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Biocatalysts for New-to-Nature Reactions: Engineered Metalloenzymes for Asymmetric C-C and C–N Bond Formation via Carbene Transfer

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PURPOSE OF THE ABSTRACT
Expanding the reaction scope of biological catalysts beyond the realm of enzymatic transformations occurring in nature can offer new opportunities for the exploitation of biocatalysis for organic chemistry and asymmetric synthesis. Our group has been engaged in the design, investigation, and application of engineered hemoproteins for enabling the construction of new carbon-carbon and carbon-nitrogen bonds via ‘abiological' enzyme-catalyzed carbene and nitrene transfer reactions. These efforts have led to the development of efficient and highly stereoselective biocatalysts for the synthesis of optically active cyclopropanes and amines as well as the asymmetric C(sp3)–H functionalization of heterocycles and other valuable scaffolds for medicinal chemistry. As illustrated by representative examples discussed during this talk, these biocatalytic strategies are amenable to gram-scale synthesis and can be applied to enable the chemoenzymatic synthesis and late-stage C–H functionalization of pharmaceuticals and other bioactive molecules.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

BIBLIOGRAPHY