

Curriculum Vitae -- Christopher L. Exstrom

University of Nebraska at Kearney
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EDUCATION:

University of Minnesota, Ph.D., 1995, Chemistry (Interdisciplinary: Inorganic/Analytical/Physical)
Illinois Wesleyan University, B.A., 1990, Chemistry (*magna cum laude*, department honors)

PROFESSIONAL EMPLOYMENT:

University of Nebraska at Kearney (UNK), Professor of Chemistry, 2006-present

- Director, Science/Math Education M.S.Ed. Program, 2012-present

University of Nebraska at Kearney (UNK), Associate Professor of Chemistry, 2000-2006

- Chair, Department of Chemistry, 2000-2006

University of Nebraska at Kearney, Assistant Professor of Chemistry, 1996-2000

Kenyon College, Visiting Assistant Professor of Chemistry, 1995-1996

ADDITIONAL APPOINTMENT

Affiliated Faculty, Department of Electrical Engineering, University of Nebraska-Lincoln, 2007-present

AWARDS:

UNK Leland Holdt/Security Mutual Life Insurance Company Distinguished Faculty Award, 2010

UNK Pratt-Heins Award for Excellence in Research and Scholarship, 2006.

UNK Undergraduate Research Faculty Mentor of the Year, Natural Sciences, 2006

TEACHING & UNK HIGHLIGHTS

Have taught 10 different courses in Introductory, General, Analytical, Environmental, Inorganic Chemistry & Senior Seminar

Developed an online, two-semester, inorganic chemistry graduate-course sequence for high school teachers

UNK Chemistry Department has 10 faculty and is ACS-accredited with strong records in teaching and undergraduate research; graduates have been accepted into Ph.D. programs at Cal Tech, Cal-Berkeley, Illinois, Texas A&M, Wisconsin, Minnesota

RESEARCH INTERESTS & HIGHLIGHTS

Interests: Non-vacuum preparation methods of semiconductor and noble metal nanocrystalline materials for solar cell and biomedical sensor electronics applications

PI for over \$2,300,000 in external funding (DOE, NSF, Nebraska Research Initiative Program) since 2002

21 refereed journal and proceedings articles, 4 patents, numerous faculty and student conference presentations

Mentored 56 undergraduate research students since 1996

ADMINISTRATIVE HIGHLIGHTS

UNK Chemistry Department Chair: Created a chemistry research apprentice program for 2nd-semester freshmen (annual participation: 10-12 students); Orchestrated joint Biochemistry/Molecular Biology facilities collaborations for NU system Programs of Excellence funding; Renovation experience – planned space re-design and directing department activities during major renovation

UNK Science/Math Education M.S.Ed. Program Director: Reorganized administrative structure to be a cross-disciplinary program that reports directly to the Dean of Graduate Studies; In the process of orchestrating a national marketing campaign to enhance program growth

SERVICE HIGHLIGHTS

Developed online training curriculum for Keep Nebraska Beautiful and the EPA School Chemical Cleanout Campaign

EPA Cleburn Street Superfund site (Grand Island, NE) maintenance project director (2000-2002, \$229,854 external funding)

UNK Faculty Senator, Chair of Academic Freedom & Tenure committee, Chair of College of Natural & Social Sciences Advisory Committee

University system-wide committees – NU Department Teaching Award selection, NU Innovation, Enhancement &

Development Award selection, Nebraska EPSCoR First Award Grant Pre-proposal evaluation, NU Original Research & Creative Activity Award selection

PROFESSIONAL SOCIETY & CENTER MEMBERSHIPS:

Faculty Associate, Nebraska Center for Materials & Nanoscience, 2007-present

Faculty Associate, Univ. of Nebraska-Lincoln Center for Nanohybrid Functional Materials, 2010-present

Active Memberships: American Chemical Society, Phi Kappa Phi, Materials Research Society, Sigma Xi, IEEE

Scholarly Publications (all articles are in refereed journals – undergraduate co-authors denoted by *)

1. "Spectroscopy and Photophysics of $\text{Rh}_2(\text{dimen})_4^{2+}$ (dimen = 1,8-Diisocyanomenthane). Exceptional Metal-Metal Bond Shortening in the Lowest Electronic Excited States." Miskowski, V. M.; Rice, S. F.; Gray, H. B.; Dallinger, R. F.; Milder, S. J.; Hill, M. G.; Exstrom, C. L.; Mann, K. R. *Inorganic Chemistry*, **1994**, 33, 2799-2807.
2. "Inclusion of Organic Vapors by Crystalline, Solvatochromic $[\text{Pt}(\text{arylisonitrile})_4][\text{Pd}(\text{CN})_4]$ Compounds. 'Vapochromic' Environmental Sensors." Exstrom, C. L.; Sowa, J. R., Jr.; Daws, C. A.; Janzen, D.; Mann, K. R.; Stewart, F. F.; Moore, G. A. *Chemistry of Materials*, **1995**, 7, 15-17.
3. "X-ray Structural Characterization of $\text{Rh}_2(\text{dimen})_4^{2+}$ and $\text{Ir}_2(\text{dimen})_4^{2+}$ (dimen = 1,8-Diisocyno-menthane) Crystals with an Exceptionally Wide Range of Metal-Metal Distances and Dihedral Twist Angles" Exstrom, C. L.; Mann, K. R.; Hill, M. G.; Miskowski, V. M.; Schaefer, W. P.; Gray, H. B.; Lammana, W. H. *Inorganic Chemistry* **1996**, 35, 549-550.
4. "'Vapochromic' Compounds as Environmental Sensors. 2. Synthetis, Near-Infrared and Infrared Spectroscopy Studies of $[\text{Pt}(\text{arylisonitrile})_4][\text{Pt}(\text{CN})_4]$ Upon Exposure to Volatile Organic Compound Vapors" Daws, C. A.; Exstrom, C. L.; Sowa, J. R., Jr.; Mann, K. R. *Chemistry of Materials*, **1997**, 9, 363-368.
5. "A Vapochromic LED" Kunugi, Y.; Mann, K. R.; Miller, L. L.; Exstrom C. L. *Journal of the American Chemical Society*, **1998**, 120, 589-590.
6. "Infrared Spectroscopy Studies of Platinum Salts Containing Tetracyanoplatinate(II). Evidence for Strong Hydrogen-Bonding Interactions in 'Vapochromic' Environmental Sensor Materials" Exstrom, C. L.; Pomije, M. K.; Mann, K. R. *Chemistry of Materials*, **1998**, 10, 942-945.
7. "A Novel Chemistry Camp Format as an Outreach Model for Regional Colleges and Universities" Exstrom, C. L.; Mosher, M. D. *Journal of Chemical Education*, **2000**, 77, 1295-1297.
8. "Optical and Electronic Characterization of a-SiGe:H Thin Films Prepared by a Novel Hollow Cathode Deposition Technique" Soukup, R.J., Ianno, N.J., Darveau, S.A., Exstrom, C.L., *Materials Research Society Symposium Proceedings*, **2004**, 808, A9.4.1.
9. "Thin Films of a-SiGe:H With Device Quality Properties Prepared By a Novel Hollow Cathode Deposition Technique" Soukup, R.J., Ianno, N.J., Darveau, S.A., Exstrom, C.L., *Solar Energy Materials and Solar Cells*, **2005**, 87, 87-98.
10. "Thin Films of GeC Deposited Using a Unique Hollow Cathode Sputtering Technique" R.J. Soukup, N.J. Ianno, J.S. Schrader, C.L. Exstrom, S.A. Darveau, R.N. Udey, V.L. Dalal, *Solar Energy Materials and Solar Cells*, **2006**, 90, 2338-2345.
11. "Copper-Indium-Boron-Diselenide Absorber Materials" Ianno, N.J., Soukup, R.J., Santero, T., Kamler, C., Huguenin-Love, J., Darveau, S.A., Olejníček, J., Exstrom, C.L., *Materials Research Society Symposium Proceedings*, **2007**, 1012, Y03-21.
12. "Thin Films Formed by Selenization of $\text{CuIn}_x\text{B}_{1-x}$ Precursors in Se Vapor" Kamler, C.; Soukup, R.J.; Ianno, N. J.; Huguenin-Love, J.; Olejníček, J.; Darveau, S.A.; Exstrom, C.L., *Solar Energy Materials and Solar Cells*, **2009**, 93, 45-50.
13. "Problems with Synthesis of Chalcopyrite $\text{CuIn}_{1-x}\text{B}_x\text{Se}_2$ " Olejníček, J.; Darveau, S.A.; Exstrom, C.L.; Soukup, R.J.; Ianno, N.J.; Kamler, C.A.; Huguenin-Love, J.L., *Materials Science Forum*, **2009**, 609, 33-36.
14. "Solvothermal Preparation, Processing, and Characterization of Nanocrystalline $\text{CuIn}_{1-x}\text{Al}_x\text{Se}_2$ Materials" Exstrom, C.L.; Olejníček, J.; Darveau, S.A.; Mirasano, A.*; Paprocki, D.S.*; Schliefert, M.L.*; Ingersoll, M.A.*; Slaymaker, L.E.*; Soukup, R.J.; Ianno, N.J.; Kamler, C.A., *Materials Research Society Symposium Proceedings*, **2009**, 1165, M05-03.

15. "A Non-vacuum Process for Preparing Nanocrystalline $\text{CuIn}_{1-x}\text{Ga}_x\text{Se}_2$ Materials Involving an Open-air Solvothermal Reaction" Olejníček, J.; Kamler, C.A.; Mirasano, A.*; Martinez-Skinner, A.*; Ingersoll, M.*; Exstrom, C.L.; Darveau, S.A.; Huguenin-Love, J.; Diaz, M.; Ianno, N.J.; Soukup, R.J. *Solar Energy Materials and Solar Cells*, **2010**, *94*, 8-11.
16. "Formation of $\text{CuIn}_{1-x}\text{Al}_x\text{Se}_2$ Thin Films Studied by Raman Scattering," Olejníček, J.; Kamler, C.A.; Darveau, S.A.; Exstrom, C.L.; Slaymaker, L.E.*; Vandeventer, A.R.*; Ianno, N.J.; Soukup, R.J. *Thin Solid Films*, **2011**, *519*, 5329-5334.
17. "Properties of $\text{CuIn}_{1-x}\text{Ga}_x\text{Se}_2$ Films Prepared by the Rapid Thermal Annealing of Spray-deposited $\text{CuIn}_{1-x}\text{Ga}_x\text{S}_2$ and Se," Slaymaker, L.E.*; Hoffman, N.M.*; Ingersoll, M.A.*; Jensen, M.R.*; Olejníček, J.; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; Sarkar, A.; Kment, Š., *Materials Research Society Symposium Proceedings*, **2011**, *1324*, DOI: 10.1557/opl.2011.1152.
18. "Thermoelectric Properties of p-type CuInSe_2 Chalcopyrites Enhanced by Introduction of Manganese," Yao, J.; Takas, N.J.; Schliefer, M.L.*; Paprocki, D.S.*; Blanchard, P.E.R.; Mar, A.; Exstrom, C.L.; Darveau, S.A.; Poudeu, P.F.P.; Aitken, J.A., *Physical Review B*, **2011**, *84*, 075203.
19. " $\text{CuIn}_{1-x}\text{Al}_x\text{S}_2$ Thin Films Prepared by Sulfurization of Metallic Precursors," Olejníček, J.; Slaymaker, L.E.*; Darveau, S.A.; Exstrom, C.L.; Kment, Š.; Prabukanthan, P.; Ianno, N.J.; Soukup, R.J. *Journal of Alloys and Compounds*, **2011**, *509*, 10020-10024.
20. "Air Stable, Photosensitive, Phase Pure Iron Pyrite Nanocrystal Thin Films for Photovoltaic Application," Bu, Y.; Yuan, Y.; Exstrom, C.L.; Darveau, S.A.; Huang, J., *Nano Letters*, **2011**, *11*, 4953-4957.
21. "M-M Bond-Stretching Energy Landscapes for $\text{M}_2(\text{dimen})_4^{2+}$ (M = Rh, Ir; dimen = 1.8-dissocyanomethane) Complexes," Hunter, B.M.; Villahermosa, R.M.; Exstrom, C.L.; Hill, M.G.; Mann, K.R.; Gray, H.B., *Inorganic Chemistry*, **2012**, *51*, 6898-6905.
22. "Zinc Alloyed Iron Pyrite Nanocrystals for Band Gap Broadening," Mao, B.; Dong, Q.; Xiao, Z.; Exstrom, C.L.; Darveau, S.A.; Webber, T.E.*; Lund, B.D.*; Huang, H.; Kang, Z.; Huang, J., *Journal of Materials Chemistry A*, **2013**, in press, available online, DOI: 10.1039/C3TA11039G.
23. "Preparation of CIGS Thin Films by HiPIMS or DC Sputtering and Various Selenization Processes," Olejníček, J.; Hubička, Z.; Kšířová, P.; Kment, Š.; Brunclíková, M.; Kohout, M.; Čada, M.; Darveau, S.A.; Exstrom, C.L., *Journal of Advanced Oxidation Technologies*, **2013**, *16*, 314-319.
24. "Surface Thermal Stability of Iron Pyrite Nanocrystals: Role of Capping Ligands," Mao, B.; Dong, Q.; Exstrom, C.L.; Huang, J., *Nanoscale*, submitted for publication.

Patents

1. U.S. Patent No. 5,766,952 "Vapochromic Platinum-Complexes and Salts" Mann, K. R.; Daws, C. A.; Exstrom, C. L.; Janzen, D. E.; Pomije, M. K, 1998.
2. U.S. Patent No. 6,160,267 "A Vapochromic LED" Kunugi, Y.; Mann, K. R.; Miller, L. L.; Exstrom C. L., 2000.
3. U.S. Patent No. 6,338,977 "A Vapochromic LED" Kunugi, Y.; Mann, K. R.; Miller, L. L.; Exstrom C. L., 2002.
4. U.S. Patent No. 6,578,406 "A Vapochromic LED" Kunugi, Y.; Mann, K. R.; Miller, L. L.; Exstrom C. L., 2003.
5. U.S. Provisional Patent, "Facile Preparation of Nanocrystalline Multinary Chalcopyrite Materials," Exstrom, C.L.; Darveau, S.A., filed October 2009.
6. U.S. Patent Application No. 2013/0119346, "Synthesis of Air-stable Pyrite Nanocrystals for Photovoltaic Application," Huang, J.; Mao, B.; Exstrom, C.L., filed November 2012.

Scholarly and Invited Presentations (undergraduate co-authors denoted by *)

1. "The Chemistry and Spectroscopy of Some Proposed Environmental Sensor Materials" Exstrom, C. L.; Lee, D.* J.; Johnson, D.* *Proceedings of the UN System Undergraduate Research in Chemistry Symposium*, Kearney, NE, October 18, 1996.
2. "Substituent Effects on the Degree of Solvatochromism of Charge-Transfer-to-Diimine Complexes" Exstrom, C. L.; Johansen, A. N.* *32nd Midwest Regional Meeting of the American Chemical Society*, Osage Beach, MO, October 30, 1997.
3. "Chemistry of Novel Indicator Compounds", *UNK Research & Creative Activity Symposium*, March 9, 1998.
4. "Interligand Charge-Transfer Solvatochromism", invited seminar, Department of Chemistry, University of South Dakota, Vermillion, SD, September 29, 1998.
5. "Preparation and Properties of Novel Binuclear Palladium(II) Complexes and Bridging Ligand Effects on Charge-Transfer Solvatochromism" Exstrom, C. L.; Garnett, K. A.*; Fagot, B. L.*; Sinani, D.* *33rd Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, November 5, 1998.
6. "Development of a Summer High School Chemistry Camp as an Outreach Model for College and Universities" Exstrom, C. L.; Mosher, M. D. *35th Midwest Regional Meeting of the American Chemical Society*, St. Louis, MO, October 27, 2000.
7. "Calibrated Peer Review in the Chemistry Laboratory" Mosher, M. D.; Exstrom, C. L.; Clark, R. D. *35th Midwest Regional Meeting of the American Chemical Society*, October 27, 2000.
8. "Applications of Preferential Solvation Concepts in Multiple Undergraduate Chemistry Courses" Exstrom, C. L. *36th Midwest Regional Meeting of the American Chemical Society*, Lincoln, NE, October 12, 2001.
9. "Study of the Preferential Solvation of Transition Metal Complexes by ^1H NMR" Mosher, M. D.; Haeberle, A. J.*; Exstrom, C. L. *37th Midwest Regional Meeting of the American Chemical Society*, Lawrence, KS, October, 2002.
10. "Spectroscopic and Ellipsometric Characterization of Amorphous Silicon Germanium Hydride Thin Films Prepared by a Novel Hollow-Cathode Method" Darveau, S.A.; Exstrom, C.L.; Soukup, R.J.; Ianno, N.J.; Okuno, K.*; Ota, N.*; Laue, C.*; Fitch, A.*; Puppala, N.S.P.; Ramakrishnan, V.; Shicheng, D.H. *38th Midwest Regional Meeting of the American Chemical Society*, Columbia, MO, November, 2003.
11. "MLCT Solvatochromism of Molybdenum-Diimine-Tetracarbonyl Complexes as a Probe for Solvent-Solvent Interactions in Solution Mixtures" Exstrom, C.L.; Smith, J.R.*; Okuno, K.* *38th Midwest Regional Meeting of the American Chemical Society*, Columbia, MO, November, 2003.
12. "Uncovered Vapochromic Properties of Common $\text{Fe}(\text{diimine})_2(\text{CN})_2$ Complexes" Exstrom, C.L.; Garretson, C.A.*; Miller, B.D.* *37th Great Lakes Regional Meeting of the American Chemical Society*, Milwaukee, WI, May 31-June 2, 2006.
13. "Fabrication and Characterization of New Photovoltaic Materials: CuBSe_2 (CBS) and $\text{CuIn}_x\text{B}_{1-x}\text{Se}_2$ (CIBS)" Darveau, S.A.; Olejnicek, J.; Exstrom, C.L.; Ianno, N.J.; Santero, T.; Soukup, R.J. *233rd National Meeting of the American Chemical Society*, Chicago, IL, March 26, 2007.
14. "Chemical Bath Deposition of Bismuth Oxychloride. An Experimental Introduction to Thin-Film Materials at the Undergraduate and High-School Levels" Exstrom, C.L.; Lahners, J. *233rd National Meeting of the American Chemical Society*, Chicago, IL, March 29, 2007.
15. " $\text{CuI}_x\text{B}_{1-x}\text{Se}_2$ Absorber Materials" Ianno, N.J.; Santero, T.; Soukup, R.J.; Exstrom, C.L.; Olejnicek, J.; Darveau, S.A. *Materials Research Society Symposium*, San Francisco, CA, April 9-13, 2007.
16. "Variation in the Indium-Gallium Stoichiometry in the Solvothermal Preparation of $\text{CuIn}_{1-x}\text{Ga}_x\text{Se}_2$ Nanocrystalline Materials" Martinez-Skinner, A.L.*; Ingersoll, M.A.*; Olejnicek, J.; Mirasano, A.*; Haussler, A.T.*; Exstrom, C.L.; Darveau, S.A.; Huguenin-Love, J.; Kamler, C.; Ianno, N.J.; Soukup, R.J. *42nd Midwest Regional Meeting of the American Chemical Society*, Kansas City, MO, November 7-9, 2007.

17. "Reaction Pathway Insights into the Solvothermal Preparation of $\text{CuIn}_{1-x}\text{Ga}_x\text{Se}_2$ Nanocrystalline Materials" Exstrom, C.L.; Darveau, S.A.; Martinez-Skinner, A.L.*; Ingersoll, M.A.*; Olejníček, J.; Mirasano, A.*; Haussler, A.T.*; Huguenin-Love, J.; Kamler, C.; Diaz, M.; Ianno, N.J.; Soukup, R.J. *33rd IEEE Photovoltaics Specialists Conference*, San Diego, CA, May 11-16, 2008.
18. "Incorporation of Aluminum and Boron into CuInSe_2 Chalcopyrite Structures: Preparation and Characterization of the First nanocrystalline $\text{CuIn}_{1-x}\text{M}_x\text{Se}_2$ (M = Al, B) Materials" Exstrom, C.L.; Darveau, S.A.; Olejníček, J.; Schliefert, M.L.*; Paprocki, D.S.*; Vandeventer, A.R.*; Mirasano, A.*; Soukup, R.J.; Ianno, N.J.; Kamler, C.A. *43rd Midwest Regional Meeting of the American Chemical Society*, Kearney, NE, October 10, 2008.
19. "Solvothermal Preparation, Processing, and Characterization of Nanocrystalline $\text{CuIn}_{1-x}\text{Al}_x\text{Se}_2$ Materials" Exstrom, C.L.; Olejníček, J.; Darveau, S.A.; Mirasano, A.*; Paprocki, D.S.*; Schliefert, M.L.*; Ingersoll, M.A.*; Slaymaker, L.E.*; Soukup, R.J.; Ianno, N.J.; Kamler, C.A. *Materials Research Society Symposium*, San Francisco, CA, April 13-17, 2009.
20. "Raman Spectroscopy Studies of $\text{CuIn}_{1-x}\text{Al}_x\text{Se}_2$ Thin Film Growth" Olejníček, J.; Exstrom, C.L.; Darveau, S.A.; Vandeventer, A.R.*; Slaymaker, L.E.*; Ianno, N.J.; Soukup, R.J. *238th National Meeting of the American Chemical Society*, Washington, DC, August 16-20, 2009.
21. "Low-temperature Aqueous Solution-based Routes for the Preparation of Chalcopyrite Solar Cell Absorber Materials," Exstrom, C.L.; Darveau, S.A.; Ingersoll, M.A.*; Jensen, M.R.*; Cook, C.*; Slaymaker, L.E.*; Vandeventer, A.R.*; Soukup, R.J.; Ianno, N.J. *44th Midwest Regional Meeting of the American Chemical Society*, Iowa City, IA, October 23, 2009.
22. "Room Temperature Non-vacuum Preparation of Nanocrystalline CuInSe_2 Employing Aqueous Solvents," Exstrom, C.L.; Darveau, S.A.; Ingersoll, M.A.*; Jensen, M.R.*; Cook, C.*; Slaymaker, L.E.*; Soukup, R.J.; Ianno, N.J., *35th IEEE Photovoltaics Specialists Conference*, Honolulu, HI, June 20-25, 2010.
23. "Solvothermal Preparation of Nanocrystalline Pyrite FeS_2 and its Outlook as a Third-generation Solar Cell Absorber Material," Exstrom, C.L.; Darveau, S.A.; Webber, T.E.*; Neville, C.; Slaymaker, L.E.*; Olejníček, J.; Huang, J.; Bi, Y.; Soukup, R.J.; Ianno, N.J.; Amitabha, S., *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 28, 2010.
24. "Solvothermal Preparation of Nanocrystalline SnS_2 via Hot-Injection and Thermal Decomposition Methods," Exstrom, C.L.; Darveau, S.A.; Webber, T.E.*; Jensen, M.R.*; Ingersoll, M.A.*; Neville, C.; Soukup, R.J.; Ianno, N.J.; Amitabha, S., *242nd National Meeting of the American Chemical Society*, Denver, CO, August 28-29, 2011.
25. "Earth-Abundant Sulfides as Nanocrystal-based Solar Cell Materials," invited seminar, Duquesne University, Pittsburgh, PA, March 30, 2012.

Student and co-Authored Presentations (undergraduate authors denoted by *)

1. "Reactions of PdCl_2 with Dipyritydyltetrzine Ligands" Lee, D. J. *; Exstrom, C. L. *Argonne Symposium of Undergraduate Research*, Argonne, IL, Spring, 1997
2. "Preparation and Acid-Base Chemistry of Novel Acridine-Containing Polymers." Polk, M. A. *; Exstrom, C. L.; Major, J. S. *; Mosher, M. D. *32nd Midwest Regional Meeting of the American Chemical Society*, Osage Beach, MO, October 30, 1997.
3. "Synthesis and Properties of Nickel Charge-Transfer-to-Diimine Complexes" Fagot, B. L. *; Exstrom, C. L. *UNK Research & Creative Activity Symposium*, March 9, 1998.
4. "Acid-Base Chemistry of Acridine Derivatives" Polk, M. A. *; Exstrom, C. L. *UNK Research & Creative Activity Symposium*, March 10, 1998.
5. "Chemistry of Copper Charge-Transfer-to-Diimine Complexes" Sinani, D. *; Exstrom, C. L. *UNK Research & Creative Activity Symposium*, March 10, 1998.

6. "Preparation and Spectroscopic Properties of Novel Diimine Nickel(II) Catecholate Complexes." Fagot, B. L.*; Exstrom, C. L. *33rd Midwest Regional American Chemical Society*, Wichita, KS, November 5, 1998.
7. "Diimine Structural Effects on the Spectroscopic Properties of Copper(II) Diimine Catecholate Complexes." Sinani, D.*; Exstrom, C. L. *33rd Midwest Regional American Chemical Society*, Wichita, KS, November 5, 1998.
8. "Acid-Base Chemistry of Novel Nitrophenylhydrazine Derivatives." Polk, M. A.*; Bolling, S. M.*; Exstrom, C. L. *33rd Midwest Regional American Chemical Society*, Wichita, KS, November 5, 1998.
9. "Pi-donor Substituent Effects on the Solvatochromic Shifts of Palladium(II) Charge-Transfer-to-Diimine Complexes." Holmes, K. L.*; Weber, G. A.*; Exstrom, C. L. *33rd Midwest Regional American Chemical Society*, Wichita, KS, November 5, 1998.
10. "Preparation and Solution Properties of Nickel Complexion Pairs" Fagot, B. L.*; Exstrom, C. L. *14th National Conference on Undergraduate Research*, Missoula, MT, April 28, 2000.
11. "Diimine Substituent Effects on the Solvatochromic Shifts of Palladium(II) Charge-Transfer-to-Diimine Complexes" Weber, G. A.*; Holmes, K. L.*; Exstrom, C. L. *14th National Conference on Undergraduate Research*, Missoula, MT, April 28, 2000.
12. "Preparation And Solvation Studies On Cadmium(II) Diimine Catecholate And Dithiolate Complexes", Exstrom, C. L.; Leonard, B.* *36th Midwest Regional Meeting of the American Chemical Society*, Lincoln, NE, October 12, 2001.
13. "Tunability of Charge-Transfer Energies in Cadmium Complexes", Exstrom, C. L.; Leonard, B.* *17th National Conference on Undergraduate Research*, Salt Lake City, UT, March 15, 2003.
14. "Analyses of Iron Content in the Platte River Water Using Ultraviolet-Visible Spectroscopy and Atomic Absorption", Exstrom, C. L.; Darville, L.* *17th National Conference on Undergraduate Research*, Salt Lake City, UT, March 15, 2003.
15. "Optical and Electronic Characterization of a-SiGe:H Thin Films Prepared by a Novel Hollow Cathode Deposition Technique" Soukup, R.J., Ianno, N.J., Darveau, S.A., Exstrom, C.L., *Materials Research Society Symposium*, San Francisco, CA, April 13-16, 2004.
16. "Solid-State Phase Properties of Thin-Film GeC Fabricated by a Novel Hollow-Cathode Plasma-Jet Deposition Method", Udey, R.N.*; Exstrom, C. L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J. *19th National Conference on Undergraduate Research*, Lexington, KY, April 22, 2005.
17. "Synthesis and Characterization of Novel Binuclear Molybdenum-diimine-diphosphine Complexes. The First Step Toward Solvatochromic "Molecular Grid" Materials", Larson, P.T.*; Exstrom, C.L. *40th Midwest Regional Meeting of the American Chemical Society*, Joplin, MO, October 27, 2005, and the *20th National Conference on Undergraduate Research*, Asheville, NC, April 6, 2006.
18. "Preparation, Characterization, and Vapochromic Properties of the novel Fe(4,4'-di-t-butyl-2,2'-bipyridine)₂(CN)₂ Complex", Garretson, C.A.*; Miller, B.D.*; Exstrom, C.L. *40th Midwest Regional Meeting of the American Chemical Society*, Joplin, MO, October 27, 2005.
19. "Evidence of Novel Water-Soluble Mo(diimine)(CO)₄ Complexes", Martinez-Skinner, A.L.*; Exstrom, C.L. *40th Midwest Regional Meeting of the American Chemical Society*, Joplin, MO, October 27, 2005.
20. "Characterization of Thin-Film GeC Fabricated by a Hollow-Cathode Plasma-Jet Deposition Method", Udey, R.N.*; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; *40th Midwest Regional Meeting of the American Chemical Society*, Joplin, MO, October 27, 2005, and the *20th National Conference on Undergraduate Research*, Asheville, NC, April 6, 2006.
21. "Chemistry of Mo(diimine)(CO)₄ with Isocyanides and Diisocyanides: Evidence of Binuclear Complex Formation and Effects on MLCT Solvatochromism", Miller, B.D.*; Exstrom, C.L. *21st National Conference on Undergraduate Research*, San Rafael, CA, April 12-14, 2007.

22. "Ionic Strength and Counterion Effects on the Solvothermal Preparation of CuInSe₂ Nanocrystalline Materials", Martinez-Skinner, A.L.*; Ingersoll, M.A.*; Darveau, S.A.; Exstrom, C.L. *42nd Midwest Regional Meeting of the American Chemical Society*, Kansas City, MO, November 7-9, 2007.
23. "Solid-state Intermediates in the Solvothermal Preparation of CuInSe₂ Nanocrystalline Materials", Ingersoll, M.A.*; Martinez-Skinner, A.L.*; Darveau, S.A.; Exstrom, C.L. *42nd Midwest Regional Meeting of the American Chemical Society*, Kansas City, MO, November 7-9, 2007.
24. "Effects of Annealing on CuIn_{1-x}Ga_xSe₂ Nanocrystalline Materials Prepared by Solvothermal Means", Mirasano, A.*; Darveau, S.A.; Exstrom, C.L. *22nd National Conference on Undergraduate Research*, Salisbury, MD, April 2008.
25. "Problems with Synthesis of Chalcopyrite CuIn_{1-x}B_xSe₂", Olejníček, J.; Darveau, S.A.; Exstrom, C.L.; Soukup, R.J.; Ianno, N.J.; Kamler, C.A.; Huguenin-Love, J.L., *First International Conference on Thin Films and Porous Materials*, Algiers, Algeria, May 19-22, 2008.
26. "A Non-vacuum Process for Preparing Nanocrystalline CuIn_{1-x}Ga_xSe₂ Materials Involving an Open-air Solvothermal Reaction" Olejnicek, J., Kamler, C.A., Mirasano, A.*, Martinez-Skinner, A.*, Ingersoll, M.*, Exstrom, C.L., Darveau, S.A., Huguenin-Love, J., Diaz, M., Ianno, N.J., Soukup, R.J., *XVII International Materials Research Congress*, Cancun, Mexico, August 2008.
27. "Investigation of Non-vacuum Annealing Process Applied on Cu(In,Ga)Se₂, Cu(In,Al)Se₂, and Cu(In,B)Se₂ Nanocrystals Prepared by Solvothermal Reaction", Olejníček, J.; Darveau, S.A.; Exstrom, C.L.; Mirasano, A.*; Schliefert, M.L.*; Vandeventer, A.R.*; Paprocki, D.S.*; Soukup, R.J.; Ianno, N.J.; Kamler, C.A. *43rd Midwest Regional Meeting of the American Chemical Society*, Kearney, NE, October 8-10, 2008.
28. "Preparation and Characterization of Mixed Indium-Gallium-Selenium Nanocrystalline Materials", Mirasano, A.*; Olejnicek, J.; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; Kamler, C.A. *43rd Midwest Regional Meeting of the American Chemical Society*, Kearney, NE, October 8-10, 2008, and *23rd National Conference on Undergraduate Research*, LaCrosse, WI, April 2009.
29. "Reaction Pathway Investigations of the Solvothermal Preparation of Nanocrystalline CuInSe₂ in Chelating Amine Solvents: Effects of Added Salts and Solvent Coordinating Ability", Paprocki, D.S.*; Martinez-Skinner, A.L.*; Ingersoll, M.A.*; Olejnicek, J.; Vandeventer, A.R.*; Mirasano, A.*; Haussler, A.T.*; Exstrom, C.L.; Darveau, S.A.; Huguenin-Love, J.L.; Kamler, C.A.; Diaz, M.; Ianno, N.J.; Soukup, R.J. *43rd Midwest Regional Meeting of the American Chemical Society*, Kearney, NE, October 8-10, 2008.
30. "Use of Surfactant-based Solvents in the Preparation of Nanocrystalline CuIn_{1-x}M_xSe₂ (M = Ga, Al, B) Materials", Schliefert, M.L.*; Vandeventer, A.R.*; Mirasano, A.*; Paprocki, D.S.*; Olejnicek, J.; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; Kamler, C.A. *43rd Midwest Regional Meeting of the American Chemical Society*, Kearney, NE, October 8-10, 2008.
31. "Use of Stearate Complexes as Metal Sources in the Preparation of Nanocrystalline CuIn_{1-x}M_xSe₂ (M = Ga, B) Materials", Vandeventer, A.R.*; Exstrom, C.L.; Darveau, S.A. *43rd Midwest Regional Meeting of the American Chemical Society*, Kearney, NE, October 8-10, 2008.
32. "Self-organized Nanostructures of Vapor-phase Grown CuGaS₂ Thin Films", P. Prabukanthan, G. Harichandran, R.J. Soukup, N.J. Ianno, C.L. Exstrom, S.A. Darveau, J. Olejníček, *34th IEEE Photovoltaics Specialists Conference*, Philadelphia, PA, June 8-11, 2009.
33. "Formation of CuIn_{1-x}Al_xSe₂ Thin Films Studied by Raman Scattering", J. Olejníček, C.A. Kamler, C.L. Exstrom, S.A. Darveau, N.J. Ianno, R.J. Soukup, *216th Meeting of the Electrochemical Society*, Vienna, Austria, October 4-9, 2009.
34. "Thin Films of CuIn_xB_{1-x}Se₂ as Absorbers for CIBS Solar Cells", R. J. Soukup, N. J. Ianno, C. A. Kamler, J. Olejníček, S. A. Darveau, and C. L. Exstrom, *216th Meeting of the Electrochemical Society*, Vienna, Austria, October 4-9, 2009.
35. "Preparation and Studies of Nanocrystalline CuInSe₂ Materials Prepared from Aqueous Solution at Room Temperature," Ingersoll, M.A.*; Jensen, M.R.*; Cook, C.*; Slaymaker, L.E.*; Vandeventer, A.R.*; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J., *44th Midwest Regional Meeting of the American Chemical Society*, Iowa City, IA, October 21-23, 2009.

36. "Effects of Complexing Agents on the Aqueous Solution-based Preparation of Nanocrystalline CuInSe₂ and CuInS₂ Materials," Jensen, M.R.*; Ingersoll, M.A.*; Cook, C.*; Slaymaker, L.E.*; Vandeventer, A.R.*; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J., *44th Midwest Regional Meeting of the American Chemical Society*, Iowa City, IA, October 21-23, 2009.
37. "Structural Properties of Poly(vinyl alcohol)-capped Selenium Nanoparticles Prepared from Aqueous Solution," Vandeventer, A.R.*; Slaymaker, L.E.*; Exstrom, C.L.; Darveau, S.A., *44th Midwest Regional Meeting of the American Chemical Society*, Iowa City, IA, October 21-23, 2009.
38. "Effects of Argon Atmosphere on the Selenization of CuIn_{1-x}Al_x and CuIn_{1-x}B_x Thin Films," Slaymaker, L.E.*; Vandeventer, A.R.*; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J., *44th Midwest Regional Meeting of the American Chemical Society*, Iowa City, IA, October 21-23, 2009.
39. "Use of Sodium Thiosulfate in the Water Solution-based Preparation of Copper Indium Disulfide," Cook, C.*; Ingersoll, M.A.*; Jensen, M.R.*; Slaymaker, L.E.*; Vandeventer, A.R.*; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J., *44th Midwest Regional Meeting of the American Chemical Society*, Iowa City, IA, October 21-23, 2009.
40. "A Novel Method for Synthesis of SnS and SnS₂ Thin Films as Potential Heterjunction Partners for FeS₂ Solar Cells," Sarkar, A.; Soukup, R.J.; Ianno, N.J.; Kamler, C.A.; Exstrom, C.L.; Darveau, S.A.; Olejníček, J., *35th IEEE Photovoltaics Specialists Conference*, Honolulu, HI, June 20-25, 2010.
41. "Raman Spectroscopy of Cu(In,Al)S₂ Thin Films Prepared by Sulfurization of Metallic Precursors," Olejníček, J.; Darveau, S.A.; Exstrom, C.L.; Slaymaker, L.E.*; Kment, Š.; Soukup, R.J.; Ianno, N.J., *Nebraska Research & Innovation Conference*, Lincoln, NE, October 5, 2010 and *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 29, 2010.
42. "CuIn_xGa_(1-x)Se₂ Films Prepared by Rapid Thermal Annealing of Layered Nanocrystalline CuIn_xGa_(1-x)S₂ and Se," Slaymaker, L.E.*; Hoffman, N.M.*; Ingersoll, M.A.*; Jensen, M.R.*; Olejníček, J.; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; Amitabha, S., *Nebraska Research & Innovation Conference*, Lincoln, NE, October 5, 2010 and *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 29, 2010.
43. "Solvothermal Reaction of Copper and Indium Salts with Sulfur/selenium Mixtures in Oleylamine," Ingersoll, M.A.*; Jensen, M.R.*; Slaymaker, L.E.*; Olejníček, J.; Darveau, S.A.; Exstrom, C.L., *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 29, 2010.
44. "Investigation of an Aqueous-based Solution Method for Preparing CuInSe₂ using KBH₄ as a Selenium Reducing Agent," Jensen, M.R.*; Hervert, B.A.*; Darveau, S.A.; Exstrom, C.L., *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 29, 2010.
45. "Chemical Deposition of Microcrystalline Se Films from Commercial Se Powder in Ethylenediamine Solvent Mixtures," Hoffman, N.M.*; Slaymaker, L.E.*; Olejníček, J.; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; Amitabha, S., *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 29, 2010.
46. "Solvothermal Reaction Studies of FeS₂ and SnS₂ Nanoparticle Formation," Webber, T.E.*; Neville, C.; Slaymaker, L.E.*; Olejníček, J.; Darveau, S.A.; Exstrom, C.L.; Soukup, R.J.; Ianno, N.J.; Amitabha, S., *45th Midwest Regional Meeting of the American Chemical Society*, Wichita, KS, October 29, 2010.
47. "Properties of CuIn_{1-x}Ga_xSe₂ Films Prepared by the Rapid Thermal Annealing of Spray-deposited CuIn_{1-x}Ga_xS₂ and Se," Slaymaker, L.E.*; Neville, C.; Hoffman, N.M.*; Ingersoll, M.A.*; Jensen, M.R.*; Olejníček, J.; Exstrom, C.L.; Darveau, S.A.; Soukup, R.J.; Ianno, N.J.; Amitabha, S.; Kment, Š., *Materials Research Society Symposium*, San Francisco, CA, April 25-29, 2011.
48. "Raman spectroscopy of Cu(In,Al)S₂ thin films prepared by sulfurization of metallic precursors," Olejníček, J.; Darveau, S.A.; Exstrom, C.L.; Slaymaker, L.E.*; Kment, Š.; Soukup, R.J.; Ianno, N.J., *Materials Research Society Symposium*, San Francisco, CA, April 25-29, 2011.
49. "A Novel Sol-Gel Route to Pinhole-Free Iron Sulfide Thin Films," Kment, Š.; Kmentova, H.; Sarkar, A.; Soukup, R.J.; Ianno, N.J.; Krysa, J.; Hubicka, Z.; Olejníček, J.; Exstrom, C.L.; Darveau, S.A., *37th IEEE Photovoltaics Specialists Conference*, Seattle, WA, June 19-24, 2011.

50. "Preparation of Gold Nanoparticles via Oxalate Reduction of HAuCl_4 Without the Presence of Polymeric Stabilizing Agents," Lipps, K.M.*; Lueck, B.A.*; Svatora, R.L.*; Exstrom, C.L.; Darveau, S.A., *47th Midwest Regional Meeting of the American Chemical Society*, Omaha, NE, October 24-26, 2012.
51. "Studies of Iron Depletion in the Solvothermal Preparation of Nanocrystalline Pyrite FeS_2 in Oleylamine," Webber, T.E.*; Exstrom, C.L.; Darveau, S.A., *47th Midwest Regional Meeting of the American Chemical Society*, Omaha, NE, October 24-26, 2012.
52. "Effects of Aminopropyltrimethoxysilane on Gold Nanoparticle Aggregation and Binding to Crystalline and Glass Substrates," Svatora, R.L.*; Exstrom, C.L.; Darveau, S.A., *47th Midwest Regional Meeting of the American Chemical Society*, Omaha, NE, October 24-26, 2012.
53. "Effects of pH in the Synthesis of Branched Gold Nanoparticles in Water/Methanol Solutions," Lueck, B.A.*; Exstrom, C.L.; Darveau, S.A., *47th Midwest Regional Meeting of the American Chemical Society*, Omaha, NE, October 24-26, 2012.

GRANTS and CONTRACTS FUNDED -- grants listed in bold are currently active:

1. Principal Investigator for "Synthesis and Physical Studies of Novel Organometallic Complexes that are Potential Environmental Sensors for the Detection of Hazardous Organic Vapors in the Environment", \$2000, UNK Research Services Council (internal), 1996-1997
2. Principal Investigator for "Acid-Base Sensors: Preparation and Chemistry of 'Reusable pH Test Strips'", \$3990, UNK Research Services Council (internal), 1998
3. Principal Investigator for "Effects of Molecular Modifications on the Degree of Charge-Transfer-to-Diimine Solvatochromism in Square-Planar Complexes", \$24,838, Petroleum Research Fund (type B), 1998-2000.
4. Principal Investigator for "Molecular Modification Effects on Charge-Transfer-to-Diimine Solvatochromic Shifts", \$23,303, Research Corporation, 1998-2000.
5. Project Director for "Summer Program to Enhance Rural High School Student Awareness of the Chemical Sciences", \$19,949, Camille and Henry Dreyfus Foundation (Special Grants Program), 1999-2000.
6. Co-PI for "Implementation of a Writing-Intensive Chemistry Laboratory Curriculum", \$128,957, National Science Foundation (CCLI Adapt & Adopt), 1999-2001.
7. Project Director for "Soil-Vapor and Groundwater Monitoring at the EPA Cleburn Street Superfund Site", \$229,854, Nebraska Department of Environmental Quality, 2000-2002.
8. Project Director for "A Multicampus Renewable Energy Laboratory of Excellence", \$303,255, Nebraska Research Initiative program, 2002-2006.
9. Principal Investigator for "Preparation of Color-Changing "Molecular Square" Materials using Amino Acids as Linkers", \$3483, UNK Research Services Council (internal), Summer 2005.
10. Principal Investigator for "CIBS Solar Cell Development", \$770,000, U.S. Department of Energy, 2006-2008.
11. Institutional Project Director for "A New Wide Bandgap Material for Semiconductor Solar Cell Materials", \$132,000, University of Nebraska-Lincoln (Nebraska Research Initiative Program), 2006-2010
12. Institutional co-PI for "Satellite Contaminant Materials Program", \$134,523, University of Nebraska-Lincoln (NASA), 2008-2011.
13. Principal Investigator for "CIBS Solar Cell Development", \$936,000, U.S. Department of Energy, 2008-2011.
14. Institutional co-PI for "New Science and Engineering of Carbon-Based Low-Dimensional Nanoelectronics", \$50,000, University of Nebraska-Lincoln (Nebraska Research Initiative Program), 2009-2010.

15. Institutional PI for "Low-cost, Non-vacuum Nanomanufacturing of the Absorber Layer of High-efficiency Solar Cells," \$20,600, University of Nebraska-Lincoln (Nebraska Center for Energy Sciences Research), 2010-2011.
16. **Institutional PI for "Center for Nanohybrid Functional Materials," \$312,990, Nebraska EPSCoR (NSF-RII), 2010-2015.**
17. Project Director for "Nanoscale Imaging at the Benchtop: Enhancing Materials Science Research and Education across the Physical and Life Sciences using New Low-Voltage Electron Microscope Technology," \$286,610, Nebraska Research Initiative Program, 2011-2012.
18. **Institutional PI for "Development of High-Efficiency, Low-Cost Thin Film Solar Cells Based on Naturally Abundant and Non-Toxic Materials," \$29,112, University of Nebraska-Lincoln (Nebraska Research Initiative), 2012-2014.**
19. **Principal Investigator for "Acquisition of a benchtop x-ray diffractometer to enhance materials science research across the physical and earth sciences at UNK," \$64,000, Nebraska Research Initiative Program, 2013-2014.**

UNFUNDED AND PENDING GRANT PROPOSALS:

- Principal Investigator for "Studies of Host-Guest Interactions Between Novel Solvatochromic Pt(II) and Pd(II) Macrocyclic Complexes and Volatile Organic Vapor", \$16,814, Research Corporation (**submitted November 15, 1996**)
- Project Director for "Enhancement of Undergraduate Laboratory Instruction and Research in Analytical Chemistry", \$38,700, National Science Foundation (ILI) (**submitted November 15, 1996**)
- Co-PI for "Spectrometric Properties of Polymeric Acridines", \$346,559, EPSCoR (DoD program) (**submitted May 6, 1997**)
- Principal Investigator for "Preparation and Studies of Macrocyclic Sensor Materials that Detect Hazardous Organic Compounds in Water Samples.", \$278,535, EPSCoR (DoD program) (**submitted May 6, 1997**)
- Project Director for "Enhancement of Undergraduate Laboratory Instruction and Research in Solid-State Chemistry", \$55,405, National Science Foundation (ILI) (**submitted November 14, 1997**)
- Co-PI for "Thin Film Semiconductor Materials Manufactured using a Unique Supersonic, Multicathode Plasma-Chemical Reactor with Hollow Cathodes", \$598,299, University of Nebraska (Nebraska Research Initiative) (**submitted December 1, 1997**)
- Co-PI for "Development of a Medicinal Chemistry Initiative in Anticancer and Antiviral Research", \$557,100, University of Nebraska (Nebraska Research Initiative) (**submitted December 1, 1997 -- not funded**)
- Co-PI for "Cost-Effective Solar Cells: A Renewable Energy Program", \$526,334, Nebraska Research Initiative (**submitted December 1, 1999 -- not funded**).
- Project Director for "Undergraduate Curriculum and Service Enhancement by Atomic Spectroscopy", \$26,375, Camille & Henry Dreyfus Foundation (**submitted July 1, 2001 -- not funded**)
- Co-PI for "Electrically Insulating Tribological Coatings", \$482,580, Nebraska Research Initiative (**submitted December 1, 2001 -- not funded**).
- Co-PI for "Light Weight, Mobile Solar Cell Structures", \$594,197, Nebraska DEPSCoR, US Army Research Office (**submitted August, 2002 – not funded**)
- Co-PI for "High Frequency, High Power Heterojunction Devices Based on Silicon Carbide", \$426,771, University of Nebraska (Nebraska Research Initiative) (**submitted December 1, 2003 – not funded**)

- PI for “Reaction Pathway Studies of the Solvothermal Preparation of $\text{CuIn}_{1-x}\text{M}_x\text{Se}_2$ ($\text{M} = \text{Ga}, \text{Al}, \text{B}$) Nanocrystalline Materials”, \$348,839, National Science Foundation (**submitted September 15, 2007 – not funded**)
- Institutional PI for “Exploring Low-bandgap Inorganic Nanocrystals as Donors in Organic/Inorganic Hybrid Solar Cells,” \$223,203, University of Nebraska-Lincoln (NSF-DMR-EPM), 2010-2013. (**submitted October 15, 2009 – not funded**)
- Institutional PI for “Agile Non-Vacuum Photovoltaic Research and Development Center,” \$841,620, Nebraska EPSCoR (DOE), 2010-2013. (**submitted October 15, 2009 – not funded**)
- Institutional PI for “Development of High Efficiency Pyrite Nanocrystal Solar Cells from Phase Pure and Surface Stable Pyrite Nanocrystals,” \$111,147, University of Nebraska-Lincoln (NSF-CBET), 2011-2014 (**submitted March 3, 2011 – not funded; revision for \$87,920 submitted February 15, 2012 – not funded**)
- co-PI for “MRI: Acquisition of a 400-MHz NMR Spectrometer to Enhance Chemistry Research and Education at UNK,” \$339,750, NSF-MRI, 2012-2014. (**submitted January 26, 2012 – not funded**)
- co-PI for “Single-Crystal Optical-Fiber Probes for in vivo Raman Spectroscopy,” \$25,000, University of Nebraska-Lincoln (Nebraska Research Initiative), 2013-2015 (**submitted November 1, 2012 – not funded**)

UNK UNDERGRADUATE RESEARCH STUDENTS MENTORED -- semesters of research activity in parentheses.
Current group members are listed in bold

Student	Research Project
Rupesh Shrestha (96F – 97S)	Preparation and Study of Pd(II) Interligand Charge-transfer Complexes
Andy Johansen (97S)	Spectroscopy of Pd(II) Interligand Charge-transfer Complexes
Matthew Polk (97S – 97U)	Acid-Base Chemistry of Novel Nitrophenylhydrazine Derivatives
Devis Sinani (97S – 99F)	Diimine Structural Effects on the Spectroscopic Properties of Copper(II) Diimine Catecholate Complexes
Ben Fagot (98S - 00S)	Preparation and Solution Properties of Nickel Complexion Pairs
Sara Bolling (98S)	Preparation and Chemistry of Novel Acridine and Pyridine Hydrazones
Kristina Garnett (98S)	Spectroscopy of Organic Anions in Various Solvents
Shane Kohl (98S)	Analysis of Drinking Water for Heavy Metals by Atomic Absorption Spectroscopy. Correlation to Onset of Parkinson’s Disease
Jeff Seier (98S)	Analysis of Drinking Water for Heavy Metals by Atomic Absorption Spectroscopy. Correlation to Onset of Parkinson’s Disease
Kristi Holmes (98F, 99U)	Pi-donor Substituent Effects on the Solvatochromic Shifts of Palladium(II) Charge-Transfer-to-Diimine Complexes
Greg Weber (98F – 99F)	Diimine Substituent Effects on the Solvatochromic Shifts of Palladium(II) Charge-Transfer-to-Diimine Complexes
Tim Slocum (99S - 00S)	Preparation and Study of Pd(II) Salicylate Complexes
Christopher Ferris (00U - 00F)	Preparation of Solvatochromic Werner Complexes
Gina Kissel (00U - 00F)	Preparation and Study of Cadmium Charge-Transfer Complexes
Joshua Skrdla (01S)	Preparation of Novel Fe(II) MLCT Complexes and their Preferential Solvation Properties

Brian Leonard (01F - 03S)	Preparation And Solvation Studies On Cadmium(II) Diimine Catecholate And Dithiolate Complexes
Brent Barta (02S)	Preparation of Novel Fe(II) MLCT Complexes and their Preferential Solvation Properties
Jenny Smith (00U, 03F)	Preparation and Study of Binuclear Pd Charge-Transfer Complexes
Amanda Peterson (02U)	Analysis of Drinking Water for Heavy Metals by Atomic Absorption Spectroscopy. Correlation to Onset of Parkinson's Disease
Lancia Darville (02U - 03S)	Analyses of Iron Content in the Platte River Water Using Ultraviolet-Visible Spectroscopy and Atomic Absorption
Scott Meisenbach (02F)	Method Development for Infrared Analysis of Thin Film Materials
Notabushi Ota (03S – 03U)	Ellipsometric Analysis of SiGe:H Thin Film Materials
Kyoko Okuno (03S – 03U)	Infrared Spectroscopic Analysis of SiGe:H Thin Film Materials
Marc Penny (03S – 03F)	Reflective Spectroscopy Method Development for Thin Film Characterization
Ruth Udey (03S – 05S)	Raman Spectroscopic and Ellipsometric Analysis of SiGe:H and GeC Thin Films Materials
Tiffany Feldman (04U – 04F)	Spin Coating Thin Film Materials of Charge-Transfer Complexes
Preston Larson (04F – 08S)	Preparation of Novel Solvatochromic “Molecular Grid” Materials
Andrea Martinez-Skinner (04F – 08S)	Preparation and Characterization of Novel Water-Soluble Mo(diimine)(CO) ₄ Complexes; Wet Chemical Preparation of CIS Materials
Christina Garretson (05U)	Preparation and Vapochromic Properties of Fe(diimine) ₂ (CN) ₂ Complexes
Bradley Miller (05F – 07S)	Solvatochromic Properties of Group 6 Isocyanide Complexes
Peter Longo (06S – 06F)	CdS Thin Film Preparation by Chemical Bath Deposition
Ashley Vandeventer (06S – 10S)	Development of Se Nanoparticles for Spray Deposition
Matt Ingersoll (07S – 11S)	Solvothermal Reaction of Copper and Indium Salts with Sulfur/selenium Mixtures in Oleylamine
Anatole Mirasano (07S – 08F)	Solvothermal Preparation, Processing, and Characterization of Nanocrystalline CuIn _{1-x} Al _x Se ₂ Materials
Ayumi Yamanashi (07S)	Preparation and Characterization of Mo(diimine)(PR ₃)(CO) ₃ Complexes
Mike Norris (07S)	Solvatochromism of Group 6 Diimine-Phosphine Complexes
Laura Slaymaker (08S – 11F)	CuIn _x Ga _(1-x) Se ₂ Films Prepared by Rapid Thermal Annealing of Layered Nanocrystalline CuIn _x Ga _(1-x) S ₂ and Se
Brandon Karlin (08S)	Solvothermal Preparation of CuInSe ₂ -Family Materials
David Paprocki (08S – 11S)	Size and Shape Control of Gold Nanostructures; Raman studies of Mn-doped CuInSe ₂ -based Chalcopyrites
Megan Schliefert (08S – 11S)	Size and Shape Control of Gold Nanostructures; Raman studies of Mn-doped CuInSe ₂ -based Chalcopyrites
Joe Shanle (08F)	Solvothermal Preparation of CuInSe ₂ -Family Solar Cell Materials
Chelsey Cook (08F – 09F)	CuInS ₂ Preparation via Aqueous Solution-based Methods

Tiffani Doss (09S)	Solvothermal Preparation of CuInSe ₂ -Family Solar Cell Materials
Mark Gardner (09S)	Solvothermal Preparation of CuInSe ₂ -Family Solar Cell Materials
Matt Jensen (09S – 12S)	CuInS ₂ Preparation via Aqueous Solution-based Methods; Preparation and Studies of Nanocrystalline FeS ₂ and SnS ₂
Thomas Webber (09U – 13S)	Preparation and Studies of Nanocrystalline FeS ₂ and SnS ₂
Maurice Chessmore (10S – 10U)	ICP-OES Analyses of Sulfur from Semiconductor Materials
Britni Hervert (10U)	CuInSe ₂ Preparation via Se reduction by KBH ₄
Nathan Hoffman (10U – 12S)	Chemical Bath Deposition of Selenium for Solar Cell Fabrication
Jesse Lange (11S-11F)	Fabrication and Characterization of CIGS Thin Films
Loany Fajardo (11S)	Preparation and Studies of Nanocrystalline FeS ₂ as a Solar Cell Absorber
Kirsten Lipps (11F – 12U)	Development of Controlled Syntheses of Branched Au Nanoparticles
Bethany Lueck (12S - present)	Synthesis of Novel Branched Au Nanoparticles for Biosensor Applications
Becky Svatora (12U - present)	Studies of Au Nanoparticle Films as Biosensors
Xiaojun Liu (12F)	Studies of Au Nanoparticle Binding Interactions to Crystalline and Glassy Substrates
Bjorn Lund (12F – 13S)	Iron Pyrite Nanoparticle Formation and Growth Mechanistic Studies
Aspen Clements (13S – present)	Iron Pyrite Nanoparticle Formation and Growth Mechanistic Studies
Zack Colgrove (13S – 13U)	Synthesis and Coating of Novel Branched Au Nanoparticles for Biosensor Applications
Daniel Connor (13S)	Synthesis of Novel Branched Au Nanoparticles for Biosensor Applications
Michael Hanrahan (13S – present)	Iron Pyrite Nanoparticle Formation and Growth Mechanistic Studies
Ryan Matzen (13S)	Synthesis of Novel Branched Au Nanoparticles for Biosensor Applications
Molly O'Brien (13S)	Synthesis of Novel Branched Au Nanoparticles for Biosensor Applications

MOST NOTABLE & EXTENSIVE SERVICE ACTIVITIES

Creator and Director of UNK Department of Chemistry Research Apprentice Program (2006-present). In this program, 10-12 freshmen from the Fall CHEM 160 course are invited to join chemistry research groups in the following Spring semester. The apprenticeships last 8 weeks (3 hours of lab work per week) and the students earn a \$150 scholarship. Experience research students who serve as student mentors to the apprentices earn a \$200 stipend. I coordinate the recruitment of apprentices and serve as the primary contact for students during this process.

Steering Committee Member and Training Curriculum Developer, Nebraska School Chemical Cleanout Campaign, Keep Nebraska Beautiful (2007-present). The non-profit group Keep Nebraska Beautiful has initiated a new Nebraska School Chemical Cleanout Campaign that is designed to assist schools in disposing of outdated chemicals and educating pre- and in-service teachers on proper chemical safety. I have developed a 1-credit online course on chemical hygiene and safety that has been offered through UNK (as CHEM 899P) several times since Spring 2009. I have presented ESU workshops to teachers across the state on chemical safety, inventory compiling, and storage. This EPA-funded initiative is expected to impact Rule 24 requirements for chemistry teaching endorsement requirements.

Service Contract -- Project Director for "Cleburn Street Superfund Site Environmental Sampling and Monitoring", Nebraska Department of Environmental Quality (NDEQ), \$229,854 (2000-2002). Volatile organic compounds levels were monitored at a soil-vapor extractor and groundwater wells in the Grand Island, Cleburn Street area. I acted as liaison to NDEQ, prepared and submitted quarterly and annual reports, processed supply/salary paperwork, contracted out engineering maintenance tasks and laboratory analyses that could not be done in our department, hired and coordinated student laboratory technicians (8 different students over the 3-year period) and travel for vapor sampling, prepared and maintained vapor sampling equipment for weekly inspections, reported weekly VOC level data. I also traveled to the site and supervised quarterly water sampling, prepared equipment for sampling events, prepared samples for analysis and reported results.

Coordinator of annual summer UNK Adventures in Chemistry Camp for high school students, 1998-2003 (D, Col, U, Com) – In order to establish closer ties with regional high school chemistry teachers, step up recruiting of promising science students, and provide high schools with experience with lab techniques and equipment that are unavailable in most high school laboratories, In 1998, Michael Mosher and I created a week-long residential summer chemistry camp for exceptional high school science students in the state of Nebraska. The students were introduced to a variety of laboratory and instrumental techniques (UV-vis, IR, and NMR spectroscopy) that are not typically experienced until well into a college career. Additionally, there were field trips to regional chemistry facilities such as Ward Laboratories, the chemistry lab at Eaton Manufacturing, and the biochemistry labs at the USDA Meat Animal Research Center. This was one of the programs offered as in the UNK Division of Continuing Education Summer Synergy.

My administrative roles included coordinating the direct marketing/advertising and the camp admission processes, making residence hall arrangements, hiring and supervising undergraduate camp counselors, arranging field trips, and managing camp finances. In January, a mailing is sent to all Nebraska high school science teachers asking them to nominate up to 5 promising math and science students for camp attendance. Applications were solicited from those students nominated, and students were chosen by myself and camp co-coordinator Michael Mosher to attend based on year in school (juniors are preferred), strength of academic background, and suitability of the camp for career plans. For the first camp, we received 34 applications (out of the 114 students nominated) for 12 spots. Thanks to the above-listed grant from the Camille and Henry Dreyfus Foundation, the camp was expanded in 1999 and 2000 from one to two sessions of 16 students each. Additionally, the student fee was lowered from \$275 to \$50

The Bruner Hall Phase I renovation prevented a camp offering in 2001. With support from the UNK Honors Program and NU Priority Program Funds, the camp brought in 11-14 students per year in 2002 and 2003. Curricular improvements made during this time featured the inclusion of faculty from other disciplines – Joan Blauwkamp from Political Science and Tom Martin and Dave Rozema from Philosophy – who added class and discussion sections on topics that bridged chemistry with environmental, political, and ethical issues.

Coordinator of CNSS Summer Academic Camps for high school students, 2004 (D, Col, U, Com) – The ideas behind the Adventures in Chemistry Camp were expanded to four simultaneous academic camps in the Departments of Biology, Chemistry, CSIS, and Political Science. The camp brought in 24 students across these disciplines. My administrative roles were similar to those for the previous chemistry camp but individual faculty directors developed the curricular components within each individual camp.

Department Equipment Maintenance (D) – Listed below are department equipment items for which I take at least a significant share of maintenance responsibility:

Bruker D2 Phaser X-ray Diffractometer – primary caretaker

LVEM-5 Electron Microscope – primary caretaker

Veeco Dektak 150 Stylus Profilometer – co-primary caretaker

Varian 720-ES ICP-OES – primary caretaker, attended training workshop in December 2008

Nexus 680 Fourier-Transform Infrared Spectrophotometer -- primary caretaker, replaced MCT detector, implemented software upgrade to system, supervised installation of new research-grade instrument

Computer-Driven Electroanalyzer -- primary caretaker, installed system.

Magnetic Susceptibility -- obtained through my research grant funds, primary caretaker, installed system.

Academic Advisor (D) -- I serve as academic advisor for 20 students and *am the designated department advisor for all students pursuing the grade 7-12 Chemistry Subject Teaching Endorsement.*

OTHER CURRENT AND RECENT COMMITTEE ASSIGNMENTS & SERVICE POSITIONS

Member, University of Nebraska System-Wide Original Research & Creative Activity Award selection committee, 2012-present (U)

Member of Faculty Senate Academic Freedom & Tenure Committee, 2005-2009, 2011-present (Col, U) – elected by NSS faculty.

- Chair, 2007-2009, 2011-present
- Coordinated the review and revision of UNK Post-Tenure Review campus policy document

Member, UNK Undergraduate Research Council, 2012-present (U)

Member, CNSS Rank and Tenure Committee, 2013-present (Col)

Member, Leland Holdt/Security Mutual Life Insurance Company Distinguished Faculty Award Selection Committee, 2011-present (U)

Member, Director of Sponsored Programs Search Committee, 2012-2013 (U)

Member, Board of Representatives, Sigma Xi, UNK Chapter, 2008-2012 (Prof)

Member, CNSS Advisory Committee, 2006-2012 (Col)

- Chair, 2009-2012

Member of Faculty Senate Grievance Committee, 2009-2011 (Col, U) – elected by NSS faculty.

PAST COMMITTEE ASSIGNMENTS & SERVICE POSITIONS

Chemistry Department Representative on the Science/Math Education Graduate Program Committee, 2011-2012 (D, Col)

Member, UNK Academic Success Center Advisory Board, 2009-2011 (U)

Member, University of Nebraska System-Wide Innovation, Enhancement, and Development Award selection committee, 2009-2010 (U)

Member, UNK Pratt-Heins Faculty Award Committee, 2007-2009 (U)

- Chair, 2008-2009

Presenter, UNK Center for Teaching Excellence “Developing and Teaching Capstone Courses” Forum, 2009 (U)

Member, Nebraska EPSCoR First Award Grant Evaluation Subcommittee, 2009 (U)

Treasurer, Phi Kappa Phi UNK Chapter, 2002-2008 (U, Prof) – Charter member of the UNK chapter. Responsibilities include managing chapter finances, tracking chapter membership, submitting finance reports to national headquarters, and filing income tax paperwork to the IRS.

Member of Organizing Committee for 43rd Midwest Regional Meeting of the American Chemical Society held in Kearney (October 2008) (Prof) -- I served as Printing and Publicity Chair. I was responsible for the meeting website, creating calls for papers (and arranging their distribution via *Chemical and Engineering News* or bulk mail), the meeting's abstract book, and meeting signs.

Member of Organizing Committee for 36th Midwest Regional Meeting of the American Chemical Society in Lincoln (Oct. 10-13, 2001) (Prof) -- I served as Printing and Publicity Chair. I was responsible for creating calls for papers (and arranging their distribution via *Chemical and Engineering News* or bulk mail), the meeting's abstract book, and meeting signs.

Faculty Senator, 2002-2005 (Col, U) – elected by NSS faculty.

Member of Faculty Senate Oversight Committee, 2004-2005 (Col, U) – organized and ran NSS elections for Faculty Senate committee seats and senate positions.

Member of UNK Judicial Board Pool, 2004-2006 (U) – served on two hearing boards and one appellate board as part of the disciplinary action process specified in the UNK Student Handbook

Member, University of Nebraska System-Wide Department Teaching Award Selection Committee, 2007 (U)

Member, NUPATHS Scholarship Committee, 2002 (U)

Member, Honors Program Academic Program Review Team, 2003 (U)

Member, Office of Sponsored Programs Administrative Program Review Team, 2007 (U)

Member, CNSS Technology Committee, 2002 (Col)

Member of Faculty Search Committee for UNK Department of Political Science, 1999-2000 (Col)

Christopher Exstrom was the CNSS representative for an Admission Dept. Saturday Tour (2002, 2003)

Participated in chemical demonstration show presented to elementary, middle school, and high school students at Camp Arrowhead, Lexington, June 26, 2001 (Com)

Led chemical laboratory exercises for high school students at Valentine High School in conjunction with a science fair event held there, 2002 (Com)

Served as CNSS representative for Admission Dept. Saturday Tours, 2002-2003 (Col, U, Com)

Presentor, Scholars' Recognition Days, 2002 and 2003 (Col, U, Com)