laboratories in Switzerland (Swiss Institute for Reactor Research) and France (Center for Nuclear Studies at Saclay), where his interests were in biomedical research and reactor theory. He has a lovely wife and plays a mean guitar.

Tumour Localization with Radioactive Agents
(Proceedings, Advisory Group Meeting, Vienna, December 9-13, 1974)

Publisher	International Atomic Energy Agency (Distributed by Unipub., Inc.) (1975)
Pages	142
Price	$10.00
Reviewer	James M. Woolfenden, MD

This volume, the Proceedings of an International Atomic Energy Agency Advisory Group Meeting held in Vienna in 1974, is composed of 11 contributed papers and group discussions. The purpose of the meeting was to summarize results obtained to date using radioactive tumor-localizing agents and to delineate some possible trends in further development. Characteristics of an ideal radiopharmaceutical for tumor localization are noted in the Foreword:

> The present agents for detecting tumors by scintigraphic techniques are not as good as they should be. The ideal agent should be highly specific for cancer with an avid uptake in the tumor, and a fraction which is not taken up by the tumor should be rapidly excreted from the body. The compound should be inexpensive, simple to prepare, heat-stable, easily sterilized, have low chemical toxicity, be reliable and only cause a low radiation exposure. These criteria may never be met at the same time in any one radiopharmaceutical.

The present era of tumor localization with radiopharmaceuticals and external imaging devices was foreshadowed, as one of the contributors notes, as early as 1930 by Herbert Kahn, who discovered that radioactive bismuth could accumulate in tumors. Kahn observed that if adequate equipment were available, the agent could be used for "photographic" diagnosis of a primary tumor and its metastatic lesions. Although no chapter of the book is devoted expressly to the history of tumor-seeking agents, historical citations such as this one help to place the current search for better tumor-seeking radiopharmaceuticals in perspective.

The overall quality of the contributed papers is excellent, and several are outstanding. McCready and Trott of the Royal Marsden Hospital provide a detailed survey of the physical and biological factors affecting tumor imaging. In a complementary paper, Hayes of Oak Ridge Associated Universities presents a lucid discussion of factors affecting tumor uptake of radioactive agents.

The stimulating discussions that follow each paper provide useful perspective on the papers and also contribute additional theoretical and practical information on tumor imaging. The "Summary of General Discussion," presented as the final chapter, provides concise guidelines and recommendations for developing new tumor-seeking radiopharmaceuticals. This summary should be required reading for anyone interested in tumor localization using radionuclides.

Most of the material presented remains timely, although the meeting was held in 1974. Gallium-67 citrate, which at present is probably the most widely used agent for soft tissue tumor imaging, is considered in some detail. Cobalt-57 bleomycin, which at present is a promising investigational new drug for tumor localization, is briefly discussed, along with other radiolabeled antibiotics that show selective uptake in tumors. Preliminary data are presented that suggest some of the radiolanthanides may have useful tumor-seeking properties; the lanthanides have not yet been fully evaluated in this regard. The chapters on radiomercurials and ^{75}Se labeled compounds are now mainly of historical interest.

The final contributed paper by Comar from Orsay, France, presents the potential for tumor localization using compounds labeled with accelerator-produced short-lived radionuclides, such as ^{11}C, ^{13}N, ^{15}O, and ^{18}F. Development of such compounds poses a number of challenges, particularly in the area of ultra-rapid radiochemistry; as Comar observes, the 2-min half-life of ^{15}O prevents its use in synthesis of complex molecules or investigation of slow phenomena. Utilization of such compounds also requires proximity to a particle accelerator; Comar anticipates that compact medical cyclotrons, installed in or near hospitals, will become more widely available.

This book is well produced, with a clear typeface and a minimum number of typographical errors. Graphs and line drawings are clear, but the few radiographic and scintigraphic images are poorly reproduced.

Tumour Localization with Radioactive Agents is highly recommended to anyone interested in medical applications of radionuclides. At $10.00, the book is an exceptional bargain.

James M. Woolfenden is assistant professor of radiology in the Division of Nuclear Medicine at the University of Arizona Health Sciences Center, Tucson. He received his undergraduate degree from Stanford University and his MD from the University of Washington. His current research is directed at developing both improved tumor-seeking radiopharmaceuticals and miniature radiation detectors for in vivo *localization of the radiopharmaceuticals. He has been actively involved in clinical studies of radiolabeled bleomycin for tumor localization.*

Exploration for Uranium Ore Deposits
(Proceedings of a Symposium, Vienna, March 24 to April 2, 1976)

Publisher	International Atomic Energy Agency (Distributed by Unipub, Inc.) (1976)
Pages	807
Price	$49.00
Reviewer	Donald E. Livingston

This volume, costing $49.00 for 807 pages, more than 6¢ per page, is hardly the kind of tome a person would buy just to find out the contents. Certainly students and

beginning professionals would hesitate to include it on their bookshelves.

Fifty articles and discussions—one in French, two in Spanish, and the remainder in English—make up the contents of this book. It is divided, unevenly, into six sections: "Exploration Policy," 1 paper; "Exploration Techniques," 28 papers; "Case Histories of Recent Exploration," 9 papers; "Preliminary Evaluation Techniques," 3 papers; "Research and Development of Exploration Techniques," 4 papers; and "Reports of Working Groups," 5 papers.

The first paper, the only one in the section titled "Exploration Policy," is slightly more than a listing of current and potential exploration techniques. It deals little, if at all, with matters of exploration policy. Nonetheless, it includes some interesting facts and figures.

The next section, "Exploration Techniques," is separated into four sections: "Gamma-Ray," ten papers; "Radon and Geochemical Surveys," nine papers; "Non-Radiometric Geophysical Methods," four papers; and "Exploration Drilling and Logging," five papers. These 28 papers vary widely in the significance of their technical content. Students and professionals not acquainted with the field will find this a good exposition of the scope of uranium exploration techniques. Experienced professionals will find themselves criticizing many of the articles that deal with subjects in which they are expert.

The nine "Case Histories of Recent Exploration," two in Spanish, constitute the most significant section in the book. Here one can compare large-scale (or should I say small-scale?) exploration programs throughout the world with the propitious newer discoveries in northern Australia.

The two sections on "Preliminary Evaluation Techniques" and "Research and Development of Exploration Techniques" are the most interesting parts of the book. Terms such as resource evaluation, equilibrium analysis, geostatistical study, labile uranium, remote sensing, and pulsed neutrons convey the breadth of subject matters and the timeliness of the content of these sections. Unfortunately, little mention is made of uranium-isotopic variations in the hydrologic cycle. Stuckless comes closest in his article on labile uranium.

A comprehensive technical review of this volume would be beyond the abilities of most professionals, for the subject matter varies widely. Prospective purchasers should look at the contents of the papers of their interest before buying the book. As a reference, it would be nice to have it available in someone else's library, but this reviewer would not pay the price to place it on his own bookshelves. Much of this information and some much better is or soon will be available in appropriate journals.

Donald E. Livingston (BS, University of New Mexico; post-graduate degrees, University of Arizona) is manager of the Geochemical Department of Bendix Field Engineering Corporation at Grand Junction, Colorado. He has recently reentered the field of georesources, which was his initial interest. He moved to Colorado in 1977 from the Geoscience Department of the University of Arizona, where he had been active in teaching and research in geochemistry, geochronology, and field geology. Prior to leaving Arizona, he initiated a government-sponsored program in geothermal research for the Arizona Bureau of Geology and Mineral Technology. His interest in energy resources extends to solar energy and application in family homes.

Advanced LMFBR Fuels
(Proceedings of a Topical Meeting)

Publisher The University of Arizona, Tucson (distributed by The American Nuclear Society, La Grange Park, Illinois) (1977)

Pages 694

Price Soft, $17.00; Hardbound, $20.00

Reviewer Donald R. Olander

The purpose of this volume, and the conference on which it is based, is to provide a forum for exchanging technical information and for summarizing national programs pertaining to advanced fuels for liquid-metal fast breeder reactors (LMFBRs). The efforts of seven countries are represented by 45 papers, which can be subdivided into categories representing:

1. national program descriptions (8 papers, nos. 1-7, 28)
2. properties of advanced fuels (9 papers, nos. 14-20, 31, 35)
3. irradiation testing of advanced fuels (15 papers, nos. 8-13, 21-27, 33, 44)
4. advanced fuel system studies, covering analytical work on fuel element modeling, core design, and safety (13 papers, nos. 29, 30, 32, 34, 36-43, 45).

For the purpose of this review, the numbering of the papers follows the table of contents of the proceedings; papers presented but not published are not counted. The breakdown given above follows closely but not exactly the subdivisions of the editors of the proceedings. Categories 1 and 2 emphasize the fuel material, and a final paper summarizing the complementary cladding and structural material aspects of LMFBR development from the recent Scottsdale Conference on Radiation Effects in Breeder Reactor Structural Materials completes the present volume.

The term "advanced fuels" means not only carbides and nitrides (sodium or helium bonded) but oxides as well. In the latter case, it is not the fuel *per se* that is advanced, but its configuration in the core; in the American and British programs, an advanced oxide fuel is one that can provide a doubling time of less than 15 years at higher linear power, burnup, and core fuel fraction than current oxide fuels for LMFBR use. Practically, development of advanced oxide fuel elements is a matter of increasing fuel pin diameter, increasing fuel smear density, and reducing cladding thickness. French advanced oxide fuel elements are ones in which fertile material (UO_2) is located at the axial center of the pin, surrounded above and below by mixed-oxide fuel.

The national programs are presented in a bewildering variety of detail, ranging from a discussion of the global ecological consequences of advanced breeder reactors complete with drawing of dinosaurs and a map of the world with its population distribution (paper no. 3) to a chart showing each item of equipment, down to ball mills and analytic balances, in the glove boxes of the Japanese fuel research laboratory (paper no. 5). The French presentation is no-nonsense and brief, perhaps too brief. (This is true of the entire French contributions, with 4 papers