

# DEBBIE C. CRANS

**Business Address** Department of Chemistry and the Cell and Molecular Biology Program  
Colorado State University, Fort Collins, CO 80523-1872, (970) 491-7635

**Personal Address** 721 North County Rd 27E, Berthoud, CO 80513 (970)532 2706  
Born August 13, 1955

**Professional Position** Professor of Chemistry and Cell and Molecular Biology, 1998-present.  
Professor Laureate College of Natural Sciences (2015-2017)  
Fellow of the Faculty Institute for Inclusive Excellence, Colorado State University

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**Research** Biological, Bioinorganic, Bioorganic and Bioanalytical Chemistries. Specifically, my interests are in the areas of biological and fundamental chemistries with special emphasis on inorganic and organic chemistry. Currently we are involved in problems related to the mode of action of drugs for diseases such as tuberculosis, Alzheimer's, diabetes, and cancer and these studies often require synthesis and preparatory chemistry. We have interests in a range of different drugs including organic drugs, and transition metal based drugs and understanding their bioprocessing. Currently my group and I are particularly interested in menaquinone, pyrazinamide, metformin, platinum and vanadium derivatives, and characterizing their chemistries. Studies of lipid systems and micro-emulsion environments help us understand how drugs and metabolites interact and penetrate lipid interfaces. Our solution studies are carried out using 1D and non-routine 2D NMR spectroscopies, EPR, UV-vis, IR spectroscopy as well as novel time-resolved methods and extreme ultraviolet microscopy and mass spectral imaging. As life-scientists our studies with vanadium exploit new types of chemistries in biological systems ranging from isolated proteins to cell culture to plants to animals and human beings. We also study the effects of metal ions on signal transduction and potential application in immunotherapy and are interested in drug formulation and delivery.

**Education** HARVARD UNIVERSITY  
Cambridge, Massachusetts 02138  
Ph.D. in Organic Chemistry, 1980-1985  
Advisor: Dr. George M. Whitesides  
Title of Thesis: Methodology in Enzyme-Catalyzed Organic Synthesis:  
Glycerol Kinase Catalyzed Phosphorylations

UNIVERSITY OF COPENHAGEN  
H. C. Orsted Institute, Copenhagen, Denmark  
Cand. Scient. 1. part (BS) 1974-1978  
Cand. Scient. 2. part (research) 1978-1980

**Postdoctoral Education** UNIVERSITY OF CALIFORNIA, LOS ANGELES, 1985-1986  
Joint project with Orville L. Chapman and Paul D. Boyer. Research:  
Mechanistic Enzymology on F<sub>1</sub>-ATP Synthase from Chloroplasts and Beef Heart.

**Professional Appointments**

1998-present	Professor of Chemistry, Colorado State University
2019-present	Chair of the Biological Chemistry Program, Colorado State University
2015-2017	Professor Laureate College of Natural Sciences, Colorado State University
1991-1998	Associate Professor of Chemistry, Colorado State University
1987-1991	Assistant Professor of Chemistry, Colorado State University
1989-present	Member of the Cell and Molecular Biology Program, Colorado State University
1986	Instructor (1 semester) University of California, Los Angeles

**Awards**

- 2021 Scholarship, Impact Award, Colorado State University  
 2020 Stanley C. Israel Regional Award for Advancing Diversity in the Chemical Sciences  
 2020 Violet Diller Award for Professional Excellence, Iota Sigma Pi Womens Honors Society  
 2019 ACS Award for Distinguished Service and Outstanding Research in the Advancement of Inorganic Chemistry  
 2019 Office for Undergraduate Research and Artistry Award, CSU  
 2017 Vice President for Research Interdisciplinary Scholarship Award (Individual award, CSU)  
 2016 Royal Society Fellow  
 2016 Dalton Discussions International Team Award (5x5x5)  
 2015 Fellow of the Faculty Institute for Inclusive Excellence, CSU  
 2015 Arthur P. Cope Scholar award (Late Career) American Chemical Society  
 2014 AAAS Fellow  
 2012 Lectureship Award, Japanese Coordination Chemistry Society  
 2011 Best Teacher Award, Alumni Association, Colorado State University  
 2011 American Chemical Society Colorado Section Award  
 2009 American Chemical Society Fellow (Inaugural Awardee)  
 2005 CSU Undergraduate Research Mentoring Award  
 2004 Vanadis Award (Inaugural Awardee)  
 2003 Margaret Hazaleus Award, Colorado State University  
 2001 Japan Society of Promotion of Science Fellowship  
 2000/2001 Alexander von Humboldt Senior Research Awardee  
 1993-96 Alfred P. Sloan Research Fellow Award  
 1994 Alberta Heritage Foundation Award  
 1990-1992 Eli Lilly Young Investigator Award  
 1989-1994 NIH FIRST Award  
 1986-1987 American Heart Junior Fellowship  
 Spring, 1980 Fellowship awarded by the Egmond H. Petersens Fund  
 1979-1980 Scholarstipendium, University of Copenhagen, Denmark  
 1976-1977 Exchange Student Fellowship, Washington State University

**Professional Service and Honors**

- 2024 Chair, ICC-45 (International Coordination Chemistry Conference), CO, Aug.1-6.  
 2021-10-30-23 Pharmacogenomics Research and Personalized Medicine, Xiangya Hospital Central South U.  
 2021 Nov 3-5 The 12<sup>th</sup> International Vanadium Symposium, Co-organizer  
 2021-2023 Councilor, Colorado Section for ACS  
 2021 Chair, ACS Divisional Officers Council Caucus  
 2020 Chair, Colorado Section, American Chemical Society (COACS)  
 2020 Co-Chair, Rocky Mountain Colorado Regional Meeting 2020, Fort Collins, Oct. 28  
 2020 Program Chair, Rocky Mountain Colorado Regional Meeting 2020, Fort Collins, Oct. 28  
 2020 ICC-44 International Advisory Board  
 2018-present(2021) New Journal of Chemistry, Associate Editor  
 2018-present International Advisory Board for the 1<sup>st</sup> International Conference on Noncovalent Interactions (ICNI)  
 2016-present(2022) Coordination Chemistry Reviews, Associate Editor  
 2015-18; 2019-21 Chair, Chair-Elect, Past Chair Colorado Section, American Chemical Society (Chair 2016-17, 2020)  
 2018 ICC-43 International Advisory Board  
 2017 Rocky Mountain Regional Meeting 2017 (RMRM17), Local Arrangements Chair  
 2016-2017 Chair, Colorado Section, American Chemical Society  
 2018 Associate on the Meetings and Expedition Committee, ACS  
 2016-2024 Councilor, Division of Inorganic Chemistry, American Chemical Society  
 2016-2017 Co-Organizer of “Young Talent in Colorado and Beyond Symposium” – received award (see below)  
 2016 ICC-42 International Advisory Board  
 2015-2016 ACS Presidential Task Force on U.S. Employment of Chemists

2013-2015	Chair, Chair-Elect, Past Chair, Div. Inorganic Chemistry, American Chemical Society (Chair 2014)
2014-2022	Chair, Vanadis Award Committee
2014-2028	Advisory Board of the International Coordination Chemistry Conference
2014-2024	Editorial Board, <i>J. Inorganic Biochemistry</i>
2013-2017	Assistant Editor, Presentation on Demand, American Chemical Society
2013	Zing Coordination Chemistry Conference Chair
2012-2017	Committee of Science, American Chemical Society (elected for continuation, but declined)
2012-2017	Associate Editor, Presentation on Demand, American Chemical Society
2011	Zing Coordination Chemistry Conference Chair
2011-2012	Bioinorganic Chemistry Subcommittee Chair, Division of Inorganic Chemistry, ACS
2011-present	Editorial Board, <i>New Journal of Chemistry</i>
2010-2016	Assistant Program Chair, Division of Inorganic Chemistry, ACS
2010	Chair, Metals in Medicine, Gordon Research Conference
2010-2013	Editorial Board, <i>Inorganic Chemistry</i> , American Chemical Society
2010-2011	Bioinorganic Chemistry Chair-Elect, Division of Inorganic Chemistry, ACS
2010-2013	Member, Council of Society for Biological Inorganic Chemists
2008-2012	Editorial Board, <i>Journal of Biological Inorganic Chemistry</i>
2009	Zing Coordination Chemistry Conference Chair
2008	Zing Coordination Chemistry Conference Chair
2007-present	Editorial Board, Chemija
1999-2009	Program Chair, Inorganic Division, American Chemical Society
1997-1999	Assistant Program Chair, Inorganic Division, American Chemical Society
1996-2000	Member, Biophysical Biochemistry Study Section, NIH
1996-1998	Advisory Board Member, <i>Chemical and Engineering News</i>
1993	Ad hoc Reviewer NIH "Biophysical Biochemistry" Study Section
1992-1993	Nomination Committee, Division of Biological Chemistry, ACS
1992-1993	Ad hoc Reviewer NIH "Biochemistry" Study Section
1991-1993	International Faculty, Danish Research Academy
1991	NSF Panel Member for review of Post-Doctoral Research Grants
1991	Tenth NSF Workshop on Reactive Intermediates (WORI)
1991-1994	BRSF Panel Member for review of Colorado State University Research Grants
1989	Twentieth Annual NSF Workshop on Organic Synthesis and Natural Products Chemistry

#### Honors and Awards for Colorado Section of ACS (COACS) and ACS Division of Inorganic Chemistry

2020	Partners for Progress & Prosperity Award – P3 award (Collaboration between Chem Club at CSU, CSU Chemistry Department and Colorado ACS; Regional ACS award)
2020	ChemLuminary Award finalist for Periodic Table Programming involving Student Organizations
2018	ChemLuminary Award finalists for ACS Senior Award Programming 2018
2017	Partners for Progress & Prosperity Award - P3 award (Collaboration between Colorado ACS and High School Organizations – Colorado Chemistry Teacher Association (CCTA) and the Colorado chapter for the American Association for Chemistry Teachers (AACT))
2017	Young Chemists Committee ChemLuminary Award (for COACS Programming 2017)
2017	Local Section Innovative and Creative Career ChemLuminary Award (for COACS Programming 2017)
2017	COACS Team Salute to Excellence Award for symposium “Young Talent in Colorado and Beyond” Aug. 4-5, 2016 at CSU (co-organizers James Blakemore, Kelly Hassell, and Carlos Olivo-Delgado)
2016	Senior Chemist Award to Local Section (for COACS Programming 2016)
2016	ChemLuminary Award to Division of Inorganic Chemistry for Membership Drive and Increasing Members (for COACS Programming 2015; with Ben Zhu and Michael Johnson)
2015	ChemLuminary Awards to Division of Inorganic Chemistry for Young Investigator Symposia (DIC activities during 2014; nominator and facilitator of organization as Program Chair)
2011-2015	Nominated current ACS Fellows through the Divisional & Local Section

#### Visiting Professorships

University of Alberta, Alberta, Canada, Nov. 1994

University of Bielefeld, Alexander von Humboldt Senior Research Awardee, Bielefeld, Germany, Jan. through Sep. Humboldt Awardee, 2001  
University of Toyama, Osaka and Hiroshima, Toyama, Osaka and Hiroshima, Japan, Japan Society of Promotion of Science Fellowship, the month of November 2001  
New Mexico State University, NSF-Advance Visiting Professor, 2002  
Invited Fellow of the Medicinal Chemistry Gordon Conference 2008  
University National Cheng-Kung University, Taipei; Academia Sinica, Taipei; National Tsing Hua U Taiwan, 2012  
University of Wuhan, Wuhan, China, Sep. 2014  
University of Vilnius, Lithuania, Nov. 2014  
University of Strasbourg, Strasbourg, France, Jun. 2015  
International Research Collaboration Awardee, University of Sydney, Australia, 2015  
Visiting Professor Technical University of Munchen, Germany, May 2018  
Visiting Professor Facultad de Ciencias Exactas, UNLP, La Plata, Argentina Nov. 2018  
Visiting Professor Eco-Friendly Applied Materials Laboratory, College of Chemistry, Central China Normal University, Wuhan, China, 2019  
Visiting Professor Universidade Federal do Paraná, Curitiba, Brazil, 2021

### **Plenary and Keynote Lectures, Award Lectures and Named Lectureships**

Howard Hughes Lecturer, Dept. Chemistry, William & Mary University, Williamsburg, VA, 1994  
Plenary lecture, Annual Alexander von Humboldt meeting, Bamberg, Germany March 2001  
NSF-Advance Lecturer, New Mexico State University, 2002  
Vanadis Award Lecture, The Fourth International Symposium on Chemistry and Biological Chemistry of Vanadium, Szeged Hungary 2004  
Colorado Section Award Lecture, Colorado State University, 2011  
Plenary presentation, International Vanadium Symposium, Crystal City, Virginia, 2012  
Lectureship Award Japan Society of Coordination Chemistry Conference (JSCC), 2012  
Plenary Presentation, Zing Bioinorganic Chemistry Conference, 2013  
XIX National Symposium on Organic Chemistry (XIX SINAQO), Mar del Plata, Argentina, 2013  
Plenary Presentation. "Undergraduate Research - A Tool to Explore Chemistry and Excite" 209th Two-Year College Chemistry Consortium Conference Front Range – Westminster Campus, Westminster CO, 2015.  
Arthur P. Cope Scholar Award lecture in the Cope Scholar Symposium, 250<sup>th</sup> ACS meeting Aug. 19, 2015  
International Research Collaboration Lecture, University of Sydney, Sydney, Australia, Oct.18-Nov. 8, 2015  
Australian Chemical Society Lecturer, University of Melbourne, Melbourne, Australia, 2015  
Plenary Lecture, MTIC-XVI, Dept. Chemistry, Jadavpur University, India, 2015  
Idless Scientific Seminar I, University of New Hampshire, 2016  
Idless Broad Interest Seminar II, University of New Hampshire, 2016  
Plenary presentation, closing ceremony of the REU program, University of Puerto Rico Rio Piedras Campus (Puerto Rico Chemical Learning Integrated in Materials and Biomolecular applications, PR CLIMB), 2016  
Plenary Lecture 10<sup>th</sup> International Vanadium Symp, Howard International House, Taipei, Taiwan, 2016  
Keynote lecture 8th Asian Biological Inorg. Chemistry Conf (AsBIC8) U. of Auckland, New Zealand 2016  
Frontier in Science Lectureship, University of Toledo, 2017  
Inorganic Chemistry Leader program, University of Puerto Rico Rio Piedras Campus (Puerto Rico Chemical Learning Integrated in Materials and Biomolecular applications, PR CLIMB) 2017  
Keynote Speaker, ICBIC-18, Fluorionapolis, Brazil 2017  
Keynote Speaker, 9<sup>th</sup> International Conference on Group IV, V and VI, New Delhi 2017  
Keynote Speaker, ICC-18, Sendai, Japan, 2018  
Keynote Speaker, EuroBIC14 Birmingham, UK 2018  
Plenary Speaker, XIX Brazilian Meeting on Inorganic Chemistry; VI Latin American Meeting on Biological Inorganic Chemistry; VIII Brazilian Meeting on Rare Earths, Fortaleza, Brazil, 2018  
Plenary Speaker, 11<sup>th</sup> International Vanadium Symposium, Montevideo, Uruguay 2018  
Plenary Speaker, ACS Award Symposium, March 31-April 5, Orlando, 2019  
Keynote Speaker, 15th International Symposium on Applied Bioinorganic Chemistry, 2019  
Keynote Speaker, 7<sup>th</sup> International Symposium on Metallomics, Warsaw, Poland, 2019  
Plenary Speaker, ICBIC-19, Interlaken, Switzerland, c/o University of Zurich

Plenary Speaker, 1<sup>st</sup> International Conference on Noncovalent Interactions (ICNI), 2<sup>nd</sup> - 6<sup>th</sup> September 2019  
 Keynote Speaker, XXI Mendeleev Congress on General and Applied Chemistry, Saint-Petersburg, 2019  
 Keynote Speaker, XV International Symposium on Inorganic Biochemistry, June 24-27, Wrodaw, Poland (canceled COVID-19))  
 Plenary Speaker, Women in Science, Malaga, Jan. 20-24, 2020  
 Keynote Speaker, CCE-conference in LA, 24-26, 2020  
 Keynote Speaker, EuroBic, Iceland, August 16-20, 2020 (canceled COVID-19)  
 Keynote Speaker, Labic, Montevideo, September 22-25, 2020, delayed to December 8, 2020  
 The Chapman Lecturer for the UCLA Department of Chemistry and Biochemistry, Jan 2022

**Publications (in peer-reviewed journals) Total 237, H-index 60; total citations >11.000 (WOS Jan, 2022)**

1. "cis and trans-Azoalkanes: Force field determination of molecular structures, heats of formation and strain energies," Debbie C. Crans and James P. Snyder, *Chem. Ber.*, **1980**, *113*, 1201-1204.
2. "A theoretical evaluation of the synergetic capto-dative stabilization of free radicals," Debbie C. Crans, Timothy Clark and Paul von R. Schleyer, *Tetrahedron Letters*, **1980**, *21*, 3681-3684.
3. "Tetracoordinate planar carbon: A singlet biradical," Debbie C. Crans and James P. Snyder, *J. Am. Chem. Soc. J. Am. Chem. Soc.*, **1980**, *102*, 7152-7154.
4. "A convenient synthesis of disodium acetyl phosphate for use in *in situ* ATP cofactor regeneration," Debbie C. Crans and George M. Whitesides, *J. Org. Chem.*, **1983**, *48*, 3130-3132.
5. "Practical enzymatic synthesis of adenosine-5'-0-(3-thiotriphosphate) (ATP- $\gamma$ -S)," Obsidiana Abril, Debbie C. Crans and George M. Whitesides, *J. Org. Chem.*, **1984**, *49*, 1360-1364.
6. "Glycerol kinase: Substrate specificity," Debbie C. Crans and George M. Whitesides, *J. Am. Chem. Soc.*, **1985**, *107*, 7008-7018.
7. "Glycerol kinase: Synthesis of dihydroxyacetone phosphate, syn-glycerol-3-phosphate, and chiral analogs," Debbie C. Crans and George M. Whitesides, *J. Am. Chem. Soc.*, **1985**, *107*, 7019-7027.
8. "Probes of the binding change mechanism and possible rotational catalysis by studies of subunit interactions," P. D. Boyer, T. Melese, Z. Xue, R. J. Kandpal, Debbie C. Crans and J. D. Wise, *EBEC Reports*, **1986**, *4*, 236.
9. "Enzymatic regeneration of ATP: Acetyl phosphate, phosphoenolpyruvate, methoxycarbonyl phosphate, dihydroxyacetone phosphate, 5-phospho-D-ribose- $\alpha$ -1-pyrophosphate, uridine-5'-diphosphoglucose," Debbie C. Crans, Romas J. Kazlauskas, Bernard L. Hirshbein, Chi-Huey Wong, Obsidiana Abril and George M. Whitesides, *Methods Enzymol.*, **1987**, *136*, 263-280.
10. "The enantiomeric purity of polar substrates can be determined using chiral lanthanide NMR shift reagents in polar solvents," Linda M. Sweeting, Debbie C. Crans and George M. Whitesides, *J. Org. Chem.*, **1987**, *52*, 2273-2276.
11. "Synthesis of 3-deoxy-D-manno-2-octulosonate-8-phosphate (KDO-8-P) from D-arabinose: Generation of D-arabinose-5-phosphate using hexokinase," Mark D. Bednarski, Debbie C. Crans, Robert DiCosimo, Ethan S. Simon, Philip D. Stein, George M. Whitesides and Marilyn J. Schneider, *Tetrahedron Letters*, **1988**, *29*, 427-430.

**Publications at Colorado State University (undergraduate coauthors underlined)**

12. "Spontaneous and reversible interactions of vanadium(V) oxyanions with amine derivatives," Debbie C. Crans and Paul K. Shin, *Inorg. Chem.*, **1988**, *27*, 1797-1806.
13. "Reversible and *in situ* formation of organic arsenates and vanadates as organic phosphate mimics in enzymatic reactions: Mechanistic investigation of aldol reactions and synthetic applications," D. G. Drueckhammer, J. R. Durrwachter, R. L. Pederson, Debbie C. Crans, L. Daniels and C-H. Wong, *J. Org. Chem.*, **1989**, *54*, 70-77.
14. "Interaction of trace levels of vanadium (IV) and (V) in biological systems," Debbie C. Crans, Robin L. Bunch and Lisa A. Theisen, *J. Am. Chem. Soc.*, **1989**, *111*, 7597-7607.

15. "Vanadate monomers and dimers both inhibit the human prostatic acid phosphatase," Debbie C. Crans, Carmen M. Simone, Asish K. Saha and Robert H. Glew, *Biochem. Biophys. Res. Comm.*, **1989**, *165*, 246-250.
16. "Vanadate tetramer as inhibiting species in enzyme reactions *in vitro* and *in vivo*," Debbie C. Crans, Ellen M. Willging and Steven K. Butler, *J. Am. Chem. Soc.*, **1990**, *112*, 427-432.
17. "A kinetic method for determination of free vanadium(IV) and (V) at trace level concentrations," Debbie C. Crans, Miri Shaia Gottlieb, Jeanne Tawara, Robin L. Bunch and Lisa A. Theisen, , **1990**, *180*, 53-64.
18. "Application of Time-Resolved V-51 2D NMR For Quantitation of Kinetic Exchange Pathways Between Vanadate Monomer, Dimer, Tetramer, and Pentamer", Debbie C. Crans, Christopher D. Rithner and Lisa A. Theisen, *J. Am. Chem. Soc.*, **1990**, *112*, 2901-2908.
19. "Vanadate dimer and tetramer both inhibit glucose-6-phosphate dehydrogenase from *Leuconostoc mesenteroides*," Debbie C. Crans and Susan M. Schelble, *Biochemistry*, **1990**, *29*, 6698-6706.
20. "A cyclic vanadium(V) alkoxide – An analog of the ribonuclease inhibitors," Debbie C. Crans, Robert A. Felty and Mary M. Miller, *J. Am. Chem. Soc.*, **1991**, *113*, 265-269.
21. "Structural and kinetic characterization of simple complexes as models for vanadate–protein interactions in aqueous solution," Debbie C. Crans, Per Magnus Ehde, Paul K. Shin and Lage Pettersson, *J. Am. Chem. Soc.*, **1991**, *113*, 3728-3736.
22. "Substituent effects of organic vanadate esters in imidazole buffered aqueous solutions," Debbie C. Crans, Susan M. Schelble and Lisa A. Theisen, *J. Org. Chem.*, **1991**, *56*, 1266-1274.
23. "Nonreductive interaction of vanadate with an enzyme containing a thiol group in the active site: Glycerol-3-phosphate dehydrogenase," Debbie C. Crans and Carmen M. Simone, *Biochemistry*, **1991**, *30*, 6734-6741.
24. "Inhibition of human seminal fluid and *Leishmania donovani* phosphatases by molybdate heteropolyanions," Asish K. Saha, Debbie C. Crans, Michael T. Pope, Carmen M. Simone and Robert H. Glew, *J. Biol. Chem.*, **1991**, *266*, 3511-3517.
25. "Vanadate interactions with bovine copper, zinc-superoxide dismutase as probed by <sup>51</sup>V NMR spectroscopy," Lisa Wittenkeller, Aida Abraha, Ravichandran Ramasamy, Duarte Mota de Freitas, Lisa A. Theisen and Debbie C. Crans, *J. Am. Chem. Soc.*, **1991**, *113*, 7872-7881.
26. "NMR, CD and MCD studies of vanadate-nucleosides and vanadate-deoxynucleosides," Debbie C. Crans, Sven E. Harnung, Eric Larsen, Paul K. Shin, Lisa A. Theisen and I. Trabjerg, *Acta Chem. Scand.*, **1991**, *45*, 456-462.
27. "Synthesis and reactivity of oxovanadium(V) trialkoxides of bulky and chiral alcohols," Debbie C. Crans, Haojiang Chen and Robert A. Felty, *J. Am. Chem. Soc.*, **1992**, *114*, 4543-4550.
28. "Chemically induced modification of cofactor specificity of glucose-6-phosphate dehydrogenase," Debbie C. Crans, Carmen M. Simone and John S. Blanchard, *J. Am. Chem. Soc.*, **1992**, *114*, 4927-4928.
29. "Interaction of rabbit muscle aldolase at high ionic strengths with vanadate and other oxoanions," Debbie C. Crans, Katakam Sudhakar and Thomas J. Zamborelli, *Biochemistry*, **1992**, *31*, 6812-6821.
30. "(-)-Cryptaustoline. Its synthesis, revision of absolute stereochemistry, and mechanism of inversion of stereochemistry," Albert I. Meyers, Thais M. Sielecki, Debbie C. Crans, Robert W. Marshman and Thank Nguyen, *J. Am. Chem. Soc.*, **1992**, *114*, 8483-8489.
31. "Oxovanadium(V) 1,3-propanediolate chloride complexes - tetrameric clusters," Debbie C. Crans, Robert W. Marshman, Miri Shaia Gottlieb, Oren P. Anderson and Mary M. Miller, *Inorg. Chem.*, **1992**, *31*, 4939-4949.
32. "Interaction of porcine uterine fluid purple acid phosphatase with vanadate and vanadyl cation," Debbie C. Crans, Carmen M. Simone, Richard C. Holz and Lawrence Que, Jr., *Biochemistry*, **1992**, *31*, 11731-11739.

33. "Comparison of phosphorus metabolites in various extraction procedures of *Phaseolus vulgaris* seeds using  $^{31}\text{P}$  NMR spectroscopy," Debbie C. Crans, Milos Mikus and Robert W. Marshman, *Anal. Biochem.*, **1993**, 209, 85-94.
34. "Structural characterization and solution properties of a dimeric tetrahedral vanadium(V) chloride alkoxide," Debbie C. Crans, Robert A. Felty, Oren P. Anderson and Mary M. Miller, *Inorg. Chem.*, **1993**, 32, 247-248.
35. "NADV - a new cofactor for alcohol dehydrogenase from *Thermo-anaerobium brockii*," Debbie C. Crans, Robert W. Marshman, Rikke Nielsen and Irene Felty, *J. Org. Chem.*, **1993**, 58, 2244-2252.
36. "Vanadium(V)-protein model studies: Solid state and solution structure," Debbie C. Crans, Haojiang Chen, Oren P. Anderson, and M. M. Miller, *J. Am. Chem. Soc.*, **1993**, 115, 6769-6776.
37. "Interaction of polyoxovanadates and selected polyoxomolybdates with proteins," Debbie C. Crans, *Molecular Engineering*, **1993**, 3, 277-284.
38. "Characterization of vanadium(V) complexes in aqueous solutions: Ethanolamine and glycine derived complexes," Debbie C. Crans and Paul K. Shin, *J. Am. Chem. Soc.*, **1994**, 116, 1305-1315.
39. "Oxovanadium(V) alkoxide derivatives of 1,2-diols: Synthesis and solid-state  $^{51}\text{V}$  NMR characterization," Debbie C. Crans, Robert A. Felty, Haojiang Chen, Hellmut Eckert and Nandini Das, *Inorg. Chem.*, **1994**, 33, 2427-2438.
40. "The X-ray structure of  $(\text{NH}_4)_6(\text{Gly-Gly})_2\text{V}_{10}\text{O}_{28}\cdot 4\text{H}_2\text{O}$ : Model studies of polyoxometalate-protein interactions," Debbie C. Crans, M. Mahroof-Tahir, O. P. Anderson and S. M. Miller, *Inorg. Chem.*, **1994**, 44, 5586-5590.
41. "Phytate metabolism in bean seedlings during post-germinative growth," Debbie C. Crans, Milos Mikus and Blayne R. Friehauf, *J. Plant Physiol.*, **1995**, 145, 101-107.
42. "A slow exchanging vanadium(V) peptide complex: Vanadium(V)-Gly-Tyr," Debbie C. Crans, Hartmut Holst, Anastasios Keramidas and Dieter Rehder, *Inorg. Chem.*, **1995**, 34, 2524-2534.
43. "Structure of the dimeric ethylene glycol- vanadate complex and other 1,2-diol-vanadate complexes in aqueous solution. Vanadate-based transition state analog complexes of phosphotransferases," William J. Ray, Jr., Debbie C. Crans, J. Zheng, James W. Burgner, II, H. Deng, and Mohammed Mahroof-Tahir, *J. Am. Chem. Soc.*, **1995**, 117, 6015-6026.
44. "Comparison of phytate in radicle, plumula, scutellum and endosperm of *Zea mays* and *Zea diploperennis*," Milos Mikus, Alexander Lux, Debbie C. Crans, Paul K. Shin and Josef Kristin, *Structure and Function of Roots, Proceedings of the 4th International Symposium on Structure and Function of Roots*, Baluska, F.; Cianporova, M.; Gaspariakova; Barlow, O. (Eds.) Kluwer Academic Publishers, **1995**, 175-180.
45. "The effect of vanadate on growth and phospholipid levels in the root and hypocotyl of bean seedlings (*Phaseolus vulgaris* L.)," Milos Mikus, Paul K. Shin and Debbie C. Crans, *Structure and Function of Roots, Proceedings of the 4th International Symposium on Structure and Function of Roots*, Baluska, F.; Cianporova, M.; Gaspariakova; Barlow, O. (Eds.) Kluwer Academic Publishers, **1995**, 181-187.
46. "Application of NMR spectroscopy to studies of aqueous coordination chemistry of vanadium(V) complexes," Debbie C. Crans, Paul K. Shin and Kathleen Armstrong, *Mechanistic Bioinorganic Chemistry*, Thorp, H. H.; Pecoraro, V. L. (Eds.) ACS Symposium Series, **1995**, 246, 303-328.
47. "Vanadium chemistry and biochemistry of relevance for use of vanadium compounds as antidiabetic agents," Debbie C. Crans, Mohammed Mahroof-Tahir and Anastasios D. Keramidas, *Cell Mol. Biochemistry*, **1995**, 17-24.
48. "Organic vanadium compounds - Transition state analogy with organic phosphorus compounds," Debbie C. Crans, Anastasios D. Keramidas and Chryssoula Drouza, *Phosphorus, Sulphur, and Silicon*, **1996**, 109-110, 245-248.

49. "Factors affecting solution properties of vanadium(V) compounds: X-ray structure of  $\beta$ -*cis*-NH<sub>4</sub>[VO<sub>2</sub>(EDDA)]," Debbie C. Crans, Anastasios D. Keramidas, Mohammad Mahroof-Tahir, Oren P. Anderson, and Susie M. Miller, *Inorg. Chem.*, **1996**, *35*, 34599-34606.
50. "Evidence for distinct vanadyl(+4)-dependent activating system for manifesting insulin-like effects," Jinping Li, Gerard Elberg, Debbie C. Crans, and Yoram Shechter, *Biochemistry*, **1996**, *35*, 8314-8318.
51. "Four- and five-coordinate oxovanadium(V) alkoxides: Do steric effects or electronic properties dictate the geometry?," Jean Yves Kempf, Bernard Maignret and Debbie C. Crans, *Inorg. Chem.*, **1996**, *35*, 6485-6494.
52. "Protein bodies in dry germ of cereals," Alexander Lux, Zora Hanáková, Jozef Kristín, Debbie C. Crans and Milos Mikus, *Acta Universitatis Carolinae Biologica*, **1997**, *41*, 111-119.
53. "Vanadium oxoanions and cAMP-dependent protein kinase: An anti-substrate inhibitor," Scott Pluskey, Mohammad Mahroof-Tahir, Debbie C. Crans and David S. Lawrence, *Biochem. J.*, **1997**, *321*, 333-339.
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248. "Exploring growth of *Mycobacterium Smegmatis* treated with anticarcinogenic vanadium-compounds", Zeyad Arhouma, Heide A. Murakami, Jordan T. Kohen, Xiaorong Li, Deborah A. Roess, Dean C. Crick and Debbie C. Crans, *Inorganics*, Revised
249. "Instability is an Advantage: Potential Applications of Metal-Based Anticancer Drugs for Intratumoral Injections" Aviva Levina, Debbie C. Crans and Peter A. Lay *ChemMedChem* **2022**, under preparation.
250. "Exploring properties of new non-innocent vanadium(V) compounds and their anti-cancer activities" Canan Usulan Yigit<sup>1#</sup>, Heide A. Murakami, Allison A. Haase, Jordan T. Koehn, Adriana Pires Vieira, D. Jackson Gaebler, John Hagan, Cheryle N. Beuning, Victoria R. Bachtell, Nicholas Proschogo, Aviva Levina, Peter A. Lay, Debbie C. Crans, Under Preparation
251. "Exploring properties of new non-innocent vanadium(V) compounds" Allison A. Haase, Heide A. Murakami, Allison A. Haase, Jordan T. Koehn, John Hagan, Cheryle N. Beuning, Aviva Levina, Peter A. Lay, Debbie C. Crans, Under Preparation
252. "Acute toxicity evaluation of non-innocent oxidovanadium(V) Schiff base complex" Lidiane M. A. de Lima, Heide Murakami, Daniel Jackson Gaebler, Wagner E. Silva, Mônica F. Belian, Eduardo C. Lira and Debbie C. Crans, Under Preparation
253. "Regiospecific Saturation of the Isoprenyl Side Chain of Truncated Bacterial Menaquinone Analogs Affects Quinone Redox Potentials in Aprotic Solvents" Cheryle N. Beuning, Jordan T. Koehn, Dean C. Crick, and Debbie C. Crans, *Electrochimica Acta*, under preparation.
254. "First Principle Studies Exploring the Conformational Preferences of Short-chain Hydrophobic Menaquinone Substrates of Bacterial Electron Transfer Reactions" Jordan T. Koehn, Jacob B. Holmes, Corbin R. Lewis, Leonard J. Mueller, Dean C. Crick, and Debbie C. Crans, under preparation.

## Books / Edited Journal Issues

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3. "Modern coordination chemistry and its impact for meeting global challenges" by Debbie C. Crans and Franc Meyer. Developed from the 2011 Zing Coordination Chemistry Conference, Dec. 5-9, 2011. *Eur. J. Inorg. Chem.* **2012**.
4. "Vanadium in inorganic chemistry: excerpts from the 8<sup>th</sup> International Vanadium Symposium" by Craig C. McLauchlan and Debbie C. Crans, *Dalton's Trans.* **2013**, volume 42, Developed from the 2011 International Vanadium Chemistry Conference (V8), August 2011. The volume is featured on the inside cover for the *Dalton's Trans.* issue
5. "Forum on metals in medicine and health: New opportunities and approaches to improving health" by Debbie C. Crans, and Thomas J. Meade *Inorg. Chem.* **2013**, IC Forum. The volume is featured on the cover of *Inorg. Chem.*
6. "Modern coordination chemistry 100 years of Werner" by Debbie C. Crans and Ebbe Nordlander. Developed from the 2013 Zing Coordination Chemistry Conference, Dec. 5-9, 2013. *Eur. J. Inorg. Chem.* **2014**, 27. The volume is featured on the inside cover of *Eur. J. Inorg. Chem.*

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8. "Emergent Polyoxometalates and Soft-oxometalates" by Soumyajit Roy and Debbie C. Crans in *New J. Chemistry*, **2016**, *40*.
9. "Applications of speciation chemistry in a modern society" by Debbie C. Crans, Special Issue Organizer *Coord. Chem. Rev.* **2017**, *352*.
10. "Metal Nanoparticles: Synthesis and Applications in Pharmaceutical Sciences" Ed. Sreekanth Thota and Debbie C. Crans, **2018** Wiley-VCH Verlag GmbH & Co. KGaA, Boschstr. 12, Weinheim, Germany.
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12. "Coordination compounds and catalysis" Celebrative issue for Armando Pombeiro by Guest Editors Georgiy B. Shul'pin, Debbie C. Crans, Luisa M. Martins and Kamran T. Mahmudov *Coord. Chem. Rev.* **2019**.
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14. Special Issue organized to celebrate Debbie C. Crans ACS Award for Distinguished Service and Outstanding Research in the Advancement of Inorganic Chemistry, 2020
15. Special Issue for Catalysis Today 2020, Guest Editors Mannar Ram Maurya, Sibudjing Kawi, Debbie C. Crans
16. "JIB @ 50 – a jubilee special issue" 50<sup>th</sup> anniversary organized by Debbie C. Crans, Angela Casini, Stephen G. Sligar, Takashi Hayashi, Martin J. Stillman, Rachel Codd and John H. Dawson, *J. of Inorg. Biochem.* **2021** (251) 111621, <https://doi.org/10.1016/j.jinorgbio.2021.111621>
17. Special Issue for Catalysis Today 2021, Guest Editors Mannar Ram Maurya, Sibudjing Kawi, Debbie C. Crans

**Invited Publications (not refereed; undergraduate coauthors underlined)**

1. "Interaction of polyoxovanadates and selected polyoxomolybdates with proteins," Debbie C. Crans in "Polyoxometalates: From Platonic solids to anti-retroviral activity" Müller, A.; Pope, M. T. (Eds) Kluwer Academic Publishers, **1993**, 399-406.
2. "Aqueous chemistry of labile oxovanadates: Of relevance to biological studies," Debbie C. Crans in *Comments on Inorganic Chemistry*, **1994**, *16*, 1-33.
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5. "Inhibition of phosphate-metabolizing enzyme by oxovanadium complexes," Paul J. Stankiewicz, Debbie C. Crans, and Alan S. Tracey, in *Vanadium and Its Role for Life*, Sigel, H. and Sigel, A. (Eds.), Marcel Dekker, Inc., New York, Volume 31 in *Metal Ions in Biological Systems*, **1995**, 287-324.
6. "Interactions of vanadates with biogenic ligands," Debbie C. Crans, in *Vanadium and Its Role for Life*, Sigel, H. and Sigel, A. (Eds.), Marcel Dekker, Inc., New York, Volume 31 in *Metal Ions in Biological Systems*, **1995**, 147-209.
7. "Biological chemistry: Representative areas and approaches," Debbie C. Crans, *Women's Contribution to Chemistry and Chemical Engineering*, Puskas, J. E. (Ed.), Polysar, Anaheim, **1995**, 209th ACS National Meeting, 37-61.

8. "Oxovanadate and oxomolybdate cluster interactions with enzymes and whole cells," Debbie C. Crans and Gail Willsky Adapted from the Proceedings the 25th Steenbock Symposium, June 10-14th, 1997, published by the University of Wisconsin-Madison, **1997**, p. 116-125.
9. "Chemistry of relevance to vanadium in the environment," Debbie C. Crans, Shahid Amin, Anastasios D. Keramidas; in *Vanadium in the environment, Part I*, J. Nriagu, Ed.; John Wiley & Sons, Inc.: New York, **1998**, Vol. 30, pp. 73-96.
10. "Tetravanadate, decavanadate, Keggin and Dawson oxotungstates inhibit growth of *S. cerevisiae*" Debbie C. Crans, Harvinder S. Bedi, Sai Li, Boyan Zhang, Kenji Nomiya, Noriko C. Kasuga, Yukihiro Nemoto, Keijchi Nomura, Kei Hashino, Yoshiraka Sakai, Yosief Tekeste, Gary Sebel, Lori-Ann E. Minasi, Jason J. Smee and Gail R. Willsky. In "Polyoxometalate chemistry for nanocomposite design" Eds. Toshihiro Yamase and Micheal T. Pope, Kluwer Academic/Plenum Publishers, **2002**, p. 181-196.
11. "Transition and heavy metal ions complex formation with 2,5-pyridinedicarboxylic acid". E. Norkus, I. Stalnioniene and D. C. Crans "Chemistry and Technology of Inorganic Compounds". Conference proceedings (Eds. V. Janickis and V. J. Sukyte), Kaunas **2002**, 107-109.
12. "Identification of gene expression changes in skeletal muscle from diabetic rats corrected by oral administration of vanadyl sulfate" Gail R. Willsky, Lai-Har Chi, and Debbie C. Crans, *BITREL 2002. Proceedings of International Symposium on Bio-Trace Elements 2002* **2003**, 119-124.
13. "Vanadium" in *Comprehensive Coordination Chemistry Reviews* 2<sup>nd</sup> edition. Debbie C. Crans, and Jason J. Smee, **2004**, 4.175-239
14. "Recent advances and highlights of the 5<sup>th</sup> International vanadium symposium" Joao Costa Pessoa, Debbie C. Crans and Kenneth Kustin ACS Symposium Series 974 (*Vanadium: The Versatile Metal*) **2007** p. xi to xliii
15. "Interaction of decavanadate with model lipid interfaces" in *Vanadium Biochemistry*, Ed. Manuel Aureliano Alves "Research Signpost" Debbie C. Crans, Bharat Baruah, C. Ryan Murphy **2007**, p. 1-13
16. "Introduction" Debbie. C. Crans and Franc Meyer in "*Modern coordination chemistry and its impact for meeting global challenges*" Debbie C. Crans and Franc Meyer. Developed from the 2011 Zing Coordination Chemistry Conference, Dec. 5-9, 2011. *Eur. J. Inorg. Chem.* **2012**, p. 4521-4523
17. "Preface" for the Forum on metals in medicine and health: New opportunities and approaches to improving health" Debbie C. Crans, and Thomas J. Meade *Inorg. Chem.* **2013**, 52, 12181-12183. IC Forum.
18. "Vanadium in inorganic chemistry: excerpts from the 8<sup>th</sup> International Vanadium Symposium" Editorial by Craig C. McLauchlan and Debbie C. Crans, *Dalton's Trans.* **2013**, 42, 11744-11748. Developed from the 2011 International vanadium chemistry conference (V8), August, 2011. We obtained the inside cover for Dalton's Transactions issue.
19. "Modern coordination chemistry 100 years of Werner" Editorial by Debbie C. Crans and Ebbe Nordlander. Developed from the **2013** Zing Coordination Chemistry Conference, Dec. 5-9, 2013. *Eur. J. Inorg. Chem.* **2014**, 27, 4413-4416. The volume is featured on the back cover of *Eur. J. Inorg. Chem.*
20. "Preface: Celebrating vanadium science with leading bioinorganic contributions from the 9th International Vanadium Symposium" Debbie C. Crans, Andrew Ghio and Valeria Conte. *J. Inorg. Biochem.* **2015**, 147, 1-3.
21. "Introduction" to the New Journal of Chemistry Journal in "Emergent Polyoxometalates and Soft-oxometalates, including clusters having related compositions" by Debbie C. Crans and Soumyajit Roy in *New J. Chemistry*, **2016**, 40, 882-885.
22. "Preface: Applications of speciation chemistry in a modern society" Debbie C. Crans in *Coord. Chem. Rev.* **2017**, 352, 398-400.
23. "Introduction" in "Metal Nanoparticles: Synthesis and Applications in Pharmaceutical Sciences" Ed. Sreekanth Thota and Debbie C. Crans, **2018**, 1-14.
24. "Time has come for an Overdue Resurgence of "Speciation" Chemistry" Debbie C. Crans in IUPAC Magazine Chemistry International, April, **2018**.

25. “Coordination compounds and catalysis Preface” Georgiy B. Shul’pin, Debbie C. Crans, Luisa M. Martins and Kamran T. Mahmudov *Coord. Chem. Rev.* **2019**, 380, 600-600
26. “Vanadium Compounds as enzyme inhibitors with a focus on anticancer effects” Debbie C. Crans, Noah E. Barkley, Liliana Montezinho and M. Margarida Castro in *Metallobiology Series No. 14 “Metal-based Anticancer Agents”* Editors Angela Casini, Anne Vassieres and Samuel M. Meier-Menches, **2019** Chap 7, pp 169-195, Royal Society of Chemistry.
27. “Editorial: Polyoxometalates in Biology, Catalysis, Energy and Materials Science” Soumyayit Roy, Debbie C. Crans and Tatjana N. Parac-Vogt *Frontiers in Chemistry*, **2018-2019**
28. “Vanadium Science: chemistry, catalysis, materials, biological and medicinal studies” Debbie. C. Crans, Dinorah Gambino, and Susana B. Etcheverry, *New Journal of Chemistry*, **2019**, 43 (45), 17535-17537
29. “Vanadium compounds as Indirect Activators of a G Protein-Coupled Receptor” Duaa Alhumairy, Heide A. Murakami, Rachel Colclough, B. George Barisas, Deborah Roess and Debbie C. Crans, “Vanadium Catalysis” Editors, **2020** Chap 21, Royal Society of Chemistry.
30. “Vanadium – speciation chemistry is important when assessing health effects on living systems” Chapter 6 in *Metal Toxicology Handbook*, Taylor & Francis Group, **2021**, Debbie C. Crans, Kahoana Postal, and Judith A. MacGregor
31. “2020 Rocky Mountain Virtual Meeting Book of Abstracts: Celebrating 100 Years of Chemistry in the Rockies” Kateryna Kostenkova and Debbie C. Crans
32. “JIB @ 50 – a jubilee special issue” Preface and Cover for the 50<sup>th</sup> anniversary organized by Debbie C. Crans, Angela Casini, Stephen G. Sligar, Takashi Hayashi, Martin J. Stillman, Rachel Codd and John H. Dawson, *J. of Inorg. Biochem.* **2021** (xxxx) 111621, <https://doi.org/10.1016/j.jinorgbio.2021.111621>
33. Preface for Special Issue for Catalysis Today, Mannar Ram Maurya, Sibudjing Kawi, Debbie C. Crans

**Patents:**

United States Patent; Patent Number: 4,701,285; Date of Patent: Oct. 20, 1987. “Acyl Phosphate Salts and Their Use,” George M. Whitesides, Debbie C. Crans, and Romas J. Kazlauskas.

**Funding:**

Crans research projects have strong collaborative aspects thus much funding has been collaborative. Currently funded by NSF, Arthur Cope Foundation, Colorado State University and private corporate sponsors.

**Teaching:****Undergraduate**

General Chemistry II (CHEM113)  
 Fundamentals of Inorganic Chemistry (CHEM261)  
 Introduction to Research (NS 295, NS296)  
 Organic Chemistry I and II (CHEM341, CHEM343, CHEM345, CHEM346)  
 Clinical Chemistry (CHEM433)  
 Senior Seminar (CHEM493 Capstone Class)  
 Independent Study (CHEM495)  
 Undergraduate Research (CHEM498)

**Graduate**

Principles of Chemical Biology (CHEM521)  
 Organic Molecular Structure Determination (CHEM541)  
 Structure/Mechanisms in Organic Chemistry (C543)  
 Physical Organic Chemistry (CHEM547)  
 Physical Methods in Inorganic Chemistry: Magnetic Spectroscopies (CHEM563D)  
 Biological Chemistry (CHEM651 Special Topics)  
 Bioinorganic Chemistry (CHEM651 Special Topics)



Bioinorganic and Medicinal Chemistry (CHEM566)  
Introduction to Cell and Molecular Biology (CM510 Cell contribution on metabolism)  
Seminar Series, Introduction to the Seminars (C792)

**Teaching Innovation**

Dr. Crans's teaching innovation is apparent both at the undergraduate and graduate levels. At the undergraduate level she developed teaching materials using i-clickers in CHEM341 Modern Organic Chemistry. Seeing a need to help introduce undergraduates to research, she created NS295 and NS296 Introduction to Research. She incorporated service-learning approaches into CHEM261 Fundamentals of Inorganic Chemistry as well as NS295 and NS296 Introduction to Research classes. She has included inclusionary practices in the CHEM493 Senior Seminar.

At the graduate level she is currently updating CHEM521 Principles of Chemical Biology to have a more general approach that includes ongoing work in the various laboratories at CSU. In the past she developed CHEM541 Organic Molecular Structure Determination, which includes a combination of theory, workshops covering real spectroscopic problems in the department and a hands-on section, where the students determine components of an unknown sample using methods they learned in the course. This class has been taught for more than 20 years and has become a critical stepping-stone for the incoming beginning organic graduate students. In addition, Dr. Crans has taught C543 Structure/Mechanisms in Organic Chemistry and CHEM547 Physical Organic Chemistry, as well as Bioorganic Chemistry, and Bioinorganic and Medicinal Chemistry as special topics courses

**Outreach and Service Learning:**

Throughout her career, Dr. Crans has worked to bring state-of-the-art science experiments and college student role models to elementary and middle schools in Colorado. The focus has been on activities in schools that are more distant from universities in Colorado. She has initiated and run school science fairs, special science events as well as assisting 2<sup>nd</sup> grade teachers in development of science experiments during curriculum changes. Some of these activities comprised a NSF grant and others as part of teaching assignments at CSU. As a result, service-learning components have been included in Fundamentals of Inorganic Chemistry (CHEM261) and in the Introduction to Research Class (NS295, NS296). Occasionally service-learning activities have been used as extracurricular activities in the Organic Chemistry classes

**Invited Seminars at Universities and Conferences (\* denotes international invitations):****1987**

Dept. Biochemistry, Colorado State University, Fort Collins, CO (April 6)  
Dept. Chemistry, University of Denver, Denver, CO (June 4)

**1988**

\*Dept. Organic Chemistry, Kemisk Laboratorium II, H. C. Orsted Institut, Copenhagen, Denmark (February 8)  
Dept. Chemistry, University of Kansas, Lawrence, KS (April 7)  
Dept. Engineering, Colorado State University, Fort Collins, CO (November 4)

**1989**

"Physical Organic Chemistry Gordon Conference" at Holderness School, Plymouth, NH (June 12-16)  
"Twentieth Annual NSF Workshop on Organic Synthesis and Natural Products Chemistry" (WOSNPC-XX)" Minary Conference Center, Plymouth, NH (July 12-16)  
\*"Fourth International Conference on Bioinorganic Chemistry (ICBIC4)" minisymposium on "Environmental and Trace Element Bioinorganic Chemistry" at MIT, Cambridge, MA (July 24-28)  
Cellular and Molecular Biology Program, Colorado State University, Fort Collins, CO (September 21)  
Dept. Chemistry, Colorado State University, Fort Collins, CO (November 3)  
"Annual Cellular and Molecular Biology Conference," Colorado State University, Fort Collins, CO (November 8)  
Dept. Chemistry, Carnegie Mellon University, Pittsburgh, PA (November 30)  
Department of Chemistry, Fort Lewis College, Durango, CO (December 8)

- \*"1989 International Chemical Congress of Pacific Basin Societies" symposium on "Polyoxymetal Cluster Complexes: Reactivity, Structures, and Biological Activity" Honolulu, HI (Dec. 17-22, 1989)  
\*"1989 International Chemical Congress of Pacific Basin Societies" symposium on "Polyoxymetal Cluster Complexes: Reactivity, Structures, and Biological Activity" Honolulu, HI (Dec. 17-22, 1989)

**1990**

- Sigma Xi, Colorado State University, Fort Collins, CO (February 9)  
Dept. Chemistry, Colorado College, Colorado Springs, CO (February 13)  
Dept. Chemistry, University of Colorado, Boulder, CO (February 20)  
Dept. Chemistry, University of New Hampshire, Durham, NH (April 26)  
Dept. Chemistry, Brandeis University, Waltham, MA (April 30)  
\*Dept. Chemistry, University of Hamburg, Germany (July 30)  
Dept. Chemistry, University of Wyoming, Laramie, WY (October 11)  
Dept. Chemistry, Syracuse University, Syracuse, NY (November 20)

**1991**

- Dept. Chemistry, Florida State University, Tallahassee, FL (January 10)  
Dept. Chemistry and Biochemistry, Emory University, Atlanta, GA (January 11)  
Chemistry Division, Los Alamos, NM (January 17)  
Dept. Chemistry, University of New Mexico, Albuquerque, NM (January 18)  
"Metals in Biology" Gordon Conference, Ventura, CA (January 28-February 1) (short-talk)  
Dept. Chemistry, University of Missouri, St. Louis, MO (February 5)  
Dept. Chemistry, Southern Illinois University, Carbondale, IL (February 6)  
Dept. Chemistry, Eastern Illinois University, Charleston, IL (February 7)  
Dept. Chemistry, Bradley University, Peoria, IL (February 8)  
Dept. Chemistry, Illinois State University, Normal, IL (February 9)  
Dept. Biochemistry, Purdue University, West Lafayette, IN (February 18)  
Dept. Chemistry, Purdue University, West Lafayette, IN (February 19)  
Dept. Chemistry, University of Illinois, Urbana-Champaign, IL (February 20)  
Argonne National Laboratory, Chicago, IL (February 21)  
Dept. Chemistry, University of Chicago, IL (February 22)  
Dept. Biochemistry, University of California, Berkeley, CA (March 4)  
Dept. Chemistry, Santa Cruz, NM (March 6)  
Dept. Chemistry, University of California, Los Angeles, CA (March 7)  
Dept. Chemistry, University of Reno, NV (March 15)  
Dept. Chemistry, Georgetown University, Washington, DC (April 1)  
Dept. Chemistry, Johns Hopkins University, Baltimore, MD (April 2)  
National Institutes of Health, Washington, DC (April 3)  
Dept. Chemistry, University of Georgia, Athens, GA (April 11)  
Dept. Chemistry, Georgia State University, Atlanta, GA (April 12)  
Dept. Chemistry, University of Utah, Salt Lake City, UT (April 30)  
Dept. Chemistry, Utah State University, Logan, UT (May 1)  
Dept. Chemistry, Brigham Young University, Provo, UT (May 2)  
"Tenth NSF Workshop on Reactive Intermediates (WORI)" Miramar Hotel and Resort, Santa Barbara, CA (May 17-21)  
Dept. Chemistry, Stanford University, Stanford, CA (May 22)  
Dept. Chemistry, University of Toronto, Ontario, Canada (May 28)  
Dept. Chemistry, McGill University, Montreal, Quebec, Canada (May 29)  
Dept. Biochemistry, Merck Frosst Centre, Point Claire-Dorval, Quebec, Canada (May 30)  
Gordon Conference in Physical Organic Chemistry, Plymouth, NH (June 10-14)

**1992**

- Dept. Chemistry, Southern Illinois University, Carbondale, IL (February 26)  
Dept. Chemistry, St. Louis University, St. Louis, MO (February 27)  
Dept. Chemistry, University of Missouri, Columbia, MO (MASUA Lecture) (February 28)

Dept. Chemistry, State University of New York, Buffalo, NY (March 16)  
Dept. Biochemistry, State University of New York, Buffalo, NY (March 17)  
Dept. Chemistry, Nebraska Wesleyan College, Lincoln, NE (April 22)  
Dept. Chemistry, University of Nebraska, Lincoln, NE (MASUA Lecture) (April 23)  
Dept. Chemistry, University of Nebraska, Lincoln, NE (MASUA Lecture) (April 23)  
Dept. Chemistry, University Nebraska, Omaha, NE (April 24)  
Dept. Chemistry, Creighton College, Omaha, NE (April 24)  
Dept. Chemistry, University of Nebraska, Lincoln, NE (April 25)

**1993**

Dept. Chemistry, Oregon State University, Corvallis, OR (January 11)  
Dept. Chemistry, Southern Oregon State University, Ashland, OR (January 12)  
"Bioinorganic Chemistry" Symposium 205th ACS Meeting, Denver, CO (March 28-April 5)  
Johnson Matthews, Inc., West Chester, PA (May 19)  
Fox Chase Cancer Research Institute, Philadelphia, PA (May 20)  
\*4th International Symposium on Structure and Function of Roots, Slovak Academy of Sciences, Bratislava (June 20-26)  
"Enzymes, Coenzymes and Metabolic Pathways," Gordon Conference, Kimbal Union Academy, Meriden, NH (July 19-23)  
"Carbohydrates" Gordon Conference, Tilton College, NH (July 5-10)  
"Biochemistry of Vanadium" Symposium in The 45th Southeast Regional Meeting of the American Chemical Society, Johnson City, TN (October 17-20)  
Dept. Chemistry, University of Tennessee, Knoxville, TN (October 20)

**1994**

Dept. Chemistry, William & Mary University, Williamsburg, VA (Howard Hughes Lectureship) (February 25)  
Dept. Chemistry, University of Delaware, Newark, DE (February 28)  
Dept. Chemistry, University of Alberta, Alberta, Canada (October 7)

**1995**

Bayer (then Miles) Company, West Haven, CT (January 10-11)  
\*Department of Chemistry, Simon Fraser University, Vancouver, British Columbia, Canada (February 27)  
\*University of British Columbia in the Modern Chemistry Lecture Series, Vancouver, British Columbia, Canada (Feb. 28)  
\*Dept. Chemistry, University of Victoria, Victoria, Canada (March 2)  
Dept. Chemistry, University of Washington, Seattle, WA (March 3)  
209th ACS meeting, Symposium "Women's Contributions to Chemistry and Chemical Engineering," Anaheim, CA (April 2-7)  
209th ACS meeting, "Award Symposium for Margaret Cavenaugh", Anaheim, CA (April 2-7)  
\*13th International Conference on Phosphorus Chemistry (ICPC) Jerusalem, Israel (July 17-21)  
\*Pacifichem 1995 International Chemical Congress of Pacific Basin Societies in the symposium, Honolulu, HI (December 17-22)  
\*Pacifichem 1995 International Chemical Congress of Pacific Basin Societies, in the symposium Honolulu, HI (December 17-22)

**1996**

13th Rocky Mountain Regional ACS Meeting in the Symposium "Metalloenzymes: Structure, Function, Mechanism and Models," Denver, CO (June 9-12)  
\*VI World Conference on Clinical Pharmacology and Therapeutics, Buenos Aires, Argentina (August 4-9)

**1997**

213th ACS Meeting in the Symposium "Redox Reactions in Natural and Engineered Aqueous Systems." subsections Natural Systems: Inorganics, San Francisco, CA (April 13-17)  
25th Steenbock Symposium, Topic: "Biosynthesis and Function of Metal Clusters for Enzymes" University of Wisconsin, Madison, WI (June 10-14)  
Orville L. Chapman Symposium, University of California, Los Angeles, CA (July 12)

Inorganic Chemistry Gordon Conference, Salva Regina University, Newport, RI (July 20-24)

\*ICBIC8, in the "Vanadium" session, Yokohama, Japan, (July 28-August 1)

\*Research Institute, University of Tokyo, Yokohama Campus, Japan (July 30)

\*The Fifth Chemical Congress of North America in the Symposium "Chemistry, Biochemistry, and Therapeutic Applications of Vanadium", Cancun, Mexico (November 11-15)

**1998**

General Electric, Schenectady, NY (January 15)

U. Rochester, Rochester, NY (January 16)

216<sup>th</sup> ACS Meeting, Boston, Aug. 23-27, 1998 in the Symposium on "H-Bonding in Inorganic Chemistry"

National Minority Research Symposium, New York City, NY (November 11-14)

**1999**

Dept. Chemistry, University of Indiana (March 10)

Dept. Biochemistry, University of Indiana (March 11)

Dept. Chemistry, University of Louisville (March 12)

**2000**

Stereochemistry Gordon Conference, Rhode Island, June 2000

New Mexico Institute of Mining and Technology Oct. 13, Socorro, New Mexico

\*Polyoxometalate symposium at Pacificchem, Honolulu, Hawaii, Dec. 14-19.

**2001**

Department of Chemistry, University of Szeged, Hungary (March 5)

Plenary lecture, Yearly Humboldt meeting, Bamberg, Germany (March 29-31)

Department of Chemistry, University of Hamburg, Germany (May 9)

Department of Chemistry, University of Bielefeld, Bielefeld, Germany (July 19)

Vanadium Symposium, ICBIC, Florence, Italy August 26-31

Department of Chemistry, University of Münster, Münster, Germany (Sept. 5)

Department of Chemistry, Nara Women University, Japan (Nov. 9)

Department of Applied Chemistry, Faculty of Engineering, University of Osaka, Japan (Nov. 12)

Mukaishima Marine Biological Laboratory, Faculty of Science and Laboratory of Marine Molecular Biology, Hiroshima University, Hiroshima, Japan (Nov. 15)

Department of Chemistry, Toyama University, Toyama, Japan (Nov. 19)

The 3<sup>rd</sup> Vanadium Symposium, Osaka, Japan (Nov. 27-29)

**2002**

223<sup>rd</sup> ACS meeting, Orlando, Florida, April 7-11, 2002 "Paramagnetic NMR Spectroscopy of Transition Metal Complexes with and without Insulin-Like Properties," Ernestas Gaidamauskas, Luqin Yang, and Debbie C. Crans, Department of Chemistry, Colorado State University, Fort Collins, CA 80523-1872

223<sup>rd</sup> ACS meeting, Orlando, Florida, April 7-11, 2002 "Effects of Oxotungstates and Oxomolybdates on Growth of *S. cerevisiae*" Debbie C. Crans, Cristina Rosu, Achim Muller, Gail R. Willsky, and Kenji Nomiya

Metal in Medicine, "Introducing the topic of Chromium and vanadium as nutritional elements" first Gordon Conference on Metals in Medicine, 2002

224<sup>th</sup> ACS meeting, Boston, MA, August 18-22, 2002 "Can the coordination chemistry of a series of transition metal dipicolinate complexes predict the restoration of the altered metabolism of diabetes to normal?" Debbie Crans, Luqin Yang, Ernestas Gaidamauskas, Lai-Har Chi, Josephine A. Alfano, and Gail R. Willsky.

Department of Chemistry, Colorado School of Mines, Oct. 8

Cargill Inc. Nov. 12

New Mexico State, Dec. 4. "Making Ice Cream from Milk, Sugar, Vanilla and Liquid Nitrogen: A Strategy to Introduce Science at K-12

New Mexico State, Dec. 5, "Diabetes, Combating one of Americas Heavyweights"

New Mexico State Chemistry Department Dec. 5, "Chemistry and insulin mimetic properties of vanadium and other transition metal complexes"

New Mexico State, Dec. 6 “Mentoring and being Mentored”

**2003**

Inorganic Reaction Mechanisms, Newcastle, England, Jan. 7-9<sup>th</sup>, 2003.  
University of Southern California

**2004**

“Anion Recognition Symposium” ACS meeting in Anaheim, March 28-April 1, Anaheim California  
NIH, Raleigh, North Carolina July 28  
Award Lecture, The Fourth International Symposium on Chemistry and Biological Chemistry of Vanadium, Szeged  
Hungary 3-5 September  
NIH, Charlotte, North Carolina  
The Orville L. Chapman Memorial Symposium, UCLA, LA, California, Sept. 27, 04  
University of North Carolina, Charlotte Oct. 3, 2004

**2005**

University of Southern California, February 13, 2005  
NIH, Charlotte, North Carolina August 17-18<sup>th</sup> 2005  
ACS meeting in San Diego, March 13-17<sup>th</sup>, 2005  
3<sup>rd</sup> SFB Congress “Metal Mediated Reactions Modeled after Nature” 2005, Jena, Germany, September 25-29, 2005.\*  
University of Arkansas, Nov. 21  
Pacifichem, Dec. 2005

**2006**

USC, February 2006  
ACS meeting in San Diego, March 2006  
Metal in Medicine, Gordon Conference, Oxford, England\*  
NIH, Charlotte, North Carolina  
The fifth International Symposium on Chemistry and Biological Chemistry of Vanadium, ACS meeting in San Francisco,  
September 2006\*  
Texas A & M, October 2006

**2007**

USC, March 2007  
ACS Lecturer at Truman University, Fall 2007  
Dept. Chemistry, University of Texas, El Paso  
“Structure and dynamics at Interfaces in reverse micelles” Nancy E. Levinger, Debbie C. Crans, and Bharat Baruah, 233<sup>rd</sup>  
National Meeting of the American Chemical Society, Chicago, IL  
“Interactions of oxovanadates with lipid interfaces” Debbie C. Crans and Bharat Baruah, 234<sup>th</sup> ACS National Meeting,  
Boston, MA  
NIH, Charlotte, Raleigh Summer 2007  
ICBIC 13, July 2007\*

**2008**

USC, Spring 2008  
ACS meeting in New Orleans, Louisiana, Spring 2008  
Medicinal Chemistry Gordon Conference (Invited Fellow)  
Dept. Chemistry, University of Southern Florida, Tampa  
Dept. Chemistry, New Mexico State University, Las Cruces, NM  
“Using the reverse micellar environment to change the coordination chemistry of vanadium” Debbie C. Crans, Bharat  
Baruah, and Nancy E. Levinger, ACS Philadelphia ACS meeting  
“NMR studies of aerosol-OT reverse micelles with alkali and magnesium counterions” Michelle L. Stahla, Debbie C.  
Crans and Nancy E. Levinger, ACS meeting in New Orleans, 2008

“Probing interactions of insulin enhancing vanadium compounds with lipid interfaces” Debbie C. crans, Muhammad A. Choudhary, Ernestas Gaidamauskas, Bharat Baruah, Sandra Bonetti, Sandra S. Eaton, Nancy E. Levinger, Deborah A. Roess, Gail R. Willisky, Steve Distin, Riki Gordon, Audra G. Sostarecz, ACS meeting New Orleans, 2008

**2009**

“Diabetes and vanadium compounds” NIH Bridges to the Doctorate Program, CSU/Pueblo Seminar Series, February 19, 2009

“Studies with simple compounds in microemulsions – relevance to the current controversies regarding Overton’s rule and lack of compliance with Lipinski’s rule” Debbie C. Crans in *Ken Karlin Award Symposium*, ACS meeting, Salt Lake City, Utah, 2009

“<sup>51</sup>V Solid-state NMR and density-functional theory studies eight-coordinate non-oxo vanadium(V) complexes: Amavadin” Kristopher J. Ooms, Stephanie E. Bolte, Bharat Baruah, Muhammad Aziz Choudhary, Debbie C. Crans, Tatyana Polenova, NO Symposium, ACS meeting, Salt Lake City, Utah, 2009

“Probing interactions of vanadium(IV) dipicolinate in AOT Reverse Micelles” Ernestas Gaidamauskas, Sandra J. Bonetti, Debbie C. Crans and Sandra S. Eaton, in the Undergraduate Symposium, ACS Meeting, Salt Lake City, Utah, 2009

“Complexation of bisphosphonates with ytterbium(III): Application of Yb<sup>3+</sup>-pyrocatechol complex for solute sensing” Ernestas Gaidamauskas, Kanokkarn Saejueng, Alvin A. Holder, Subalitat Bharat, Helen Parker, Boris A. Kashemirov, Debbie C. Crans, Charles E. McKenna, ACS meeting, Salt Lake City, Utah, 2009

“Insulin enhancing vanadium (and other transition metal ) complexes and progresses toward therapeutic treatment”, Debbie C. Crans, XXII International Conference on Coordination and Bioinorganic Chemistry, Smolenice, Slovakia, June 7-12, 2009

**2010**

Bioinorganic Research Conference, Gordon Research Seminar January

Metals in Medicine, Gordon Conference, Chair, July 25-Aug 2

New Mexico State University, MARC Program

International Vanadium Symposium, Toyama, Japan, Oct. 7-9

**2011**

Award Presentation for the Colorado Section ACS Award, Colorado State University, March 7

University of Southern California, August

ACS Spring meeting, Anaheim, Inorganic Chemistry

ACS Fall meeting, Denver, Colloid Division

National Jewish Health, Denver, Colorado, September

NREL Boulder, November 10

Montana State University, November 21

University of Montana, November 22

Zing Coordination Chemistry Conference 2011

**2012**

ACS meeting San Diego, Metals in Medicine Spring San Diego

NJC Symposium, The University of Hong Kong April 23

NJC Symposium, East China University of Science and Technology, April 25

NJC Symposium, Institute of Chemistry, Chinese Academy of Sciences, April 27

Metals in Medicine, GRC, July 2012

International Vanadium Symposium, Crystal City, Virginia, USA

ACS meeting Philadelphia, Aug. 19-23 Memorial Symposium for Michelle Millar

ICOM25 Lisboa, Portugal Sept 4

University of Toulouse, Toulouse, France Sept.8

ICCC40 Valencia, Spain, Sept 10

Award Lecture, Symposium of Japan Society of Coordination Chemistry (JSCC), Sept. 21-23

National Cheng-Kung University, Tainan, Sept. 25

Academia Sinica, Taipei, Ty Sept. 26

National Tsing Hua U, Sept. 27

Rocky Mountain Regional ACS Meeting, Oct. 17-19, Multiple talks in the symposium entitled "Reactions in Lipid and Lipid-Environments and applications of the Chemistry"  
New Mexico State, Dec. 4, Las Cruces, New Mexico

**2013**

Zing Bioinorganic Chemistry Conference, February

ACS meeting Anaheim, Spring

"Soft Oxometalates (SOMs): Design and Applications" 15th Asian Chemical Congress (ACC), Aug. 19-23 Singapore School of Chemistry, University of Science, Suranaree U of Technology, Nakhon Ratchasima 30000, Thailand

Depart Chemistry, National University of Rio Cuarto, Rio Cuarto, Cordoba, Argentina

"Werner Symposium" 247<sup>th</sup> National ACS meeting in Indianapolis, Sept. 2013

XIX National Symposium on Organic Chemistry (XIX SINAQO), Nov. 16 to 19, 2013 in Mar del Plata, Argentina

**2014**

University of Utah, February, 2014

247<sup>th</sup> National ACS meeting in Dallas, March 16-20 2013

New J. Chemistry Symposium, Karolinska Institute, Stockholm, Sweden, April 20-22, 2014

New J. Chemistry Symposium, Lund University, Land, Sweden, April 23, 2014

Metals in Medicine Gordon Conference, Procter Academy, June 22-27<sup>th</sup> 2014

Collaborative Conference for Materials Research, June 23-27<sup>th</sup>, Songdo Convensia, Incheon/Seoul, South Korea  
(Declined)

International Vanadium Symposium, June 29-July 2, 2014

Keynote lecture, ICC-41 Singapore, July 21-25, 2014

248<sup>th</sup> ACS Meeting in San Francisco, Symposium to honor Kenneth Kustin Aug. 10-14, 2014

Department of Chemistry, University of Vilnius, Lithuania, Nov. 3

The Institute of Chemistry Center for Physical Sciences and Technology, Vilnius, Lithuania, Nov. 4

Dept. Chemistry, Wuhan University, Nov. 24, 2014

**2015**

Plenary presentation (Section III). "Undergraduate Research - A Tool to Explore Chemistry and Excite" 209th Two-Year College Chemistry Consortium Conference Front Range Community College – Westminster Campus

249<sup>th</sup> ACS Meeting in Denver, CO March 22-26, 2015 "Interactions of Metal Complexes with Proteins or Nucleic Acids"

249<sup>th</sup> ACS Meeting in Denver, CO March 22-26, 2015 "Symposium to Honor Kim Dunbar for receiving the 2015 ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry"

249<sup>th</sup> ACS Meeting in Denver, CO March 22-26, 2015 "Symposium to Honor Jacqueline Kiplinger for receiving the 2015 ACS Albert Cotton award for Synthetic Inorganic Chemistry"

"Data mining transition state complexes of phosphatases: Inhibitor design and mechanistic studies" New Journal of Chemistry, University of Montreal, Montreal, Quebec, June 2

"Chemistry in nanosized water droplets" New Journal of Chemistry, McGill University, Montreal, Quebec, June 3

"Metals in Medicine – anticancer and antidiabetic drugs" New Journal of Chemistry, University of York, Toronto, Canada, June 5

"Electron transfer reactions in confined spaces" North Campus Cronenbourg, Strasbourg, France, 2015

"Drug membrane interactions and uptake as key aspects of drug action" University of Strasbourg, France, 2015

"Is the geometry of vanadium in the active site of phosphatase important to the design and antidiabetic properties of vanadium compounds" University of Strasbourg, France, 2015

"Pyrazinamide and related drugs act through changes in the protomotive force" University of Strasbourg, France, 2015

"Is the geometry of vanadium in the active site of phosphatase important to the design and antidiabetic properties of vanadium compounds" University of Toulouse, June 24, 2015

College of Life Science, Graduate University of Chinese Academy of Sciences, Beijing 100049, China July

National Laboratory of Natural and Biomimetic Drugs, Dept. Chemical Biology, School of Pharmaceutical Sciences, Peking University Health Science Center, HaiDion District, Beijing 100083, P.R. China

Keynote lecture, ICBIC17, Beijing, China 2015

- Award lecture, 250<sup>th</sup> ACS meeting Cope Scholar Symposium “Characterization of the structures and properties of organic vanadium complexes and applying these principles to understand the impact of different coordinated ligands on anti-diabetic activity” Aug. 18
- International Research Collaboration Lecture, University of Sydney, Sydney Australia Oct. 30 and Nov. 4<sup>th</sup>
- Inorganic Chemistry Collogium, University of Melbourne, Melbourne, Australia, Nov. 10
- Australian Chemical Society Lecturer, Department of Chemistry, University of Melbourne, Melbourne, Australia, Nov. 11
- Plenary Lecture, MTIC-XVI, Dept. Chemistry, Jadavpur University, India, 2015
- “Speciation and its importance in drug administration and mode of action of metal based drugs” 1st International Symposium on Clinical and Experimental Metallodrugs in Medicine: Cancer Chemotherapy, Dec. 13-15 the Sullivan Center, University of Hawaii Cancer Center, Honolulu, Hawaii.
- “Distortions in decavanadates and how that may impact interactions with biological interfaces” Polyoxometalate Symposium, Pacifichem, Honolulu, Hawaii, Dec. 15-20
- “Changes in properties of sulfur containing microbial chelator by nanoconfinement” Organo Sulfur Symposium, Pacifichem, Honolulu, Hawaii, Dec. 15-20

**2016**

- University of Texas, El Paso, Feb. 8
- University of New Mexico Las Cruces, Feb. 9
- “Coordination chemistry of vanadium combined with ligand properties lead to effective phosphatase inhibitors with potential antidiabetic properties” 251<sup>st</sup> ACS meeting, San Diego, Presidential Symposium, March 13-19<sup>th</sup> 251<sup>st</sup> ACS meeting, San Diego, Award Symposium for Vincent Pecoraro, March 13-19<sup>th</sup>
- Dalton Discussions, England, March 29-30
- Idless Seminar, University of New Hampshire, April 4, Named lectureship
- Idless Seminar, University of New Hampshire, April 5, Named lectureship
- New York University, April 22
- 2016 Metals in Medicine GRC June 26<sup>th</sup> - July 1; NSF – Power – empowering women
- “Design of the geometry of antidiabetic vanadium compounds using phosphatase active site complementarity” ICC42, Brest, France July 3-8, 2016; <http://iccc2016.sciencesconf.org>, Keynote lecture
- 252<sup>th</sup> ACS meeting, August 21-25, 2016 Philadelphia, Pennsylvania (presented invited lecture Inorganic Lectureship award for Serena Debeer, Division of Inorganic Chemistry)
- 252<sup>th</sup> ACS meeting, August 21-25, 2016 Philadelphia, Pennsylvania Symposium (presented an invited Second Sphere Coordination Chemistry symposium, Division of Inorganic Chemistry)
- 252<sup>th</sup> ACS meeting, August 21-25, 2016 Philadelphia, Pennsylvania (presented an oral contributed presentation in the Colloid Division)
- 3rd Int. Symp. on Molecular Neurodegenerative Disease Res. (ISMNDR) at KAIST (Daejeon, South Korea)
- 10<sup>th</sup> International Vanadium Symposium, Howard International House, Taipei, Taiwan, Nov. 8-10, 2016, plenary lecture
- Catalysis and Fine Chemicals (C&FC) 2016, Howard International House, Taipei, Taiwan, Nov. 10-14, Bioinorganic and bioorganic chemistry section – Topic: Benzoic acid
- Catalysis and Fine Chemicals (C&FC) 2016, Howard International House, Taipei, Taiwan, Nov. 10-14, Catalysis – topic: Vanadium chemistry
- 8th Asian Biological Inorganic Chemistry Conference (AsBIC8) U. of Auckland, New Zealand Dec. 4–9, 2016, Keynote lecture

**2017**

- ACS Leadership Institute Facilitator, “Communication Strategies”, Dallas Jan 23
- UC Denver, The School of Pharmacy, CU Medical Anschutz campus, Jan. 26, 2017
- Frontier in Chemistry Lecturer, University of Toledo, Feb. 5, 2017, named lectureship
- University of Louisiana, Baton Rouge, March 11, 2017
- 253<sup>rd</sup> ACS meeting, San Francisco, 60 year anniversary for the Division of Inorganic Chemistry, April 2-6
- Inorganic Chemistry Leader program, University of Puerto Rico Rio Piedras Campus (Puerto Rico Chemical Learning Integrated in Materials and Biomolecular applications, PR CLIMB) on May 9<sup>th</sup>, 2017
- 14th Int. Symp. on Applied Bioinorganic Chemistry (ISABC14), Toulouse, France, June 7 - 10<sup>th</sup> 2017
- 6<sup>th</sup> Asian Conference on Coordination Chemistry (ACCC6) and RACI Centenary Congress in Melbourne, Australia 23-28, July 2017 (invited, declined)



18th International Conference on Biological Inorganic Chemistry (ICBIC18) Keynote Lecture July 31<sup>st</sup> to August 4<sup>th</sup> in 2017, <http://icbic18.weebly.com/>  
254rd ACS meeting, Washington, Aug. 20-24  
2017 Rocky Mountain Regional Meeting, Oct. 25-27 Nanoscience Symposium  
2017 Rocky Mountain Regional Meeting, Oct. 25-27 Medicinal Chemistry and Inhibitor Design Symposium, “Phosphatase inhibition by Vanadium Compounds” (coauthored by Craig McLauchlan)  
2017 Rocky Mountain Regional Meeting, Medicinal Chemistry and Inhibitor Design Symposium, on “Immunotherapy enhancement by vanadium compounds” (coauthored by Jean-Simon Diallo)  
9th Symposium on Group Five Elements, Keynote speaker, Delhi from November 22-24, 2017

**2018**

ACS Leadership Conference, Presenting the “Young Talent in Colorado and Beyond Symposium” – the ChemLuminary Awards Jan 19  
ACS Leadership Institute Facilitator, “Fostering Innovation” Dallas Jan 20  
University of Missouri, Science and Technology, Rolla Jan 25  
Keystone Immunotherapy Conference (presentation declined)  
255th ACS meeting, New Orleans, LA, March 18-22, 2018 Bader (for Alison Butler) Award Symposium  
Metals in Medicine Gordon Research Conference Jun 24-29, 2018  
Keynote Speaker, ICC43 Sendai, Keynote Speaker, Japan July 30-August 4,  
256th ACS meeting, Boston, Massachusetts, Aug. 19-23, 2018  
Keynote Speaker, EuroBIC14 Birmingham, Keynote Speaker, UK Aug. 26-30, 2018  
Keynote Speaker, N-Ligands, Lisbon, Portugal, Sept 3-5, 2018  
Plenary Speaker, XIX Brazilian Meeting on Inorganic Chemistry; VI Latin American Meeting on Biological Inorganic Chemistry; VIII Brazilian Meeting on Rare Earths, Fortaleza, Brazil, September 25-28, 2018  
Plenary Speaker, 11<sup>th</sup> International Vanadium Symposium, Montevideo, Uruguay Nov 5-8 2018

**2019**

Colorado State University-Pueblo Jan. 31, 2019  
University of Massachusetts, Amherst, Feb. 14<sup>th</sup>, 2019  
Plenary Speaker, 257<sup>th</sup> ACS Award Symposium, Orlando, March 31-April 5<sup>th</sup>, 2019  
Garvin Medalist Award Symposium, 257<sup>th</sup> ACS meeting, Orlando, March 31-April 5<sup>th</sup>, 2019  
Memorial Symposium for Elena Rybak-Akimova, 257<sup>th</sup> ACS meeting, March 31-April 5<sup>th</sup>, 2019  
Local ACS Columbus Section, HS Awards, The Periodic Table of Medicines, April 23, 2019  
Keynote Speaker, 15th International Symposium on Applied Bioinorganic Chemistry, June 2-5, Nara, Japan 2019  
Nara International Conference on Applied Bioinorganic Chemistry (NICABC), Nara June 6<sup>th</sup>, 2019  
Summit forum on innovative drug development, Nanjing, China, June 25, 2019  
2019 Mini-Symposium on Supramolecular Chemistry and Catalysis Center for Supramolecular Chemistry and Catalysis, Shanghai University, June 28<sup>th</sup>, 2019  
Keynote Speaker, 7<sup>th</sup> International Symposium on Metallomics, Warsaw, Poland, 30 June-3 July, 2019  
Summer Lecturer, Helmholtz-Zentrum Dresden-Rossendorf Inst. of Radiopharmaceutical Cancer Research, 7-5-2019  
Plenary Speaker, ICBIC-19, Interlaken, Switzerland, c/o University of Zurich  
Plenary Speaker, 1<sup>st</sup> International Conference on Noncovalent Interactions (ICNI), 2<sup>nd</sup> - 6<sup>th</sup> September 2019  
Keynote Speaker, XXI Mendeleev Congress on General and Applied Chemistry, Saint-Petersburg, Sept. 9-12, 2019  
COACS meeting at Adam State, Alamosa; “The Periodic Table of Medicines”, Sept. 18, 2019  
Technical Seminar and class for undergraduate students, Wuhan, China  
ACC2019 Taipei, Taiwan, Dec. 2019

**2020**

Women in Science, Malaga, Jan. 9-15, 2020  
Royal Society of Chemistry Editors Symposium, Feb. 22-24, 2020, canceled  
CCE-conference (Chemical Catalysis and Engineering) in LA, 24-26, 2020, keynote speaker  
259<sup>th</sup> ACS meeting, Mar. 22-26, 2020, Bursten Symposium; Karlin Symposium, Frantz Symposium (canceled, COVID-19)

Seminars to China and Israel were canceled because of COVID

Keynote Speaker, XV International Symposium on Inorganic Biochemistry, June 24-27, Wroclaw, Poland (canceled COVID-19)

ICCC-2020, Rimini, July 5-10 (delayed COVID-19)

Award Recipient, Iota Sigma Si July 15-19 (delayed COVID-19)

Metals in Medicine Symposium, ACS Meeting, Aug 16-20, oral presenter at the virtual meeting

260<sup>th</sup> ACS meeting, Fall 2020

Keynote Speaker, EuroBic, Iceland, August 16-20, 2020 (delayed, COVID-19)

International Symposium for Heterogeneous Catalysis (ISHC) Lisbon, Sept 6-10 (delayed to 2021)

Keynote Speaker, Labic, Montevideo, September 22-25, 2020; delayed to December 8, 2020 (delayed COVID-19)

Orville L. Chapman lecture at University of California, Los Angeles, October 2020 (delayed COVID-19)

International Vanadium Symposium and Group Five Elements Nov. 3-6, 2020 (delayed COVID-19)

Pacificchem, Innovative applications in medicine and diagnostics, Dec. 15-20, 2020 (delayed COVID-19)

## 2021

Vanadium - An element with both Chemical and Biological Catalytic Functions, 5th International Conference and Chemical Engineering, CCE-conference (Chemical Catalysis and Engineering United Scientific Group), keynote speaker, Feb 22, 2021, virtual

Award Symposium in Inorganic Chemistry, Bowman-James Symposium 261<sup>st</sup> ACS, March 5<sup>th</sup>, 2021, virtual

Karlin Symposium 261<sup>st</sup> ACS, March 5<sup>th</sup>, 2021, virtual

ACS Award for Encouraging Women into Careers in the Chemical Sciences Symposium Honoring Katherine Franz, 261<sup>st</sup> ACS, March 5<sup>th</sup>, 2021, virtual

The Periodic Table Of Medicines and Minerals, Vitamins and Therapeutics, Seminar, Division of Small Chemical Business, 261<sup>st</sup> ACS, March 5<sup>th</sup>, 2021, virtual

16th International Symposium on Applied Bioinorganic Chemistry (ISABC) June 6-9 (delayed to 2022)

Keynote Speaker, XV International Symposium on Inorganic Biochemistry, June 24-27, Wroclaw, Poland (canceled COVID-19)

Award Recipient, Iota Sigma Si July 15-19 (Canceled COVID-19)

Keynote Speaker, ICC-2020, Rimini, July 5-10 (canceled COVID-19)

EuroBic, Iceland, August 16-20, 2020 (canceled, COVID-19)

ICBIC, Australia

International Symposium for Heterogeneous Catalysis (ISHC) Lisbon, Sept 6-10

WCC Symposium of Resilience of Women, 262<sup>nd</sup> ACS, Fall, 2021, virtual

## 2022

Orville L. Chapman lecture at University of California, Los Angeles, Jan 13, 2022

CCE-conference (Chemical Catalysis and Engineering), 21-23, 2022, keynote speaker

## Contributed Posters or Talks Presented at Conferences (\* denotes international meetings):

1987 - 2	1999 - 5	2011 - 18 (4*)
1988 - 1	2000 - 7 (*2)	2012 - 17 (4*)
1989 - 8 (*2)	2001 - 4	2013 - 11 (5*)
1990 - 9 (*1)	2002 - 8 (3*)	2014 - 11 (5*)
1991 -	2003 - 3	2015 - 9
1992 - 12 (*2)	2004 - 7 (2*)	2016 - 9 (5*)
1993 - 19	2005 - 5 (1*)	2017 - 9(RMRM)7(ACS)3
1994 - 4 (*3)	2006 - 6 (5*)	2018 - (2)
1995 - 2 (*1)	2007 - 4	2019 - 9(ACS)
1996 - 4	2008 - 9 (6*)	2020 -
1997 - 3 (*1)	2009 - 5	2021 -
1998 - 5 (*1)	2010 - 8	2022 -

**Professional Societies:**

American Chemical Society  
American Association for Advancement of Science  
Society for Bioinorganic Chemists  
International EPR (ESR) Society  
Society for Vanadium Chemists  
Royal Society of Chemistry

**Other Professional Activities:**a. Workshops/Programs:

ACS Leadership Institute (Foster Innovation, 2017)  
Ohio State University (Oct. 3-4, 2015)  
NSF-Advance workshop on "Mentoring" (December 6, 2002)  
As program Chair for the Inorganic Chemistry Program, American Chemical Society planned annual ACS meetings from 1999-present; in this capacity recruited organizers for various programs at these meetings.  
Designed and conducted a workshop on "Enzyme Catalyzed Synthesis" for Syntex Chemical Company, Summer 1987.  
Women in Science Program - 1993-1996  
Faculty Teacher Outreach Program (Howard Hughes Foundation); Pikes Peak Boozes, Colorado Springs, 1990

b. Reviewer of candidates for tenure and/or promotion

1995 (2), 1996 (1), 1997 (1), 1998 (1), 2000 (1), 2001 (1), 2002 (2), 2003 (2), 2004 (1), 2005 (2), 2006 (3), 2007 (1), 2008 (2), 2009 (2), 2010 (3), 2011 (2), 2012 (2), 2013 (1), 2014 (3), 2015 (2), 2016 (3), 2017 (3)

c. Reviewer of Manuscripts:

*Inorganic Chemistry, J. Am. Chem. Soc., Daltons Transactions, J. Organic Chemistry, Langmuir, Eur. J. Inorganic Chemistry, New J. Chemistry, Arch. Biochem. Biophys., Biochemistry, Biochimica Biophysica Acta, Bioorganic and Medicinal Chemistry Letters, Can. Chem., Carbohydrate Res., Chem. Reviews, Z. Allgem. Inorg. Chem., Inorg. Chim. Acta, J. Inorg. Biochem., J. Coll. Sci. Tech., J. Computational Chem., J. Coord. Chem. Rev., Mol. Cell Biochem, Nature, Science, Synthesis and Reactivity in Inorganic Metal-Organic Chemistry*

d. Reviewer of Proposals:

*NSF Instrumentation, NSF Biochemistry, NSF Chemistry, NSF fellowships, PRF, also review grants for Canadian Medical Research Council, Stanford Synchrotron, North Carolina's Biotechnology Program, NIH ad hoc, Postdoctoral Panel, NIH, NSGRP*

e. Conception, Planning and Organization of Symposia and Meetings:

Planned a local ACS meeting (Colorado-Wyoming section). Speaker Alfred Bader, Aldrich Chemicals (1988).  
Organized a Symposium entitled "Shattering the Glass Ceiling Through Research Accomplishments" 205th ACS Meeting, Denver, 1993.  
Cell and Molecular Biology Program Student-Poster Competition and Seminar, CSU, 1994 and 1995.  
Organized a Symposium entitled "Metalloenzymes: Structure, Function, Mechanism and Models," 13th Rocky Mountain Regional ACS Meeting, 1996, Lakewood, CO.  
Organized a Symposium with Alan S. Tracey entitled "Chemistry, Biochemistry, and Therapeutic Applications of Vanadium," Fifth Chemical Congress of North America, 1997, Cancun, Mexico.  
Planned 2000 INOR-ACS program 219<sup>th</sup> ACS meeting in San Francisco, California.  
Planned 2001 INOR-ACS program 221<sup>st</sup> ACS meeting in San Diego, California.  
Planned 2002 INOR-ACS program 223<sup>rd</sup> ACS meeting in Orlando, Florida.  
Co-planned 2002 INOR-ACS program 224<sup>th</sup> ACS meeting in Boston, Massachusetts.  
Co-planned 2003 INOR-ACS program at 225<sup>th</sup> ACS meeting in New Orleans, Louisiana.  
Planned 2004 INOR-ACS program at 227<sup>th</sup> ACS meeting in Anaheim, Anaheim California  
Co-planned 2004 INOR-ACS program at 228<sup>th</sup> ACS meeting in Philadelphia, Philadelphia, PA.

- Planned 2005 INOR-ACS program at 229<sup>th</sup> ACS meeting in San Diego, San Diego, California  
 Co-planned 2005 INOR-ACS program at 230<sup>th</sup> ACS meeting in Washington, DC.  
 Planned 2006 INOR-ACS program at 231<sup>th</sup> ACS meeting in Atlanta, Georgia  
 Co-planned 2006 INOR-ACS program at 232<sup>th</sup> ACS meeting in San Francisco, California.  
 Organized "Fifth International Symposium on Vanadium Chemistry and Biochemistry" at 232<sup>th</sup> ACS meeting in San Francisco, CA  
 Planned 2007 INOR-ACS program at 233<sup>th</sup> ACS meeting in Chicago, IL  
 Planned 2007 INOR-ACS program at 234<sup>th</sup> ACS meeting in Boston, MA  
 Organized the Zing Coordination Chemistry Conference, 2008.  
 Planned 2008 INOR-ACS program at 235<sup>th</sup> ACS meeting in New Orleans, LA.  
 Planned 2008 INOR-ACS program at 236<sup>th</sup> ACS meeting in Philadelphia, PA.  
 Organized the Zing Coordination Chemistry Conference, 2009.  
 Planned 2009 INOR-ACS program at 237<sup>th</sup> ACS meeting in Salt Lake City, UT.  
 Planned 2009 INOR-ACS program at 238<sup>th</sup> ACS meeting in Washington DC.  
 Planned 2010 INOR-ACS program at 239<sup>th</sup> ACS meeting in San Francisco, CA.  
 Organized the "Metals in Medicine Gordon Conference" 2010.  
 Planned 2010 Bioinorganic and Coordination Chemistry INOR-ACS program at 240<sup>th</sup> ACS meeting in Boston, MA.  
 Planned 2011 Coordination Chemistry INOR-ACS program at 241<sup>th</sup> ACS meeting in Anaheim, CA.  
 Planned 2011 Coordination Chemistry INOR-ACS program at 242<sup>nd</sup> ACS meeting in Denver, CO.  
 Organized the Zing Coordination Chemistry Conference, 2011.  
 Planned 2012 Coordination Chemistry INOR-ACS program at 243<sup>th</sup> ACS meeting in San Diego, CA.  
 Planned 2012 Coordination Chemistry INOR-ACS program at 244<sup>th</sup> ACS meeting in Philadelphia, PA.  
 Organized the symposium in the "Reactions at Lipid and Lipid-like surfaces" Rocky Mountain Regional Meeting 2012 (RMRM12)  
 Planned 2013 Coordination Chemistry INOR-ACS program at 245<sup>th</sup> ACS meeting in New Orleans, LA.  
 Planned 2013 Coordination Chemistry INOR-ACS program at 246<sup>th</sup> ACS meeting in Indianapolis, IN.  
 Organized the Zing Coordination Chemistry Conference, 2013.  
 Planned 2014 Coordination Chemistry INOR-ACS program at 247<sup>th</sup> ACS meeting in Dallas, TX.  
 Planned 2014 Coordination Chemistry INOR-ACS program at 248<sup>th</sup> ACS meeting in San Francisco, CA.  
 Planned 2015 Coordination Chemistry INOR-ACS program at 249<sup>th</sup> ACS meeting in Denver, CO.  
 Planned the Young Talent in Colorado and Beyond Symposium 2016  
 Planned 2017 Celebrating the 60-year anniversary of DIC for the San Francisco meeting, Spring 2017  
 Planned Medicinal Chemistry and Inhibitor Design Symposium for RMRM17  
 Planned the Young Scholar Symposium for the RMRM17  
 Planned the Speciation Symposium for the ICC-18 in Japan 2018
- f. Vanadis Award administration (2014-2022)  
 Administered and Presented the 8<sup>th</sup> Vanadis Award to Armando Pombeiro in Monte Video, Uruguay  
 Administered and Presented the 7<sup>th</sup> Vanadis Award to Tamas Kiss and to Ron Wever in 2016 in Taipei, Taiwan
- g. Participation in Meetings (other than presenting research):  
 Chairperson of Bioorganic Section Physical Organic Chemistry Gordon Conference, June 12-16, 1989.  
 Panel Member. Topic: "Gender in Science: A Panel Exploring the Issues of Gender in Science and Research."  
 Sponsoring Organization: Colorado State University/Fort Collins Chapter, Association for Women in Science, 1989.  
 Chairperson, Physical Organic Section 199<sup>th</sup> National ACS Meeting in Boston, April 22-27, 1990.  
 Chairperson, Bioinorganic Section 200<sup>th</sup> National ACS Meeting in Washington, August 26-31, 1990.  
 Chairperson, Bioorganic Section 201<sup>st</sup> National ACS Meeting, Atlanta, April 14-19, 1991.  
 Chairperson, Bioorganic Section of the 205<sup>th</sup> National ACS Meeting, Denver, March 28-April 3, 1993.  
 Chairperson, Bioinorganic Section of the 213<sup>th</sup> National ACS Meeting, San Francisco, April 13-17, 1997  
 Chairperson, Bioinorganic Section of the 220<sup>th</sup> National ACS Meeting, Washington DC, Aug. 20-24, 2000  
 Chairperson, Bioinorganic Section of the 222<sup>th</sup> National ACS Meeting, Chicago, Aug. 26-30, 2001  
 Chairperson, Metal in Medicine, Gordon Conference, 2002  
 Planning Meetings for ACS; P2C2 Conference and Long Term Planning Committee 2004  
 Monitor, Metals in Medicine Gordon Conference, 2004

Planning Meetings for ACS; P2C2 Conference and Long Term Planning Committee 2005  
Chairperson, ICBIC 12, Ann Arbor, Michigan, 2005  
LSAMP Planning Committee Member 2006  
Chairperson, Metal in Medicine, Gordon Conference, 2008  
ACS Leadership Conference, Jan 2013, 2014  
AAAS Induction, Chicago Feb. 15, 2014  
Chairperson, Metal in Medicine, Gordon Conference, 2014  
Chairperson, Poster award committee, 2014  
Chairperson, Oxometalates, ICCS, 2014  
ICCS-41, poster award committee, Singapore, 2014  
Polyoxometalate Symposium, Pacificchem, Honolulu, Hawaii, Dec. 15-20, 2015  
Chairperson, Metals in Medicine Gordon Conference, 2016  
Chairperson, 10<sup>th</sup> Vanadium Symposium, 2016  
Chairperson, Asian Biological Inorganic Chemistry Conf (AsBIC8) University of Auckland, New Zealand, 2016  
Chairperson for multiple events for the COACS activities during 2016 and 2017

h. Current Department and University Committee Service

Chair, Faculty Awards Committee, Department of Chemistry (2014-present)  
Graduate Recruiting and Admissions Committee, Department of Chemistry 2017-present  
Commission on Women and Gender Equity (2015-present)

**Research Group (current):**

Crans has mentored > 250 students. Approximately 200 of these students have been undergraduates and 60 students have been graduate or postgraduate students.

*Current Graduate and Post-Graduate Students (CMB designates Graduate Program in Cell and Molecular Biology)*

Zeyad Arhouma (CMB graduate student 2014 - present), Allison Haase (Chemistry graduate student 2016 - present; COACS Travel Award), Heide Murakami (Chemistry graduate student 2016 - present; COACS Travel Award), Maggi Braasch-Turi (Chemistry graduate student 2016 – present), Kate Kostenkova (Chemistry graduate student 2018 – present; Chemistry Dept. and COACS Travel Award), Nathan Gasparovic (Chemistry graduate student 2019 – present), Skyler Markham (Chemistry graduate student, 2020 – present), John Manganaro (Chemistry graduate student, 2021 – present), Sarah Sanders (Chemistry graduate student 2021 – present), Andrew Bates (Chemistry graduate student 2020 – present), Joseph Grundy (Chemistry graduate student 2021 – present)

*Current Undergraduate Students*

John Hagan (chemistry, 2018 - present), Vi Tran (chemistry, 2019 – present), Matthew Yohannes (chemistry, 2019 – present), Beth Trent-Ringler (chemistry, 2020 –present). Anna Galaeva (chemistry, 2021 – present), Drew Walters (chemistry, 2020 – present), Theresa Clairmont (chemistry, 2020 – present), Madeline Geist (Biology, 2021 – present)