Wisconsin, M. D. Anderson Hospital in Houston, and, most recently, at the University of Arizona Health Sciences Center in Tucson. His current interests include interstitial hyperthermia and the development and dosimetry of new implantable radionuclides for cancer therapy. Hevezi is a board certified radiological physicist and consults for several industrial firms.

Flow Visualization II

Editor	W. Merzkirch
Publisher	Hemisphere Publishing Corporation, Washington, D.C. (1982)
Pages	803
Price	$90.00
Reviewer	Clifford J. Cremers

This volume contains the published proceedings of the Second International Symposium on Flow Visualization. The symposium was held September 9-12, 1980, in Bochum, Federal Republic of Germany. It was actually the seventh consecutive conference on flow visualization since the Japanese started the series in 1973; their fifth domestic symposium being immediately succeeded by the International Symposium on Flow Visualization in 1977 (proceedings published as *Flow Visualization*, T. Asanuma, Ed., Hemisphere, 1979). That the series is providing a needed forum for researchers is evidenced by the fact that there were 55 papers in *Flow Visualization* and 114 in *Flow Visualization II*. The editor reports that participants from 30 countries were in attendance at the Second International Symposium.

The volume leads off with two review articles. F. J. Weinberg surveys the application of optical methods to combustion research. This discussion is quite informative, but there are no accompanying illustrations, which, in a publication of this sort, detracts considerably from its usefulness. A second article by W.-J. Yang concerns flow visualization techniques in medical and biological applications. This should be particularly useful to workers in that field because of the relative paucity in the literature of good work in biomedical fluid mechanics.

There is also a fine review article buried in the last part of the book. This is a survey of schlieren techniques, particularly those using color. The article is authored by G. S. Settles who wrote a prize-winning undergraduate paper on the subject in 1970 and has been pursuing the topic ever since. This article contains 68 citations and should be most valuable for anyone wishing to investigate the topic further.

The remainder of the volume is divided into two general categories. The first of these, the one that occupies most of the space, is dedicated to the application of flow visualization techniques. About a third of this section comprises material that would be of significance to nuclear engineers working with flow problems. The chapters of interest here are: Heat Transfer, Heat Exchangers; Pipe and Channel Flow; Flow Separation; Wakes and Vortices; Boundary Layers; and Multiphase Flow. The second section emphasizes methods of flow visualization but the distinction is not sharp. The four chapters here are: Surface Flow; Tracers; Optical Methods; and Instrumentation. Within the two sections, a wide variety of geometries and techniques, both traditional and new, are discussed.

Several of the newer methods should be of interest to readers of *Nuclear Technology*. For example, there is the pulse-luminescence technique. Here optically excitable microparticles made by combining an appropriately active chemical with neutrally buoyant particles are excited to luminescence in a flow section by an external laser beam. The method is applied to visualize the flow near a screw blade. Another interesting approach is the application of holography to multiphase flow problems. It appears to be quite suitable for the counting and sizing of liquid droplets in airstreams and vapor bubbles in liquid streams. In general, this noninvasive technique apparently permits the spatial mapping and recording of many rapid multiphase phenomena with the information stored on film for postexperiment analysis. It is easy to see how this method could be used to study the transient behavior of a flashing liquid/vapor mixture in a loss-of-coolant accident experiment.

Another new approach is that of flow visualization using a unique electrochemical method. The application was to the study of flow near the surface of a rotating disk. Here electrodeposition of zinc from a zinc chloride solution carried an imprint of the adjacent hydrodynamic flow. For the rotating disk experiment, the topography of the deposition shows surface flow patterns as predicted by theory. The same is shown to be true in the case of free convective flow on a vertical flat plate. This article is one of the relatively few in the book that are well illustrated, which seems strange considering the topical matter.

Another interesting method, which departs from one's concept of flow visualization as being a real time technique, is the application of computerized data acquisition for visualizing flows. There are two interesting articles on using transduced outputs of both dynamic pressure probes and hot-wire probes with computers to develop computed velocity profiles based on the probe measurements. Given the rapidly increasing availability of micro-and minicomputers in laboratories, one would expect to see much more of this sort of thing in the future.

On the whole, the book is an interesting reference for researchers wishing to visualize complex flows. As the state of the art advances beyond flow geometries that one can treat theoretically, researchers will need to become increasingly dependent on the computations of these complex flows relying heavily on flow visualization to substantiate calculations. The book does have two weaknesses, however, both of which hinder its usefulness. One is that the material is photographed from author-supplied manuscripts and tends to be in serious need of editing. Another is that it is lacking in good pictures. Perhaps an excellent companion volume for the book would be the recently published collection of classical flow visualizations called *An Album of Fluid Motion* (M. Van Dyke, Ed., Parabolic Press, 1982).

Clifford J. Cremers is currently professor and chairman of the Department of Mechanical Engineering at the University of Kentucky, where he has been since 1966. Before *that he was on the faculty at the Georgia Institute of Technology, where he went after receiving a PhD from the University of Minnesota in 1964. He teaches courses across the spectrum of the thermal sciences and has published more than 60 papers on heat transfer in plasma systems, heat transfer in frost layers, and thermophysical property measurement.*

Active Non-Destructive Assay of Nuclear Materials
(Principles and Applications)

Author	Tsahi Gozani
Publisher	National Technical Information Service Springfield, Virginia (1981)
Pages	403
Price	$30.00
Reviewer	Glenn F. Knoll

This book contains a good representation of the experimental and analytical techniques that have been developed over the past 15 years for the active nondestructive assay (ANDA) of fissionable materials. While the topic is somewhat specialized, many of the techniques and principles are potentially applicable to other areas of nondestructive examination. The author concentrates on active methods of assay in which an external source of neutrons or gamma rays is used. The secondary radiations created by interaction of these "interrogation" radiations then provide information on the composition of the object.

The author begins by presenting an overview of the different physical approaches to ANDA in the first chapter. To provide a background, there then follow discussions of the fundamental interaction of neutrons and gamma rays with matter and a review of neutron and gamma-ray production mechanisms and sources. Additional chapters then discuss the more specialized topics of the transport of gamma rays and neutrons in the type of bulk material of interest in ANDA, and the signatures of neutron- and photon-induced fissions. A general review is given of neutron and photon detection systems with emphasis on those aspects of the instrumentation of most significance in assay measurements. Finally, the book concludes with two chapters that present representative complete systems for ANDA and considerations in the analysis of instrument response and calibration of these systems.

The exposition style of the text is reasonably clear. The continuity in some sections suffers from an excessive number of footnotes, which seem to have been added as afterthoughts. In an applied text of this sort, it is understandable that non-SI units such as gallons and barrels must be used to suit convention. However, there are numerous examples of the misuse of SI units (e.g., double solidi in compound units), and the newer SI units for activity and radiation dose are not even mentioned.

As one would expect, the text draws heavily from published journal articles and reports for much of the data that are presented. However, a large fraction of the tables and figures appear without citation of the original source. Not only is this omission a discourtesy, but it also prevents the reader from seeking verification or elaboration of the information elsewhere. References are collected at the end of each chapter and include a good assortment of books, reports, and journal articles that are relevant to each topic. In a book carrying a 1981 publication date, however, it is disappointing to see that most of these references date back to the early 1970s.

Some of the technical background presented is so abbreviated as to be misleading (for example, the discussion of pulse shaping). However, the topics that are unique to ANDA are generally presented with excellent clarity and completeness. For example, the treatment of fission multiplicity detectors and the related discussion of efficiency and chance coincidence rates in multiple coincidence systems is extremely valuable and unduplicated in any other single source.

The text does not provide a subject index. While this omission might present some difficulty for the casual reader, the organization is such that it is relatively easy to locate any specific topic, once familiarity is gained with the overall contents.

On the whole, the book is a valuable summary of ANDA measurements in nuclear safeguards. Because of the completeness of its presentation of both the principles and applications, it should be useful to all readers whether or not they have prior experience in the field.

Glenn Knoll has been a member of the nuclear engineering faculty at The University of Michigan for 20 years, where he now serves as professor and chairman of the department. His research interests have been in the areas of nuclear instrumentation and radiation measurements, and he has authored the widely adopted text Radiation Detection and Measurement. *He is currently engaged in nuclear cross-section measurements and in the development of radiation instrumentation for medical applications.*