

Integrated Chemistry: Innovative Upper-Level Laboratory Experiences

Organizing committee

Workshop Liaison: Alison R. Keimowitz, Assistant Professor of Chemistry, Vassar College
alkeimowitz@vassar.edu

Marisa Buzzeo, Assistant Professor of Chemistry, Barnard College

Zachary J. Donhauser, Associate Professor of Chemistry, Vassar College

Albert J. Fry, Elisha B. Nye Professor of Chemistry, Wesleyan University

Casey H. Londergan, Assistant Professor of Chemistry, Haverford College

Kathleen L. Purvis-Roberts, Associate Professor of Chemistry, the Claremont Colleges

Tentative Dates and Location: August 17-18, Philadelphia, PA. Immediately before the American Chemical Society Annual Meeting.

Background and goals

The undergraduate chemistry curriculum has traditionally been defined by separate courses in foundational sub-disciplines, including physical, inorganic, analytical, organic, and biochemistry, with associated laboratory courses following this pattern. Several colleges participating in the AALAC have begun to offer an innovative laboratory curriculum that incorporates material from two or more of these traditional upper level laboratories into an “integrated” chemistry lab; others are considering doing so. The integrated approach offers practical and pedagogical advantages; most importantly, as science becomes more interdisciplinary and divisional boundaries within chemistry are blurred, an integrated laboratory course may better prepare students for chemistry research and work in the chemical sciences. The integrated approach, however, also presents several challenges, among them synchronization of lecture and lab courses, depth of student learning, and true “integration” of laboratory exercises that have traditionally been compartmentalized into their respective sub-disciplines.

We propose to meet to discuss these courses with faculty from colleges already using integrated laboratories and those colleges considering integrated laboratories. As the integrated approach to teaching chemistry is less mature, knowledge sharing and collaboration could potentially have a large impact, broadly improving the overall approach. The workshop goals are: 1) to share successful implementation strategies for integrated labs; 2) to workshop and improve specific experiments or exercises, and 3) to develop a group of faculty interested in sustained communication around these issues over the following years. We hope this would prevent faculty from different colleges duplicating previously tested approaches and would improve the quality of integrated chemistry labs at all participating institutions.

Tentative workshop schedule

Prior to workshop	Six facilitators circulate syllabi and catalog descriptions for relevant courses to all participants
Session 1; Day 1 afternoon	Welcome; Discussion of strengths and weaknesses of integrated labs led by one or two facilitators
Session 2; Day 1 afternoon	Six facilitators present syllabi and one experiment for detailed workshopping
Session 3; Day 2 morning	Participants divide into six groups of approximately four faculty each. Each group would contain one facilitator and would discuss and develop one integrated laboratory exercise in detail.
Session 4; Day 2 afternoon	One representative of each small group presents to the large group about ideas and improvements made to the experiment discussed in Session 3.
Session 5; Day 2 afternoon	Discussion of common themes that emerged from small group discussions, overall structure of courses, and future directions led by one or two facilitators

Follow-up activities

After the workshop, a group of web-accessible documents would be shared among workshop participants on a Wordpress blog, hosted and administered at Vassar College. This blog will contain a public area for broader dissemination of general workshop ideas and a private area for sharing of sensitive documents such as modified, workshopped experimental plans, modified syllabi, new experimental plans, and reflections on courses. It is the organizing committee's intention that the participating faculty would remain in contact over the next several years to continue to discuss implementation of these courses. If there were sufficient interest, one or two webinars or conference calls could also be organized at the end of the next academic year(s) to discuss faculty experiences.

Workshop evaluation

The workshop will be evaluated using an online survey (via Survey Monkey) with opportunities for both quantitative and qualitative responses. Feedback will be used to focus the workshop follow-up in the most helpful directions.

<i>AALAC Integrated Chemistry Laboratory Workshop: Tentative Budget</i>			
Item	Cost per person	Number of people	Total cost
Travel expenses for participants	\$600	25	\$15,000
Dinner, 8/24	\$30	25	\$750
Breakfast and Lunch, 8/25	\$30	25	\$750
Workshop Venue			\$2,000
Organizer Stipend			\$1,000
Administrative costs			\$250
TOTAL			\$19,750

MARISA C. BUZZEO

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EDUCATION

- November 2005* University of Oxford, St. John's College, Oxford, UK
DPhil (Physical Chemistry)
Thesis: "Electrochemical Applications of Room Temperature Ionic Liquids"
- May 2001* Barnard College, Columbia University, New York, NY
B.A. (Chemistry), *cum laude*

ACADEMIC AND RESEARCH EXPERIENCE

- Aug 2009 - present* **Assistant Professor**, Department of Chemistry, Barnard College, New York, NY
- Jul 2008 - Jul 2009* **Independent Research Scientist**, Nanoscale Science and Engineering Center, Columbia University, New York, NY
- Jan 2006 - Jul 2008* **Postdoctoral Scholar**, Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA; *Advisor: Prof. Jacqueline K. Barton*
- Sep 2002 - Nov 2005* **Graduate Student**, Physical & Theoretical Chemistry Laboratory, University of Oxford, Oxford, UK; *Advisor: Prof. Richard G. Compton*
- Jan 2002 - Jun 2002* **Student Teacher**, Bronx High School of Science, New York, NY
- Jun 2000 - May 2002* **Undergraduate Research Assistant**, Chemistry Department, Barnard College, New York, NY; *Advisor: Prof. Linda H. Doerrer*

ACADEMIC HONORS & AWARDS

Analytical Division Studentship, *Royal Society of Chemistry* (2002-2005); CASE studentship, *sponsored by Alphasense Ltd., UK*, (2002-2005)

PROFESSIONAL AFFILIATIONS

American Chemical Society, *member*, (1999 – present); Bioelectrochemical Society, *member*, (2011-present)

SELECTED PUBLICATIONS (*undergraduate authors underlined*)

- (1) Cantalupo, S.C.; Lum, J.S.; Buzzeo, M. C.; Moore, C.; DiPasquale, A. G.; Rheingold, A. L.; Doerrer, L. H. "Three-Coordinate Late Transition Metal Fluorinated Alkoxide Complexes" *Dalton Transactions* **2010**, 39, 374-383.
- (2) Gorodetsky, A.A.; Buzzeo, M.C.; Barton, J.K. "DNA-Mediated Electrochemistry" *Bioconjugate Chem.* **2008**, 19, 2285-2296.
- (3) Buzzeo, M.C.; Barton, J.K. "Redmond Red as a Redox Probe for the DNA-mediated Detection of Abasic Sites" *Bioconjugate Chem.* **2008**, 19, 2110-2112.
- (4) Buzzeo, M.C.; Hardacre, C.; Compton, R.G. "Extended Electrochemical Windows Made Accessible by Room Temperature Ionic Liquid / Organic Solvent Electrolyte Systems" *ChemPhysChem* **2006**, 7, 176-180.
- (5) Allen, G.D.; Buzzeo, M.C.; Villigrán, C.; Hardacre, C.; Compton, R.G. "A Mechanistic Study on the Electro-oxidation of Bromide in Acetonitrile and the Room Temperature Ionic Liquid, 1-Butyl-3-Methylimidazolium Bis(trifluoromethylsulfonyl)imide at Platinum Electrodes" *J. Electroanal. Chem.* **2005**, 575, 311-320.
- (6) Allen, G.D.; Buzzeo, M.C.; Davies, I.; Villigrán, C.; Hardacre, C.; Compton, R.G. "A Comparative Study on the Reactivity of Electrogenenerated Bromine with Cyclohexene in Acetonitrile and the Room

- Temperature Ionic Liquid, 1-Butyl-3-Methylimidazolium Bis(trifluoromethylsulfonyl)imide” *J. Phys. Chem. B* **2004**, *108*, 16322-16327.
- (7) Buzzeo, M.C.; Evans, R.G.; Compton, R.G. “Non-Haloaluminate Room Temperature Ionic Liquids in Electrochemistry – A Review” *ChemPhysChem* **2004**, *5* 1106-1120.
 - (8) Buzzeo, M.C.; Giovanelli, D.; Lawrence, N.S.; Hardacre, C.; Seddon, K.R.; Compton, R.G. “Elucidation of the Electrochemical Oxidation Pathway of Ammonia in Dimethylformamide and the Room Temperature Ionic Liquid, 1-Ethyl-3-methylimidazolium Bis(trifluoromethylsulfonyl)imide” *Electroanalysis* **2004**, *16*, 888-896.
 - (9) Buzzeo, M.C.; Klymenko, O.V.; Wadhawan, J.D.; Hardacre, C.; Seddon, K.R.; Compton, R.G. “Kinetic Analysis of the Reaction Between Electrogenenerated Superoxide and Carbon Dioxide in the Room Temperature Ionic Liquids 1-Ethyl-3-methylimidazolium Bis(trifluoromethylsulfonyl)imide and Hexyltriethylammonium Bis(trifluoromethylsulfonyl)imide” *J. Phys. Chem. B* **2004**, *108*, 3947-3954.
 - (10) Buzzeo, M.C.; Klymenko, O.V.; Wadhawan, J.D.; Hardacre, C.; Seddon, K.R.; Compton, R.G. “Voltammetry of Oxygen in the Room Temperature Ionic Liquids, 1-Ethyl-3-methylimidazolium Bis(trifluoromethylsulfonyl)imide and Hexyltriethylammonium Bis(trifluoromethylsulfonyl)imide: One Electron Reduction to Form Superoxide. Steady-state and Transient Behavior in the Same Cyclic Voltammogram Resulting from Widely Different Diffusion Coefficients of Oxygen and Superoxide” *J. Phys. Chem. A* **2003**, *107*, 8872-8878.

SELECTED CONFERENCE PRESENTATIONS (*undergraduate authors underlined*)

- (1) Sokolovskaya, O.; Buzzeo, M. C.; Magyar, J. S. “Overexpression and characterization of cytochrome *c*₅₅₂ from a psychrophilic marine bacterium.” 241st ACS National Meeting, Anaheim, CA, March 2011.
- (2) Jarenwattananon, N. N.; Buzzeo, M. C. “Microfluidic electrochemical DNA hybridization sensors for parallel sequence screening.” 241st ACS National Meeting, Anaheim, CA, March 2011.
- (3) Jarenwattananon, N.; Lahiji, B. D.; Sykes, M. D.; Buzzeo, M. C. “Electrochemical Characterization of Biomimetic Bilayers: Insights into Drug-Membrane Interactions” 240th ACS National Meeting, Boston, MA, August 2010.
- (4) Buzzeo, M.C.; Barton, J.K. “Development of an Electrochemical Assay for the Products of Transcription”, 235th ACS National Meeting, New Orleans, LA, April 2008.

COURSES TAUGHT

CHEM BC3365x Integrated Chemistry Laboratory I; CHEM BC 3252y Thermodynamics and Kinetics; CHEM BC3338/3340y Quantitative & Instrumental Techniques Laboratory; CHEM BC 2002/2102y General Chemistry II (with Laboratory); CHEM BC3901x/3902Y Senior Honors Thesis ; CHEM 3597/3599 Problems in Chemistry

EXTERNAL FUNDING

PI, National Science Foundation, CHE-0959177, \$166,668, MRI-R²: Acquisition of UV-Vis-NIR, FT-IR, and Fluorescence Spectrometric Instrumentation, 2010-2013

PI, American Chemical Society, Petroleum Research Fund, 2009-2011 PI, PRF #50108-UN15, \$50,000, “Probing the Dynamics of Ion Transport by Scanning Electrochemical Microscopy: Towards the Development of Enhanced Fuel Cell Membranes”, 2009-2011

Subaward PI, National Science Foundation, CHE-0641523, \$208,000, Nanoscale Science and Engineering Center: Columbia University Center for Electronic Transport in Molecular Nanostructures, 2008-2011

RELEVANT SERVICE TO THE COLLEGE

Academic advisor, first-year/sophomore students and chemistry majors
Chemistry Department Summer Undergraduate Research Program, coordinator
Outreach, Education, and Diversity Committee member, Columbia University NSF Nanoscale Science and Engineering Center
Barnard Chemistry Society, faculty advisor

RELEVANT SERVICE TO THE PROFESSION

Journal Referee: *Electrochemistry Communications*, *Journal of Electroanalytical Chemistry*, *Bioelectrochemistry*, *Analytical Methods*, *Crystal Growth and Design*

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Education

Ph.D., The Pennsylvania State University, Chemistry, June 2003. Semiconductor Research Corporation Graduate Fellow.
B.S., Providence College, Chemistry, May 1998. Graduated with honors.

Employment

Associate Professor of Chemistry, Vassar College, 2011-
Assistant Professor of Chemistry, Vassar College, 2004-2011.
Postdoctoral Research Assistant, The Pennsylvania State University, 2003-2004.
Research Assistant, The Pennsylvania State University, 1999-2003.
Teaching Assistant, The Pennsylvania State University, 1998-1999.

Grants, Fellowships, Honors, Awards

National Institutes of Health Academic Research Enhancement Award, *Nanomechanics of biologically-relevant microtubule systems*, 2008-2013, **PI**.
Vassar College Computing Technology Grant, *Finite Element Software for Multi-Disciplinary Scientific Modeling and Visualization*, 2006, B. C. Daly and **Z. J. Donhauser**.
Camille and Henry Dreyfus Foundation Start-up Award, *Nanometer-scale characterization and manipulation of microtubules*, 2004-2008, **PI**.
Research Corporation Cottrell College Science Award, *Characterization of molecular-level inhomogeneities in the structure of microtubules*, 2005- 2007, **PI**.
Semiconductor Research Corporation Graduate Fellowship, *Studies in nanoscale electronics using the scanning tunneling microscope*, 2001-2003.
Materials Research Society Silver Medal, 2002
American Vacuum Society Morton M. Traum Award Finalist, 2002

Other Professional Activity

Reviewer for *Journal of the American Chemical Society*, *Journal of Physical Chemistry*
Reviewer for Research Corporation

Selected Publications - undergraduate coauthors underlined.

1. *Immobilization and Imaging of Zn-Induced Tubulin Sheets using Atomic Force Microscopy*, **Z. J. Donhauser**, V. Appadoo, E. J. Kliman, W. B. Jobs, and E. C. Sheffield, manuscript in preparation.
2. *Mechanics of Microtubules: Effects of Protofilament Orientation*, **Z. J. Donhauser**, W. B. Jobs, and E. C. Binka, *Biophysical Journal* **99**, 1668 (2010).
3. *Analyzing the Motion of Benzene on Au{111}: Single Molecule Statistics from Scanning Probe Images*, B. A. Mantooth, E. C. H. Sykes, P. Han, A. M. Moore, **Z. J. Donhauser**, V. H. Crespi and P. S. Weiss, *Journal of Physical Chemistry C* **111**, 6167 (2007).

4. *Enhanced Mechanical Stability of Microtubules Polymerized with a Slowly Hydrolyzable Nucleotide Analogue*, K. M. Munson, P. G. Mulugeta, and Z. J. Donhauser, *Journal of Physical Chemistry B* **111**, 5053 (2007).
5. *Substrate-Mediated Intermolecular Interactions: A Quantitative Single Molecule Analysis*, E. C. H. Sykes, B. A. Mantooth, P. Han, Z. J. Donhauser, and P. S. Weiss, *Journal of the American Chemical Society* **127**, 7255 (2005).
6. *Cross-Step Place-Exchange of Oligo(Phenylene-Ethynylene) Molecules*, A. M. Moore, B. A. Mantooth, Z. J. Donhauser, F. Maya, D. W. Price, Jr., Y. Yao, J. M. Tour, and P. S. Weiss, *Nano Letters* **5**, 2292 (2005).
7. *Benzene on Au{111} at 4K: Monolayer Growth and Tip-induced Molecular Cascades*, P. Han, B. A. Mantooth, E. C. H. Sykes, Z. J. Donhauser, and P. S. Weiss, *Journal of the American Chemical Society* **126**, 10787 (2004).
8. *Control of Alkanethiolate Monolayer Structure Using Vapor-Phase Annealing*, Z. J. Donhauser, D. W. Price, Jr., J. M. Tour, and P. S. Weiss, *Journal of the American Chemical Society* **125**, 11462 (2003).
9. *Cross-Correlation Image Tracking for Adsorbate Analysis and Drift Correction*, B. A. Mantooth, Z. J. Donhauser, K. F. Kelly, and P. S. Weiss, *Review of Scientific Instruments* **73**, 313 (2002).
10. *Conductance Switching in Single Molecules through Conformational Changes*, Z. J. Donhauser, B. A. Mantooth, K. F. Kelly, L. A. Bumm, J. D. Monnell, J. J. Stapleton, D. W. Price Jr., D. L. Allara, J. M. Tour, and P. S. Weiss, *Science* **292**, 2303 (2001).

Relevant Courses Taught

Chem 108/109: General Chemistry Lecture and Lab

Chem 125: Chemical Principles Lecture and Lab

Chem 145: Chemical Research Techniques Lab

Chem 350: Physical Chemistry: Thermodynamics and Kinetics Lecture and Lab

Chem 357: Chemical Physics (Special Topic: Physical Chemistry of Surfaces)

Chem 372: Integrated Chemistry Lab

Relevant College Service & Activities

Premedical Advisory Committee, 2006-

Freshman Premajor Advisor, 2005-

Vassar College URSI Program, 2005-

Biochemistry Major Advisor, 2005-

'Diving into Research' mentor, 2010

Chemistry Major Advisor, Class of 2010

Quantitative Analysis Center Study Group 2008-2009

January 15, 2012

CURRICULUM VITAE

- Name:** Albert Joseph Fry
Elisha B. Nye Professor of Chemistry
Wesleyan University
Middletown, Connecticut
- Office:** Department of Chemistry
Wesleyan University
Middletown, CT 06459
(860) 685-2622
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- Home:** 116 Maple Shade Rd.
Middletown, CT 06457
(860) 346-1398
- Education:** B.S., University of Michigan, 1958
Ph.D., University of Wisconsin, 1963 (Research Director: David M. Lemal)
- Academic Honors:** American Men and Women of Science
Connecticut Academy of Science and Engineering (elected 1980)
Manuel M. Baizer Award in Organic Electrochemistry of The Electrochemical Society (2008)
Fellow of The Electrochemical Society (elected 2009)
- Experience:** Postdoctoral Research Fellow: California Institute of Technology, 1963-1964
Wesleyan University, 1964-65
Assistant Professor of Chemistry, Wesleyan University, 1965-72
Associate Professor of Chemistry, Wesleyan University, 1972-77
Professor of Chemistry, Wesleyan University, 1977-
Elisha B. Nye Professor of Chemistry, 1993-
Chair, Department of Chemistry, 1978-80, 1983, 1985-86
Visiting Professor of Chemistry, :
Institute for Organic Chemistry, Heidelberg University (West Germany), 1970
University of Arizona, 1984 and 1988
University of California at Santa Barbara, 1992
University of Indiana, 2001
- Research Interests:** Synthetic and mechanistic organic electrochemistry; computational electrochemistry, use of quantum chemical computations to obtain information about mechanisms of organic electrode processes and structures of electrochemically generated intermediates; electrocatalytic oxidation of electronegatively-substituted organic substances

Teaching: Fall 2010: Introductory organic chemistry;
 Spring 2011: Physical organic chemistry
 Fall 2011: Integrated Laboratory
 Spring 2012: Applications of spectroscopy in organic chemistry
 Integrated Laboratory (shared with R. Pratt)

Memberships: American Chemical Society
 The Electrochemical Society (member of Executive Committee of the Organic and Biological Electrochemistry Section) 2003-present; Divisional Secretary-Treasurer, May 2005-2007; Vice-chair 2007-2009; Chair, 2009-2011; member, Board of Directors, 2009-2011
 International Society of Electrochemistry; Vice-Chair for Molecular Electrochemistry 2002-2004.
 Alpha Chi Sigma (Professional Chemical Fraternity)
 Sigma Xi

A. Books:

- "Synthetic Organic Electrochemistry," Harper and Row, 1972.
 "Topics in Organic Electrochemistry," A. J. Fry and W. E. Britton, co-editors, Plenum Press, New York, 1986.
 "Synthetic Organic Electrochemistry," 2nd edition, Wiley, 1989.
 "New Directions in Organic Electrochemistry", A. J. Fry, editor, The Electrochemical Society, 2000.

B. Recent Research Papers (of 145):

- Fry, A. J.; Steffen, L. K. "On the Nature of Tetraalkylammonium Ions in Common Electrochemical Solvents. General and Specific Solvation. I. Quantitative Aspects", *J. Electroanal. Chem.* **2010**, *638*, 218.
- Fry, A. J. "The Effect of Tetramethylammonium Ion on the Voltammetric Behavior of Polycyclic Aromatic Hydrocarbons: Computations Explain a Long-Standing Anomaly", *Phys. Chem. of Chem. Phys.* **2010**, *12*, 14775.
- Davis, A. P.; Fry, A.J. "Experimental and Computed Absolute Redox Potentials of Polycyclic Aromatic Hydrocarbons are Highly Linearly Correlated Over a Wide Range of Structures and Potentials", *J. Phys. Chem. (A)*. **2010**, *114*, 12299.
- Lambert, P. C.; Fry, A. J. "Anodic Oxidation of a Tetrasubstituted Cyclooctatetraene. Multiple Carbon-Carbon Bond Cleavage and Aromatization", *Tetrahedron Letters*, **2011**, *52*, 5281.
- Bours, J.; Morton, M.; Fry, A. J. "Electrochemical Oxidation of Cyclooctatetraene in the Presence of Allyltrimethylsilane Anodic Trialkylation with *Bis*-Cyclization", *Tetrahedron Letters*, **2012**, *53*, 1015.

Alison Rachel Keimowitz
(Married & Legal Name: Alison Spodek)

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(845) 437-5745 ◦ alkeimowitz@vassar.edu

Education

- 2006 **Ph.D. and M.Phil.**, with distinction, *Columbia University*
Department of Earth & Environmental Sciences at Lamont-Doherty Earth Observatory
- 2001 **M.S.**, *Yale University*
Department of Chemistry, Division of Physical Chemistry
- 1997 **B.A.**, with high honors, *Wesleyan University*
Department of Chemistry

Positions Held

- 2009— **Assistant Professor**, Vassar College
- 2009— **Adjunct Research Scientist**, Lamont-Doherty Earth Observatory
- 2006—2009 **Columbia Science Fellow**, Columbia University
- 2006 **Instructor**, Summer Term, Boston University Department of Geology
- 2005—2006 **Fulbright Fellow**, Tel Aviv University Department of Microbiology

Grants

- 2011 **Exploratory Research**, Department of Energy, \$43,954. “Linking As, Se, V, and Mn Behavior to Natural and Biostimulated Uranium Cycling”
- 2010 **Rapid Response Grant**, National Science Foundation, \$56,607. “Collaborative Research: Assessing the Effects of Gulf Oil Spill on Mobility of Toxic Metals and Microbial Activities in Alabama Wetlands.”
- 2009 **Collins Fund for Faculty Research**, Vassar College, \$3165. “Arsenic and Manganese in Union Lake.”

Courses Taught

- | | |
|---|------------------------|
| Chemistry 372/373—Integrated Chemistry Laboratory | Spring 2011, Fall 2011 |
| Chemistry 352—Physical Chemistry/Molecular Structure | Fall 2009, 2010, 2011 |
| Environmental Studies 107—Global Change | Fall 2011 |
| Chemistry/Environmental Studies 375—Aquatic Chemistry | Spring 2011 |
| Chemistry 109—General Chemistry | Spring 2010, 2011 |
| Chemistry 108—General Chemistry | Fall 2009, 2010 |

Students Supervised

- | | |
|--------------------------------|---------------------------------------|
| Heili Lowman, VC '12 | Spring 2010 and Fall 2011—Spring 2012 |
| Hansol Chung, VC '11 | Fall 2010—Spring 2011 |
| Katherine Interlichia, VC '11, | Fall 2010—Spring 2011 |
| Deirdre Lewis, VC '11 | Spring 2010—Spring 2011 |
| Tristan Feldman, VC '12 | Fall 2009—Fall 2010 |

Peer-Reviewed Publications

Wovkulich, K., B. J. Mailloux, A. Lacko, **A.R. Keimowitz**, M. Stute, H.J. Simpson, S.N. Chillrud (2010). Chemical treatments for mobilizing arsenic from contaminated aquifer solids to accelerate remediation. *Applied Geochemistry* 25(10): 1500-1509.

Mailloux, B. J., E. Alexandrova, **A. Keimowitz**, K. Wovkulich, G. Freyer, M. M. Herron, J. F. Stolz, T. Kenna, and T. Pichler (2009). Microbial mineral weathering for nutrient acquisition releases arsenic. *Applied and Environmental Microbiology* 75(8): 2559-2565.

Keimowitz, A.R., B. J. Mailloux, P. Cole, M. Stute, H. J. Simpson, S.N. Chillrud. Laboratory investigations of sulfate reduction as a groundwater arsenic remediation strategy (2007). *Environmental Science & Technology* 41(19): 6718-6724.

Parisio, S, **A.R. Keimowitz**, H. J. Simpson, and A. Lent. Arsenic-rich iron floc deposits in seeps downgradient of solid waste landfills (2006). *Soils & Sediment Contamination*: 15(5).

Keimowitz, A. R., Y. Zheng, S. N. Chillrud, B. J. Mailloux, H. B. Jung, M. Stute and H. J. Simpson. Arsenic redistribution between sediments and water near a highly contaminated source (2005). *Environmental Science & Technology* 39: 8606-8613.

Keimowitz, A. R., H. J. Simpson, M. Stute, S. Datta, S. N. Chillrud, J. Ross and M. Tsang (2005). Naturally-occurring arsenic: mobilization at a landfill in Maine and implications for remediation. *Applied Geochemistry* 20: 1985-2002.

Keimowitz, A. R., H. J. Simpson, S. N. Chillrud, M. Stute, M. Tsang, S. Datta and J. Ross (2005). Oxidation of groundwater arsenic and iron. In: *Advances in Arsenic Research: Integration of Experimental and Observational Studies and Implications for Mitigation*. ACS Symposium Series, vol. 915: 206-219. P. A. O'Day, D. Vlassopoulos, D. Meng and L. G. Benning, Eds. American Chemical Society: Washington, DC.

Tyl, R.W., C.B. Myers, M.C. Marr, B.F. Thomas, **A.R. Keimowitz**, D.R. Brine, M.M. Veselica, P.A. Fail, T.Y. Chang, J.C. Seely, R.L. Joiner, J.H. Butala, S.S. Dimond, S.Z. Cagen, R.N. Shiotsuka, G.D. Stropp, J.M. Waechter (2002). Three-generation reproductive toxicity study of dietary bisphenol A in CD Sprague-Dawley rats. *Toxicological Sciences* 68(1): 121-146.

Kang, L., **A.R. Keimowitz**, M.R. Munrow, S.E. Novick (2002). Rotational spectra of argon acetone: A two-top internally rotating complex. *Journal of Molecular Spectroscopy* 213(2): 122-129.

Keimowitz, A.R., B.R. Martin, R.K. Razdan, P.J. Crocker, S.W. Mascarella, B.F. Thomas (2000). QSAR analysis of Delta(8)-THC analogues: Relationship of side-chain conformation to cannabinoid receptor affinity and pharmacological potency. *Journal of Medicinal Chemistry* 43(1): 59-70.

Thomas, B.F., V.L. Parker, L.W. Caddell, L.V. Jones, S.K. Sabharwal, A.I. McDaniel, **A.R. Keimowitz**, N.M. Scheffler, E.D. Hart, J.M. Mitchell, K.H. Davis Jr. (1999). Composition and stability of a standard marijuana cigarette. In: *Marihuana and Medicine*. G.G. Nahas, K.M. Sutin, D. Harvey, and S. Agurell, Eds. Humana Press: Totowa, NJ.

CASEY H. LONDERGAN

Assistant Professor of Chemistry

Department of Chemistry
Haverford College
370 Lancaster Ave
Haverford, PA 19041-1392

email: clonderg@haverford.edu

website: <http://www.haverford.edu/chem/Londergan/>

POSITIONS **Haverford College** Haverford, PA
Assistant Professor of Chemistry 7/2006–present

EDUCATION **University of California, San Diego** La Jolla, CA
Ph.D. in Chemistry 6/2003
M.S. in Chemistry 1/2000

Williams College Williamstown, MA
B.A. *Cum Laude* with Honors in Chemistry 6/1997

TRAINING **University of Pennsylvania** Philadelphia, PA
Postdoctoral fellow for Robin M. Hochstrasser 7/2003–6/2006

University of California, San Diego La Jolla, CA
Graduate student of Clifford P. Kubiak 9/1998–6/2003

Los Alamos National Laboratory Los Alamos, NM
Post-baccalaureate research assistant 6/1997–9/1998
for Thomas A. Zawodzinski, Jr.

Williams College Williamstown, MA
Senior thesis student of Enrique Peacock-López 6/1996–6/1997

RECENT GRANTS AND AWARDS

Pennsylvania Department of Health
CURE grant 2011–2013

National Institutes of Health (NIGMS)
R15 AREA grant GM087499 2009–2011

Research Corporation
Cottrell College Science Award 2009–2011

Camille and Henry Dreyfus Foundation
New Faculty Start-Up Award 2006–2011

National Institutes of Health (NIGMS)
NRSA Kirschstein postdoctoral fellowship 2004–2006

TEACHING Recent courses taught:

Chemistry 305: Quantum Chemistry	Spring 2012
Chemistry 302: Integrated Advanced Laboratory (Superlab)	Spring 2011, Spring 2012
Chemistry 304: Statistical Thermodynamics and Kinetics	Fall 2011
Chemistry 115: Chemical Structure Inquiry Laboratory	Fall 2010, Fall 2011
Chemistry 111: Chemical Structure and Bonding	Spring 2011

RECENT TALKS AND PRESENTATIONS

Swarthmore College Department of Chemistry, invited talk	March 24, 2011
Lehigh University Department of Chemistry, invited talk	Nov. 17, 2011
Gordon Research Conference on Vibrational Spectroscopy	Biddeford, ME, Aug. 1-6, 2010

IN PRESS (undergraduates denoted by *)

Yang, H.*, Habchi, J., Londergan, C. H., Longhi, S. Monitoring structural transitions in intrinsically disordered proteins by vibrational spectroscopy of cyanylated cysteine. invited chapter in *Methods in Molecular Biology*, V. Uversky, volume editor. volume in press.

RECENT PUBLICATIONS

(undergraduates denoted by *)

Wolfshorndl, M.*, Baskin, R.*, Dhawan, I.* Londergan, C. H. Covalently bound azido groups are very specific water sensors, even in strongly hydrogen-bonding environments. *J. Phys. Chem. B*, **2012**, *116*, 1172–1179.

Alfieri, K. N.*, Vienneau, A. R.*, Londergan, C. H. Using infrared spectroscopy of cyanylated cysteine to map membrane binding structure and orientation of the antimicrobial peptide CM15. *Biochemistry*, **2011**, *50*, 11097–11108.

Bischak, C. G.*, Longhi, S., Snead, D. M.*, Costanzo, S., Terrer, E., Londergan, C. H. Probing structural transitions in the intrinsically disordered C-terminal domain of the measles virus nucleoprotein by vibrational spectroscopy of cyanylated cysteines. *Biophys. J.*, **2010**, *99*, 1676-1683.

Edelstein, L.*, Stetz, M. G.*, McMahon, H. A.*, Londergan, C. H. The effects of cyanylated cysteine and α -helical structure on each other. *J. Phys. Chem. B*, **2010**, *114*, 4931-4936.

McMahon, H. A.*, Alfieri, K. N.*, Clark, K. A. A.*, Londergan, C. H. Cyanylated cysteine: a covalently attached vibrational probe of protein-lipid contacts. *J. Phys. Chem. Lett.* **2010**, *1*, 850-855.

Maienschein-Cline, M. C.*, Londergan, C. H. "The CN stretching mode of aliphatic thiocyanate is sensitive to solvent dynamics and specific solvation." *J. Phys. Chem. B*, **2007**, *111*, 10020–10025.

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Education

Postdoctoral Fellow (July 2000-June 2001)
Advanced Study Program
National Center for Atmospheric Research
Boulder, CO

Ph.D. in Physical Chemistry (February 2000)
Princeton University, Princeton, NJ
Advisor: Professor Steven L. Bernasek

Certificate in Science, Technology,
& Environmental Public Policy
Woodrow Wilson School of Public & International Affairs
Princeton University, Princeton, NJ
Advisor: Professor Daniel Kammen

B.S. Chemistry, Cum Laude (May 1995)
Westmont College, Santa Barbara, CA
Advisor: Professor Allen Nishimura

Work Experience

2007- present Associate Professor of Chemistry, Joint Science Department of the
Claremont Colleges, Claremont, CA

2001-2007 Assistant Professor of Chemistry, Joint Science Department of the Claremont
Colleges, Claremont, CA

Selected Professional Activities

July 2009 - present Editorial board for the Association for Environmental Studies and Sciences Journal.

September 2008- present Member of the American Chemical Society California State Government Affairs Committee
which lobbies for stronger STEM education for K-12 in California.

Selected Awards

American Chemical Society, Younger Chemists Committee Leadership Development Award January 2008

Teresa Heinz Scholar for Environmental Research 1999-2000

Pickering Teaching Award October 1998

Princeton Environmental Institute- Science, Technology, and Public Policy (PEI-STEP) Fellowship 1997-1999

Selected Grants (out of 9)

Co-PI on NSF Proposal (AGS-0849243) **Collaborative Research: Reactions and Fate of Amines in the Atmosphere
Emitted from Animal Feeding Operations** in Collaboration with Dr. Phil Silva, U.S. Department of Agriculture, and
Professor David Crocker, University of California Riverside, July 2009–July 2011 (**\$460,101**).

Co-PI on National Science Foundation Grant (DUE-0525574) **Increasing Science Graduates Through Interdisciplinary
Teaching and Research** in collaboration with Professors Newton H. Copp, Gretchen Edwalds-Gilbert, Kersey A. Black, and
Scot A. Gould, Joint Science Department, September 2005–August 2011 (**\$498,700**).

Kathleen L. Purvis-Roberts

Co-PI on National Science Foundation Grant (BCS-0214406) **Collaborative Proposal: Perceptions of Risk From Nuclear Testing in Kazakhstan: A Comparative Study of Kazakh Villagers, Health Care Workers & Research Scientists** in collaboration with Professor Cynthia Werner, Texas A&M University, and Nurlan Ibraev, M.D., Director of “Densaulylyq” State Agency for Health Care in East-Kazakhstan Oblast, July 2002–July 2005 (\$144,400).

Co-PI on National Council for Eurasian and East European Research Grant **Perceptions of Risk from Nuclear Testing in Kazakhstan: A Comparative Study of Kazakh Villagers, Health Care Workers, and Research Scientists** in collaboration with Cynthia Werner and Nurlan Ibraev, January 2002–July 2005 (\$30,000).

Books

Spiro, T.G.; Purvis-Roberts, K. L.; and Stigliani, W. M. **Chemistry of the Environment**, 3rd Edition. Herndon, VA: University Science Books, August 2011.

Middlecamp, C.H.; Anderson, K.L.; Bentley, A.K.; Cann, M.C.; Ellis, J.P.; and Purvis-Roberts, K.L. **Chemistry in Context: Applying Chemistry to Society**, 8th Edition. New York, NY: McGraw-Hill, (in preparation for publication, January 2013).

Selected Publications (Out of 21, Student co-authors underlined in bold)

“Determination of Methylamines, Ethylamines, Triethylamine-*N*-oxide, and Butylamine in Particulate Matter by Non-suppressed Ion Chromatography,” (submitted to *Journal of Chromatography A*, January 2012) **Praske, E.J., Pearlstone, E., Shattuck, M.A., Lee, S.A.** Tang, X., Silva, P.J., Cocker III, D.R., Brown, R., Purvis-Roberts, K.L.

“Cold War Memories and Post-Cold War Realities: Narratives of the State in the Everyday Life of Kazakhstan’s Radiation Victims,” Cynthia Werner and Kathleen Purvis-Roberts, In an edited book to be submitted to Indiana University Press. Edited by Madeleine Reeves, Johan Rasanayagam, and Judith Beyer, (Submitted January 2011).

“Determination of Methylamines and Trimethylamine-*N*-oxide in Particulate Matter by Non-suppressed Ion Chromatography,” Erupe, M.E., **Lieberman-Martin, A.**, Silva, P.J., Malloy, Q.G.J. **Yonis, N.**, Cocker III, D.R. Purvis-Roberts, K.L. *Journal of Chromatography A* 2010, 1217, 2070–2073.

“Accelerated Integrated Science Sequence (AISS): An Introductory Biology, Chemistry and Physics Course for College Students,” Purvis-Roberts, K.L., Edwalds-Gilbert, G., Landsberg, A.S., Copp, N., Ulsh, L., Drew, D. *Journal of Chemical Education*, 2009, 86 (11), 1295–1299.

“Atmospheric formation of 9,10-phenanthroquinone in the Los Angeles Air Basin,” Eiguren-Fernandez, A., Miguel, A.H., Lu, R., Purvis, K., Grant, B., Mayo, P., Di Stefano, E., Cho, A., and Froines, J. *Atmospheric Environment* 2008, 42, 2312–2319.

“Geographical Information Systems (GIS) Mapping of Environmental Samples Across a College Campus,” Purvis-Roberts, K.L., Moeur, H.P., Zanella, A. *Journal of Chemical Education*, 2007, 82 (10), 1691–1692.

“Perceived Risks from Nuclear Testing Near Semipalatinsk, Kazakhstan: A Comparison Between Laypeople, Doctors, and Scientists,” Purvis-Roberts, K.L., Werner, C.A., and **Frank, I.** *Risk Analysis*, 2007, 27, 291–302.

“Worker Exposure and Health Risks from Volatile Organic Compounds Utilized in the Paint Manufacturing Industry of Kenya,” Purvis, K.L., Jumba, I.O., Wandiga, S., Zhang, J., Kammen, D.M. *Applied Occup. Environ. Hyg.* 2001, 16, 1035–1042.

“Surface Characterization and Modification of Indium Tin Oxide in Ultrahigh Vacuum,” Purvis, K.L., Lu, G., Schwartz, J., Bernasek, S.L. *J. Am. Chem. Soc.* 2000, 122, 1808–1809.

“Ligand Metathesis in Surface-Bound Alkoxyzirconium Complexes. 2. Preparation of Alkanecarboxylate Complexes in Ultrahigh Vacuum,” Purvis, K.L., Lu, G., Schwartz, J., Bernasek, S.L. *Langmuir*, 1998, 14, 3720–3722.