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## BOOK REVIEWS

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**Field Theory: A Modern Primer, 1981.** (Ed. Pierre Raymond) Published by The Benjamin/Cummings Publishing Co. Inc., Reading, Massachusetts, USA. Pages: 397, Price: \$ 26.50

The book deals with the structure and the methods of perturbative analysis as a tool for renormalisation. The idea of renormalisation is shown in detail for  $\phi^4$  and only lightly to gauge theories (GT).

The idea and importance of action(s) is given in the beginning. Invariance of field theories with fields (scalar, spinor) having certain transformation properties is shown. Certain tips to find true action are quoted. Way to find the action is shown for cases of scalar and spinor fields.

The Feynman Path Integral (FPI) in Field Theory (FT) is given in detail. Analysis of Green's function, finding the effective action for propagators are lucidly described. FPI is found using the saddle point method involving perturbation expansion of the fields. The way to find quantum corrections using  $S$  function is given.

Perturbative analysis of  $\phi^4$  FT is done in detail. Removal of divergences through redefinition of fields and coupling constants for each order in the perturbation is demonstrated. Various prescriptions for renormalisation are given. Expressing the Green's function in Minkowski space and the condition under which they can be identified with transition amplitudes are brought out. The method of FPI for fermions is described in the case of free and interacting fermions. Of course, the condition of renormalisation rules out a large number of possible spinor interactions.

Examples are given as to obtain field theories for spin  $>1$  by making the global symmetries in local FT of spin 0,  $\frac{1}{2}$ . Various Lagrangians satisfying gauge symmetry are presented. Gauge symmetry in the case of non-abelian lie symmetry is shown. Young-Mills field is studied in detail.

The Hamiltonian and Faddeev formulation of FPI for gauge theories are given. Perturbation analysis is done for QED and Young-Mills FT. A brief mention of asymptotic freedom is made.

The book is ideal for people who want to learn FT. Rigour is always sacrificed for clarity and almost always new ideas are presented through examples. The book teaches us to solve problems in (perturbative) field theory and introduces the readers to the all important field of gauge theory. The idea of Renormalisation, central to all FT is conveyed in a very easy manner. No knowledge of axiomatic field theory nor its high powered mathematics is necessary. The exercises keep the reader on his toes and help to clarify a lot of ideas. A must for any one who wants to learn FT.

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**"Crystal Cohesion and Conformational energies" Ed.**  
by R. M. Metzger, Topics in Current Physics, Vol.  
No. 26, Springer Verlag, Berlin, Pages: xii + 154  
(1981). Price: \$ 23.00

This is a volume in the Springer series, aimed at providing quick and contemporary reviews on topics in current physics. This volume is a collection of 4 specialist reviews on a subset of the general problem of crystal cohesion. It assumes, on the part of the readers, an acquaintance with the general theory of the solid state, especially in relation to crystal energies and cohesion.

When the ideas of the crystal structure of solids began to be accepted in the early part of this century, there were parallel developments in understanding the nature of interatomic forces. The names of at least a dozen famous scientists are associated with these developments. In the postwar period, the Soviet crystallographer Kitaigorodsky showed how one could understand the structure of a very large number of organic solids by relatively simple considerations of the packing of the molecules. Naturally the first review article in the book by D. E. Williams discusses the current trend in this. The non-bonded potential parameters obtained from a few simple structures are applied to a large number of neutral organic solids. Crystal cohesive energies, lattice energy minima and some features of vibration spectra are obtained. The next chapter by F. A. Momany moves on to the structures of peptides. Here considerably more computations are needed along with correlations with the biological activity data. The goal is to be able to design specific drug structures, which is far away but visible. This chapter is followed by the review by R. M. Metzger of the cohesion and ionicity in organic semiconductors and metals. The measure of ionicity becomes a crucial issue in these calculations. The final chapter is by B. D. Silverman and deals with the TTF-TCNQ class of quasi one-dimensional materials. The donor-acceptor complexes and the molecular orbital calculations of the stability of these complexes are briefly reviewed.

The reviews, each self contained, show the current status and the vitality of the topics. As mentioned earlier the book is not meant to be comprehensive. It illuminates a few selected areas. The style is informal and varied. The offset printing enables the references

to be up-to-date. The book is a good addition in the series of current topics in physics. It is a recommended buy for all those seriously working in this area.

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**Solar Radiation Over India** by A. Mani and S. Rangarajan, (Allied Publishers Pvt. Ltd., A-104, Mayapuri, Phase II, New Delhi), 1982. Pages: 646. Price: Rs.350/-

The book under review is a companion volume to an earlier book entitled 'Handbook of Solar Radiation Data for India' published in 1980. The earlier book was concerned with giving measured values of solar radiation, sunshine hours and climatological data for 18 stations all over India. These measurements have partly formed the basis for the computations presented in this book.

The information is essentially presented in the form of tables, which can be grouped under three categories: (1) Solar radiation values on a horizontal surface, (2) Tilt factors for global solar radiation, and (3) Meteorological data.

The solar radiation tables are presented for 145 stations covering all parts of India. Two types of predictive methods have been used for computing the values. In one method, regression analyses are used to show the dependence of solar radiation on parameters like sunshine and cloudiness for the 18 stations where measurements are available. The constants obtained from these regression analyses are then used to compute the radiation at the stations where measurements of sunshine or cloudiness are only available.

In the second method, the depletion of extra-terrestrial radiation by absorption and scattering as it passes through the atmosphere is accounted for in order to predict the availability on the earth's surface.

The solar radiation values presented are for horizontal surfaces. In order to use these values on tilted surfaces, it is necessary to obtain tilt factors. Tilt factors for global radiation for the same 145 stations are therefore presented in the next set of tables. These values are given for each month and for eight orientations which cover the entire range of interest.

Finally meteorological data are tabulated in the form of values of air temperature, humidity, wind speed and rainfall. These data are given for 105 stations.

The tables are preceded by a series of chapters which describe the theory and the models used for computing the solar radiation values and the tilt factors.

Like the preceding book, the present book will pro-

vide timely and valuable information to all scientists and engineers who are interested in direct or indirect applications of solar energy. It will also be of considerable use to engineers in other fields like refrigeration and air conditioning who are interested in calculating quantities like solar loads on buildings. In conclusion, this reviewer would like to commend the speed with which the information in the book has been compiled and published. It reflects in a sense, the urgency of the energy problem.

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**Water Pollution and Management Reviews 1981 Ed.** C. K. Varshney (South Asian Publishers Pvt. Ltd., 36, Netaji Subhas Marg, Daryaganj, New Delhi 110 002) Pages: pp. ix + 154. Price: Rs. 95/-

This publication, as the editor says in the introduction, "is intended to overcome the communication gap by providing up to date information on topics of current interest" and "is aimed to provide present state of knowledge on specific topics to enable a rational decision-making and help plan future research more effectively".

The review articles include: "Water for the Third World" by Asit K. Biswas; "From Forest to Fish: Biology of Woodland Streams" by N. K. Kaushik; "The Biological Monitoring of Surface Waters" by Bernard Reiff; "Water Hyacinths for Controlling Water Pollution" by B. C. Wolverton; "Water Quality Indices" by B. N. Lohani; "Surface Water Management in Landscape Architecture" by Arther L. Sullivan; "Impact of Man on the Hooghly Estuary" by P. Ray; "Recent Developments in Coastal Zone Ecology" by Peter J. Holmes and Andrew J. Newton; and "Management Strategies for Coastal Marine Pollution" by A. Prakash.

The selection of most of the material and the style of presentation leave much to be desired. To what extent the aim of the publication will be achieved remains to be seen.

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