



Book Review

Doubt and Certainty

Tony Rothman and George

Sudarshan:

Perseus Books, Reading, Massachusetts,
USA, 1998

ISBN 0-7382-0169-3, pp. 320, \$15.00.

This is a very readable book on philosophy of modern physics written by two eminent physicists in a unique style, viz, in the form of debates taking place in Plato's Academy among laymen and experts on perennial metaphysical questions. Personally, this style of presentation and also the humorous anecdotes did not appeal to me. The authors could have done without such light-hearted interludes, even though the topics are difficult to discuss without mathematics. The mention of authors like Fritjof Capra, Deepak Chopra, Amit Goswami in a serious book on physics or philosophy put me off even before I had started to read the book. Also the references to Indian and Chinese scriptures did little to reduce my initial disinclination to read the book, one of whose authors I had listened to with admiration only recently. These remarks, reflecting my personal likes and dislikes, exhaust my negative comments about the book.

Overlooking the references to Plato's Academy (about which I am a bit foggy) and the stories and anecdotes (involving foxes and hedgehogs, Sphinxes, etc.), introduced no doubt to lighten the heavy topics, I could thoroughly enjoy the book right to its end and learn a lot of things. Many things which I wanted to know or of which I had only a vague idea, became clear from the well-written book.

The wide range of topics covered in the eleven chapters (called Debates) can be seen from the following list :

Is the Universe Describable? Laws, Principles, Theories and Models.

Is Nature Unreasonably Mathematical? Mathematics, Theories and Reality.

Is the World Symmetrical? Friezes, Particles and Groups.

Why Do Things Happen? Causality, Synchronicity and All That.

Does Time Go Forward? Past and Future.

Why Is there Left and Right? Chirality, Complexity and Emergent Properties.

Is the Universe Weird? Quantum Mechanics.

Is there an Answer? Theories of Everything.

How Did We Get Here? Cosmology.

What Do You Mean? Metaphors, Analogies, Culture Wars.

Can We Make Any Money Off This? Applied Quantum Mechanics.

In the eighth debate (Theory of Everything), for instance, the authors discuss the subject of string theories as the best candidate for a theory of everything. The ups and downs of string theories and views of prominent physicists are cited both in favour of and against these theories. It is difficult to summarise the results of these mathematical theories for the layman, but the authors have tried to present the main ideas in a popular form. String theories gained prominence in the mid-1980s. The fundamental objects in them were not point objects but either one-dimensional strings or p -dimensional D-branes. (p. 213)

To a physicist a theory of everything is merely a theory that unifies the four forces of nature — strong and weak nuclear forces, electromagnetic and gravitational forces — into one superforce. It is believed that these fundamental forces were unified at the very high energies found at the very beginning of the universe. As the energies dropped, the forces fragmented in a process of spontaneous symmetry breaking. The world we live in, the authors remind us, is not a world of unified forces. The authors also state that the GUTs (Grand Unified Theories) that in the 1970s truly united all the forces with the exception of gravity, rode a wave of popularity. However, due to a total lack

of experimental evidence, GUTs have since then fallen out of favour, according to Rothman and Sudarshan...(p.212)

One can see that many metaphysical questions that can arise from a study of modern physics or astronomy, are included in the list given above. The authors have clearly formulated the questions, considered alternative approaches and given a balanced appraisal. What particularly pleased me is that the authors after briefly citing their work, have put the New Age and other speculative writers in their proper place, viz, outside domains of rational science or philosophy. The authors have done an excellent job of discussing a large range of topics within the covers of a single volume, supplying authentic information in a non-mathematical language, lightened here and there by humorous anecdotes and aphorisms.

The authors remind the reader who might be perplexed by result of modern physics that science deals with models (which strictly follow laws) and not with reality. Of course there must be some relationship between the model and reality, but what that is, is a big philosophical question. Similarly, mathematics, considered to be the language of modern physics, relates rather to a modern than to ultimate reality, which Kant declared to be unknowable.

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