# Preface

The physical world involves both nonliving and living systems. Biology deals with living things. Various branches in physics with associated physical laws and principles evolved historically to deal with properties of matter in different dimensions. Quantum mechanics principles are applied to explain physical phenomena in low dimensions. About a century ago, the idea of understanding biology's most important concept, namely 'life', with the help of quantum principles, got initiated. Quantum mechanics of biological systems (QMBS) is a growing field of biology in which quantum mechanics principles are utilised to elucidate key biological processes. Biophysics has historically been using classical physics principles until the end of the last century, when quantum physics started creating a few breakthrough discoveries in biology. In biomedical research, quantum physics is recently penetrating fast and attempting to take a big stake in the discoveries. We have experienced considerable progress in quantum physics explorations and have acquired an enormous amount of quantum information in various biological areas of applications such as ion channel functioning, microtubule excitations, the molecular mechanism of photosynthesis, bird navigation, the molecular basis of the sense of smell-olfaction, gene mutations, brain dynamics, electron tunnelling in biochemical enzymatic structures, biomolecular surface energy states, and above all understanding the origin of life. Quantum mechanics methods have made huge breakthroughs in addressing the molecular basis of diseases and also in drug discovery, where methods such as quantum mechanics/molecular mechanics provide precise evaluations of ligand-protein interaction energies. QMBS is now considered a core field in the biomedical area. This field not only reveals underlying mechanisms active in molecular biology but also helps us translate the information to applied medical research, aiming at the discovery of means to deal with the molecular-level origins of various pathologies. Quantum mechanical understanding of genetic correlation and evolution will also be discussed in this book.

We invited renowned scientists from around the globe who have been currently active in quantum biology. They contributed 10 chapters to this book, which will enrich readership with a modern understanding of various key processes and phenomena in biology using quantum mechanics laws. This book will also create a background for revealing ground-breaking ideas and developing future research projects. It will be especially useful as a textbook for undergraduate and graduate students in biophysics, chemistry, biomedical sciences and engineering, and many related subjects.

**Mohammad Ashrafuzzaman**
**Edmonton (Canada) and Riyadh (Saudi Arabia)**

**Jack A. Tuszynski**
**Edmonton (Canada) and Turin (Italy)**

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