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ACADEMIC QUALIFICATIONS

2006—2012 University of Chicago (Illinois, United States)
Ph.D., Chemistry, June 2012
Advisor: Professor Viresh H. Rawal
Candidacy committee: Professors Hisashi Yamamoto and Stephen B.H. Kent
Dissertation committee: Professors Hisashi Yamamoto and Sergey A. Kozmin
Thesis: "*Studies on Squaramide-Catalyzed Phospha-Michael Addition and Palladium-Catalyzed Indole Functionalization Reactions*"
M.S., Chemistry, August 2007

2002—2006 Peking University (Beijing, China)
B.S., Chemistry, July 2006
Advisor: Professor Xinsheng Zhao (Department of Chemistry)
Thesis: "*Nucleic Acid Aptamer Biosensors for Electrochemical Detection of Proteins*"
Interdisciplinary Research (Principal Research Fund)
Advisor: Professor Zhijian Chen (Department of Physics)
"*Engineered OLED Through Self-assembly Guided by Theoretical Calculation*"

EMPLOYMENT HISTORY

National University of Singapore (Republic of Singapore)
Assistant Professor of Chemistry **2018—Present**
Bristol-Myers Squibb (New Jersey, United States)
Senior Research Investigator **2017—2018**
Research Investigator II **2014—2017**

POSTDOCTORAL EXPERIENCE

Massachusetts Institute of Technology (Massachusetts, United States)
Postdoctoral Fellow **2012—2014**
Advisor: Professor Stephen L. Buchwald

AWARDS

Asian Core Program Lectureship Award – Hong Kong (Taipei, 2024)
Asian Core Program Lectureship Award – Taiwan (Taipei, 2024)

Asian Core Program Lectureship Award – Japan (Singapore, 2023)
Asian Core Program Lectureship Award – Korea (Singapore, 2023)
Horizon Prize (Team Member) – Robert Robinson Award in Synthetic Organic Chemistry (The Royal Society of Chemistry, 2022)
Asian Core Program Lectureship Award – China (Hong Kong, 2022)
Research and Development Star Award (Bristol-Myers Squibb, 2015)
McCormick Graduate Fellowship (University of Chicago, 2006—2008)
Gerhard Closs Teaching Award (University of Chicago, 2007)
Principal Research Fund First-Class Award (Peking University, 2006)
Mingde Scholarship (Peking University, 2003—2006)
Gold Medal, 1st Place, 34th International Chemistry Olympiad (Netherlands, 2002)

INDUSTRY RESEARCH EXPERIENCE AND PATENTS / INVENTIONS

Pharmaceutical Research Experience at Bristol-Myers Squibb (New Jersey)
Virology
- HIV Maturation Inhibitor (BMS-986173, Phase I)

Inflammation and Immunology
- Bruton's Tyrosine Kinase (BTK) Inhibitor (BMS-986142, Phase II for Rheumatoid Arthritis)

Oncology
- Stimulator of Interferon Genes (STING) Agonist
- Casein Kinase 2 (CK2) Inhibitor
- C–C Chemokine Receptor Type 2/5 (CCR2/5) Dual Antagonist (Phase I)

Technology Development
- Prodrug for Pharmacokinetic Optimization
- Antibody Bioconjugation
- Phosphorothioate Oligonucleotide Synthesis
- Environmentally Sustainable Cross-Coupling Reactions

Patent Application at Bristol-Myers Squibb (New Jersey)
- “Process for Preparing Tetrahydrocarbazole Carboxamide Compound” United States Patent Application Number 62/436696; WO2018118830A1
- “Process for the Preparation of N-((1R,2S,5R)-5-(tert-Butylamino)-2-((S)-3-(7-tert-Butylpyrazolo[1,5-A][1,3,5]Triazin-4-ylamino)-2-Oxopyrrolidin-1-yl)Cyclohexyl)Acetamide” United States Patent Application Number 62/534908; WO2019018592A2

PUBLICATION LIST

<u>Graduate work</u>

- **Ye Zhu**, Jeremiah P. Malerich, and Viresh H. Rawal “Squaramide-Catalyzed Enantioselective Michael Addition of Diphenyl Phosphite to Nitroalkenes” ***Angewandte Chemie International Edition*** 2010, *49*, 153–156 (Highlighted

in *Science* 2009, *326*, 1460–1461; Top 1% Highly Cited Paper according to Web of Science; Commercialized by Sigma-Aldrich, Catalog No. 728357).

- **Ye Zhu** and Viresh H. Rawal “Palladium-Catalyzed C3-Benzylation of Indoles” ***Journal of the American Chemical Society*** 2012, *134*, 111–114 (Highlighted in *Organic Process Research & Development* 2012, *16*, 720).
- Thomas D. Montgomery, **Ye Zhu**, Natsuko Kagawa, and Viresh H. Rawal “Palladium-Catalyzed Decarboxylative Allylation and Benzylation of *N*-Alloc and *N*-Cbz Indoles” ***Organic Letters*** 2013, *15*, 1140–1143.
- Thomas D. Montgomery, Antoinette E. Nibbs, **Ye Zhu**, and Viresh H. Rawal “Rapid Access to Spirocyclized Indolenines via Palladium-Catalyzed Cascade Reactions of Tryptamine Derivatives and Propargyl Carbonate” ***Organic Letters*** 2014, *16*, 3480–3483.
- Antoinette E. Nibbs, Thomas D. Montgomery, **Ye Zhu**, and Viresh H. Rawal “Access to Spirocyclized Oxindoles and Indolenines via Palladium-Catalyzed Cascade Reactions of Propargyl Carbonates with 2-Oxotryptamines and Tryptamines” ***The Journal of Organic Chemistry***, 2015, *80*, 4928–4941.

Postdoctoral work

- **Ye Zhu** and Stephen L. Buchwald "Ligand-Controlled Asymmetric Arylation of Aliphatic α-Amino Anion Equivalents" ***Journal of the American Chemical Society*** 2014, *136*, 4500–4503 (Highlighted in *Synfacts* 2014, *10*, 716 and in *Organic Process Research & Development* 2014, *18*, 565).

Industry research

- Nachiket Likhite, Sivaraj Ramasamy, Shankar Tendulkar, Shunmugaraj Sathasivam, Michael Luzung, **Ye Zhu**, Neil Strotman, Jeffrey Nye, Adrian Ortiz, Susanne Kiau, Martin D. Eastgate, and Rajappa Vaidyanathan “Development of a Safe and Robust Process for the Large-Scale Preparation of a Vinyl Bromide from a Ketone Using a $(PhO)_3P/Br_2$-Derived Reagent” ***Organic Process Research & Development***, 2016, *20*, 977–981.
- Gregory Beutner, Ronald Carrasquillo, Peng Geng, Yi Hsiao, Eric C. Huang, Jacob Janey, Kishta Katipally, Sergei Kolotuchin, Thomas La Porte, Andrew Lee, Paul Lobben, Federico Lora-Gonzalez, Brendan Mack, Boguslaw Mudryk, Yuping Qiu, Xinhua Qian, Antonio Ramirez, Thomas M. Razler, Thorsten Rosner, Zhongping Shi, Eric Simmons , Jason Stevens, Jianji Wang, Carolyn Wei, Steven R. Wisniewski , and **Ye Zhu** “Adventures in Atropisomerism: Total Synthesis of a Complex Active Pharmaceutical Ingredient with Two Chirality Axes” ***Organic Letters*** 2018, *20*, 3736–3740.
- Kyle W. Knouse, Justine N. deGruyter, Michael A. Schmidt, Bin Zheng, Julien C. Vantourout, Cian Kingston, Stephen E. Mercer, Ivar M. Mcdonald, Richard

E. Olson, **Ye Zhu**, Chao Hang, Jason Zhu, Changxia Yuan, Qinggang Wang, Peter Park, Martin D. Eastgate, and Phil S. Baran “Unlocking P(V): Reagents for Chiral Phosphorothioate Synthesis” ***Science*** 2018, *361,* 1234–1238.

- Bin Zheng, Chao Hang, Jason Zhu, Geoffrey E. Purdum, Melda Sezen-Edmonds, Daniel S. Treitler, Miao Yu, Changxia Yuan, **Ye Zhu**, Adam Freitag, Siwei Guo, Guanghui Zhu, Ben Hritzko, James Paulson, Jonathan G. Shackman, Brian L. He, Weiqing Fu, Hua Chia Tai, Sloan Ayers, Hyunsoo Park, Martin D. Eastgate, Ben Cohen, Amanda Rogers, Qinggang Wang, and Michael A. Schmidt “P(III) vs P(V): A P(V) Reagent for Thiophosphoramidate Linkages and Application to an Asymmetric Synthesis of a Cyclic Dinucleotide STING Agonist” ***The Journal of Organic Chemistry*** 2022, *87*, 1934–1940.

<u>Independent academic research</u>

- Yazhou Lou, Junqiang Wei, Mingfeng Li, and **Ye Zhu*** “Distal Ionic Substrate–Catalyst Interactions Enable Long-Range Stereocontrol: Access to Remote Quaternary Stereocenters through a Desymmetrizing Suzuki–Miyaura Reaction” ***Journal of the American Chemical Society*** 2022, *144*, 123–129.

- Mingfeng Li, Xiu Li Chia, and **Ye Zhu*** “Tethered photocatalyst-directed palladium-catalysed C–H allenylation of *N*-aryl tetrahydroisoquinolines” ***Chemical Communications*** 2022, *58*, 4719–4722.

- Mingfeng Li, Xiu Li Chia, Chong Tian* and **Ye Zhu*** “Mechanically planar chiral rotaxanes through catalytic desymmetrization” ***Chem*** 2022, *8*, 2843–2855.

- Ivan Keng Wee On, Wenyang Hong and **Ye Zhu*** “Crossing the ortho-hurdle: Ionic stereocontrol enables atroposelective Suzuki–Miyaura coupling” ***Chem Catalysis*** 2023**,** *3*, 100523.

- Ivan Keng Wee On, Wenyang Hong and **Ye Zhu*** “Remote control over both site-selectivity and atroposelectivity of Suzuki–Miyaura coupling through distal ionic interactions’’ ***Tetrahedron Letters*** 2023, *119*, 154408. (Invited contribution to special issue on Remote Fuctionalization)

- Ivan Keng Wee On and **Ye Zhu*** “Enantioselective Pd-catalyzed Suzuki–Miyaura reactions enabled by ionic ligand–substrate interactions’’ ***Synlett*** 2023, DOI: 10.1055/a-2112-9552 (Invited contribution to Synlett Cluster for the 11th Singapore International Chemistry Conference, SICC-11)

- Junqiang Wei, Vincent Gandon*,* and **Ye Zhu*** ’’Amino Acid-Derived Ionic Chiral Catalysts Enable Desymmetrizing Cross-Coupling to Remote Acyclic Quaternary Stereocenters’’ ***Journal of the American Chemical Society*** 2023, *145*, 16796–16811.

- Xiao Hai, Yang Zheng, Qi Yu, Na Guo, Shibo Xi*, Xiaoxu Zhao, Sharon Mitchell, Xiaohua Luo, Victor Tulus, Mu Wang, Xiaoyu Sheng, Longbin Ren, Xiangdong Long, Jing Li, Peng He, Huihui Lin, Yige Cui, Xinnan Peng, Jiwei Shi, Jie Wu, Chun Zhang, Ruqiang Zou, Gonzalo Guillén-Gosálbez, Javier Pérez-Ramírez*, Ming Joo Koh*, **Ye Zhu***, Jun Li*, and Jiong Lu* "Geminal-atom catalysis for cross-coupling" ***Nature*** 2023, 622, 754–760.

- Mingfeng Li, Clement Kim Soon Ho, Ivan Keng Wee On, Vincent Gandon*****, and **Ye Zhu*** "Inherently chiral resorcinarene cavitands through ionic catalyst-controlled cross-coupling" ***Chem*** 2024, *10*, 3323–3341.

- Chi Liu, Yang Yang, Wenyang Hong, Jun-An Ma*, **Ye Zhu*** "Ion Hydration Enables Generality in Asymmetric Catalysis: Desymmetrization to *P*-Stereogenic Triarylphosphine Derivatives." *Angewandte Chemie International Edition*, Accepted. DOI: https://doi.org/10.1002/anie.202417827.

Book Chapter

- Yunus. E. Türkmen, **Ye Zhu**, and Viresh H. Rawal "Asymmetric Catalysis with Non-Covalent Activations: Brønsted Acids" in *Comprehensive Enantioselective Organocatalysis*, Ed. Peter I. Dalko, Wiley-VCH 2013, Pages 241–288.

Preview

- Ivan Keng Wee On, and **Ye Zhu** "Modular assembly of highly functionalized allenes through radical allenylation of alkene" ***Chem Catalysis*** 2023**,** *4*, 100604.

CONFERENCES and SEMINARS

- "Targeting Synthetic Reactions Applicable to Drug Discovery and Development" (Talk) 10th Singapore International Chemical Conference (SICC-10). 18 December 2018, Singapore.

- "Remote Quaternary Stereocenters Through Distal Ionic Interactions-Directed Desymmetrizing Suzuki–Miyaura Reaction" (Poster) 15th International Conference on Cutting-Edge Organic Chemistry in Asia (ICCEOCA-15). 25 July 2022, Hong Kong.

- "Remote Stereocontrol Through Distal Ionic Interactions-Directed Cross-Coupling" (Talk) 11th Singapore International Chemical Conference (SICC-11). 12 December 2022, Singapore.

- “Ionic interactions enable remote stereocontrol of Pd-catalyzed cross-coupling” (Talk) 11th Asian-European Symposium on Metal-Mediated Organic Synthesis. 6 February 2023, Technion – Israel Institute of Technology, Haifa.

- “Remote Stereocontrol of Cross-Coupling Reactions Directed by Distal Ionic Substrate–Catalyst Interactions” (Talk) 10 April 2023, Bilkent Üniversitesi, Ankara.

- “Ionic interactions enable stereoselective access to mechanically planar chiral rotaxanes” (Poster) Harnessing non-covalent interactions for synthesis and catalysis Faraday Discussion. 12 April 2023, York.

- “Developing chemical tools to precisely control the chemo-, regio-, and stereo-selectivity of molecular functionalization”. Advancing the Frontiers of Science and Technology with Chemistry Talk (Chem Week 2023) to secondary students and junior college students. May 29, 2023.

- “Stereoselective Pd-catalyzed cross-coupling enabled by ionic ligand–substrate interactions” The 16th International Symposium for Chinese Organic Chemists (ISCOC). 29 August 2023, Peking University, Beijing.

- “Ionic ligand–substrate interactions enable electrostatic catalysis: long-range stereocontrol in palladium-catalyzed cross-coupling reactions” The 15th International Kyoto Conference on New Aspects of Organic Chemistry (IKCOC-15). 23 November 2023, Kyoto.

- “Ionic ligand–substrate interactions enable electrostatic catalysis: long-range stereocontrol in palladium-catalyzed cross-coupling reactions” 16th International Conference on Cutting-Edge Organic Chemistry in Asia (ICCEOCA-16). 2 December 2023, Singapore.

- “Ionic interactions enable electrostatic catalysis: remote stereocontrol in palladium-catalyzed cross-coupling reactions” 57th Bürgenstock Conference (Swiss Chemical Society Conference on Stereochemistry). 29 April 2024, Brunnen.

- “Electrostatic interactions enable remote stereocontrol in palladium-catalyzed cross-coupling” 27 May 2024, Seoul National University, Seoul; 28 May 2024, Korea Advanced Institute of Science & Technology (KAIST), Daejeon; 29 May 2024, Pusan National University, Busan.

- 《通过离子键作用实现对钯催化的交叉偶联反应的远程立体控制》2024 年 5 月 31 日，山东大学，济南

- “Electrostatic interactions enable remote stereocontrol in palladium-catalyzed cross-coupling” 4 June 2024, Nagoya University, Nagoya; 5 June 2024, Gakushūin University, Tokyo; 6 June 2024, Tohoku University, Sendai. 7 June 2024, Tokyo University of Agriculture and Technology, Tokyo.

- “Catalysis in Drug Discovery and Development” NUS Science Summer Institute, 8 July 2024.

- “Catalysis has a long arm: asymmetric induction in the construction of mechanically planar chiral rotaxanes” Junior College Visit Program, 7 August 2024.

- “Electrostatic interactions enable remote stereocontrol in palladium-catalyzed cross-coupling” The 6th International Conference on Organometallics and Catalysis (OM&CAT-6), Nankai University, 17 August 2024, Tianjin.

- “Inherently chiral cavitands through ionic catalyst-controlled cross-coupling” 17th International Conference on Cutting-Edge Organic Chemistry in Asia (ICCEOCA-17). 1 December 2024, Taipei.