

# BRENTON L. DEBOEF

University of Rhode Island, Department of Chemistry, 140 Flagg Road, Kingston, RI 02881

(401) 874-9480, bdeboef@chm.uri.edu

## Synopsis

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Associate Professor of Chemistry, Department of Chemistry, University of Rhode Island. Expert in organic synthesis and organometallic catalysis. *Publications*: 20 scholarly articles, 1258 total citations, 3 book chapters, 1 patent; H-index 12. *Funding*: >\$2.3M total for independent career from multiple sources, including the National Science Foundation, the National Institutes of Health, the Petroleum Research Fund and the Rhode Island Science and Technology Advisory Council. *Awards*: NSF CAREER Award (2009), Pfizer Green Chemistry Award (2011), Thieme Chemistry Journal Awardee (2011).

## Professional Preparation

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Ph.D. Organic Chemistry, 2003, Washington University, St. Louis, Missouri

A.M. Organic Chemistry, 2000, Washington University, St. Louis, Missouri

B.S. Chemistry, 1998, Evangel College, Springfield, Missouri

## Appointments

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2013-Present      Coordinator, Rhode Island INBRE Training Core

2010-Present      Associate Professor, University of Rhode Island

2005-2010        Assistant Professor, University of Rhode Island

2003-2005        Postdoctoral Fellow, Columbia University

## Awards

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ACS GREET Award (Travel award for international collaboration), 2012

Pfizer Green Chemistry Award, 2011

Thieme Chemistry Journal Award, 2011

Early Career Award, NSF, 2009

Outstanding Young Alumnus Award, Evangel University, 2008

NRSA Postdoctoral Fellowship, NIH, Awarded 2005, Declined (in lieu of tenure-track position at URI)

Curriculum Development Award, University of Rhode Island, 2005

Excellence in Teaching Award, Washington University, 1999

Outstanding Chemistry Graduate, Evangel College, 1998

*Summa Cum Laude*, Evangel College, 1998 (4.0 GPA)

## Synergistic Activities

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**Coordinator**, NIH INBRE Training Core (2013–present). This is a statewide program dedicated to expanding the research infrastructure in Rhode Island. The primary function of this position is to oversee the summer undergraduate research program, which annually sponsors summer research projects for between 95 and 105

students throughout Rhode Island. The summer program culminates with a statewide undergraduate research conference with ~150 student presentations and >500 attendees, including US Senators and the Governor of the State of Rhode Island.

**Director**, Graduate Program, URI Department of Chemistry.

**Green chemistry**, Received the Pfizer Green Chemistry Award (2011). Organized Pfizer Green Chemistry Workshops at URI in 2011 and 2017 (currently in the planning stage).

**Lectures and laboratories in organic chemistry**, Completely rewrote all laboratory exercises for the sophomore-level organic laboratory course. Awarded the URI Curriculum Development Award (2005) and the Washington University Excellence in Teaching Award (1999).

**Manuscript Reviewer**, >100 scientific manuscripts for journals such as *Journal of the American Chemical Society*, *Chemical Science*, *Journal of Organic Chemistry*, *Chemical Communications*, *Chemical Reviews* and the *Journal of Chemical Education*.

**Proposal Review**, NSF Panel on Organic Synthesis (2011 & 2013); NIH Synthetic and Biological Chemistry Study Section B (2011); ad hoc reviewer for NSF (six times), DOE and the Petroleum Research Fund (eight times).

**Committee Work**, Served on numerous university-level committees, such as the TA Task Force (2015-2016), Strategic Plan Review Committee (2016), Sabbatical Review Committee (2012), Cluster Hire Review (2012 & 2014) and Health Professions Advisory Committee (2010–present).

## Scholarly Activity

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Research in the DeBoef group spans the fields of organic and organometallic chemistry and attempts to use these tools for solving medicinal and pharmaceutical problems. These efforts are divided into two separate research programs: the Development of New Reactions Using C-H Functionalization and the development of MR Molecular Imaging Agents.

The peer reviewed publications listed below have **1,254 citations** (Google Scholar, accessed July 25, 2016) and represent a wide range of chemical topics such as organic synthesis, organometallic catalysis, C–H activation, molecular probes, magnetic resonance imaging, xenon-129 nuclear magnetic resonance, supramolecular chemistry and biofuels.

### Peer-Reviewed Articles (independent career)

1. Timothy A. Dwight, Nicholas. R. Rue<sup>†</sup>, Dagmara Charyk<sup>†</sup>, Ryan Josselyn<sup>†</sup> and Brenton DeBoef\*, “C-C Bond Formation via Double C-H Functionalization: Aerobic Oxidative Coupling as a Method for Synthesizing Heterocoupled Biaryls” *Organic Letters*, **2007**, 9, 3137–3139. 342 citations
  - Fifth most downloaded article from the *Organic Letters* website during the three year period from 2007–2010.
2. Shathaverdhan Potavathri, Timothy A. Dwight, Ashley Dumas, Gregory Naumiec, Jeffery Hammann<sup>†</sup> and Brenton DeBoef\*, “Oxidant Controlled Regioselectivity in the Oxidative Arylation of *N*-Acetylindoles,” *Tetrahedron Letters* **2008**, 49, 4050–4053. 106 citations
3. Matthew M. Hooper<sup>†</sup> and Brenton DeBoef\*, “Teaching Green Chemistry and Combinatorial Chemistry in One Laboratory Module: The Aqueous Passerini Reaction,” *Journal of Chemical Education* **2009**, 86, 1107–1110. 17 citations
4. Jessica Hegner,<sup>†</sup> Kyle C. Pereira, Brenton DeBoef\* and Brett L. Lucht\* “Conversion of cellulose to glucose and levulinic acid via solid-supported acid catalysis,” *Tetrahedron Letters* **2010**, 51, 2356–2358. 109 citations
5. Shathaverdhan Potavathri, Kyle C. Pereira, Serge I. Gorelsky, Andrew Pike,<sup>†</sup> Alexis P. LeBris, and Brenton DeBoef\* “Regioselective Oxidative Arylation of Indoles Bearing *N*-Alkyl Protecting Groups: Dual C–H Functionalization via a Concerted Metalation–Deprotonation Mechanism,” *Journal of the American Chemical Society* **2010**, 132, 14676–14681. 191 citations
6. Shathaverdhan Potavathri, Abhishek Kantak and Brenton DeBoef\* “Increasing synthetic efficiency via direct C-H functionalization: Formal synthesis of an inhibitor of botulinum neurotoxin,” *Chemical Communications* **2011**, 47, 4679–4681. 17 citations

7. Abhishek A. Kantak, Shathaverdhan Potavathri, Rose A. Barham, Kaitlyn M. Romano<sup>†</sup> and Brenton DeBoef\* "Metal-Free Intermolecular Oxidative C-N Bond Formation via Tandem C-H and N-H Bond Functionalization" *Journal of the American Chemical Society* **2011**, *133*, 119960–19965. *122 citations*
8. Joshua Potvin, Erin Sorlien, Jessica Hegner, Brenton DeBoef,\* Brett L. Lucht\* "Effect of NaCl on the conversion of cellulose to glucose and levulinic acid via solid supported acid catalysis," *Tetrahedron Letters* **2011**, *52*, 5891–5893. *42 citations*
9. Gregory R. Naumiec, Angela N. Del Padre, Matthew M. Hooper, Alison St. Germaine<sup>†</sup> and Brenton DeBoef\* "A Modern Apparatus for Performing Flash Chromatography: An Experiment for the Organic Laboratory" *Journal of Chemical Education* **2013**, *90*, 376–378.
10. Kyle C. Pereira, Ashley L. Porter, Shathaverdhan Potavathri, Alexis P. LeBris and Brenton DeBoef\* "Mechanistic insight into the palladium catalyzed oxidative arylation of benzofuran: Heteropoly acid oxidants evoke a Pd(II)/Pd(IV) mechanism" *Tetrahedron* **2013**, *69*, 4429–4435. *12 citations*
11. John J. Sirois, Riley Davis<sup>†</sup> and Brenton DeBoef\* "Iron Catalyzed Arylation of Heterocycles via Directed C-H Bond Activation" *Organic Letters*, **2014**, *16*, 868–871. *16 citations*
12. Kyle C. Pereira, Ashley L. Porter and Brenton DeBoef\* "Intramolecular arylation of benzimidazoles via Pd(II)/Cu(I) catalyzed cross-dehydrogenative coupling" *Tetrahedron Letters*, **2014**, *55*, 1729–1732.
13. Louis Marchetti, Abhishek Kantak, Riley Davis<sup>†</sup> and Brenton DeBoef\* "Regioselective Gold-Catalyzed Oxidative C-N Bond Formation" *Organic Letters*, **2015**, *17*, 358–361. *11 citations*
14. Gregory R. Naumiec, Grace A. Lincourt, Jeremy P. Celver, Michael A. McGregor, Abraham Kovoov, and Brenton DeBoef\* "Synthesis of a  $\beta$ -CCT-lanthanide conjugate for binding the dopamine transporter" *Organic & Biomolecular Chemistry*, **2015**, *13*, 2537–2540.
15. Abhishek A. Kantak, Louis Marchetti and Brenton DeBoef\* "Regioselective C–H bond amination by aminoiodanes" *Chemical Communications*, **2015**, *51*, 3574–3577.
16. Louis Marchetti and Brenton DeBoef\* "Solution-Phase Synthesis of Dipeptides: A Capstone Project That Employs Key Techniques in an Organic Laboratory Course" **2015**, *92*, 1536–1538.
17. John J. Sirois and Brenton DeBoef\* "Transition-metal free umpolung carbon-nitrogen versus carbon-chlorine bond formation" *Tetrahedron Letters* **2015**, *56*, 5610–5612.
18. Pinku Kaswan, Ashley Porter, Kasiviswanadharaju Pericherla, Marissa Simone, Sean Peters,<sup>†</sup> Anil Kumar\* and Brenton DeBoef\* "Oxidative Cross-Coupling of  $sp^3$ - and  $sp^2$ -Hybridized C-H Bonds: Vanadium-Catalyzed Aminomethylation of Imidazo[1,2-a]pyridines" *Organic Letters* **2015**, *17*, 5208–5211.
19. Pinku Kaswan, Nitesh Kumar Nandwana, Brenton DeBoef and Anil Kumar\* "Vanadyl Acetylacetonate Catalyzed Methylenation of Imidazo[1,2-a]pyridines by Using Dimethylacetamide as a Methylene Source: Direct Access to Bis(imidazo[1,2-a] pyridin-3-yl)methanes" *Advanced Synthesis & Catalysis* **2016**, *358*, 2018–2115.
20. Francis Hane, Peter Smylie, Tao Li, Julia Ruberto, Krista Dowhos,<sup>†</sup> Iain Ball, Boguslaw Tomanek, Brenton DeBoef, Mitchell Albert\* "HyperCEST Detection of Cucurbit[6]uril in Whole Blood Using an Ultrashort Saturation Pre-pulse Train" *Contrast Media and Molecular Imaging* **2016**, *in press*.
21. Tao Li, Peter Smylie, Raiili Pellizzari, Jennifer Plata, Brenton DeBoef, Mitchell Albert\* "In vivo detection of a hyperpolarized xenon magnetic resonance molecular imaging contrast agent" *Scientific Reports* **2016**, *submitted August 2016*.

\* corresponding author

<sup>†</sup> undergraduate author

All other coauthors are graduate students or collaborators.

#### **Peer Reviewed Articles (prior to independent career)**

1. Scott R. Gilbertson\* and Brenton DeBoef, "Rhodium Catalyzed [4+2+2] Cycloaddition and Alkyne Insertion: A Novel Route to Eight-Membered Rings," *J. Am. Chem. Soc.*, **2002**, *124*, 8784–8785. *94 citations*
  - *Highlighted in Chemical & Engineering News (the primary trade magazine in the fields of chemistry and chemical engineering) [C&EN 2002, 80(30), 24 (July 29, 2002)] and Angewandte Chemie [Angew. Chem. Int. Ed. 2003, 42, 718–720].*

- Brenton DeBoef, Stefan J. Pastine and Dalibor Sames,\* "Cross-Coupling of  $sp^3$  C-H Bonds and Alkenes: Catalytic Cyclization of Alkene-Amide Substrates," *J. Am. Chem. Soc.*, **2004**, *126*, 6556-6557. 126 citations
- Brenton DeBoef, W. Richard Counts and Scott R. Gilbertson,\* "Rhodium Catalyzed Synthesis of Eight-Member Rings" *J. Org. Chem.*, **2007**, *72*, 799-804. 33 citations

### **Non-Peer Reviewed Articles**

- Brenton DeBoef and Scott R. Gilbertson\*, "C-C Bond Formation via C-H Bond Activation: Synthesis of the Core of Teleocidin B4," *Chemtracts* **2003**, *16*, 249-253.

### **Book Chapters**

- Abhishek Kantak and Brenton DeBoef "Intermolecular Coupling via C( $sp^2$ )-H Activation" In *Science of Synthesis*; George Thieme Verlag KG: New York, 2013; pp. 585–641.
- Brenton DeBoef and Ashley Porter "Aryl-Aryl Coupling via CDC Reactions" In *Cross-Dehydrogenative Coupling*; C.-J. Li, Ed.; RSC Press, 2015; pp. 114–132.
- Brenton DeBoef "The Role of Design, Serendipity, and Scientific Competition in the Development of Oxidative Coupling Reactions" in *Strategies and Tactics in Organic Synthesis, v. 11*; Michael Haramata, Ed.; Academic Press: Amsterdam, 2015; pp. 151–170.

### **Patents**

- Brenton DeBoef "Aerobic Oxidative Coupling for the Formation of Bis-Arenes" U.S. Patent 8703966, issued April 22, 2014.
- Joseph Brown and Brenton DeBoef "Bowl-Shaped Molecular Probes for Hyperpolarized Xenon-129 Magnetic Resonance Imaging", Provisional Patent, filed March 2014.

### **Invited Talks**

- "Synthesis of C-C and C-N bonds via oxidative C-H functionalization" Wuhan University, Wuhan, China; August 2012
- "Synthesis of C-C and C-N bonds via oxidative C-H functionalization" Peking University, Beijing, China; September 2012
- "Water soluble cryptophanes for use in hyperpolarized xenon-129 MRI" Wuhan University, Wuhan, China; September 2012
- "Synthesis of C-C and C-N bonds via oxidative C-H functionalization" University of Delhi, India; February 2013
- "Synthesis of C-C and C-N bonds via oxidative C-H functionalization" Indian Society of Chemists and Biologists Conference, Udaipur, India; March 2013
- "International collaborations furthering the development of biosensors for xenon-129 MRI" ACS National Meeting, New Orleans; April 2013
- "C-H Bonds, Xenon Cages and the Role of Competition in Scientific Discovery" Thunder Bay Regional Research Institute, Thunder Bay, Canada; May 2013
- "C-H Bonds, Xenon Cages and the Role of Competition in Scientific Discovery" Lakehead University, Thunder Bay, Canada; May 2013
- "Molecular Imaging without Radionuclides" Rhode Island College, October 2015
- "1) Synthesis of C-C and C-N bonds via oxidative C-H activation; 2) Bowl-shaped molecular probes for xenon-129 magnetic resonance imaging" University of Massachusetts-Boston; December 2015
- "1) Synthesis of C-C and C-N bonds via oxidative C-H activation; 2) Bowl-shaped molecular probes for xenon-129 magnetic resonance imaging" West Virginia University; February 2016

12. "1) Synthesis of C–C and C–N bonds via oxidative C–H activation; 2) Bowl-shaped molecular probes for xenon-129 magnetic resonance imaging" Pittsburg University; February 2016
13. "Molecular Imaging without Radionuclides" Bridgewater State College; February 2016
14. "Synthesis of C–C and C–N bonds via oxidative C–H activation" Third International Symposium on C–H Activation, Montreal, Canada; June 2016

***Presentations at Regional, National or International Meetings (recent, 34 prior to 2012)***

15. Brenton DeBoef "Water-soluble cryptophanes for use in hyperpolarized xenon-129 MRI" ACS National Meeting, Philadelphia; August 2012, *Oral Presentation*
16. Brenton DeBoef "Synthesis of C-C and C-N bonds via oxidative C-H functionalization" ACS National Meeting, Philadelphia; August 2012, *Oral Presentation*
17. Abhishek A. Katak and Brenton DeBoef "Metal-free intermolecular oxidative C-N bond formation via tandem C-H and N-H bond functionalization" ACS National Meeting, Philadelphia; August 2012, *Poster Presentation*
18. Louis Marchetti and Brenton DeBoef "Intramolecular cyclization of pyridine substrates via C-H bond activation" ACS National Meeting, Philadelphia; August 2012, *Poster Presentation*
19. Ashley L. Porter and Brenton DeBoef "Intramolecular cyclization of benzimidazoles and intermolecular arylation of indoles via palladium catalyzed C-H bond activation" ACS National Meeting, Philadelphia; August 2012, *Poster Presentation*
20. Brenton DeBoef "Flash chromatography: A safer method for teaching this important and ubiquitous technique" ACS National Meeting, Philadelphia; August 2012, *Oral Presentation*
21. John Sirois and Brenton DeBoef "Directed arylation of pyridine substrates by C-H bond activation via a ruthenium catalyst" ACS National Meeting, Philadelphia; August 2012, *Poster Presentation*
22. Marissa Simone and Brenton DeBoef "Development of water soluble cryptophane A for xenon biosensors" ACS National Meeting, Philadelphia; August 2012, *Poster Presentation*
23. Brenton DeBoef "Synthesis of C-C and C-N bonds via oxidative C-H functionalization" ACS National Meeting, New Orleans; April 2013, *Oral Presentation*
24. Abhishek A. Katak and Brenton DeBoef "Regioselective C-H amination using iodanes and iodonium salts" ACS National Meeting, New Orleans; April 2013, *Poster Presentation*
25. Joseph D. Brown and Brenton DeBoef "Rapid microwave enhanced synthesis of functionalized cryptophanes" ACS National Meeting, New Orleans; April 2013, *Poster Presentation*
26. John Sirois and Brenton DeBoef "Iron catalyzed directed arylation of heterocyclic imines by C-H bond activation" ACS National Meeting, New Orleans; April 2013, *Poster Presentation*
27. Marissa Simone and Brenton DeBoef "Development of water soluble cryptophane A for xenon biosensors" ACS National Meeting, New Orleans; April 2013, *Poster Presentation*
28. Abhishek A. Katak, John Sirois, Hillary (Riley) Davis<sup>†</sup> and Brenton DeBoef "Synthesis of C-C and C-N bonds via oxidative C-H activation" New Reactions and Processes Gordon Conference, Smithfield, RI; July 2013, *Poster Presentation*
29. Brenton DeBoef "Synthesis of C-C and C-N bonds via oxidative C-H activation" Northeast Regional Meeting of the American Chemical Society, New Haven, CT; October 2013, *Oral Presentation*
30. Riley Davis<sup>†</sup>, John Sirois and Brenton DeBoef "Iron catalyzed directed arylation by C-H bond activation of heterocyclic imines" Northeast Regional Meeting of the American Chemical Society, New Haven, CT; October 2013, *Poster Presentation*
31. Sean Peters<sup>†</sup>, Abhishek Katak and Brenton DeBoef "Metal Free, Oxidative Amination of sp<sup>3</sup>-Hybridized Carbons" Northeast Regional Meeting of the American Chemical Society, New Haven, CT; October 2013, *Poster Presentation*
32. Brenton DeBoef "Regioselective Synthesis of Aniline Derivatives via C-H Amination using Aza-Iodanes" New Reactions and Processes Gordon Conference, Smithfield, RI; July 2014. *Poster Presentation*

33. John J. Sirois and Brenton DeBoef "Iron-catalyzed arylation of heterocycles via directed C-H bond activation" ACS National Meeting, San Francisco, August 2014; *Oral Presentation*
34. Louis Marchetti, Abhishek Kantak and Brenton DeBoef "Metal mediated regioselective C-N bond formation via tandem C-H and N-H bond activation" ACS National Meeting, San Francisco; August 2014, *Oral Presentation*
35. Brenton DeBoef "C-H Bonds, Xenon Cages and the Role of Competition in Scientific Discovery" Rhode Island Section of the American Chemical Society Meeting, Kingston, RI; May 2015, *Oral Presentation*
36. Joseph Brown John Sirois and Brenton DeBoef "Drug discovery: From computational screening to synthesis of lead compounds" ACS National Meeting, Boston; August 2015, *Oral Presentation*
37. Brenton DeBoef "Synthesis of C-C and C-N bonds via oxidative C-H activation" ACS National Meeting, Boston; August 2015, *Oral Presentation*
38. Louis Marchetti, Abhishek Kantak, Riley Davis<sup>†</sup> and Brenton DeBoef "Regioselective C-N bond formation via gold catalysis" ACS National Meeting, Boston; August 2015, *Poster Presentation*
39. Brenton DeBoef "Bowl-shaped molecular probe for xenon-129 magnetic resonance imaging" ACS National Meeting, Boston; August 2015, *Oral Presentation*

presenting author

<sup>†</sup> undergraduate author

All other coauthors are graduate students or collaborators.

## Funded Research Projects

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### **21 funded projects since coming to URI, totaling \$2.3M**

1. "Preparing Students for Successful Careers in Chemistry," URI Foundation, **\$1,000**, Awarded 8/2005, *Sole PI*
2. "Total Synthesis of UCS1025A and Derivatives Thereof for Use as Anti-Telomerase Agents," URI-INBRE Program (NIH), **\$15,000**, 9/2005–3/2006, *Sole PI*
3. "Development of Expedient and Environmentally Benign Methods for Synthesizing Biaryl Molecules," URI Research Council, **\$8,540**, 5/2006–8/2006, *Sole PI*
4. "Acquisition of Rotary Evaporators for the Undergraduate Organic Chemistry Laboratory," URI Foundation, **\$18,000**, Awarded 11/2006, *Sole PI*
5. "Delivering a True Research Experience in the Teaching Laboratory," URI Foundation, **\$2,000**, Awarded 3/2007, *Sole PI*
6. "Oxidative Coupling: A Novel Method for Synthesizing *N*-Aryl Amines," Petroleum Research Fund, **\$40,000**, 7/2007–6/2009, *Sole PI*
7. "Development of an MRI Contrast Agent for Dopamine Transporter," URI Research Council, **\$8,459**, 7/2008–12/2008, *Sole PI*
8. "Synthesis of Next-Generation Inhibitors of Botulinum Neurotoxin," URI-INBRE Program (NIH), **\$18,700**, 5/2007–4/2008, *Sole PI*
9. "Research Collaboration with P&H Therapeutics," P&H Therapeutics, **\$28,440**, 8/2008–2/2009, *Sole PI*
10. "CAREER: Oxidative Cross-Coupling—An Efficient and Green Method for Synthesizing Biaryls," NSF, **\$550,000**, 3/2009–2/2015 (with one year extension), *Sole PI*
11. "SUMR: Synthesis of Bis-arenes via Oxidative Coupling," Petroleum Research Fund (SUMR program to support underrepresented minority undergraduates), **\$5,000**, 6/2009–8/2009, *Sole PI*
12. "Chemical Methods for Converting Biomass to Biofuels," USDA Land Grant, **\$10,000**, with Brett Lucht, 10/2009–9/2010, *Co-PI*
13. "Next Generation MRI Probes for Translocator Protein 18 kDa, an Inflammation Biomarker," NIH-NINDS, with Jeremy Clever (Kovogen) and Mitchell Albert (UMass Medical School), **\$149,900**, 9/2009–8/2011, *Subcontract PI*
14. "Advanced Technology for Laboratories Serving Students in Chemistry, Engineering, Life Sciences and the Health Professions," The Champlain Foundations, **\$175,000**, with Cindy Brittain, Jason Dwyer and Geoffrey Bothun, Awarded 11/2010, *Lead PI*

15. "New Methods for Synthesis via Oxidative Coupling," NIH-NIGMS (R15 program), **\$421,199**, 12/2010–11/2013, *Sole PI*
16. "Optimization of Biosensors for HyperCEST Enhanced Xenon-129 Imaging," with Marissa Simone, The American Chemical Society (GREET Program), **\$11,000**, 6/2012–11/2012, *Lead PI*
17. "Advanced Instrumentation for Probing the Structure and Physiological Function of Purified Therapeutics," with Jason Dwyer, Mindy Levine, Abraham Kovoor and Geoff Bothun, The Champlin Foundations, **\$135,00**, Awarded 11/2013, *Co-PI*
18. "Development of a New Platform for Molecular Imaging: Hyperpolarized Xenon-129 Molecular Probes," with Li Qiong-Wang (Brown University), RI STAC, **\$75,000**, 6/2014–12/2015, *Lead PI*
19. "Acquisition of a 400 MHz NMR for Chemical and Forensic Science," with Geoff Bothun, Brett Lucht, William Euler, James Smith, Jimmie Oxley, Mindy Levine and Matthew Kieseewetter, NSF (MRI Program), **\$245,700**, 8/2015–7/2017, *Lead PI*
20. "Drug Discovery in the Organic Chemistry Teaching Laboratory: A Model for Incorporating Experiential Learning into Traditional Curricula," URI Innovation II Program, with Christopher Hemme, **\$24,725**, 7/2016–6/2017, *Lead PI*
21. "Mechanistic Investigations of Oxidative C-H Functionalization Reactions," NSF (SYN Program), **\$360,000**, 9/2016–8/2019, *Sole PI*