
Preface

The advent of near-infrared spectroscopy (NIRS) presents a unique tool for understanding the regulation of oxidative metabolism during the transition from rest to an active state. Many laboratories have started to apply NIRS to interrogate both cerebral and muscle metabolism and have garnered insights to discriminate the bioenergetics and hemodynamics of healthy and diseased tissue. Yet using NIRS technology and methodology appropriately requires a solid understanding of the principles of physics, biochemistry, and physiology. Indeed, introducing a complex biophysics topic in an academically rigorous but interesting way often poses a challenge.

In keeping with the style of the *Handbook of Modern Biophysics*, the current volume balances the need for physical science/mathematics formalism with a demand for biomedical perspectives. Each chapter divides the presentation into two major parts: the first establishes the conceptual framework and describes the instrumentation or technique, while the second illustrates current applications in addressing complex biology questions. With the additional sections on further reading, problems, and references, the interested reader can explore some chapter ideas more widely.

In the fourth volume in this series, *Application of Near-Infrared Spectroscopy in Biomedicine*, the authors have laid down a solid biophysical foundation. Masatsugu Niwayama and Yutaka Yamashita open by delineating the different types of NIRS methods, describing different instrumentations, and explaining the underlying idea about photon migration. Eiji Okada expands on the key concept of photon migration, especially as it applies to brain imaging. Hajime Miura surveys the application of NIRS in the clinic, while Takafumi Hamaoka describes the use of NIRS in studying human locomotion. Kazumi Masuda explores the use of NIRS to understand regulation of intracellular and vascular oxygen from the start of muscle contraction. Williams and Ponganis show the unique application of NIRS to investigate oxygen regulation in marine mammals during a breathhold or a dive. Finally, Chung and Jue compare the use of NIRS and NMR in determining the role of intracellular oxygen during muscle contraction.

This volume continues the philosophy behind the *Handbook of Modern Biophysics* in providing the reader with a fundamental grasp of concepts and applications on current biophysics topics.

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