Quantum Field Theory: A 20th Century Profile. A. N. Mitra (ed.). Hindustan Book Agency and Indian National Science Academy. 2000. 914 pp. Price: Rs 1500.

Quantum field theory (QFT) in all its breadth, is one of the grandest discoveries of twentieth century science. Soon after quantum mechanics was developed in order to understand the properties of few-particle microscopic systems like the hydrogen atom, experimental observations (such as spontaneous decays of excited states of atoms) forced physicists to extend the same ideas to systems with a very large number or even an infinite number of degrees of freedom. The first example of a QFT was the electromagnetic field which has two degrees of freedom at each point in space. Over the years, people learned how to develop QFTs for all the particles found in nature, both the elementary ones such as electrons as well as composite particles such as protons and neutrons. Today, all the basic forces of nature (except gravity) are well-understood in the language of QFT. All these QFTs necessarily contain the special theory of relativity as a key ingredient. Simultaneously, condensed-matter physicists developed non-relativistic QFTs as an efficient way to study many-particle systems such as the collection of electrons and ions in a metal. It was also found that some problems in statistical mechanics (even for classical systems) can be rephrased mathematically as problems in QFT; this allows one to use a large arsenal of techniques to attack those problems. Many of the important concepts in modern physics such as symmetry breaking and the renormalization group have developed through the common language of QFT and statistical mechanics. Some of the QFTs developed by high-energy physicists have also been used to study the evolution of the universe as a whole, starting from the time of the big bang. Finally, over the last two decades, the ideas of QFT have been applied to certain areas of mathematics such as the theory of knots and the classification of manifolds in different dimensions, and they have yielded some beautiful results. Thus, the applications of QFT range over particle physics, astrophysics, condensed-matter and statistical physics, and some areas of pure mathematics.

The present book is a collection of articles written by experts from all over the world. It begins with a preface by F. Dyson who played an important role in the early development of the subject. This is followed by an excellent editorial summary by A. N. Mitra who traces the history of the subject and introduces each of the articles. The majority of the articles in the book deal with relativistic QFT in three space dimensions, which is used primarily in particle physics. These articles cover a wide range of subjects such as the standard model of particle physics (which consists of the electroweak theory and the theory of strong interactions called quantum chromodynamics (QCD)), extensions of the standard model such as supersymmetry and string theory (which is an ambitious attempt to include gravity in the framework of a quantum theory), and some important technical aspects of QFT such as the renormalization group, finite temperature field theory, anomalies, symmetry breaking, light-front methods, and conformal and topological field theories. In addition, there are articles on Chern-Simons field theories in two space dimensions by A. Khare and R. Rajaraman, some aspects of quantum mechanics by N. Mukunda (geometrical phases) and D. Home (foundations of quantum mechanics), and integrable models by B. M. Sodermark. A notable omission in the book is the subject of QFT on a lattice, except for a brief discussion in the paper by O. Pene who considers how lattice gauge theory may be used to study QCD.

The articles differ widely in style and scope. Some of them are in the nature of pedagogic articles which provide a thorough introduction to their respective subjects. Examples of these are the articles on the renormalization group by D. V. Shirkov, the standard model by V. Novikov, the light-front formalism by P. P. Srivastava, supersymmetry by R. N. Mohapatra and by N. Sakai, string theory by J. Maharana, fractional statistics by A. Khare, QCD sum rules by L. S. Kisslinger, and light-front dynamics by V. A. Karmanov. A few of these articles could be used as material for graduate level courses. Some other papers in the book are written as review articles which provide a broad overview of some area and point the reader to the references for the technical details. These include articles on the dynamics of non-equilibrium phase transitions by D. Boyanovsky and H. J. de Vega, topological QFTs by R. K. Kaul, coherent states by W.-M. Zhang, the Skyrme model by J. Schecter and H. Weigel, finite temperature field theory by A. Das, conformal field theory by W. Nahm, the relation between Yang–Mills theories and string theory by L. Bonora, and the bound state problem in QCD by A. N. Mitra. Finally, there are papers written at a technical level which can be best understood by researchers in those particular areas. A seminal paper by E. Witten linking QFT to the theory of knots is reprinted, as is an unusual set of lectures on confinement by the late V. N. Gribov.

On the whole, the book is excellent as reference material but not as an introductory textbook on QFT. The editor has done a remarkable job in collecting such a variety of papers on the frontiers of modern QFT. For practitioners of QFT, it is a pleasure to browse through the different articles and to feel the vitality of the subject even after seventy years of development. Although the book is somewhat expensive for individuals, it would be a very useful addition for libraries of modern science.

The book suffers from some deficiencies in proof reading. To give an example, several paragraphs are repeated on pp. 597–599.

DIPTIMAN SEN

Centre for Theoretical Studies,
Indian Institute of Science,
Bangalore 560 012, India

Folk Tales of Science – Curious Stories, Amusing Anecdotes, Quaint Characters. Dilip M. Salwi. Rupa & Co, 7/16, Ansari Road, Daryaganj, New Delhi 110 002. 2000. 187 pp. Price: Rs 50.

The book under review has anecdotes on about 160 scientists. Fourteen are Indian names. Gracefully, none of the chosen is alive. It will not be correct for me to quote these anecdotes (since the reader must find a copy for himself, in an age where we learn to protect the rights of an author), but the very last one made me really laugh. The book is modest in its purpose and scope. If scientists are also human beings, it seems to be alright to emphasize it with some actual stories. Funnier, the better. However, humour is usually very limited in science circles, unlike elsewhere. Even teachers and students as a class fare better on the humour front than the scientists, though nowhere close the class of doctors and nurses. The egghead is usually at the butt end of jokes than be the perpetrator of *humour most foul* on his fellow beings. Search the NET and you will surely find out that science is rather low on humour. If my friend Gangal became hysterical when someone used the term temperature fluctuations, since for him it is an oxymoron, I would think it is very specialized humour. My students very politely smile, if not yawn, when I tell them that Szent Gyorgyi named the then unknown ascorbate originally as ignose, and when the editor objected violently to the lowly pun, renamed it as godnose.

Many anecdotes came to my mind that have not been mentioned in this book. I do not want to fall prey to the temptation saying that I know many more anecdotes, while the fact of the matter is that many anecdotes I read here were not known to me. The book is decidedly for the younger in language and temperament: I would place the recommended readership at the school level.

Strange as it is, I still have to review it for *Current Science* and therefore I need to say a few things about what the author stated as his purpose for the book, if only to reflect the kind of thoughts other readers also may have when they read this book.

The book came into my hands after just having completed Hal Hellman's *Great Feuds in Science* (John Wiley and Sons, 1998). It was about Urban VIII vs Galileo, Huxley vs Soapy Sam, Cope vs Marsh, Newton vs Liebnitz, Freeman vs Mead and so on . . ., some ten issues in all. The fact is that the issues could be bloody. There was some mild interest on the author's part in the preface to state that a greater familiarity with lives and foibles of scientists interspersed in lectures will make students see science as a more human activity and be attracted to it. Could be. The problem of course is that all foibles do not contribute to science. Nor are folk tales simply humorous. Some indeed are intensely sad. There is an aspect of life which is more real than that *Reader's Digest* paints for us. There is more to doing science than what Brownowski tells us. If Conant, the then President of Harvard preferred to accept the letter of Subbarow (who did not figure in the list) that all the credit should go to Fiske and did not appreciate nor reward the handsomeness of the gesture, that is also science for you. If power politics of a courtier, rather than the undiluted love of truth turned Galileo against the Church who did not heed the advise of the Jesuit priest that refutation of a canon cannot be based on observations for which a theory does not exist (he was referring to the theory of optics), and was duly chastised for it, must not the modern students argue about the unexpurgated history?

I remember a meeting long ago on philosophy of science in a university. The speaker, a very balanced person, was speaking of how difficult it is to do good philosophy of science in India because philosophy of science cannot be done *in vacuo* . . . It requires the presence of top science, of a level that raises important questions. Popper referred to top dogs. The ensuing discussion was an antithesis. The local professor went on to say that top science is unnecessary for a philosopher. According to him, the statement that 'matter gravitates' is enough (*sic*) of science. He would then take that statement and could go on philosophizing (his emphasis was largely on linguistic analysis). It became very clear to all of us how a perfectly legitimate expression of anguish regarding the poverty of environment could be diluted and trivialized by someone who has never 'lived' in the thickness of things.

In a sense, Salwi may not have any objection to what I am saying. His selection of Indians, a very proper 10% of the lot, is dotted with people whose claim to fame is administration and teaching. He must have had considerable difficulty in getting acceptable anecdotes about good scientists from here. The tragedy of the lives of the wives of two greatest among Indian scientists (is that acceptable?), Ramanujam and Subbarow, would not be inspiring reading. Given the times, what would they have contributed had they been god-fearing loyal husbands . . . what price, science?

All this is very unfair to write about a book which is very unpretentious and written in a very proper and mild manner. At least, Salwi has gone ahead and taken the effort to write a book that many could read. I hope they do. All I do is ineffectually teach a small number of students. Whether either activity inspires the students, I have my doubts. Indians usually test the bath water, they rarely jump in.

V. SITARAMAM

Department of Biotechnology,
University of Pune,
Pune 411 007, India
e-mail: sitaram@unipune.ernet.in

Plant Cell Vacuoles: An Introduction. D. N. De. CSIRO Publishing, P.O. Box 1139 (150 Oxford Street), Collingwood VIC 3066, Australia. 2000. 288 pp. Price: US $ 60.00.

'Vacuoles are ubiquitous, multifaceted and indispensable organelles and yet they have been thinly treated in the literature to date. This is at odds with the amount of interest in vacuoles that has been expressed in the last two decades.' The statement on the cover of the book and other comments in the preface of the book by D. N. De highlight a small part of the larger syndrome experienced in the plant sciences which are often perceived as overwhelmed by work on animal systems. However, it should hardly surprise one, considering the facts that (a) a vast majority of cell and molecular biologists (and there are tens of thousands of them!) work with microbes and animal cells, and (b) botany and zoology were and still are taught as separate subjects in many schools and colleges. In fact, biochemistry, cell biology and molecular biology have evolved in a fashion that automatically excludes from the mainstream, anything that is related to plants. Thus, despite the customary chapters on biochemical and cellular unity of life, almost all good texts may not even provide passing reference to plants, except about chloroplasts and photosynthesis. The predicament of the out-of-the-mainstream biologists working with plants was clearly expressed two decades ago by Stumpf and Conn[1] and despite the upsurge of interest in plant cell and molecular biology in the subsequent years, the perception of continued marginalization of plant knowledge has pained many, including De. Now, there are separate books on Biochemistry (read *Animal Biochemistry*) and Plant