

# Professor ZHAO Yu

S9-13-01E, Department of Chemistry, National University of Singapore  
4 Science Drive 2, Singapore 117544  
Phone: 65-65167964; Email: zhaoyu@nus.edu.sg



## Employment

Jan 2024-present	Professor of Chemistry, NUS
Jul 2019-Jun 2022	Dean's Chair Associate Professor, NUS
Jul 2017-Dec 2023	Associate Professor of Chemistry, NUS
Aug 2011-Jun 2017	Assistant Professor of Chemistry, NUS
2008-2011	Postdoctoral associate with Prof. Richard R. Schrock Massachusetts Institute of Technology

## Education

2002- 2008	Ph.D. in Chemistry with Profs. Marc L. Snapper & Amir H. Hoveyda, Boston College
1998- 2002	B.S. in Chemistry with Prof. Limin Qi, Peking University

## Research interests

- Efficient catalytic methodology development
- Medicinal chemistry
- Pharmaceutical manufacturing
- Organic material and polymer chemistry

## Publications

1. "Enantioselective Construction of Eight-Membered N-Heterocycles from Simple 1,3-Dienes via Pd(0) Lewis Base Catalysis," Pan, J.; Ho, T. O.; Chen, Y.-C.;\* Yang, B.-M.;\* Zhao, Y.\* *Angew. Chem. Int. Ed.* **2024**, *63*, e202317703.
2. "Scalable Synthesis of Antihistamines and Sensipar via Intensified Hydrogen Borrowing Methodology," Ng, X. Q.; Zhao, Y.\*; Isoni, V.\* *ACS Sustain. Chem. Eng.* **2023**, *11*, 12389–12396.
3. "Enantioconvergent transformations of secondary alcohols through borrowing hydrogen catalysis," Gao, Y.; Hong, G.; Yang, B.-M.;\* Zhao, Y.\* *Chem. Soc. Rev.* **2023**, *52*, 5541–5562 ([invited review](#)).
4. "When Remote C-H Activation Meets Planar Chirality," Yang, G.; Zhao, Y.\* *Sci. Bull.* **2023**, *68*, 1595–1597 ([invited highlight](#)).
5. "Concise Synthesis of Chiral Tricyclic Lactams by Tandem Dynamic Kinetic Asymmetric Reductive Amination/Lactamization Using Ammonium Salts," Wang, J.; Shi, Y.; Wang, F.; Huang, F.; Bai, S.-T.;\* Zhao, Y.\*; Zhang, X.\* *Angew. Chem. Int. Ed.* **2023**, *62*, e202303868.
6. "Chiral Acid-Catalyzed Atroposelective Indolization Enables Access to 1,1-Indole-Pyrroles and Bisindoles Bearing a Chiral N–N Axis," Wang, L.-Y.; Miao, J.; Zhao, Y.\*; Yang, B.-M.\* *Org. Lett.* **2023**, *25*, 1553–1557.
7. "Direct Access to Chiral Aliphatic Amines by Catalytic Enantioconvergent Redox-Neutral Amination of

- Alcohols," Ng, X. Q.; Lim, C. S.; Liaw, M. W.; Quach, T. T.; Yang, B.-M.; Isoni, V.; Wu, J.\* Zhao, Y.\* *Nat. Synth.* **2023**, *2*, 572–580.
8. "Iridium-Catalyzed Enantioconvergent Borrowing Hydrogen Annulation of Racemic 1,4-Diols with Amines," Liu, Y.; Diao, H.; Hong, G.; Edward, J.; Zhang, T.; Yang, G.; Yang, B.-M.;\* Zhao, Y.\* *J. Am. Chem. Soc.* **2023**, *145*, 5007–5016.
  9. "Enantioselective Access to Triaryl-2-pyrones with Monoaxial or Contiguous C-C Diaxes via Oxidative NHC Catalysis," Zhang, S.-C.; Liu, S.; Wang X.; Wang, S.-J.; Yang, H.; Li, L.; Yang, B.; Wong, M. W.; Zhao, Y.; Lu, S.\* *ACS Catal.* **2023**, *13*, 4, 2565–2575.
  10. "Anion Effect in Enantioselective Oxidative NHC Catalysis: Highly Efficient Kinetic Resolution of Tertiary alcohols and Beyond," Hu, D.; Poh, S. B.; Liu, F.; Tu, Z.; Wang, X.; Lu, S.;\* Zhao, Y.\* *Org. Chem. Front.* **2023**, *10*, 416-421.
  11. "Economical Access to Diverse Enantiopure Tetrahydropyridines and Piperidines Enabled by Catalytic Borrowing Hydrogen," Ng, T. W.;<sup>†</sup> Tao, R.;<sup>†</sup> See, W. W. L.; Poh, S. B.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2023**, *62*, e202212528.
  12. "Co/Zn Bimetallic Catalysis Enables Enantioselective Alkynylation of Isatins and  $\alpha$ -Ketoesters Using Terminal Alkynes," Huang, R.-Z.; Ma, Z.-C.; Huang, Y.\* Zhao, Y.\* *J. Org. Chem.* **2022**, in press (Invited for Special Issue "Modern Enantioselective Catalysis in Organic Chemistry").
  13. "Enantioselective Synthesis of Indoles through Catalytic Indolization," Yang, B.-M.;\* Ng, X. Q.; Zhao, Y.\* *Chem Catal.* **2022**, *2*, 3048-3076 (invited review).
  14. "A Green Access to Supported Cinchona Alkaloid Amide Catalysts for Heterogeneous Enantioselective Allylsilylation of Aldehydes and Process Intensity Evaluation in Batch and Flow," Ng, X. Q.; Kang, M. H.; Toh, R. W.; Isoni, V.;\* Wu, J.;\* Zhao, Y.\* *Green Synth. Catal.* **2022**, *3*, 272-277.
  15. "Atroposelective Synthesis of 1,1'-Bipyrrroles Bearing a Chiral N-N Axis: Chiral Phosphoric Acid Catalysis with Lewis Acid Induced Enantiodivergence," Gao, Y.; Wang, L.-Y.; Zhang, T.; Yang, B.-M.;\* Zhao, Y.\* *Angew. Chem. Int. Ed.* **2022**, *61*, e202200371 (VIP).
  16. "Enantioselective Cascade Annulation of  $\alpha$ -Amino-ynones and Enals Enabled by Gold and Oxidative NHC Relay Catalysis," Jiang, J.; Wang, X.; Liu, S.; Zhang, S.; Yang, B.; Zhao, Y.; Lu, S.\* *Angew. Chem. Int. Ed.* **2022**, e202115464.
  17. "Experimental and Computational Studies on the Directing Ability of Chalcogenoethers in Palladium-Catalyzed Atroposelective C–H Olefination and Allylation," Liao, G.; Zhang, T.; Jin, L.; Wang B.-J.; Xu, C.-K.; Lan, Y.;\* Zhao, Y.;\* Shi, B.-F.\* *Angew. Chem. Int. Ed.* **2022**, e202115221.
  18. "Tandem Catalytic Indolization/Enantioconvergent Substitution of Alcohols by Borrowing Hydrogen to Access Tricyclic Indoles," Yang, G.; Pan, J.; Ke, Y.-M.; Liu, Y.;\* Zhao, Y.\* *Angew. Chem. Int. Ed.* **2021**, *60*, 20689-20694.
  19. "Redox-Enabled Direct Stereoconvergent Heteroarylation of Simple Alcohols," Liu, Y.; Tao, R.; Lin, Z.-K.; Yang, G.;\* Zhao, Y.\* *Nat. Commun.* **2021**, *12*, 5035.
  20. "Catalytic Diastereo- and Enantioconvergent Synthesis of Vicinal Diamines from Diols through Borrowing Hydrogen," Pan, H.-J.;<sup>†</sup> Lin, Y.;<sup>†</sup> Gao, T.; Lau, K. K.; Feng, W.; Yang, B.;\* Zhao, Y.\* *Angew. Chem. Int. Ed.* **2021**, *60*, 18599-18604.
  21. "Catalytic Atroposelective Dynamic Kinetic Resolution of Biaryl Lactones with Activated Isocyanides," Qian, L.; Tao, L.-F.; Wang, W.-T.; Jameel, E.; Luo, Z.-H.; Zhang, T.; Zhao, Y.; Liao, J.-Y.\* *Org. Lett.* **2021**, *23*, 5086-5091.

22. "Stereoselective Access to Polyfunctionalized Nine-Membered Heterocycles by Sequential Gold and Palladium Catalysis," Yang, G.; Ke, Y.-M.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2021**, *60*, 12775-12780.
23. "Access to 5,6-Spirocycles Bearing Three Contiguous Stereocenters via Pd-Catalyzed Stereoselective [4 + 2] Cycloaddition of Azadienes," Sheikh Ismail S. N. F.; Yang, B.\*; Zhao, Y.\* *Org. Lett.* **2021**, *23*, 2884-2889.
24. "Desymmetrization of 1,3-Diones by Catalytic Enantioselective Condensation with Hydrazine," Yang, B.;<sup>†</sup> Dai, J.;<sup>†</sup> Luo, Y.; Lau, K. K.; Lan, Y.\*; Shao, Z.\*; Zhao, Y.\* *J. Am. Chem. Soc.* **2021**, *143*, 4179-4186.
25. "Nickel-Catalyzed Site- and Stereoselective Reductive Alkylalkynylation of Alkynes," Jiang, Y.; Pan, J.; Yang, T.; Zhao, Y.\*; Koh, M. J.\* *Chem* **2021**, *7*, 993-1005.
26. "Ligand Coordination/Dissociation-Induced Divergent Allylic Alkylations Using Alkynes," Huang, Y.;<sup>†</sup> Ma, C.;<sup>†</sup> Liu, S.;<sup>†</sup> Yang, L.; Lan, Y.\*; Zhao, Y.\* *Chem* **2021**, *7*, 812-826.
27. "Transformation of Corn Lignin into Sun Cream Ingredients," See, J. Y.; Song, S.; Xiao, Y.; Pham, T. T.; Zhao, Y.; Lapkin, A.; Yan, N.\* *ChemSusChem*, **2021**, *14*, 1586-1594.
28. "Access to Substituted Cyclobutenes by Tandem [3,3]-Sigmatropic Rearrangement/[2+2] Cycloaddition of Dipropargylphosphonates under Ag/Co Relay Catalysis," Ni, Q.;<sup>†</sup> Song, X.;<sup>†</sup> Png, C. W.; Zhang, Y.\*; Zhao, Y.\* *Chem. Sci.* **2020**, *11*, 12329-12335.
29. "Isothiourea-Catalyzed Atroposelective N-Acylation of Sulfonamides," Ong, J. Y.;<sup>†</sup> Ng, X. Q.;<sup>†</sup> Lu, S.\*; Zhao, Y.\* *Org. Lett.* **2020**, *22*, 6447-6451.
30. "Dynamic Kinetic Asymmetric Amination of Alcohols Assisted by Microwave: Stereo-convergent Access to Tetralin- and Indane-Derived Chiral Amines," Rong, Z.-Q.; Yu, Z.; Weng, C.; Yang, L.-C.; Lu, S.; Lan, Y.\*; Zhao, Y.\* *ACS Cat.* **2020**, *10*, 9464-9475.
31. "Stereoselective access to [5.5.0] and [4.4.1] bicyclic compounds through Pd-catalysed divergent higher-order cycloadditions," Yang, L.-C.;<sup>†</sup> Wang, Y.-N.;<sup>†</sup> Liu, R.; Luo, Y.; Ng, X. Q.; Yang, B.; Rong, Z.-Q.; Lan, Y.\*; Shao, Z.\*; Zhao, Y.\* *Nat. Chem.* **2020**, *12*, 860-868.
32. "Nickel-Catalyzed Allylmethylation of Alkynes Using Allylic Alcohols and AlMe<sub>3</sub>: A Facile Access to Skipped Dienes and Trienes," Li, W.\*; Yu, S.; Li, J.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2020**, *59*, 14404-14408.
33. "Room-Temperature Guerbet Reaction with Unprecedented Catalytic Efficiency and Enantioselectivity," Ng, T. W.;<sup>†</sup> Liao, G.;<sup>†</sup> Lau, K. K.; Pan, H.-J.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2020**, *59*, 11384-11389.
34. "Diastereo- and Atroposelective Synthesis of Bridged Biaryls Bearing an Eight-Membered Lactone through an Organocatalytic Cascade," Lu, S.; Ong, J.-Y.; Poh, S. B.; Liew, X.; Seow, C. S. D.; Wong, M. W.\*; Zhao, Y.\* *J. Am. Chem. Soc.* **2019**, *141*, 17062-17067.
35. "NHC-Catalyzed Atroposelective Acylation of Phenols: Access to Enantiopure NOBIN Analogs by Desymmetrization," Lu, S.; Poh, S. B.; Rong, Z.-Q.\*; Zhao, Y.\* *Org. Lett.* **2019**, *21*, 6169-6172.
36. "Stereoconvergent, Redox-Neutral Access to Tetrahydroquinoxalines by Relay Catalytic Epoxide Opening/Amination of Alcohol," Xu, G.;<sup>†</sup> Yang, G.;<sup>†</sup> Wang, Y.; Shao, P.-L.; Yau, J. N. N.; Liu, B.; Zhao, Y.; Sun, Y.; Xie, X.; Wang, S.; Zhang, Y.\*; Xia, L.\*; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2019**, *58*, 14082-14088.
37. "Practical Access to Axially Chiral Sulfonamides and Biaryl Amino Phenols via Organocatalytic Atroposelective N-Alkylation," Lu, S.; Ng, S. V. H.; Lovato, K.; Ong, J.-Y.; Poh, S. B.; Ng, X. Q.; Kurti, L.\*; Zhao, Y.\* *Nat. Commun.* **2019**, *10*, 3061.

38. "B(C<sub>6</sub>F<sub>5</sub>)<sub>3</sub>-Catalyzed Redox-Neutral  $\beta$ -Alkylation of Tertiary Amines using p-Quinone Methides via Borrowing Hydrogen," Li, R.; Chen, Y.; Jiang, K.; Wang, F.; Lu, C.; Nie, J.; Chen, Z.; Yang, G.;\* Chen, Y.-C.; Zhao, Y.;\* Ma, Chao.\* *Chem. Commun.* **2019**, *55*, 1217–1220.
39. "Ag-Catalyzed Thiocyanofunctionalization of Terminal Alkynes To Access Alkynylthiocyanates and  $\alpha$ -Thiocyanoketones," See, J. Y.; Zhao, Y.\* *Org. Lett.* **2018**, *20*, 7433–7436.
40. "Rhodium-Catalyzed Enantioconvergent Isomerization of Homoallylic and Bishomoallylic Secondary Alcohols," Huang, R.-Z.; Lau, K. K.; Li, Z.; Liu, T.-L.;\* Zhao, Y.\* *J. Am. Chem. Soc.* **2018**, *140*, 14647–14654.
41. "Cu-Catalyzed [3 + 3] Cycloaddition of Isocyanoacetates with Aziridines and Stereoselective Access to  $\alpha,\gamma$ -Diamino Acids," Kok, G. P. Y.; Yang, H.; Wong, M. W.;\* Zhao, Y.\* *Org. Lett.* **2018**, *20*, 5112–5115.
42. "Divergent, Enantioselective Synthesis of Pyrroles, 3H Pyrroles and Bicyclic Imidazolines by Ag- or P-Catalyzed [3 + 2] Cycloaddition of Allenates with Activated Isocyanides," Kok, G. P. Y.; Shao, P.-L.;\* Liao, J.-Y.; Sheikh Ismail, S. N. F.; Yao, W.; Lu, Y.;\* Zhao, Y.\* *Chem. Eur. J.* **2018**, *24*, 10513–10520.
43. "Pd-Titanium Relay Catalysis Enables Switch of Alkoxide- $\pi$ -Allyl to Dienolate Reactivity for Spiro-Heterocycle Synthesis," Yang, L.-C.; Tan, Z. Y.; Rong, Z.-Q.; Liu, R.; Wang, Y.-N.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2018**, *57*, 7860–7864.
44. "Direct Enantioselective  $\alpha$ -Allylation of Unfunctionalized Cyclic Ketones with Alkynes via Pd-Amine Cooperative Catalysis," Lee, J. T. D.; Zhao, Y.\* *Chem. Eur. J.* **2018**, *24*, 9520–9524.
45. "Catalytic and Enantioselective Direct  $\alpha$ -Alkylation of 3-Aryl and 3-Alkyl Oxindole Using Quinine-Derived Urea Catalyst," Paderes, M. C.;\* Siau, W. Y.; Rong, Z.-Q.; Zhao, Y.\* *Chem. Select* **2018**, *3*, 6160–6164.
46. "Visible-Light-Driven Alkyne Hydro-/Carboxylation Using CO<sub>2</sub> via Iridium/Cobalt Dual Catalysis for Divergent Heterocycle Synthesis," Hou, J.; Ee, A.; Feng, W.; Xu, J.-H.; Zhao, Y.;\* Wu, J.\* *J. Am. Chem. Soc.* **2018**, *140*, 5257–5263.
47. "Transition Metal-Free Decarboxylative Propargylic Substitution/Cascade Cyclization with Azolium Enolates or Acyl Anions," Lu, S.;<sup>†</sup> Ong, J.-Y.;<sup>†</sup> Poh, S. B.; Tsang, T.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2018**, *57*, 5714–5719.
48. "FeCl<sub>3</sub>-Catalyzed Dimerization/Elimination of 1,1-Diarylethenes: Efficient Synthesis of Functionalized 4H-Chromenes," Ma, C.;\* Zhao, Y.\* *Org. Biomol. Chem.* **2018**, *16*, 703–706.
49. "Highly Regio- and Stereodivergent Access to 1,2-Amino Alcohols or 1,4-Fluoro Alcohols by NHC-Catalyzed Ring Opening of Epoxy enals," Poh, S. B.; Ong, J. Y.; Lu, S.;\* Zhao, Y.\* *Angew. Chem. Int. Ed.* **2018**, *57*, 1645–1649.
50. "Pd-Catalyzed Enantioselective [6+4] Cycloaddition of Vinyl Oxetanes with Azadienes to Access Ten-Membered Heterocycles," Wang, Y. N.;<sup>†</sup> Yang, L. C.;<sup>†</sup> Rong, Z.-Q.; Liu, T.-L.; Liu, R.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2018**, *57*, 1596–1600.
51. "Desymmetrizing Enantio- and Diastereoselective Selenoetherification through Supramolecular Catalysis," See, J. Y.; Yang, H.; Zhao, Y.; Wong, M. W.;\* Ke, Z.;\* Yeung, Y.-Y.\* *ACS Catal.* **2018**, *8*, 850–858.
52. "Nickel-catalyzed Difunctionalization of Allyl Moieties Using Organoboronic Acids and Halides with Divergent Regioselectivities," Li, W.; Boon, J. K.; Zhao, Y.\* *Chem. Sci.* **2018**, *9*, 600–607.
53. "Nine-Membered Benzofuran-Fused Heterocycles: Enantioselective Synthesis by Pd-Catalysis and Rearrangement via Transannular Bond Formation," Rong, Z.-Q.;<sup>†</sup> Yang, L.-C.;<sup>†</sup> Liu, S.; Yu, Z.; Wang, Y.-N.; Tan, Z. Y.; Huang, R.-Z.; Lan, Y.;\* Zhao, Y.\* *J. Am. Chem. Soc.* **2017**, *139*, 15304–15307.

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59. "Construction of Nine-Membered Heterocycles through Palladium-Catalyzed Formal [5 + 4] Cycloaddition," Yang, L.-C.;<sup>†</sup> Rong, Z.-Q.;<sup>†</sup> Wang, Y.-N.; Tan, Z. Y.; Wang, M. Zhao, Y.\* *Angew. Chem. Int. Ed.* **2017**, *56*, 2927–2931.
60. "Access to Enantiopure Triarylmethanes and 1,1-Diarylalkanes by NHC-Catalyzed Acylative Desymmetrization," Lu, S.;<sup>†</sup> Song, X.;<sup>†</sup> Poh, S. B.; Yang, H.; Wong, M. W.;\* Zhao, Y.\* *Chem. Eur. J.* **2017**, *23*, 2275–2281.
61. "Acid-Assisted Ru-Catalyzed Enantioselective Amination of 1,2-Diols through Borrowing Hydrogen," Yang, L.-C.; Wang, Y.-N.; Zhang, Y.;\* Zhao, Y.\* *ACS Catal.* **2017**, *7*, 93–97.
62. "Formal [3 + 2] cycloaddition of  $\alpha$ -unsubstituted isocyanoacetates and methyleneindolinones: enantioselective synthesis of spirooxindoles," Peng, X.-J.; Ho, Y. A.; Wang, Z.-P.; Shao, P.-L.;\* Zhao, Y.;\* He, Y.\* *Org. Chem. Front.* **2017**, *4*, 81–85.
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64. "Stereoselective 1,6-Conjugate Addition/Annulation of Para-Quinone Methides with Vinyl Epoxides/Cyclopropanes," Ma, C.;<sup>†</sup> Huang, Y.;<sup>†</sup> Zhao, Y.\* *ACS Catal.* **2016**, *6*, 6408–6412.
65. "Asymmetric Transfer Hydrogenation of Imines using Alcohol: Efficiency and Selectivity Are Affected by the Hydrogen Donor," Pan, H.-J.; Zhang, Y.; Shan, C.; Yu, Z.; Lan, Y.;\* Zhao, Y.\* *Angew. Chem. Int. Ed.* **2016**, *55*, 9615–9619.
66. "Cobalt-Catalyzed Enantioselective Vinylation of Activated Ketones and Imines," Huang, Y.;<sup>†</sup> Huang, R.-Z.;<sup>†</sup> Zhao, Y.\* *J. Am. Chem. Soc.* **2016**, *138*, 6571–6576.
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69. "Cobalt-Catalyzed Allylation of Heterobicyclic Alkenes: Ligand-Induced Divergent Reactivities," Huang, Y.; Ma, C.; Lee, Y. X.; Huang, R.-Z.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2015**, *54*, 13696–13700.
70. "Iron-catalyzed amination of alcohols assisted by Lewis acid," Pan, H.-J.; Ng, T. W.; Zhao, Y.\* *Chem. Comm.* **2015**, *51*, 11907–11910.

71. "Phase-Transfer-Catalyzed Enantioselective  $\alpha$ -Hydroxylation of Acyclic and Cyclic Ketones with Oxygen," Sim, S. B. D.; Wang, M.; Zhao, Y.\* *ACS Catal.* **2015**, *5*, 3609–3612.
72. "Dynamic Kinetic Asymmetric Amination of Alcohols: From A Mixture of Four Isomers to Diastereo- and Enantiopure  $\alpha$ -Branched Amines," Rong, Z. Q.;<sup>†</sup> Zhang, Y.;<sup>†</sup> Chua, R. H. B.; Pan, H.-J.; Zhao, Y.\* *J. Am. Chem. Soc.* **2015**, *137*, 4944–4947.
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74. "Stereoselective Synthesis of  $\epsilon$ -Lactones or Spiro-Heterocycles through NHC-Catalyzed Annulation: Divergent Reactivity by Catalyst Control," Wang, M.;<sup>†</sup> Rong, Z.-Q.;<sup>†</sup> Zhao, Y.\* *Chem. Comm.* **2014**, *50*, 15309–15312.
75. "Kinetic Resolution of 1,1'-Biaryl-2,2'-Diols and Amino Alcohols through NHC-Catalyzed Atroposelective Acylation," Lu, S.; Poh, S. B.; Zhao, Y.\* *Angew. Chem. Int. Ed.* **2014**, *53*, 11041–11045.
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79. "Practical, Highly Stereoselective Allyl- and Crotylsilylation of Aldehydes Catalyzed by Readily Available Cinchona Alkaloid Amide," Huang, Y.; Yang, L.; Shao, P.; Zhao, Y.\* *Chem. Sci.* **2013**, *4*, 3275–3281.
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#### PhD and Postdoc Periods:

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†Equal contribution.

## Patents and Invention Disclosures

1. “Highly *Z*-Selective Olefin Metathesis,” Schrock, R. R.; Hoveyda, A. H.; Jiang, A. J.; Zhao, Y.; Flook, M. M. US patent No. 9713808 (issued on 25-07-2017).
2. “Catalytic Enantioselective Silylations of Substrates,” Snapper M. L.; Hoveyda A. H.; Rodrigo, J.; Zhao, Y. PCT Int. Appl. **2007**, # WO2007082026.
3. “Novel Cinchona Alkaloid Derived Catalyst Available in One-Pot Synthesis for Highly Diastereo- and Enantioselective Addition of Allyltrichlorosilane and Crotyltrichlorosilane to Aldehydes,” Zhao, Y.; Huang, Y.; Shao, P.; Yang, L. US 61/765,315.
4. “Practical, Catalytic Enantiospecific Synthesis of Substituted Tetrahydropyridines,” Zhao, Y.; Ng, T. W. SG Non-Provisional Application No. 10201911047Q.

## Awards

- 2019 **Asian Rising Stars Lectureship Award**, 18<sup>th</sup> Asian Chemical Congress, FACS
- 2018 **Tokyo Chemical Industry-SNIC Industry Award in Synthetic Chemistry**
- 2017 **Outstanding Chemist Award**, Department of Chemistry, NUS
- 2016 **Thieme Chemistry Journal Award**
- 2015 **Young Scientist Award**, Faculty of Science, NUS
- 2015 **Young Chemist Award**, Department of Chemistry, NUS
- 2015 **Asian Core Program Lectureship Award** from Japan and Hong Kong
- 2014 **Asian Core Program Lectureship Award** from Taiwan and Thailand
- 2013 **Asian Core Program Lectureship Award** from China and South Korea
- 2011-2016 **Singapore National Research Foundation Fellowship**, Singapore
- 2006-2007 **John LaMattina Graduate Student Fellowship**, Boston College
- 1998-1999 **Guanghua Scholarship**, Peking University