendell, M. M., Koshland, C. P. and Daisey, J. M. (1998) Development of New VOC Exposure Metrics and Their Relationship to "Sick Building Syndrome" Symptoms. *Indoor Air*. 8: 140-152.
32. Clack, H. C., Koshland, C.P., Lucas, D. and Sawyer, R.F. (1998) Observations of Spray Density Effects on Multicomponent Chlorinated Hydrocarbon Vaporization and Thermal Destruction. *The 27th Symposium (Int.) on Combustion*.
33. Vitovec, W.M., Higgins, B. S., Lucas, D., Koshland, C.P., and Sawyer, R. F. (1999) Post-flame oxidation of CHCl_3 and C_2Cl_4 . *Combust. Sci. Tech.* 116-117, 153.
34. Clack, H., Koshland, C. P., Lucas, D., and Sawyer, R. F. (1999). Post-flame Byproduct Formation from Size and Density Controlled 1,1, 1-Trichloroethane Sprays. *Environmental Engineering Science*. 16: (3) 177-185
1. Lee, S.C., Koshland, C. P., Lucas, D. and Sawyer, R. F. (1999). Effect of Postflame Injection of Fuel on the Destruction of Chlorinated Hydrocarbons and the Oxidation of NO. *Combustion and Flame* 119. 144-153
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65. Jong Hyun Choi, Catherine Koshland, Robert Sawyer, Donald Lucas (2005), The Interaction of Polystyrene Nanospheres with 193 nm Light; Extended Abstract. Joint meeting of the US Sections of the Combustion Institute, Philadelphia PA, March
66. (2005) Holder, A, Lucas, D, Roth-Goldstein, R., Koshland, C.P. and Sawyer, R. F. Characterization of Diesel Exhaust Particulate for Lung Cell Exposure, Extended Abstract. Joint meeting of the US Sections of the Combustion Institute, Philadelphia PA, March 2005
67. J. H. Choi, C. P. Koshland, R. F. Sawyer, and D. Lucas (2005) The Interaction of Polystyrene Nanospheres with 193 nm Light. *Proceedings of the Fourth Joint Meeting of the U.S. Sections of The Combustion Institute*, 54, Philadelphia, PA, Mar. 20-23.
68. G. Lanzaolo, L. A. Sgro, A. D'Anna, K. Hineckley, D. Lucas, C. P. Koshland, R. F. Sawyer Brownian and Coulombic coagulation effect on size distributions of nano-particles: theory and measurement. *Extended Abstract. Combustion and Urban Areas, 28th meeting of the Italian Section of the combustion Institute*, Naples, July 4-6, 2005.
69. Tian, L., Lucas, D., Fisher, S.L., and Koshland, C. P. (2005), Particle and Gas Emissions from a Simulated Household Firepit; *Conference proceedings, WSS/CI Fall Meeting*, October 2005
70. Holder, A. L., Lucas, D., Goth-Goldstein, R., Koshland, C. P. (2007) Health Effects of Partially Oxidized Soot, *Proceedings of the Fifth Joint Meeting of the U.S. Sections of The Combustion Institute* San Diego, California.

PRESENTATIONS AND POSTERS

*** = New since last review (July 2014-present); # = invited talk; and #1-19 prior to 1991)**

- #20. Koshland, C. P. (1991). Grand Rounds. California Occupational and Environmental Health Center. Division of Occupational Medicine, San Francisco General Hospital/UCSF, San Francisco, CA, January.
21. Fisher, E. M., Koshland, C. P. and Cervera, R. (1991). Formation of Byproducts from 1,1,1

$C_2H_3Cl_3$ in the Post-Flame Zone of a Turbulent Combustor. Presented at the Western States Section/The Combustion Institute Spring Meeting, Boulder, Colorado, March.

22. Fisher, E. M. and Koshland, C. P. (1991). Presented at the Second International Congress on Toxic Combustion By-Products: Formation and Control. Salt Lake City, Utah, March 26-29.

23. Koshland, C. P. and Thomson, M. J. (1991). An experimental comparison of the thermal destruction of gaseous and liquid 1,1,1-trichloroethane. Presented at the Second International Congress on Toxic Combustion By-Products: Formation and Control. Salt Lake City, Utah, March 26-29.

24. Lucas, D., Koshland, C. P., McEnally, C. S. and Sawyer, R. F. (1991) Detection of Chlorinated Hydrocarbons Using Photofragmentation. Presented at the Second International Congress on Toxic Combustion By-Products: Formation and Control. Salt Lake City, Utah, March 26-29.

#25. Koshland, C. P. (1991). Chlorinated Hydrocarbon Destruction and Byproduct Synthesis. Advanced Combustion Engineering Research Center Seminar Series, University of Utah & Brigham Young University, Salt Lake City, Utah, April 9.

#26. Koshland, C. P. (1991). Overview of the University of California Superfund Basic Research Program, Health Effects of Toxic Substances, and Project 15, Thermal Destruction of Hazardous Wastes, NIEHS Research Council, Research Triangle Park, NC, Sept 15-17, 1991.

27. Fisher, E. M. and Koshland, C. P. (1991). Measurements and Computations of the Post-Flame Thermal Destruction of CH_3Cl . Eastern States Section/The Combustion Institute, Ithaca, NY.

28. Koshland, C. P., Lucas, D., Higgins, B. and Sawyer, R. F. (1991). Measurement of Chlorinated Hydrocarbons Using In-Situ FTIR. Presented at Fall Meeting, Western States Section/The Combustion Institute, UCLA, October.

29. Thompson, M., Lucas, D., Koshland, C., Sawyer, R. F., Wu, Y. and Bozzelli, J. (1992). The High Temperature Oxidation of 1,1,1-trichloroethane, Western States Section/The Combustion Institute, Spring Meeting, Corvallis, Oregon, March.

30. Buckley, S. G., Koshland, C. P., Lucas, D. and Sawyer, R. F. (1992) Combustion of Methyl Chloride and Ethyl Chloride in a Diffusion Flame Burner, presented at Western States Section/The Combustion Institute, Spring Meeting, Corvallis, Oregon, March.

31. Koshland, C. P., Lee, S. and Lucas, D. (1992). The Effectiveness of Clean Fuel Injection on the Destruction of CH_3Cl , presented at Western States Section/The Combustion Institute, Spring Meeting, Corvallis, Oregon, March.

32. Koshland, C. P., Lucas, D., Higgins, B. and Sawyer, R. F. (1992). Measurement of Chlorinated Hydrocarbons Using In-Situ FTIR, presented at The Twenty-fourth Symposium (International) on Combustion, Sydney, Australia, July

33. Thomson, M. J., Higgins, B. S., Lucas, D., Koshland, C. P., and Sawyer, R. F. (1992). Mechanisms of Phosgene Formation, poster presented at The Twentyfourth Symposium (International) on Combustion, Sydney, Australia, July.

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34. Lucas, D., Koshland, C.P., McEnally, C.S., and Sawyer, R. F. (1992) Chlorinated Hydrocarbon Measurement in Combustion Systems, poster presented at The Twenty-fourth Symposium (International) on Combustion, Sydney, Australia, July .
35. Lee, S., Koshland, C.P. and Lucas, D. (1992). The Effectiveness of Clean Fuel Injection on the Destruction of CH_3Cl , poster presented at The Twenty-fourth Symposium (International) on Combustion, Sydney, Australia, July .
36. McEnally, C.S., Sawyer, R.F., Koshland, C.P. and Sawyer, R.F. (1992). In-situ, Real-time Measurement of Chlorinated Hydrocarbon Concentrations in Combustion Systems, Western States Section/The Combustion Institute, Fall Meeting, Lawrence Berkeley Laboratory, Berkeley, California, October.
37. Thomson, M.J. , Higgins, B. S., Lucas, D., Koshland, C.P. and Sawyer, R. F. (1992). Mechanisms of Phosgene Formation, Western States Section/The Combustion Institute, Fall Meeting, Lawrence Berkeley Laboratory, Berkeley, California, October.
38. Thomson, M.J., Koshland, C.P., Lucas, D.L and Higgins, B. (1993). The contribution of the products of incomplete combustion to outlet toxicity. Presented at the Third International Colloquium on Toxic Combustion Byproducts, MIT, Cambridge, MA.
39. Lee, S. Koshland, C.P., Sawyer, R. F., Lucas, D. (1994) Effects of Post-Flame Fuel Injection on the Destruction of Chlorinated Hydrocarbons, Presented at the Third International Colloquium on Toxic Combustion Byproducts, MIT, Cambridge, MA.
40. Thomson, N. J., Lucas, D., Koshland, C.P. and Sawyer, R. F. (1993). Reducing hazardous Waste Incinerator Emissions Through Blending: A Study of 1,1,1-Trichloroethane Injection. Presented at the Western States Section/The Combustion Institute. 1993 Fall Meeting, Menlo Park, CA.
41. McEnally, C. S., Sawyer, R. F., Koshland, C.P. and Lucas, D. (1993). In situ detection of hazardous waste. Presented at the Western States Section/The Combustion Institute. 1993 Fall Meeting, Menlo Park, CA.
42. Lee, S. , Koshland, C.P., Lucas, D. and Sawyer, R. F. (1993). Effect of post-flame fuel injection on the destruction of chlorinated hydrocarbons and NO conversion. Presented at the Western States Section/The Combustion Institute. 1993 Fall Meeting, Menlo Park, CA.
43. Sawyer, R. , Koshland, C., Lucas, D. , Buckley, S., Engleman, S., Higgins, B., Lee, S., McEnally, C., and Thomson, M. (1993). Studies of the thermal destruction of chlorinated hydrocarbons. Presented at the Joint meeting of the Russian and Japanese Sections of the Combustion Institute, Moscow, Russia.
- #44. Koshland, C.P., Sawyer, R. F. and Lucas, D. (1993). Incineration: control in the combustor. Presented at the Pacific Basin Conference on Hazardous Waste, Honolulu, HI.
45. Vitovek, W., Higgins, B. S., Sawyer, R. F., Koshland, C.P. and Lucas, D. (1994). Thermal destruction of CHCl_3 during high temperature post-flame oxidation. Presented at the Western States Section/The Combustion Institute Spring Meeting, Davis, CA.
46. Lau, B.C., Higgins, B.S., Sawyer, R. F., Koshland, C.P., Lucas, D. L. (1994). The design

and characterization of a vertical combustion flow reactor. Presented at the Western States Section/The Combustion Institute Spring Meeting, Davis, CA.

47. Buckley, S. , McEnally, C.S., Sawyer, R. F., Koshland, C. P. and Lucas, D. L. (1994). Excimer Laser Fragmentation Fluorescence Spectroscopy for Metal Emissions Monitoring, Presented at the Eastern States Section/The Combustion Institute Annual Meeting, June 1994.

#48. Koshland, C. P. (1994). Role of the engineer in environmental problem solving. Presented at the Regional Conference for Society of Women Engineers. Stanford University, Stanford CA.

#49. Koshland, C. P. (1994) "Environmental Health and Industrial Ecology" Presented at the Industrial Liaison Program, College of Engineering, University of California, Berkeley, CA.

#50. Koshland, C. P. (1994). "Combustion Byproducts: How do we assess the risks and what can we do about it." Environmental Engineering Science Seminar, Dept of Civil Engineering, Stanford University, Stanford, CA. April 8.

#51. Koshland, C. P. (1994) In Situ diagnostics for Combustion Processes, High Temperature Gasdynamics Laboratory Seminar, Department of Mechanical Engineering, Stanford University, Stanford, CA, May 25, 1994.

#52. Koshland, C. P., Lucas, D. and Sawyer, R. F. (1995) Combustion Diagnostics. Presented at the Transfer of (Superfund) Basic Research to Waste Site Remediation NIEHS Super-fund Basic Research Program, UC Davis, Mare Island Naval Shipyard, March 22-24.

#53. Koshland, C.P. (1995) Comparative Waste Stream Assessment: Environmental Impacts. A Seminar on Strategies and Methods in Environmentally Conscious Design and Manufacturing. Consortium on Green Design and Manufacturing, UC Berkeley and Sun Microsystems. Menlo Park, CA March 27.

54. Sgro, L. A., Higgins, B. S., Koshland, C. P., Eibeck, P. A. , Lucas, D. and Sawyer, R. F. (1995) Numerical Characterization of a Vertical Flow Combustion Flow Reactor. Presented at the Central States and Western States Section/ The Combustion Institute Joint Meeting, San Antonio, April 1995.

#55. Koshland, C.P. (1995). Environmental Council Colloquium: "Industrial Ecology", April 12, 1995. University of California, Berkeley, CA.

56. Vitovec, W., Koshland, C. P., Lucas, D., and Sawyer, R. F. (1995). The Destruction of Methylene Chloride in Lean Post-flame Conditions. Presented at the Fourth International Congress on Toxic Combustion Byproducts, University of California, Berkeley CA, June 1995

57. Buckley, S. G., Sawyer, R. F., Koshland, C. P. and Lucas, D. L. (1995). *In Situ* Monitoring of Toxic Metal Emissions Using Excimer Laser Fragmentation Fluorescence Spectroscopy. Presented at the Fourth International Congress of Toxic Combustion Byproducts California, Berkeley CA, June 1995

58. Higgins, B. S., Koshland, C. P., Lucas, D. and Sawyer, R. F. (1995). Thermal Oxidation of Chlorobenzene. Presented at the Fourth International Congress on Toxic Combustion Byproducts, University of California, Berkeley CA, June 1995

59. Buckley, S. , Sawyer, R. F., Koshland, C.P. and Lucas, D. L, (1995). In Situ Monitoring of Toxic Metal Emissions Using Excimer Laser Fragmentation Fluorescence Spectroscopy for Metal Emissions. Air and Waste Specialty Conference, SF, CA. September, 1995.
60. Higgins, B. S., Koshland, C. P., Lucas, D. and Sawyer, R. F. (1995). Thermal Oxidation of Benzene and Chlorobenzene, Presented at the Western StatesSection/The Combustion Institute Fall Meeting, Stanford, October 1995.
61. Millet, C-N, Sgro, L. A., Higgins, B. S., Koshland, C.P., Lucas, D. and Sawyer, R. F. (1995). Oxidation of Methylene Chloride (CH₂Cl₂) in the Post-Flame Region of a Vertical Flow Reactor. Presented at the Western States Section/The Combustion Institute Fall Meeting, Stanford, October 1995.
62. Buckley, S. G., Sawyer, R. F., Koshland, C.P., and Lucas, D. (1995). Laser Methods for Lead Monitoring in Flames and Post-flame Gases. Presented at the Western States Section/The Combustion Institute Fall Meeting, Stanford, October 1995.
63. Vitovec, W., Higgins, B. S. Lucas, D. , Koshland, C.P. and Sawyer, R. F. (1995) The Formation of Toxic Byproducts During High Temperature, Post-Flame Oxidation of Chlorinated Hydrocarbons in a Laboratory Scale Reactor. Presented at the 3rd Asia Pacific International Symposium on combustion and Energy Utilization. Hong Kong, Dec. 1995.
- #64. Koshland, C.P. (1995). Environment, Teaching and Research: A Campus-wide Response. Presented at the International Workshop on Environmental Chemical Engineering, The University of Sydney, Sydney, Australia, Dec. 1995.
65. Buckley, S. G., Koshland, C.P. , Lucas, D. and Sawyer, R. F. (1996). A Real-TimeMonitor for Toxic Metal Emissions from Combustion Systems. Presented at Spring Western States Meeting/ The Combustion Institute, Tempe AZ, March.
- #66. Koshland, C.P. ,D.L. Lucas and L. A. Sgro (1996). Chlorinated combustion byproducts: combustion driven flow reactor studies. Present at the Session on Mitigation, American Chemical Society Symposium on New Perspectives in Environmental Chemistry. New Orleans, March.
67. Hertwich, E.G., Sheng, P. S. and Koshland, C. P. (1996). A Flexible Method for Including Environmental Toxicity in DfE and LCA. The 1996 International Symposium on Electronics and the Environment.
- #68. Koshland, C.P. (1996) Impacts and Control of Air Toxics from Combustion. Invited mini review, Twenty-sixth Symposium (International) on Combustion, Naples, Italy, July 1996.
69. Higgins, B.S., Koshland, C.P. , Lucas, D., and Sawyer, R. F. (1996). Thermal Oxidation of Benzene and Chlorobenzene. Poster, Twenty-sixth Symposium, (International) on Combustion, Naples, Italy, July 1996.
70. Millet, C-M, Sgro, L. A., Koshland, C.P., Lucas, D. L., Sawyer, R. F., Lacas, F. and Darabiha, N. (1996)The Variations of Chemical Destruction Pathways of Methylene Chloride in a Combustion Driven Flow Reactor. Poster, Twenty-sixth Symposium (International) on Combustion, Naples, Italy, July 1996.
71. Clack, H.L., Koshland, C.P., Lucas, D. and Sawyer, R.F. (1997). Post-Flame Thermal Destruction

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of Bi-component Size- and Density-controlled 1, 1, 1- Trichloroethane Sprays. WSS/CI, Presented at the Western States Section / Combustion Institute Fall 1997.

72. Sgro, L.A., Koshland, C.P., Lucas, D., and Sawyer, R.F. (1997). Influence of Equivalence Ratio and Temperature on Chemical Destruction Pathways of Dichloromethane (CH₂Cl₂) in a Combustion Driven Flow Reactor. WSS/CI, Presented at the Western States Section / Combustion Institute October, 1997.

#73. Koshland, C.P. (1997). Invited lecture, Princeton Mechanical Engineering Seminar, Princeton University, April

74. Buckley, S.G., Damm, Vitovec, W., Sgro, L.A., Sawyer, R.F., Koshland, C.P., and Lucas, D. (1998). Ammonia Detection and Monitoring Using Photofragmentation-Fluorescence. WSS/CI, Presented at the Western States Section / Combustion Institute March,.

#75. Koshland, C.P., Invited lecture, Emissions Monitoring, Superfund 10th Anniversary Meeting, Research Triangle Park. NC, February 1998

76. Franklin, Pamela, Koshland, C.P., Sawyer, R.F., and Lucas, D. (1998). Evaluation of Automotive MTBE Combustion Byproducts. WSS/CI, Presented at the Western States Section / Combustion Institute March, 1998.

#77. Koshland, C.P. Invited lecture: UC Riverside, May 1998

#78. Koshland, C.P., Invited discussion chair, First Industrial Ecology Gordon Conference, New Hampshire, June 1998

#79. Koshland, C.P., Panel Member, Mixtures meeting, Colorado State University, August 1998

80. Clack, H., Koshland, C.P., Lucas, D. and Sawyer, R. F. (1998) Observations of spray density effects on multicomponent chlorinated hydrocarbon vaporization and thermal destruction. 27th Symposium (International on Combustion, Boulder, Colorado, August 1998.

#81. Koshland, C.P. (1998). Preventing Future Superfund Sites. Superfund Annual Meeting, Berkeley, November 1998.

82. Kyle, A. and Koshland, C.P. (1998) Curriculum of leadership in public health. American Public Health Association Annual Meeting. Nov.

83. Sgro, L.A., Koshland, C.P., Lucas, D. and Sawyer, R.F. (1998). Post Flame CH₂Cl₂ Combustion: Effects of Excess Oxygen and Temperature. Poster at the United States/Mexico Conference on Hazardous Waste Management and Technologies, Tucson, AZ, August.

84. Minc, K., Lucas, D., Koshland, C.P. and Sawyer, R. F. (1998) Investigation of the Geometry for in Situ FTIR Measurements in a Combustion Flow Reactor. Presented at the Western States Section/The Combustion Institute Fall Meeting, Seattle, WA. October, 1998.

85. Franklin, P., Koshland, C.P., Lucas, D. and Sawyer, R. F. (1999) Evaluation of Combustion Products of MTBE as a component of reformulated gasoline. First Joint Meeting of the United States Sections of the Combustion Institute, Washington DC, March. p. 883-886.

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86. Clack, H. L., Koshland, C. P., Lucas, D., Minc, K. and Sawyer, R. F. (1999) Effect of in-situ oxygenate delivery on the thermal oxidation of 1,1,1-trichloroethane within vaporizing component sprays. Presented at the Sixth International Congress on Toxic Combustion Byproducts, Karlsruhe, Germany, June 1999.
87. Higgins, Thomson, Lucas, Koshland and Sawyer (1999). An experimental and numerical study of the thermal oxidation of chlorobenzene, Presented at the Sixth International Congress on Toxic Combustion Byproducts, Karlsruhe, Germany, June 1999.
88. Franklin, P., Koshland, C. P., Lucas, D. and Sawyer, R. F. (1999) Evaluation of MTBE as a component of reformulated gasoline. Presented at the Sixth International Congress on Toxic Combustion Byproducts, Karlsruhe, Germany, June 1999
89. Damm, Christopher, Lucas, D; Sawyer, R. F and Koshland, C. P. (1999). Excimer Laser Fragmentation Fluorescence Spectroscopy as a Method for Monitoring Ammonium Nitrate and Ammonium Sulfate Particles. Presented at the Sixth International Congress on Toxic Combustion Byproducts, Karlsruhe, Germany, June 1999
- #90. Koshland, C. P. (1999) Industrial Ecology and Designing for Human and Environmental Health. The Nineteenth Annual Steven Manly Memorial Lecture. UC Santa Barbara, June 7, 1999.
- #91. Koshland, C. P. (1999). Diagnostic Requirements for Toxic Emission Control. Gordon Research Conference, Laser Diagnostics for Combustion Research, Italy, June 20-24, 1999.
92. Deumling, R. and Koshland, C. P. (1999). Material and Energy Implications of Decreasing the Product Life of Refrigerators: Missing the Forest for the Trees. Presented at Troyes, Sept. 1999
93. Minc, K., Lucas, D., Koshland, C. P., and Sawyer, R. F. (1999) Prototype Investigation for In Situ FTIR Measurements in a Combustion Flow Reactor, Presented at the Western States Section Combustion Institute Fall Meeting, Irvine, CA.
- #94. Koshland, C. P. (2000). The Challenge of Automotive Pollution and Public Health, School of Public Health Research Symposium, UC Berkeley, February.
95. Damm, C. J., Lucas, D., Sawyer, R. F. and Koshland, C. P. (2000) Measurement of combustion generated particles with excimer laser fragmentation fluorescence spectroscopy. Presented at WSS/CI Western States Section Combustion Institute Spring Meeting, Golden, CO.
- #96. Koshland, C. P. (2000). From the lab to the field and back: Engineering and the Public Interest, Society of Women Engineers Annual Luncheon, UC Berkeley. April
97. Kyle, A. and Koshland, C. P. (2000) Curriculum for leadership in environment and health. Poster, 13th Annual Research Symposium, UC Toxic Substances Research & Teaching Program, San Diego, April.
- #98. Koshland, C. P. (2000) Invited discussion chair, Second Gordon Conference on Industrial Ecology, New Hampshire, June
99. C.J. Damm, D. Lucas, R.F. Sawyer and C.P. Koshland, (2000) Real-time Measurement of Combustion Generated Particles with Photofragmentation-Fluorescence Spectroscopy, Poster,

Twenty-eighth Symposium (International) on Combustion, Edinburgh, Scotland, August

#100. Koshland, C. P. (2000). Vehicles, air pollution and public health: mobility vs. morbidity, and the challenges of the freedom of the road, Third Joint China/USA Chemical Engineering Conference September 25 - 28, 2000 Beijing, China

101. C.J. Damm, D. Lucas, R.F. Sawyer and C.P. Koshland, (2000) Real-time Measurement of Combustion Generated Particles with Photofragmentation-Fluorescence Spectroscopy, Poster, Twenty-eighth Symposium (International) on Combustion, Edinburgh, Scotland, August

102. Herek L. Clack, Catherine P. Koshland, Donald Lucas and Robert F. Sawyer (2000). On the vaporization and thermal oxidation of chlorinated hydrocarbon/alcohol sprays. Paper presented, Twenty-eighth Symposium (International) on Combustion, Edinburgh, Scotland, August

103. Cheng, A. S., Damm, c. J., Sawyer, R. F., Dibble, R. W., Lucas, D and Koshland, C. P. (2001) The effect of oxygenate in-Diesel blends and Fischer-Tropsch Diesel on particulate matter emissions from a compression-ignition engine, Paper presented, 2nd Joint Meeting of the U. S. Sections of the Combustion Institute, Oakland, CA March

104. Damm, C. J., Sawyer, R. F., Lucas, D. and Koshland, C. P. (2001) Monitoring diesel particulate matter with photofragmentation fluorescence, Paper presented, 2nd Joint Meeting of the U. S. Sections of the Combustion Institute, Oakland, CA March

105. Stipe, C. , Lucas, D., Sawyer, R. F. and Koshland, C. P. (2001) Detection of Cerium by excimer laser fragmentation fluorescence spectroscopy, Poster, 2nd Joint Meeting of the U. S. Sections of the Combustion Institute, Oakland, CA March

106. Damm, C. J. , Cheng, A.S., R. W. Dibble, Lucas, D, Sawyer, R. F. and Koshland, C. P. (2001). Photofragmentation-fluorescence measurement of particulate emissions from a diesel engine fueled by oxygenate-in-diesel and fischer-tropsch diesel blends. Paper presented at The Seventh International Congress on Combustion Byproducts, NIEHS, Research Triangle Park, North Carolina, June.

#107. Koshland, C. P. and Lucas, D. (2001) Invited Plenary Talk, Diesels and Coal: Particles in the lab and in the field. Western States Section, The Combustion Institute, Fall Meeting, University of Utah, October.

108. Stipe, C. , Lucas, D, Koshland, C. P. , and Sawyer, R. F. (2001). Excimer Laser Fragmentation Fluorescence Spectroscopy Detection of Cerium Chloride and Cerium Sulfate Particles presented at Western States Section, The Combustion Institute, Fall Meeting, University of Utah, October.

#109. Koshland, C. P. (2002) School of Public Health, UC Berkeley (Dean Candidate Talk)

110. Tian, L., Lucas, D., Hammond, S. K., Yano, J. Yachandra, V. K., and Koshland, C. P. (2002). Electron Paramagnetic Resonance Study on Coal Combustion Emission Particles. The 16th Annual TSRT&P Research Symposium, April 25-26 2003, Oakland Ca

111. O'Donovan, N. Stipe, C.B., Choi, J. H., Lucas, D, Sawyer, R. F., and Koshland, C. P. (2002). "Development of a Diagnostic Tool for Detecting Lead in Soil and combustion Generated Particles, Annual NIEHS/EPA Basic Research and Training Meeting, March 16-19 2003.

112. Stipe, C. B, Lucas, D. , Sawyer, R. F. and Koshland, C. P. (2003) Two Laser Fragmentation of Soot Particles, Paper D19 presented at the Joint Meeting of the U. S. Sections of the Combustion Institute, Chicago, IL, 2003
113. Stipe, C. B., Choi, J. H., Lucas, D., Sawyer, R. F., and Koshland, C. P. (2003), UV Photofragmentation of Combustion Generated Particles, Paper PH4 presented at the Joint Meeting of the U. S. Sections of the Combustion Institute, Chicago, IL, 2003
114. J.H. Choi*, N.J. O'Donovan, R.F. Sawyer, C.P. Koshland, and D. Lucas "Detection of lead in soil with Photofragmentation Fluorescence Spectroscopy," 8th International Congress on Combustion By-products, June 17-19, 2003, Umeå, Sweden.
115. Damm, C. J, Cheng, A. S., Dibble, R. W., Lucas, D., Sawyer, R. F., and Koshland, C. P. The Effect of Low Sulfur Diesel, Oxygenate-in-Diesel Blends, and Fischer-Tropsch Diesel on Particulate Matter Emissions from a Compression-Ignition Engine, 8th International Congress on Toxic Combustion Byproducts, Umea, Sweden, June 17-19, 2003.
116. Fischer, S. L. and Koshland, C. P., (2003) Indoor concentrations of particles and Co, Exposures to CO and Particle composition in a solid-fuel burning village in northeastern China, 8th International Congress on Combustion Byproducts, Umea, Sweden, June 17-19.
117. Fischer, S.L., Young, J. A., and Koshland, C. P. (2003) Evaluating Social, Economic and Environmental Impacts of a Village Energy Project in NE China: A Multidisciplinary Approach., 2003 Society for Applied Anthropology Annual Conference, Portland, OR March 17-22.
- #118. Koshland, C. P. (2003) "Working at the Intersections: The challenges of engineering and public policy", Department of Mechanical Engineering, Stanford University
119. J.H. Choi**, C.B. Stipe, D. Lucas, R.F. Sawyer, and C.P. Koshland, "UV Photofragmentation of Combustion Generated Particles," NIEHS Superfund Quad-University/EPA Region 9 Conference, Oct. 8-10, 2003, Berkeley, CA, USA.
- #120 Koshland, C. P. (2003) "Meeting Global Challenges: Energy and Environment", Energy and Environment Strategic Planning workshop Keynote address, Presented at Princeton University, Workshop on Energy and Environment, October 20, 2003
- #121. Koshland, C. P. (2004) Superfund Distinguished Lecture Series, June 10, 2004, National Institute of Environmental Health Science
122. J.H. Choi**, C.B. Stipe, R.F. Sawyer, C.P. Koshland, and D. Lucas, "Soot Particle Interaction with UV Light," 30th International Symposium on Combustion, Jul. 25-30, 2004, Chicago, IL, USA.
- #123. C. P. Koshland, College of Engineering and Mathematics, University of Vermont, December 2004
- 124 Jong Hyun Choi, Catherine Koshland, Robert Sawyer, Donald Lucas (2005), The Interaction of Polystyrene Nanospheres with 193 nm Light; Joint meeting of the US Sections of the Combustion Institute, Philadelphia PA, March
125. A. Holder, D. Lucas, R.Goth-Goldstein, C. P. Koshland, and R.F. Sawyer (2005) Characterization of Diesel Exhaust Particulate for Lung Cell Exposure. Proceedings of the Fourth

Joint Meeting of the U.S. Sections of The Combustion Institute, 168 Philadelphia, PA, Mar. 20–23.

#126. Koshland, C.P., Particles, Health and Interventions: Coal in China, Queen Mary College, May 3, 2005, London, England

#127. Koshland, C.P., Particles, Health and Interventions: Indoor Air in rural China. Department of Mechanical Engineering, Imperial College, London University, May 5, 2005, London, England.

128. Fisher, S. and Koshland C.P., Indoor air quality and driving factors in a rural Chinese Village (2005) International congress on Combustion Byproducts and their Health Effects, Tucson AZ, June

129. Holder, A.; Lucas, D, Roth-Goldstein, R., Koshland, C.P. and Sawyer, R. F. (2005) In vitro exposure of lung cells to diesel exhaust at the air cell interface International congress on Combustion Byproducts and their Health Effects, Tucson AZ, June

130. L. Tian, D. Lucas, S. K. Hammond, and C.P. Koshland (2005). Coal Combustion Emissions and Lung Cancer in Xuan Wei, China: An Ecological Study. Int. Congress on Combustion By-Products and Their Health Effect, June 12 -15, Tucson, AZ.

131. Particle and gas emissions from a simulated household fire pit, October 17-18, 2005 Western States Section/Combustion Institute (Palo Alto, California), L Tian, D Lucas, SL Fischer, SC Lee, and CP Koshland.

132. J.H. Choi, R.F. Sawyer, C.P. Koshland, and D. Lucas, “Laser Ablation of Nanoscale Materials with 193nm Light”, 8th International Conference on Laser Ablation, Sep. 11-16, 2005, Banff, Canada.

133. J.H. Choi, R.F. Sawyer, C.P. Koshland, and D. Lucas, “Nanoscale Particle Interactions with 193 nm Light”, Gordon Research Conference on Laser Diagnostics in Combustion, Jul. 31-Aug. 05, 2005, South Hadley, MA, USA.

134. G. Lanzuolo, L. A. sgro, A. D”Anna, K. Hinckley, D. Lucas, C. P. Koshland, R. F. Sawyer Brownian and Coulombic coagulation effect on size distributions of nano-particles: theory and measurement. Presented at Combustion and Urban Areas, 28th meeting of the Italian Section of the combustion Institute, Naples, July 4-6, 2005.

135. Field performance of a nephelometer in rural kitchens: effects of high humidity excursions and correlations to gravimetric analyses, October 17-18, 2005 Western States Section/Combustion Institute (Palo Alto, California), SL Fischer and CP Koshland (podium presentation by SL Fischer).

136. L Tian, D Lucas, SL Fischer, SC Lee, and CP Koshland. Particle and gas emissions from a simulated household fire pit, October 17-18, 2005 Western States Section/Combustion Institute (Palo Alto, California)

137. Fischer, SL, Young, J and Koshland, CP (2006) Institutional Reception of Ethnographic Assessment of a Village-Scale Energy Project: A Case Study in Resistance to Learning from Local Experience, March 28-April 2, 2006, Society for Applied Anthropology Annual Meeting, Vancouver, British Columbia

138. Holder, A. L., Lucas, D., Goth-Goldstein, R., Koshland, C.P. (2006) Characterization of Diesel Exhaust Particulate for Lung Cell Exposure, American Chemical Society Spring National Meeting

Atlanta, Georgia.

139. Predictors of and Correlations Between Peak Pollution Period and Daily Average Indoor Air Quality in a Rural Chinese Village, September 2-6, 2006, International Conference on Environmental Epidemiology & Exposure (ISEE/ISEA), Paris, SL Fischer and CP Koshland (poster presentation by SL Fischer).

140. Holder, A. L., Lucas, D., Koshland, C.P. (2007), In Vitro Toxicogenomics for Assessing the Health Effects of Biodiesel Exhaust, 10th International Congress on Combustion By-Products and Their Health Effects Ischia, Italy.

141. Koshland, CP, Fischer, S, Young, J (2007) Interventions and Institutions: Who and what define success?, 10th International Congress on Combustion By-Products and Their Health Effects Ischia, Italy.

142. Holder, A. L., Lucas, D., Goth-Goldstein, R., Koshland, C.P. (2007) Health Effects of Partially Oxidized Soot, Proceedings of the Fifth Joint Meeting of the U.S. Sections of The Combustion Institute San Diego, California.

143. Holder, A. L., Lucas, D., Goth-Goldstein, R., Koshland, C.P. (2007), Toxicity of Combustion Generated Particles is Modified by Reaction with Ozone, The 12th International Conference of the Pacific Basin Consortium for Environment and Health Science Beijing, China.

144. Koshland, CP, Fischer, S. and Young, J. (2007) Institutions and development: Learning for project success, The 12th International Conference of the Pacific Basin Consortium for Environment and Health Science Beijing, China.

145. Koshland, C.P., Holder, A and Lucas, D (August 2008) Nanoparticle Characteristics and Impacts, ACS meeting, Philadelphia PA (presentation by C. Koshland).

146. James, JZ, Lucas, D and Koshland, C (2008) Nano-particle-based Detection of metals, SBRP Annual Meeting Pacific Grove, CA.

147. Koshland, C.P (Feb 2009) invited panel presentation, Economics and Policy Perspectives on R&D at the NBER conference, Toward an R&D Agenda for the New Administration and Congress: Perspectives from Scientists and Economists, Washington, DC.

148. Koshland, C.P. (2009) Engineering as a liberal art. Invited seminar presentation, Department of Civil Engineering, Stanford University, May 2009.

149. Jay Z. James (Presenter), Catherine P. Koshland, and Donald Lucas (June 2009) Gold nano-based mercury sensors. Paper presented at the Combustion byproducts meeting, NIEHS, RTP, North Carolina.

150. Holder, A. L., Lucas, D., Goth-Goldstein, R., Koshland, C.P.(2009),) Combustion generated particles interfere with the measurement of cellular toxicity, paper presented at the Combustion Byproducts meeting, June 2009 (presentation by A. Holder).

151. James, JZ, Koshland, C and Lucas D (2009) Gold nano-based mercury sensors, paper presented at the Combustion byproducts meeting, NIEHS, RTP, North Carolina, June 2009 (presentation by J. James)

152. A. L. Holder, R. Goth-Goldstein, D. Lucas, C. P. Koshland, L.C. Marr (2009) In vitro toxicity testing of nanoparticles deposited at the air-liquid interface, presented at International Conference on the Environmental Implications of Nanotechnology, Howard University, Washington, D.C. September 9-10, 2009.

153. Koshland, C. P. (2009) Renewal, Reinvention and Innovation; invited talk, Department of Civil Engineering, Hong Kong Polytechnic University, Hong Kong, October, 2009.

154. Koshland, C. P. (2009) Nanotechnology: Challenges, invited talk, Department of Environmental Health Sciences, School of Public Health, Chinese University of Hong Kong, October. 2009.

#155. Koshland, CP (2011) New Directions in Engineering: the role of the liberal arts. East China University of Science & Technology (ECUST), June 2, 2011.

156. James, JZ (Presenter), Lucas, D, Koshland, CP (2011) Gold nanorod based mercury vapor sensing. Presented at 10th International Conference on Mercury as a Global Pollutant, Halifax, Canada, July 28, 2011.

157. James, JZ (Presenter), Lucas, D, Koshland, CP (2011) Gold nanorod based mercury vapor sensing. Presented at 12th International Congress on Combustion By-Products and their Health Effects: Combustion Engineering and Global Health in the 21st Century-Issues & Challenges. Paper PIC-038, June 8, 2011.

158. Shaw, SD, Blum, A, Weber, R, Kannan, K, Rich, D, Lucas, D (Presenter), Koshland, CP, Dobraca, D, Hanson, S and Birnbaum, LS (2011) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Presented at 12th International Congress on Combustion By-Products and their Health Effects: Combustion Engineering and Global Health in the 21st Century-Issues & Challenges. Paper PIC-039, June 8, 2011.

159. Crosby, JS (Presenter), Lucas, D, Koshland, CP (2012) Fiber Optic Based Evanescent Wave Sensor for the Detection of Elemental Mercury Utilizing Gold Nanorods. TechConnect World: Nanomaterial for Clean and Sustainable Technology. TH8.577, June 19, 2011

160. Crosby, JS (Presenter), James, J, Lucas, D, Koshland, CP (2012) Mercury Detection Using Gold Nanoparticles. ASTDR-SRP Connecting Research and Practice: Session 3 Environmental Fate and Transport. August 8, 2012.

161. Crosby, JS (Presenter), Lucas, D, Koshland, CP (2013) Determination of Total Mercury Concentration in Aqueous Samples Utilizing Gold Nanoparticles. 13th International Congress on Combustion Byproducts. May 16, 2013

162. Crosby, JS (Presenter), James, JZ, Lucas, D, Koshland, CP (2013) Determination of Total Mercury Concentration in Aqueous Samples Utilizing Gold Nanoparticles. The 11th International Conference on Mercury as a Global Pollutant (ICMGP): Session G01 Analytical Methodologies, July 31, 2013

163. Koshland, CP and Brown, Judith (2013). Presentation on Liberal Arts at Large Public Research Universities for Center for Studies in Higher Education. April 8, 2013.

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164. James, JZ (Presenter), Lucas, D, Koshland, CP (2013) Results from a gold nanoparticle mercury detection system. 16th Annual Energy, Utility & Environment Conference. Paper B4.5, January 29, 2013.
165. James, JZ (Presenter), Lucas, D, Koshland, CP (2013) Mercury sensing with optically responsive gold nanoparticles. Mechanical engineering graduate seminar. Cal Poly, San Luis Obispo. February 6, 2013.
166. Koshland, CP (Presenter) (2013) Plasmonic Mercury Sensing with Gold Nanoparticles. Xi'an, China, September 2013.
- *167. Koshland, CP (2014). The Critical Role of Research Universities and the Role of the Faculty Scholar, invited talk. 2014 ACS Creative Advances in Environmental Science and Technology in honor of Dr. Harold B. Dellinger. American Chemical Society. Dallas, Texas. March 18, 2014.
- *168. Koshland, CP (2014). Meeting Challenges in Environmental Health Research and Academia and How a Liberal Arts Education Matters, invited talk. Haverford College. April 2, 2014.
- *169. Koshland, CP (2014). Travers Conference on Ethics and Accountability in Higher Education: Implementing the Mission: Strategic Management in Universities. Invited talk, Department of Political Science, UC Berkeley. May 1, 2014.
- *170. Gao M, Cao J, Seto E, Koshland C. "Development of a Multi-pollutant Land-use Regression Model for Xi'an, China." Poster presentation at the International Aerosol Conference, Aug 28-Sept 2 2014, Busan, Korea.
- *171. Gao M, Seto E, Koshland C. "Associations of Self-reported Neighborhood Built Environment with Health-related Quality of Life in Xi'an, China." Conference presentation at the International Society for Environmental Epidemiology. Aug 24-28 2014, Seattle, USA.
- #*172. D. Lucas, A. Blum, A. Lindeman, C. Koshland, and R. Weber. "Management of Brominated Flame Retarded Wastes in the United States: Towards a more Circular Economy." Solid Waste Association meeting in Novi Sad, Serbia. Sept 19-21, 2016
- #*173. Panel Moderator, Strategies and Programs to Improve First-Year Retention. UC Systemwide Conference, UC Riverside (2015)
- #174. J. James, J. Crosby, D. Lucas, C. Koshland. Plasmonic Mercury Sensor. Abstract. EHS Sensors and Technologies Fair. NIEHS Environmental Health Science FEST in Durham, NC. Dec 5-8, 2016.
- #*175. Panel Member, Examining the Graduate Skills Gap. Times Higher Education Academic Summit, June 2017
- #*176. Panel Member, "Focusing on the Future: Defining Success." edX Global Forum, Paris, 2016.
- #*177. Panel Member, Times Higher Education. "Examining the graduate skills gap: is it real?" Innovation and Impact Summit. Hong Kong. June 2017.
- *178. Lecturer, "Majors, Degrees and Employment – Matching Degrees and Majors to Careers – What Matters?" Education 24, Fall 2018.

*179. Co-Presenter, Koshland, CP, Hunter, M. “Catalyzing and Managing Transformative Change in Independent Colleges” AACU Annual Conference (in Collaboration with Mills College). Atlanta, GA. January 24, 2019

*180. Panelist, “Reimagining New Student Orientation as “Advising”: A UC System Initiative. A Panel Discussion at the Reinventing Undergraduate Education at US Research Universities. Reinvention Collaborative at UC Davis. October 16, 2019

*#181. Upcoming: Panelist, “Understanding Campus Climate: Towards an Inclusive Environment for Undergraduate and Graduate Students.” SERU Research Symposium and Business Meeting. June 17-19, 2020.

#NSF Workshop

- **1915714 (Harding, D)**
 - IUSE/NSF / \$1,893,357 / 10/01/20119 -09/30/2024
 - Mills College / UC Berkeley Partnership
 - "Undergraduate Data Science Education at Scale," is under the direction of David J. Harding, David E. Culler, Cathryn L. Carson, Catherine P. Koshland, Rodolfo Mendoza-Denton.
 - Role:
 - Overlap:

- **P42 ES04705 (Smith M)** 03/31/11- 2016
 - NIH/ NIEHS
 - Superfund Basic Research Program: Toxic Substances in the Environment
 - Core E: Training Core
 - The major goal(s) of this project: to develop professionals and scholars who can assess the impact of environmental and regulatory policies on the long-term prospects for prevention, and who can incorporate advances in science and engineering for environmental and human health protection.
 - Role: Investigator
 - Overlap: None

- **R13ES025490 (NIEHS)**
 - NIEHS/NSF Workshop / \$86,544 / April 1, 2015 - March 31, 2016
 - Support for workshop on “Responsible Disposal Research for Flame Retarded Plastic and Polyurethane Foam: Developing the Basic Science for Improved Separation and Destruction Technologies”
 - Role: Principal Investigator
 - Overlap: None

- **R1500091 (NSF)**
 - NIEHS/NSF Workshop / \$86,544 / April 1, 2015 - March 31, 2016
 - “Responsible Disposal Research for Flame Retarded Plastic and Polyurethane Foam: Developing the Basic Science for Improved Separation and Destruction Technologies”
 - Role: Principal Investigator

Patents

1. James JZ, Crosby, JS, Lucas D, Koshland CP. Localized Surface Plasmon Resonance Mercury Detection System and Methods. U.S. Application Nos. 61/585,542 and 61/587,546. January 10, 2013 (filed)

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Vivan Gratton (M.S., ERG) Free lance writer/science curricula
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