BOOKS AND PUBLICATIONS

All interested medical physicists are encouraged to have their names added to a list of available reviewers. Please rank your interest among radiation therapy, x-ray imaging, nuclear medicine imaging, ultrasound imaging, MR imaging, radiation injury, radiation protection, and others. Make your interest known to Rodica Alecu, Ph.D., Books Review Editor (rodicaa@aol.com). Include your name and e-mail address in the body of the response.

Book Reviews

Is Radiation as Dangerous as They Say? John R. Cameron. $25.00 (shipping included). A 43-minute educational video available from Medical Physics Publishing, 4513 Vernon Blvd., Madison, WI 53705. Phone: 800-442-5778. Fax: 608-265-2121. (www.medicalphysics.org)

John Cameron, a highly respected nuclear and radiation physicist, is well known for his original and thought provoking presentations of controversial scientific subjects. The topic for this review is his 43-minute video taped lecture to the Medical Effects of Ionizing Radiation course of the Armed Forces Radiation Biology Institute of 9 August 2001. It has a 16-page handout, which includes his recent article on ''Is radiation an essential trace energy?'' in the October 2001 issue of *Physics and Society*. Those who marvel at John's ability to present scientific concepts in a lucid and humorous manner that even a lay person can understand and enjoy, certainly will not be disappointed by this excellent presentation. This lecture is ''vintage'' Cameron, guaranteed to challenge the tenets of even those who may differ with his conclusions.

John's thesis is simple: There is no scientific evidence that low level ionizing radiation in the range of 10 to 200 times the average background dose and dose rates is carcinogenic or in any way harmful. Quite the contrary. There are compelling studies, which indicate that low-level radiation exposure not only reduces the cancer death rate compared to background controls but also reduces the mortality rate in general. In other words, small doses of radiation are good for you and beneficial to mankind. It is as simple as that. He attributes this phenomenon to radiation stimulation of the body's immune system, although he does not attempt to explain the mechanism involved. John cites in some detail four studies, which support his thesis, and proposes a simple, inexpensive double-blind study, which could further resolve the current controversy of whether a little radiation is inherently beneficial. If that should prove to be the case, John suggests additional studies will be needed to determine the optimum radiation doses and dose rate for maximum benefit so that programs to INCREASE the population exposure to optimum levels can be undertaken. Until then, he feels that the evidence already available is strong enough to bring into serious doubt the current ICRP/NCRP philosophies embracing the linear no-threshold (LNT) hypotheses and the ALARA principle. Indeed, John suggests that governmental agencies may very well be wasting billions of taxpayer's dollars in pursuit of ALARA to the detriment of public health. He even speculates, perhaps somewhat tongue-in-cheek, that the time will come (but not in our lifetime!) when we will use our radioactive waste selectively to enhance the population background exposure to optimum levels for maximizing the benefits for public health! Controversial? Yes! Will health physicists lose their jobs? Perhaps. Will the NCRP, ICRP, and governmental radiation protection agencies go out of business? Maybe. Stay tuned.

John points out that the public is badly misinformed about the fictional hazards of low level radiation and he offers practical advice for both patients and medical practitioners on how to equate diagnostic exposures in terms of equivalent background exposure times, thereby circumventing any misconceived notions of radiation risk.

Some viewers may wish that professionals had conducted the video recording, while others may find the low-budget format appealing and consistent with John's frugal nature. In any case, this reviewer immensely enjoyed the presentation and highly recommends it to all medical and health physicists, particularly those who teach the fundamentals of radiation effects and protection.

Reviewed by Robert O. Gorson

Robert O. Gorson is Emeritus Professor of Medical Physics at Thomas Jefferson University.

Monitor Unit Calculations for External Photon and Electron Beams. John P. Gibbons, editor. 152 pp. Advanced Medical Publishing, Inc., Madison, WI 53705. Price: $95.00. ISBN: 1-883526-08-6.

An experienced medical physicist edited this book with contributions from other experienced medical physicists. It provides a wealth of information on the subject of monitor unit calculations for external photon and electron beams. It is a compilation of the Proceedings of a South-East AAPM Chapter Symposium. This book goes into great detail on the various factors that are required for the determination of monitor units for the accurate delivery of the pre-scribed patient dose. I found it to be particularly appropriate because, with the increase of more sophisticated treatment techniques such as the use of asymmetric jaws, multileaf collimators, and dynamic and virtual wedges, the determination of monitor units is more complex. Many medical physicists consider the calculation of monitor units by commercial treatment planning systems to be ''black box,'' that is, difficult to verify. So, methods to independently verify these calculations are very important to medical physicists. Some treatment techniques, such as total skin electron treatment and total body irradiation, are not supported by most commercial treatment planning systems, but are described in this text.

Contributing authors go into great detail in discussing their particular subject areas. Although much of the information presented here can be found in various publications, I found it very useful to have them together in one comprehensive text with all the appropriate references. The authors discuss the various dosimetric quantities required and how to measure them to perform monitor unit calculations for simple unblocked photon fields, to blocked, dynamic wedged asymmetrical fields. It was instructive that they describe how to measure the various dosimetric quantities and their relative importance in the monitor unit calculations. The inclusion of a number of sample calculations using the various factors given in the text was very helpful.

In any work of this type one finds some replication such as the discussion of the Mallinckrodt Institute of Radiology formalism given in Chaps. 4 and 6. Also, some of the figures, particularly Fig. 1 in Chap. 9, I found somewhat confusing; it provided examples for constructing equivalent rectangular fields for irregularly shaped electron fields. I also thought that it would have been useful to include some discussion on the accuracy of some treatment planning systems in determining monitor units. This was mentioned in Chap. 7 for heterogeneity corrections. Finally, with the increasing availability and use of intensity modulated radiation therapy some discussion on the calculation of monitor units for these techniques would have been useful. However, this modality is still relatively new and still emerging, and was probably not a significant issue at the time of the proceedings. Even with these relatively minor reservations, I found the book to be extremely useful for describing the different dosimetric quantities used in calculating monitor units. Therefore, I would recommend it for

the clinical medical physicists who are involved with dosimetry measurements and calculations.

Reviewed by Chester S. Reft

Dr. Reft is an Assistant Professor in the Department of Radiation Oncology at the University of Chicago. His research interests are in the areas of clinical dosimetry including both the measurement and calculation of radiation doses.

Handbook of Medical Imaging. Processing and Analysis. Isaac N. Bankman, editor. Academic, San Diego, 2000. ISBN: 0-12-077790-8. Price: $119.00.

Among other books dealing with the same challenging topic, the *Handbook of Medical Imaging* claims special attention because of its attempt to assemble a ''comprehensive summary of the state-of-the-art in image processing and analysis tools for diagnostic and therapeutic applications of medical imaging.'' As far as I am concerned, as a graduate student in Medical Physics, it really succeeded in providing me an exhaustive picture of the fundamental principles and of the newest achievements and applications of medical imaging techniques as well.

This 901-page handbook brings together a total of 97 contributors. Seventy-four of these ''who's who'' specialists are from North-America, 22 are from 9 different European countries (including Greece, Poland or Belarus), and one is from Australia. The book has six sections, each of them related to one of the six fundamental classes of algorithms in medical imaging: enhancement, segmentation, quantification, registration, visualization, and a section that covers storage, compression, and communication. The text of the book is supported by excellent illustrations and by four consistent separate sheets of color images, diagrams, and maps meant to enhance the visual comprehensibility of certain procedures and techniques.

The first section (four chapters) deals with enhancement algorithms. It presents an array of both basic and revolutionary techniques along with a useful guide of how each method serves a specific need and address a certain range of applications.

The segmentation section (nine chapters) discusses pattern recognition problems. For example, it offers a comprehensive review of the advantages and limitations of deformable models but insightfully surveys other segmentation techniques as well. The last two chapters include a comparison between eight different techniques used in volumetric segmentation, with illustrations on volumetric data of brain, hand, and tooth.

The next two sections, quantification (12 chapters) and registration (15 chapters) share together almost one-third of the book, because of the large spectrum of applications they are related with: the arterial tree morphometry, the biomechanics of the musculoskeletal system, and bone angle quantification are some of them. As breast cancer has the greatest incidence on women, I found Chapter 22 extremely interesting for physicians because it refers to classification of breast lesions from mammograms. The section of registration deals a lot with the problem of distortions and spatial transformations that are subject to linear constraint. By using linear models, medical images actually contain more information than the minimal requirements and this redundancy in information becomes a tool for achieving better accuracy and more diverse approaches for registration. This section offers a chapter about ''Clinical Applications of Image Registration,'' one about ''Registration for Image-Guided Surgery,'' and an exciting one about multidimensional brain atlases.

Of great importance in biomedicine, biology and medicine, where the need to ''see into'' and comprehend living systems becomes vital, the process of visualization is covered in the fifth section (five chapters), from basic principles to practical applications. Of greater interest for medical physicists could be Chapter 42, in which there are presented some 3D visual applications for prostate cancer for radiation treatment planning.

The last section of the book (seven chapters) ''presents the fundamentals and standards that form the basis of medical image archiving and telemedicine systems.'' Chapter 50 provides examples which illustrate quantitative methods for the evaluation of diagnostic accuracy of compressed images.

Finally, Chapter 53 of the book briefly describes the software packages commonly used for medical image processing and analysis. It actually presents 17 different such software packages, each presentation containing data about system requirements, platforms, and main components or application areas.

In summary, I recommend this excellent handbook to all scientists interested or involved in medical imaging. It is to be used as a quick reference and as an exhaustive scientific treatise as well. Every chapter is by itself a small book and the volume of bibliographical references for each of them is quite impressive. In spite of the great number of authors, the handbook reveals itself as a compact, well-organized collection of excellent articles. Physicians, radiologists, software or biomedical engineers, physicists or biologists together should find this Handbook as a standard reference text in medical imaging.

Reviewed by Serban Morcovescu, M.S.

Serban Morcovescu is a teaching assistant in Medical Physics and graduate student at Wright State University, Dayton, OH. He earned his M.S. in Medical Physics and Biophysics from "Babes-Bolyai" University, Cluj-Napoca, Romania in 1997.

I would like to bring your attention to recent unabridged republication of the following two books on computed tomography (CT) as classics in Applied Mathematics by the Society for Industrial & Applied Mathematics (SIAM):

The Mathematics of Computerized Tomography. F. Natterer. List Price: $61.00. Paperback. 222 pp. July 2001. ISBN: 0898714931.

Principles of Computerized Tomographic Imaging. Avinash C. Kak and Malcolm Slaney. List Price: $59.00. Paperback. 327 pp. July 2001. ISBN: 089871494X.

The book by Natterer, originally published by John Wiley & Sons in 1986, is mathematically oriented but it is a must for any scientists and engineers who are seriously interested in CT. This masterpiece offers a most rigorous and greatly unified treatment with extremely succinct notations. It also theoretically addresses major practical issues, such as stability, resolution, and regularization. To a large degree, I consider this book as a major cornerstone of the CT field.

The book by Kak and Slaney, first published by IEEE Press in 1987, provides a best technical tutorial on CT algorithms. It also contains excellent discussions on artifacts of various types caused by physical and algorithmic limitations. Because of the introductory nature of this popular text, since its publication it has been most suitable as the first reading for students and engineers in the CT field. The C programs used to generate the images in the book have been made publicly accessible for years, as described in the preface to the reprint. Here, I gratefully acknowledge the benefits I gained from these codes when I was a graduate student ten years ago.

Taking this opportunity, I would like to mention the following SIAM monograph as well:

Mathematical Methods in Image Reconstruction. F. Natterer and Frank Wubbeling. List Price: $65.00. Hardcover. 216 pp. April 2001. ISBN: 0898714729.

This book is very much in the same style of the 1986 book by Natterer. While there is a significant overlap with the 1986 book, the 2001 book effectively reflects the theoretical progress over the past decade. For three-dimensional algorithms, the authors derive exact and approximate inversion formulas and describe their algorithmic implementation. However, in my opinion, the coverage on cone-beam tomography could have been wider, particularly to include recent results on exact reconstruction with spiral/helical cone-beam data from a long object.

The theory and techniques covered in the three books are instrumental to many

important applications, including x-ray computed tomography, magnetic resonance imaging, emission tomography, electron microscopy, ultrasound imaging, industrial tomography, seismic tomography, impedance tomography, and so on. I have no doubt that these books will be invaluable for further development of the CT field.

Reviewed by Ge Wang, Ph.D.

Dr. Wang is Associate Professor in the Radiology Department and the Department of Biomedical Engineering, University of Iowa, Iowa City, and is an Associate Editor of Medical Physics.

Books Received

The editor acknowledges receipt of the following publications which may be reviewed in later issues if they are judged to be of sufficient interest to the majority of readers, subject to space limitations. Readers interested in reviewing books should advise the Book Review Editor of their availability, qualifications, and interests.

Radiation Protection for Procedures Performed Outside the Radiology Department. NCRP REPORT No. 133. National Council on Radiation Protection and Measurements. ISBN 0-929600-66-5. Price $30.00.

Handbook of Medical Imaging Processing and Analysis. Isaac N. Bankman. Academic. ISBN 0-12-077790-8. Price $119.00.

Calibration of Radiation Protection Monitoring Instruments. Safety Reports Series No. 16. International Atomic Energy Agency. ISBN 92-0-100100-2. Price 37.06 Euro.

Advances in Film Processing Systems Technology and Quality Control in Medical Imaging. Arthur G. Haus. Medical Physics Publishing. ISBN 1-930524-01-3. Price $75.00.

Magnetic Resonance Procedures: Health Effects and Safety. Frank G. Shellock. CRC Press. ISBN 0-8493-0874-7. Price $79.95.

Achieving Quality in Brachytherapy. Bruce Thomadsen. Institute of Physics Publishing Ltd., 2000. ISBN 0-7503-0554-1. Price $110.00.

Radiation Exposure in Computed Tomography: Fundamentals, Influencing Parameters, Dose Assessment, Optimization, Scanner Data, Terminology. Hans Dieter Nagel. COCIR—European Coordination Committee of the Radiological and Electromedical Industries. Price 25.00 Euro.

Radiation Safety and ALARA Considerations for the 21st Century. Proceedings of the 34th Midyear Topical Meeting February 4–7, 2001, Anaheim, California. Medical Physics Publishing. ISBN 1-930524-02-1. Price $35.95.

Accreditation Programs and the Medical Physicist. Robert L. Dixon, Priscilla F. Butler, and Wlad T. Sobol. American Association of Physicists in Medicine Medical Physics Monograph No. 27. ISBN 1-930524-04-8 (hardcover). Regular Price: $80.00, AAPM Members: $65.00.

Radiation Instruments. Herman Cember. Health Physics Society 2001 Summer School. ISBN 1-930524-03-X (hardcover). Price $70.00.

The Structures of Life. National Institute of General Medical Sciences, U.S. National Institutes of Health, Publication Number 01-2778 (softcover), FREE. Order at: pub_info@nigms.nih.gov, or http://www.nigms.nih.gov/news/publist.html., or call (301) 496-7301.

X-ray Physics: Interaction with Matter, Production, Detection. R. Cesareo. Editrice Compositori, Bologna. ISSN 0393-697X (softcover). Price $40.00.

Radiation Dosimetry Instrumentation and Methods, Second Edition. Gad Shani. CRC. ISBN 0-8493-1505-0 (hardcover). Price $139.95.

Digital Mammography—IWDM 2000 5th International Workshop. Martin J. Yaffe. Medical Physics Publishing, Toronto, Canada. ISBN 1-930524-00-5 (hardcover). Price $195.00.

