Unraveling the mechanism of multicopper oxidases : from ensemble to single molecule

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Ankur Gupta

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Preface

Natural processes rely heavily on proper functioning of nature's tiny machineries called proteins and enzymes. They are not only supposed to perform their tasks in isolation but also in collaboration with all other colleagues in a synergistic manner. Any imbalance imposes severe penalties not only to the immediate surroundings but often to the organism as a whole. It turns on feedback mechanisms calling for an emergency. Maybe we don't realize it but it is this synergy and functioning of these tiny machineries that keeps us alive and allows us to enjoy the beauty that nature has to offer us. While it is always fascinating to explore nature with our eyes and other senses, some of us derive great pleasure in "getting a feeling" about how does it all work at the molecular level. It is beyond the scope of this thesis to understand the "synergy" in multicomponent systems but an effort has been made to understand the functioning of a protein in isolation.

The protein studied is derived from *Streptomyces coelicolor*, called small laccase (SLAC). It utilizes four copper ions to catalyze the oxidation of substrate molecules concomitant with the reduction of oxygen to water. The catalytic cycle of this enzyme is studied using a variety of spectroscopic and kinetic methods in an attempt to improve our understanding of the internal operations which are critical to its functioning. The new results obtained are presented in this thesis.

Ankur Gupta

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