BEHAVIOUR OF INSULATION

Dielectric Relaxation

By Vera V. Daniel. Pp. xiv+281. (Academic Press: London and New York, 1967.) 75*s*; $13.

THE days are remote when a Ferranti could suggest paper, when questioned about the possibilities of a cable for high voltage (10 kV ?) transmission. The days are also gone when a famous Metropolitan-Vickers engineer, taking part in one of the incessant conferences to consider the reduction of manufacturing costs, could afford to say in effect, even if I do inadvertently misquote. "The trouble with our insulation is that it is too thick". The lessons at any rate are clear: no one makes a significant advance without either introducing a new material or significantly achieving a new understanding of an old one. The book *Dielectric Relaxation* has certainly contributed greatly to our understanding of the behaviour of insulation for a specialist few.

It was to be hoped that this topic, which is of great importance to the electrical engineering industry, might have been presented in a form more suited to its reading; this is particularly so, for the book has emanated from the Electrical Research Association. For example, the following specific criticisms could well be advanced. The MKS system, and for that matter SI units, are now universally accepted throughout electrical engineering; Miss Daniel's book uses CGS units throughout. The physicists' notation for complex terminology, which is $\varepsilon' + i\varepsilon''$, is not used; the form acceptable to engineers, $\varepsilon' - i\varepsilon''$, is used, although i is used instead of j to represent the square root of minus. Furthermore, the physicists' terminology such as "Dielectric Constant" is used even though the author observes that engineers prefer "Relative Permittivity".

The book in general is very good because it has been cast correctly towards physicists, engineers and chemists. It reduces mathematical proofs to a minimum and lucidly explains prevailing theories pertaining to the physical behaviour of dielectrics. The original criticism still remains, however, because couching the book in terms which are acceptable only to pure science research workers makes it difficult for it to be used by the majority of people most concerned with dielectrics; much is heard about two cultures, but it often appears that no concessions are to be made in terms of communication between the engineer and the physicist ! This criticism is particularly apt when one considers the lack of sufficient detail in certain chapters, such as chapter six on measurements, for example. A practical engineer or, for that matter, a practical physicist would gain little from such a chapter because the material is lightweight and there are far better books covering the subject. A confusing misprint appears in chapter six in connexion with the Schering bridge equation, which should obviously be $Z_1 Z_3 = Z_2 Z_4$.

All those interested in dielectrics, their physical response and the interpretation of their behaviour should find the book both illuminating and very useful. It is one of the very few books attempting to relate theory with practice; this is an extremely difficult task when the theory has been derived for simple models, when practical insulation is in reality very complex.

COLIN ADAMSON

ALL ABOUT LASERS

Gas Lasers

By Arnold L. Bloom. (Wiley Series in Pure and Applied Optics.) Pp. ix+172. (Wiley: New York and London, 1968.) 80*s*.

Laser Parameter Measurements Handbook

By H. G. Heard. (Wiley Series in Pure and Applied Optics.) Pp. xii+489. (Wiley: New York and London, 1968.) 150*s*.

THESE books are both in the Wiley Series in Pure and Applied Optics, and supplement one another rather well in the field of gas lasers. Bloom's book is intended for scientists who need to use gas lasers and who wish to understand the principles of their operation so that they can select a laser best suited to their particular needs and can appreciate the design criteria which limit its performance. The handbook is really a laboratory reference work dealing with all the available techniques for measuring properties, from noise and coherence to energy of many types of laser. It contains the contributions of thirty-seven authors who conducted an extensive literature survey.

Gas Lasers deals first with the fundamental properties and principles of laser action. Mathematical techniques are used wherever they are appropriate, but one of the best features of the book is that it emphasizes the physical principles involved rather than trying to preserve mathematical rigor. An interesting derivation of the basic equations is given using an analogue of Bloch's phenomenological equations to describe the behaviour of classical variables directly. Some discussion of the rate equations could perhaps usefully have been included as well. The next section reviews the practical characteristics of neutral atom, molecular and continuous ion gas lasers and treats briefly the effects of applied magnetic fields and tube length and bore on the gain of the lasers. The properties of resonators and methods of achieving single spatial or temporal mode operation are discussed. Optical characteristics of laser beams including the effects of truncation and aberration in focused beams and plasma and mode interaction noise are compared with the characteristics of "ideal" Gaussian laser beams. Finally, some applications are discussed and safety problems reviewed.

The *Laser Parameter Measurements Handbook* is unique in the sense that it deals comprehensively with a wide range of measurement techniques spanning a wavelength range from 200 nm to 0·4 mm and suitable for lasers operating in modes from continuous to Q-switched. It includes a discussion of some statistics of data analysis and the problems associated with sampling the required characteristic of the laser beam, particularly that of the interaction of the beam with the sampling device.

Newer techniques like resonant transition monitoring, harmonic conversion and photochemical decomposition are evaluated. Each chapter reviews the principles of and the chief problems associated with the measurement of the parameters concerned, which are the beam and gain parameters, the energy, the wavelength, the frequency stability and the noise and modulation on laser carriers. The editor takes into account the fact that the book covers a wide variety of fields, each with its own system of symbols, by including in each chapter a list of its own principal symbols. This is an effective way of dealing with the problem. It is unfortunate, although no doubt understandable, that the references do not include any after 1966. Because the book covers thoroughly such a wide range of subjects, it seems well worth buying as a reference work.

LINDSAY WARD

NUCLEAR MODELS

Collective Models of the Nucleus

By J. P. Davidson. Pp. xii+238. (Academic Press: London and New York, August 1968.) 112*s*.

THIS monograph gives a general review of collective models of the nucleus mainly from a phenomenological point of view. A basic introduction to macroscopic collective theory is given in a chapter on the physics of the liquid drop and some useful appendices on rotation matrices, collective parameters and model state functions. This is followed by three chapters on the rotational and vibrational models for even–even nuclei, odd–A nuclei and odd–odd nuclei. The applications of these models in the inter-