Moxon-Ray detector capture results. The scattering measurements seem to be useful mainly in very special cases. Great care is needed to avoid errors due to multiple scattering, etc., to avoid misleading and wrong results.

Chapter IV, by Lowell Bollinger [Argonne National Laboratory (ANL)], "Gamma Rays from Neutron Capture in Resonances," is excellent, although giving perhaps overly extensive accounts of the settling of controversies of mainly historic interest where Bollinger's results finally proved to be definitive. At the end of the chapter (Fig. 35) I finally found the very interesting recent ANL results (partly presented here) on their gamma-ray measurements where neutron capture is over many resonances (also Figs. 8 and 9). Since 1968, experimental work has emphasized the use of high resolution Ge-γ detectors. Capture involving many resonances to remove fluctuations in Γ_γ, to particular final states, have yielded results important to the theory of the EI, EII, MI, MII, etc. transitions versus gamma-ray energy, and in establishing the compound nucleus bound levels. Bollinger has pioneered in developing many of the techniques discussed in this chapter. Other examples are in Chap. I.

The final chapter, "Measurements on Fissile Nuclides," by M. S. Moore, covers many of the types of experiments and results in neutron fission physics. It is the only chapter completely lacking figures on experimental systems. A reader of this and the other chapters would profitably supplement the subject matter by browsing through various editions of BNL-325. The σ_t, σ_f, etc., versus E curves in Chap. V, and the extensive tables of resonance parameters should be supplemented by the more recent resonance parameters in the (1973) third edition (Vol. I) of BNL-325, and the cross curves in BNL-325, second edition, Supplement 2 (Vol. III for fissile nuclei). The recent Lawrence Livermore Laboratory publication (UCRL-50400, Vol. 7, Part II) presents the most recent curves. One obvious minor mistake I caught was the factor of 10 error in labeling the ordinate in Fig. 21 (a) of σ_f for ^{239}Pu, since σ_f is shown as $>\sigma_t$ (p. 410) for 68 eV $< E <$ 98 eV.

After reading Chap. V, I reread the review article (1966) "Neutron Fission" by J. F. Fraser and J. C. D. Milton (*Annual Review of Nuclear Science*, Vol. 16) to supplement Chap. V. Their initial comment is appropriate: "We know a great deal about Nuclear Fission, but understand rather little." This comment is useful in reading Chap. V.

I recommend this book to the reader interested in learning about this subject.

James Rainwater

Columbia University
Physics Department
Irvington, New York 10533

July 22, 1974

About the Reviewer: James Rainwater is professor of physics at Columbia University where, since 1941, he has been engaged in research on neutron resonance spectroscopy first with the Pupin cyclotron and, over the past 15 years, with the Nevis synchrocyclotron. He spent the World War II years on the Manhattan Project and in 1950 authored the well-known paper on the spheroidal nuclear model. Dr. Rainwater did his undergraduate studies at Cal Tech and completed his graduate work at Columbia. He is a fellow of APS, IEEE, AAAS, and the New York Academy of Sciences, received the USAEC's Lawrence Award in 1963, and is a member of the National Academy of Sciences.

Nuclear Energy: Its Physics and Its Social Challenge. By David Rittenhouse Inglis. Addison-Wesley Publishing Co., Reading, Mass. (1973). 395 pp. $4.95 (paperback).

An unexpected thing happened on my way to the end of this book. I noticed on p. 150 a grudging statement about "a gratifying beneficial use of nuclear radiation."

I thought this was interesting and worth telling because it all started at the Preface where it said that the book was designed for a college course for a general "arts" student who wants to understand the physics and sociopolitical aspects of nuclear energy." I even fancied myself as ". . . the reader who is youthful at least in spirit, . . ." and I hoped to have "a piercing glimpse into both the scientific and humanistic aspects of nuclear energy problems, including the problems of nuclear weapons, from the point of view of a scientist who professes enough concern that he may be given heed."

At this point I sort of expected to read something about nuclear (electric) power and why it was important. There was indeed a lonely terse statement in the Introduction that "nuclear energy, when and if it becomes an important contributor, will be important mainly as a producer of electric power." And then after the first three chapters which delt with the physics underlying the operation of atom bombs and nuclear reactors, I thought that finally there would be some good reasons why nuclear power seems to interest many people besides nuclear engineers and physicists.

But in the fourth chapter on "Nuclear Reactors as a Power Source" I kept reading about troubles and "Thus nuclear generation has almost but not quite caught up with coal fired generation of electricity in economic cost, if we overlook certain subsidies of the nuclear enterprise." The discussions of the reactor accidents at Chalk River, Windscale, Fermi, and SL-1 were pretty sobering, and the China Syndrome and WASH 740 didn't help.

*Chapter 5 on the "Effects and Uses of Radioactive Prod*ucts" told how radiation produces mutations, and "Thus each mutation is in a sense a curse on society that will eventually make trouble in some future generation." There was nothing about dose rate effects, fractionation of dose, or genetic and somatic repair. I found there that "Rem stands for 'Roentgen equivalent mammal,'" which I guessed as OK since a man is a mammal. There was the celebrated 30 000 deaths/yr argument of Gofman and Tamplin, but nothing about the ideas of their critics, or other opinions like the BEIR Report (Nov. 1972), which concludes that the Gofman-Tamplin risk estimates are about 10 times too high. There was a cogent observation about a conclusion made by Sternglass, "There is a tendency for it to be believed or not according to the prejudices of the critic." And after a few sentences more ". . . If infant mortality and malformation as a result of permitted exposures from nuclear power plants might be 10 or 100 times those surmised by Gofman and Tamplin, as Sternglass further concludes, this casts further doubt on the advisability of such a program." I reread the bit about the prejudices of the critic, and wondered if I just had a "piercing glimpse."

Finally, in sections about medical and industrial uses of radiation, there it was on p. 150, "a gratifying beneficial use of nuclear radiation."

The next chapter dealt with the substantial problems of nuclear bomb proliferation, and the diversion of fissile materials to make bombs. About here I started wishing my prejudices hadn't been jangled because it seemed what I was reading made some sense.

The chapter on "Other Possible Power Sources and Fu-

ture Needs" touched all too briefly on fusion power by magnetic containment and didn't mention laser-fusion. The need to curtail energy demand was discussed in view of the supply difficulties and the notion that "all power pollutes."

Chapters 8 and 9, on "Nuclear Explosives" and "Constraints on the Arms Race," respectively, included the political aspects as well as the technical. This joined to the no-win nuclear power story the aura and substance of even more frightening matters, the challenge of dealing and dueling with nuclear bomb threats, ABMs, and MIRVs. These chapters were discursive and somewhat anecdotal and documented the story of our super-weapons which, alas, are also possessed by our enemies. The account was authoritative and incisive except for a small thing that happened on p. 214 where the story is recounted of the Marshall Islanders who were exposed to the fallout from the Bikini Bravo shot. "Many of them developed severe skin burns and other injuries, and by now many of the adults and almost all of the children have contracted cancer. . . ." Strangely though, the UNSCEAR Report, 1972, Vol. II, p. 415, says that only thyroid tumors have been observed in the exposed population, no cases of leukemia have been reported, and of the children who had thyroid tumors one in six was malignant.

A strength of the book lies in the 18 excellent appendexes. The early ones contain some elegant expositions of elementary nuclear theory and other appropriate noncontroversial material. Appendix 15 has excerpts from writers, pro and con, about nuclear power, and Appendexes 16, 17, and 18 contain interesting materials on the bomb and the arms race.

There is a challenge here for the student who, after going through all this, wonders why some men espouse nuclear power. I don't think the book was designed to explain that; or, more importantly, what is right or wrong with the alternatives. The "piercing glimpse" I got seemed always to be from the same pole of the controversies which surround the subject.

Ferdinand J. Shore

Department of Physics
Queens College of the City University
of New York
Flushing, New York 11367

May 7, 1974

About the Reviewer: Ferd Shore has been a member of the Physics Department faculty of Queens College (of the City University of New York) since 1960 and a full professor since 1965. Following completion of his graduate studies at Illinois, Dr. Shore carried on research in radiation shielding and neutron spectroscopy at the Brookhaven National Laboratory. He has served on the National Council on Radiation Protection and Measurement and has participated in public proceedings considering licensing nuclear powered electric generating stations. He presently teaches courses on energy, electric power, and the environment.

Radioecology. By V. M. Klechkoskii, G. G. Polikarpov, and R. M. Aleksakhin (Eds.). A translation from Russian by N. Kaner and H. Mills of Radioekologiya (Sovremennye Problemy Radiobiologii, Tom II), Atomizdat, Moscow. John Wiley & Sons, New York (1971). 371 pp. $35.00.

This book is the collective effort of 32 Russian scientists who review the extensive radioecological work done inside as well as outside the USSR. The monograph is divided into two parts: Part 1, Radioecology of Land Biogeocenoses, and Part 2, Radioecology of Aquatic Biocenoses. Part 1, consisting of 13 chapters, is much more comprehensive than Part 2, which contains only four chapters. Part 1 is divided into three sections: Radionuclide Migration in Land Biogeocenoses, Effect of Ionizing Radiation on Land Biogeocenoses, and General Radioecological Aspects of Lane Biogeocenoses. The major emphasis in all three sections is on the radioecology of forested ecosystems.

The first chapter deals with behavior of natural radionuclides in soils. There is no doubt that the Russians have carried out the most comprehensive studies relating the distribution of natural radionuclides in soil profiles to various soil-forming processes. In this chapter they have tabulated large amounts of data describing concentrations of natural radionuclides in soils from various countries, as well as major soil groups and climatic zones in the USSR; however, summarization and explicit discussion in the text are a bit vague. Nevertheless, these data sets are the best in the world. Judging from the concluding remarks, more attention should be directed at thorium/uranium ratios than at thorium/radium ratios in various soil horizons. Likewise, characterization of chemical forms of the natural radionuclides should be delineated in future research.

In Chap. 2, the authors have done an excellent job in characterizing and describing fallout distribution of radioactive products throughout the world. Chapters 3, 4, and 5 deal with movement of fallout radionuclides in soils, with the major emphasis on ^{90}Sr and ^{137}Cs. The physicochemical properties of the various radionuclides, adsorption capacities of various soils, clay minerals, and soil horizons are thoroughly considered. The authors also point out the influence of natural and artificial chelating agents on movement in soil and availability to plants of these radionuclides. Their thermodynamic treatises of strontium and cesium adsorption to soil were easy to follow, but are probably fortuitous, simplified examples. Chapter 5 not only adequately describes various diffusion processes in soil, but properly evaluates the role diffusion plays in root uptake of radionuclides by plants. Distribution and cycling of radionuclides in forest ecosystems is described in Chap. 6. The authors point out that knowledge governing uptake of radionuclides by arboreal species is not nearly as well known as uptake by agricultural crops. They stressed the importance of clarifying uptake by different arboreal species in relation to the physicochemical properties of various forest soils.

Chapter 7 addresses the problem of radionuclide movement along food chains to the human population. Here the authors point out that, contrary to popular opinion, ^{137}Cs concentrations found in plants are more dependent on uptake from certain soils than from aerial contamination. Generally, ^{137}Cs is adsorbed so tenaciously by soil that uptake through plants roots is minimal. They present data implying that movement of ^{137}Cs from sod-podzolic and peaty sandy soils through the grass-cow-milk food chain is more intensive than movement of ^{90}Sr. A similar observation in various grass-food chains has been made from sandy acid soils of Florida.

In Sec. 2, a much larger portion of the review consists of studies outside the USSR than in the previous section. The effect of ionizing radiation on forest biogeocenoses is addressed in Chap. 9. Tables are presented listing the consequences of various levels of ionizing radiation on arboreal plants. The best chapter in Sec. 3 is on Radioecology of Landscapes in the Far North, where the