Preface

This book covers some of the most recent advances in the fields of Bioenergetics and Photosynthesis presented at an international workshop held in the Institute of Advanced Studies (IAS), Nanyang Technological University (NTU), Singapore, from 21st to 23rd March, 2016. The meeting was held as a tribute to Jan Anderson FRS who passed away in August 2015 and to celebrate the 75th birthdays of Leslie Dutton *FRS* and John Walker *FRS*, Nobel Laureate. Contributions to the workshop and to this book, are from outstanding scientists which includes the Nobel Laureate Rudolph Marcus (Chapter 2 by Marcus and Volkán-Kacsó) who created a theory of electron transport reactions. Marcus first provided the kinetic and thermodynamic description of the movement of electrons between molecules — a chemical processes at the very heart of the biological electron transfer in the major classes of bioenergetic systems such as bacterial cells, mitochondria and chloroplasts. Not surprisingly, the theme of electron transport reactions in the key redox enzymatic complexes of mitochondria and chloroplasts is covered in the majority of chapters of this book. Indeed, Chapters 3 (Wikström) and 4 (Rich) are dedicated to cytochrome *c* oxidase — a complex that terminates the respiratory electron transport chain producing water as a by-product. The most recent advances in studies of cytochrome *c* oxidase, photosystem II (PSII), that splits water and produces oxygen, are thoroughly reviewed in Chapters 5 (Kaucikas *et al.*) and 6 (Barber). The recent structural advances in understanding photosystem I that functions in series with PSII, are covered in Chapter 7 (Nelson). In modern times the science of bioenergetics attained an extraordinary progress with development and applications of state-of-the-art techniques, such as femtosecond crystallography (Chapter 5, Kaucikas *et al.*); single molecule microscopy and spectroscopy,

(Chapter 2, Marcus and Volkán-Kacsó); combination of electron and confocal fluorescence microscopy (Chapter 9, Ruban; Chapter 10, Koochak *et al.*). A significant pool of chapters is dedicated to the regulatory processes that take place in the photosynthetic electron transport chain owing to the dynamic nature of the photosynthetic membrane organisation reviewed in Chapter 10 by Koochak *et al.* These mechanisms include regulation of the photosynthetic light harvesting (Chapter 9, Ruban), cyclic electron transport (Chapter 12, Kou *et al.*; Chapter 13, Hanke and Schreibe and Chapter 14, Larkum *et al.*) and the whole oxygenic electron transport chain (Chapter 11, Järvi *et al.*). Chapter 8 by Shivhare and Mueler-Cajar, summarises the recent progress in understanding the protein *rubisco activase* that regulates the most abundant enzyme, Rubisco (ribulose-1,5-bisphosphatecarboxylase/oxygenase) in the biosphere and is responsible for carbon fixation. And finally, the ideas and the most recent developments in the field of applications of the knowledge of Bioenergetics and Photosynthesis are discussed in Chapter 1 (Ennist *et al.*) and Chapter 6 (Barber).

We recommend this book to specialists in Bioenergetics and Photosynthesis, researchers and postgraduate students who are working and studying various aspects of respiratory and photosynthetic electron transport chains as well as dynamic regulation of the light harvesting and electron transport events in oxygenic photosynthesis.

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