

Queen's Chemistry Seminar Series

Thursday, November 10th, 9:30 am, Rm 117, Chernoff Hall

Enzyme Discovery and Engineering to Create Biocatalysts Suitable for Applications

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This lecture will cover recent achievements in the discovery, protein engineering and application of enzymes as well as some recent trends in biocatalysis [1].

For the asymmetric synthesis of chiral amines, we created (S)-selective amine transaminases for the acceptance of bulky ketones using rational design, but also high-throughput screening methods [2]. For the regioselective methylation/alkylation, we have explored SAM-dependent O-methyltransferases to make flavonoids and related compounds [3] and developed engineered halide methyltransferases to transfer alkyl residues such as ethyl-, propyl- or allyl-, substantially expanding the repertoire of target compounds [4]. In addition, we have engineered a P450 enzyme for the highly selective formation of ursodeoxycholic acid (UDCA) from lithocholic acid [5]. For the degradation of complex algal polysaccharides, we have discovered unique P450-monooxygenases, which catalyze the demethylation of 6-O-methyl-D-galactose [6] present in agar/porphyran and elucidated a multi-enzyme degradation pathway for ulvan [7].

- [1] Yi, D. et al., *Chem. Soc. Rev.*, **50**, 8003-8049 (2021); Wu, S. et al. *Angew. Chem. Int. Ed.*, **60**, 88-119 (2021); Rudroff, F. et al., *Nat. Catal.* **1**, 12-22 (2018); Badenhorst C.P.S., Bornscheuer, U.T., *Trends Biochem. Sci.*, (2018), **43**, 180-198; Bornscheuer, U.T. et al., *Nature*, **485**, 185-194 (2012)
- [2] Pavlidis, I. et al., *Nature Chem.*, **8**, 1076-1082 (2016); Weiß, M.S. et al., *Org. Biol. Chem.*, **14**, 10249-10254 (2016); Weiß, M.S. et al., *ChemBioChem*, **18**, 1022-1026 (2017)
- [3] Tang, Q. et al., *ChemBioChem*, **22**, 2584-2590 (2021); Tang, Q. et al., *ChemCatChem*, **12**, 3721-3727 (2020); Tang, Q. et al., *ChemCatChem*, **11**, 3227-3233 (2019)
- [4] Tang, Q. et al., *Angew. Chem. Int. Ed.*, **60**, 1524-1527 (2021)
- [5] Grobe, S. et al., *Angew. Chem. Int. Ed.*, **60**, 753-757 (2021)
- [6] Reisky, L. et al., *Nature Chem. Biol.*, **14**, 342-344 (2018)
- [7] Reisky, L. et al., *Nature Chem. Biol.*, **15**, 803-812 (2019)