JIMMY WU
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EDUCATION

2001–2005 **Harvard University, Department of Chemistry and Chemical Biology**
Degree awarded: Ph.D.; NDSEG Fellowship, ACS DOC Graduate Fellowship
Research Advisor: Professor David A. Evans

1994–1998 **Princeton University, Department of Chemistry**
Degree awarded: A.B.
Research Advisor: Professor Martin F. Semmelhack

PROFESSIONAL AND ACADEMIC APPOINTMENTS

2021–present **Professor of Chemistry, Dartmouth College**
- Total synthesis of complex alkaloid natural products
- Reaction methodology development in heterocyclic chemistry and catalysis
- Small molecule drug discovery – cancer biology, GLP1 secretagogues, PCSK9 inhibitors

2013–2021 **Associate Professor of Chemistry, Dartmouth College**

2007–2013 **Assistant Professor of Chemistry, Dartmouth College**

2018–present **Member of the COBRE Institute for Biomolecular Targeting** [link]
Geisel School of Medicine at Dartmouth

2012–present **Member of the Cancer Biology Therapeutics Program** [link]
Dartmouth-Hitchcock Norris Cotton Cancer Center

2005–2007 **Ruth L. Kirschstein NRSA Postdoctoral Fellow, Stanford University**
Research Advisor: Professor Barry M. Trost

1999–2001 **Associate Chemist, Merck Process Research**

1998–1999 **Management Consultant Analyst, Oliver Wyman**

AWARDS AND HONORS

- Hobart and William Smith Colleges – 2018 Franks Chemistry Lecturer
- Douglas C. Floren Fellowship 2013
- Thieme Chemistry Journal Award 2013
- American Cancer Society – Research Scholar Grant (Jan 2013 – Dec 2016)
- NSF Career Award (Feb 2011 – Jan 2016)
- Dartmouth Junior Faculty Fellowship (Fall 2011)
- Ruth L. Kirschstein National Research Service Award for Postdoctoral Fellows (2005 – 2007)
- American Chemical Society Division of Organic Chemistry Graduate Fellowship (2004 – 2005)

- Department of Defense NDSEG Predoctoral Fellowship (2001 – 2004)
- Certificate of Distinction in Teaching, Harvard University (Fall 2003, 2004, Spring 2005)

INDEPENDENT PUBLICATIONS

1. *"Synthesis of Functionalized Hexahydrocarbazoles by Beckmann Elimination and Nucleophile-Intercepted Beckmann Fragmentation"* Saha, D.; Protich, Z.; Wu, J. *Org. Lett.* **2023**, asap. [link]

2. *"Regiodivergent (3+2) Annulation Reactions of Oxyallyl Cations"* Protich, Z.; Lowder, L. L.; Hughes, R. P.; Wu, J. *Chem. Sci.* **2023**, *14*, 5196–5203 [link]

3. *"Diversification of Nucleophile-Intercepted Beckmann Fragmentation (NuBFr) Products and Related DFT Studies"* Lowder, L. L.; Zhao, F.; Vaughan, M. M.; Houk, K. N.; Liu, F.; Wu, J. *J. Org. Chem.* **2020**, *85*, 11396–11408.

4. *"Nucleophile-Intercepted Beckmann Fragmentation Reactions"* Touchette, S. J.; Dunkley, E. M.; Lowder, L. L. Wu, J. *Chem. Sci.* **2019**, *10*, 7812–7815

5. *"Nuphar Alkaloids Induce Very Rapid Apoptosis Through a Novel Caspase-Dependent but BAX/BAK-Independent Pathway"* Mallick, D. J.; Korotkov, A.; Li, H.; Wu, J.; Eastman, A. *Cell Bio. Toxicol.* **2019**, *35*, 435–443.

6. *"Canvass: A Crowd-Sourced, Natural-Product Screening Library for Exploring Biological Space"* Kearney, S. E.; Zahoránszky-Kőhalmi, G.; Brimacombe, K. R.; Henderson, M. J.; Lynch, C.; et al. *ACS Cent. Sci.* **2018**, *4*, 1727–1741.

7. *"Catalytic Vinylogous Cross-Coupling Reactions of Rhenium Vinylcarbenoids"* Chen, J.; Wu, J. *Chem. Sci.* **2018**, *9*, 2489–2492.

8. *"Synthesis of 2-Aminoimidazolones and Imidazolones by (3+2) Annulation of Azaoxyallyl Cations"* DiPoto, M. C.; Wu, J. *Org. Lett.* **2018**, *20*, 499–501.

9. *"A Quinolinol-Based Small Molecule with Anti-MRSA Activity that Targets Bacterial Membrane and Promotes Fermentative Metabolism"* Nair, D. R.; Chen, J.; Monteiro, J. M.; Josten, M.; Pinho, M.; Sahl, H.-G.; Wu, J.; Cheung, A. *J. Antibiot. (Tokyo)*, **2017**, *70*, 1009–1019.

10. *"Transition Metal-Free C3 Arylation of Indoles with Aryl Halides"* Chen, J.; Wu, J. *Angew. Chem. Int. Ed.* **2017**, *56*, 3951–3955.

    Top 20 Most Downloaded Recent Papers
    Highlighted in: *Synfacts* **2017**, *17*, 531

11. *"Stereoselective Synthesis and Biological Evaluation of C1-Epimeric and Desmethyl Monomeric Nuphar Analogues"* Li, H.; Cooke, T. J.; Korotkov, A.; Chapman, C. W.; Eastman, A.; Wu, J. *J. Org. Chem.* **2017**, *82*, 2648–2655.

12. *"Synthetic Small Molecule GLP-1 Secretagogues Prepared by Means of a Three-Component Indole Annulation Strategy"* Chepurny, O. G.; Leech, C. A.; Tomanik, M.; DiPoto, M. C.; Li, H.; Han, X.; Meng, Q.; Cooney, R. N.; Wu, J.; Holz, G. G. *Sci. Rep.* **2016**, 28934.

13. *"Enantioselective Formal Syntheses of 11 Nuphar Alkaloids and Discovery of Potent Apoptotic Monomeric Analogues.* Li, H.; Korotkov, A.; Chapman, C. W.; Eastman, A.; Wu, J. *Angew. Chem. Int. Ed.* **2016**, *55*, 3509–3513.

14. *"Dearomative Indole (3+2) Reactions with Azaoxyallyl Cations – New Method for the Synthesis of Pyrroloindolines"* DiPoto, M. C.; Hughes, R. P.; Wu, J. *J. Am. Chem. Soc.* **2015**, *137*, 14861–14864.

15. *"Vinylogous Mukaiyama–Michael Reactions of Dihydropyridinones"* Li, H.; Wu, J. *Org. Lett.* **2015**, *17*, 5424–5427.

16. *"Total Syntheses and Biological Evaluation of Both Enantiomers of Several Hydroxylated Dimeric Nuphar Alkaloids"* Korotkov, A.; Li, H.; Chapman, C. W.; Xue, H.; MacMillan, J. B.; Eastman, A.; Wu, J. *Angew. Chem. Int. Ed.* **2015**, *54*, 10604–10607.

17. *"Regioselective Formal Hydroamination of Styrenes with 1-Phenyl-1H-tetrazole-5-thiol"* Savolainen, M. A.; Han, X.; Wu, J. *Org. Lett.* **2014**, *16*, 4349–4351.

18. *"Dearomative Indole (3+2) Cycloaddition Reactions"* Li, H.; Hughes, R. P.; Wu, J. *J. Am. Chem. Soc.* **2014**, *136*, 6288–6296.

19. *"Markovnikov-Selective Hydrothiolation of Styrenes: Application to the Synthesis of Stereodefined Trisubstituted Olefins"* Savolainen, M. A.; Wu, J. *Org. Lett.* **2013**, *15*, 3802–3804.

20. *"Redox Chain Reaction — Indole and Pyrrole Alkylation with Unactivated 2° Alcohols"* Han, X.; Wu, J. *Angew. Chem. Int. Ed.* **2013**, *52*, 4637–4640.

21. *"Pd-Catalyzed Allylic Fluorination of Cinnamyl Phosphorothioate Esters"* Lauer, A. M.; Wu, J. *Org. Lett.* **2012**, *14*, 5138–5141.

22. *"Ga(III)-Catalyzed Three-Component (4+3) Cycloaddition Reactions"* Han, X.; Li, H.; Hughes, R. P.; Wu, J. *Angew. Chem., Int. Ed.* **2012**, *51*, 10390–10393.

23. *"Phosphorothioic Acids and Related Compounds as Surrogates for H_2S – Synthesis of Chiral Tetrahydrothiophenes"* Robertson, F. J.; Wu, J. *J. Am. Chem. Soc.* **2012**, *134*, 2775–2780.

24. *"Cu(I)-Catalyzed, α-Selective, Allylic Alkylation Reactions between Phosphorothioate Esters and Organomagnesium Reagents"* Lauer, A. M.; Mahmud, F.; Wu, J. *J. Am. Chem. Soc.* **2011**, *133*, 9119–9123.

    Highlighted in: *Synfacts* **2011**, *9*, 1009

25. *"Direct Annulation and Alkylation of Indoles with 2-Aminobenzyl Alcohols Catalyzed by TFA"* Robertson, F. J.; Kenimer, B. D.; Wu, J. *Tetrahedron* **2011**, *67*, 4327–4332 (Invited Contribution – Symposium in Print: Tetrahedron Young Investigators Award for Prof. Dean Toste)

26. *"$Ga(OTf)_3$-Catalyzed Direct Substitution of Alcohols with Sulfur Nucleophiles"* Han, X.; Wu, J. *Org. Lett.* **2010**, *12*, 5780–5782.

27. *"Convenient Synthesis of Allylic Thioethers from Phosphorothioate Esters and Alcohols"* Robertson, F.; Wu, J. *Org. Lett.* **2010**, *12*, 2668–2671.

28. *"Mild Two-Step Process for the Transition Metal-Free Synthesis of Carbon–Carbon Bonds from Allylic Alcohols/Ethers and Grignard Reagents"* Han, X.; Zhang, Y.; Wu, J. *J. Am. Chem. Soc.* **2010**, *132*, 4104–4106.

Highlighted in: *Synfacts* **2010**, *6*, 700

REVIEWS

29. *"(3+2)-Cycloaddition Reactions of Oxyallyl Cations"* Li, H.; Wu, J. *Synthesis* **2015**, *47*, 22–23.

30. *"Review of Recent Advances in Nucleophilic C–F Bond-forming Reactions"* Wu, J. *Tetrahedron Lett.* **2014**, *55*, 4289–4294.

31. *"Diethylphosphorothioic Acid"* Wu, J. *Encyclopedia of Reagents for Organic Synthesis*, **2014**, DOI: 10.1002/047084289X.rn01667

PUBLICATIONS PRIOR TO DARTMOUTH

32. *"Stereoselective Preparation of a Cyclopentane-Based NK1 Receptor Antagonist Bearing an Unsymmetrically Substituted Sec-Sec Ether"* Kuethe, J. T.; Marcoux, J.-F.; Wong, A.; **Wu, J**.; Hillier, M. C.; Dormer, P. G.; Davies, I. W.; Hughes, D. L. *J. Org. Chem.* **2006**, *71*, 7378–7390.

33. *"Asymmetric, anti-Selective Scandium-Catalyzed Sakurai Additions to Glyoxamide. Applications to the Syntheses of N-Boc d-Alloisoleucine and d-Isoleucine"* Evans, D. A.; Aye, Y.; **Wu, J**. *Org. Lett*. **2006**, *8*, 2071–2073.

34. *"Enantioselective Syn-Selective Scandium-Catalyzed Ene Reactions"* Evans, D. A.; **Wu, J**. *J. Am. Chem. Soc.* **2005**, *127*, 8006–8007.

35. *"Enantioselective Rare-Earth Catalyzed Quinone Diels–Alder Reactions"* Evans, D. A.; **Wu, J**. *J. Am. Chem. Soc*. **2003**, *125*, 10162–10163.

36. *"Enantioselective Indole Friedel–Crafts Alkylations Catalyzed by Bis(oxazolinyl)pyridine-Scandium(III) Triflate Complexes"* Evans, D. A.; Scheidt, K. A.; Fandrick, K. R.; Lam, H. W.; **Wu, J**. *J. Am. Chem. Soc.* **2003**, *125*, 10780–10781.

37. *"Unfunctionalized, α-Epimerizable Nonracemic Ketones and Aldehydes Can Be Accessed by Crystallization-Induced Dynamic Resolution of Imines"* Kosmrlj, J.; Weigel, L. O.; Evans, D. A.; Downey, W. C.; **Wu, J**. *J. Am. Chem. Soc.* **2003**, *125*, 3208–3209.

38. *"A General Method for the Enantioselective Synthesis of Pantolactone Derivatives"* Evans, D. A.; **Wu, J**.; Masse, C. E.; MacMillan, D. W. C. *Org. Lett.* **2002**, *4*, 3379–3382.

39. *"C_2-Symmetric Sc(III)–Complexes as Chiral Lewis Acids. Catalytic Enantioselective Aldol Additions to Glyoxylate Esters"* Evans, D. A.; Masse, C. E.; **Wu, J**. *Org. Lett.* **2002**, *4*, 3375–3378.

40. *"Asymmetric Synthesis of 1,2,3-Trisubstituted Cyclopentanes and Cyclohexanes as Key Components of Substance P Antagonists"* Kuethe, J. T.; Wong, A.; **Wu, J**.; Davies, I. W.; Dormer, P. G.; Welch, C. J.; Hillier, M. C.; Hughes, D. L.; Reider, P. J. *J. Org. Chem.* **2002**, *67*, 5993–6000.

41. *"β-Regioselective Intermolecular Heck Arylation of N,N-Disubstituted Allylamines"* **Wu, J**.; Marcoux, J.-F.; Davies, I. W.; Reider, P. J. *Tetrahedron Lett.* **2001**, *42*, 159–162.

42. *"Experimental and Theoretical Studies on the Oxidative Addition of Palladium (0) to β-Chlorovinamidium Salts"* Davies, I. W.; **Wu, J**.; Marcoux, J.-F.; Taylor, M.; Hughes, D.; Reider, P. J.; Deeth, R. J. *Tetrahedron* **2001**, *57*, 5061−5066.

43. *"A General Preparation of Pyridines and Pyridones Via the Annulation of Ketones and Esters"* Marcoux, J.-F.; Marcotte, F.-A.; **Wu, J**.; Dormer, P. G.; Davies, I. W.; Hughes, D.; Reider, P. J. *J. Org. Chem.* **2001**, *66*, 4194−4199.

44. *"Preparation and Novel Reduction Reactions of Vinamidinium Salts"* Davies, I. W.; Taylor, M.; Marcoux, J.-F.; **Wu, J**.; Dormer, P. G.; Hughes, D.; Reider, P. J. *J. Org. Chem.* **2001**, *66*, 251−255.

45. *"Stereoselective Hydrogen Bromide-Promoted Hydrogenation of an α-Hydroxy Oxime"* Davies, I. W.; Taylor, M.; Marcoux, J.-F.; Matty, L.; **Wu, J**.; Hughes, D.; Reider, P. J. *Tetrahedron Lett.* **2000**, *41*, 8021−8025.

46. *"A Practical Synthesis of a COX-2-Specific Inhibitor"* Davies, I. W.; Marcoux, J.-F.; Corley, E. G.; Journet, M.; Cai, D.-W.; Palucki, M.; **Wu, J**.; Larsen, R. D.; Rossen, K.; Pye, P. J.; DiMichele, L.; Dormer, P.; Reider, P. J. *J. Org. Chem.* **2000**, *65*, 8415−8420.

47. *"Annulation of Ketones with Vinamidinium Hexafluorophosphate Salts: An Efficient Preparation of Trisubstituted Pyridines"* Marcoux, J.-F.; Corley, E. G.; Rossen, K.; Pye, P.; **Wu, J**.; Robbins, M. A.; Davies, I. W.; Larsen, R. D.; Reider, P. J. *Org. Lett.* **2000**, *2*, 2339−2341.

48. *"An Efficient Preparation of Vinamidinium Hexafluorophosphate Salts"* Davies, I. W.; Marcoux, J.-F.; **Wu, J**.; Palucki, M.; Corley, E. G.; Robbins, M. A.; Tsou, N.; Ball, R. G.; Dormer, P.; Larsen, R. D.; Reider, P. J. *J. Org. Chem.* **2000**, *65*, 4571−4574.

49. *"Carboranophanes"* Barnett-Thammattoor, L.; **Wu, J**.; Ho, D. M.; Jones, M., Jr. *Tetrahedron Lett.* **1996**, *37*, 7221−7224.

SEMINARS PRESENTED

Invited Academic Lectures (*International lectures in bold*)

1. **University of Florence, Italy** (April 5, 2023)
2. **University of Bologna, Italy** (April 4, 2023)
3. **University of Milan, Italy** (April 3, 2023)
4. University of Rochester (Oct 7, 2022)
5. **National Central University, Taiwan ROC** (Mar 15, 2022) – *virtual seminar*
6. **NYU Shanghai, China** (Feb 7, 2022) – *virtual seminar*
7. Marquette University (Dec 9, 2019)
8. Colby College (Sept 13, 2019)
9. Brandeis University (Sept 9, 2019)
10. **University of Graz/Technical University of Graz, Austria** (April 12, 2019)
11. **Technical University of Vienna, Austria** (April 11, 2019)
12. **University of Vienna, Austria** (April 10, 2019)
13. The Cancer Biology Therapeutics Program at the Norris Cotton Cancer Center (March 14, 2019)
14. Institute for Biomolecular Targeting (BioMT) at Dartmouth (Nov 13, 2018)
15. Hobart and William Smith Colleges (two lectures Oct 4 and 5, 2018)
16. **Institute of Chemical Research of Catalonia (ICIQ), Spain** (April 13, 2018)
17. **University of Nottingham, UK** (May 5, 2017)
18. **University of Oxford, UK** (May 4, 2017)
19. **École Polytechnique Fédérale de Lausanne (EPFL), Switzerland** (March 29, 2017)

20. **ETH Zürich, Switzerland** (March 27, 2017)
21. Hunter College (Dec 2, 2016)
22. College of the Holy Cross (April 8, 2016)
23. SUNY Cortland (Dec 7, 2015)
24. University of Houston (Dec 1, 2015)
25. Rice University (Nov 30, 2015)
26. Bowdoin College (Sept 11, 2015)
27. University of Nevada, Reno (Feb 6, 2015)
28. Hope College (Sept 6, 2013)
29. Calvin College (Sept 5, 2013)
30. University of Pittsburgh (May 30, 2013)
31. SUNY Potsdam (April 9, 2013)
32. University of Wisconsin-Madison School of Pharmacy (Mar 22, 2013)
33. UC Riverside (Mar 15, 2013)
34. University of Southern California (Mar 13, 2013)
35. Dartmouth College (Nov 8, 2012)
36. UT Austin (Oct 26, 2012)
37. UT Southwestern (Oct 25, 2012)
38. UC Davis (Oct 9, 2012)
39. UC Irvine (Oct 8, 2012)
40. Colorado State University (Aug 28, 2012)
41. Emory University (Mar 21, 2012)
42. Georgia Institute of Technology (Mar 20, 2012)
43. University of Florida (Mar 1, 2012)
44. Florida State University (Feb 28, 2012)
45. Wesleyan University (Feb 24, 2012)
46. Northwestern University (Feb 9, 2012)
47. University of Michigan (Feb 7, 2012)
48. University of New Hampshire (Jan 24, 2012)
49. University of Pennsylvania (Nov 21, 2011)
50. Rutgers University (Nov 18, 2011)
51. Boston University (Nov 7, 2011)
52. Ohio State University (Oct 27, 2011)
53. West Virginia University (Oct 26, 2011)
54. Middlebury College (Oct 7, 2011)
55. University at Albany – SUNY (Sept 20, 2011)
56. University of Massachusetts – Boston (Sept 14, 2011)
57. Boston College (Sept 13, 2011)
58. Notre Dame University (May 5, 2011)
59. University of Vermont (March 24, 2011)

Invited Industrial Lectures

60. Eisai Co., Ltd. (June 24, 2016)
61. Amgen (Sept 11, 2013)
62. Eli Lilly, Indianapolis, IN (10 July 2012)
63. Bristol-Myers Squibb: Process Research, New Brunswick, NJ (13 June 2012)
64. Bristol-Myers Squibb: Discovery Chemistry, Lawrenceville/Hopewell, NJ (12 June 2012)

Invited Conference Lectures

65. Gordon Research Conference in Heterocyclic Compounds, Newport, RI, (June 20, 2018)
66. National Medicinal Chemistry Symposium, Chicago, IL, (July 29, 2016)

67. Medicinal & Bioorganic Chemistry Foundation, Steamboat, CO, (Jan 26, 2015)
68. American Association of Pharmaceutical Scientists Annual Meeting & Exposition, San Diego, CA, (November 2–6, 2014)
69. Gordon Research Conference in Organic Reactions and Processes, Smithfield, RI, (July 14–19, 2013)
70. Young Investigators Symposium (244th American Chemical Society National Meeting), Philadelphia, PA, (August 21, 2012)
71. Martin F. Semmelhack Symposium, Princeton, NJ (Nov 19, 2011)
72. Gordon Research Conference in Heterocyclic Compounds, Newport, RI, (June 26–30, 2011)
73. Florida Heterocyclic and Synthetic, Gainesville, FL, (March 6–9, 2011)
74. Session on Synthetic Organic Methods Across the Border (SOMAB). American Chemical Society Northeast Regional Meeting, Hartford, CT (October 7–10, 2009)
75. Session on Arthur C. Cope Scholar Award Symposium. American Chemical Society Northeast Regional Meeting, Burlington, VT (June 29 – July 2, 2008)

RESEARCH GRANT ACTIVITY (CURRENT) *(US$4.9 million total current and completed)*

1. NIH NIGMS – (R01GM147650) – "Novel Dearomative Indole Annulation Reactions, Beckmann Fragmentations, and Their Applications to Synthesis" **US$1,502,537** total (August 2022 – June 2026); **PI: Jimmy Wu**

RESEARCH GRANT ACTIVITY (COMPLETED)

1. National Science Foundation (CHE-1856273) – "New Reactions for Targeting the Akuammiline Alkaloids" **US$450,000** total (July 2019 – June 2022); **PI: Jimmy Wu**

2. COBRE Institute for Biomolecular Targeting Pilot Project (P20GM113132) – "Identification of the Biological Target and Mechanism of the Nuphar Alkaloids" **US$75,000** direct total (Mar 2018 – Feb 2021); PI: Dean Madden; Co-I: Jimmy Wu (Collaborator: Scott A. Gerber – Geisel School of Medicine) [link]

3. NIH NIGMS – (R01GM111638) – "Synthesis and Target Identification of Potent GLP1 Secretagogues" **US$1,520,000** total (April 2014 – March 2020); **PI: Jimmy Wu**; (Co-Investigator: George G. Holz – SUNY Upstate Medical University)

4. Dartmouth Chemistry Innovation Fund – "In Vivo Testing of Small Molecule PCSK9 Inhibitors in Guinea Pigs" **US$44,813** direct (January 2016 – October 2017); **PI: Jimmy Wu**; (Co-Investigator: Sergio Fazio – Oregon Health and Science University)

5. American Cancer Society Research Scholar Grant (RSG-13-011-01-CDD) – "Studies of the Nuphar Alkaloids - Potent Apoptosis-Inducing Compounds" **US$720,000** total (Jan 2013 – Dec 2016); **PI: Jimmy Wu**; (Collaborator: Alan R. Eastman – Geisel School of Medicine)

6. NIH Lung Biology COBRE – "Optimization of a Novel Compound with Activity against MRSA and *P. Aeruginosa*" **US$50,000** total (Sept 2013 – July 2015): PI: Ambrose Cheung; OSC: Jimmy Wu

7. National Science Foundation – CAREER (CHE -1052824) – "Versatility of Phosphorothioate Esters in the Synthesis of Sulfur-Containing Molecules" **US$550,000** total (Feb 2011 – Jan 2016); **PI: Jimmy Wu**

8. Burke Research Initiation Award – "Enantioselective S_N1 Reactions" **US$25,000** total (July 2007 – June 2013); **PI: Jimmy Wu**

PATENTS

1. **Notice of Allowability US Patent** (March 2023) – Methods of Inhibiting PCSK9. US 2019/0336480 A1

2. **European Patent Granted** (Jan 27, 2021) – Cycloalkanyl[b]indoles Useful as GLP-1 Modulators. Patent No. EP 2887804 B1; UK, DE, FR.

3. **Japanese Patent Granted** (February 26, 2020) - Method for Synthesizing Cycloalkanyl[*b*]indoles, Cycloakanyl[*b*]benzo-furans, Cycloalkanyl[*b*]benzothiophenes, Compounds and Methods of Use. Grant No. JP 6653573 B2.

4. **US Patent Granted** (March 21, 2017): Method for Synthesizing Cycloalkanyl[*b*]indoles, Cycloalkanyl[*b*]benzofurans, Cycloalkanyl[*b*]benzothiophenes, Compounds and Methods of Use. Patent No. US 9,598,365 B2.

5. U.S. Provisional and PCT – Methods of Inhibiting PCSK9. Published July 12, 2018; Patent No. PCT WO2018129205A1.

6. U.S. Provisional and PCT – Antibiotic Compositions. Published August 10, 2017; Patent No. PCT WO2017136642A1.

7. EPO Patent Filing - Method for Synthesizing Cycloalkanyl[*b*]indoles, Cycloalkanyl[*b*]benzofurans, Cycloalkanyl[*b*]benzothiophenes, Compounds and Methods of Use. EPO Patent Application 13794752.9, Dec 22, 2014.

8. U.S. Provisional - Compounds, Compositions and Methods for Treating Bacterial Infections. U.S. Provisional Patent Application No. 61/917,000; Dec 17, 2013.

9. **US Patent Granted** (Aug 26, 2014) – Hydrothiolation of Unactivated Alkenes. Patent No. US 8,816,094 B2