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**REVIEWS**


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**Golden Jubilee Commemoration Volume of National Academy of Sciences.** Edited by V. S. Srivastava. (Naya Prakash, 206, Bidhar Sarani, Calcutta 700 006), 1980. Pp. 746. Price Rs. 240.

This book of 746 pages is a collection of 27 articles on a wide spectrum of areas of science. No one scientist can follow more than a quarter of these and much less be able to review. Yet on reflection one finds a distinct use of such collection of articles. Regular research papers cannot deviate from the rigid framework of "introduction, methods, experimental and discussion", or reviews from merely presenting a summary of what happened. A large number of the 27 articles, but not all, did give a different sense of purpose indicating the need for new approaches or deliberately inducing the reader to expand his own thinking. A commemoration volume thus would have served the community it represents, where value cannot be measured. I will comment on a few articles that I read but cannot claim to have understood in full. The first one by Ramachandran on "Computerization of Logic" is enigmatic, introducing sanskrit terms Syad—Nyaya—Yantra—electronic logic machine. The speciality of these articles is exemplified in the historical touch given by Maramorosch on the discovery of tetracycline sensitivity of mulberry dwarf disease and how a casual suggestion of Koshimizu led to it. This article is an excellent overview to spiroplasmas of plants and animals with concern on a number of cash crops of interest to India (sandal, rice, cotton, potato, brinjal, sesamum), as well as other developing countries in Africa and West Indies. While the work on lactate dehydrogenase presented by Siwan, Sharma and Talukdar gave an Indian bias, a welcome feature appropriate for such proceedings, the reviewer is puzzled with the detailed description (example: effect of buffers). The article on a functional approach to the origin of life problem by Bahadur, Ranganayaki, Folsome and Smith dealing with microstructures, euphemistically called "Jcewanu", consisting of salt complexes having certain catalytic properties, gave a more balanced view than was expected in view of its controversial nature. Wild life resources of India describe how from the time of Mahabharata to recent "British Raj" hunting had been in "human blood" as a pastime that led to extinction of many species—an irreparable loss—an interesting article to read, but with conflict of interests, as for example while on one side monkeys are traded for foreign exchange on the same line as ivory, drastic measures of presenting their damaging

urban property was frowned upon. A short article by Krishnamurthy on Computers, Topology and Drug Design scans from basic mathematics to quantum chemical method, to chemical structural analysis to drug design—a crisp presentation of role of computers, combinatorics and statistics. A review on quarantine for seed by Neergaard looked more like a document of a Government Department, but gave important information on the procedures. Manna's article on the living mutagens gave a good perspective of this field and it is particularly alarming to note that *Vibrio cholera* and its toxin have chromosome-breaking effects. The extensive article by Rao and Moorthy is more like a chapter in a text-book on the radiation chemical concepts and mechanisms.

The high cost will limit circulation of this book only to some libraries. It is hoped that young scientists reading some of these pages will be inspired to develop new thinking of their own.

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**Free-Electron Generators of Coherent Radiation.** Eds. S. F. Jacobs, H. S. Pilloff, M. Sargent III, M. O. Scully and R. Spitzer. (Addison-Wesley, Reading), 1980. Pp. xix + 813. Price: \$ 36.50.

The book is based on the lectures delivered by experts at the workshop sponsored by the office of Naval Research and held at Telluride, Colorado. The book is divided into four parts under the headings—tutorial, general interest, variable wigglers, research interest articles. The book, more or less tries to cover a wide spectrum of free electron laser physics along with many technological aspects.

I have especially enjoyed reading tutorial articles of Pantell; Hopf, Kuper Moore, Scully; Kroll *et al.*, Walsch, sprangle *et al.* These articles are extremely well written and explain the concepts involved right from first principles. In fact any one wanting to learn free electron laser physics could very well start from these tutorial articles and come right upto the recent aspects of free electron sources of coherent radiation. The book should be quite useful to graduate students. Most of the articles are self-contained and clearly written, thereby making it easy for readers to follow. Kroll's treatment of relativistic synchrotron radiation in a medium (Chapter 12) is

quite stimulating. The description of free electron laser by Colson and Ride (Chapter 13) in terms of the second order phase transitions is very interesting. Articles on variable wigglers are also well done. I especially appreciated the articles by Mani, Louisell *et al.*, which present a very nice treatment from first principles. The articles in the category "research interests" have some interesting suggestions, for example Gover's suggestion of using electrostatic bremsstrahlung which may be better at smaller wavelengths. It is nice to find the details of topics like the effect of transverse gradient in the periodic magnetic field, on the behaviour of free electron laser.

In my opinion the book is a very valuable addition to any library. I am sure that many physicists interested in laser physics as well as in the general area of the radiation-charged particle interaction would like to possess a copy of the book. The book is very moderately priced for its size and quality of paper used.

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**Gauge Fields—Introduction to Quantum Theory.**

By L. D. Faddeev and A. A. Slavnov. (Benjamin Cummings Publishing Co.), 1980. Pp. 232. Price \$ 28.50.

This text on the quantum theory of non-Abelian Gauge fields has been written by two of the foremost experts in the field. Faddeev (along with V. N. Popov) pioneered in 1967 the now widely used procedure for obtaining Feynman rules for such theories. Slavnov (and independently J. C. Taylor) generalised the Ward Identities, first used in quantum electrodynamics, to the non-Abelian context. The credentials of the authors for attempting such a book are therefore impeccable.

After an introductory chapter where the origin and overall structure of the Yang-Mills theory is described, the substantive portion of the book begins with a chapter on the functional-integral formalism. This is very welcome because as yet there are not too many texts on this basic technique. This chapter includes a discussion of path integrals for Fermi fields as well as the procedure for systematic perturbation expansion starting from the path integral.

The next chapter quantises the Yang-Mills field. The canonical Hamiltonian is derived, but the quantisation is basically carried out in the path integral formalism. The presentation is such that generalisation to non-Abelian theories for higher  $SU(N)$  groups is straightforward.

This is followed by Chapter 4 which forms the hard-core of the book. It deals with the renormalisation of the quantum Yang-Mills system. Readers familiar with the complications of the comparatively simpler problem of renormalising QED, will enjoy and appreciate the elegant presentation here. The Generalised Ward-identities are derived (including anomalies) and the technique of dimensional regularisation is described.

The book concludes with a brief section on applications of quantum gauge theories to both electro-weak and strong interactions.

It is both natural and useful to compare this book with another recent book on Gauge Theories by J. C. Taylor (Cambridge University Press, 1976). I would say that the Faddeev-Slavnov book is pitched at a somewhat higher technical plane than the Taylor book. A systematic and fairly rigorous treatment of quantisation is given. Taylor's book is comparatively more physical, and the notions of the Higgs phenomenon, spontaneous symmetry breaking, etc., are emphasized. This difference between the two books is welcome since they nicely complement one another. Readers interested in learning the basics of quantum gauge theory and its role in particle physics would be advised to study both these books in conjunction. They would also be advised to become familiar, as a prerequisite, with some standard text on quantum field theory, such as the one by Björken and Drell (McGraw-Hill, 1965).

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**Annual Review of Biochemistry.** Vol. 49. Editors : E. Snell, P. D. Boyer, A. Meister and C. C. Richardson. (Annual Reviews Inc., Palo Alto, California, U.S.A.), 1980. Pp. vii + 1269. Price : USA \$ 21.00. Elsewhere \$ 22.00.

With the phenomenal growth in the number of journals and publications in recent years, it is becoming increasingly difficult to keep abreast with biochemical literature. Consequently one has to depend heavily on authoritative review articles, a need admirably satisfied by the *Annual Review of Biochemistry*. This volume, as in the past, covers many topics of contemporary interest. Besides the prefatory chapter written by Severo Ochoa, it contains thirty-four articles covering broadly the areas of enzymes, enzyme regulation, proteins, energy transduction, biochemistry of some physiological processes and molecular biology and protein synthesis. Ochoa's article, a personal account of his association with many major discoveries in biochemistry, is very inspiring and instructive.

Among the articles on enzymes is an exhaustive review on phosphorylase  $\alpha$ , its primary and three-dimensional structure and their relation to function and articles on transglutaminases and collagenases. Some of the recent work in lipids is reviewed in the articles on enzymes of glycerolipid synthesis in eukaryotes and on lipolytic enzymes and plasma lipoprotein metabolism. The article on the present knowledge of the molecular details of enzyme catalyzed transfer of phosphoryl groups, so ubiquitous in nature, is of profound interest. Mechanism of action of folate- and bipterin requiring enzymes, selenium dependent enzymes, enzymes of pyridine nucleotide synthesis and hormone-sensitive adenylate cyclase are the other aspects covered in this volume. Enzyme regulation is also adequately reviewed with excellent articles on control of proteinases, their inhibitors, regulation of hepatic fatty acid oxidation, actin-myosin-ATP interaction and regulation of tryptophan biosynthesis. The review on enzyme cascade systems is particularly interesting. In addition there are useful articles on

cytochromes, iron transport proteins and on the calcium binding protein-calmodulin.

Energy transduction in biological systems, one of the most challenging problems in biochemistry, has been ably reviewed in two articles, one on chloroplast ATPase complex and the other on proton-translocating pumps of oxidative phosphorylation. Blood coagulation and phagocytosis are the other physiological processes that are reviewed.

In the field of molecular biology, there are six extremely interesting reviews. These include articles on molecular genetics of yeast, repeated genes in eukaryotes, integrated genomes of animal viruses, nucleosome structure, replication of eukaryotic chromosome and the discontinuous replication of DNA. All the articles are well written providing a wealth of information and a clear perspective of the topic.

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