

Jeffrey B. Johnson

Department of Chemistry
Hope College
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Education

- Ph. D. in Chemistry Sept 2000 – Dec 2004
University of Wisconsin-Madison
Advisor: Prof. Charles P. Casey
Thesis Title: Analysis of a Hydroxycyclopentadienyl Ruthenium Hydride Ligand-Metal Bifunctional
Catalyst: Reactivity, Mechanistic Studies and the Development of More Active and Selective Catalysts
- B.A. in ACS Chemistry (*Magna cum laude*) Sept 1996 – May 2000
Gustavus Adolphus College, St. Peter, MN
Advisor: Prof. Brian A. O'Brien

Professional Experience

- Assistant Professor of Chemistry July 2007 – Present
Hope College, Holland, MI
Towsley Research Scholar, Hope College Nov 2009 – Present
- Postdoctoral Fellow Jan 2005 – July 2007
NIH Postdoctoral Fellow (2006 – 2007)
Colorado State University, Fort Collins, CO
Prof. Tomislav Rovis
Enantioselective desymmetrization of meso carboxylic anhydrides – use in natural product synthesis
Development of carbon dioxide fixation methodology
- Referee for the *Journal of the American Chemical Society* Jan 2006 – Present
Chemical Society Reviews Dec 2007 – Present
Chemical Communications Nov 2008 – Present
Journal of Organometallic Chemistry Jan 2009 – Present
Tetrahedron Letters May 2009 – Present
Organic and Biomolecular Chemistry June 2009 – Present
Nature: Chemistry July 2009 – Present

Research Experience

- Doctoral Research Sept 2000 – Dec 2004
University of Wisconsin-Madison with Prof. Charles P. Casey
Reaction mechanism elucidation of hydrogenation catalysis through kinetic and isotopic labeling studies
Development of more active and selective hydrogenation catalysts
- Stockholm University, Stockholm, Sweden with Prof. Jan-E. Bäckvall April – July 2001
Mechanistic elucidation of alcohol dehydrogenation reaction
- Undergraduate Research Feb 1998 – May 2000
Gustavus Adolphus College with Prof. Brian A. O'Brien
Includes Moissan Summer Undergraduate Research Fellowship (ACS Fluorine Division)
Development of synthetic route to primary alkyl phosphines via phospho-Gabriel reaction

Colorado State University with Prof. Frank R. Stermitz June – Aug 1999
National Science Foundation-Research Experience for Undergraduates

Synthesis of analogues of naturally occurring flavonolignans for testing of biological activity

Teaching Experience

<i>Instructor.</i> Organic Chemistry I (CSU, Hope)	2006 – Present
Organic Chemistry II (Hope)	2008 – Present
Organic Chemistry Laboratory I (Hope)	2007 – Present
Organic Chemistry Laboratory II (Hope)	2008 – Present
Structure, Synthesis and Dynamics (Hope)	2009 – Present
Inorganic Chemistry (Hope)	2010 – Present
<i>Instructor.</i> General Chemistry Review for MCAT (The Princeton Review)	2003 – 2004
<i>Substitute lecturer.</i> Undergraduate organic chemistry (CSU)	2005 – 2007
Graduate level organometallics (UW, CSU)	2003 – 2007
<i>Research mentor.</i> Prior to Hope: Four undergraduate students and three first year graduate students, in addition to mentoring junior graduate students. Four of these students have co-authored publications. (CSU, UW)	2002 – 2007
<i>Laboratory teaching assistant.</i> Organic chemistry (UW)	2000 – 2001
<i>Tutor.</i> General, organic, and inorganic chemistry (GAC and UW)	1999 – 2004

Hope College Service Activities

Hope College Chemistry Department Faculty Search Committee	Fall 2009
Advisor, Hope College Chemistry Club/ACS Student Affiliates Chapter	2008-present
Hope College Judicial Board	2009-present
Health Professions Advisory Committee	2010-present

Research Students (Hope College)

Jonathan Parrish (HHMI Scholar)	2007-2009
-currently a graduate student at the University of Wisconsin-Madison (chemistry)	
Alexander Wotal	2007-2009
-currently a graduate student at the University of Rochester (chemistry)	
Lauren Moak	2007-2008
-currently a medical student at the University of Michigan	
Sarah Havlik	2008-2010
Valerie Winton (Dean's Summer Research Award)	2008-present
Andrew Franks	2009
-currently a graduate student at Duke University (chemistry)	
Timothy Boman	2009-2010
-currently at Ash Stevens	
David Todd	2009-present
Breanna Powell	2009-2010
-currently a dental student at the University of Michigan	
Amanda Witte (REACH student)	Summer 2009
Nick Rebhan	2009
Jessica Simmons	2009-present
Colin Rathbun	2009-present
Patrick Lutz	2010-present
Thomas Endean	2010-present

Suzie Stevenson	2010-present
Cameron Evans	2010
Casey Baxter	2010-present

To date, students have combined for 34 semesters/summers of research and 47 research presentations at local, regional and national conferences.

Honors and Awards

Men in Mentoring Award from State Sen. Wayne Kuipers, May 2010
Towsley Research Scholar, Hope College, 2009 – 2013
Research Corporation Cottrell College Science Award, 2009 – 2010
Camille and Henry Dreyfus Faculty Start-Up Award, 2007 – 2012
Vilas Travel Grant (UW), 2004
ACS Organic Division Graduate Fellow – Emmanuel Troyansky Fellowship (UW), 2003 – 2004
McElvain Scholarship (UW), 2000 – 2001
Guild of Saint Ansgar (GAC), inducted 2000
Phi Beta Kappa (GAC), inducted 1999
Barry M. Goldwater Scholar (GAC), 1999 – 2000
Sigma Xi (GAC), inducted 1999
National Merit Scholar (GAC), 1996 – 2000

Grants (at Hope College--\$562,439 in external grants to date)

Camille and Henry Dreyfus Faculty Start-Up Award, "Development of Carbon-Carbon Bond Activation and Functionalization Methodology" \$30,000, 2007-2012. Awarded 8/07.

Research Corporation Cottrell College Science Award, "Carbon-Carbon Single Bond Activation for the Carboacylation of Alkenes" \$60,072, 2009-2010. Awarded 10/08.

National Science Foundation – Major Research Instrumentation, "NSF-MRI: Acquisition of a Remotely-Accessible 400 MHz Spectrometer" \$416,767, 09/01/2009 – 08/30/2012. co-PI: Moses Lee. Awarded 8/09.

Eli Lilly, "Origin of Stereoselectivity in a Gilman Addition to an α,β -Unsaturated Ester" \$5,000, 06/01/2009 – 05/31/2010. Awarded 5/09.

ACS-PRF – Undergraduate New Investigator, "The Utilization of Carbon Dioxide in New Applications of Carbon-Carbon Single Bond Activation Methodology" \$50,000, 09/01/2009 – 08/30/2011. Declined.

ACS Division of Organic Chemistry Faculty Travel Award for attendance of the 41st National Organic Symposium, June 2009. \$600. Awarded 5/09.

ACS-PRF – Undergraduate New Investigator, "Toward Greater Understanding and Expanded Utility of the Palladium-Catalyzed Activation of Carbon-Carbon Single Bonds" \$50,000, 09/01/2010 – 08/30/2012. Awarded 6/10.

Towsley Research Scholar Program – Hope College. "Carbon-Carbon Bond Activation: Mechanistic Elucidation and New Methods for Carbon Dioxide Fixation" \$16,000 + semester sabbatical (spring 2011), 1/1/2010 – 12/30/2013. Awarded 11/09.

Moissan Summer Undergraduate Research Fellowship – ACS Division of Fluorine Chemistry, “The Role of Fluorine in the Stabilization of Pd-Aryl Intermediates” \$3500, 05/15/2010 – 07/30/2010.
Pending.

Affiliations

Member, American Chemical Society, 1999 – Present

Organic, Inorganic and Fluorine Divisions

Member, Phi Beta Kappa, 1999 – Present

Member, American Association for the Advancement of Science, 2000 – Present

Publications (*undergraduate coauthors are underlined*)

Havlik, Sarah E.; Simmons, Jessica M.; Winton, Valerie J.; Johnson, Jeffrey B. “Nickel-Mediated Decarbonylative Cross-Coupling of Phthalimides with *in situ* Generated Diorganozinc Reagents” *J. Org. Chem.* In press.

Rathbun, Colin M.; Johnson, Jeffrey B. “Rhodium-Catalyzed Acylation with Quinolinyl Ketones: Carbon-Carbon Single Bond Activation as the Turnover Limiting Step of Catalysis” *J. Am. Chem. Soc.* **2011**, *133*, 2031.

Casey, Charles P.; Johnson, Jeffrey B.; Jaio, Xiandong.; Beetner, Sharon E.; Singer, Steven W. “Chain Mechanism for Exchange of D₂ with a Ruthenium Hydride.” *Chem. Commun.* **2010**, *46*, 7915.

Johnson, Jeffrey B.; Cook, Matthew J.; Rovis, Tomislav “Ligand Differentiated Complementary Rh-Catalyst Systems for the Enantioselective Desymmetrization of *meso*-Cyclic Anhydrides.” *Tetrahedron* **2009**, *65*, 3202-3210.

Williams, Catherine M.; Johnson, Jeffrey B.; Rovis, Tomislav “Ni-Catalyzed Reductive Carboxylation of Styrenes Using CO₂.” *J. Am. Chem. Soc.* **2008**, *130*, 14936-14937.

Johnson, Jeffrey B.; Rovis, Tomislav “Enantioselective Cross-Coupling of Anhydrides with Organozinc Reagents: The Controlled Formation of Carbon-Carbon Bonds through the Nucleophilic Interception of Metalacycles.” *Acc. Chem. Res.* **2008**, *41*, 327-338.

Casey, Charles P.; Beetner, Sharon E.; Johnson, Jeffrey B. “Determination of the Active Catalytic Species via Reaction Modeling and *in situ* IR Spectroscopy During Carbonyl Reduction with Shvo’s Hydroxycyclopentadienyl Ruthenium Hydrogenation Catalyst.” *J. Am. Chem. Soc.* **2008**, *130*, 2285-2295.

Johnson, Jeffrey B.; Rovis, Tomislav “More than Bystanders: The Effects of Olefins on Transition Metal Catalyzed Cross-Coupling Reactions.” *Angew. Chem. Int. Ed.* **2008**, *47*, 840-871. *Angew. Chem.* **2008**, *120*, 852-884.

Johnson, Jeffrey B.; Bercot, Eric A.; Williams, Catherine M.; Rovis, Tomislav “Enantioselective Anhydride Desymmetrization with *in situ* Formed Arylzinc Reagents: A Concise Synthesis of Eupomatilones 4, 6, and 7.” *Angew. Chem. Int. Ed.* **2007**, *46*, 4514-4518. *Angew. Chem.* **2007**, *119*, 4598-4503.

Johnson, Jeffrey B.; Bercot, Eric A.; Rowley, John M.; Coates, Geoff W.; Rovis, Tomislav “Ligand Dependent Catalytic Cycle and Role of Styrene in Nickel-Catalyzed Anhydride Cross-Coupling: Evidence for Turnover Limiting Reductive Elimination.” *J. Am. Chem. Soc.* **2007**, *129*, 2718-2725.

Johnson, Jeffrey B.; Yu, Robert, T.; Fink, Paul; Bercot, Eric A.; Rovis, Tomislav “Ligand Dependent Transfer from Mixed Zinc Reagents in Ni-Catalyzed Anhydride Alkylation.” *Org. Lett.* **2006**, *8*, 4307-4310.

Casey, Charles P.; Strotman, Neil A.; Beetner, Sharon E.; Johnson, Jeffrey B.; Priebe, David C.; Vos, Thomas E.; Khodavandi, B.; Guzei, Iliia A. “The PPh₃ Substituted Hydroxycyclopentadienyl Ruthenium Hydride [2,5-Ph₂-3,4-Tol₂(η⁵-C₄COH)]Ru(CO)(PPh₃)H is a More Efficient Catalyst Hydrogenation of Aldehydes.” *Organometallics* **2006**, *25*, 1230-1235.

Casey, Charles P.; Strotman, Neil A.; Beetner, Sharon E.; Johnson, Jeffrey B.; Priebe, David C.; Guzei, Iliia A. “Slower Stoichiometric and Faster Catalytic Reduction of Aldehydes by [2,5-Ph₂-3,4-Tol₂(η⁵-C₄COH)]Ru(CO)(PPh₃)H: A Highly Chemoselective Catalyst for Hydrogenation of Aldehydes over Ketones.” *Organometallics* **2006**, *25*, 1236-1244.

Johnson, Jeffrey B., Casey, Charles P. “Ligand-Metal Bifunctional Catalysis: Mechanistic Elucidation and Rational Development of More Selective Catalysts.” *Organometallics*. Invited review in preparation.

Casey, Charles P.; Johnson, Jeffrey B. “Kinetic Isotope Effect Evidence for the Concerted Transfer of Hydride and Proton from Hydroxycyclopentadienyl Ruthenium Hydride in Solvents of Different Polarities and Hydrogen

Bonding Ability." *Can. J. Chem.* **2005**, *83*, 1339-1346. *Invited Contribution for a Special Issue on Organic Reaction Mechanisms.*

Casey, Charles P.; Johnson, Jeffrey B.; Singer, Steven W.; Cui, Qiang "Hydrogen Elimination from a Hydroxycyclopentadienyl Ruthenium(II) Hydride: Study of Hydrogen Activation in a Ligand-Metal Bifunctional Hydrogenation Catalyst." *J. Am. Chem. Soc.* **2005**, *127*, 3100-3109.

Casey, Charles P.; Johnson, Jeffrey B. "Isomerization and Deuterium Scrambling Evidence for a Change in Rate Limiting Step During Imine Hydrogenation by Shvo's Hydroxycyclopentadienyl Ruthenium Hydride." *J. Am. Chem. Soc.* **2005**, *127*, 1883-1894.

Casey, Charles P.; Johnson, Jeffrey B. "Kinetic Isotope Effect Evidence for a Concerted Hydrogen Transfer Mechanism in Transfer Hydrogenations Catalyzed by [*p*-(Me₂CH)C₆H₄Me] Ru(NHCHPhCHPhNSO₂C₆H₄-*p*-CH₃)." *J. Org. Chem.* **2003**, *68*, 1998-2001.

Johnson, Jeffrey B.; Bäckvall, Jan-E. "Mechanism of Ruthenium-Catalyzed Hydrogen Transfer Reactions. Concerted Transfer of OH and CH Hydrogens from an Alcohol to a (Cyclopentadienone)ruthenium Complex." *J. Org. Chem.* **2003**, *68*, 7681-7684.

Éll, Alida, H.; Johnson, Jeffrey B.; Bäckvall, Jan-E. "Mechanism of Ruthenium-Catalyzed Hydrogen Transfer Reactions. Evidence for a Stepwise Transfer of NH and CH Hydrogens from an Amine to a (Cyclopentadienone)ruthenium Complex." *Chem. Commun.* **2003**, 1652-1653.

Nelson, Ryan C.; Johnson, Jeffrey B.; Congdon, David J.; Nedrelow, Jonathan H.; O'Brien, Brian A. "Alkali-Metal Phthaloylphosphides: Easily Prepared Phosphide Reagents for Coordination and Main-Group Chemistry." *Organometallics* **2001**, *20*, 1705-1708.

Guz, Nathan R.; Stermitz, Frank R.; Johnson, Jeffrey B.; Beeson, Teresa D.; Willen, Seth; Hsiang, Jen-Fang; Lewis, Kim. "Flavonolignan and flavone inhibitors of a Staphylococcus aureus multidrug resistance pump: structure-activity relationships." *J. Med. Chem.* **2001**, *44*, 261-268.

Presentations – National Meetings (*undergraduate coauthors are underlined*)

Todd, David P.; Johnson, Jeffrey B. "Origin of diastereoselectivity in a Gilman addition to an α,β -unsaturated ester" 239th ACS National Meeting, San Francisco, CA, March 7-11, 2010.

Boman, Timothy S.; Johnson, Jeffrey B. "Mechanistic investigation of rhodium(I)-catalyzed carbon-carbon single bond activation in quinoliny ketones" 239th ACS National Meeting, San Francisco, CA, March 7-11, 2010.

Winton, Valerie J.; Johnson, Jeffrey B. "Mechanistic Investigation of Palladium-Catalyzed Carbon-Carbon Single Bond Activation in Triaryl Methanols" 239th ACS National Meeting, San Francisco, CA, March 7-11, 2010.

Johnson, Jeffrey B.; Parrish, Jonathan D.; Wotal, Alexander C. "Mechanistic Investigation of Rhodium-Catalyzed C-C Bond Activation." 41st National Organic Symposium, Boulder, CO, United States, June 7-11, 2009.

Williams, Catherine M.; Johnson, Jeffrey B.; Rovic, Tomislav "Nickel-Catalyzed Reductive Carbonylation of Styrenes Using Carbon Dioxide." 41st National Organic Symposium, Boulder, CO, United States, June 7-11, 2009.

Winton, Valerie J.; Johnson, Jeffrey B. "Investigation of Pd-Catalyzed C-C Bond Activation of Tertiary Alcohols." 41st National Organic Symposium, Boulder, CO, United States, June 7-11, 2009.

Johnson, Jeffrey B.; Winton, Valerie J. "Mechanistic Studies on the Activation of a Carbon-Carbon Single Bond Via Palladium-Catalyzed β -Alkyl Elimination." 2008 Annual AIChE Meeting, Philadelphia, PA, November 16-21, 2008.

Beetner, Sharon E.; Casey, Charles P.; Johnson, Jeffrey B. "Determination of the Active Catalyst Species via Reaction Modeling and *in situ* IR Spectroscopy during Carbonyl Reduction with Shvo's Hydroxycyclopentadienyl Ruthenium Hydride Catalyst." 233rd ACS National Meeting, Chicago, IL, United States, March 25-29, 2007.

Johnson, Jeffrey B.; Rovic, Tomislav "Rate Limiting Reductive Elimination and Variable Olefin Effects in Nickel-Catalyzed Anhydride Alkylation." 232nd ACS National Meeting, San Francisco, CA, United States, September 10-14, 2006.

Johnson, Jeffrey B. "Mechanistic Elucidation and its Role in the Development of Organic Methodology." 232nd ACS National Meeting, San Francisco, CA, United States, September 10-14, 2006.

- Johnson, Jeffrey B.; Casey, Charles P. "Determination of the Active Catalytic Species During Aldehyde Hydrogenation via *in situ* IR Spectroscopy and Reaction Modeling." 39th National Organic Symposium, Salt Lake City, UT, United States, June 12-16, 2005.
- Casey, Charles P.; Johnson, Jeffrey B.; Bikzhanova, Galina A.; Singer, Steven W. "New Hydrogenation Catalysts and New Mechanisms for Hydrogenation." 228th ACS National Meeting, San Diego, CA, United States, March 13-17, 2005.
- Casey, Charles P.; Johnson, Jeffrey B.; Singer, Steven W. "Heterolytic Cleavage of Hydrogen by Shvo's Hydroxycyclopentadienyl Ru(II) Catalyst." Abstracts of Papers, 227th ACS National Meeting, Anaheim, CA, United States, March 27-April 1, 2004.
- Casey, Charles P.; Priebe, David; Johnson, Jeffrey B. "Increased Activity of Phosphine Substituted Hydroxycyclopentadienyl Ru(II) Catalysts." Abstracts of Papers, 227th ACS National Meeting, Anaheim, CA, United States, March 27-April 1, 2004.
- Casey, Charles P.; Vos, Thomas E.; Bikzhanova, Galina, A.; Johnson, Jeffrey B.; Priebe, David C.; Singer, Steven. "New Hydrogenation Catalysts for Polar Molecules." Abstracts, 58th Northwest regional Meeting of the American Chemical Society, Bozeman, MT, United States, June 12-14, 2003.
- Casey, Charles P.; Vos, Thomas E.; Bikzhanova, Galina A.; Singer, Steven W.; Johnson, Jeffrey B. "New Hydrogenation Catalysts for Polar Molecules." Abstracts of Papers, 225th ACS National Meeting, New Orleans, LA, United States, March 23-27, 2003.
- Casey, Charles P.; Johnson, Jeffrey B. "Experimental Evidence for Concerted Hydride and Proton Transfer in Noyori's *p*-cymene-Ru(II)-TsDPEN catalyst." Abstracts of Papers, 224th ACS National Meeting, Boston, MA, United States, August 18-22, 2002.
- O'Brien, Brian A.; Sass, Philip A.; Johnson, Jeffrey B.; Nelson, Ryan C. "Synthesis of Primary Alkylphosphines by a Phospha-Gabriel Route." Abstracts of Papers, 222nd ACS National Meeting, Chicago, IL, United States, August 26-30, 2001.
- O'Brien, Brian A.; Nelson, Ryan C.; Johnson, Jeffrey B. "Cesium and Potassium Phthaloylphosphanides" Abstracts of Papers, 219th ACS National Meeting, San Francisco, CA, March 26-30, 2000.
- Johnson, Jeffrey B.; O'Brien, Brian A. "Preparation and Reactions of Bis(trifluoromethyl)phosphine and Perfluoro-2-phosphapropene." 42nd Annual ACS Minnesota Undergraduate Research Symposium, Northfield, MN April 1999.

Invited Presentations

- "Carbon-Carbon Single Bond Activation: We can do *what?* To *which* bonds?" St. Olaf College, March 25th, 2010.
- "Carbon-Carbon Single Bond Activation: Does that really work?" Calvin College, October 15th, 2009.
- "Carbon-Carbon Single Bond Activation: We can do *what?* To *which* bonds?" Hope College, September 5th, 2008.
- "Catalytic Enantioselective Desymmetrization of *meso* Cyclic Carboxylic Anhydrides." Gustavus Adolphus College, November 11th, 2005.

Book Chapter

- Johnson, Jeffrey B. "Ring Opening Reactions of Epoxides, Aziridines and Cyclic Anhydrides" *Stereoselective Synthesis*, Vol. 3, P. Andrew Evans, ed. Thieme Chemistry, Stuttgart, Germany. In Press.

Patent

- "Transition Metal-Catalyzed Carbon Dioxide Incorporation with Alkenes" Rovis, Tomislav; Williams, Catherine M.; Johnson, Jeffrey B. U.S. Provisional Patent Application, Filed with the United States Patent & Trademark Office August 7, 2008.

Other Activities

- Mentor and Advisory Board Member for *Total Trek Quest*, an after school wellness program for 3-5th grade boys (2008 – present)

Participant in the 1998 Winter Olympic Trials for curling

Two-time Junior Men's Curling National Championship participant

Trumpet and tuba player in the Gustavus Wind Orchestra (1996 – 2000, vice president 2000)

Columnist for the *Gustavian Weekly* (1996, 1999 – 2000)

Member of the Red Cross '5 Gallon Club' for blood donations