Eclectic view of the cosmos

Cosmology: Conversations About the Invisible. Translated from the French by Saroj Butani Wiley Eastern Ltd, New Delhi, 1990, 200 pp. Price not mentioned.

Reading *Conversations About The Invisible* is an aesthetic experience. It goes beyond that—it is an open-ended philosophic synthesis of modern science and classical thought. The twentieth century has witnessed a rapid growth in our understanding of the atom, the subatomic particles, and of the myriad astronomical objects in the vast depths of space and time. We also appreciate today the dynamical interrelationship that exists between the microcosm of the subatomic domain and the macrocosm revealed by astronomy. But these scientific findings are outside our everyday experiences and it is not possible to comprehend these scientific truths solely with the intuition developed from our commonplace observations of nature. Yet these scientific discoveries must find a place in everyone's world view, which includes in it not merely matters scientific but social, religious and artistic as well. *Conversations* achieves this objective of introducing the essence of modern science into our perceptions in an exciting and unique way. Imagine, then, a cozy kitchen with the tea-water boiling in a samovar—this is the scene of the action. A discussion is under way among the three that are assembled there, each an erudite scholar and a deep thinker. Two of them, Jean Audouze and Michel Cassé, are versatile astrophysicists of great accomplishment and the third, Jean-Claude Carrière, an artist, dramatist, philosopher, and writer of prodigious intellect. They are talking about the world of science, religions, literature, ethics and philosophy. The book is a record of their discussions during which Jean-Claude draws out from Jean and Michel the world view of the scientist and intersperses it with anecdotes, comments, and quotations from his extensive knowledge of occidental and oriental literature and philosophies. The language is kept at the conversational level, with no recourse to scientific jargon or mathematics. But he does not let them be obscure on any point, nor gloss over any issue with inaccurate generalities, even though all the subtleties of particle physics and modern cosmology are being discussed. In his own words: '... this book is as if it were woven, as if it were composed of several threads of various colours. From time to time one of the colours appears, comes to the surface, then disappears and gives place to another colour. Later it reappears. It is a very ancient, apparently sinuous and neglected technique of narration. ... It is like a pleasantly venturesome outing in which the participants stop under the shade of a tree, or make an unplanned halt at an inn, to listen to stories of encounters.'

Conversations starts at an easy pace talking of generalities of imagination, the triumphs of the subtle, of science, of life and beauty on the one hand, and of myths, classicism and fanaticism on the other. Just like in *The Tao of Physics* by Fritjof Capra, the many astonishing similarities between the imagery and ideas of ancient writings and those of modern technologies and science are noted. It suggests that an intuition, or a solitary reflection, can sometimes find a meeting point in the most sophisticated conclusions of scientific experimentation. This is to be expected and it is natural, they say, because, after all, the human mind conceives of hypotheses and scenarios stimulated by nature, and some of these do indeed acquire a reality substantiated by modern technologies and scientific endeavour. This does not mean that the ancients actually had vehicles of space travel and weapons of horrendous destruction as written down in the myths. It is just that the human mind in the ancient past was not very different from what it is today and could conceive of things which took millennia to become realities. This theme of juxtaposing ancient philosophic writings with the modern scientific discoveries goes on throughout the book with poignant discussions of the role played by religious thoughts and attitudes in shaping the progress of science and modern cosmologies. As Jean and Michel unravel the subtle and yet beautiful ideas of modern science and cosmology, the counterpoint is provided by Jean-Claude, who draws intensively upon the Vedic, Upanishadic and mythological literature. He orchestrates the discussion and leads it into methodological and ethical aspects of science. The Brahmanical and Hindu attitudes and cosmologies find their favour. The ideas of the East, which conceived of immeasurable depth in space and time, the ideas of unity in duality and in diversity, intractable as they are to an uninitiated Western thinker, are presented with surprising clarity. Jean-Claude quotes Milan Kundera to illustrate the dangers of rigid censorship, which off and on have plagued the European artists and intellectuals. He says incessantly that the greatest danger for a people is forgetting itself, forgetting its culture, its identity. An artistic form or an intellectual tradition can disappear and may not be rejuvenated for a long time. I feel that this cautionary note is particularly relevant in the present Indian context. During the last half century anti-intellectualism has grown, we are denigrating our own social and cultural traditions, and have failed to build upon the renaissance in science that happened here during the first half of this century.

Christian thought and its influence on the development of science and modern cosmology is also discussed intensively. Most of us are familiar with how the Catholic Church persecuted people who questioned the dogma as heretics—some of this is referred to in *Conversations*. But more importantly, a new thought is introduced: The very existence of the 'Mysteries' in Christianity—the Holy Trinity, the Dual Nature of Christ, Eucharist, existence of Evil and the mysteries surrounding the Virgin Mary—must have prompted the mind, which is always wanting order and clarity, to try to understand them and to explain them. Thus these mysteries might have played the role of a goad to push the mind into logical thought, so that, in Jean-Claude's words:

'Science is the first and the decisive heresy Could it be on account of Christianity that science was born in the West? It is perhaps due to this conflict between science and faith which the East has not experienced. It is possible that the European scientific minds, the heretics, had been provoked to fight both as a result of the biblical principles, which give man all power over nature, and on

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account of exile from Paradise that seems to deny him this power. It is perhaps here that the deepest mystery is to be found, the stifling contradiction that the more vast, more open, more joyous East has not known. Because, if we look closely, God, the God of the Bible, gives us full and entire enjoyment of creation. To exercise this enjoyment, we need to know. And we have a violent desire to know.'

The sweep of *Conversations* is extensive. Not a single essential scientific concept is missed nor is neglected a single observation or concept of cosmological significance. And all the time Jean-Claude holds a tight rein and Jean and Michel are halted repeatedly in their gallop and are asked to repeat and explain the essence of the ideas without recourse to obscure technical language. They, in turn, repeatedly suggest and prompt Jean-Claude to bring in analogies from the literature and to examine ethical and sociological issues. We are told of three things: the building blocks of the physical world, the nature of space and time, and the astronomical observations relevant to cosmology. We are also told of the subtleties of the mechanics and the dynamics of subatomic particles and of the cosmos. The interaction and interrelationship of these three aspects of the physical world with the subtle state of life and consciousness is also discussed. It would not serve any purpose here to give a précis of the contents of the book, but one should mention that the coverage is essentially complete. All the topics of current research, from the big-bang origins and nucleosynthesis to the grand unification of the four known forces, are covered with elegant simplicity. Even subtle questions like origins of time and space and the effects of an observer on quantum systems are not left out. All of these make it the most enjoyable and thought-provoking book on elementary particles and cosmology written for the non-specialist in recent years.

For an excellent translation which captures the spirit of *Conversations*, Saroj Butani is to be congratulated. The poetic and philosophic passages of the book sparkle with undiminished splendour. However, I should add that the reading pleasure is often marred by numerous typographical errors and the occasional use of the wrong synonyms in translating, especially the technical terminology. But these are not serious. A brief effort on the part of the scientific editor and a proof reader is all that is needed before bringing out the next edition.

In closing, I should express my appreciation of the fine effort on the part of Saroj Butani and Wiley Eastern Ltd which has made the excellent book accessible to the English readership.

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Brief reviews

Essentials of Nuclear Chemistry (Third edn.). H. J. Arnikar. Wiley Eastern Ltd, New Delhi. 1990, 433 pp.

Earlier editions of this book did not contain information on 'Detection and measurement of activity'. This, the third edition contains a full chapter on it and the description and explanation of the principles are lucid and indicative of Prof. Arnikar's expertise in teaching. However there seems to be some scope to revise the chapter on the following lines: (i) measurement of range and energy of radiation are taught in postgraduate classes and some experiments are also arranged for the laboratory course; (ii) detection by neutron activation needs some elaboration; (iii) well-structured problems with answers on this topic are required.

The other important addition in this book is the Mössbauer effect and its applications. Relevant revisions on breeder reactor and thermonuclear reactions have been made. On the whole the book is an essential one for postgraduate students as the syllabus content is fully covered with sufficient detail.

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Genetic Engineering and Biotechnology: Concepts, Methods and Applications. V. L. Chopra and A. Nasim, eds. Oxford and IBH, New Delhi.

In recent years there has been a spurt of publications in the field of biotechnology. Many of these books describe methods that are commonly used in laboratories. This book is one such publication. The chapter on DNA sequencing by R. Brousseau *et al.* and the one on purification and characterization of nucleic acids and proteins by S. Muthukrishnan could be useful for researchers embarking in this area. The strategy for analysis and sequencing of large DNA fragments could have been described in a little more detail in view of genome projects being undertaken worldwide. Methods for isolation and purification of undegraded proteins from different plant tissues are useful for young researchers. Moreover, the book adequately covers a number of different nucleic acid-based techniques that are routinely used. However, there are a few important omissions, for example radiolabelling of DNA by random priming, separation of chromosome-size nucleic acids by pulse field gradient electrophoresis, and amplification of target DNA by polymerase chain reaction. The chapter on genetic engineering in medicine by J. R. Lupski is out of place in this book.

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