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.

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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

movement of long-lived artificial radionuclides (^{137}Cs and ^{90}Sr), as well as natural radionuclides (^{210}Pb and ^{210}Po) through the lichen-deer-man food chain, is critically reviewed. An explanation is presented for the difference in seasonal variation in ^{137}Cs concentration between Alaskan Eskimos and Soviet reindeer breeders. It seems that peak ^{137}Cs concentrations in Soviet reindeer breeders occur in the winter while maximum ^{137}Cs concentrations in Alaskan Eskimos appear in the summer. The discrepancy apparently results from Alaskan Eskimos harvesting highly contaminated reindeer in the spring which are consumed in the spring and summer. Soviet reindeer breeders generally consume only freshly slaughtered venison, and in the summer months venison in the diet is partly replaced by fish.

Part 2, dealing with radioecology of marine and freshwater systems, points out some very important relationships such as the influence of potassium and stable cesium in ambient food and water on ^{137}Cs fish concentrations and a similar influence of stable strontium on ^{90}Sr in fish. Various pathways through which fish accumulate radionuclides are presented, but there is little mentioned concerning the role of bottom sediments.

I found the book to be very readable, well-researched, and well-organized. Even though contributions were made by a large number of authors, the style was consistent from chapter to chapter. Perhaps presenting the subheadings in bold type or underlining them would have provided a clearer transfer from one topic to another. An index would make the work more valuable as a reference text. Probably the most important contribution is an attempt at the end of each chapter to define specific problems and outline how these problems might be resolved. Every serious student of radioecology should carefully study sections germane to his discipline. The high price of the book will likely limit its distribution primarily to libraries and research groups where it can be profitably shared.

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