Preface

This is not a book about NO, or about hemoglobin, or indeed about heme-based sensors *per se*. Of course, it covers all of these subjects and more, but above all, the book's raison d'être is to present a multifaceted overview of the interaction of diatomic ligands with heme proteins. An overarching goal is to build bridges among disciplines, to bring about a meeting of minds.

The contributors to this book hail from diverse university departments and disciplines – chemistry, biochemistry, molecular biology, microbiology, zoology, physics, medicine and surgery, bringing with them diverse viewpoints on heme–diatomic interactions. My hope is that the juxtaposition of this diversity will lead to increased exchanges of ideas, approaches, and techniques across traditional disciplinary boundaries. In other words, the goal is to inspire bioinorganic chemists to think about physiological problems and biomedical researchers to think along bioinorganic lines and so on.

The book starts with two introductory overviews. The first, by Olson and Ghosh, recounts the upheaval in recent years of our conception of how heme proteins discriminate among the three very similar-sized diatomics CO, NO, and O_2. The old picture that an oxygen-carrier such as myoglobin discriminates against CO by forcing the bound ligand into a high-energy bent conformation has given way to a view where protein electrostatics (especially hydrogen-bonding interactions) is the key agent of discrimination. The second chapter, by Gilles-Gonzalez provides an overview of the rapidly burgeoning field of heme-based sensors, a major theme of the book.

The next set of chapters on electronic structure and spectroscopy focus on well-established techniques – resonance Raman (Spiro and coworkers) and EPR (Lehnert) as well as on a new spectroscopy, nuclear resonance vibrational spectroscopy (Scheidt and Sage), that promises to become a part of the bioinorganic chemist's toolbox.

Chapters 6–10 focus on a variety of somewhat specialized aspects of globins, including protoglobins and globin-coupled sensors (Alam), neuroglobin and cytoglobin (Burmester and Hankeln), root effect hemoglobins (Brittain), and hemoglobins from unicellular organisms (Yeh).

The next six chapters (nos. 11–16) provide a fairly comprehensive overview of heme–NOx interactions. Chapter 11 (Kim-Shapiro *et al.*) focuses on a major biomedical story that is currently unfolding, namely the role of nitrite in hemoglobin-mediated hypoxic vasodilation. Similarly, Chapter 12 addresses another recent development, the role of hemoglobin as a nitric oxide dioxygenase. The next few chapters cover other important topics: respiratory nitric oxide reductases (Zumft), P450nor (Daiber, Shoun, Ullrich), insect nitrophorins (Walker), and the bioinorganic chemistry of the HNO ligand (Sulc and Farmer).

The book concludes with a set of chapters (nos. 17–21) on specific enzymes and sensors: nitric oxide synthase (Rousseau et al.), CooA (Roberts et al.), soluble guanylate cyclase (Sousa et al. and Pal and Kitagawa), and FixL (Rodgers and Lukat-Rodgers).

Early versions of several of the chapters appeared as review articles in the *Journal of Inorganic Biochemistry* (JIB), where many of them quickly ranked among the most downloaded JIB articles. Indeed, this success, along with the considerations outlined above, ultimately led me to put together this volume.

My sincerest thanks go to all authors for taking time out of their busy schedules to contribute to this unique collaborative project. In addition, I am most grateful to Prof. John Dawson of the University of South Carolina for much helpful advice.

In conclusion, to the broader heme community, I would say: I hope you find this book useful and enjoyable; should any comments or criticisms occur to you, please do not hesitate to contact me.

Abhik Ghosh
Tromsø, June 2007