

Preface to the Third Edition

Since the preparation of the second edition (1995) of *Atoms, Radiation, and Radiation Protection*, many important developments have taken place that affect the profession of radiological health protection. The International Commission on Radiological Protection (ICRP) has issued new documents in a number of areas that are addressed in this third edition. These include updated and greatly expanded anatomical and physiological data that replace “reference man” and revised models of the human respiratory tract, alimentary tract, and skeleton. At this writing, the Main Commission has just adopted the Recommendations 2007, thus laying the foundation and framework for continuing work from an expanded contemporary agenda into future practice. *Dose constraints*, *dose limits*, and *optimization* are given roles as core concepts. Medical exposures, exclusion levels, and radiation protection of nonhuman species are encompassed. The National Council on Radiation Protection and Measurements (NCRP) in the United States has introduced new limiting criteria and provided extensive data for the design of structural shielding for medical X-ray imaging facilities. *Kerma* replaces the traditional *exposure* as the shielding design parameter. The Council also completed its shielding report for megavoltage X- and gamma-ray radiotherapy installations. In other areas, the National Research Council’s Committee on the Biological Effects of Ionizing Radiation published the BEIR VI and BEIR VII Reports, respectively dealing with indoor radon and with health risks from low levels of radiation. The very successful completion of the DS02 dosimetry system and the continuing Life Span Study of the Japanese atomic-bomb survivors represent additional major accomplishments discussed here.

Rapid advances since the last edition of this text have been made in instrumentation for the detection, monitoring, and measurement of ionizing radiation. These have been driven by improvements in computers, computer interfacing, and, in no small part, by heightened concern for nuclear safeguards and home security. Chapter 10 on Methods of Radiation Detection required extensive revision and the addition of considerable new material.

As in the previous edition, the primary regulatory criteria used here for discussions and working problems follow those given in ICRP Publication 60 with limits on *effective dose* to an individual. These recommendations are the principal ones employed throughout the world today, except in the United States. The ICRP-60

limits for individual effective dose, with which current NCRP recommendations are consistent, are also generally encompassed within the new ICRP Recommendations 2007. The earlier version of the protection system, limiting *effective dose equivalent* to an individual, is generally employed in the U.S. Some discussion and comparison of the two systems, which both adhere to the ALARA principle (“as low as reasonable achievable”), has been added in the present text. As a practical matter, both maintain a comparable degree of protection in operating experience.

It will be some time until the new model revisions and other recent work of the ICRP become fully integrated into unified general protocols for internal dosimetry. While there has been partial updating at this time, much of the formalism of ICRP Publication 30 remains in current use at the operating levels of health physics in many places. After some thought, this formalism continues to be the primary focus in Chapter 16 on Internal Dosimetry and Radiation Protection. To a considerable extent, the newer ICRP Publications follow the established format. They are described here in the text where appropriate, and their relationships to Publication 30 are discussed.

As evident from acknowledgements made throughout the book, I am indebted to many sources for material used in this third edition. I would like to express my gratitude particularly to the following persons for help during its preparation: M. I. Al-Jarallah, James S. Bogard, Rhonda S. Bogard, Wesley E. Bolch, Roger J. Cloutier, Darryl J. Downing, Keith F. Eckerman, Joseph D. Eddlemon, Paul W. Frame, Peter Jacob, Cynthia G. Jones, Herwig G. Paretzke, Charles A. Potter, Robert C. Ricks, Joseph Rotunda, Richard E. Toohey, and Vaclav Vylet. Their interest and contributions are much appreciated. I would also like to thank the staff of John Wiley & Sons, particularly Esther Dörring, Anja Tschörtner, and Dagmar Kleemann, for their patience, understanding, and superb work during the production of this volume.

Oak Ridge, Tennessee
March 21, 2007

James E. Turner