



## Profile

Dr. Yunpeng Bai is a tenured associate professor at East China University of Science and Technology and a Core-PI at the State Key Laboratory of Bioreaction Engineering, Shanghai, China. He obtained BEng and MPhil degrees from Tsinghua University (China) in 2004 and 2007, and PhD degree from University of Cambridge (UK) in 2011, under the supervision of Prof. Wilhelm T. S. Huck. After that, he was a postdoctoral research associate at the Royal Institute of Technology (KTH), Stockholm, Sweden with Prof. Helene Andersson-Svahn from 2012 to 2014. Bai works on biocatalysis, microfluidics and synthetic biology towards translational developments in industrial bioengineering and biotechnology. He has published more than 30 peer-reviewed papers in SCI-indexed journals such as PNAS, Lab Chip, J. Agric. Food Chem., Sensor Actuat B-Chem etc, 1 book, and filed 5 patents. His research has been sponsored by NSFC, MOE and MOT, and he was elected in “Shanghai Pujiang Program”.

## Research Field

Despite the rapid evolution of synthetic chemistry, the importance of selectivity - the ability to precisely synthesize molecules in a controlled fashion - has not diminished. Our group is interested in the development of new biocatalytic strategies for chemical synthesis that engage novel biocatalysts to enable the rapid generation of architecturally defined molecules. High-throughput technologies are extensively used for discovering and engineering novel enzymes for asymmetric synthesis of chiral molecules, controlled biodegradation of environmentally harmful compounds, and supramolecular protein assembly. Main research topics include:

- 1) Biocatalytic asymmetric synthesis of chiral molecules
- 2) Biodegradation of harmful compounds for environmental remediation
- 3) Biosensors for high-throughput biotechnologies
- 4) Synthetic biology for supramolecular biocatalysis

## Research results and selected published papers

19. Huang, H.; Zhang, X.Y.; Zhao, Y.L.; Xu, D.S.; Bai, Y.P.\* Biodegradation of Structurally Diverse Phthalate Esters by a Newly Identified Esterase with Catalytic Activity toward Di(2-ethylhexyl) Phthalate. *Journal of Agriculture and Food Chemistry*, 2019, 67 (31): 8548-8558.
18. Chen, M.; Zhang, X.Y.; Zhang, C.; Zheng, Y.C.; Pan, J.; Xu, J.H.\*; Bai, Y.P.\* Efficient Stereoselective Synthesis of Structurally Diverse  $\gamma$ - $\delta$ -Lactones Using an Engineered Carbonyl Reductase. *ChemCatChem*, 2019, 11, 2600-2606.
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16. Zhang, X.Y.; Ye, R.F.; Hu, F.X.; Zheng, Y.T.; Gao, S.H.; Zhuang, Y.P.; Wang, Q.Y.\*; Bai, Y.P.\* Learning from competitions: an outcome-based introductory activity for first-year biotechnology undergraduates. *American Biology Teacher*, 2019, 81(7), 467-473.
15. Cheng, H.; Zhao, Y.L.; Luo, X.J.; Xu, D.S.; Cao, X.; Dai, Q.; Xu, J.H.; Zhang, X.Y.\*; Ge, J.\*; Bai, Y.P.\* Cross-linked enzyme-polymer conjugates with excellent stability and detergent-enhanced activity for efficient organophosphate degradation. *Bioresources & Bioprocessing*, 2018, 5, 49.
14. Zheng, L.H.; Zhang, X.Y.; Bai, Y.P.\*; Fan, J.H\*. Using algal cells to drive cofactor regeneration and asymmetric reduction for the synthesis of chiral chemicals. *Algal Research*, 2018, 35, 432-438.
13. Yu, J.M.; Liu, Y.Y.; Zheng, Y.C.; Li, H.; Zhang, X.Y.; Zheng, G.W.; Li, C.X.; Bai, Y.P.\*; Xu, J.H.\* Direct access to medium-chain  $\alpha,\omega$ -dicarboxylic acids using a Baeyer-Villiger monooxygenase of abnormal regioselectivity. *ChemBioChem*, 2018, 19, 2049-2054. (VIP paper, Cover Feature, Highlighted in ChemistryViews).
12. Xu, Z.H.; Cheng, A.D.; Xing, X.P.; Zong, M.H.; Bai, Y.P.; Li, N.\* Improved synthesis of 2,5-bis(hydroxymethyl)furan from 5-hydroxymethylfurfural using acclimatized whole cells entrapped in calcium alginate. *Bioresource Technology*, 2018, 262: 177-183.
11. Bai, Y.P.\*; Luo, X.J.; Zhao, Y.L.; Li, C.X.; Xu, D.S.; Xu, J.H.\* Efficient degradation of malathion in the presence of detergents using an engineered organophosphorus hydrolase highly expressed by *Pichia pastoris* without methanol induction. *Journal of Agriculture and Food Chemistry*, 2017, 65 (41): 9094-9100.
10. Zheng, G.W.\*; Liu, Y.Y.; Chen, Q.; Huang, L.; Yu, H.L.; Lou, W.Y.; Li, C.X.; Bai, Y.P.; Li, A.T.; Xu, J.H.\* Preparation of structurally diverse chiral alcohols by engineering ketoreductase CgKR1 based on molecular dynamics simulations. *ACS Catalysis*, 2017, 7 (10): 7174-7181.
9. Zhang, C.; Pan, J.; Li, C.X.; Bai, Y.P.\*; Xu, J.H.\* Asymmetric bioreduction of keto groups of 4- and 5- Oxodecanoic acids/esters with a new carbonyl reductase. *Catalysis Communications*, 2017, 102: 35-39.
8. Bai, Y.P.; Cheng, H.; Xu, J.H.\* Recent advances in discovery, engineering and applications of organophosphorus hydrolases. *Acta microbiology Sinica*, 2017, 57(8):1168-1179.
7. Luo, X.J.; Zhao, J.; Li, C.X.; Bai, Y.P.; Reetz, M.T.; Yu, H.L.; Xu, J.H. Combinatorial evolution of phosphotriesterase toward a robust malathion degrader by hierarchical iteration mutagenesis. *Biotechnology Bioengineering*, 2016, 113(11): 2350-2357.
6. Huang, M.T.; Bai, Y.P.(co-author); Sjöström, S.L.; Hallström, B.M.; Liu, Z.H.; Petranovic, D.; Uhlén, M.; Joensson, H.N.; Andersson-Svahn, H.; Nielsen, J.\* Microfluidic screening and whole-genome sequencing identifies mutations associated with improved protein secretion by yeast. *Proceedings of the National Academy of Sciences of the United States of America*, 2015, 112(34): 4689-4696.
5. Sjöström, S. L.; Bai, Y. P.; Huang, M. T.; Liu, Z. H.; Nielsen, J.; Joensson, H. N.; Andersson-Svahn, H.\* High-throughput screening for industrial enzyme production hosts by droplet microfluidics. *Lab on a Chip*, 2014, 14, 806-813.
4. Bai, Y. P.; Weibull, E.; Joensson, H. N.; Andersson-Svahn, H.\* Interfacing picoliter droplet microfluidics with addressable microliter compartments using fluorescence activated cell sorting. *Sensors and Actuators B-Chemical*, 2014, 194, 249-254.
3. Bai, Y. P.; Patil, S. N.; Bowden, S. D.; Poulter, S.; Pan, J.; Salmond, G. P. C.; Welch, M.; Huck, W. T. S.; Abell, C.\* Intra-Species Bacterial Quorum Sensing Studied at Single Cell Level in a Double Droplet Trapping System. *International Journal of Molecular Sciences*, 2013, 14, (5), 10570-10581.
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