

PREFACE

The genesis of ideas for these two volumes of *Methods in Enzymology* appears to be a talk (subtitled *Bloody Bacteria*) that I presented at the Agouron Institute meeting in Santa Fe, New Mexico, in April of 2006. The topic of the meeting was *Oxygen*, but my message was not how microbial hemoglobins manage oxygen but rather how the primary function of many such hemoglobins is nitric oxide detoxification. Despite my straying from my brief, John Abelson and Mel Simon generously invited me to consider editing a volume of *Methods in Enzymology* to cover these emerging aspects of such a well-studied protein family. Further discussion of the proposal at the XIVth International Conference on Dioxygen Binding and Sensing Proteins at Stazione Zoologica Anton Dohrn in beautiful Napoli later that year—warmly hosted by Cinzia Verde and Guido di Prisco—generated much interest and support. The result was a two-volume heterodimer: I hope cooperativity can be found in Volumes 436 and 437.

Just as the organizers of the Agouron Institute conference interpreted *Oxygen* with commendable flexibility, *Methods in Enzymology* has allowed some freedom in the definition of an enzyme. In 1994, when the topic *Hemoglobins (Part C)* was last covered explicitly in this series (Volume 232), some justification for labeling a hemoglobin as an enzyme might have been warranted. But as Maurizio Brunori pointed out in 1999 (*Trends in Biochemical Sciences*, 24, 158–161), the promotion of hemoglobin to the status of “honorary enzyme” had been conferred decades earlier by Monod, Wyman, and Changeux. In 2007, the idea that certain hemoglobins, even those not displaying allosteric heme–heme interactions, have enzymatic functions is well established; the most obvious examples being those hemoglobins that transform substrates into products, such as nitric oxide into nitrate.

Other topics covered in these volumes are not new to the *Methods in Enzymology* series either. The most recent coverage of overtly related topics was *Nitric Oxide (Part E)* in Volume 396 (2005) and *Oxygen Sensing* in Volume 381 (2004). I hope, however, that the particular juxtaposition of topics in these two volumes will draw attention to the intimate links between globins, their gaseous ligands (nitric oxide, oxygen, and carbon monoxide), and the sensing and detoxification of these biologically critical small molecules. There is a strong microbial flavor in these volumes,

reflecting some of the most exciting developments in recent years. Volume 436 deals with some chemical and analytical aspects of nitric oxide and methods for bacterial and archaeal hemoglobins, as well as diverse (especially "newer") hemoglobins in plants and animals. Volume 437 covers various non-hemoglobin nitric oxide-detoxifying proteins, sensors for gaseous ligands, advanced spectroscopic tools, and aspects of the functions of these proteins in microbial and plant physiology. In each volume, some chapters serve not as methodological recipes but short reviews to place the methods in a proper framework.

These volumes would not have been possible without the tremendous enthusiasm of so many colleagues, contributors, and friends around the world. I thank them all, and also Tari Broderick and Cindy Minor (Elsevier, San Diego, California), for their help and encouragement in leading these volumes to a successful and timely outcome.

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