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**BOOK REVIEWS**


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**Superconductivity and Superconducting Materials** by A. V. Narlikar and S. N. Ekbote (Published by South Asian Publishers Pvt Ltd, 36, Netaji Subhash Marg, Daryaganj, New Delhi 110 002) pp. xi + 294. Price Rs. 140/-

This book attempts to critically assess the recent advances in the field of superconductivity both from the scientific and technological points of view. This attempt is to be welcomed at the present moment especially in the Indian context. The book is divided into seven chapters and may be roughly divided into two parts: (1) Chapters I to IV which deal with the basic ideas of superconductivity and Type I and Type II superconductors, industrial superconductors and their applications and micro structural effects and (ii) Chapters V, VI and VII which are concerned with novel materials such as organic and amorphous superconductors, materials which become superconducting under high pressure and those in which magnetic and superconducting order coexist.

The first part of the book is, on the whole, well-written except perhaps for chapter I which is 'a hurried retrospect' indeed of the basic phenomenon of superconductivity. It may however be contended that this material is discussed already in detail in many other textbooks and monographs, yet a somewhat detailed account of the BCS theory is conspicuous by its absence; this omission is all the more unfortunate in a book which claims to put forth an alternate view point to the BCS theory in its later chapters. The GLAG theory could also have been allotted some more space; however the account, which follows these sections, of flux motions and pinning of vortices is lucid. Micro structural effects are treated in detail by the authors one of whom (AVN) has made many significant contributions to this field. The fourth chapter deals with industrial superconductors *e.g.* superconducting magnets. The account given of stabilisation techniques and performance of superconducting magnets is sketchy, but preparation methods for superconducting materials are dealt with in somewhat greater detail. The topic of applications of superconductors is treated superficially.

The main points made in the subsequent chapters may be summarised as follows:

1) Organic materials, as a rule, pass through the

spin density wave (SDW) state before becoming superconductors.

2) In amorphous materials the systematics of  $T_c$  appear not to be determined by changes in the electronic or the phonon systems alone. Attention is also drawn to an 'inverse isotope effect' in  $H(D)$  implanted transition metals. These features are cited in order to highlight the difficulties in explaining superconductivity in terms of the generally accepted electron-phonon mechanism.

3) Several unresolved anomalies in high pressure studies of superconductors are noticed and it is argued that at least some of these anomalies may be satisfactorily answered if one invokes the role of exchange interactions in the conduction band for the occurrence of superconductivity.

4) Experimental results and especially the authors' own work in conduction electron spin resonance in itinerant magnetic superconductors are summarized in the last chapter. The authors' suggestion that superconductivity can possibly occur through exchange interaction among conduction electrons is reiterated and the theoretical examination of this question by Schmit *et al* is cited in support of this suggestion. While it appears too early for us to comment decisively on this question it may be stated that this represents a certain point of view which has been painstakingly developed by the authors in recent years. The evidence marshalled in support of their hypothesis is impressive but confusing and much experimental as well as theoretical work may have to be carried out before the question can be resolved satisfactorily. However this latter half of the book can hardly be said to have been written with the needs of the fresh graduate student and the materials engineer in mind!

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**Energy from Biomass** by O. P. Vimal and P. D. Tyagi (Published by Agricole Publishing Academy, 308, Defence Colony Flyover, New Delhi 110 024), pp. 440, Price: India Rs. 300.00, Other countries \$60.00.

The authors are to be congratulated for bringing out a topical work compiling valuable information on Energy from Biomass with special reference to Indian experience. Dr Maheswar Dayal has written an appropriate foreword setting out the subject in perspective.

The book is structured in two parts. The first deals with an overview covering current energy scenario in India, briefly indicating possible strategies for area dependent pragmatic approaches and usable options in harmony with the socioeconomic needs of the country. The concluding remarks rightly stress the interdisciplinary nature of the subject involving biotechnology, ecology, photosynthetic productivity and study of globally available energy alternatives prior to formulating a national energy policy. They rightly stress the need for detailed investigations into organised aquatic biomass production, afforestation, extension of biogas technology, conversion of biomass to chemicals, bioconversion of lignocellulosics to ethanol and survey and selection of marine nitrogen fixing organisms using solar energy and sea water for nitrogen fixation.

Part two comprises a complete bibliography covering general and specific biomass, organic residues, energy plantations, the alcohol programme etc. The book will be most useful both to the specialist and the layman. However with the vast experience of the authors one would have expected a critical evaluation instead of a mere compilation. It is hoped that this valuable volume would be followed by a companion volume with, if needed, contributions by Indian authorities on the subject.

The publishers appear to have brought out the book in a hurry. Not enough attention has been paid to usage and grammar of the language. This does not detract the value of the book which should find a rightful place in libraries and research institutions dealing with biomass and energy. The price is steep for individuals. The get up is reasonably good.

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**Annual Review of Nuclear and Particle Science** by J. D. Jackson, Editor, H. E. Gove and R. F. Schwitters, Associate Editors, (Annual Reviews Inc., Palo Alto, California 94306, USA) Vol. 33, 1983, Pages viii + 706.

The present volume in this important annual series contains sixteen reviews; ten of these are devoted to high energy physics, four are devoted to nuclear physics while the remaining two deal with cosmic rays.

The major new theoretical development, namely the further unification of Quantum chromodynamics, describing strong interactions, with Salam-Weinberg-Glashow unification of electromagnetic and weak interaction, is described by P. Ramond. These grand-unified theories open up the exciting possibility of understanding the origin of the Baryon-Antibaryon asymmetry in the universe. E. W. Kolb and M. S. Turner cover these applications of high energy physics to cosmology. The important development concerning 'inflationary universe' is however, only very briefly mentioned.

The discovery of  $\psi$  resonances required the existence of a new quark *i.e.* b-quark. Their study thus allows us to study the properties and interactions of b-quarks. These are discussed by P. Franzini and J. Lee-Franzini. The progress of the last five years in the "measurement of Charmed Particle Lifetimes" is covered by R. A. Sidwell, N. W. Reay and N. R. Stanton. This has required the use of "fine-grained vertex detectors followed by a downstream spectrometer". "Physics with the Crystal Ball Detector" described by E. D. Bloom and C. W. Peck is again mainly concerned with charmonium states and radiative transitions from the  $\psi$  state. Search for axion, F-meson etc is also covered. The Crystal Ball detector with its high detection efficiency, large solid angle coverage, high precision energy measuring capability for photons ( $\sim 100$  MeV), has proved to be very versatile. These reviews are primarily devoted to the experimental results. "Sum Rule Approach to Heavy Quark Spectroscopy" is discussed by M. A. Shifman. The light quark spectroscopy is however quite profitably discussed using "Bag Models of Hadrons" and are described by C. E. deTar and J. F. Donoghue.

The deep inelastic lepton experiments from the nucleons (or nuclei) have come of age. We can now use longitudinally polarised electron beams on longitudinally polarised proton targets. This allows us to discuss "Internal Spin Structure of The Nucleon" (V. W. Hughes and J. Kuti). Further the use of muon beam

allows us to study the structure function for a wide range of momentum transfer, details of heavy quark production and possible scaling violations. These are reviewed by J. Drees and H. E. Montgomery. "Progress and Problems in Performance of electron-positron Storage Rings" by R. D. Kohaupt and G.-A. Voss is a review from the point of view of an accelerator physicist.

We now come to reviews in the area of nuclear physics. A. D. Jackson in "Nuclear Matter Theory: A Status Report" provides a rather balanced picture of this complex area. The "Fusion reaction between Heavy nuclei" has been a very active area. J. R. Birkelund and J. R. Huizenga, mainly restrict themselves to a discussion of various models for fusion excitation functions. A list of 385 "reactions with measured cross sections" is also given. "Channeling Radiation" technique has proved a rather powerful technique and is covered by J. U. Andersen, E. Bonderup and R. H. Pantell with emphasis on MeV-particle beams. "Inelastic electron scattering from Nuclei" is a time-honoured method for determining the nuclear charge and current distribution. Results on nuclear structure are reviewed by J. Heisenberg and H. P. Blok.

J. A. Simpson describes our present understanding about "Elemental and Isotopic Composition of the Galactic Cosmic Rays". R. C. Reedy, J. R. Arnold and D. Lal cover the evidence on "Cosmic-Ray Record in Solar System Matter" such as Earth, Moon and Meteorites.

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**Cell and Tissue Culture Techniques for Cereal crop Improvement** (published by Science Press, Beijing, China and International Rice Research Institute, Manila, Philippines), 1983, pp. 455, Price - Not known.

This title appearing in a soft cover edition contains the proceedings of the Workshop on "Cell and Tissue Culture Techniques for Cereal Crop Improvement" co-sponsored by the Institute of Genetics, Academia Sinica, Beijing, China and IRRI, Manila.

The symposium includes chapters on 1. Production of haploid plants 2. Regulation of morphogenesis

3. Crop Improvement through tissue culture  
4. Screening mutants through tissue culture  
5. Preservation of germplasm 6. Genetic Engineering  
7. Poster abstracts 8. Workshop recommendations.

These proceedings present the achievements in anther and pollen culture in terms of progress in technological development in various aspects of tissue culture. Impressive progress has been made in China and the literature of which in English is normally not available for scientists in other countries is extensively presented in this proceedings. This book also brings out the remarkable progress made in China not only in rice but also in wheat, maize and other dicot crops like rubber. Latest advances in basic research on anther culture in rice at IRRI from 1979 are also presented bringing out the genotypic variation among rice varieties in anther response and regeneration of calli. Genetic variability in rice plants regenerated from cell culture, variety improvement in rice by anther culture and recent process in rice embryo culture in IRRI are useful papers in rice culture improvement.

In general, a wide range of methodologies, techniques, applications and usefulness and achievements through anther, pollen and ovule culture are reported and most of the topics have been dealt with respect to rice. In this aspect this book is very useful for biologists, cytogeneticists and plant breeders engaged in rice improvement. Approach through ovule culture for haploids production is also presented. Almost all possible approaches known to this date, on anther and pollen culture technique, the basic studies on various aspects of morphogenesis in anther culture and the impressive advancements and success made have been dealt with effectively.

The background and authoritative status paper by Dr C. Nitsch on the technique on haploid production is very useful. Another base paper by Dr Kiyoharu Oono on genetic variability in rice plants regenerated from tissue culture is informative. Production of haploids through chromosome elimination technique with *Hordeum bulbosum* is now a proven approach. This has been well presented by Dr C. J. Jensen in his paper on "Producing haploid plants by chromosome elimination". Plant Breeding through haploidy by wild species crosses and chromosome elimination, biological materials for cell and tissue experiments on gene transfer and related aspects have been critically discussed and presented by him.

All the three papers dealing with the regulation of morphogenesis, especially the one on somatic embryogenesis in cereals by Dr I. K. Vasil are very instructive and informative.

The third and fourth parts of the workshop deal with application of cell culture for the crop improvement. The papers cover wide range of applications namely cellular level selection for stress tolerance, herbicide tolerance, increased ability to protein synthesis and selection for salt tolerance, resistance to toxins of important diseases and also for base analogues. Procedures for various approaches on screening have been also presented in detail. Along with the previous chapters, this portion will provide the scientists an effective exposure on the methodology and possible applications of this approach. The paper on protoplast culture and fusion and generation of newer kinds of plants by Schieder and the paper "Beyond haploids" by Dr Carlson are very stimulating and underline the future perspectives very well. The portions on preservation of germplasm and genetic engineering makes advanced and comprehensive reading

for the practising scientists. There is also a detailed paper on cryopreservation and its scope and implications by Dr A. Withers.

On the whole this proceedings on cell and tissue culture and its application in Agriculture will be very much useful to those who would like to develop this subject for specialisation and practising. The deliberations of the conference by scientists from dozen countries and the recommendations will no doubt be well received by the other scientists working on this aspect. This will serve as a useful source book for frequent reference.

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## NEWS

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### IAEA ANNUAL REPORT

Now that almost all the countries throughout the world have started generating electricity with the Atomic Energy, the following brief review of the Annual Report of 1983 published by the International Atomic Energy Agency (Wagramerstrasse 5, P.O. Box 100, A-1400, Vienna, Austria) will be of interest to *Current Science* Readers.

The International Atomic Energy Agency now forecasts that nuclear power plants will take a 20% share in electricity generation in the year 2000. This will be supplied by a worldwide nuclear capacity of 485–725 gigawatts (electrical), significantly less than the 720–950 GWe projected in 1982.

In its annual report for 1983, now published, the IAEA notes that nuclear power plant investment costs continued their general strong rise during the year. As these costs constitute up to 80% of the total costs of nuclear-generated electricity, concern about nuclear power now relates to the technical and economic performance of nuclear power plants. Accordingly, in addition to the standardization of licensing procedures and the reduction of construction times, nuclear power plant reliability is being emphasized as a key question from the point of view of ensuring the

long-term competitiveness of nuclear power.

The world total of installed nuclear power generating capacity reached 191 GWe by the end of 1983, with 25 new plants being connected to the grid during the year. Three of these new plants were in developing countries. In total, nuclear power accounted for about 12% of the world's total electricity generation in 1983. In the near term, the IAEA expects that although work on several plants now under construction may be delayed or cancelled, the world total of installed nuclear generating capacity in 1985 will be 255–275 GWe, accounting for 15% of the world's electricity generation.

The report notes that renewed interest in small and medium power reactors, for both electricity and heat generation, may lead to new markets, if the economic competitiveness of such reactors can be established.

There was a continued slow-down in programmes for the development of advanced reactor systems in several countries, especially the United States. However, the report notes, 1983 was also marked by a trend towards increasing international co-operation—for example, in the development of liquid-metal cooled fast breeder reactors in Western Europe.