

dosimetry, as well as some of the experimental and epidemiological results available on embryonic tissues. Real-time ultrasound provides an opportunity for prolonged observation and extensive exposure of the fetus, so that consideration of possible toxicity should be of concern to obstetricians contemplating routine screening. I highly recommend that this book be read by anyone involved in obstetrical scanning. Ideally, everyone should have a copy in his personal library.

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**HEAVY PARTICLE RADIOTHERAPY.** M. R. Raju. New York, Academic Press, 1980, pp 500, \$36.50

According to the author "The scientific literature on the physical and radiobiological aspects of heavy particles in radiotherapy is scattered." The objective in writing this book is to synthesize most of the available literature on the subject and to convey this information to readers with various backgrounds. Heavy particles are those that are many times heavier than electrons, and, except for protons, they are also known as high-LET radiation and are being used therapeutically at approximately 30 institutions worldwide. The appearance of such a book is, therefore, very timely and welcome.

The book is divided into eight chapters and an extensive appendix. Chapters 1 and 2 consist of an introduction to radiobiological phenomena and the biological effects of high-LET radiations, which set the main tone of the book. It is very heavily oriented toward the radiobiological aspects of this subject, and this area is further enhanced by the final chapter, 8, which is mainly a radiobiological comparison of heavy particles, and by the appendix on radiobiological techniques. The remaining chapters deal with each heavy particle in turn: neutrons, protons, helium ions, heavy ions, and negative pions. Because they have been used longer, however, there is a large amount of data on neutrons, and a section on the early experiences with neutrons and their implication for the future use of high-LET radiations in therapy. The early experience with neutrons was not too favorable, but later data on RBE versus fraction-size and a better understanding of early and late reactions could explain these results that led to renewed clinical trials.

Each chapter begins with a brief synopsis of the particle under discussion, including when its use as a treatment beam was suggested, where the particle facilities are, a brief description of the radiobiological characteristics, and their current use in radiotherapy.

Each particle has its own potential advantage over conventional radiotherapy. Neutrons have a purely biological advantage because of a reduced oxygen enhancement ratio (OER), whereas protons have a purely dose distribution advantage because of their sharp dose localization characteristics. The other heavy particles (helium, heavy ions, and negative pions) also have a dose distribution advantage but do exhibit some biological advantages. For the heavy ion, however, OERs appear to be a function of the ion (carbon, neon, argon) and were found to be higher than expected, which could be due to nuclear secondaries and a large delta-ray penumbra.

Since it is not the aim of the author to give an in-depth discussion on each subject, he includes an extensive reference list at the end of each chapter for those interested in pursuing specific subjects further. The book would be improved, however, if it contained a little more information on the concepts of LET and dosimetry. This discussion could have been included in the early chapters so that when such concepts as lineal energy, dose average LET, etc. are

introduced, the uninitiated would have a better idea of what is involved.

Upon reading the book the feeling is given that it would have been better to call it "Heavy Particle Radiobiology," but other than that, the author does an excellent job and provides an in-depth review of the radiobiology behind heavy particle radiotherapy.

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**PERCEPTION OF RISK: PROCEEDINGS OF THE XVTH ANNUAL MEETING OF THE NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS.** Washington, D.C. NCRP Publications 1980, pp 191

The book is a conglomerate of formal papers, discussions, and the textual minutes of a round table discussion with audience participation. The first part, and most interesting from my viewpoint, deals with the perception of risk or harm and societal attitudes. The second part contains papers that seem to be historical primers concerning radiobiology. This subject is surrounded by controversy, and it seems in part to be approached as an elephant would be by a tribe of blind zoologists. They poke and pinch, sometimes describe small parts in great detail, but never exactly circumscribe the object of the study. The purpose is to present a discussion of the harm due to radiation, specifically radiation from power sources. Closely related to this is the question of the regulatory agencies' role.

This book should be read if only for the lucid presentation by Margaret N. Maxey, who describes the difference between risk and harm and how benefits, ranging from essential or vital to peripheral, should be compared with harm. Risk, of course, is at both sides of the equation. I cannot in this brief review do justice to her paper. The book would have gained enormously if the other participants had adopted her epistemology.

Two more presentations deserve, for widely different reasons, to be mentioned specifically. Roy E. Albert explains well what the political consequences of "no threshold" are: i.e., the Delaney amendment. It does not require much imagination to see that if one consistently acts on the presumption that there is "no safe level" for a toxic substance, the situation may become a political and economical nightmare. Albert proposes that efforts be directed (a) at toxic substances that put many people at risk, and (b) toward what we can expect from regulations that will have a substantially beneficial effect. On the other hand, Ida Hoos' contribution is not a rational discussion. Her presentation contains a number of incorrect statements of industry spokesmen. Her point, however, is important—it is difficult to obtain unfiltered data on controversial subjects. Indeed, the experts tend to present the data inasmuch as they clarify their conclusion. What she fails to discuss is that the conclusion was not necessarily reached on the basis of the presented data only.

Rather than review each paper, it may be more productive to answer two questions: Does the book provide good information on the subject of the perception of risk? To this question the answer is mixed. There is information there, but it is not presented in a well-structured manner that would instruct the uninformed. Does the book increase the understanding of the question? To this, the answer is yes. We recommend the book to all those involved in the field of nuclear technology application, who will be forced at some time to leave their ivory towers and to speak with the public.

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