

# JOHN DAVID LAMB

## *Curriculum Vitae*

### Education

- Ph.D. Inorganic Physical Chemistry, Brigham Young University, 1978  
B.S. Chemistry, Brigham Young University, 1971; "high honors with distinction"; University Scholar

### Professional Experience

**Associate Chair, Chemistry and Biochemistry**, Brigham Young University, 2011-present.

**Associate Dean, Undergraduate Education, for General Education**, Brigham Young University, 2000-2008.

**Eliot A. Butler Professor of Chemistry**, Brigham Young University, 1998-present.

**Professor of Chemistry**, Brigham Young University, 1991-1998.

**Editor-in Chief**, *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 1992-2012.

**Associate Professor of Chemistry**, Brigham Young University, 1984-1991.

**Executive Director of Research and Creative Work**, Brigham Young University, 1990-1992.

Responsibilities included: representing the University's research programs to research organizations, funding agencies, and other universities; developing policies and procedures to foster research and to facilitate technology transfer; administering the University's patents and licensing of technologies and software; coordinating the preparation of large, inter-collegiate and inter-institutional research proposals; and administering the activities of the Office dealing with the management of grants and contracts.

**Director of Research Administration**, Brigham Young University, 1985-1990.

**Visiting Professor**, University of Catania, Italy, 1989. (one month)

**Visiting Professor**, University of Parma, Italy, 1989, 1990, 1991. (one month each time)

**Visiting Professor**, Sichuan University, People's Republic of China, 1991. (two weeks)

**Visiting Professor**, University of Pavia, Italy, 1995. (one month)

**Program Manager**, Separations and Analysis, Office of Basic Energy Sciences, U.S. Department of Energy, 1982-1984. Responsibilities included: management of a \$12 million/year research program, including approximately 20 projects at DOE labs and 35 at universities; evaluation and funding of research proposals.

**Associate Research Scientist**, Thermochemical Institute, Brigham Young University, 1983-1984.

**Assistant Research Scientist**, Thermochemical Institute, Brigham Young University, 1981-1982. Responsibilities included: direction of graduate and undergraduate student research involving macrocyclic ligand-cation interactions, titration calorimetry, macrocycle mediated cation transport in liquid membranes, atomic absorption spectroscopy, ion chromatography, manuscript and research proposal preparation; taught Chemistry 105 for two semesters, 1981-1982; chosen as one of four reviewers to review research programs in the Chemical Sciences Division of BES/DOE, Fall 1981.

**Research Associate**, Thermochemical Institute, Brigham Young University, 1978-1981.

### Awards

Summerhays Lectureship, BYU College of Physical and Mathematical Sciences, September, 2015.

Maeser Distinguished Faculty Lecturer Award (highest award given to a BYU faculty member, one per year out of ~2000 faculty), BYU, 2013.

Ion Chromatography Award, from the International Separation Science Society, Berlin, Germany, 2012.

BYU College of Physical and Mathematical Sciences Excellence in Teaching Award, 2012.

Hall of Achievement, Thousand Islands Secondary School, Brockville, Ontario, Canada, 2009.

Karl G. Maeser Excellence in Teaching Award, BYU, 2007.

BYU Student Honor Association Award for inspiring students to live the principles of the Honor Code, 2006

Excellent Textbook Award, Osaka City University, 2006 (for *Click Chemistry*, the Japanese version of *Chem Tutor*)

CASE Utah Professor of the Year (Carnegie Foundation), 2000.

Alcuin Fellowship (for General Education Teaching), Brigham Young University, 1997.

Karl G. Maeser Excellence in Research and Creative Arts Award, BYU, 1996.

BYU Outstanding Achievement in Sponsored Research, 1993.

### Professional Societies

American Chemical Society, **Member**, 1971-2013.

Central Utah Section, American Chemical Society, **Chair**, 1990; (**Awards Chairman** and **High School Relations Chairman**, 1979-1981; **Secretary-Treasurer** 1981-1982).

Rocky Mountain Chapter, Society of Research Administrators, **Chair-Elect**, 1991.

Sigma Xi, **Member**, 1977-1994.

American Association for the Advancement of Science, **Member**, 1978-1991.

Intermountain University Research Administrators, **Member**, 1985-1992.

Utah Ion Chromatography Users' Group, **President**, 1985-1990.

#### Professional Service outside BYU

Izatt-Christensen Award in Macrocyclic Chemistry, Awards Committee member, 1998-2010.

Department of Energy Site Review Team, Argonne National Laboratory Chemistry Division, **Member** (one of three), November, 1993, 2000.

Reviewer and adviser to McGraw-Hill, Inc. for chemistry education materials, 1999-2000.

Review of CAV Videodiscs, "Matter and Concepts in Chemistry", Media Design Associates, Inc., 1998.

"What is an Educated Person?" Conference Working Group, Utah Regents Task Force on General Education, **BYU Representative**, 1998-2008.

Department of Energy Site Review Team, Ames Laboratory Analytical Chemistry Programs, **Member** (one of three), April, 1993.

U.S. Department of Energy Chemical Sciences Division, Small Business Innovation Research Program, **Review Coordinator**, February, 1985-91. (Requiring 1 week each year in Washington DC to coordinate proposal reviews)

Board of Directors, Associated Western Universities, **Member**, 1985-1992.

Utah Educational Resources Council, **Member**, 1985-1992.

Board of Directors, Utah Research Institute, **Member**, 1985-1992.

State of Utah Advisory Council on Science and Technology, **Chairman** (1989) and **Member** (1985-1992).

Research Committee, Utah Partnership for Educational and Economic Development, **Member**, 1988-1992.

Higher Education Committee, Utah Science Center Task Force, **Member**, 1989-1992.

#### Professional Meeting Organization

International Symposium on Macrocyclic Chemistry, **Chair**, International Organizing Committee, 1998-2008; **Organizer**, Symposium held in Park City, Utah, 2002;

**Secretary**, Symposium held in Provo, Utah, 1992.

International Seminar on Inclusion Compounds, **Member**, International Organizing Committee, Istanbul, Turkey, August 1995.

1995 Northwest/Rocky Mountain Regional ACS Meeting, **Fund-Raising Chairman**.

International Ion Chromatography Symposium, **Chairman**, Organizing Committee, 1990-1992; member 1990-1994; 2006-2008.

International Ion Chromatography Symposium, **Program Chairman**, Denver, Colorado, 1991.

Brigham Young University, Micro ACS Meeting, **Program Chairman**, 1991.

### University Service

University Academic Unit Review Committee, Member, 2008-2012.

Faculty Rank Advancement Committee, Department of Chemistry and Biochemistry, **Chair**, 2005-present.

Review Committee on Advanced Placement, International Baccalaureate, Concurrent Enrollment, and Transfer Credit, **Member**, 2003-2008.

University Faculty Development Council, **Member**, 2005-2008.

General Education Evaluation Task Force, **Chair**, 2000-2004.

BYU Faculty General Education Council, **Chair**, 2000-2008.

BYU Curriculum and Instruction Working Group, **Member**, 2002-2004.

GE Academy on Teaching and Learning, **Organizer**, 2001, 2002, 2003, 2004, 2005, 2006 and 2007.

BYU Forum Committee, **Member**, 2002-2008.

BYU University Curriculum Council, **Member**, 2000-2001.

BYU Freshman Registration and Planning Committee, **Member**, 2000-2002.

BYU Chemistry Department Faculty Recruitment Committee, **Member**, 1996-2003.

BYU Faculty Advisory Council, **Co-chair**, 1998-99; **Member**, 1996-99.

BYU Freshman Orientation, **Speaker**, August 1997, 1998.

BYU Annual University Conference Workshop, **Speaker**, August 1998.

BYU Committee on Faculty Compensation, **Chair**, 1997-98.

BYU Chemistry Department Teaching and Curriculum Committee, **Chair**, 1993-99; **Member**, 1992-99.

BYU Intellectual Properties Committee, **Member**, January 1997-2001.

BYU Faculty Development Series Spring Seminar, **Discussion Leader**, May 1997.

BYU Chemistry Department Computer Lab Committee, **Chair**, 1995-present; **Member**, 1992-1998.

BYU ACERC *ad hoc* Internal Review Committee, **Member**, 1993.

BYU Institutional Animal Care and Use Committee, **Executive Secretary**, 1985-1992.

Cold Fusion Steering Committee, **Executive Secretary**, 1986-1991.

BYU Faculty Awards Committee, **Chair**, 1992-1994; **Member**, 1991-1994.

BYU Chemistry Department Rank Advancement Committee, **Member**, 1992-97.

BYU Chemistry Department General Chemistry On-Line Development Committee, **Member**, 2000-2003.

### Languages

French: fluent in reading

Italian: fluent in reading, writing, speaking

Computer: Fortran, Basic, familiar with VAX/VMS, CP/M, MS-DOS, Windows environments

### Externally Funded Research

Principal Investigator of project in ion chromatography research, funded by Dionex Corporation, at ~\$45,000/year, 1989-present.

Principal Investigator of project investigating liquid membrane separations of metal ions, funded by U.S. Department of Energy at ~\$100,000/year, 1978-2000.

Principal Investigator of project concerning separation of Cs<sup>+</sup> and Sr<sup>2+</sup> from nuclear waste, funded by Idaho National Engineering Laboratory, at ~\$100,000/year, 1995-98.

Principal Investigator of project concerning ion chromatographic separations for the nuclear industry, funded by Westinghouse Idaho Nuclear at ~\$30,000/year, 1985-1995.

Principal Investigator of project concerning the analysis of sugars in potatoes as it relates to the chemistry of browning, funded by American Potato, Inc., at ~\$20,000/year, 1986-1988.

Principal Investigator of a NATO grant to study site binding constants, jointly with Professor Braibanti of University of Parma, Italy, \$6,000, 1988-1989; renewed two years, 1990-1991.

National Science Foundation Funding to participate in 1993 Chautauqua Conference on Video Technology in the Classroom, \$2,000, January 1993.

Principal Investigator of project to develop chemistry multimedia tutorial *Chem Tutor*, Jones and Bartlett Publishers and Dionex Corporation, \$25,000, 1996-97.

Principal Investigator of a joint US-Italy grant to study liquid membranes, jointly with Professor Arena of University of Catania, Italy, \$12,000, 1997-98.

Assisted in preparation of other proposals to the National Institutes of Health and the National Science Foundation.

#### BYU Internally Funded Research

Recipient of ORCA Mentoring grants (joint with Profs Harrison and Dearden), 2010-2011, \$17,540 for *Supramolecular Chemistry for Students*.

Recipient of a grant from Undergraduate Education, 2009, \$4000 for *Multimedia Keys for Chem 105 Quizzes*.

Recipient of ORCA Mentoring grants (joint with Profs Harrison and Dearden), 2006-9, \$30,000 for *Selective Anion Hosts*.

Recipient of a grant from Undergraduate Education, January 2003 and 2004, \$5000-\$10,000 for *Introductory Chemistry Learning Modules*.

Recipient of a grant from the Committee on Instructional and Media Arts, May 1998, \$23,000 for development of an interactive multimedia chemistry problem solving tutorial; April, 1999, \$9,000

Recipient of a grant from the Faculty Center, March 1998, \$2,750 for *Chem Tutor* Course Development.

Recipient of a grant from the Faculty Center, February 1993, \$17,252 for Development of Multimedia Chemistry Classroom.

Recipient of a grant from General Education/Honors, December 1992, \$7,050 for Courseware Development.

#### Visiting Scientists and Post-Doctoral Fellows

Dr. Yoshiuki Kobuke, Nara Institute of Science and Technology, visiting scientist, 1984-85.

Dr. Alexander Y. Nazarenko, Taras Shevchenko University, visiting scientist, 1995-98.

Dr. Yu Liu, Brigham Young University (M.L. Lee group), post-doctoral fellow, 1998.

Mr. Antonio Magri, University of Catania, Italy, visiting graduate student, 1997.

Dr. Lan Gao, Xinjiang Institute of Technology, Urumqi, China, visiting scientist, 1997-98.

Dr. Sang Chul Lee, Kangwon National University, Korea, post-doctoral fellow, 1998-99.

Dr. Lucy Wang, Texas Tech University, post-doctoral fellow, 2007-8.

### Publications

1. J.B. Ott, J.R. Goates, and J.D. Lamb, "Solid-Liquid Phase Equilibria in Water + Ethylene Glycol," *Journal of Chemical Thermodynamics*, **4**, 123-126 (1972).
2. J.R. Goates, J.B. Ott, J. Reeder, and J.D. Lamb, "Solid/Liquid Phase Equilibria and Solid Compound Formation in Mixtures of Dimethylsulphoxide with CCl<sub>4</sub>, CHCl<sub>3</sub>, and CCl<sub>3</sub>CHCl<sub>2</sub>," *Journal of the Chemical Society, Faraday Transactions I*, **68**, 2171-2174 (1972).
3. R.M. Izatt, J.D. Lamb, G.E. Maas, R.E. Asay, J.S. Bradshaw, and J.J. Christensen, "Synthesis of Two Novel Cyclic Polyether-Ester Compounds and Some Comparisons of Their Reactions with Na<sup>+</sup>, K<sup>+</sup>, and Ba<sup>2+</sup> with Those of 18-Crown-6 and Valinomycin," *Journal of the American Chemical Society*, **99**, 2365-2366 (1977).
4. R.M. Izatt, J.D. Lamb, R.E. Asay, G.E. Maas, J.S. Bradshaw, J.J. Christensen and S.S. Moore, "Unusual Stability Characteristics in Methanol of the Complexes of a New Pyridine-Substituted Cyclic Polyether-Ester Compound with Na<sup>+</sup>, K<sup>+</sup>, Ag<sup>+</sup>, and Ba<sup>2+</sup>-- Comparison with Oxygen, Sulfur, and Nitrogen Analogues," *Journal of the American Chemical Society*, **99**, 6134-6136 (1977).
5. R.M. Izatt, J.D. Lamb, J.J. Christensen, and B.L. Haymore, "Anomalous Stability Sequence of Lanthanide(III) Chloride Complexes with 18-Crown-6 in Methanol. Abrupt Decrease to Zero from Gd<sup>3+</sup> to Tb<sup>3+</sup>," *Journal of the American Chemical Society*, **99**, 8344-8346 (1977).
6. J.J. Christensen, J.D. Lamb, S.R. Izatt, S.E. Starr, G.C. Weed, M.S. Astin, B.D. Stitt, and R.M. Izatt, "Effect of Anion Type on Rate of Facilitated Transport of Cations across Liquid Membranes via Neutral Macrocyclic Carriers," *Journal of the American Chemical Society*, **100**, 3219-3220 (1978).
7. R.M. Izatt, J.D. Lamb, B.E. Rossiter, N.E. Izatt, J.J. Christensen, and B.L. Haymore, "Thermodynamics of Formation of 18-Crown-6 Complexes with Arenediazonium and Anilinium Salts in Methanol at 25°C," *Journal of the Chemical Society, Chemical Communications*, 386-387 (1978).
8. J.D. Lamb, "Synthetic Macrocyclic Ligands: Stability, Selectivity and Transport of their Cation Complexes," Ph.D. Dissertation, August 1978, Brigham Young University.
9. R.M. Izatt, J.D. Lamb, D.J. Eatough, J.J. Christensen, and J.H. Rytting, "Design of Selective Ion Binding Macrocyclic Compounds and Their Biological Applications," *Drug Design*, **8**, E.J. Ariens, ed., Academic Press, New York, NY, 355-400 (1978).
10. J.S. Bradshaw, G.E. Maas, R.M. Izatt, J.D. Lamb, and J.J. Christensen, "Preparation and Cation Complexing Properties of Substituted Macrocyclic Polyether-Diester Compounds Containing the Pyridine Subcyclic Unit," *Tetrahedron Letters*, **7**, 635-638 (1979).
11. J.S. Bradshaw, S.L. Baxter, D.C. Scott, J.D. Lamb, R.M. Izatt, and J.J. Christensen,

- “Complexation Properties of Macrocyclic Polyether-Diester Compounds Containing Furan and Benzene Subcyclic Units,” *Tetrahedron Letters*, **36**, 3383-3386 (1979).
12. J.D. Lamb, R.M. Izatt, J.J. Christensen, and D.J. Eatough, “Thermodynamics and Kinetics of Cation-Macrocyclic Interaction,” *Chemistry of Macrocyclic Compounds*, G.A. Melson, ed., Plenum Publishing Corp., New York, NY, 145-217 (1979).
  13. R.M. Izatt, J.D. Lamb, N.E. Izatt, B.E. Rossiter, Jr., J.J. Christensen, and B.L. Haymore, “A Calorimetric Titration Study of the Reaction of Several Organic Ammonium Cations with 18-Crown-6 in Methanol,” *Journal of the American Chemical Society*, **101**, 6273-6276 (1979).
  14. L.D. Hansen, B.E. Richter, D.K. Rollins, J.D. Lamb, and D.J. Eatough, “Determination of Arsenic and Sulfur Species in Environmental Samples by Ion Chromatography,” *Analytical Chemistry*, **51**, 633-637 (1979).
  15. J.J. Christensen, J.D. Lamb, and R.M. Izatt, “Transport of Metal Ions by Liquid Membranes Containing Macrocyclic Carriers,” *Bioenergetics and Thermodynamics: Model Systems*, A. Braibanti, ed., Reidel Pub., Dordrecht, Holland, pp. 111-126 (1980).
  16. J.S. Bradshaw, G.E. Maas, J.D. Lamb, R.M. Izatt, and J.J. Christensen, “Cation Complexing Properties of Synthetic Macrocyclic Polyether-Diester Ligands Containing the Pyridine Subcyclic Unit,” *Journal of the American Chemical Society*, **102**, 467-474 (1980).
  17. J.D. Lamb, R.M. Izatt, C.S. Swain, and J.J. Christensen, “A Systematic Study of the Effect of Macrocyclic Ring Size and Donor Atom Type on the Log K,  $\Delta H$ , and  $\Delta S$  of Reactions at 25° C in Methanol of Mono- and Divalent Cations with Crown Ethers<sup>1</sup>,” *Journal of the American Chemical Society*, **102**, 475-479 (1980).
  18. J.D. Lamb, R.M. Izatt, C.S. Swain, J.S. Bradshaw, and J.J. Christensen, “Cation Complexes of Crown Ether Diesters. Stabilities, Selectivities, Enthalpies, and Entropies of Reaction at 25° C in Methanol,” *Journal of the American Chemical Society*, **102**, 479-482 (1980).
  19. J.S. Bradshaw, R.E. Asay, S.L. Baxter, P.E. Fore, S.T. Jolley, J.D. Lamb, G.E. Maas, M.D. Thompson, R.M. Izatt, and J.J. Christensen, “The Preparation and Cation Complexation Properties of Macrocyclic Polyether-Diester Ligands: A Short Review,” *I&EC Product Research & Development*, **19**, 86-91 (1980).
  20. J.D. Lamb, J.J. Christensen, and R.M. Izatt, “Experimenting with Liquid Membranes,” *Journal of Chemical Education*, **57**, 227-229 (1980).
  21. J.D. Lamb, R.M. Izatt, P.A. Robertson, and J.J. Christensen, “Highly Selective Membrane Transport of Pb<sup>2+</sup> from Aqueous Metal Ion Mixtures Using Macrocyclic Carriers,” *Journal of the American Chemical Society*, **102**, 2452-2454 (1980).
  22. R.M. Izatt, J.D. Lamb, C.S. Swain, J.J. Christensen, and B.L. Haymore, “Influence of Steric and Electronic Effects on the Binding of Arenediazonium Cations to 18-Crown-6 in Methanol at 25° C,” *Journal of the American Chemical Society*, **102**, 3032-3034 (1980).
  23. J.D. Lamb and J.J. Christensen, S.R. Izatt, K. Bedke, M.S. Astin, and R.M. Izatt, “Effects of Salt Concentration and Anion on the Rate of Carrier-Facilitated Transport of Metal Cations through Bulk Liquid Membranes Containing Crown Ethers,” *Journal of the American Chemical Society*, **102**, 3399-3403 (1980).



24. J.D. Lamb, J.J. Christensen, J.L. Oscarson, B.L. Nielsen, B.W. Asay, and R.M. Izatt, "The Relation-ship between Complex Stability Constants and Rates of Cation Transport through Liquid Membranes by Macrocyclic Carriers," *Journal of the American Chemical Society*, **102**, 6820-6824 (1980).
25. S.J. Rehfeld, H.F. Loken, F.R. Nordmeyer, and J.D. Lamb, "Improved Ion-Chromatographic Method for Determining  $Mg^{2+}$  and  $Ca^{2+}$  in Serum," *Clinical Chemistry*, **26**, 1232-1233 (1980).
26. F.R. Nordmeyer, L.D. Hansen, D.J. Eatough, D.K. Rollins, and J.D. Lamb, "Determination of Alkaline Earth and Divalent Transition Metal Cations by Ion Chromatography with Sulfate-Suppressed Barium and Lead Eluents," *Analytical Chemistry*, **52**, 852-856 (1980).
27. J.A. Bandy, M.R. Truter, J.N. Wingfield, and J.D. Lamb, "Complex Formation between Guanidinium Nitrate and 1,4,7,10,13,16-Hexaoxacyclo-octadecane (18-Crown-6). Crystal Structure of the Hydrogen-bonded 2:1 Complex," *Journal of the Chemical Society, Perkin II*, 1025-1030 (1981).
28. M.L. Campbell, N.K. Dalley, R.M. Izatt, and J.D. Lamb, "Correlation of Molecular Conformation and Thermodynamic Stability of Metal-Cation Complexes of 1,4,7,10,13-Pentaoxa-16-thiacyclooctadecane," *Acta Crystallographica*, **B37**, 1664-1669 (1981).
29. J.D. Lamb, L.D. Hansen, G.G. Patch, and F.R. Nordmeyer, "Iodate-Suppressed Lead Eluent for Ion Chromatographic Determination of Divalent Cations," *Analytical Chemistry*, **53**, 749-750 (1981).
30. J.D. Lamb, R.M. Izatt, D.G. Garrick, J.S. Bradshaw, and J.J. Christensen, "The Influence of Macrocyclic Ligand Structure on Carrier-Facilitated Cation Transport Rates and Selectivities Through Liquid Membranes," *Journal of Membrane Science*, **9**, 83-107 (1981).
31. J.S. Bradshaw, S.L. Baxter, J.D. Lamb, R.M. Izatt and J.J. Christensen, "Cation-Complexing Properties of Synthetic Macrocyclic Polyether-Diester Ligands Containing the Furan, Benzene, Tetrahydrofuran, and Thiophene Subcyclic Units," *Journal of the American Chemical Society*, **103**, 1821-1827 (1981).
32. J.D. Lamb, R.M. Izatt, and J.J. Christensen, "Stability Constants of Cation-Macrocyclic Complexes and Their Effect on Facilitated Membrane Transport Rates," *Progress in Macrocyclic Chemistry*, R.M. Izatt and J.J. Christensen, eds., Wiley-Interscience, New York, NY, **2**, 41-90 (1981).
33. R.M. Izatt, B.L. Nielsen, J.J. Christensen, and J.D. Lamb, "Membrane Transport of Ammonium and Alkylammonium Cations Using Macrocyclic Carriers," *Journal of Membrane Science*, **9**, 263-271 (1981).
34. J.J. Christensen, J.D. Lamb, P.R. Brown, J.L. Oscarson, and R.M. Izatt, "Liquid Membrane Separations of Metal Cations Using Macrocyclic Carriers," *Separation Science and Technology*, **16**, 1193-1215 (1981).
35. J.D. Lamb, J.E. King, J.J. Christensen, and R.M. Izatt, "Determination of Macrocyclic Compounds in Solution by Thermometric Titration against Metal Cations," *Analytical Chemistry*, **53**, 2127-2130 (1981).

36. M.P. Biehl, R.M. Izatt, J.D. Lamb, and J.J. Christensen, "Use of a Macrocyclic Crown Ether in an Emulsion (Liquid Surfactant) Membrane to Effect Rapid Separation of  $\text{Pb}^{2+}$  from Cation Mixtures," *Separation Science and Technology*, **17**, 289-294 (1982).
37. B.L. Haymore, J.D. Lamb, R.M. Izatt, and J.J. Christensen, "Thermodynamic Origin of the Macrocyclic Effect in Crown Ether Complexes of  $\text{Na}^+$ ,  $\text{K}^+$ , and  $\text{Ba}^{2+}$ ," *Inorganic Chemistry*, **21**, 1598-1602 (1982).
38. J.S. Bradshaw, B.A. Jones, R.B. Davidson J.J. Christensen, J.D. Lamb, R.M. Izatt, F.G. Morin, and D.M. Grant, "Chiral Recognition by the S,S and R,R Enantiomers of Dimethyldioxypyridino-18-crown-6 as Measured by Temperature-Dependent  $^1\text{H}$  NMR Spectroscopy in  $\text{CD}_2\text{Cl}_2$ , Titration Calorimetry in  $\text{CH}_3\text{OH}$  at  $25^\circ\text{C}$ , and Selective Crystallization," *Journal of Organic Chemistry*, **47**, 3362-3364 (1982).
39. R.M. Izatt, M.P. Biehl, J.D. Lamb, and J.J. Christensen, "Rapid Separation of  $\text{Tl}^+$  and  $\text{Pb}^{2+}$  from Various Binary Cation Mixtures Using Dicyclohexano-18-crown-6 Incorporated into Emulsion Membranes," *Separation Science and Technology*, **17**, 1351-1360 (1982).
40. J.D. Lamb, P.R. Brown, J.J. Christensen, J.S. Bradshaw, D.G. Garrick, and R.M. Izatt, "Cation Transport at  $25^\circ\text{C}$  from Binary  $\text{Na}^+--\text{M}^{n+}$ ,  $\text{Cs}^+--\text{M}^{n+}$ , and  $\text{Sr}^{2+}--\text{M}^{n+}$  Nitrate Mixtures in a  $\text{H}_2\text{O}--\text{CHCl}_3--\text{H}_2\text{O}$  Liquid Membrane System Containing a Series of Macrocyclic Carriers," *Journal of Membrane Science*, **13**, 89-100 (1983).
41. P.R. Brown, R.M. Izatt, J.J. Christensen, and J.D. Lamb, "Transport of  $\text{Eu}^{2+}$  in a  $\text{H}_2\text{O}--\text{CHCl}_3--\text{H}_2\text{O}$  Liquid Membrane System Containing the Macrocyclic Polyether 18-Crown-6," *Journal of Membrane Science*, **13**, 85-88 (1983).
42. R.M. Izatt, D.V. Dearden, P.R. Brown, J.S. Bradshaw, J.D. Lamb, and J.J. Christensen, "Cation Fluxes from Binary  $\text{Ag}^+--\text{Mn}^+$  Mixtures in a  $\text{H}_2\text{O}--\text{CHCl}_3--\text{H}_2\text{O}$  Liquid Membrane System Containing a Series of Macrocyclic Ligand Carriers," *Journal of the American Chemical Society*, **105**, 1785-1790 (1983).
43. J.J. Christensen, S.P. Christensen, M.P. Biehl, S.A. Lowe, J.D. Lamb, and R.M. Izatt, "Effect of Receiving Phase Anion on Macrocyclic-Mediated Cation Transport Rates and Selectivities in Water-Toluene-Water Emulsion Membranes," *Separation Science and Technology*, **18**, 363-373 (1983).
44. R.M. Izatt, J.D. Lamb, R.T. Hawkins, P.R. Brown, S.R. Izatt, and J.J. Christensen, "Selective  $\text{M}^+--\text{H}^+$  Coupled Transport of Cations through a Liquid Membrane by Macrocyclic Calixarene Ligands," *Journal of the American Chemical Society*, **105**, 1782-1785 (1983).
45. R.M. Izatt, D.V. Dearden, D.W. McBride, Jr., J.L. Oscarson, J.D. Lamb and J.J. Christensen, "Metal Separations Using Emulsion Liquid Membranes," *Separation Science and Technology*, **18** (12&13), 1113-1129 (1983).
46. D.W. McBride, Jr., R.M. Izatt, J.D. Lamb, and J.J. Christensen, "Cation Transport in Liquid Membranes Mediated by Macrocyclic Crown Ether and Cryptand Compounds," *Inclusion Compounds III*, J.L. Atwood, J.E.D. Davies, and D.D. MacNicol, eds., Academic Press, London, **3**, 571-628 (1984).
47. R.M. Izatt, R.M. Haws, J.D. Lamb, D.V. Dearden, P.R. Brown, D.W. McBride, Jr., and J.J. Christensen, "Facilitated Transport from Ternary Cation Mixtures through Water-Chloroform-

- Water Mem-brane Systems Containing Macrocyclic Ligands,” *Journal of Membrane Science*, **20**, 273-284 (1984).
48. R.M. Izatt, J.S. Bradshaw, S.A. Nielsen, J.D. Lamb, J.J. Christensen, and D. Sen, “Thermodynamic and Kinetic Data for Cation-Macrocyclic Interaction,” *Chemical Reviews*, **85**, 271-339 (1985).
  49. R.M. Izatt, G.C. LindH, G.A. Clark, J.S. Bradshaw, Y. Nakatsuji, J.D. Lamb, and J.J. Christensen, “Alkali Cation Transport by Proton-ionizable Macrocyclics in a H<sub>2</sub>O-CH<sub>2</sub>Cl<sub>2</sub>-H<sub>2</sub>O Bulk Liquid Membrane System,” *Journal of the Chemical Society, Chemical Communications*, 1676-1677 (1985).
  50. J.S. Bradshaw, D.A. Chamberlin, P.E. Harrison, B.E. Wilson, G. Arena, N.K. Dalley, J.D. Lamb, R.M. Izatt, F.G. Morin, and D.M. Grant, “Proton-Ionizable Crown Compounds. 1. Synthesis, Complexation Properties, and Structural Studies of Macrocyclic Polyether-Diester Ligands Containing a Triazole Subcyclic Unit,” *Journal of Organic Chemistry*, **50**, 3065-3069 (1985).
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- Adsorption," *Journal of Chromatography A*, **982**, 49-54 (2002).
149. D. A. Richens, S. Peterson, D. Simpson, A. McGinn, and J. D. Lamb, "Use of Mobile Phase 18-Crown-6 To Improve Peak Resolution Between Mono- and Divalent Metal and Amine Cations in Ion Chromatography," *Journal of Chromatography A*, **1016**, 155-164 (2003).
  150. A. Y. Nazarenko, N. K. Dalley, J. S. Bradshaw, V. N. Pastushok and J. D. Lamb, "Crystal structure of 13,27-dichloro-29,30-dihydroxy-3,9,17,23-tetramethyl-6,20-dioxa-3,9,17,23-tetraazatri-cyclo [23.3.1.1<sup>11.15</sup>]triaconta-1(29),11,13,15(30),25,27-hexaene-(aqua)magnesium hydrate, Mg[C<sub>28</sub>H<sub>40</sub>C<sub>12</sub>N<sub>4</sub>O<sub>4</sub>(H<sub>2</sub>O)] · H<sub>2</sub>O," *Zeitschrift für Kristallographie NCS*, **218**, 1-3 (2003).
  151. J. Gardner, J. Walker, and J.D. Lamb, "Permeability and Durability Effects of Cellulose Polymer Variation in Polymer Inclusion Membranes," *Journal of Membrane Science*, **229**, 87-93 (2004).
  152. J. D. Lamb and H. Tsukube, *Click Chemistry: Enjoy Chemistry & English with Chem Tutor*, Sankyo Shuppan, Tokyo, Japan, 2004.
  153. T.L. Niederhauser, R.A. Lochhead, D.H. Scoville, and J.D. Lamb, "Retention Model for Tetradecyl-18-Crown-6 Based Anion Chromatography," *Journal of Chromatography A*, in press.
  154. J. D. Lamb, "Pulling the Pins on Voodoo Science," *Perspective*, **4**, 53-62 (2004).
  155. J. D. Lamb and J. S. Gardner, "Application of Macrocyclic Ligands to Analytical Chromatography," in *Macrocyclic Chemistry: Current Trends and Future Perspectives*, Karsten Gloe, ed., Kluwer Academic Publishers, 2005, pp 349-363.
  156. John D. Lamb, David Simpson, Bryce D. Jensen, Joseph S. Gardner, and Quinn P. Peterson, "Determination of Perchlorate in Drinking Water by Ion Chromatography using Macrocyclic-based Concentration and Separation Methods," *Journal of Chromatography A*, **1118**, 100-105 (2006).
  157. Joseph S. Gardner, Martin Conda-Sheridan, Dana N. Smith, Roger G. Harrison, and John D. Lamb, "Anion Binding by a Tetradipicolylamine-Substituted Resorcinarene Cavitand," *Inorganic Chemistry*, **44**, 4295-4300 (2005).
  158. John D. Lamb, "Interview concerning the *Journal of Inclusion Phenomena and Macrocyclic Chemistry*," *InCites*, ISI Essential Science Indicators, Thomson Publishing, 2005, <http://www.in-cites.com/journals/JInclusion-Phenomena-Macrocyclic-Chem.html>
  159. John D. Lamb, "Witnesses in the Starry Heavens," *BYU Magazine*, Fall 2005, 39-40.
  160. Joseph S. Gardner, Quinn P. Peterson, Jedediah O. Walker, Bryce D. Jensen, Bibhutosh Adhikary, Roger G. Harrison, and John D. Lamb, "Anion transport through polymer inclusion membranes facilitated by transition metal containing carriers," *Journal of Membrane Science*, **277**, 165-176 (2006).
  161. Joseph S. Gardner, Roger G. Harrison, John D. Lamb, and David V. Dearden, "Sonic Spray Ionization Mass Spectrometry: A Powerful Tool Used to Characterize Fragile Metal-Assembled Cages," *New Journal of Chemistry*, **30**, 1276-1282 (2006).
  162. John D. Lamb, Cheryl A. Morris, Jeremiah N. West, Kirk T. Morris, and Roger G. Harrison, "Cation Effect on Anion Separations by Novel Aza-Crown Ligands in Liquid Membranes," *Journal of Membrane Science*, **321**, 15-21 (2008).

163. Jing Wang, Roger G. Harrison, and John D. Lamb, Anion Separation and Preconcentration with Cyclen Derivatives, *Journal of Chromatographic Science*, **47**, 510-515 (2009).
164. John D. Lamb, *Let's Start Chemistry*, text and CD, Sankyo Shuppan, Tokyo, Japan, 2009.
165. John D. Lamb, Jeremiah N. West, David P. Shaha, and Jayson C. Johnson, "An evaluation of polymer inclusion membrane performance in facilitated transport with sequential membrane reconstitution," *Journal of Membrane Science*, **365**, 256-259 (2010).
166. Wang, Jing; Lamb, John D.; Hansen, Lee D.; Harrison, Roger G., Multiple anion binding by a zinc-containing tetratopic cyclen-resorcinarene, *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, **67**, 55-61(2010).
167. Na Li, Christopher English, Ammon Eaton, Austin Gillespie, T. C. Ence, Taylor J. Christensen, Adam Sego, Roger G. Harrison, and John D. Lamb, "Cation separation and preconcentration using columns containing cyclen and cyclen-resorcinarene derivatives," *Journal of Chromatography A*, **1245**, 83-89 (2012).
168. Na Li, Fan Yang, Hillary A Stock, David V. Dearden, John D. Lamb, and Roger G. Harrison, "Resorcinarene-based cavitands with chiral amino acid substituents for chiral amine recognition," *Organic and Biomolecular Chemistry*, **10**, 7392-7401 (2012).
169. Giuseppe Arena, Raffaele P. Bonomo, Laura I. Vagliasindi, Valeria Zito, John D. Lamb, and Roger G. Harrison, "Anion binding to a tetracopper resorcinarene-based complex," *Supramolecular Chemistry*, **25**, 158-165 (2013).
170. Na Li, Roger G. Harrison, Lee Allen, and John D. Lamb, "Transition metal cation separations with a resorcinarene-based amino acid stationary phase," *Analyst*, **138**, 1467-1474 (2013).
171. John D. Lamb and Na Li, Ion chromatography and membrane separations using macrocyclic ligands, in *Supramolecular Chemistry, from Molecules to Nanomaterials*, P.A. Gale and J.W. Steed, eds, Wiley, 2012, pp 563-588.
172. Na Li, Roger G. Harrison, and John D. Lamb, Application of resorcinarene derivatives in chemical separations, *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, **78**, 39-60 (2014).
173. Tayyeb Panahi, Douglas J. Weaver, John D. Lamb and Roger G. Harrison, A new approach for trace analysis of guanidine compounds in surface water with resorcinarene-based ion chromatography columns, *Analyst*, **141**, 939 – 946 (2016).

#### Student Theses/Dissertations

Phillip A. Drake, Master's Thesis: "Anion Chromatography with Variable Capacity Separators Based on Macrocyclic Complexes," 1990.

Kezhan Cheng, Master's Thesis: "Metal Cation Separations by Capillary Electrophoresis," 1993.

Robert G. Smith, PhD Dissertation: "Anion Separations Using Macrocyclic-Based Ion Exchange Columns," 1993.

Chuan Wang, PhD Dissertation: "Membrane Separations of Metal Cations Using Macrocyclic Ligand Carriers and Thermodynamics of Macrocyclic Interaction with Metal Cations at Elevated Temperatures," 1994.

- Randall T. Peterson, Honors Thesis: "Improving Chemical Separations," 1995.
- Tom L. Huxford, Honors Thesis: "Quantitative Analysis of Cyanide and Sulfide Ions from Basic Waste Solutions by Capillary Zone Electrophoresis," 1995.
- Brad R. Edwards, Master's Thesis: "The Application of Macrocycles to Analytical Separation Systems," 1995.
- Dusten M. Macdonald, Honors Thesis: "Calorimetric Investigation of the Complexation of Didodecylcalix[4]arene-crown-6 with Alkali Metal Cations in Acetonitrile," 1998.
- Shu Chang, Master's Thesis: "Determination of Carbohydrates by Novel Capillary Electrophoresis and Micellar Electrokinetic Chromatography Systems," 1999.
- Tatiana Levitskaia, PhD Dissertation: "Selective Separation of Cs<sup>+</sup> from Complex Matrices by Calix-Crown Carriers in Polymer Inclusion Membranes", 1999.
- Travis L. Niederhauser, PhD Dissertation: "Macrocyclic-Based Anion Chromatography: I. Mathematical Model for Anion Retention II. Carbohydrate Separations," 2000.
- Dean A. Richens, Master's Thesis: "Use of Macrocyclic Ligands in Mobile and Stationary Phases for Ion Separation by Ion Chromatography," 2001.
- Joseph S. Gardner, PhD Dissertation: "Tetra-picolylamine-Substituted Resorcin[4]arene Cavitands," 2004.
- Jeremiah N. West, Honors Thesis: "Cation Effect on Anion Separations by Novel Aza-Crown Ligands in Liquid Membranes," 2008.
- Na Li, PhD Dissertation: "Resorcinarene-based Cavitands: from Structural Design and Synthesis to Separations Applications," 2013.

Scientific Meetings and Presentations

**In addition to the presentations listed below, since 1984 I have frequently taken both undergraduate and graduate students to Scientific Meetings where they have presented work which we have carried out jointly.**

1. "The Effect of Solvent on Binding of Metal Cations of Similar Size to Cyclic Polyethers," Second Symposium on Macrocyclic Compounds, Provo, Utah, August 14-16, 1978.
2. "Crown Ethers as Metal Ion Carriers in Liquid Membranes," American Chemical Society/Chemical Society of Japan Chemical Congress, Honolulu, Hawaii, April 1-6, 1979.
3. "Selective Transport of Cations through Bulk and Liquid Surfactant Membranes by Macrocyclic Carriers," Fourth Symposium on Macrocyclic Compounds, Provo, Utah, August 11-13, 1980.
4. "Determination of Alkaline Earth and Divalent Transition Metal Cations by Ion Chromatography with Sulfate-Suppressed Barium or Iodate-Suppressed Lead Eluents," Joint Northwest/Rocky Mountain Meeting of the American Chemical Society, Salt Lake City, Utah, June 12-14, 1980.

5. "Thermodynamic Origin of the Macrocyclic Effect in 18-Crown-6 Complexes of Na<sup>+</sup>, K<sup>+</sup>, and Ba<sup>+</sup>," Fifth Symposium on Macrocyclic Compounds, Provo, Utah, August 10-12, 1981.
6. "Selective Cation Transport Through Emulsion Liquid Membranes by Macrocyclic Carriers," Fifth Symposium on Macrocyclic Compounds, Provo, Utah, August 10-12, 1981.
7. "Rapid Separation of Ag<sup>+</sup> and Pb<sup>+</sup> from Various Binary Cation Mixtures Using Dicyclohexano-18-Crown-6 Incorporated into Emulsion Membranes," Colloque International Du C.N.R.S. Composes Macrocycliques, Strasbourg, France, September 1982.
8. "The Thermodynamics of Complexation of Cations by Macrocyclic Ligands," XII Convegno Nazionale di Termodinamica dei Complessi, Udine, Italy, June 11-14 1985, invited lecture.
9. "Effect of Macrocycle Type on Carrier-Mediated Cation Transport Through an Emulsion Liquid Membrane," 4th Symposium on Separation Science and Technology, Knoxville, Tennessee, October 1985.
10. "Macrocycle-Mediated Selective Cation Transport Through Supported Liquid Membranes," National American Chemical Society Meeting, New York City, New York, April 1986.
11. "Macrocyclic Ligands as Selective Cation Carriers in Supported Liquid Membranes," International Symposium on Bioorganic and Bioinorganic Chemistry, Kyoto, Japan, July 1987.
12. "Comparison of Bulk, Emulsion, Supported, and Hollow-Fiber Liquid Membrane Systems in the Macrocycle-Mediated Transport and Separation of Metal Cations," Fifth Symposium on Separation Science and Technology for Energy Applications, Knoxville, Tennessee, October 26-29, 1987.
13. "Analysis of Nicotine by MPIC," 29th Rocky Mountain Conference, Denver, Colorado, August 1987.
14. "New Developments in Ion Chromatography," Utah Ion Chromatography User's Group, Salt Lake City, Utah, October 1987.
15. "Ion Chromatographic Separation from Complex Ionic Mixtures for Subsequent Radioanalysis," National American Chemical Society Meeting, Toronto, Canada, June 1988.
16. "Macrocycle-Mediated Cation Separations in Hollow Fiber Supported Liquid Membranes," North American Membrane Society, Syracuse, New York, June 1988.
17. "Research at Brigham Young University," Provo Kiwanis Club, Provo, Utah, May 1988, invited.
18. "HPIC and Macrocycle Chromatography Methods for the Separation and Concentration of Radiostrontium from Complex Ionic Mixtures," First International Ion Chromatography Forum, Boston, Massachusetts, September 1988, invited lecture.
19. "Ion Chromatography Based on Macrocycle-Cation Complexation," Sixth Symposium on Ion Chromatography, Sils Maria, Switzerland, April 1989, invited lecture.
20. "Anion Chromatography Based on Macrocycle-Cation Complexation," Chemistry Department of the University of Catania, Italy, April 1989, invited lecture.

21. "Anion Chromatography Based on Macrocycle-Cation Complexation," Chemistry Department of the University of Messina, Italy, April 1989, invited.
22. "Macrocyclic Ligands in Ion Chromatography," Chemistry Department of the University of Parma, Italy, October 31, 1989, invited.
23. "Macrocyclic Ligands in Ion Chromatography," Symposium on Advances in Ion Exchange Chromatography and Electrochemical Detection, Newport Beach, California, September 14, 1989, invited lecture.
24. "Variable Capacity Columns for Anion Chromatography Based on Macrocyclic Complexes," International Ion Chromatography Forum, Boston, Massachusetts, September 19, 1989.
25. "Anion Separations Using Cation Macrocycle Complex Stationary Phases," Symposium on Advances in Ion Exchange Separation and Electrochemical Detection, Baltimore, Maryland, September 21, 1989, invited lecture.
26. "The Application of Macrocyclic Ligands to Ion Chromatography," Dionex Corporation, Sunnyvale, May 1, 1990, invited.
27. "Application of Macrocyclic Ligands to Ion Chromatography," International Ion Chromatography Symposium, San Diego, California, September 30 - October 3, 1990.
28. "Macrocycle-Based Ion Chromatography," Chemistry Department of the University of Pisa, Italy, October 1990.
29. "Capacity and Temperature Gradients in Macrocycle-Based Anion Chromatography," National American Chemical Society Meeting, Atlanta, Georgia, April 1991, invited lecture.
30. Series of Lectures on Macrocyclic Ligand Chemistry, Sichuan University, Chengdu, People's Republic of China, May 1991, invited.
31. "Gradient Ion Chromatographic Separation of Nucleotides Using Macrocycle-Based Columns," International Ion Chromatography Symposium, Denver, Colorado, September 1991.
32. "High Performance Anion Chromatography Using Cation-Macrocycle Complex Exchange Sites," International Macrocyclic Chemistry Symposium, Provo, Utah, August 1992.
33. "Thermodynamics of Cation Complexation by Crown Thiaethers," IUPAC Conference on Chemical Thermodynamics, Snowbird, Utah, August 1992.
34. "Capacity Gradient Anion Chromatography Using Crown Ether- and Cryptand-Based Stationary Phases," International Ion Chromatography Symposium, September 1992, Linz, Austria, invited lecture.
35. "Macrocyclic Ligands in Ion Chromatography," Chemistry Department of the University of Hamburg, Germany, September 18, 1992, invited.
36. "Macrocycle-Based Columns for Higher Performance Ion Chromatography," 33rd ORNL-DOE Conference on Analytical Chemistry in Energy Technology, Gatlinburg, Tennessee, October 6-8, 1992.

37. "Macrocyclic Ligands in Ion Chromatography--Recent Developments," Dionex Corporation, Sunnyvale, California, December 7, 1992, invited.
38. "High Performance Anion Chromatography Based on Alkali- and Transition Metal- Macrocycle Complex Exchange Sites," National Meeting of the American Chemical Society, Denver, Colorado, March 29, 1993, invited.
39. "Anion Separations Using Columns Based on Transition Metal-Macrocycle Complex Exchange Sites," International Ion Chromatography Symposium, Baltimore, Maryland, September 12-15, 1993.
40. "Separation of Metal Cations by Capillary Electrophoresis Using a Coated Capillary and 2-Amino-pyridine Buffer," International Ion Chromatography Symposium, Torino, Italy, September 18-21, 1994.
41. "Creating Multimedia Lectures from the Desktop," Faculty Share Fair, Brigham Young University, Provo, Utah, November 18, 1994.
42. "Multimedia in the Chemistry Classroom," Chemistry Department Seminar, University of Utah, Salt Lake City, Utah, March 2, 1995.
43. "Optimizing Macrocyclic Ligand Structure for Liquid Membrane Cation Carriers," National Meeting of the American Chemical Society, Anaheim, California, April 2-6, 1995.
44. "Multimedia in the Chemistry Classroom," Associated Western Universities Annual Board of Directors= Meeting, Provo, Utah, April 10, 1995.
45. "Multimedia Lecture Approach to Teaching First-Year Chemistry," ACS Northwest and Rocky Mountain Regional Meeting, Park City, Utah, June 16, 1995.
46. "Macrocyclic Carriers for Liquid Membrane Transport," DOE/OBES Separation Research Conference, Santa Fe, New Mexico, June 7-9, 1995.
47. "Macrocycles in Separations: Solvent Extraction, Liquid Membranes, Ion Chromatography and Capillary Electrophoresis," Seminar presented to the Department of Chemistry, University of Pavia, Italy, May 10, 1995.
48. "Macrocycles in Separations: Solvent Extraction, Liquid Membranes, Ion Chromatography and Capillary Electrophoresis," Seminar presented to the Department of Chemistry, University of Parma, Italy, May 12, 1995.
49. "Macrocycles in Separations: Solvent Extraction, Liquid Membranes, Ion Chromatography and Capillary Electrophoresis," Seminar presented to the Department of Chemistry, University of Pisa, Italy, May 15, 1995.
50. "Macrocycles in Separations: Solvent Extraction, Liquid Membranes, Ion Chromatography and Capillary Electrophoresis," seminar presented to the Department of Chemistry, University of Catania, Italy, May 18, 1995.
51. "Macrocycles in Separations," series of 10 lectures, University of Pavia, Italy, May 2-11, 1995.



52. "Macrocyclic Ligands in Ion Separations: Chromatography, Membranes, and Solvent Extraction," International Seminar on Inclusion Compounds, Tarabya, Istanbul, Turkey, August 27-31, 1995.
53. "Separation of Small Inorganic Anions Using Polymeric Hollow Fiber Capillaries in Capillary Zone Electrophoresis," International Ion Chromatography Symposium, Dallas, Texas, October 1-5, 1995.
54. "Macrocyclic Ligands in Ion Separations: Ion Chromatography and Liquid Membranes," 211th ACS National Meeting: Division of Industrial and Engineering Chemistry, New Orleans, Louisiana, March 24-28, 1996.
55. "Selective Ion Sorption and Transport Using Polymer Inclusion Membranes Containing Dicyclohexano-18-crown-6," XXI International Symposium of Macrocyclic Chemistry, Montecatini Terme, Italy, June 23-28, 1996.
56. "Novel Separation Systems for Waste Processing and Resource Recovery Based on Macrocyclic Ligand Complexation," with Alex Y. Nazarenko at the Annual University Research Consortium Symposium, Idaho Falls, ID, July 29-31, 1996, invited lecture.
57. "Separation of Carbohydrates by Macrocyclic-Based Ion Chromatography Using the Cryptand *n*-Decyl 2.2.2," International Ion Chromatography Symposium, Reading, England, September 14-20, 1996, invited lecture.
58. "Macrocyclic-Mediated Selective Cation Transport Through Polymer Inclusion Membranes," 14<sup>th</sup> Annual Membrane Technology/Separations Planning Conference, Newton, MA, October 28-30, 1996, invited lecture.
59. "Macrocyclic Ligands in Ion Separations: Chromatography, Membranes, and Solvent Extraction," Department Seminar, Kyushu University, Japan, November 14, 1996.
60. "Macrocyclic Ligands in Ion Separations: Chromatography, Membranes, and Solvent Extractions," International Symposium for the Japan Society for Analytical Chemistry, Fukuoka, Japan, November 14-16, 1996, invited plenary lecture.
61. "Macrocyclic Ligands in Ion Separations: Chromatography, Membranes, and Solvent Extractions," Department Seminar, Saga University, Japan, November 18, 1996.
62. "*Chem Tutor*: A New Multimedia Tutorial for Introductory Chemistry," Second Annual BYU-Public School Partnership Educational Research Symposium, Brigham Young University, Provo, UT, February 13, 1997.
63. "Macrocyclics in Separations," Chemistry Department Seminar, University of Iowa, Iowa City, Iowa, May 1, 1997.
64. "Macrocyclics in Separations," Chemistry Department Seminar, Chalk River Nuclear Facility, Chalk River, Ontario, Canada, June 5, 1997.
65. "Novel Separation Systems for Waste Processing and Resource Recovery Based on Macrocyclic Ligand Complexation," presented at Lockheed Martin Idaho Technologies Company, Idaho Falls, Idaho, July 27, 1997.

66. "Applying the Metal Cation Selectivity of Macrocyclic Ligands in Liquid Membrane and Ion Chromatography Separations," plenary lecture at the XXII International Symposium on Macrocyclic Chemistry, Seoul, Korea, August 3-8, 1997, invited lecture.
67. "Macrocycles in Separations," Post ISMC Meeting: *From Macrocyclic Chemistry to Supramolecular Chemistry*, Saga, Japan, August 10-11, 1997, invited lecture.
68. "*Chem Tutor*: A Novel Multimedia Tutorial for College Freshman Chemistry," The American Institute of Chemists 74<sup>th</sup> National Meeting, Las Vegas, Nevada, September 4-6, 1997, invited lecture.
69. "Ion Chromatography in Macrocyclic Perspective," International Ion Chromatography Symposium, San Francisco, California, September 14-17, 1997, invited plenary lecture.
70. "Macrocycles in Separations," department seminar, Department of Chemistry, University of Idaho, Moscow, Idaho, February 19, 1998, invited.
71. "*Chem Tutor*: A Novel Multimedia Tutorial for College Freshman Chemistry," department colloquium, Department of Physics, Brigham Young University, Provo, Utah, March 25, 1998, invited.
72. "A Comparison of Crown Ethers and Calix-Crowns as Selective Metal Ion Carriers in Polymer Inclusion Membranes," XXIII Symposium on Macrocyclic Chemistry, Turtle Bay, Oahu, Hawaii, June 7-12, 1998, Poster.
73. "Metal Ion Separations using Polymer Inclusion Membranes containing Macrocyclic Carriers," International Symposium on Liquid Membranes: Theory and Practice, Klyazma, Moscow, Russia, June 25, 1998, invited plenary lecture.
74. "A Multimedia Tutorial Approach to Teaching Freshman Chemistry," 15<sup>th</sup> Biennial Conference on Chemical Education, Waterloo, Ontario, Canada, August 9-13, 1998.
75. "Applying the Metal Cation Selectivity of Macrocyclic Ligands in Ion Chromatography Separations," Presentation to Analytical Group, Eastman Chemical Corp., Kingsport, TN, October 5, 1998.
76. "Pursuing the Golden Mean: Innovations in Separations and Pedagogy," department seminar, Department of Chemistry, Provo, UT, March 9, 1999.
77. "Macrocycles in Separations", Department Seminar, Department of Chemistry, U of Catania, Italy, February, 1999, invited.
78. "Calixarene Carriers for Metal Ions in Polymer Inclusion Membranes," Calixarenes in Separations Symposium, National American Chemical Society Meeting, Anaheim, CA, March 24, 1999.
79. "Ion Separation Using Macrocyclic Ligands," XXIV International Symposium on Macrocyclic Chemistry, Barcelona, Spain, July 18-23, 1999, plenary lecture.
80. "*Chem Tutor* and Chem Coach," Rocky Mountain Chemistry Chairs Conference, Provo, UT, October 2, 1999.

81. “*Chem Tutor*,” McGraw-Hill General Chemistry Summit, Chicago, IL, November 5-7, 1999.
82. “Selective Cs<sup>+</sup> Transport through Polymer Inclusion Membranes Using Calix-Crown Ligands and a Novel Isoguanosine Self-Assembled Ionophore,” NAIR Workshop, Tsukuba, Japan, March 7, 2000, invited plenary lecture.
83. “Selective Cs<sup>+</sup> Transport through Polymer Inclusion Membranes Using Calix-Crown Ligands and a Novel Isoguanosine Self-Assembled Ionophore,” Chemistry Department Seminar, Wakayama University, Wakayama, Japan, March 9, 2000, invited.
84. “Selective Cs<sup>+</sup> Transport through Polymer Inclusion Membranes Using Calix-Crown Ligands and a Novel Isoguanosine Self-Assembled Ionophore,” Chemistry Department Seminar, Osaka City University, Osaka City, Japan, March 10, 2000, invited.
85. “Selective Cs<sup>+</sup> Transport through Polymer Inclusion Membranes by Self-Assembled Isoguanosine Ionophore,” National ACS Meeting, San Francisco, CA, March 28, 2000, invited lecture.
86. “A Novel Isoguanosine Self-Assembled Ionophore for Selective Cs<sup>+</sup> Transport through Polymer Inclusion Membranes,” XXV International Symposium on Macrocyclic Chemistry, St. Andrews, Scotland, July 2-7, 2000, poster.
87. “Assessing BYU’s General Education Program,” Annual University Conference, Brigham Young University, Provo, UT, August 21, 2000, presenter.
88. “Macrocyclic Ligands in Ion Separations,” University of Utah Chemistry Department Seminar, University of Utah, Salt Lake City, UT, October 24, 2000, invited.
89. “Macrocycles in Separations,” Series of Lectures, Technical University of Dresden, Germany, November 14-15, 2000, invited.
90. “Macrocyclic Ligands as Membrane Carriers,” Chemistry Department Seminar, Technical University of Dresden, Dresden, Germany, November 15, 2000, invited.
91. “Macrocycles in Liquid Membrane Separations,” Chemistry Department Seminar, University of Parma, Parma, Italy, November 20, 2000, invited.
92. “Macrocycles in Liquid Membrane Separations,” Department of Pharmacy, University of Parma, Parma, Italy, November 20, 2000, invited.
93. “Use of Mobile Phase 18-Crown-6 to Improve Peak Resolution Between Mono- and Divalent Metal and Amine Cations in Ion Chromatography,” XXVI International Symposium on Macrocyclic Chemistry, Fukuoka, Japan, July 16, 2001, poster.
94. “Witnesses in Stars and Stones,” University Devotional, Brigham Young University, Provo, UT, January 15, 2002.
95. “18-Crown-6 as an Eluent Additive for Both Cation and Anion Separations in Ion Chromatography,” International Ion Chromatography Symposium 2002, Baltimore, MD, September 30, 2002, invited lecture.
96. “Macrocycles in Ion Chromatography,” Department Seminar, Department of Chemistry and Biochemistry, Baylor University, Waco, Texas, January 31, 2003, invited.

97. "Macrocyclic-based Ion Chromatography: Perchlorate Determination," XXVIII International Symposium on Macrocyclic Chemistry, Gdansk, Poland, July 16, 2003, invited lecture.
98. "Ion Chromatographic Quantification of Low-Level Perchlorate Concentrations Using 18-Crown-6 as a Mobile Phase Additive," International Ion Chromatography Symposium 2003, San Diego, CA, September 23, 2003.
99. "Pulling the Pins on Voodoo Science," BYU Idaho Forum Assembly, November 21, 2003, invited.
100. "Anion Binding by Upper-Rim Substituted Resorcinarene Cavitands," XXIX International Symposium on Macrocyclic Chemistry, Cairns, Australia, July 6, 2004, invited keynote lecture.
101. "Pulling the Pins on Voodoo Science," BYU Honors Colloquium, September 16, 2004, invited.
102. "Macrocyclic Ligands in Ion Separations," University of Alberta Chemistry Department seminar, Edmonton, Alberta, April 8, 2005, invited.
103. "Resorcinarenes with Metal Ion Centers for Anion Complexation," XXX International Symposium on Macrocyclic Chemistry, Dresden, Germany, July 20, 2005, invited keynote lecture.
104. "Determination of ppb Perchlorate Concentrations by an 18-Crown-6-based IC Method using a Cryptand C1 Concentrator," 18<sup>th</sup> International Ion Chromatography Symposium," Montreal, Canada, September 19, 2005, poster.
105. "Macrocycles in Separations," Osaka City University Department Seminar, Osaka, Japan, May 25, 2006, invited.
106. "ChemTutor II, A Multimedia Tool for General Chemistry," Osaka City University Department Seminar, Osaka, Japan, May 24, 2006, invited.
107. "Macrocycles in Separations," Sophia University Department Seminar, Tokyo, Japan, May 26, 2006, invited.
108. "Macrocycles in Separations," 1<sup>st</sup> Japanese Symposium on Host-Guest Chemistry, Tsukuba, Japan, May 30, 2006, invited plenary lecture.
109. "Chelate-substituted Resorcinarenes as Selective Carriers in Liquid Membranes," XXXI International Symposium on Macrocyclic and Supramolecular Chemistry, Victoria, British Columbia, June 25, 2006, poster.
110. "Macrocyclic-Based Ion Chromatography," University of Parma Department Seminar, Parma, Italy, June 22, 2007, invited.
111. "A Comparison of Mobile Phase and Stationary Phase Macrocyclic-Based Ion Chromatography," 2<sup>nd</sup> International Symposium on Macrocyclic and Supramolecular Chemistry, Salice Terme, Italy, June 28, 2007, invited lecture.
112. "The Persistence of Memory," Brigham Young University Chemistry Department Teaching

- Seminar, Provo, Utah, February 14, 2008.
113. "The Application of Novel Macromulticycles to Ion Chromatography," International Ion Chromatography Symposium, September 24, 2008, Portland, Oregon, invited lecture.
  114. "The Rise and Fall of Scientific Certainty," BYU Honors Colloquium, October 23, 2008, invited.
  115. "Novel Resorcinarene-based Macrocyclic Ion Exchange Sites for Ion Preconcentration and Matrix Elimination," International Ion Chromatography Symposium, September 22, 2009, Dublin, Ireland, invited lecture.
  116. "Cyclen-Substituted Resorcinarene Exchange Sites for Transition Metal Ion Separations," International Ion Chromatography Symposium, September 20, 2010, Cincinnati, Ohio, invited lecture.
  117. "Application of Novel Macrocyclic Structures to Ion Chromatography," PacificChem 2010, December 14, 2010, Honolulu, Hawaii, invited lecture.
  118. "Separation of Transition Metal Cations and Preconcentration of  $\text{Cu}^{2+}$  using a Cyclen-Resorcinarene Column," International Ion Chromatography Symposium, October 8, 2011, Providence, Rhode Island, invited lecture.
  119. "Putting Technology to Work in Large Chemistry Classes," Seminar to Department of Mathematics, Brigham Young University, March 14, 2012.
  120. "Applying Host-Guest Chemistry to Ion Chromatography," International Ion Chromatography Symposium, Berlin, Germany, September, 2012, invited plenary award lecture.
  121. "Ion Chromatographic Separations using a Cyclen-Resorcinarene Host," International Symposium on Macrocyclic and Supramolecular Chemistry, Arlington, Virginia, July 2013, poster.
  122. "All Ye Need to Know," Distinguished Faculty Lecture, Brigham Young University, de Jong Concert Hall, May 20, 2014.
  123. "The Dogma Trap," Summerhays Lecture, College of Physical and Mathematical Sciences, Lee Library, Brigham Young University, Sept 18, 2014.

#### Student Presentations

1. Phillip A. Drake, "Ion Chromatography HPIC Separation and Analysis of Radiostrontium in Ionic Mixtures," Spring Research Conference, BYU, Provo, UT, March 21, 1987.
2. Brenda K. Sedar, "Characterization of the Winter Haze in the Southwest Desert," Spring Research Conference, BYU, Provo, UT, March 12, 1988.
3. Kelly J. Wall, "Chromium(VI) Determination Using Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 12, 1988.
4. Phillip A. Drake, "Ion Chromatographic Separation of Radiostrontium from Nuclear Reprocessing Solutions of High Ionic Strength," Spring Research Conference, BYU, Provo, UT, March 11,

- 1989.
5. Robert Smith, "Ion Chromatographic Separation of Iodine from Nuclear Reprocessing Solutions for Subsequent Radioanalysis," Spring Research Conference, BYU, Provo, UT, March 11, 1989.
  6. A. K. Van Orden, "Separation of Strontium from Complex Matrices Using Silica-Based Crown Ethers," Spring Research Conference, BYU, Provo, UT, March 11, 1989.
  7. C. Smith, "Selective Metal Cation Transport in Novel Dual Module Hollow Fiber Liquid Membranes," Spring Research Conference, BYU, Provo, UT, March 11, 1989.
  8. R. T. Paxton, "The Separation of Fluoride as a Trace from Environmental Air Samples by Ion Pairing Reverse Phase Chromatography," Spring Research Conference, BYU, Provo, UT, March 11, 1989.
  9. R. T. Paxton, "Cationic Concentration for Subsequent Reversed Phase Chromatographic Determination of Nicotine and Vinylpyridine," Spring Research Conference, BYU, Provo, UT, March 10, 1990.
  10. Robert G. Smith, "The Liquid Chromatographic Separation of Cations Using an Immobilized Crown Ether Stationary Phase," Spring Research Conference, BYU, Provo, UT, March 10, 1990.
  11. Y. K. Ye, "Separation of Nucleotides Using Cation-Macrocyclic Complexes as Chromatographic Stationary Phase," Spring Research Conference, BYU, Provo, UT, March 10, 1990.
  12. Nancy K. Edge, "Separation of Alkali Metal Cations Using Neutral and Proton Ionizable Crown Ethers in Extraction and Membrane Systems," Spring Research Conference, BYU, Provo, UT, March 10, 1990.
  13. Phillip A. Drake, "Variable Capacity Columns for Gradient Elution Anion Chromatography Based on Macrocyclic Complexes," Spring Research Conference, BYU, Provo, UT, March 10, 1990.
  14. Robert Allison, "Separation and Analysis of Iodine in Nuclear Reprocessing Solutions of High Ionic Strength," Spring Research Conference, BYU, Provo, UT, March 10, 1990.
  15. Chuan Wang, "Cation Separations Using a Proton-Ionizable Macrocyclic-Mediated Dual Module Hollow Fiber Membrane Contactor," Spring Research Conference, BYU, Provo, UT, March 9, 1991.
  16. Robert G. Smith, "Temperature Programming in Macrocyclic-Based Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 9, 1991.
  17. Y. K. Ye, "The Separation of Nucleotides by Macrocyclic-Based Chromatography," Spring Research Conference, BYU, Provo, UT, March 9, 1991.
  18. Robert G. Smith, "A Comparison of Gradient Capacity Anion Chromatography in Macrocyclics D-2.2.2 and D-2.2.1 in Constant or Variable Temperature Mode," International Ion Chromatography Symposium, Denver, CO, October 8, 1991.
  19. Brad R. Edwards, "The Determination of Concentrated Uranium in a Complex Matrix by Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 14, 1992.

20. Y. K. Ye, "The Comparison of Macrocyclic-Based and Omnipac Pax-500 Columns for the Separation of Nucleotides and Nucleosides," Spring Research Conference, BYU, Provo, UT, March 14, 1992.
21. Chuan Wang, "Cation Separation Using a Proton-Ionizable Macrocyclic in a Dual Module Hollow Fiber Membrane System," Spring Research Conference, BYU, Provo, UT, March 14, 1992.
22. Robert G. Smith, "A Comparison of Gradient Capacity Anion Chromatography Using Macrocyclics D-2.2.1 and D-2.2.2 in Constant or Variable Temperature Mode," Spring Research Conference, BYU, Provo, UT, March 14, 1992.
23. K. Cheng, "Separation of Metal Cations by Capillary Electrophoresis with Indirect UV Detection," Spring Research Conference, BYU, Provo, UT, March 13, 1993.
24. Chuan Wang, "An Isothermal Flow Calorimeter Study of Macrocyclic-Metal Ion Interaction at High Temperature," Spring Research Conference, BYU, Provo, UT, March 13, 1993.
25. Robert G. Smith, "Anion Chromatography Using a Crown Ether-Based Stationary Phase," Spring Research Conference, BYU, Provo, UT, March 13, 1993.
26. Richard M. Garrick, "Influence of Cryptand 2.2.2 on the Separation of Nucleotides and Nucleosides by Capillary Electrophoresis," Spring Research Conference, BYU, Provo, UT, March 13, 1993.
27. Brad Edwards, "The Determination of Inorganic Anions in Nuclear Waste Streams by Capillary Electrophoresis," Spring Research Conference, BYU, Provo, UT, March 26, 1993.
28. Brad Edwards, "The Use of Macrocyclics as Electroosmotic Flow Modifiers in the Separation of Nucleotides and Inorganic Anions by Capillary Electrophoresis" (Poster), International Ion Chromatography Symposium, Baltimore, MD, Fall 1993.
29. Robert Smith, "Use of Step Gradients on Different Polymeric Substrates in the Separation of Anions by Macrocyclic-Based Ion Chromatography," International Ion Chromatography Symposium, Baltimore, MD, Fall, 1993.
30. Brad Edwards, "The Use of Macrocyclics as Electroosmotic Flow Modifiers in the Separation of Inorganic Anions by Capillary Electrophoresis," Spring Research Conference, BYU, Provo, UT, March 25, 1994.
31. Anthony Giaque, "The Use of Macrocyclic-Based Columns in the Separation of Inorganic Cations by Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 25, 1994.
32. Randall Peterson, "The Affect of Temperature on Macrocyclic-Cation Binding as Determined by a Novel High Temperature Flow Calorimeter," Spring Research Conference, BYU, Provo, UT, March 25, 1994.
33. Tom Huxford, "The Use of Polymeric Crown Ethers in the Ion Chromatographic Separation of Inorganic Anions," Spring Research Conference, BYU, Provo, UT, March 25, 1994.
34. David Bearss, "Determination of Thermodynamic Equilibrium Constants and Membrane

- Separation of Metal Ions with Alkoxyethyl-Substituted 18-Crown-6 and 21-Crown-7 Ligands,” Spring Research Conference, BYU, Provo, UT, March 25, 1994.
35. Richard Garrick, “Separation of Metal Cations by Capillary Electrophoresis Using Coated Capillaries,” Spring Research Conference, BYU, Provo, UT, March 25, 1994.
  36. Brad Edwards, “A Macrocyclic-Based Column for the Separation of Inorganic Cations by Ion Chromatography,” International Ion Chromatography Symposium, Turin, Italy, Fall 1994.
  37. Brad Edwards, “The Incorporation of 15-Crown-5 Macrocyclics Having Different Aliphatic Side Chains in Cation and Anion Separator Columns,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  38. Anthony Giaque, “A Macrocyclic-Based Column for the Separation of Inorganic Cations by Ion Chromatography,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  39. Karl Czirr, “Separation of Cyanide and Sulfide in Nuclear Reprocessing Streams,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  40. Randall Peterson, “Coalescence Extraction: A Novel, Rapid Means of Performing Solvent Extraction,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  41. Tyler Crawford, “Quantitative Separation and Determination of Amino Acids Using Macrocyclic-Based Ion Chromatography,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  42. Nolan Polson, “The Use of Macrocyclic-Based Columns in Carbohydrate Analysis Using Pulsed Amperometric Detection,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  43. Tom Huxford, “Separation of Small Inorganic Anions Using Polymeric Hollow Fiber Capillaries in Capillary Zone Electrophoresis,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  44. Adam Schow, “Polymer Inclusion Membranes for Use in Cation Separations,” Spring Research Conference, BYU, Provo, UT, March 26, 1995.
  45. Randall Peterson, “Coalescence Extraction: A Novel Means of Performing Solvent Extractions,” National ACS Meeting, Anaheim, CA, April 3, 1995.
  46. Tom Huxford, “Separation of Small Inorganic Anions Using Polymeric Hollow-Fiber Capillaries in Capillary Zone Electrophoresis,” National ACS Meeting, Anaheim, CA, April 3, 1995.
  47. Anthony Giaque, “A Macrocyclic-Based Column for Inorganic Cation Separations,” National ACS Meeting, Anaheim, CA, April 3, 1995.
  48. Tyler Crawford, “Quantitative Separation and Determination of Amino Acids Using Macrocyclic-Based Ion Chromatography,” National ACS Meeting, Anaheim, CA, April 3, 1995.
  49. Brad Edwards, “A Macrocyclic-Based Column for the Separation of Inorganic Cations by Ion Chromatography,” Northwest/Rocky Mountain Regional ACS Meeting, Park City, UT, June 16, 1995.
  50. Nolan Polson, “Separation of Carbohydrates by Macrocyclic-based Ion Chromatography,” Spring



- Research Conference, BYU, Provo, UT, March 30, 1996.
51. Karl Czirr, "Capillary Electrophoresis of Anions in an Untreated Polypropylene Hollow Fiber," Spring Research Conference, BYU, Provo, UT, March 30, 1996.
  52. Tatiana Levitskaia, "Study of Novel Macrocyclic-based Solvent Extraction Systems," Spring Research Conference, BYU, Provo, UT, March 29, 1997.
  53. Travis Niederhauser, "Chromatography Separations with a Stationary Phase Based on a Nickel (II) Macrocyclic Complex," Spring Research Conference, BYU, Provo, UT, March 29, 1997.
  54. Jon Halling, "Carbohydrate Separations Using a Novel Macrocyclic-Based Stationary Phase in Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 29, 1997.
  55. Stanford Pugsley, "Metal Cation Separations Using Optimized Polymer Inclusion Membranes," Spring Research Conference, BYU, Provo, UT, March 29, 1997.
  56. Ryan Hansen, "Novel Coalescent Solvent Extraction Systems for Effective Extraction of Lead and Strontium using Dicyclohexano-18-Crown-6," Spring Research Conference, BYU, Provo, UT, March 29, 1997.
  57. A.Y. Nazarenko, "Metal Ion Transport Through Polymer Inclusion Membranes with Crown Ether Carriers," ACS Symposium on Chemistry and Materials Science of Synthetic Membranes, Las Vegas, Nevada, September 9, 1997.
  58. George Thomas, "Extraction of  $Pb^{2+}$  and  $Sr^{2+}$  Using Organic Solvent Mixtures," Spring Research Conference, BYU, Provo, UT, March 28, 1998.
  59. Travis Niederhauser, "Anion Chromatography Separation of Maltooligosaccharides on a Macrocyclic-Based Stationary Phase," Spring Research Conference, BYU, Provo, UT, March 28, 1998.
  60. Chang Shu, "High-performance Capillary Electrophoretic Separation of Carbohydrates with Indirect UV Detection Using Diethylamine and Borate as Electrolyte Additives," Spring Research Conference, BYU, Provo, UT, March 28, 1998.
  61. Tatiana G. Levitskaia, "Novel cesium Selective Polymer Inclusion Membrane Separation Systems Based on Calixcrown Ligands," Spring Research Conference, BYU, Provo, UT, March 28, 1998.
  62. Dusten Macdonald, "Calorimetric Investigation of the Complexation of Didodecylcalix[4]crown-6 with Alkali Metal Cations in Acetonitrile," Spring Research Conference, BYU, Provo, UT, March 28, 1998.
  63. Liskin A. Neilson, "A Novel Extraction System Composed of Poly(Ethylene Oxide) and Trichloroacetic Acid," Spring Research Conference, BYU, Provo, UT, March 28, 1998.
  64. Alexander Y. Nazarenko, "New Solvent System for Metal Ion Separation with Macrocyclic Ligands," XXIII Symposium on Macrocyclic Chemistry, Turtle Bay, Oahu, Hawaii, 1998.
  65. Chang Shu, "Separation of Carbohydrates by Capillary Electrophoresis with Indirect UV Detection," NW Regional ACS Meeting, Columbia Basin College, Pasco, WA, June 17, 1998.

66. Tatiana G. Levitskaia, "The Role of Cage-Like Crown Ether Complexes with Cs<sup>+</sup> Ion in Providing Clefts for Neutral or Anionic Guests," ACS Meeting, Anaheim, CA, March 21-25, 1999.
67. Richard A. Lochhead, "A New Retention Model for Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 13, 1999.
68. Travis Niederhauser, "Retention Model for Macrocyclic-Based Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 13, 1999.
69. George Thomas, "Separation of Mercury using Coalescence Solvent Extraction and Polymer Inclusion Membranes," Spring Research Conference, BYU, Provo, UT, March 13, 1999.
70. Tatiana Levitskaia, "Coordination and Equilibrium Aspects of the Cesium Complexation by Tetrabenzocrown-8-Ligands," Eleventh Symposium on Separation Science and Technology for Energy Applications, Gatlingburg, Tennessee, October 18, 1999.
71. Sang Chul Lee, "A Lipophilic Acyclic Polyether Dicarboxylic Acid as Pb<sup>2+</sup> Carrier in Polymer Inclusion and Bulk Liquid Membranes," 35<sup>th</sup> ACS Western Regional Meeting, Ontario, CA, October 6-7, 1999.
72. David Scoville, "Determination of Stationary Phase Surface Areas in Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 18, 2000.
73. Travis Niederhauser, "Retention Model for Anion Chromatography with Macrocyclic-Based Stationary Phases," Spring Research Conference, BYU, Provo, UT, March 18, 2000.
74. David Scoville, "Surface Area Determination of a Polystyrene-divinylbenzene Stationary Phase Used in Ion Chromatography," 55<sup>th</sup> Northwest/16<sup>th</sup> Rocky Mountain Regional ACS Meeting, Idaho Falls, ID, June 15, 2000.
75. Travis Niederhauser, "Retention Model for Anion Chromatography with a Tetradecyl-18-Crown-6-Based Stationary Phase," 55<sup>th</sup> Northwest/16<sup>th</sup> Rocky Mountain Regional ACS Meeting, Idaho Falls, ID, June 15, 2000.
76. Arlo McGinn, "Cellulose Acetate/Butyrate as a Support Polymer in Polymer Inclusion Membranes," Spring Research Conference, BYU, Provo, UT, March 17 2001.
77. Dean Richens, "The Use of Mobile Phase 18-crown-6 to Improve Peak Resolution Between the Mono, Divalent and Amine Cations in Ion Chromatography," Spring Research Conference, BYU, Provo, UT, March 17 2001.
78. David Simpson, "Effects of 18-Crown-6 as an Eluent Additive in Cation Chromatography Separation using an Underivatized Column," Spring Research Conference, BYU, Provo, UT, March 16, 2002.
79. Joseph Gardner, "Liquid Membrane and Ion Chromatography Separations of Anions Using Resorcinarene Based Cavities," Spring Research Conference, BYU, Provo, UT, March 16, 2002.
80. Joseph Gardner, "Novel Resorcinarene Based Multitopic Ionic Receptors for Liquid Membrane

- and Ion Chromatography Separations,” 57<sup>th</sup> Northwest Regional ACS Meeting, Spokane, WA, June 21, 2002.
81. Joseph Gardner, “Novel Resorcinarene Based Multitopic Ionic Receptors for Liquid Membrane and Ion Chromatography Separations,” XXVII International Symposium on Macrocyclic Chemistry, Park City, UT, June 24, 2002.
  82. David Simpson, “18-Crown-6 and 15-Crown-5 as Eluent Additives for Cation Separations in Ion Chromatography,” XXVII International Symposium on Macrocyclic Chemistry, Park City, UT, June 26, 2002.
  83. Jedediah Walker, “Stability of Cellulose Based Polymer Inclusion Membranes: Ion Transport Using Macrocyclic Carriers,” XXVII International Symposium on Macrocyclic Chemistry, Park City, UT, June 26, 2002.
  84. Joseph S. Gardner, “Novel Resorcinarene Based Multitopic Ionic Receptors for Anion Binding,” XXVIII International Symposium on Macrocyclic Chemistry, Gdansk, Poland, July 17, 2003.
  85. Joseph S. Gardner, “Guest Inclusion in Resorcinarene Metal Assembled Cages and Nanoarchitectures”, College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2004.
  86. Martin Conda, “H-NMR Anion Binding Studies of 2,2’-Dipicolylamine Derivatized Resorcinarene Cavitands”, College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2004.
  87. Bryce Jensen, “Comparison of Stationary Phases Using Cryptand 2.2.1 Covalently Bonded Versus Adsorbed in IC”, College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2004.
  88. Quinn Peterson, “18-crown-6 as an Eluent Additive for the Determination of Perchlorate in Water Samples”, College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2004. (\*won best of session prize)
  89. Jedediah Walker, “Cellulose Based Polymer Inclusion Membranes: Ion Transport Effects and Hydrolysis Durability”, College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2004.
  90. Quinn P. Peterson, “18-crown-6 as an Eluent Additive for the Determination of Perchlorate in Water Samples.” 227<sup>th</sup> ACS National Meeting. Anaheim, California, March 2004, Poster.
  91. Jedediah O. Walker, “Cellulose Based Polymer Inclusion Membranes: Ion Transport Effects and Hydrolysis Durability,” 227<sup>th</sup> ACS National Meeting. Anaheim, California, March 2004, Poster.
  92. Martin Conda-Sheridan, “H-NMR Probed Anion Binding of 2,2’-Dipicolylamine Derivatized Resorcinarene Cavitands,” 227<sup>th</sup> ACS National Meeting. Anaheim, California, March 2004, Poster.
  93. Joseph S. Gardner, “Guest Inclusion in Resorcinarene Metal Assembled Cages and Nanoarchitecture,” 227<sup>th</sup> ACS National Meeting. Anaheim, California, March 2004, Oral.

94. Quinn Peterson, Brandon Tibbitts, and John D. Lamb, "Improved trace analysis of highly retained anions by macrocycle-based ion chromatography," 229th ACS National Meeting. San Diego, California, March 2005, poster.
95. Martin Conda-Sheridan, 229th ACS National Meeting. San Diego, California, March 2005, poster.
96. Brandon Tibbitts, "Improved trace analysis of highly retained anions by macrocycle-based ion chromatography," College of Physical and Mathematical Sciences Spring Research Conference, March 18, 2005.
97. Joseph Gardner, "Resorc[4]arene derivatized Tetranuclear Transition Metal Complexes as Carriers for Facilitated Anion Transport through Polymer Inclusion Membranes," College of Physical and Mathematical Sciences Spring Research Conference, March 18, 2005.
98. Cheryl Morris, "Cation Separations by Novel Aza-Crown Resorcinarene Ligands in Liquid Membranes," College of Physical and Mathematical Sciences Spring Research Conference, March 18, 2006.
99. Jing Wang, "Synthesis and Application of Cyclen Derivatives," College Spring Research Conference, March 15, 2008.
100. Matthew Freeman, "Application of aza-crown compounds in ion exchange chromatography," College Spring Research Conference, March 15, 2008.
101. Jeremiah West, "Cation Effect on Anion Separations by Aza-Crown Ligands in Liquid Membranes," College Spring Research Conference, March 15, 2008.
102. Lucy Wang, "Capacity-Adjustable Anion Exchange Macrocycles," Joint Northwest/Rocky Mountain Meeting of the American Chemical Society, Park City, Utah, June 15-18, 2008.
103. Wang, J.; Lamb, J. D.; Harrison, R. G. and Li, N., Capacity-adjustable Anion Exchange Macrocycles, International Symposium on Macrocyclic and Supramolecular Chemistry, Las Vegas, Nevada, July 2008.
104. Na Li, "Synthesis and Properties of Resorcinarene-based Chiral Receptors," National American Chemical Society Meeting, Salt Lake City, Utah, March, 2009.
105. Na Li, "Synthesis and Properties of Resorcinarene-based Chiral Receptors," College of Physical and Mathematical Sciences Spring Research Conference, March 21, 2009.
106. Thomas C. Ence, "A Novel Cyclen-Resorcinarene Concentrator Column for Transition Metal Cations in Ion Chromatography," College of Physical and Mathematical Sciences Spring Research Conference, March 21, 2009.
107. Taylor J. Christensen, "A Novel Cyclen-Resorcinarene Concentrator Column for Transition Metal Cations in Ion Chromatography," Utah Academy of Sciences, Arts, and Letters, Provo, Utah, April 10, 2009.

108. Na Li, "Synthesis and Properties of Resorcinarene-based Chiral Receptors," Utah Academy of Sciences, Arts, and Letters, Provo, Utah, April 10, 2009.
109. Taylor J. Christensen, "The Development of a Simplified Method for Perchlorate Determination using a Resorcinarene-based Chromatographic Column," College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2010.
110. Na Li, "Characterization and Separation Applications of an Alanine-substituted Resorcinarene Cavitand," College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2010.
111. Ammon Eaton, "A Cyclen-Resorcinarene Column for the Selective Concentration of Transition Metal Ions in Chelation Ion Chromatography," College of Physical and Mathematical Sciences Spring Research Conference, March 20, 2010. (award winner)
112. Na Li, "Characterization and Preliminary Separation Applications of a Resorcinarene-based Cavitand," College of Physical and Mathematical Sciences Spring Research Conference, March 19, 2011.
113. Na Li, "Characterization and Preliminary Separation Applications of a Resorcinarene-based Cavitand," Utah Academy of Sciences, Arts, and Letters, Salt Lake City, Utah, April 8, 2011.
114. Na Li, "Cation Separation and Preconcentration in Ion Chromatography using Columns Containing Cyclen and Cyclen-Resorcinarene Derivatives," College of Physical and Mathematical Sciences Spring Research Conference, March 17, 2012.
115. Stewart Morley, "Cucurbit[6]uril as a Macrocyclic Separator of Alkali Metals and Amines in Ion Chromatography," College of Physical and Mathematical Sciences Spring Research Conference, March 17, 2012.
116. Na Li, "Cation Separation and Preconcentration in Ion Chromatography using Columns Containing Cyclen and Cyclen-Resorcinarene Derivatives," National American Chemical Society Meeting, San Diego, California, April, 2012, oral presentation.
117. Ammon Eaton (substituted by Na Li), "A Cyclen-Resorcinarene Column for the Selective Concentration of Transition Metal Ions in Chelation Ion Chromatography," National American Chemical Society Meeting, San Diego, California, April, 2012, poster presentation.
118. Courtney Britsch, "Preconcentration and Separation of  $\text{Cu}^{2+}$  through High Performance Chelation Ion Chromatography," BYU College of Physical and Mathematical Sciences Spring Research Conference, March 9, 2013.
119. Stewart Morley, "Application of Cucurbituril Macrocycles in Ion Chromatography," BYU College of Physical and Mathematical Sciences Spring Research Conference, March 9, 2013.
120. Douglas Weaver, "Direct detection and separation of guanidino compounds in synthetic urine with a macrocycle based stationary phase," BYU College of Physical and Mathematical Sciences Spring Research Conference, March 15, 2014.

*Student Research Fellowships*

Robert G. Smith, IC Symposium Travel Award, 1992 (Linz, Austria).

Brad R. Edwards, Chemistry Department Fellowship, \$1000, 1992.

Brad R. Edwards, IC Symposium Travel Awards, 1994 (Torino, Italy).

Randall T. Peterson, Research and Creative Arts Fellowship, \$1000, 1993-94.

Anthony P. Giaque, Research and Creative Arts Fellowship, \$1000, 1993-94.

Brad R. Edwards, Graduate Research Fellowship, 1994-95.

Adam Schow, Research and Creative Arts Fellowship, \$1000, 1994-95.

Tyler Crawford, Research and Creative Arts Fellowship, \$1000, 1994-95.

Dusten Macdonald, ORCA Research Award, \$1000, December 1997.

Travis Niederhauser, Lauren C. and Maurine F. Bryner Graduate Fellowship, \$1000, 1998.

Erik Nelson, ORCA Research Award, \$1000, January 2000.

Joseph Gardner, Nicholes-Maw Fellowship, Department of Chemistry and Biochemistry, 1999-2000.

Joseph Gardner, Stanley and Leona Goates Summer Research Fellowship, Department of Chemistry and Biochemistry, 2000.

Arlo N. McGinn, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Fall 2000.

David H. Scoville, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Fall 2000.

Arlo N. McGinn, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Winter 2001.

Arlo N. McGinn, ORCA Research Award, \$1000, January 2001.

David Simpson, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Spring 2001.

David Simpson, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Fall 2001.

David Simpson, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Winter 2002.

David Simpson, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1350, Spring 2002.

Jedediah Walker, Undergraduate Research Award, Department of Chemistry and Biochemistry,

\$1350, Spring 2002.

David Simpson, Undergraduate Research Award, Department of Chemistry and Biochemistry, \$1400, Fall 2002.

Joseph S. Gardner, *Roland K. Robins Graduate Fellowship*, Department of Chemistry and Biochemistry, 2001-2002.

Martin Conda-Sheridan, ORCA Research Award, \$1500, March 2005.

Quinn Peterson, ORCA Research Award, \$1500, March 2005.

Cheryl Morris, College Undergraduate Research Award, \$1400, Fall 2005.

Matthew Freeman, College Undergraduate Research Award, \$1500 each, Fall 2006, Winter 2007, Spring 2007.

Craig Larsen, College Undergraduate Research Award, \$1500, Spring 2007.

Ammon Eaton, College Undergraduate Research Award, \$1500, Spring 2012.

Dallin Hardy, College Undergraduate Research Award, \$1500, Spring 2012.

#### *Service to the Church of Jesus Christ of Latter-Day Saints*

Missionary, Italy Milan Mission, 1973-1975; Assistant to the President, 8 months.

Elders' Quorum President, BYU 83rd Ward, 1975-1976.

Member, Stake High Council, BYU 10th Stake, 1977-1980.

Stake Mission President, BYU 10th Stake, 1978-1980.

Counselor, Orem 91st Ward Bishopric, 1980-1982.

Member, Stake High Council, BYU 8th Stake, 1989-1992.

Bishop, BYU 93rd Ward, 1992-1994.

Member, Stake High Council, Orem Windsor Stake, 1996-98.

Member, LDS Church Writing Committee, 1998-2001. member of the Heber J. Grant manual committee; chair of the Wilford Woodruff manual committee.

Missionary service as singer in the Mormon Tabernacle Choir, 2000-2007.

#### *Artistic Achievements*

##### **Paintings in Juried Exhibitions:**

“No Other Way,” Christmas Religious Art Exhibit (Juried), Springville Art Museum, December 2015.

“Power from on High,” Christmas Religious Art Exhibit (Juried), Springville Art Museum, December 2002.

“Degrees of Glory,” Christmas Religious Art Exhibit (Juried), Springville Art Museum, December 1994.

“Et Glorificamus,” Christmas Religious Art Exhibit (Juried), Springville Art Museum, December 1992.

“A Mighty Change,” Christmas Religious Art Exhibit (Juried), Springville Art Museum, December 1990.

### **Musical Organizations:**

Member of Utah Valley Choral Society, September 1997-2000; **president-elect**, 1998, **president**, 1999-2000.

Member of Mormon Tabernacle Choir, 2000-2007:

- CD recordings include *Consider the Lilies, Peace Like a River, Sing Choirs of Angels, America’s Choir, Spirit of America, Choose Something Like a Star, Miklos Rozsa, The Sound of Glory, Love is Spoken Here, Then Sings my Soul*
- DVD video recordings include *Historic Visit to Nauvoo, Christmas with the Mormon Tabernacle Choir featuring Audra McDonald & Peter Graves, Silent Night Holy Night with Walter Cronkite, The Joy of Christmas with Angela Lansbury, Friends to All Nations, Joy to the World*

Member of the Utah Baroque Ensemble, 2008-present.

- Tour of Italy and Switzerland, 2008.

Member of the Wasatch Chorale, 2015-present