

## **The Role of Structure, Energy Landscape, Dynamics, and Allostery in the Enzymatic Function of Myoglobin**

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In myoglobin, we are close to understanding the connection between structure and function. We present a model which relates structure, dynamics, energy landscape, and function. These studies suggest that myoglobin functions as a miniature chemical reactor, concentrating and orienting diatomic molecules in highly conserved internal cavities. Furthermore, they predict that myoglobin, usually described as a passive dioxygen storage protein, is actually an allosteric enzyme which may control NO, CO, O<sub>2</sub>, and H<sub>2</sub>O<sub>2</sub> in cardiac and skeletal muscle. Our model is supported by an ab initio QM model of CO binding to myoglobin below 160 K together with a structurally grounded fit to the CO rebinding kinetics from 80 to 320 K, in the folded as well as a partially unfolded state. The allostery is implied by the behavior of the taxonomic substates under changes in the protein environment.