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**BOOK REVIEWS**

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**Nuclear Radiation Detectors** by S. S. Kapoor and V. S. Ramamurthy, (Published by Wiley Eastern Limited, New Delhi) pp. 237, Price: Rs. 35.00.

It is commonly said that whenever the Nuclear Physicist discovers a new phenomenon, he tries to make a detector out of it. Radiation detectors are of varied types and of a wide range of sensitivity and resolution. These detectors are of prime importance not only in Nuclear Physics but also in other areas such as Nuclear Solid State Physics, Radiation Physics, High Energy Physics, Nuclear Geology and Geophysics, Isotope research, Health Surveillance and radiation monitoring, Radiobiology and Medicine, industrial applications of radiation and radioisotopes and in Education. A wide variety of radiation detectors are available both for qualitative detection as well as for quantitative estimation and spectroscopy. There was a longfelt need to have a comprehensive but inexpensive text book on Nuclear Radiation Detectors for post-graduate students in Indian Universities as well as for radiation workers routinely using such detectors in their work. The present book not only satisfies this requirement but goes much beyond that. It serves as an introductory text for research workers in Experimental Nuclear Physics and other areas where radioisotopes or radiation is used. The Indian Physics Association should be complemented for sponsoring the publication of this book.

The authors, having long experience in experimental nuclear physics, are amply qualified to undertake this important work of writing a detailed text book on the subject. They have proved eminently successful in this task. The chapter dealing with basic physical processes of interaction of radiation with matter is specially commendable in being detailed and comprehensive. Post-graduate students and research workers will find it extremely useful. Gas filled ionization detectors were among the earliest quantitative measuring devices for radiation. The principles of their operation and methods of their construction have been described in chapter III. More recent semiconductor detectors and spectrometers have been treated in great detail and the basic principles of their operation explained in chapter IV. Scintillation detectors are among the most widely used in research as well as in routine applications of radiation. These are treated in

chapter V. Neutron detection and spectrometry are perhaps more specialized, being used mainly by Nuclear Physicists, Solid State Scientists doing neutron diffraction, and in nuclear reactor technology, activation analysis etc. The chapter dealing with this will be useful for research workers in these areas and advanced students. The chapter on Electronics for signal processing gives the essential details of pulse-processing and shaping to get optimum performance in detection, spectroscopy and timing. It is felt that this chapter could be of much wider coverage including more detailed treatment of pulse processing for fast timing applications, multi-channel pulse-height analysis and coincidence spectroscopy. If a second edition of the book is made this may be taken care of. There is a short chapter on track etch detectors viz., the dielectric solid state track detectors. Other important forms of track detectors such as bubble chambers and spark chambers are either not dealt with in detail or not dealt with at all. There is also no mention of Cerenkov detectors even though these are useful in detecting high energy relativistic charged particles.

The book reads well and is relatively free of errors except those mentioned in the short list of errata and a few other minor ones: for example, in page 17, lower half, "... high  $z$  materials *on* (are) preferred for ..."; in page 108, last paragraph "... by diffusing lithium for (a) few minutes ..."; in page 121, lower half, "As the mass of the charged particle increases, (the) fraction of the energy lost in nuclear collision ...". These could be corrected in the next edition of the book.

To summarise, the authors have done an extremely good job and made a comprehensive volume and that too at a very affordable price. Therefore it is bound to be popular. I am sure the book will be in the hands of every research worker and post-graduate student in Nuclear Physics and other areas requiring radiation measurements.

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**Health Aspects of the Disposal of Waste Chemicals** (A Report of the Executive Scientific Panel), (ed.) Joe W. Grisham, (Published by Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, USA), 1986, pp. 454, Price: \$ 85.00.

This report presents an excellent overview of the current state of knowledge of human health effects attributed to exposure to toxic chemicals in uncontrolled disposal sites in USA. Twentyone specific sites were chosen and the data available on health effects was scientifically assessed by a panel of 12 experts. The project was sponsored by the American Industrial Health Council, Chemical Manufacturers's Association, National Association of Printing Ink Manufacturers, National Paint and Coatings Association and the United States Chamber of Commerce. The report itself was evolved by intensive discussions in a workshop which was assisted by background papers prepared by consultants.

Increasingly in recent decades, local, state and the federal Governments in USA have had to respond to the demands for better sanitation, safer drinking water, better work safety and reduction in mortality and morbidity due to pressures of urbanization and industrialization of citizens getting more and more sensitized to environmental pollution problems. The response has, however, mostly relied on technological remedies of an immediate nature but has seldom addressed long term social attitudes towards industrial wastes. As summarised in the introductory chapter the dictum "out of sight, out of mind characterizes this country's (USA) longstanding approach to resolving the waste disposal problems of environmental and public health significance".

With the creation of the US Environmental Protection Agency (EPA) in 1970 as a result of the 1969 Mrak report, there has been greater focus on the risk of toxic chemicals. Public awareness has led to regulatory actions which in turn precipitated strident protests from industry. Zealous supporters of industry decry the public's concern as unwarranted. Equally zealous environmentalists demand severe regulatory action even when scientific information is inadequate. Public concern of potential adverse effects of chemicals on human health is widespread and the same is true of the industrial waste sites, particularly after the outcry on Love Canal.

Historically, most industrial facilities did not analyse the chemical constituents in the wastes

generated by them unless they were suspected to contain valuable unreacted raw materials. Disposal sites used in the past were open dumps, containers underground in landfills, storage in bulk containers and surface impounds. Surface impoundments consist of disposal in pits, ponds and lagoons. The waste materials are sometimes subjected to primary and secondary treatments before final disposal. Until recently, there was not much of a regulatory control to prevent overflow of toxic materials leached from such wastes into surface waters. A 1984 national survey of hazardous wastes, estimated that 264 million metric tonnes of Govt. regulated wastes were generated during 1981 by over 14,098 generators. All these were high risk polluters.

Besides exhibiting enormous diversity, the chemicals in hazardous waste dumping sites have varied effects on human health because of the possibilities of migration through the different environmental media and consequent exposure of humans through water and food.

The initial detection of an excess of disease in populations living near a chemical disposal site is made by discrete enquiries and critical examination of vital statistics. Adverse health effects may involve any organ system. Of serious concern are cancer, genetic defects, congenital anomalies, reproductive abnormalities, effects on immune response and disorders of the central nervous system and behaviour. Assessing risk requires estimates of the probability of exposure and the probability of targets receiving a toxic dose.

Relatively few scientific reports are available in refereed journals on the health effects in populations near chemical disposal sites. The main source of information is incident reports in the lay press or documents prepared by enforcement agencies. Residents living near a disposal site generally link any excess of unusual or apparently relevant medical conditions in the community, to the chemical in the site.

The report also gives an account of chemical disposal sites in Europe, Japan and certain developing societies. As far as India is concerned, the limited studies made so far indicate that pollution of the environment with potential threat to human health due to chemical disposal sites is already visible. It is true, however, that no data is available to indicate that such chemical waste dumps have produced significant adverse health effects. A study commissioned by the Department of Environment, Government of India and conducted by the National



Productivity Council revealed an "ice berg" situation in regard to hazardous wastes in Gujarat and Maharashtra in regard to sources of pollution. Of grave concern to many less industrialized countries with vast open land resources is the practice of dumping hazardous wastes by industrialized countries in their anxiety to export hazard from their own territories.

Although critical reviews of 29 investigators in USA of the health of populations in the vicinity of chemical disposal sites indicate only weak causal association with occurrence of disease, there is need for additional prospective and perspective health studies using more sensitive methods. Investigators involved in health studies should take into confidence the public who have the right to be involved in various issues of waste disposal, both technological and socio-economic. Whatever preventive action has to be taken must be initiated promptly even if the supporting health data is not adequate. One need not wait for disasters to occur for action to be initiated on a crisis approach. There should be greater R&D efforts particularly using newer techniques of biotechnology in reducing the toxicity of chemical wastes sites. These are some of the important conclusions reached in the study embodied in the volume under review.

Along with a number of other studies commissioned by national and international agencies, e.g. UNEP, WHO & the World Bank, the present volume would prove useful to those concerned with disposal of hazardous wastes without compromising public health.

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**Eco-physiology of Plant Membrane Lipids** by D. S. Dalgarn and D. W. Newman (published by Agro Botanical Publishers (India) Old Ginnani, Bikaner), 1986, pp. 123, Price: Rs. 120/US \$ 25.00.

This book is a very short monograph which according to the authors is primarily intended to provide background information to those not familiar with plant lipid research. The material, there-

fore, is an introductory reference aid for research workers in this field.

Chapter 1 gives a brief account of the structure of acyl lipids that are major components of the biological membranes. The fatty acid composition of different classes of lipids occurring in the leaves of a few representative plants and in tubers has been listed. The membrane structure has been presented in relation to lipid interactions in Chapter 2. The treatment of the subject of the models of membrane structure is highly cursory with a description of the fluid-mosaic model in a single paragraph. Distribution of the acyl lipids in the membranes of the sub-cellular organelles form the content of Chapter 3. The Chapters 4 and 5 deal with the biosynthesis and the degradation of lipids respectively.

Chapter 7 is concerned with the role of acyl lipids in photosynthesis although it lacks the much required details. Chapter 6 gives an account of the different effects of light quality and quantity on the membrane lipid components. The influence of plant hormones and the synthetic growth regulators has been described in Chapter 8. Plant senescence and its influence on the structure of membrane and the consequent changes in lipid content and metabolism due to the onset senescence have been briefly documented in Chapter 9.

The effects of environmental stresses including mineral, water, salt, temperature and the air pollutants on the membrane lipids have been very briefly presented in Chapters 10-14.

A fairly extensive list of references running to twenty five pages has been provided at the end which appears to be most important plus point of the book.

Throughout the book, it is apparent that there is no critical discussion of the subject matter. The material is rather only a catalogue of the effects. Some of the chapters have a summary of their own but others lack the same thus there is no uniformity. The price is rather high for a book of this size. The book on the whole can serve as a useful reference material for research workers in the area of plant membrane lipids and the physiology of stress in plants.

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**Stochastic Phenomena and Chaotic Behaviour in Complex Systems**, *Proceedings of the Fourth Meeting of the UNESCO Working Group on Systems Analysis, Flattnitz, Kaernten, Austria, June 6-1-, 1983*, (ed.) P. Schuster, 1984, pp. 271, (Published by Springer-Verlag, Postfach, Heidelberger, Plat 23, D-1000, Berlin 33, Germany).

The Synergetics series, under the overall editorship of H. Haken, has provided an excellent forum for stochastic phenomena, chaos, nonlinear dynamics and complex behaviour. Conference proceedings in fields like these, which are currently fashionable, and therefore tend to evolve rapidly, are by their very nature, outdated by the time of printing, and of historical interest three years later. This book, the twentyfirst in the Synergetics series, a collection of papers from a meeting on Systems Analysis, has marginal utility at this point in time.

The editor of this book, Peter Schuster, has had a difficult task in presenting the various contributions under this title. Less than half the book actually deals with chaos as is commonly understood, while the rest of it is devoted to systems analysis.

An interesting pedagogical study on the double-pendulum is made by Richter and Scholz; examples of this kind are very suitable for introducing the subject of nonintegrable dynamics in conservative systems. Experimental studies of chaos are confined to two examples from chemical kinetics; Hudson, Mankin and Roessler review studies of the Be-

lousov-Zhabotinsky reaction, while Olsen analyzes the chaotic motion in the oscillating oxidase-peroxidase reaction. In this context, Noyes, who has pioneered the mechanistic study of oscillating chemical reactions, points out the dangers of applying the mathematical theory of chaos to experiments. This point is worth amplifying. It is well-known that very *simple* nonlinear equations are (mathematically) able to produce very complicated dynamics; it is also possible to write a *simple* kinetic scheme to produce such nonlinear equations, as for example the "Brusselator" of Prigogine and coworkers. This emphasis on the *simple* can be misleading (although it is attractive): in particular, Noyes suggests that it is difficult to rule out (complicated) experimental fluctuations as the source of the "chaos" that is experimentally observed.

The remainder of the book deals with complex systems and the complicated behaviour that is possible in nonlinear systems analysis. Examples range from biochemistry and ecology to urban development and economics. It is not clear that the concepts and techniques developed in the study of chaotic systems can easily be applied to these more complex systems; this portion of the book is merely a collection of papers on diverse subjects.

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## ANNOUNCEMENT

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### ADVANCED WORKSHOP ON FAULT-TOLERANT COMPUTING

This workshop to be held at Bangalore, July 20-25, 1987, aims at providing vast exposure to recent developments in the area of fault-tolerant computing (FTC), with emphasis on real-time applications. It consists of a series of invited lectures by researchers from abroad and India, providing an in-depth coverage of various aspects of FTC.

This workshop assumes a greater significance as

there is a growing need for ultra high reliability and uninterrupted operation of computer systems in a variety of applications. Last date for registration is **June 1, 1987**.

For more information contact: Dr S. Murugesan, Head, Control Electronics Section, ISRO Satellite Centre, Vimanapura Post, Bangalore 560 017.

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