Foreword

I am honored, to be invited, to write the foreword for the book "Interdisciplinary Research of Magnetic Fields and Life Sciences". The two authors of this book are outstanding young scientists I am familiar with, who have accomplished a lot in their fields. Dr. Xin Zhang has been studying the effects of magnetic field on cells and organisms, while Dr. Junfeng Wang has been using NMR to investigate the structure and function of proteins. This book is valuable because it brings together the works of young scientists currently engaged in related research in the mainland of China.

Magnetic field is a ubiquitous physical field. Humans have long been aware that certain birds can use the Earth's magnetic field to navigate. Indeed, such phenomenon inspired people to explore the biological effects of magnetic field and the underlying mechanism.

The Earth's magnetic field or geomagnetic field is a relatively weak static magnetic field. In the laboratories, people can generate static magnetic field as strong as one million times higher than the geomagnetic field. In addition, pulsed magnetic fields can be generated twice as higher as the highest static magnetic field. At the other extreme, the magnetic field in the outer space is usually very weak, which is estimated at less than thousandth of the Earth's magnetic field but can be simulated in the laboratories. As a result, the man-made ultra-high or ultra-weak magnetic fields provide excellent experimental conditions for material sciences and life sciences.

Since the beginning of the 1990s, magnetic resonance imaging (MRI) has been widely introduced as a stand-alone diagnostic technique in hospitals. As the image quality of MRI is positively correlated with the strength of the magnetic field, MRI instrument equipped with ever stronger magnet has been built, from 1.5 to 3 Tesla and higher. FDA (Food and Drug Administration) of the United States has approved the clinical use high up to 7 Tesla MRI. However, pursuing for higher magnetic field strength never topped. For example, MRI with 9.4 Tesla has recently been employed for pre-clinical research. It seems that the competition of high magnetic field human

MRI will be fierce. Thus, there is an urgent need to understand the safety limit of the maximum magnetic field strength on human health.

In comparison to the research in condensed matter physics or material science, life science research using magnetic field is at its infancy. At the same time, I believe that the life science research in magnetic fields should afford many opportunities and challenges. As such, I hope that the publication of this book will attract more young scientists to be engaged into this interdisciplinary field, which motivates me for this foreword.

Chaohui Ye
Wuhan Institute of Physics and Mathematics
Chinese Academy of Sciences
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