

## Guiding catalyst selectivity using biological architecture

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Artificial metalloenzymes aim to combine the benefits of natural enzymes (selectivity, rate enhancement) with the scope of reactions provided by traditional transition metal chemistry (both reactions inspired by nature e.g. oxidations and reactions never seen in nature i.e. Pd cross-coupling reactions).<sup>1</sup> Proteins containing apolar cavities and tunnels have been utilised as scaffolds in which transition metal complexes can be introduced to build up catalysts that provide linear selectivities and improve substrate turnover through enhancing substrate binding.<sup>2</sup> A number of different methods can be utilised to introduce the metal complex into the protein scaffold, including either introducing reactive amino acids (e.g. cysteine's) which can subsequently be modified with a metal binding ligand, or directly introducing metal binding unnatural amino acids such as bipyridylalanine using amber stop codon suppression methodology.<sup>3</sup> In this talk, I will cover the work I have conducted towards developing artificial metalloenzymes using these methods for a range of synthetic challenges from reactions in water to C-H functionalisation.

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<sup>1</sup> Schwizer, F.; Okamoto, Y.; Heinisch, T.; Gu, Y.; Pellizzoni, M. M.; Lebrun, V.; Reuter, R.; Köhler, V.; Lewis, J. C.; Ward, T. R. *Chem. Rev.* **2018**, *118*, 142.

<sup>2</sup> Jarvis, A. G.; Obrecht, L.; Deuss, P. J.; Laan, W.; Gibson, E. K.; Wells, P. P.; Kamer, P. C. J. *Angew. Chem., Int. Ed.* **2017**, *56*, 13596.

<sup>3</sup> Xie, J.; Liu, W.; Schultz, P. *Angew. Chem., Int. Ed.* **2007**, *46*, 9239.