

## PATRICK H. WILLOUGHBY

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DEPARTMENT OF CHEMISTRY  
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### APPOINTMENTS

Ripon College, Ripon, WI

- **Assistant Professor** 2013–2019
- **Associate Professor** (with tenure) 2019–Present

University of Wisconsin–Madison, Madison, WI

- **Visiting Associate Professor** 2020–2021

### EDUCATION

University of Minnesota, Minneapolis, MN

- **Ph.D.** Organic Chemistry 2013  
*Advisor:* Professor Thomas R. Hoyer  
*Thesis Title:* "Strategies for the Synthesis of Bioactive Compounds: Biomimetic Approaches to the Salinosporamides and the Hexadehydro-Diels–Alder Reaction."

- **M.S.** Organic Chemistry 2010

University of Northern Iowa, Cedar Falls, IA

- **B.S.** Chemistry, *magna cum laude* 2008

### HONORS AND AWARDS

- May Bumby Severy, Class of 1908, Award (for excellence in undergraduate teaching) 2015–2016
- National Science Foundation Graduate Research Fellowship 2010–2013
- American Chemical Society Division of Organic Chemistry Graduate Travel Award 2013
- Wayland E. Noland Outstanding Graduate Teaching Award (1 awardee per year) 2010
- University of Minnesota Graduate School Fellowship (3 awardees per year in chemistry) 2008–2009
- Purple and Old Gold Award in Chemistry and Biochemistry (1 awardee per discipline per year) 2008
- Barry M. Goldwater Scholarship 2007–2008
- Lando/National Science Foundation Summer Research Program 2007

### EXTERNAL FUNDING RECEIVED AS LEAD PRINCIPAL INVESTIGATOR

- American Chemical Society Petroleum Research Fund 2017–2021  
Undergraduate Research Program \$70,000
- Pittsburg Conference Memorial National College Grants Program 2016  
Purchase of Polarimetry Instrumentation \$10,000
- National Science Foundation Major Research Instrumentation Program 2014–2017  
Chemistry Instrumentation: Liquid Chromatography Mass Spectrometry \$237,383
- American Chemical Society Petroleum Research Fund 2014–2016  
Undergraduate New Investigator Program \$55,000

PUBLICATIONS (UNDERLINE INDICATES MENTORED UNDERGRADUATE STUDENT)

- “The Aryne-Abramov Reaction as a 1,2-Benzdiyne Platform for the Generation and Solvent-Dependent Trapping of 3-Phosphonyl Benzyne,” Bembenek, B. M.; Petersen, M. S.; Lilly, J. A.; Haugen, A. L.; Jiter, N. J.; Johnson, A. J.; Ripp, E. E.; Winchell, S. A.; Harvat, A. N.; McNulty, C.; Thein, S. A.; Grieger, A. M.; Lyle, B. J.; Mraz, G. L.; Stitgen, A. M.; Foss, S.; Schmid, M. L.; Scanlon, J. D.; Willoughby, P. H. *J. Org. Chem.* **2021**, ARTICLE ASAP.
- “The Importance of 1,5-Oxygen–Chalcogen Interactions in Enantioselective Isochalcogenourea Catalysis,” Young, C. M.; Elmi, A.; Pascoe, D. J.; Morris, R. K.; McLaughlin, C.; Woods, A. M.; Frost, A. B.; de la Houpliere, A.; Ling, K. B.; Smith, T. K.; Slawin, A. M. Z.; Willoughby, P. H. Cockroft, S. L.; Smith, A. D. *Angew. Chem., Int. Ed.* **2020**, *59*, 3705–3710.
- “Addendum: A Guide to Small-Molecule Structure Assignment Through Computation of (<sup>1</sup>H and <sup>13</sup>C) NMR Chemical Shifts,” Willoughby, P. H.; Jansma, M. J.; Hoye, T. R. *Nature Protocols* **2020**, *15*, 2277.
- “Simple and Versatile Protocol for Preparing Self-Healing Poly(vinyl alcohol) Hydrogels.” Morris, R. K.; Hilker, A. P.; Mattice, T. M.; Donovan, S. M.; Wentzel, M. T.; Willoughby, P. H. *J. Chem. Educ.* **2019**, *96*, 2247–2252.
- “BF<sub>3</sub>-Promoted, Carbene-like, C–H Insertion Reactions of Benzyne.” Shen, H.; Xiao, X.; Haj, M. K.; Willoughby, P. H.; Hoye, T. R. *J. Am. Chem. Soc.* **2018**, *140*, 15616–15620.
- “Synthesis of *N,O*-Acetals by Net Amide C–N Bond Insertion of Aldehydes into *N*-Acyl Phthalimides and *N*-Acyl Azoles.” Enright, R. N.; Grinde, J. L.; Wurtz, L. I.; Paeth, M. S.; Wittman, T. R.; Cliff, E. R.; Sankari, Y. T.; Henningsen, L. T.; Tan, C.; Scanlon, J. D.; Willoughby, P. H. *Tetrahedron* **2016**, *72*, 6397–6408.
- “Isolation and Stereochemical Assignment of Phthalides Resulting from the Diels–Alder Reaction Between 5-Isopropoxyfuran-2(5*H*)-one and Cyclopentadiene.” Resende, G. C.; Alvarenga, E. S.; Willoughby, P. H. *J. Mol. Struct.* **2015**, *1101*, 212–218.
- “Mechanism of the Reactions of Alcohols with *o*-Benzyne.” Willoughby, P. H.; Niu, D.; Wang, T.; Haj, M. K.; Cramer, C. J.; Hoye, T. R. *J. Am. Chem. Soc.* **2014**, *136*, 13657–13665.
- “Generation of Gaussian 09 Input Files for the Computation of <sup>1</sup>H and <sup>13</sup>C NMR Chemical Shifts of Structures from a Spartan’14 Conformational Search,” Reisbick, S.; Willoughby, P. *Protocol Exchange* **2014**, *Community Contribution*.
- “A Guide to Small-Molecule Structure Assignment Through Computation of (<sup>1</sup>H and <sup>13</sup>C) NMR Chemical Shifts,” Willoughby, P. H.; Jansma, M. J.; Hoye, T. R. *Nature Protocols* **2014**, *9*, 643–660.
- “Alkane Desaturation by Concerted Double Hydrogen Atom Transfer to Benzyne,” Niu, D.; Willoughby, P. H.; Woods, B. P.; Baire, B.; Hoye, T. R. *Nature* **2013**, *501*, 531–534.
- “Synthesis of Complex Benzenoids via the Intermediate Generation of *o*-Benzyne Through the Hexadehydro-Diels–Alder Reaction,” Baire, B.; Niu, D.; Willoughby, P. H.; Woods, B. P.; Hoye, T. R. *Nature Protocols* **2013**, *8*, 501–508.
- “The Hexadehydro-Diels–Alder Reaction,” Hoye, T. R.; Baire, B.; Niu, D.; Willoughby, P. H.; Woods, B. P. *Nature* **2012**, *490*, 208–212.
- “Decarboxylative Isomerization of *N*-Acyl-2-oxazolidinones to 2-Oxazolines,” May, A. E.; Willoughby, P. H. Hoye, T. R.; *J. Org. Chem.* **2008**, *73*, 3292–3294.
- “On the Heat of Formation of Nitromethane,” Bumpus, J. A.; Willoughby, P. H. *J. Phys. Org. Chem.* **2008**, *21*, 747–757.

PATENTS

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- “Methods and Intermediates Useful for the Preparation of alpha-Branched Aryl Phthalimides and alpha-Branched Aryl Amines.” Willoughby, P. H.; Enright, R. N.; Henningsen, L. T. Wurtz, L. I.; Cliff, E. R.; Grinde, J. L. US Patent 62,101,277, January 6, **2016**.
- “Cyclization Methods,” Hoye, T. R.; Baire, B.; Niu, D.; Willoughby, P. H.; Woods, B. P. US Patent 13,756,069, January 13, **2013**.

CONFERENCE PRESENTATIONS

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- “Versatile Lab for Preparing Self-Healing Poly(vinyl alcohol) Hydrogels.” Willoughby, P. H. *2018 Midwest Regional Meeting*, Ames, IA. USA, October 21–23, **2018**.
- “Synthesis of Aryl Phosphonates via 3-Phosphonyl Arynes.” Willoughby, P. H. *2018 Midwest Regional Meeting*, Ames, IA. USA, October 21–23, **2018**.
- “Synthesis of *N,O*-Acetals by Net C–N Insertion of Aldehydes into *N*-Acyl Phthalimides and Azoles,” Willoughby, P. H. *2017 ACS Great Lakes Regional Meeting*, Fargo, ND. USA, June 27–30, **2017**.
- “Synthesis of *N*-Phthalimido-*O*-Acyl-*N,O*-Acetals from Aldehydes and Their Conversion into  $\alpha$ -Branched Phthalimides,” Willoughby, P. H.; Enright, R. N.; Henningsen, L. T.; Cliff, E. R.; Grinde, J. L.; Wurtz, L. I. *The 249th ACS National Meeting*, Denver, CO. USA, March 22–26, **2015**.
- “Hexadehydro-Diels–Alder (HDDA) Reaction: Scope of Intermolecular Trapping,” Willoughby, P. H., Baire, B.; Niu, D.; Woods, B. P.; Hoye, T. R. *The 245th ACS National Meeting*, New Orleans, LA. USA, April 7–11, **2013**.
- “Synthesis of Heterocyclic Molecules via Room Temperature Decarboxylation of Cyclic Carbamates,” Willoughby, P. H.; May, A. E.; Hoye, T. R. *The 235th ACS National Meeting*, New Orleans, LA. USA, April 6–10, **2008**.
- “On the Heat of Formation of Nitromethane,” Willoughby, P. H.; Bumpus, J. A. *The 235th ACS National Meeting*, New Orleans, LA. USA, April 6–10, **2008**.