

They Wrote the Book

Cember and Johnson's *Introduction to Health Physics*

Mary Walchuk

If you are reading this newsletter, then you have probably also read Herman Cember's *Introduction to Health Physics*—the classic textbook and reference book in the field. Since its first printing in 1969, this text has been on the bookshelves of teachers, students, health physicists preparing for the CHP exam, and just about anyone involved with the safe use of ionizing and nonionizing radiation. However, because of its usefulness throughout a health physicist's career, *Introduction to Health Physics* does not remain on the shelf for long. The fourth edition of this important book, coauthored by Dr. Cember and Dr. Tom Johnson, was published in August 2008 and updates and expands on the information found in the earlier versions.

"The three impetuses for the new edition are the new lung model, the new ICRP (International Commission on Radiological Protection) standard, and increasing medical applications," Cember said. "The third edition had the old lung model and calculations based on that model. The new lung model is much better and more complex. Also, the new standard from ICRP did away with ALIs (annual limit on intake) and there are different ways of doing the calculations now."

"The biggest source of radiation exposure is in medical applications," Cember added. "We wanted to describe in

some detail the NCRP (National Council on Radiation Protection and Measurements) changes in shielding design for medical applications and these standards that need to be followed. The NCRP reports are relatively user-ferocious and I wanted to translate the NCRP shielding methodology into a more user-friendly format. The book includes a description of how to use NCRP 147, including examples, and has expanded information on the biological basis for radiation dosimetry."

"The fourth edition also has expanded the number of example problems in almost

every chapter (over 175)," Johnson said. "I believe that example problems are the key to learning health physics. Other significant updates include an overview of BEIR VII.

For nonionizing radiation users, ultraviolet light limits and examples are now included. Naturally, the latest laser safety information from Z136.1-2007 and RF information from C95.1-2005 is included, complete with examples."

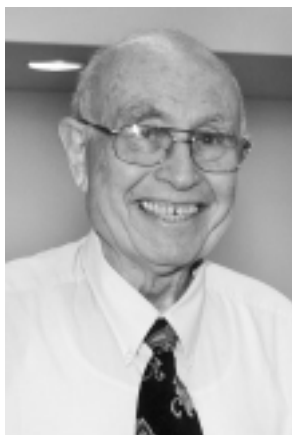
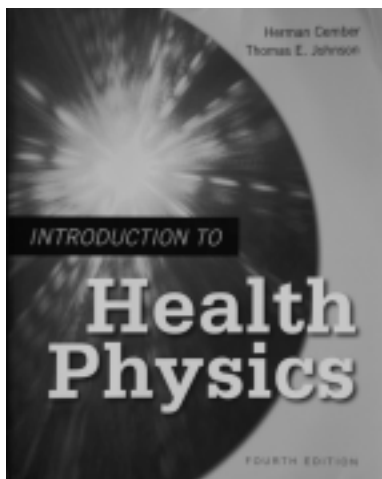
It was mainly because of Johnson's expertise on laser safety information and his work with Cember on *The Health Physics Solution Manual* that he was asked to help with this edition of Cember's book.

"We worked on *The Health Physics Solutions Manual* together after the third edition of *Introduction to Health Physics* came out and this seemed to evolve out

of that," Johnson said. "I started working on major revisions to Chapter 14 almost two years ago. I consider it an honor that Herman asked me to do it. It is really a privilege to work with him. My only regret is that we do not live closer and could not meet face to face regularly. His depth and breadth of experience and knowledge makes every conversation a learning experience that is lively and fun."

"Tom is very heavily into nonionizing radiation and is a member of the ANSI (American National Standards Institute, Inc.) committee for lasers," Cember said. "He was one of my students and then got involved in lasers. He really became a first-class expert in that and in nonionizing radiation generally. He knows it well—he is very much better at it than I am, so I asked him to help write the last chapter. Tom also reread the rest of the text in the book and checked for errors, checked the math, and made good suggestions. I think he did a first-class job with that."

Johnson first got started in health physics after joining the Nuclear Navy and being accepted for Engineering



Herman Cember, Professor Emeritus in the Environmental Health Engineering Department at Northwestern University and Adjunct Professor at Purdue University



Tom Johnson, Assistant Professor in the Department of Environmental and Radiological Health Sciences at Colorado State University

Laboratory Technician school. “I was unaware exactly what this school entailed, but knew it involved chemistry and radiation,” he said. “Only later did I discover that it was basically a health physics technician school. After I completed my tour in the Navy, I went to college and one of my colleagues (during a trip to Chernobyl) recommended that I get an advanced degree from Northwestern University with Dr. Herman Cember. He accepted me into the program and that is what started my health physics career.”

Cember began his health physics career in 1949. He was attending college at night and was a design engineer during the day for a small company. “The machines we made were not selling; in 1949 business was very bad,” he said. “I thought that any day they would lay me off and I had a wife and a child. In June 1949 I took my very last final exam (it was on thermodynamics), and because I finished early and wasn’t expected home yet, I decided to take the opportunity to see the campus. I walked around

the school and when I passed by the physics department I saw signs for National Research Council fellowships in radiation physics.” Cember thought the pay looked good, but had no idea what radiation physics was. “I went to the library and found Roberson’s book, *Introduction to Radiological Physics*,” he said. “It all sounded so exciting. I applied, took an exam, got the fellowship, and went to Oak Ridge, where I was taught about health physics by Dr. Elda Anderson. Once I got into it I really loved it.”

After his fellowship, Cember was hired at Oak Ridge “but Dr. Elda Anderson got me fired before I even started work and got me an interview at the University of Pittsburgh.” Cember explained how the University of Pittsburgh became the first university in the United States to offer a course in health physics that was not sponsored or underwritten by the U.S. government: “Dr. Thomas Parran’s wife had received radiation therapy after a mastectomy—she was overexposed and her left arm was damaged. Dr. Parran felt the doctors didn’t know enough about radiation dosimetry. He thought every doctor should have a course in radiation dosimetry, so he applied to Oak Ridge for someone to teach the

course. He started the health physics program at the University of Pittsburgh Graduate School of Public Health and hired me as the first radiation dosimetry teacher there.” In 1960 Cember moved from the University of Pittsburgh to the Kettering Laboratory at the University of Cincinnati’s College of Medicine and later became a full professor at Northwestern University.

While at Northwestern University, Cember was

contacted by the late Captain Robert Maxwell, who started Pergamon Press and was the first publisher of *Health Physics*. “He got in touch with me before the Las Vegas Health Physics Society meeting and said there was no health physics textbook and that he thought there’d be a good market for one,” Cember said. “He researched health physics teachers and I got the best reviews from former students, so Maxwell proposed I write the textbook. It was published in 1968.”

“My hope is that this newest edition of *Intro-*

duction to Health Physics will bring readers up to date on NCRP methodology and ICRP recommendations,” Cember said. “There is a lot more on the regulatory agencies and new standardization methods and on what the European Union does and agencies other than the NRC do. I hope readers will get a better understanding of the context in which health physicists work—in addition to the technical applications that I mentioned.”

“I hope that readers will find that the clear, concise descriptions, accompanied by example problems, make it easier for them (and others) to understand and apply health physics concepts,” Johnson added. “We are currently working on the second edition of *The Health Physics Solutions Manual*, which will contain detailed descriptions of how to solve each homework problem. This will provide over 380 example problems in addition to the example problems in the text.”

Introduction to Health Physics is dedicated to Cember’s wife Sylvia, Dr. Elda Anderson, and Dr. Thomas Parran. More on the book and ordering information can be found at <http://introductiontohealthphysics.com/>.



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