

QIU WANG

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PROFESSIONAL APPOINTMENT

Robert R. and Katherine B. Penn Associate Professor	07/2018–Present
Assistant Professor	08/2011–06/2018
Duke University, Department of Chemistry, Durham, NC	
Postdoctoral Researcher	
Broad Institute of Harvard and MIT, Cambridge, MA	2007–2011
Harvard University, Cambridge, MA	2005–2007
Graduate Research Assistant	2001–2005
Emory University, Atlanta, GA	

EDUCATION

Ph.D. Organic Chemistry, Emory University, Atlanta, GA	2005
B.S. Environmental Chemistry, Wuhan University, P. R. China	1999

HONORS AND AWARDS

Bass Fellow, Duke University	2018
Camille Dreyfus Teacher-Scholar Award	2016
Alfred P. Sloan Research Fellow	2016
NSF CAREER Award	2015
Thieme Chemistry Journal Award	2015
ACS PRF Doctoral New Investigator Award	2013
Osborne R. Quayle Award for Outstanding Graduate Research	2004
Boehringer-Ingelheim Graduate Student Scholarship	2003
Excellent Undergraduate Student Scholarship	1996–1999

PROFESSIONAL SERVICE AND AFFILIATIONS

Associate Editor, *Journal of Organic Chemistry*, 2021–present
 Editorial Advisory Board, *European Journal of Organic Chemistry*, 2020–present
 Editorial Advisory Board, *Organic Letters*, 2017–2019
 Journal Reviewer for ACS, Cell, Elsevier, Nature, RSC, Science, Thieme, and Wiley

NIH Study Section Standing Member, 2019–present
NIH Study Section Panel, *Ad hoc* Member, 2016, 2017, 2018
NSF Panelist, Chemistry Panel, 2015, 2016, 2018, 2019, 2020, 2021
ACS PRF Grant Reviewer, 2017, 2018, 2019, 2020
Ad Hoc Grant Reviewer, Chilean National Science and Technology Commission, 2016

Co-Chair, Recent Trends in Amination Chemistry Symposium, PacifiChem, 2021
Co-Chair, Heterocyclic Chemistry in the Southeast and Beyond Symposium, 71st SERMACS, Savannah, GA, 2019
Discussion Leader, Florida Heterocyclic and Synthetic (FloHet) Conference, 2018
Session Chair, GRC on Heterocyclic Compounds, 2016
Session Chair, GRC on High Throughput Chemistry & Chemical Biology, 2015
Session Chair, the 8th Singapore International Chemical Conference, 2014
Committee Member, Molecular Education, Technology, and Research Innovation Center (METRIC), North Carolina State University

Professional Societies

The American Association for the Advancement of Science
The American Chemical Society
International Society for Heterocyclic Chemistry

Other Professional Affiliations and Activities

Faculty Member, Duke Cancer Institute
Faculty Member, Duke Institute of Brain Science
Faculty Member, Fitzpatrick Institute for Photonics, Duke University
Participating faculty, Duke University Service-Learning Program
Participating faculty, Duke University Pharmacological Sciences Training Program
Faculty mentor, Howard Hughes Undergraduate Research Fellow Program, Duke University
Faculty mentor, Duke BioCoRE (Biosciences Collaborative for Research Engagement)
Faculty mentor, North Carolina ACS Project SEED Program for High School Students

PUBLICATIONS

RESEARCH ARTICLES – INDEPENDENT CAREER

(Undergraduate co-author, *indicates corresponding author)

- 1 Cho, S.; E.J. McLaren, **Wang, Q.*** Three-Component Difunctionalization of Cyclohexenyl Triflates Direct Access to Versatile Cyclohexenes via Cyclohexynes. *Angew. Chem. Int. Ed.*, **2021**, *60*, 26332–26336.
- 2 Bae, J.; # Zhang, G.; # Park, P.; Warren, S. W.;* **Wang, Q.*** ¹⁵N-Azides as Practical and Effective Tags for Developing Long-Lived Hyperpolarized Agents. *Chem. Sci.* **2021**, *12*, 14309–14315.

- 3 Kwon, Y.;[#] Zhang, W.;[#] **Wang, Q.*** “Copper-Catalyzed Aminoheteroarylation of Unactivated Alkenes through Distal Heteroaryl Migration” *ACS Catal.* **2021**, *11*, 8807–8817. ([#]equal contribution)
- 4 Wang, L.; Wang, H.; Shen, K.; Park, H.; Zhang, T.; Wu, X.; Hu, M.; Yuan, H.; Yue Chen, Y.; Wu, Z.*; **Wang, Q.***, Li, Z. Development of novel 18F-PET agents for tumor hypoxia imaging” *J. Med. Chem.* **2021**, *64*, 5593–5602.
- 5 Zhang, W.;[#] Wang, C.;[#] **Wang, Q.*** "Copper-Catalyzed Decarboxylative Functionalization of Conjugated β,γ -Unsaturated Carboxylic Acids" *ACS Catal.* **2020**, *10*, 13179–13185. ([#]equal contribution)
- 6 Kwon, Y.; **Wang, Q.*** “Copper-Catalyzed 1,2-Aminocyanation of Unactivated Alkenes via Cyano Migration” *Org. Lett.* **2020**, *11*, 4141–4145.
- 7 Park, P.;[#] Urs, A. N.;[#] Zimmerman, J.; Liu, C.; **Wang, Q.*** Urs, N.M.* Structure–Functional–Selectivity Relationship Studies of Novel Apomorphine Analogs to Develop D1R/D2R Biased Ligands. *ACS Med. Chem. Lett.* **2020**, *11*, 385–392. ([#]equal contribution)
- 8 Park, P.;[#] Zhang, G.;[#] Bae, J.;[#] Theis, T.; Warren, S. W.*; **Wang, Q.*** Application of ¹⁵N₂-Diazirines as a Versatile Platform for Hyperpolarization of Biological Molecules by d-DNP. *Bioconjugate Chem.* **2020**, *31*, 537–541. ([#]equal contribution)
- 9 Cho, S.; **Wang, Q.*** 1,2-Difunctionalization of Aryl Triflates: A Direct and Modular Access to Diversely Functionalized Anilines. *Org. Lett.* **2020**, *4*, 1670–1674.
- 10 Hemric, B. N.; Chen, A. W.; **Wang, Q.*** Copper-Catalyzed 1,2-Amino Oxygenation of 1,3-Dienes: A Chemo-, Regio-, and Site-Selective Three-Component Reaction with *O*-Acylhydroxylamines and Carboxylic Acids. *ACS Catal.* **2019**, *11*, 10070–10076.
- 11 Hemric, B. N.; Chen, A. W.; **Wang, Q.*** Copper-Catalyzed Modular Amino Oxygenation of Alkenes: Access to Diverse 1,2-Amino Oxygen-Containing Skeletons. *J. Org. Chem.* **2019**, *74*, 1468–1488.
- 12 Cho, S.; **Wang, Q.*** *ortho*-Difunctionalization of Arynes via LiZnEt₂(TMP)-Mediated Deprotonative Zincation/Elimination of Aryl Triflates. *Tetrahedron*, **2018**, *74* (26), 3325–3328.
 - Special issue in honor of Seth Herzon’s Tetrahedron Young Investigator Award
- 13 Liu, C.; **Wang, Q.*** Alkenylation of *sp*³ C–H Bonds by Zincation/Copper-Catalyzed Cross-Coupling with Iodonium Salts. *Angew. Chem. Int. Ed.* **2018**, *57*, 4727–4731.
- 14 Bae, J.;[#] Zhou, Z.;[#] Theis, T.;^{*} Warren, W. S.; **Wang, Q.*** ¹⁵N₄-1,2,4,5-Tetrazines as Potential Molecular Tags: Integrating Bioorthogonal Chemistry with Hyperpolarization and Unearthing *para*-N₂. *Sci. Adv.* **2018**, *4*, eaar2978. ([#]equal contribution)
- 15 Ortiz, Jr. G. X.,[#] Chansaenpak, K.[#] Wang, M.; Ma, X.; Wang, H.; Li, Z.* Wang, Q.* A Novel ¹⁸F-Labeling Method for the Synthesis of [¹⁸F]-Piperidine-Containing Ligands as Potential PET Radiotracers for Sigma Receptors. *Synlett*, **2018**, *28*, 410–414.
- 16 Shen, K.; **Wang, Q.*** Copper-Catalyzed Aminoalkynylation of Alkenes with Hypervalent Iodine Reagents. *Chem. Sci.* **2017**, *8*, 8265–8270.
- 17 Shen, K.; **Wang, Q.*** Copper-Catalyzed Alkene Aminoazidation as a Rapid Entry to 1,2-Diamines and Installation of an Azide Reporter onto Azaheterocycles. *J. Am. Chem. Soc.* **2017**, *139*, 13110–13116.

- 18 Hendrick, C. E.; Bitting, K. J. Cho, S. **Wang, Q.*** Site-Selective Copper-Catalyzed Amination and Azidation of Arenes and Heteroarenes via Deprotonative Zincation. *J. Am. Chem. Soc.* **2017**, *139*, 11622–11628.
- 19 Shen, K.;[#] Logan, A.;[#] Colell, J. F. P.;[#] Bae, J.; Ortiz, Jr. G. X.; Theis, T.; Warren, W. S.;* Malcolmson, S.;* **Wang, Q.*** Diazirines as Potential Molecular Imaging Tags: Probing the Requirements for Efficient and Long-Lived SABRE-Induced Hyperpolarization. *Angew. Chem. Int. Ed.* **2017**, *56*, 12112–12116. ([#]equal contribution)
- 20 Colell, J. F. P. J.; Emondts, M.; Logan, A. W. J.; Shen, K.; Bae, J.; Shchepin, R.; Ortiz, G. X. Jr.; Spanning, P.; **Wang, Q.**; Malcolmson, S.; Chekmenev, E. Y.; Feiters, M.; Rutjes, F.; Bluemich, B.; Theis, T.; * Warren, W. S.* Direct Hyperpolarization of Nitrogen-15 in Aqueous Media with Parahydrogen in Reversible Exchange *J. Am. Chem. Soc.* **2017**, *139*, 7761–7767.
- 21 Ortiz, Jr. G. X.; Hemric, B. N.; **Wang, Q.*** Direct and Selective 3-Amidation of Indoles Using Electrophilic *N*-Benzenesulfonyloxyamides. *Org. Lett.*, **2017**, *19*, 1314–1317.
- 22 Colell, J. F. P. J.; Logan, A. W. J.; Bae, Zhou, Z.; Shchepin, R. V.; Barskiy, D.A.; Ortiz, G. X. Jr.; **Wang, Q.**; Malcolmson, S. J.; Chekmenev, E. Y.; Warren, W. S.; * Theis, T. * Generalizing, Extending, and Maximizing Nitrogen-15 Hyperpolarization induced by Parahydrogen in Reversible Exchange. *J. Phy. Chem. C*, **2017**, *121*, 6626–6634.
- 23 Hendrick, C. E.; **Wang, Q.*** Emerging Developments Using Nitrogen–Heteroatom Bonds as Amination Reagents in the Synthesis of Aminoarenes. *J. Org. Chem.* **2017**, *82*, 839–847.
- 24 Liu, C.; **Wang, Q.*** Arylation, Vinylation and Alkynylation of Electron-deficient (Hetero)arenes with Iodonium Salts. *Org. Lett.* **2016**, *18*, 5118–5121.
- 25 Hemric, B. N.; Shen, K.; **Wang, Q.*** Copper-Catalyzed Amino Lactonization and Amino Oxygenation of Alkenes Using *O*-Benzoylhydroxylamines. *J. Am. Chem. Soc.* **2016**, *138*, 5813–5816.
- 26 Theis, T.;^{**} Ortiz Jr., G. X.;[#] Logan, A.; Claytor, K.; Feng, Y.; Kuhn, W.; Blum, V.; Malcolmson, S.; Chekmenev, E. Y.; **Wang, Q.**;^{*} Warren, W. S.* Direct and Cost-efficient Hyperpolarization of Long-lived Nuclear Spin States on Universal ¹⁵N Molecular Tags. *Sci. Adv.* **2016**, *2*, e1501438. ([#]equal contribution)
- 27 Shen, K.; **Wang, Q.*** Copper-Catalyzed Aminotrifluoromethylation of Alkenes: A Facile Synthesis of CF₃-Containing Lactams. *Org. Chem. Front.* **2016**, *3*, 222–226.
- 28 Hemric, B. N.; **Wang, Q.*** Copper-Catalyzed Intermolecular Oxyamination of Olefins Using Carboxylic Acids and *O*-Benzoylhydroxylamines. *Beilstein J. Org. Chem.* **2016**, *12*, 22–28.
- 29 Chen, Z.; **Wang, Q.*** Synthesis of *o*-Aminophenols via a Formal Insertion Reaction of Arynes into Hydroxyindolinones. *Org. Lett.* **2015**, *17*, 6130–6133.
- 30 McDonald, S. L.; Hendrick, C. E.; Bitting, K. J. **Wang, Q.*** Copper-Catalyzed Electrophilic Amination of Heteroaromatic and Aromatic C–H Bonds via tmpZnCl•LiCl Mediated Metalation. *Org. Synth.* **2015**, *92*, 356–372.
- 31 Shen, K.; **Wang, Q.*** Copper-Catalyzed Diamination of Unactivated Alkenes with Hydroxylamines. *Chem. Sci.* **2015**, *6*, 4279–4283.
- 32 Hendrick, C. E.; **Wang, Q.*** Insertion of Arynes into Nitrogen-Halo Bonds: A Rapid Approach to Novel Antipsychotic *ortho*-Haloaminoarenes. *J. Org. Chem.* **2015**, *80*, 1059–1069.
- 33 McDonald, S. L.; Hendrick, C. E.; **Wang, Q.*** Copper-Catalyzed Electrophilic Amination of Heteroarenes and Arenes by C–H Zincation. *Angew. Chem. Int. Ed.* **2014**, *53*, 4667–4670.

- 34 Feng, Y.; Sokol, E.; Del Vecchio, C.; Sanduja, S.; Claessen, J.; Proia, T.; Jin, D.; Reinhardt, F.; Ploegh, H. L.; **Wang, Q.**; Gupta, P.* Epithelial-to-Mesenchymal Transition Activates PERK-eIF2 α and Sensitizes Cells to Endoplasmic Reticulum Stress. *Cancer Discov.* **2014**, *4*, 702–715.
- 35 Wang, B.; Rao, Y.-H.; Inoue, M.; Hao, R.; Lai, C.-H.; McDonald, S. L.; Choi, M.-C.; **Wang, Q.**; Mari Shinohara, M.; Yao, T.-P.* Microtubule Acetylation Amplifies p38 Kinase Signaling and Anti-inflammatory IL-10 Production. *Nat. Commun.* **2014**, *5*, 3479.
- 36 McDonald, S. L.; **Wang, Q.*** α -Amination of Phosphonates: A Direct Synthesis of α -Amino Phosphonic Acids and Derivatives. *Synlett* **2014**, *25*, 2233–2238. (Invited highlight)
- 37 McDonald, S. L.; **Wang, Q.*** Selective α -Amination and α -Acylation of Esters and Amides via Dual Reactivity of *O*-Acylhydroxylamines toward Zinc Enolates. *Chem. Comm.* **2014**, *50*, 2535–2538.
- 38 McDonald, S. L.; **Wang, Q.*** Copper-Catalyzed α -Amination of Phosphonates and Phosphine Oxides: A Direct Approach to α -Amino Phosphonic Acids and Derivatives. *Angew. Chem. Int. Ed.* **2014**, *53*, 1867–1871.
- 39 Ortiz, Jr. G. X.; Kang, B.; **Wang, Q.*** One-Pot Synthesis of 3-Azido- and 3-Aminopiperidines by Intramolecular Cyclization of Unsaturated Amines. *J. Org. Chem.* **2014**, *79*, 571–581.
- 40 Feng, Y.; Theis, T.; Liang, X.; Davis, R. M.; **Wang, Q.**; Zhou, P.; Warren, W. S.* Storage of Hydrogen Spin Polarization in Long-Lived $^{13}\text{C}_2$ Singlet Order and Implications for Hyperpolarized Magnetic Resonance Imaging. *J. Am. Chem. Soc.* **2013**, *135*, 9632–9635.
- 41 Hendrick, C. E.; McDonald, S. L.; **Wang, Q.*** Insertion of Arynes into *N*-Halo Bonds: A Direct Approach to *o*-Haloaminoarenes. *Org. Lett.* **2013**, *15*, 3444–3447.
- 42 Huang, H.-T.; Lacy, T. L.; Blachut, B.; Ortiz Jr., G. X.; **Wang, Q.*** An Efficient Synthesis of Fluorinated Azaheterocycles by Aminocyclization of Alkenes. *Org. Lett.* **2013**, *15*, 1818–1821.

RESEARCH REVIEW AND BOOK CHAPTER – INDEPENDENT CAREER

- 43 Hemric, B. N.; Ku, C.; **Wang, Q.*** (2020) *O*-Benzoyl-*N*-Hydroxylmorpholine. In *Encyclopedia of Reagents for Organic Synthesis*. doi:10.1002/047084289X.rm02290
- 44 Hill, N.; Du, L.; **Wang, Q.*** DOS-Derived Small-Molecule Probes in Chemical Biology. pp575–617, In *Diversity-Oriented Synthesis: Basics and Applications in Organic Synthesis, Drug Discovery, and Chemical Biology*, Trabocchi, A., Ed. Wiley-VCH: 2013.
- 45 Dass, F. M.; Kemp, M.; Schroeder, F. A.; Wagner, F. F.; **Wang, Q.**; Holson, E. B.* Histone Acetylation and Deacetylation. In *Epigenetic Regulation and Epigenomics*, Editor, Meyers, R. A., Meyers, R. A., Ed. Wiley-VCH: Weinheim, Germany, 2012.

FROM POSTDOCTORAL AND GRADUATE WORK

- 46 Yuan, Y.; Tang, A. J.; Castoreno, A. B.; Kuo, S.-Y.; **Wang, Q.**; Kuballa, P.; Xavier, R.; Shamji, A.; Schreiber, S. L.; Wagner, B. K. Gossypol and an HMT G9a Inhibitor Act in Synergy to Induce Cell Death in Pancreatic Cancer Cells. *Cell Death Dis.* **2013**, *4*, e690.
- 47 Yuan, Y.; [#] **Wang, Q.**; [#] Paulk, J.; Kubicek, S.; Kemp, M.; Adams, D.; Shamji, A.; Wagner, B. K.; Schreiber, S. L. A Small-Molecule Probe of the Histone Methyltransferase G9a Induces Cellular Senescence in Pancreatic Adenocarcinoma. *ACS Chem. Bio.* **2012**, *7*, 1152–1157. ([#]equal contribution, Top 20 Most Read *ACS Chem. Bio.* Articles, May 2012 – May 2013)

- 48 Kemp, M; **Wang, Q.**; Fuller, F. H.; West, N.; Martineza, N. M.; Morse, El. M.; Weiwera, M.; Schreiber, S. L.; Bradner, J. E.; Koehler, A. K. A Novel HDAC Inhibitor with a Hydroxy-Pyrimidine Scaffold. *Bioorg. Med. Chem. Lett.* **2011**, *21*, 4164–4169.
- 49 **Wang, Q.**; Schreiber, S. L. Copper-Mediated Amidation of Heterocyclic and Aromatic C–H Bonds. *Org. Lett.* **2009**, *11*, 5178–5180. (Top 20 Most Read *Org. Lett.* Articles in Nov – Dec 2009, Highlighted in *Angew. Chem. Int. Ed.* **2010**, *49*, 2282–2285)
- 50 Sun, C.; **Wang, Q.**; Brubaker, J. D.; Wright, P. M.; Lerner, C. D.; Noson, K.; Charest, M.; Siegel, D. R.; Wang, Y.-M.; Myers, A. G. A Robust Platform for the Synthesis of New Tetracycline Antibiotics. *J. Am. Chem. Soc.* **2008**, *130*, 17913–17927.
- 51 Padwa, A.; **Wang, Q.** Synthesis of the Tetracyclic Framework of the Erythrina Alkaloids Using a [4 + 2]-Cycloaddition/Rh(I)-Catalyzed Cascade of 2-Imidofurans. *J. Org. Chem.* **2006**, *71*, 7391–7402.
- 52 Padwa, A.; **Wang, Q.** Rhodium(I)-Catalyzed Nucleophilic Ring-Opening Reactions of Oxabicyclo Adducts Derived from the [4 + 2]-Cycloaddition of 2-Imido-Substituted Furans. *J. Org. Chem.* **2006**, *71*, 3210–3220.
- 53 Padwa, A.; Nara, S.; **Wang, Q.** Additive Pummerer Reaction of Heteroaromatic Sulfilimines with Carbon Nucleophiles. *Tetrahedron Lett.* **2006**, *47*, 595–597.
- 54 Wang, Q.; Padwa, A. Synthesis of Erythrina Alkaloids 3-Demethoxyerythratidinone. Novel Acid-Induced Rearrangements of Its Precursors. *Org. Lett.* **2006**, *8*, 601–604.
- 55 Padwa, A.; Nara, S.; **Wang, Q.** Dichloroketene-Induced Cyclizations of Vinyl Sulfilimines: Application of the Method in the Synthesis of (±)-Desoxyseroline. *J. Org. Chem.* **2005**, *70*, 8538–8549.
- 56 **Wang, Q.**; Nara, S.; Padwa, A. A New Synthesis of γ -Lactams Based on the Reaction of Vinyl Sulfilimines with Dichloroketene. *Org. Lett.* **2005**, *7*, 839–841.
- 57 **Wang, Q.**; Padwa, A. Rh(I)-Catalyzed Ring Opening of an IMDAF-Derived Oxabicyclo cycloadduct as the Key Step in the Synthesis of (±)-*epi*-Zephyranthine. *Org. Lett.* **2004**, *6*, 2189–2192.
- 58 Padwa, A.; Brodney, M. A.; Lynch, S. M.; Rashatasakhon, R.; **Wang, Q.**; Zhang, H. A New Strategy toward Indole Alkaloids Involving an Intramolecular Cycloaddition/Rearrangement Cascade. *J. Org. Chem.* **2004**, *69*, 3735–3745.
- 59 Padwa, A.; Heidelbaugh, T. M.; Kuethe, J. T.; McClure, M. S.; **Wang, Q.** Tandem Pummerer/Mannich Cyclization Cascade of α -Sulfinylamides as a Method to Prepare Aza-Heterocycles. *J. Org. Chem.* **2002**, *67*, 5928–5937.

PATENTS

- 1 Myers, A. G.; Brubaker, J. D.; Sun, C.; Wang, Q. Synthesis of Tetracyclines and Analogues Thereof. (WO/2007/117639).
- 2 Wang, Q. Compositions as Molecular Tags for Hyperpolarization NMR and Magnetic Resonance and Methods of Making and Using Same.