Polymer Motion in Dense Systems (Springer Proceedings in Physics, Vol. 29)
edited by D Richter and T Springer

(Proceedings of the Workshop, Grenoble, France, September 23-25, 1987)
Springer-Verlag : Berlin-Heidelberg-New York-London-Paris-Tokyo-Hongkong, 1988
x+307 pages 192 figures ; price : DM 98 (Hard cover)

All together thirty nine articles including nine reviews contributed by eighty six workers from different laboratories have been organised under five different heads :

(a) Local relaxation in bulk polymers,
(b) Time dependent small angle scattering experiments,
(c) Fast fluctuations near the glass transition and in the glassy state,
(d) Large scale Brownian motion and
(e) Dynamics of phase separation.

Since each article has been prepared independently, they differ in style and mode of presentation. This has a positive aspect too. Despite a quite large number of clarifications into aspects of microscopic motion, a generally accepted physical picture of polymer motion in dense systems is yet to emerge. And as such, the articles serve to demonstrate clearly the present trends of research in the field. Besides the review articles, the space for each communication is limited for presenting the details of the experiments. However, this is partly compensated by the exhaustive references cited at the end of each article.

Broadly three emerging areas of investigation on the motion of polymers in dense systems have been covered. The polymer relaxation near the phase transition and in the glassy state have been thoroughly discussed in the different articles which detail on one hand the principles of measurement involving the deutron NMR and the photon correlation techniques on the low frequency side to the inelastic neutron scattering and Raman spectroscopy in the high frequency region on the other. An astounding fourteen orders of magnitude in time are covered. Next, the neutron spin echo technique and the forced Raleigh scattering method have been employed to get new results for the internal Brownian motion in long chain molecules as well as the diffusion mechanism. Lastly, the new time-dependent neutron and light scattering methods have yielded results regarding the phase separation of polymer blends the interpretation of which suggests new insights into and possibly a significant modification of the laws of diffusion.

The reviewer feels that the book provides a remarkable up-to-date survey of the knowledge regarding polymer motion in dense system, near glass transition

and during phase separation which will not only provide immense help to the workers in the field but also the problems generated out of the present studies will attract researchers from other disciplines as well. In particular, the innovative instrumentations, as is rightly emphasized by the editors, will in near future, help reveal further details and aspects of polymer motion which in turn, is sure to deepen our understanding regarding the much sought after link between the microscopic picture and the macroscopic properties.

A N BASU
Department of Physics,
Jadavpur University, Calcutta-700 032.

F'-Centers in Alkali Halides (Lecture Notes in Physics, Vol. 298)
by M Georgiev
Springer-Verlag : Berlin-Heidelberg-New York-London-Paris-Tokyo-Hong Kong, 1988
xi+282 pages ; price : DM 43·50 (Hard cover)

It is a pleasure for me to go through the book, "F'-Centres in Alkali Halides" by Dr. Mladen Georgiev published by Spinger-Verlag under the series "Lecture Notes in Physics". I am surprised to find that so much interesting work has been done in this field in these years. The published work is ably put by the author at one place ; he rarely tries to discuss the data giving his views also. On the whole the book is a valuable contribution and serves as reference material ; so I recommend the book strongly to the workers in the field of Colour Centre Phenomena in Solids.

The book contains 20 Chapters, most of them containing few pages only. Starting from the early work of Gudden and Pohl, Smakula and Pick on F'-centres in alkali halides crystals, the author has gone through the historical development of the topic, the absorption band positions of F'-centres in different crystals, F-F' conversion processes, interaction between F' centres and various other centres (upto Chapter 7). Details of production of F' centres by various methods have been given occasionally explaining the probable mechanism involved (e.g., as in F' centre formation by pulsed radiolysis-Chapter 9). The F' centre formation and $F-F'$ centre conversions in the neighbourhood of monovalent or divalent cation impurities or anion impurity like OH^-, have been reported well (Chapter 17). Two applications of F-F' conversions have been described by the author (i) calibration of light sources and (ii) optical information storage (Chapter 18). However, this reviewer has reservations about the final efficacy of such applications. (i) Theoretical calculations related to F-F' conversion efficiency, (ii) the recent interesting work on this conversion through "bound-

polaron" theory, (iii) the various F' centre models from theoretical point of view are finely summarised in Chapter 19. In the last Chapter, Dr. Georgiev presented the work on non-linear dependence of F' centre yield and trapping coefficients on light intensity when an intense flash of light is made to be incident on crystals containing F-centres.

Finally, in "Prospects" at the end of the book, it is heartening to hear from Dr. Georgiev that, inspite of so much experimental and theoretical work, the field is still "open-ended" with even some of the basic points like the electronic energy structure of F' centre etc. not being understood completely.

Reading the book several times this reviewer felt that the author made efforts in exhaustively reporting the earlier work (including his own) in the field ; attempts by him at a critical analysis of the work would have been equally welcome.

The material in the book is up-to-date (till 1988) with a large number of references to earlier work. The printing, get-up etc. is according to international standards. This book is a desirable addition to the library of the workers in the field.

K V RAO

Department of Physics,
Indian Institute of Technology, Kharagpur-721 302.

Tissue Substitutes in Radiation Dosimetry and Measurements (ICRU Report No. 44)

ICRU Publications : Maryland, 1989
190 pages ; price : US $ 22.00 ; ISBN 0-913394-38-6

The International Commission on Radiation Units and Measurements (ICRU) has, since its inception in 1925, published over 50 reports which give latest information on physical data and experimental techniques available to the workers in the field of ionizing radiations. ICRU reports bring out the best consensus on an international level and the ICRU recommendations are acceptable to a vast majority of scientists throughout the world.

ICRU Report 44 entitled "Tissue Substitutes in Radiation Dosimetry and Measurements" describes tissue substitute materials from which "phantoms" and "radiation detectors" are constructed for use in the measurement of absorbed doses. The term "tissue equivalent material" used in earlier ICRU reports has been replaced in this report by the broader term "tissue substitute" as the ICRU feels that the earlier term has been misused in the literature.

In attempting absorbed dose estimation, for whatever reason, the most suitable materials should be used in the construction of any bulk phantom being employed. This is true for all categories of phantoms from simple tanks of liquid and regular solid blocks to complex body (anthropomorphic) models. For a given radiation type and energy, these materials should absorb and scatter the radiation to the same extent, within known acceptable limits, as the irradiated tissue. The radiation detectors also should be constructed from appropriate materials. Consequently, the choice of the wall and gas filling of ionization chambers and proportional counters and the choice of the composition of other detectors must take into account the charged particle spectrum produced by the radiation interacting with these materials and the energy lost by the charged particles in traversing the sensitive volume of the detector.

The degree of simulation offered by a tissue substitute for use as a phantom material or radiation detector is given in this report whenever necessary by providing comparative radiation interaction and dosimetric data.

The report is divided into six sections and three appendices. After a brief introduction (Section 1), the physical quantities that should be considered when tissue substitutes are selected for dosimetric studies and other measurements involving photons, electrons, neutrons and heavy charged particles are described (Section 2 and 3). Next, important human body tissues requiring simulation are discussed and their elemental compositions, mass densities and electron densities are tabulated (Section 4). Comparative interaction and depth-dose data for selected tissue substitutes are then presented (Section 5) and the report concludes with general recommendations on the use of tissue substitutes (Section 6). Detailed tabulations of the elemental compositions and physical characteristics of the 62 tissue substitutes treated in the report are provided. Interaction data for all body tissues and tissue substitutes are also tabulated. An outline of the formulation and fabrication techniques used in the production of tissue substitute materials is presented in an appendix of the report.

This is a very useful report for specialists employing tissue substitutes for phantom and detector materials and is a must for libraries in the departments of radiotherapy, radiodiagnosis, radiobiology and radiological protection.

R C BHATT

Division of Radiological Protection,
Bhabha Atomic Research Centre, Trombay, Bombay-400 085.

Neutrino Physics

(Proceedings of an International Workshop held in Heidelberg, October 20-22, 1987)

ed H V Klapdor and B Povh

Springer-Verlag : Berlin-Heidelberg-New York-London-Paris-Tokyo-Hong-Kong, 1988
ISBN 3-540-19254-9 ; ix+333 pages, 167 figures ; price : DM 98 (Hard cover)

As the title promises, the book deals with the physics of neutrinos. Presented in classified topics are the six parts of the book, namely, neutrinos in gauge theories, neutrino reactions and properties, double beta decay and neutrino mass, solar and cosmological neutrinos, neutrinos from collapsing stars, and future neutrino projects. On an average, each part contains about 5 articles, most of which are written by people who have reputation as good review speakers. Even though it is an edited compendium, there is sufficient continuity and clarity of presentations for the book to succeed as a text book for any graduate student planning to bridge the gap between the current level of research and syllabi covered in the universities.

In the first review article, Langacker has summarised with adequate introduction various theoretical expectations for finite neutrino mass in extended versions of the standard $SU_2 \times U_1$ electroweak models. Mahapatra has talked about small neutrino masses arising in gauge theories, such as left-right symmetric models, $SO(10)$ grand unified theories and superstring models. Gelmini describes neutrinos in cosmology, namely relic abundances, effect on primordial nucleosynthesis, astrophysical bounds on lifetimes and number of families, and neutrinos as possible candidate for dark matter. The topic is further continued by Roos in his article on radiative massive neutrino decays, the limits on which are again derived mostly from astrophysical considerations.

The part II of the book, the longest of all, is devoted to measured properties of neutrinos in twelve presentations. Winter has discussed all the high precision tests of the neutral weak current hypothesis of the standard model. Various searches for neutrino oscillations are presented by Kleinknecht, Zacek, Freedman, and others. The Zurich group has contested the claim of the ITEP result on the upper limit of the mass of the electron antineutrinos from Tritium β-decay, and argued for consistency of their results with a zero mass model. Tauons and the mass of tau neutrinos have been reported by Schubert, and searches for right-handed currents in nuclear β-decays by the Dutch group at Groningen.

The experiments on double neutrinoless beta-decays are extremely crucial in establishing the Majorana character of the electron neutrinos. Basically double beta-decays of ^{76}Ge and ^{82}Se are studied and the results of the Frejus experiment and of the ones at Gottard Underground Laboratory, at Irvine, at Kamiokande, at Avansk-Mine and so on have been reported in this proceedings.

It is well known that there is a persistent discrepancy between the signal received on earth by radiochemical detectors of solar neutrinos and their predictions of the standard solar model, the discrepancy being popularly known as the solar neutrino problem. The present status of the new proposed Gallium Solar Neutrino Detectors at several laboratories have been duly reported in the part IV of the book. Attempts have also been made to devise possible schemes of detection of the extremely cold cosmic background of the relic neutrinos, as outlined in a comprehensive article by Muller.

The first ever detection of neutrinos of extra-solar origin took place when several neutrino detectors had simultaneously detected neutrinos supposedly coming from SN 1987A, the greatest supernova of the present century. The theories of the collapsing massive stars gained a tremendous support from these neutrino observations. The initial enthusiasm with which astrophysicists and the particle physicists worked together in an effort to understand these results is expressed through the articles in part V of the book.

The book thus contains enormous amount of material related to the most relevant issues of the current neutrino physics. Nevertheless, the subject is at present developing at such a fantastic speed that to many specialists, the content of the present book would appear far outdated. Many new experiments that were projected at the time of writing the book are now producing significant results, and so on. Even so, the book can be highly recommended for any beginner and for people who want to keep an eye on the developments of the neutrino physics up to 1987.

N C RANA
Theoretical Astrophysics Group,
Tata Institute of Fundamental Research,
Homi Bhabha Road, Bombay-400 005.