

Preface

This book is intended as a textbook for a radiation physics course in academic medical physics graduate programs as well as a reference book for candidates preparing for certification examinations in medical physics subspecialties. The book may also be of interest to many professionals, not only physicists, who in their daily occupations deal with various aspects of medical physics or radiation physics and have a need or desire to improve their understanding of radiation physics.

Medical physics is a rapidly growing specialty of physics, concerned with the application of physics to medicine, mainly but not exclusively in the application of ionizing radiation to diagnosis and treatment of human disease. In contrast to other physics specialties, such as nuclear physics, condensed matter physics, and high-energy physics, studies of modern medical physics attract a much broader base of professionals, including graduate students in medical physics; medical residents and technology students in radiation oncology and diagnostic imaging; students in biomedical engineering; and students in radiation safety and radiation dosimetry educational programs. These professionals have diverse background knowledge of physics and mathematics, but they all have a common need to improve their knowledge and understanding of the physical concepts that govern the application of ionizing radiation in diagnosis and treatment of disease.

Numerous textbooks that cover the various subspecialties of medical physics are available, but they generally make a transition from the elementary basic physics directly to the intricacies of the given medical physics subspecialty. The intent of this textbook is to provide the missing link between the elementary physics and the physics of the subspecialties of medical physics.

This book deals mainly with theoretical aspects of the discussed subject material, with some examples added for clarification. However, a recently published text book “Compendium to Radiation Physics for Medical Physicists: 300 Problems and Solutions” covers the first 14 of the 17 chapters of this book with 300 solved problems. The reader of this book who would like to reinforce the material of this book through pertinent examples is encouraged to peruse the “Compendium” book in conjunction with this book.

Most of the subjects covered in this textbook can be found discussed in greater detail in many other specialized physics texts, such as nuclear physics, quantum mechanics, and modern physics. However, these texts are aimed at students in a specific physics specialty, giving more in-depth knowledge of the particular specialty but providing no evident link with medical physics and radiation physics. Some of these important specialized texts are listed in the bibliography at the end of this book for the benefit of readers who wish to attain a better insight into subjects discussed in this book. To recognize the importance of relevant history for understanding of modern physics and medical physics, Appendix C provides short biographies on scientists whose work is discussed in this book.

I am indebted to my colleagues in the Medical Physics Department of the McGill University Health Centre for their encouragement, approval, and tolerance of my concentrating on the book during the past several years. I am greatly indebted to my former students and/or colleagues Dr. Geoffrey Dean, Dr. François DeBlois, Dr. Slobodan Dević, Michael D.C. Evans, Marina Olivares, William Parker, Horacio Patrocinio, Dr. Matthew B. Podgorsak, and Dr. Jan P. Seuntjens who helped me with discussions on specific topics as well as with advice on how to present certain ideas to make the text flow better. I also appreciate constructive comments by Prof. José M. Fernandez-Varea from the University of Barcelona and Prof. Pedro Andreo from the University of Stockholm and the Karolinska University Hospital.

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I received my undergraduate physics education at the University of Ljubljana in Slovenia. I would like to thank the many teachers from the University of Ljubljana who introduced me to the beauty of physics and provided me with the knowledge that allowed me to continue my studies in the USA and Canada.

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