

## Bruce M. Mattson, Ph.D.

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### Education:

- 1979 - 1980: University of Alberta, Edmonton, Alberta Canada: Post-doctoral appointment. Research in synthetic organometallic chemistry. Research Director: Dr. W. A. G. Graham
  - 1973 - 1977: University of Minnesota, Minneapolis, Minnesota: Ph.D. in Inorganic Chemistry, 1977. Research in synthetic inorganic coordination chemistry. Thesis Title: *The Oxidation, Reduction, and Photochemistry of Ruthenium Dithiocarbamate Complexes*; Research Adviser: Dr. L. H. Pignolet
  - 1969 - 1973: Southwest State University, Marshall, Minnesota: B. A. in Chemistry, 1973.
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### Work Experience:

- Creighton University, Omaha, Nebraska:
    - 1994 - Present: Professor of Chemistry
    - 1985 - 1994: Associate Professor of Chemistry
    - 1980 - 1985 and 1977 - 1979: Assistant Professor of Chemistry
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### Honors and Awards:

- April 2, 2019 Creighton University Research Award
- May, 2015, 8<sup>th</sup> International Symposium on Microscale Chemistry, 27 – 29 May 2015, Universidad Iberoamericana, Mexico City. Special recognition given for my “extensive merits in the field of microscale gas chemistry.”
- April, 2012, Faculty Recognition Award by Student Support Services.
- Frequent recipient of the “IGGY Award,” (three times in 2018) affectionately named after Jesuit founder St. Ignatius, the IGGY Award is sponsored by Academic Success within the new EDGE program and is awarded to outstanding freshman mentors, counselors, advocates and role models as part of our Founder’s Week celebration.
- 2004 25-Year Service Award, Creighton University
- 2001 Omicron Delta Kappa
- 1998 Recipient Deans Award for Excellence in Teaching
- 1998 Co-recipient of the William F. Kelley, S.J. Achievement Award, Outstanding Service Achievement for our department’s field day activities.
- 1997 Co-recipient of the William F. Kelley, S.J. Achievement Award, Outstanding Service Achievement for our “Melodious Musichemical Manifestation” program
- Western Connecticut Section of the American Chemical Society, Visiting Scientist Award, 1995.

- Outstanding Alumni Achievement Award, 1993, Southwest State University, Marshall, MN.

#### **Administration:**

Chair, Department of Chemistry, Creighton University, 1993 – 1999 and Acting chair, May – December, 2005. Our department had fourteen faculty members, three staff members and a sizeable budget.

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#### **Research Interests**

My recent long-term interests are with gas phase reactions taking place over an alumina-supported nanoparticle palladium catalyst developed in our laboratory. Among the interesting reactions being studied by and mass spectroscopy are:

- We are establishing an understanding of the mechanism for the hydrogenation and deuteration of simple gas-phased alkenes and alkynes using our microscale palladium catalyst tube under ambient laboratory conditions. The reactions are followed by mass spectroscopy. Alkynes are hydrogenated into alkenes by the vinyl reversal mechanism which seamlessly segues into the Horiuti-Polanyi mechanism for hydrogenation of alkenes into alkanes. The latter involves significant hydrogen-deuterium exchange.
- Hydrogen absorption onto/into palladium metal, a process that we have studied by kinetics for presentation as a classroom demonstration. We have written one article on this topic and it has appeared in the *Journal of Chemical Education*.
- Deuterium exchange in methane producing five isotopomers,  $\text{CH}_{4-n}\text{D}_n$ ,  $n = 0 - 4$ , studied by high-field nuclear magnetic resonance spectroscopy.
- Dihydrogen ( $\text{H}_2$ ) and dideuterium ( $\text{D}_2$ ) undergo D/H statistical exchange in the presence of the catalyst at temperatures as low as  $-78^\circ\text{C}$ .

Ongoing work related to microscale gas chemistry involves maintaining our website. The purpose is to provide methods for generating and manipulating small quantities of gases safely in 60 mL syringes. Prior to our work, it was unfeasible to generate several of these gases in the classroom or student laboratory. All together over 150 experiments have been devised for 18 gases including  $\text{CO}_2$ ,  $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$ ,  $\text{NH}_3$ ,  $\text{NO}_x$ ,  $\text{C}_2\text{H}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{SO}_2$ ,  $\text{Cl}_2$ ,  $\text{HCl}$ ,  $\text{CO}$ ,  $\text{C}_2\text{H}_4$ ,  $\text{SiH}_4$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ , and  $\text{O}_3$ , all described at our gas chemistry web site (redesigned in 2016 and updated most recently in November 2016):

[http://mattson@creighton.edu/Microscale\\_Gas\\_Chemistry.html](http://mattson@creighton.edu/Microscale_Gas_Chemistry.html)

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#### **Pedagogical**

- **Courses taught** (within the past 5 years)
  - Chm 203 and 205, General Chemistry I and II, every year.
  - Chm 204 and 206, General Chemistry Laboratory I and II
  - RSP 101, Ratio Studiorum, Fall 2017 (and approximately every other year)
  - Chm 451, Inorganic Chemistry
  - Chm 502, Inorganic Chemistry II
- **Author/Co-author:**

- ***Microscale Gas Chemistry, 4<sup>th</sup> Edition***, Mattson, B. M., Anderson, M. P.; and Mattson, S. E.; published by Educational Innovations, 2006. The book is now available as a free download from my website.
- ***Classroom Demonstration Aids That You Can Build!***, Mattson, B. M., Kubovy, M. A., Hepburn, J., Lannan, J., published by Flinn Scientific, 1997.
- **New Course Development:**
  - Chm 204 and 206, developed several new experiments
  - Microscale Gas Chemistry, Chm 555
  - Organometallic Chemistry, Chm 502
  - Advanced Inorganic Chemistry Laboratory, Chm 351

### **College and University Committees and Service to the Chemistry Department (past ten years):**

- University Assessment Committee, Fall 2018 - Present.
- General Chemistry demonstration mentor, Fall, 2018, for a colleague teaching Chm 203 for the first time.
- College letter write to admitted students, and host for classroom visits for students and families.
- Successfully nominate numerous students to Alpha Sigma Nu.
- Baumann Family Scholarship, administrator, 1987 – present.
- Ambassador for Chemistry Department at Opus Prize Interfaith Service, November 16, 2016.
- Reviewer, 2016 Summer Undergraduate Research Fellowship applications, February, 2016.
- Eric Villa faculty mentor, Fall 2013 – Present. In this capacity, we meet once a week to discuss a variety of issues, with the bulk of the discussion pertaining to teaching of General Chemistry
- College's Mission Implementation Committee "Catalyst Committee", 2011 – 2012, 2014 - Present
- Coordinated the Creighton Chemistry Community Development Fund project and wrote the "rules" for the administration of the fund, Fall, 2015.
- Governance Committee, Department of Chemistry 2007 - Present
- Magis Core University committee member, 2013 - 2015
- Inorganic faculty search committee member, 2015
- Club Soccer, Faculty Moderator, 2013 - 2015
- General Chemistry Committee (occasional)
- Inorganic Division leader (past)
- Calling All Jays, October 7, 2015
- Biochemistry faculty search committee member, 2013 and 2014
- Analytical Professor Search Committee, Fall 2012
- Faculty Senate of Creighton College of Arts and Sciences (2005 – 2011)
- Professional Development Committee, Fall Semester, 2008 – 2011
- Curriculum Committee, Fall Semester, 2007 – Spring 2008
- Chemistry Department webmaster, 2001 - 2012
- Chemistry Department Strategic Planning Committee, now inactive
- Review team, Department of Sociology, March 14 – 16, 2006

- College Rank & Tenure Committee, two terms, ending Spring 2006.
- Cardoner Project Investigating/Discussing Scholarship as a Calling, 2004 – 2005
- Participant in Collaborative Learning Work Group, 2010 and 2011.
- Research Advisory Cmte for Academic Affairs, 2007 – 2009 (Reviewed Research Initiative Grant Proposals, Spring Semesters of 2008, 2009)
- Chair mentor, Department of Modern Languages and Literatures, Fall, 2006 – Spring 2009.

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**Service to the Profession and Private Consulting (past ten years):**

- Frequent reviewer for *Journal Chemical Education*, averaging two reviews per year
  - External evaluator for a faculty members applying to promotion to professor, approximately one every 3 – 4 years.
  - External reviewer, Department of Chemistry St. Mary's College, Notre Dame, IN, site visit will take place in February, 2010 (some preliminary work was done in 2009)
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## List of Professional Presentations 2014 - Present

- July 23, 2019 Flip Movies All Grown Up, ChemEd 2019, North Central College, Naperville, IL
- July 23, 2019 Microscale Gas Chemistry, ChemEd 2019, North Central College, Naperville, IL
- July 22, 2019 Microscale Precipitation Reactions in 10-drop Puddles, ChemEd 2019, North Central College, Naperville, IL
- April 12, 2019: Nanoparticle Palladium Hydrogenation Catalysis of Alkynes. The Vinyl Reversal and Horiuti-Polanyi Mechanisms, Kenzie Enmeier, Kara Grossman, Grace Recker, Katie Cunningham and Bruce Mattson, Department of Chemistry, Nebraska Academy of Sciences, Lincoln, Nebraska
- April 20, 2018: On the hydrogenation of alkynes with alumina supported palladium, Tazah Weinmaster, Reba Mehaffey, Kenzie Enmeier (all three presented together), Bruce Mattson, Nebraska Academy of Sciences, Lincoln, Nebraska
- April 21, 2017: On the hydrogenation of alkynes with alumina supported palladium, Samantha Jarman and Bruce Mattson, (presenter: Samantha Jarman) Nebraska Academy of Sciences, Lincoln, Nebraska
- May 27, 2015: (Keynote address) On the Gas Phase Deuteration of 1-Butene and Methane, 8<sup>th</sup> International Symposium on Microscale Chemistry, Iberoamericana Universidad, Mexico City.
- May 27 and 28, 2015: Microscale Gas Chemistry Workshop, Iberoamericana Universidad, Mexico City.
- April 1, 2014: On the deuteration of methane over palladium, Anne Mirich, Bruce Mattson, St. Albert's Day. (presenter: Anne Mirich)
- April 11, 2014: On the deuteration of methane over palladium, Anne Mirich, Bruce Mattson, (presenter: Anne Mirich) Nebraska Academy of Sciences, Lincoln, Nebraska
- April 23, 2014: Baumann Family Scholarship report, by Anne Mirich, Chemistry Department.

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## List of Publications for Bruce Mattson