Runze MAO Curriculum Vitae

Biocatalysis, protein engineering, directed evolution

清華大學深圳国际研究生院
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PERSONAL INFORMATION

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Google Scholar: scholar.google.com/citations?user=F6tVooEAAAAJ&hl=en&oi=ao

EDUCATION & PROFESSIONAL EXPERIENCE

- ***Postdoc.*** | **California Institute of Technology**, USA Jan. 2021–present
  Advisor: Prof. Frances H. Arnold
- ***Postdoc.*** | **Swiss Federal Institute of Technology, Lausanne,** Switzerland Oct. 2020–Dec. 2020
  Advisor: Prof. Xile Hu
- ***Ph.D.*** | Chemistry | **Swiss Federal Institute of Technology, Lausanne**, Switzerland Jul. 2016–Sep. 2020
  Advisor: Prof. Xile Hu | *Doctoral Program Thesis Distinction*
- ***M.S.*** | Chemical Biology | **Peking University**, China Sep. 2013–Jul. 2016
  Advisor: Prof. Xin-Shan Ye | *Graduate Excellence Award*
- ***B.S.*** | Chemistry | **Henan Normal University**, China Sep. 2009–Jul. 2013
  Advisors: Profs. Gui-Rong Qu & Hai-Ming Guo | *Undergraduate Excellence Award*

FIRST-AUTHOR PUBLICATIONS

16. Liang, L.; Wang, Y.-H.; Cui, C.-X.; Deng, X.-S.; Wang, S.-L.; Guo, H.-M.; Li, Y.; Niu, H.-Y.; **Mao, R.*** NADH Analogues Enable Metal- and Light-Free Decarboxylative Functionalization. *Angew. Chem., Int. Ed.* **2024**, e202415131.
15. **Mao, R.**; Gao, S.; Qin, Z.**;** Wu, S. J.; Li, Z. Q. Arnold, F. H. Biocatalytic, Enantioenriched Primary Amination of Tertiary C–H Bonds. *Nat. Catalysis.* **2024**, *7, 585.*
14. **Mao, R.**; Arnold, F. H. **Research briefing:** An Engineered Enzyme Enables Stereoconvergent Alkylation of Alkene Mixtures. *Nat. Synth.* **2024**, *3*, 160.
13. **Mao, R.**; Taylor, D. M.; Wackelin, D. J.; Wu, S. J.; Sicinski, K. M.; Arnold, F. H. Biocatalytic, Stereoconvergent Alkylation of (*Z/E*)-Trisubstituted Silyl Enol Ethers. *Nat. Synth.* **2024**, *3*, 256.
    - Highlighted in Synfacts **2024**, *20*, 0191.
12. **†**Wackelin, D. J.; **†Mao, R. (co-first)**; Sicinski, K. M.; Zhao, Y.; Chen, K.; Arnold, F. H. Enzymatic Assembly of Diverse Lactone Structures: An Intramolecular C–H Functionalization Strategy. *J. Am. Chem. Soc.* **2024,** *146*, 1580. **(†Equal contribution)**.
    - Highlighted in Synfacts **2024**, *20*, 0301.
11. **Mao, R.**; Wackelin, D. J.; Jamieson, C. S.; Rogge, T.; Gao, S.; Das, A.; Taylor, D. M.; Houk, K. N.; Arnold, F. H. Enantio- and Diastereoenriched Enzymatic Synthesis of 1,2,3-Polysubstituted Cyclopropanes from (*Z/E*)-Trisubstituted Enol Acetates. *J. Am. Chem. Soc.* **2023,** *145*, 16176.
    - Highlighted in Synfacts **2023**, *19*, 1138.
10. **Mao, R.**; Bera, S.; Turla, A. C.; Hu, X. Copper-Catalyzed Intermolecular Functionalization of Unactivated C(sp^3)–H Bonds and Aliphatic Carboxylic Acids. *J. Am. Chem. Soc.* **2021,** *143*, 14667.
9. †Bera, S.; **†Mao, R. (co-first)**; Hu, X. Enantioselective C(sp^3)–C(sp^3) Cross-Coupling of Non-Activated Alkyl Electrophiles via Nickel Hydride Catalysis. *Nat. Chem.* **2021,** *13*, 270. **(†Equal contribution)**.
    - Highlighted in Synfacts **2021**, *17*, 0402.
8. **Mao, R.**; Bera, S.; Cheseaux, A.; Hu, X. Deoxygenative Trifluoromethylthiolation of Carboxylic Acids. *Chem. Sci.* **2019,** *10*, 9555.
7. **Mao, R.**; Balon, J.; Hu, X. Decarboxylative C(sp^3)–O Cross-Coupling. *Angew. Chem., Int. Ed.* **2018,** *57*, 13624.
6. **Mao, R.**; Balon, J.; Hu, X. Cross-Coupling of Alkyl Redox-Active Esters with Benzophenone Imines: Tandem Photoredox and Copper Catalysis. *Angew. Chem., Int. Ed.* **2018,** *57*, 9501.
5. **Mao, R.**; Frey, A.; Balon, J.; Hu, X. Decarboxylative C(sp^3)–N Cross-Coupling via Synergetic Photoredox and Copper Catalysis. *Nat. Catal.* **2018,** *1*, 120.
4. **Mao, R.**; Sun, L.; Wang, Y.-S.; Zhou, M.-M.; Xiong, D.-C.; Li, Q.; Ye, X.-S. *N*-9 Alkylation of Purines via Light-Promoted and Metal-Free Radical Relay. *Chin. Chem. Lett.* **2018,** *29*, 61.

3. **Mao, R.**; Xiong, D.-C.; Guo, F.; Li, Q.; Duan, J.; Ye, X.-S. Light-Driven Highly Efficient Glycosylation Reactions. *Org. Chem. Front.* **2016,** *3*, 737.
2. **Mao, R.**; Guo, F.; Xiong, D.-C.; Li, Q.; Duan, J.; Ye, X.-S. Photoinduced C–S Bond Cleavage of Thioglycosides and Glycosylation. *Org. Lett.* **2015,** *17*, 5606.
1. Guo, H.-M.*; **Mao, R. (first contributing author)**; Wang, Q.-T.; Niu, H.-Y.; Xie, M.-S.; Qu, G.-R. Pd(II)-Catalyzed One-Pot, Three-Step Route for the Synthesis of Unsymmetrical Acridines. *Org. Lett.* **2013,** *15*, 5460.

OTHER PUBLICATIONS

7. Zhang, J.; Maggiolo, A. O.; Alfonzo, E.; **Mao, R.**; Porter, N. J.; Abney, N. M.; Arnold, F. H. Chemodivergent C(sp^3)–H and C(sp^2)–H Cyanomethylation Using Engineered Carbene Transferases. *Nat. Catal.* **2023**, *6*, 152.
6. Yi, X.; **Mao, R.**; Lavrencic, L.; Hu, X. Photocatalytic Decarboxylative Coupling of Aliphatic *N*-Hydroxyphthalimide Esters with Polyfluoroaryl Nucleophiles. *Angew. Chem., Int. Ed.* **2021,** *60*, 23557.
5. Cao, Y.; Zhou, M.; **Mao, R.**; Zou, Y.; Xia, F.; Liu, D. K.; Liu, J.; Li, Q.; Xiong, D. C.; Ye, X. S. Visible-Light-Promoted 3,5-Dimethoxyphenyl Glycoside Activation and Glycosylation. *Chem. Commun.* **2021,** *57*, 10899.
4. Barzano, G.; **Mao, R.**; Garreau, M.; Waser, J.; Hu, X. Tandem Photoredox and Copper-Catalyzed Decarboxylative C(sp^3)–N Coupling of Anilines and Imines Using an Organic Photocatalyst. *Org. Lett.* **2020,** *22*, 5412.
3. Yu, Y.; Xiong, D.-C.; **Mao, R.**; Ye, X.-S. Visible Light Photoredox-Catalyzed *O*-Sialylation Using Thiosialoside Donors. *J. Org. Chem.* **2016,** *81*, 7134.
2. Guo, H.-M.*; Jiang, L.-L.; Niu, H.-Y.; Rao, W.-H.; Liang, L.; **Mao, R.**; Li, D.-Y.; Qu, G.-R. Pd(II)-Catalyzed *Ortho*-Arylation of 6-Arylpurines with Aryl Iodides via Purine-Directed C–H Activation: A New Strategy for Modification of 6-Arylpurine Derivatives. *Org. Lett.* **2011,** *13*, 2008.
1. Guo, H.-M.*; Yuan, T.-F.; Niu, H.-Y.; Liu, J.-Y.; **Mao, R.**; Li, D.-Y.; Qu, G.-R. Highly Enantioselective Synthesis of Designed Chiral Acyclonucleosides and Acyclonucleotides by Organocatalytic Aza-Michael Addition. *Chem. Eur. J.* **2011,** *17*, 4095.

AWARDS AND ACADEMIC HONORS

- **2020 Chinese Government Award for Outstanding Self-Financed Students Abroad**. 2020
  Selected as one of the 500 awardees from all Chinese graduate students overseas.
- **2020 Laureate for Doctoral Program Thesis Distinction**, EPFL. 2020
  Recognized as the best 8% doctoral thesis.
- **2019 Reaxys Ph.D. Prize**, Finalist, Elsevier. 2019
  Selected as one of the 45 finalists from almost 4,000 submissions from over 50 countries.
- **Chemistry Travel Award**, Swiss Academy of Sciences (SCNAT). 2018
  Selected as one of the Ph.D. students to attend international conferences.
- **Marie Sklodowska-Curie Ph.D. fellowship** 2016
  Scholarship to fully fund outstanding doctoral candidates.
- **Clarendon scholarship**, Oxford University (declined). 2016
  Scholarship to fully fund outstanding doctoral candidates.
- **Excellence Graduate Award**, Peking University, China. 2016
  Awarded to the top graduate students of the graduating class.
- **National Scholarship for Graduate Students**, Peking University, China. 2016
  Awarded to outstanding full-time graduates.
- **National Scholarship for Undergraduate Students**, Henan Normal University, China. 2013
  Awarded to outstanding full-time undergraduates.
- **National Science and Technology competition** (second prize), China 2011
  Science and technology competition for Chinese university students and awards outstanding individuals.
- **Youth Technology Innovation Award**, Henan, China 2011
  Selected as one of the best undergraduate students from Henan province, China.
- **4th Toshiba Cup Contest of Teaching Skills and Innovation** (second place), China 2011
  Ranked 2nd place in the chemistry section.

CONFERENCES

- **Invited lecture** *Engineering Cytochromes P450 to Navigate the New-to-Nature Reaction.* 2023 ACS Fall Meeting (NUS sub-venue). San Francisco, USA. Aug. 2023
- **Poster presentation** *Enantioenriched Primary Amination of Tertiary C–H Bonds.* GRC Natural Products and Bioactive Compounds. Andover, USA. Aug. 2023
- **Poster presentation** *Cross-Coupling via Synergetic Photoredox and Copper Catalysis.* Reaxys Ph.D. Prize Symposium. Amsterdam, Netherlands. Oct. 2019
- **Poster presentation** *Cross-Coupling via Synergetic Photoredox and Copper Catalysis.* XXII International Conference on Organic Synthesis (22-ICOS). Florence, Italy. Sep 2019
- **Poster presentation** *Cross-Coupling via Synergetic Photoredox and Copper Catalysis.* The Swiss Chemical Society Fall Meeting. Bern, Switzerland. Sep. 2017
- **Poster presentation** *Photoinduced C–S Bond Cleavage of Thioglycosides and Glycosylation.* 16th Tetrahedron Symposium Asia Edition. Shanghai, China. Nov. 2015

SECONDMENTS

- **Syngenta AG**, Switzerland | Supervisor: Dr. Chris Scarborough Apr. 2019−Jul. 2019
  Project: Electrochemical Chlorination of C(sp^3)–H Bonds.
- **Universitat de Girona**, Spain | Supervisor: Prof. Miquel Costas Mar. 2019−Apr. 2019
  Project: C(sp^3)–N Cross-Coupling for Strained Rings.
- **Leibniz Institute for Catalysis**, Germany | Supervisor: Dr. Henrik Junge Aug. 2018−Sep. 2019
  Project: Inexpensive Photocatalysts for Decarboxylative Cross Coupling.
- **University of Bern**, Switzerland | Supervisor: Prof. Martin Albrecht Aug. 2017−Sep. 2017
  Project: Mechanistic Study of Decarboxylative C(sp^3)–N Cross Coupling.

MENTORING EXPERIENCE

- **Caltech** | Ms. Sophia J. Wu | Caltech Undergraduate Research Jan. 2021–Jul. 2022
  Project: Biocatalytic, Enantioenriched Primary Amination of Tertiary C–H Bonds.
- **EPFL** | Ms. Aurélya Christelle Turla | Swiss Apprenticeship Program Apr. 2019–Jun. 2020
  Project: Synthesis of N-Fluoro Compounds and Their Applications in C–H activation.
- **EPFL** | Mr. Alexis Cheseaux | Swiss Apprenticeship Program Apr. 2018–Jun. 2019
  Project: Iron-Catalyzed alkyl radical addition.
- **EPFL** | Mr. Jonathan Balon | Swiss Apprenticeship Program Apr. 2017–Jun. 2018
  Project: Applications of Redox-Active Esters in Cross-Coupling Reactions.
- **EPFL** | Mr. Adrian Frey | Master Project | EPFL, Switzerland Feb. 2017–Jun. 2017
  Project: Synthesis of Redox-Active Esters.

TEACHING ACTIVITIES — academic year

- **Advanced General Chemistry** (I) | EPFL, Switzerland 2019–2020
- **Structural Analysis** | EPFL, Switzerland 2018–2019
- **General and Analytical Chemistry** (II) | EPFL, Switzerland 2018–2019
- **Organic Chemistry** | EPFL, Switzerland 2018–2019
- **Biooriented Chemistry** | EPFL, Switzerland 2017–2018
- **Organic Chemistry** (I) | EPFL, Switzerland 2017–2018
- **Project in Molecular Sciences** | EPFL, Switzerland 2016–2017