

# MICHAEL J. SHEVLIN

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- Objective:** Advancing my career at Merck & Co., Inc.
- Experience:**
- Catalysis Laboratory, Department of Process Research & Development, Merck & Co., Inc., Rahway, NJ  
**Associate Principal Scientist, Chemistry** 6/16 - present  
**Senior Scientist, Chemistry** 8/12 - 5/16  
**Research Chemist** 10/08 - 7/12  
**Staff Chemist** 9/06 - 9/08
- Supported all phases of drug discovery and development pipeline with innovative, timely, industry-leading catalytic chemical processes implemented on mg to 100+ kg scale
  - Became departmental expert in asymmetric hydrogenation through work on over 40 projects
  - Developed fundamental research program in precious and base metal-catalyzed asymmetric hydrogenation encompassing internal research and external academic collaborations
  - Managed high-throughput experimentation laboratory for asymmetric catalysis and gas reactions
  - Supervised colleagues, visiting scientists, postdoctoral researchers, and summer interns
- Ivy Tech State College, Lafayette IN 8/04 - 5/06  
**Adjunct Professor**
- Taught nine sections of introductory, general, and organic chemistry lecture and laboratory courses over five semesters
  - Designed and prepared instrumental and wet chemistry laboratory experiments
  - Developed course material for new general chemistry course
  - Developed online material to supplement course work
- University of Illinois at Chicago, Chicago IL 8/01 - 4/04  
**Research Assistant and Teaching Assistant**
- Developed a concise synthesis of polyoxamic acid using a chelation-controlled Strecker reaction
  - Procured solvents, reagents, and common laboratory supplies for a twenty-person research group
  - Taught five laboratory and seven recitation sections of organic chemistry over five semesters
  - Delivered lectures for professors in absentia
  - Wrote quizzes, proctored examinations, and graded exams, quizzes, homework, and labs
  - Provided supplementary information on the internet to assist learning outside the classroom
- Rose-Hulman Institute of Technology, Terre Haute IN 3/00 - 6/01  
**Teaching Assistant**
- Taught two laboratory sections of analytical chemistry
  - Graded examinations, quizzes, lab reports, and homework for general and organic chemistry
  - Operated the NMR spectrometer for four laboratory sections of organic chemistry
- Central States Analytical, Evansville IN 6/00 - 8/00  
**Analytical Chemist**
- Developed and verified HPLC methods for nutritional supplements and pharmaceuticals
  - Performed routine HPLC analysis of pharmaceuticals, wastewater samples, and vitamins
  - Performed lab work and maintained documentation in accordance with GLP guidelines
- Rose-Hulman Instructional Services, Terre Haute IN 8/98 - 3/00  
**Audio-Visual Technician**
- Advanced Audio Concepts, Evansville IN 8/92 - 8/98  
**Audio Engineer**
- Produced live audio for concerts, conventions, and meetings
  - Operated a digital multitrack recording studio
  - Installed new equipment and serviced old equipment

**Education:** University of Illinois at Chicago, Chicago, IL **GPA 4.00/4.00**  
**Ph.D. Organic Chemistry**, December 2020  
 Dissertation: *Unlocking the Potential of N-O Bonds in Organic Synthesis*

University of Illinois at Chicago, Chicago, IL **GPA 4.00/4.00**  
**M.S. Organic Chemistry**, July 2004

Rose-Hulman Institute of Technology, Terre Haute, IN **GPA 3.67/4.00**  
**B.S. Chemistry, minor in Chemical Engineering** *magna cum laude*, May 2001

Indiana Academy for Science, Mathematics and Humanities, Muncie, IN  
 Indiana Academic Honors Diploma, May 1998

**Related Courses:** Advanced Organic Chemistry, Organic Structure Determination, Synthetic Organic Chemistry, Theoretical Organic Chemistry, Peptide Synthesis, Biochemistry, Advanced Inorganic Chemistry, Analytical Chemistry, Physical Chemistry, Scientific Glassblowing, Material and Energy Balances, Fluid Mechanics, Heat Transfer, Mass Transfer, Materials Science

**Skills:**

- High-throughput experimentation, transition metal catalysis, glovebox techniques, HPLC, SFC, GC, preparative chromatography, NMR, IR, organic synthesis, statistical design of experiments
- Symyx LEA, Insight II, Gaussian 98, Cerius<sup>2</sup>, Spartan, Chemdraw, Design Expert, Maple, Matlab, C++, C, Java, HTML, CSS, Linux, Windows, IRIX, DOS, Word, Excel, Powerpoint, Access
- Skilled in the operation, maintenance, and repair of electronic equipment and instrumentation
- Adept in the research laboratory, classroom, and teaching laboratory

**Publications:**

- Schuster, C. H.; Dropinski, J. F.; Shevlin, M.; Li, H.; Chen, S. Ruthenium-Catalyzed Enantioselective Hydrogenation of Hydrazones. *Org. Lett.* **2020**, doi.org/10.1021/acs.orglett.0c02756.
- Shevlin, M.; Strotman, N. A.; Anderson, L. L. Concise Synthesis of Furo[2,3-*b*]Indolines via [3,3]-Sigmatropic Rearrangement. *Synlett* **2020**, doi.org/10.1055/s-0040-1707250. Invited contribution to special cluster on Heterocycle Synthesis and Functionalization.
- Zhong, H.; Shevlin, M.; Chirik, P. J. Cobalt-Catalyzed Asymmetric Hydrogenation of  $\alpha$ ,  $\beta$ -Unsaturated Carboxylic Acids by Homolytic H<sub>2</sub> Cleavage. *J. Am. Chem. Soc.* **2020**, *142*, 5272-5281.
- Chung, J. Y. L.; Meng, D.; Shevlin, M.; Gudipati, V.; Chen, Q.; Liu, Y.; Lam, Y.-H.; Dumas, A.; Scott, J.; Tu, Q.; Xu, F. Diastereoselective FeCl<sub>3</sub>·6H<sub>2</sub>O/NaBH<sub>4</sub> Reduction of Oxime Ether for the Synthesis of  $\beta$ -Lactamase Inhibitor Relebactam. *J. Org. Chem.* **2020**, *85*, 994-1000.
- Molinaro, C.; Phillips, E. M.; Xiang, B.; Milczek, E. M.; Shevlin, M.; Balsells, J.; Ceglia, S.; Chen, J.; Chen, L.; Chen, Q.; Fei, Z.; Hoerrner, S.; Qi, J.; de Lera Ruiz, M.; Tan, L.; Wan, B.; Yin, J. Synthesis of a CGRP Receptor Antagonist via an Asymmetric Synthesis of 3-Fluoro-4-aminopiperidine. *J. Org. Chem.* **2019**, *84*, 8006-8018.
- Zhong, Y.-L.; Cleator, E.; Liu, Z.; Yin, J.; Morris, W. J.; Alam, M.; Bishop, B.; Dumas, A. M.; Edwards, J.; Goodyear, A.; Mullens, P.; Song, Z. J.; Shevlin, M.; Thaisrivongs, D. A.; Li, H.; Sherer, E. C.; Cohen, R. D.; Yin, J.; Tan, L.; Yasuda, N.; Limanto, J.; Davies, A.; Campos, K. R. Highly Diastereoselective Synthesis of a HCV NS5B Nucleoside Polymerase Inhibitor. *J. Org. Chem.* **2019**, *84*, 4780-4795.
- Friedfeld, M. R.; Zhong, H.; Ruck, R. T.; Shevlin, M.; Chirik, P. J. Cobalt-Catalyzed Asymmetric Hydrogenation of Enamides Enabled by Single Electron Reduction. *Science* **2018**, *360*, 888-893.
- Kraska, S. W.; DiRocco, D. A.; Dreher, S. D.; Shevlin, M. The Evolution of Chemical High-Throughput Experimentation To Address Challenging Problems in Pharmaceutical Synthesis. *Acc. Chem. Res.* **2017**, *50*, 2976-2985.
- Hyde, A. M.; Zultanski, S. L.; Waldman, J. H.; Zhong, Y.-L.; Shevlin, M.; Peng, F. General Principles and Strategies for Salting-Out Informed by the Hofmeister Series. *Org. Process Res. Dev.* **2017**, *21*, 1355-1370.
- Shevlin, M.; Guan, X.; Driver, T. G. Iron-Catalyzed Reductive Cyclization of *o*-Nitrostyrenes Using Phenylsilane as the Terminal Reductant. *ACS Catal.* **2017**, *7*, 5518-5522.

- Shevlin, M. Practical High-Throughput Experimentation for Chemists. *ACS Med. Chem. Lett.* **2017**, *8*, 601-607. Invited contribution to *ACS Medicinal Chemistry Letters* Innovations series.
- Humphrey, G. R.; Dalby, S. M.; Andreani, T.; Xiang, B.; Luzung, M. R.; Song, Z. J.; Shevlin, M.; Christensen, M.; Belyk, K. M.; Tschaen, D. M. Asymmetric Synthesis of Letemovir Using a Novel Phase-Transfer-Catalyzed Aza-Michael Reaction. *Org. Process Res. Dev.* **2016**, *20*, 1097-1103.
- Chung, J. Y. L.; Shevlin, M.; Klapars, A.; Journet, M. Asymmetric Synthesis of N-Boc-(R)-Silaprolone via Rh-Catalyzed Intramolecular Hydrosilylation of Dehydroalanine and Continuous Flow N-Alkylation. *Org. Lett.* **2016**, *18*, 1812-1815.
- Chung, C. K.; Cleator, E.; Dumas, A. M.; Hicks, J. D.; Humphrey, G. R.; Maligres, P. E.; Nolting, A. F.; Rivera, N.; Ruck, R. T.; Shevlin, M. A Synthesis of a Spirocyclic Macrocyclic Protease Inhibitor for the Treatment of Hepatitis C. *Org. Lett.* **2016**, *18*, 1394-1397
- Shevlin, M.; Friedfeld, M. R.; Sheng, H.; Pierson, N. A.; Hoyt, J. M.; Campeau, L.-C.; Chirik, P. J. Nickel-Catalyzed Asymmetric Alkene Hydrogenation of  $\alpha,\beta$ -Unsaturated Esters: High-Throughput Experimentation-Enabled Reaction Discovery, Optimization, and Mechanistic Elucidation. *J. Am. Chem. Soc.*, **2016**, *138*, 3562-3569.
- Friedfeld, M. R.; Shevlin, M.; Margulieux, G. W.; Campeau, L.-C.; Chirik, P. J. Cobalt-Catalyzed Enantioselective Hydrogenation of Minimally Functionalized Alkenes: Isotopic Labeling Provides Insight into the Origin of Stereoselectivity and Alkene Insertion Preferences. *J. Am. Chem. Soc.* **2016**, *138*, 3314-3324.
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- Molinaro, C.; Scott, J. P.; Shevlin, M.; Wise, C.; Menard, A.; Gibb, A.; Junker, E. M.; Lieberman, D. Catalytic, Asymmetric, and Stereodivergent Synthesis of Non-Symmetric  $\beta,\beta$ -Diaryl- $\alpha$ -Amino Acids. *J. Am. Chem. Soc.* **2015**, *137*, 999-1006.
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- Hoyt, J. M.; Shevlin, M.; Margulieux, G. W.; Krska, S. W.; Tudge, M. T.; Chirik, P. J. Synthesis and Hydrogenation Activity of Iron Dialkyl Complexes with Chiral Bidentate Phosphines. *Organometallics* **2014**, *33*, 5781-5790. Invited contribution to special issue on Catalytic and Organometallic Chemistry of Earth-Abundant Metals.
- Friedfeld, M. R.; Shevlin, M.; Hoyt, J. M.; Krska, S. W.; Tudge, M. T.; Chirik, P. J. Cobalt Precursors for the High-Throughput Discovery of Base Metal Asymmetric Alkene Hydrogenation Catalysts. *Science* **2013**, *342*, 1076-1080.
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- Shevlin, M. Sulfate Additives Generate Robust and Highly Active Palladium Catalysts for the Cyanation of Aryl Chlorides. *Tetrahedron Lett.* **2010**, *51*, 4833-4836.
- Mangion, I. K.; Nwamaba, I. K.; Shevlin, M.; Huffman, M. A. Iridium-Catalyzed X-H Insertions of Sulfoxonium Ylides. *Org. Lett.* **2009**, *11*, 3566-3569.
- Ruck, R. T., Huffman, M. A., Kim, M. A., Shevlin, M., Kandur, W. V., Davies, I. W. Palladium-Catalyzed Tandem Heck Reaction/C-H Functionalization – Preparation of Spiro-Indane-Oxindoles. *Angew. Chem. Int. Ed.* **2008**, *120*, 4789-4792.
- Ghosh, A.; Shevlin, M. The Development of Titanium Enolate-Based Aldol Reactions. In *Modern Aldol Reactions Vol. 1: Enolates, Organocatalysis, Biocatalysis, and Natural Product Synthesis*. Marhwald, Ranier ed.; Wiley-VCH, 2004, 63-125.

**Patents:**

- Dumas, A. M.; Scott, J. P.; Shevlin, M.; Liu, Z.; Chung, K. Y. L.; Xu, F.; Meng, D.; Gudipati, V. Methods of Preparing Hydroxylamine Derivatives Useful in the Preparation of Anti-Infective Agents. U.S. Patent 10,472,345, Nov 12, 2019.
- Chung, J. Y. L.; Kassim, A.; Limanto, J.; Shevlin, M.; Maligres, P. E.; DiRocco, D. A.; Dropinski, J. F.; Mathew, R.; Ji Chen, Y. N.; Sherer, E.; Reibarkh, M.; Klapars, A.; Hyde, A.; Zultanski, S.; Moment, A.; Simmons, B.; Davis, T. A.; Wright, T. J.; Calanria, R.; Campeau, L.-C. Process for Making Chloro-Substituted Nucleoside Phosphoramidate Compounds. U.S. Patent 10,214,554, Feb 26, 2019.
- Isaacs, R. C. A.; Thompson, W. J.; Williams, P. D.; Su, D.-S.; Venkatraman, S.; Embrey, M. W.; Fisher, T. E.; Wai, J. S.; Dubost, D. C.; Ball, R. G.; Choi, E. J.; Pei, T.; Trice, S. L.; Campbell, N.; Maddess, M.; Maligres, P. E.; Shevlin, M.; Song, Z. J.; Steinhuebel, D. P.; Strotman, N. A.; Yin, J. HIV Integrase Inhibitors. U.S. Patent 8,513,234, Aug 20, 2013.
- Blizzard, T. A.; Chen, H.; Gude, C.; Hermes, J. D.; Imbriglio, J. E.; Kim, S.; Wu, J. Y.; Ha, S.; Motko, C. J.; Mangion, I.; Rivera, N.; Ruck, R. T.; Shevlin, M. Beta-Lactamase Inhibitors. U.S. Patent 8,487,093, Jul 16, 2013.

**Seminars and Short Courses:**

- Shevlin, M. Asymmetric Hydrogenation: Historical Perspectives, Mechanistic Insights, Modern Practices, and Future Directions. Presented at 30th International Symposium on Chirality, Princeton, NJ, 10 Jun 2018.
- Shevlin, M. High-Throughput Experimentation for Chemists: Large Arrays of Rationally Designed Experiments for Solving Complex Chemical Problems. Presented at Merck & Co., Inc., Boston, MA, 1 Nov 2018; Merck & Co., Inc., West Point, PA, 29 Oct 2018; Northwestern University, 19 Oct 2018; Merck & Co., Inc., Kenilworth, NJ, 12 Oct 2018; Merck & Co., Inc., Rahway, NJ, 12 Sep 2018; Seoul National University, 5 Jul 2017; Korea Advanced Institute of Science and Technology, 4 Jul 2017; Pohang University of Science and Technology, 3 Jul 2017; Shanghai SynTheAll Pharmaceuticals Co., 23 Jun 2017; Shanghai Institute of Organic Chemistry, 22 Jun 2017; Emory University, 29 Nov 2016; Takasago International Corporation, 20 Jul 2016; Nagoya University, 19 Jul 2016; Kyoto University, 15 Jul 2016; University of Tokyo, 8 Jul 2016; University of California-Berkeley, 28 Mar 2016; University of Illinois-Chicago, 1 Oct 2015; Princeton University, 27 Apr 2015; Merck & Co., Inc., Rahway, NJ, 14 Nov 2014.

**Short Talks and Posters:**

- Shevlin, M. High Throughput Experimentation-Enabled Discovery and Development of Cobalt-Catalyzed Asymmetric Hydrogenation. Presented at 3rd Small Molecule Activation Conference, Nassau, Bahamas, 21 Feb 2019.
- Shevlin, M. Industrially Relevant Cobalt-Catalyzed Asymmetric Hydrogenation: A Highly Efficient Synthesis of Levetiracetam. Presented at 9th Chicago Organic Symposium, Chicago, IL, 20 Oct 2018.
- Shevlin, M. Industrially Relevant Cobalt-Catalyzed Asymmetric Hydrogenation: A Highly Efficient Synthesis of Levetiracetam. Presented at 19th IUPAC International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis, Jeju, South Korea, 26 Jun 2017.
- Shevlin, M.; Guan, X.; Driver, T. G. Iron-Catalyzed Synthesis of Indoles from Nitrostyrenes. Presented at 7th Chicago Organic Symposium, Chicago, IL, 1 Oct 2016.
- Shevlin, M. Industrially Relevant Cobalt-Catalyzed Asymmetric Hydrogenation: A Highly Efficient Synthesis of Levetiracetam. Presented at JST-Princeton Symposium on First-Row Transition Metal Catalysis, Princeton, NJ, 2 Sep 2016.
- Shevlin, M. Nickel-Catalyzed Asymmetric Hydrogenation. Presented at 20th International Symposium on Homogeneous Catalysis, Kyoto, Japan, 14 Jul 2016.
- Shevlin, M. Homogeneous Nickel-Catalyzed Asymmetric Hydrogenation of Olefins. Presented at International Chemical Congress of Pacific Basin Societies, Honolulu, HI, 2015
- Shevlin, M. Base Metal Catalyzed Asymmetric Hydrogenation. Presented at 19th International Symposium on Homogeneous Catalysis, Ottawa, ON, 2014.
- Shevlin, M. Adventures in Transition Metal Catalysis: High Throughput Experimentation-Enabled Reaction Discovery, Development, and Optimization. Presented at 246th ACS National Meeting, Indianapolis, IN, 2013.
- Shevlin, M. Remarkable Effect of Sulfate Additives on the Palladium-Catalyzed Cyanation of Aryl Chlorides. Presented at the 240th ACS National Meeting, Boston, MA, 2010.

**Honors:** US EPA Presidential Green Chemistry Challenge Award for Greener Synthetic Pathways, 2017  
American Chemical Society Technical Achievements in Organic Chemistry Award, 2013  
Merck Special Achievement Award, 2014, 2013, 2011  
National Science Foundation Graduate Research Fellowship Honorable Mention, 2003  
University of Illinois at Chicago University Fellowship, 2001, 2003  
Rose-Hulman Institute of Technology William Albert Noyes, Sr. Award in Chemistry  
Rose-Hulman Institute of Technology Presidential Scholarship  
Indiana Academic Honors Diploma  
Attended Indiana Academy for Science, Mathematics, and Humanities

**Activities:** Club Master, American Contract Bridge League  
Second Place, Internet Raytracing Competition, May-June 2004  
Superintendent, Vanderburgh County 4-H Aerospace Program  
President, Rose-Hulman Chess Club  
Second Place, Rose-Hulman Campus Chess Tournament, 2001  
Recording Studio Director, WMHD radio station  
First Place, State American Chemical Society Advanced Examination, 1998  
First Place, Indiana Junior Academy of Science Examination, 1998  
First Place, State Junior Engineering and Technical Society Team Examination, 1998  
10 year 4-H member with 29 champion and 8 reserve champion awards  
Team Captain, Indiana Academy Solar Car Team

*References available on request.*