Book Review

Hormesis with Ionizing Radiation. By Thomas D. Luckey, CRC Press, Boca Raton, Florida (1980). 222 pp. $59.95.

Question: "What's hormesis?" Answer: "Hormesis characterizes a general observation that desirable effects are produced by small amounts of some agents which are harmful in large amounts. Such agents are hormetic agents." By this definition, various vitamins and minerals are obviously hormetic agents; so are microbial poisons for which the Arndt-Schultz law, paraphrased, states that small doses of poisons are stimulatory; the same is true for many other substances and conditions. Thus, in summarizing the actual experimental results of low-level radiation, the author of this book presents compelling evidence that ionizing radiation is also an hormetic agent, hence, the title. Unfortunately, however, neither the word hormesis (with derivatives) nor other term, which might be its synonym, is a part of our vocabulary or found in our dictionaries, professional or otherwise. Correction of this omission is strongly urged.

More than 1250 references to experimental work reported between 1898 and 1977 are summarized and classified. Included are many from behind the "Iron Curtain"; these, the author notes, are usually obtained from secondary sources. The detailed material is presented in tabular form with short summaries of the pertinent information in each referenced report. The primary classification is the type of radiation; subclassifications are the type of organism and the date of report. Obviously, one can readily prepare a further division by any criterion desired. There are also some descriptive materials and overall summaries in the text. This reviewer checked many of the references given and found the material therein to be as represented.

An incredible variety of effects are noted for both flora and fauna. For the former, organisms ranging from bacteria to major plant systems are reviewed, and many of the effects described can be listed under the rather broad headings of accelerated germination and growth, more vigorous sprouting and development, and increased overall crop yield. For animal life, ranging from protozoa to vertebrates, the desirable effects found can be broadly classified as accelerated growth, increased disease resistance and wound healing, increased reproductive capacity, and longer life span. Interestingly, it appears that the "hormetic effect" for a given type of organism is more noticeable for those specimens existing under less favorable conditions. Furthermore, it appears that, for a given agent, this effect is a maximum for doses some 10 to 1000 times those of background and some one-tenth to one-thousandth of those that are toxic.

Other than its principal material of interest, the book contains a wealth of general information, which is presented in a most readable and useful form. The summaries of background radiation and of overall radiation-dose effects to a variety of organisms are particularly noteworthy, and this reviewer found some historic material related to various aspects of biological survival to be rather interesting. The overall presentation is remarkably fair-minded with due attention paid to possible injurious effects where germane; furthermore, reports by some nuclear critics are quoted, referenced, and conclusions given. There are also a few references to material that has appeared in "popular" publications. If the book has a weakness, it is probably its rather uncritical presentation of material with little or no analysis; however, to this reviewer, that is a major strength.

In view of the relative immensity of the experimental information here shown to be available, it is difficult to understand why, even now, the effects of low-level radiation are so often considered to be mere extrapolations of high-level data. The author lists and discusses a nine-point analysis of reasons for this sad state of affairs. However, a factor that may be more important than generally realized is the absence of a word by which this effect could be identified, and thus a heading under which librarians and abstractors can classify such material for search assistance. Hence, since "hormesis" and its derivatives could readily meet that problem, this reviewer repeats his urging that such steps as necessary be taken toward adding that word to our vocabulary. Certainly, such action would remove a possible justification for a future comment such as that in the 1972 BEIR report stating that "there are little or no data on the effects of low-level chronic irradiation of plants." Furthermore, it would not only have enormously simplified what must have been a tremendous task in locating the 1250 references reported, but the author might also have run across this reviewer's 1961 article in the *Journal of the American Medical Association* and the references included therein, which are definitely germane to this topic.

Overall, the material so well covered in this book is specifically applicable to providing information for probably the most important problem (a nontechnical one, to be sure) facing today's nuclear effort, this being the public perception of radiation and its effects. Hence, the book justifies a reading, or at least a "look through" by anyone involved in nuclear activities. It should be required reading for all who have responsibilities for establishing standards or guidelines for radiation exposures and doses, and the same is true for those designing or funding appropriate programs in the field. Its information should be specifically made available to our lawmakers, members of the "communications media," and others who are frequently our very vocal, but often uninformed,

critics. Certainly, it should find a place in every university and research-oriented technical library. Its price may be a bar to individual purchase, but worthwhile things *never* come cheap!

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About the Reviewer: Hugh F. Henry became Emeritus Professor of Physics at DePauw University upon his retirement in 1981 after serving 20 years as department chairman. Prior to coming to DePauw, he supervised the radiation protection and nuclear safety programs at the Oak Ridge Gaseous Diffusion Plant and has published in these fields. He is the author of the book "Fundamentals of Radiation Protection" published by John Wiley and Sons in 1969. His article in the specific field of this book is "Is All Nuclear Radiation Harmful?," which appeared in the May 27, 1961, issue of the Journal of the American Medical Association.