TOBIAS RITTER, PH.D.

HARVARD UNIVERSITY | DEPARTMENT OF CHEMISTRY AND CHEMICAL BIOLOGY
12 OXFORD STREET, CAMBRIDGE, MA 02138
Tel. (617) 496 0750 | Fax. (617) 496 4591
ritter@chemistry.harvard.edu | http://www.chem.harvard.edu/groups/ritter/

EDUCATION

Ph.D. Organic Chemistry, ETH Zurich, Switzerland	2004
M.S. Technical University of Braunschweig, Germany	1999

APPOINTMENTS

Professor of Chemistry and Chemical Biology, Harvard University	2012 – present
Chemist, Department of Radiology, Massachusetts General Hospital	2010 – present
Founder and Scientific Advisor, SciFluor	2011 – present

RESEARCH INTERESTS

Synthetic organic and organometallic chemistry; development of new synthetic methods based on transition metal catalysis; synthesis of biologically active natural and unnatural products, molecular imaging

EXPERIENCE

HARVARD UNIVERSITY, Cambridge, MA, USA:

Assistant Professor of Chemistry and Chemical Biology	2006 – 2010
Associate Professor of Chemistry and Chemical Biology	2010 – 2012
Professor of Chemistry and Chemical Biology	2012 – present

MASSACHUSETTS GENERAL HOSPITAL, Boston, MA, USA:

Assistant Chemist, Radiology	2010 – 2012
Associate Chemist, Radiology	2012 – 2014
Chemist, Radiology	2014 – present

CALIFORNIA INSTITUTE OF TECHNOLOGY, Pasadena, CA, USA: 2004 – 2006
Post-Doctoral Fellow; Advisor: Prof. Robert H. Grubbs

SWISS FEDERAL INSTITUTE OF TECHNOLOGY, ETH-Zürich, Switzerland: 1999 – 2004
Ph.D. Thesis; Advisor: Prof. Erick M. Carreira

STANFORD UNIVERSITY, Stanford, CA, USA: 1998 – 1999
Master Thesis; Advisor: Prof. Barry M. Trost

SWISS FEDERAL INSTITUTE OF TECHNOLOGY, Lausanne, Switzerland 1997 – 1998

UNIVERSITY OF BORDEAUX, Bordeaux, France 1997 – 1997

TECHNICAL UNIVERSITY OF BRAUNSCHWEIG, Braunschweig, Germany 1995 – 1997

AWARDS

• 2013 RSC Fluorine Chemistry Prize	2013
• Klung-Wilhelmy-Weberbank Preis, Berlin, Germany	2012
• Popular Science Brilliant 10 Award	2011
• Camille Dreyfus Teacher Scholar Award	2011
• BASF Catalysis Award	2011
• Roslyn Abramson Award for Excellence in Teaching Undergraduates	2010
• AstraZeneca Excellence in Science Award	2010
• Amgen Young Investigator Award	2010
• Alfred P. Sloan Research Fellowship	2010
• NSF Career Award	2010 – 2015
• Air Force Young Investigator Award	2010 – 2013
• Eli Lilly Grantee Award	2010 – 2012
• Bayer Early Excellence in Science Award	2009
• Massachusetts Life Science Center Young Investigator Award	2009 – 2011
• Smith Family Award for Excellence in Biomedical Research	2008 – 2011
• Milton Fund Award, Harvard Medical School	2008
• Thieme Chemistry Journals Award	2007
• Postdoctoral Fellowship (DAAD)	2004 – 2006
• Kekulé-Scholarship of the Fond der Chemischen Industie e.V.	2000 – 2002
• Winterfeld Award - Towards the Total Synthesis of Teretifolione B	2000
• Fellowship of the Konrad-Adenauer-Foundation	1998 – 1999
• Scholarship of the Swiss National Science Foundation	1997 – 1998
• Scholarship of the European Union	1997
• Scholarship of the Konrad-Adenauer-Foundation	1996 – 1999

PUBLICATIONS AS INDEPENDENT FACULTY

54. D. C. Powers, T. Ritter "Oxidation of carbon–metal bonds" *Comprehensive Organic Synthesis II* **2014**, chapter 7.27.
53. T. Liang, T. Ritter "Synthesis of fluorides" *Comprehensive Organic Synthesis II* **2014**, chapter 6.07.
52. K. P. Kornecki, J. F. Berry, D. C. Powers, T. Ritter "Metal–metal bond-containing complexes as catalysts for C–H functionalization" *Prog. Inorg. Chem.* **2014**, *58*, 223–300
51. J. R. Brandt, E. Lee, G. B. Boursalian, T. Ritter "Mechanism of electrophilic fluorination with Pd(IV): fluoride capture and subsequent oxidative fluoride transfer" *Chem. Sci.* **2014**, *5*, 169–179.
50. A. R. Mazzotti, M. G. Campbell, P. Tang, J. M. Murphy, T. Ritter "Palladium(III)-catalyzed fluorination of arylboronic acid derivatives" *J. Am. Chem. Soc.* **2013**, *135*, 14012–14015.
49. M. G. Campbell, S.-L. Zheng, T. Ritter "One-Dimensional Palladium Wires: Influence of Molecular Changes on Supramolecular Structure" *Inorg. Chem.* **2013**, *52*, 13295–13297.
48. G. B. Boursalian, M.-Y. Ngai, K. N. Hojczyk, T. Ritter "Pd-catalyzed aryl C–H imidation with arene as the limiting reagent" *J. Am. Chem. Soc.* **2013**, *135*, 13278–13281.

47. T. Liang, Constanze N. Neumann, T. Ritter "Introduction of fluorine and fluorine-containing functional groups" *Angew. Chem., Int. Ed.* **2013**, *52*, 8214–8264.
46. D. Powers, T. Ritter "A transition state analogue for the oxidation of binuclear palladium(II) to binuclear palladium(III) complexes" *Organometallics* **2013**, *32*, 2042–2045.
45. A. Kamlet, C. Neumann, E. Lee, S. Carlin, C. Moseley, N. Stephenson, J. Hooker, T. Ritter "Application of palladium-mediated ^{18}F-fluorination to PET radiotracer development: overcoming hurdles to translation" *PLOS one* **2013**, *8*, e59187.
44. F. Sladojevich, S. Arlow, P. Tang, T. Ritter "Late-Stage Deoxyfluorination of alcohols with PhenoFluor" *J. Am. Chem. Soc.* **2013**, *135*, 2470–2473.
43. D. C. Powers, T. Ritter "Bimetallic catalysis with palladium" *Science of Synthesis* **2013**, *1*, 1–31.
42. J. Raynaud, J. Y. Wu, T. Ritter "Iron-catalyzed polymerization of isoprene and other 1,3-dienes" *Angew. Chem., Int. Ed.* **2012**, *51*, 11805–11808.
41. E. Lee, J. M. Hooker, T. Ritter "Nickel-mediated oxidative fluorination for PET with aqueous [^{18}F]fluoride" *J. Am. Chem. Soc.* **2012**, *134*, 17456–17458.
40. D. C. Powers, E. Lee, A. Ariafard, M. S. Sanford, B. F. Yates, A. J. Canty, T. Ritter "Connecting Binuclear Pd(III) and Mononuclear Pd(IV) Chemistry by Pd-Pd Bond Cleavage" *J. Am. Chem. Soc.* **2012**, *134*, 12002–12009.
39. D. C. Powers, T. Ritter " Bimetallic redox synergy in oxidative palladium catalysis" *Acc. Chem. Res.* **2012**, *45*, 840–850.
38. M. G. Campbell, D. C. Powers, J. Raynaud, M. J. Graham, P. Xie, E. Lee, T. Ritter "Synthesis and structure of solution-stable one-dimensional palladium wires" *Nature Chem.* **2011**, *3*, 949–953.
37. E. Lee, A. S. Kamlet, D. C. Powers, C. N. Neumann, G. B. Boursalian, T. Furuya, D. C. Choi, J. M. Hooker, T. Ritter "A fluoride-derived electrophilic late-stage fluorination reagent for PET imaging" *Science* **2011**, *334*, 639–642.
36. C. Huang, T. Liang, S. Harada, E. Lee, T. Ritter "Silver-mediated trifluoromethoxylation of aryl stannanes and arylboronic acids" *J. Am. Chem. Soc.* **2011**, *133*, 13308–13310.
35. P. Tang, W. Wang, T. Ritter "Deoxyfluorination of phenols" *J. Am. Chem. Soc.* **2011**, *133*, 11482–11484.
34. T. Furuya, A. S. Kamlet, T. Ritter "Catalysis for Fluorination and Trifluoromethylation" *Nature*, **2011**, *473*, 470–477.
33. P. Tang, T. Ritter "Silver-mediated fluorination of aryl silanes" *Tetrahedron* **2011**, *67*, 4449–4454.
32. D. C. Powers, T. Ritter "Pd(III) in Synthesis and Catalysis" *Top. Organomet. Chem.* **2011**, *35*, 129–156.
31. G. J. Chuang, W. Wang, E. Lee, T. Ritter "A Dinuclear Palladium Catalyst for α-Hydroxylation of Carbonyls with O_2" *J. Am. Chem. Soc.* **2011**, *133*, 1760–1762.
30. D. C. Powers, D. Y. Xiao, M. A. L. Geibel, T. Ritter "On the Mechanism of Palladium-Catalyzed Aromatic C–H Oxidation" *J. Am. Chem. Soc.* **2010**, *132*, 14530–14536.
29. D. C. Powers, D. Benitez, E. Tkatchouk, W. A. Goddard, III, T. Ritter "Bimetallic Reductive Elimination from Dinuclear Pd(III) Complexes" *J. Am. Chem. Soc.* **2010**, *132*, 14092–14103.

28. J. Y. Wu, B. N. Stanzl, T. Ritter "A Strategy for the Synthesis of Well-Defined Iron Catalysts and Application to Regioselective Diene Hydrosilylation" *J. Am. Chem. Soc.* **2010**, *132*, 13214–13216.
27. T. Ritter "Catalysis: Fluorination Made Easier" *Nature* **2010**, *466*, 447–448.
26. P. Tang, T. Furuya, T. Ritter "Silver-Catalyzed Late-Stage Fluorination" *J. Am. Chem. Soc.* **2010**, *132*, 12150–12154.
25. T. Furuya, E. M. N. Klein, T. Ritter "C−F Bond Formation for the Synthesis of Aryl Fluorides" *Synthesis* **2010**, 1804–1821.
24. T. Furuya, D. Benitez, E. Tkatchouk, A. E. Strom, P. Tang, W. A. Goddard, III, T. Ritter "Mechanism of C−F Reductive Elimination from Palladium(IV) Fluorides" *J. Am. Chem. Soc.* **2010**, *132*, 3793–3807.
23. D. C. Powers, M. A. L. Geibel, J. E. M. N. Klein, T. Ritter "Bimetallic Palladium Catalysis: Direct Observation of Pd(III)–Pd(III) Intermediates" *J. Am. Chem. Soc.* **2009**, *131*, 17050–17051.
22. J. Y. Wu, B. Moreau, T. Ritter "Iron-Catalyzed 1,4-Hydroboration of 1,3-Dienes" *J. Am. Chem. Soc.* **2009**, *131*, 12915–12917.
21. T. Furuya, T. Ritter "Fluorination of Boronic Acids Mediated by Silver Triflate" *Org. Lett.* **2009**, *11*, 2860–2863.
20. D. P. Powers, T. Ritter "Bimetallic Pd(III) Complexes in Palladium-Catalyzed Carbon–Heteroatom Bond Formation" *Nature Chem.* **2009**, *1*, 302–309.
19. T. Furuya, A. E. Strom, T. Ritter "Silver-Mediated Fluorination of Functionalized Arylstannanes" *J. Am. Chem. Soc.* **2009**, *131*, 1662–1663.
18. B. Moreau, J. Y. Wu, T. Ritter "Iron-Catalyzed 1,4-Addition of Olefins to Dienes" *Org. Lett.* **2009**, *11*, 337–339.
17. T. Furuya, C. Kuttruff, T. Ritter "Carbon–Fluorine Bond Formation" *Curr. Opin. Drug Disc. Dev.* **2008**, *11*, 308–319.
16. T. Furuya, T. Ritter "Carbon–Fluorine Reductive Elimination from a High-Valent Palladium Fluoride" *J. Am. Chem. Soc.* **2008**, *130*, 10060–10061.
15. T. Furuya, H. M. Kaiser, T. Ritter "Palladium-Mediated Fluorination of Arylboronic Acids" *Angew. Chem., Int. Ed.* **2008**, *47*, 5993–5996.

PREVIOUS PUBLICATIONS

14. A. P. Blum, T. Ritter, R. H. Grubbs. "Synthesis of N-heterocyclic Carbene-Containing Metal Complexes from 2-(pentafluorophenyl)-imidazolidines" *Organometallics*, **2007**, *26*, 2122–2124.
13. J. M. Berlin, K. Campbell, T. Ritter, T. W. Funk, A. Chlenov, R. H. Grubbs: "Ruthenium-Catalyzed Ring-Closing Metathesis to Form Tetrasubstituted Olefins" *Org. Lett.* **2007**, *9*, 1339–1342.
12. T. Ritter, A. Hejl, A. G. Wenzel, T. W. Funk, R. H. Grubbs. "A Standard System of Characterization for Olefin Metathesis Catalysts" *Organometallics* **2006**, *25*, 5740–5745.
11. T. Ritter, M. W. Day, R. H. Grubbs. "Rate Acceleration in Olefin Metathesis through a Fluorine–Ruthenium Interaction" *J. Am. Chem. Soc.* **2006**, *128*, 11768–11769.
10. E. Ayoub, T. Ritter: "N-heterocyclic carbenes as ligands for olefin metathesis catalysts" *Top. Organomet. Chem.* **2006**, *21*, 193–218.

9. A. W. Waltman, T. Ritter, R. H. Grubbs. "Rearrangement of N-Heterocylic Carbenes Involving Heterocycle Cleavage" *Organometallics* **2006**, *25*, 4238–4239.
8. T. Ritter, L. Kværnø, M. Werder, H. Hauser, E. M. Carreira. "Heterocyclic Ring Scaffolds as Small-Molecule Cholesterol Absorption Inhibitors" *Org. Biomol. Chem.* **2005**, *3*, 3514–3523.
7. T. Ritter, E. M. Carreira. "1,2,4-Oxadiazolidinones as Configurationally Stable Chiral Building Blocks" *Angew. Chem., Int. Ed.* **2005**, *44*, 936–938.
6. T. Ritter, E. M. Carreira. "Base-Induced or Catalyzed Addition of Terminal Alkynes to Electrophiles" in: Handbook of C-H Transformations: Applications in Organic Synthesis, G. Dyker (Ed), Wiley-VCH, 2005.
5. L. Kværnø, T. Ritter, M. Werder, H. Hauser, E. M. Carreira. "Brush Border Membrane Vesicles as the First In Vitro Assay for Intestinal Cholesterol Absorption Inhibitors" *Angew. Chem., Int. Ed.* **2004**, *43*, 4653–4656.
4. T. Ritter, P. Zarotti, E. M. Carreira. "Diastereoselective Phenol para-Alkylation: Access to a Cross-Conjugated Cyclohexadienone en Route to Resiniferatoxin" *Org. Lett.* **2004**, *6*, 4371–4374.
3. T. Ritter, K. Stanek, I. Larrosa, E. M. Carreira. "Mild Cleavage of Aryl Mesylates: Methanesulfonate as Potent Protecting Group for Phenols" *Org. Lett.* **2004**, *6*, 1513–1514.
2. T. Ritter, E. M. Carreira. "The Diazonamides: The Plot Thickens" *Angew. Chem., Int. Ed.* **2002**, *41*, 2489–2495.
1. B. König, M. Pelka, H. Zieg, T. Ritter, H. Bouas-Laurent, R. Bonneau, J. P. Desvergne. "Photoinduced Electron Transfer in a Phenothiazine-Riboflavin Dyad Assembled by Zinc-Imide Coordination in Water" *J. Am. Chem. Soc.* **1999**, *121*, 1681–1687.

AWARD LECTURES

- Novartis Lecture, Boston University — February 2010
- Eli Lilly Young Investigator Lecture, University of Wisconsin–Madison — May 2010
- Mordecai and Rivka Rubin Lecture, Technion–Israel Institute of Technology — June 2010
- Organic Synthesis Lecturer, University of California, Berkeley — April 2011
- BASF Catalysis Award, BASF, Germany — July 2011
- The Padwa Lecture, Columbia University — February 2012
- Alphora Research Inc. Lecture, University of Toronto — May 2012
- Klung-Wilhemly-Weberbank Lecture, Berlin, Germany — November 2012
- 9th Hirata Memorial Lecture, Nagoya University, Japan — January 2013
- 20th Archer Lecturer, Rensselaer Polytechnic Institute, NY — March 2013
- BMS Lecture, MIT — April 2013
- RCS Fluorine Prize Lecture, London — September 2013

OTHER INVITED LECTURES

- Gordon Research Conference–Heterocycles, 2008
- Dana Farber/Harvard Cancer Center, 2008
- University of Puerto Rico, 2009
- University of Massachusetts–Dartmouth, 2009

- Sepracor, 2009
- Bristol-Myers Squibb, 2009
- NSF workshop on Organic Synthesis and Natural Products Chemistry, 2009
- Rising Organic Chemists in Catalysis (ROCCAT), 2009
- Amgen, Cambridge, 2009
- Eli Lilly and Company, 2009
- Abbott Labs, 2009
- University of Pennsylvania, 2009
- Princeton University, 2009
- ETH Lausanne, 2009
- University of California–Irvine, 2010
- University of California–Los Angeles, 2010
- Dartmouth University, 2010
- Bristol Myers Squibb, Wallingford, 2010
- Bayer AG, Berlin, Germany, 2010
- Bayer AG, Wuppertal, Germany, 2010
- RWTH Aachen, Germany 2010
- ACS National Meeting, San Francisco, 2010
- University of California–San Diego, 2010
- The Scripps Research Institute, 2010
- Amgen, San Francisco, 2010
- Merck, West Point, 2010
- Merck, Rahway, 2010
- Northeastern Regional Meeting, American Chemical Society, 2010
- Weizmann Institute, Israel, 2010
- Tel Aviv University, 2010
- Pfizer, Groton, 2010
- ICIQ Summer School, Tarragona, 2010
- Gordon Research Conference, Stereochemistry, 2010
- American Chemical Society, National Meeting, Boston 2010
- Bayer CropScience 2010
- ORGCHEM–Weimar 2010
- AstraZeneca, Waltham 2010
- University of California–Santa Barbara 2010
- Amgen, Thousand Oaks 2010
- Pacifichem 2010
- Winter Fluorine Conference, St. Pete Beach 2011
- Dow Chemicals, Midland 2011
- Merck, Boston 2011
- Ludwig-Maximilians-Universität, Munich, Germany 2011
- Sanofi-Aventis, Frankfurt, Germany 2011
- Max Planck Institut fur Kohlenforshung, Mulheim, Germany 2011
- University of Munster, Germany 2011
- Hoffman-La Roche, Nutley 2011

- University of North Carolina, Chapel Hill 2011
- University of Illinois at Urbana-Champaign 2011
- ACS National Meeting, Anaheim 2011
- Genentech, South San Francisco 2011
- Theravance, South San Francisco 2011
- RSC Organic Symposium, Queen Mary University of London, United Kingdom 2011
- Oxford University, Oxford, United Kingdom 2011
- University of Bristol, Bristol, United Kingdom 2011
- GlaxoSmithKline, Stevenage, UK 2011
- Syngenta, Berkshire 2011
- University of Minnesota 2011
- California Institute of Technology 2011
- Annual Graduate Student Symposium, University of Buffalo 2011
- High Throughput Chemistry & Chemical Biology Gordon Research Conference 2011
- Heterocycles Gordon Research Conference 2011
- Organic Reactions and Processes Gordon Research Conference 2011
- Natural Products Gordon Research Conference 2011
- Medicinal Chemistry Gordon Research Conference 2011
- UCLA, Crump Institute 2011
- ACS National Meeting, Denver 2011
- Dow Corning, Midland MI, 2011
- GSK, Philadelphia, 2011
- Princeton ACS meeting, Princeton, 2011
- Harvard University, 2011
- Boston College 2011
- New Jersey Biotechnology Chemistry Consortium 2011
- Northeastern University, Boston 2011
- ETH Zurich, Switzerland 2011
- Yale University, 2012
- University of Oregon 2012
- Columbia University, New York 2012
- Gilead, Foster City, CA
- UCSF, San Francisco 2012
- Eli Lilly and Company, Indianapolis 2012
- Free University Berlin, Germany, 2012
- Humboldt University, Berlin, Germany, 2012
- TU Berlin, Germany, 2012
- ACS National Meeting, San Diego 2012
- UCLA, CA, 2012
- National RSC Meeting, Warwick, UK 2012
- ANROCQ Conference, Caen, France, 2012
- Ecole Nationale Superieure de Chimie de Paris, France, 2012
- DuPont, Wilmington, 2012
- GSK, Research Triangle Park, North Carolina, 2012

- University of Toronto 2012
- ISACS 7, Edinburgh, UK 2012
- UCLA, CA 2012
- Belgian Organic Synthesis symposium, Leuven, Belgium 2012
- Stereochemistry Gordon Research Conference, 2012
- Abbott Pharmaceuticals, Chicago, 2012
- Harvard Medical School, Boston, 2012
- Dreyfus Foundation, New York, 2012
- Meyers Symposium, Colorado State University, 2012
- Klung-Wilhemly-Weberbank Lecture, Berlin, Germany 2012
- Merck, Rahway, 2012
- Nagoya University, Japan, 2013
- University of Tokyo, Japan, 2013
- Rensselaer Polytechnic Institute, Troy, NY, 2013
- University of Ottawa, Canada, 2013
- MIT, 2013
- ACS National Meeting, New Orleans, 2013
- University of Texas Austin, 2013
- University of Texas Southwestern Medical Center, Dallas, 2013
- Stanford, 2013
- Sloan Kettering, New York, 2013
- Broad Institute, Cambridge 2013
- 15th Brazilian Meeting on Organic Synthesis, Sao Paulo, 2013

AWARDED RESEARCH SUPPORT

• UCB Pharma	2013–2016
• Phelps Foundation	2013–2016
• Camille Dreyfus Teacher Scholar Award	2011–2016
• NIH NIBIB (RO1)	2011–2015
• Roslyn Abramson Award for Excellence in Teaching Undergraduates	2010
• Harvard Catalyst	2010
• AstraZeneca Excellence in Science Award	2010
• Amgen Young Investigator Award	2010
• Alfred P. Sloan Fellowship	2010
• NSF Career Award	2010–2015
• Air Force Young Investigator Award	2010–2013
• Eli Lilly Grantee Award	2010–2012
• NIH NIGMS (RO1)	2009–2014
• ACS PRF	2009–2011
• Massachusetts Life Science Center	2009–2011
• Smith Family Award for Excellence in Biomedical Research	2008–2011
• Harvard Accelerator Grant	2008–2010
• Harvard University Center for the Environment	2008–2009

TEACHING EXPERIENCE

CHEMISTRY 30 – ORGANIC CHEMISTRY 2006–2010

Fundamental principles and advanced topics in organic chemistry. Carbonyl chemistry and pericyclic reactions are covered in detail. Students learn about strategies in multi-step organic synthesis and are given an introduction into organometallic chemistry. Laboratory: an introduction to organic chemistry laboratory techniques and experimental organic synthesis. Committee for Undergraduate Education instructor ratings by students (out of 5.0): 4.5 (06–07), 4.8 (07–08), 4.5 (08–09), 4.9 (09–10) 4.3 (13–14).

CHEMISTRY 153 – ORGANOMETALLIC CHEMISTRY 2010–2013

Fundamental principles and advanced topics in organometallic chemistry. Transition metal catalysis and principles thereof are covered in detail, with focus on the organometallic reactivity. Committee for Undergraduate Education instructor ratings by students (out of 5.0): 4.6 (10–11); 4.5 (11–12); 4.6 (12–13).