“Mind, Matter and Mystery. Questions in science and philosophy”, edited by Ranjit Nair, Scientia Press, 2001, Rs. 195/-.

The perception that philosophers and scientists are at two opposite ends of the academic spectrum is a widespread one. After all, it is commonly believed, philosophers work almost totally in the realm of ideas, with no direct connection to the outside world. On the other hand, scientists experiment and are actively engaged with the natural world. It is noteworthy that this dichotomy is a recent one since for most of human history, philosophy was not treated as distinct from science. Philosophers constructed theories about the world, human behavior, the State and everything else under the Sun. Apart from a few isolated examples, experiments were discouraged. In fact, science, till recently was called natural philosophy! It was only in the last few centuries, with the rise of the empirical method that the two vocations diverged and leading to a situation now where scientists **do** science while philosophers agonize over questions like “what is science”?

And yet, there are scientists who worry about the philosophical implications of their theories. In fact, some of the most illustrious scientists of recent times have also been deep thinkers about the wider ramifications of science. From Schrödinger and Heisenberg to Penrose, Stephen Jay Gould and Marvin Minsky, the list is long. These scientists have not been content with the technical virtuosity of their theories but have been troubled with the philosophical (and in some cases the social) implications of scientific theories. There has however been little interaction between the philosophers and scientists.

Center for Philosophy and Foundations of Science is an institution established three years ago with the intention of providing a platform for investigations into the connections between philosophy and science. It has, apart from other activities, been instrumental in organizing several series of lectures in Delhi where illustrious scientists and philosophers have shared their views with the public. The recent and possibly the most well known one was the Einstein Lecture delivered by Stephen Hawking which also turned out to be a major media event of the page three variety! The book under review is a collection of some of the recent lectures given by scientists and philosophers and includes a couple of conversations with two well known scientists.

The first and possibly the most provocative essay in the volume is by the famous mathematician and physicist, Roger Penrose. Penrose, a former professor at Oxford is well known for his work on the singularity theorems in Einstein’s Theory of gravitation and for his path breaking work on the mathematical problem of tiling of surfaces. For the last few years he has been concerned with the connections between consciousness, intelligence, computers and the fundamental laws of physics. A wonderful popular exposition of his ideas is found in his bestselling books, “Emperor’s New Mind” and “Shadows of the Mind”.

In this volume, in his essay “Can a Computer Understand”, Penrose seeks answers to this question within and outside of the conventional bounds of the thesis of artificial intelligence (AI). A particular variant of the AI thesis is the strong AI argument which maintains that any mental quality must be a feature of computation in some form. It is

obvious that if this thesis is correct, then understanding is a computable process in principle and one can answer the question in the title in the affirmative.

Penrose convincingly demonstrates by using an example from chess and one from pure mathematics, that there are always problems which can only be solved correctly if we understand them rather than by some brute force computation. The chess example is particularly illustrative where a chess position which can easily be "solved" by even a novice and yet has stumped the most sophisticated chess playing computers. By a series of easily understood arguments, Penrose, shows that it is impossible for a computer to successfully mimic the mind. And this is independent of the kind of progress we may make in designing computers. He uses a famous result of Gödel to argue that there are mathematical truths we can sense for which no algorithmic proof (of the kind computers work with) can be given.

And since for him, consciousness ultimately has to have a physical basis, the question then arises whether our existing laws of physics are enough to "understand" consciousness even in principle. In his view, the known laws are grossly inadequate and we need new laws of physics which would be inherently non-computational. His own prejudice in this regard favors a somewhat esoteric union of the hitherto incompatible arenas of quantum physics and gravitation. As to whether there are any known biological structures which could possibly behave according to these "new" laws, he mentions some experiments which have shown that there are structures present in nerve cells which might behave in this queer way.

Penrose's arguments, though very convincingly and elegantly put are by no means uncontroversial. Most researchers in artificial intelligence, neurophysiology and even evolutionary theory think that "there are no clothes on Penrose!" They feel that he has a kind of arrogance that comes from being a physicist where they pontificate not only on physics but also on other disciplines. But, in the words of the influential philosopher Daniel Dennett, "if Penrose hadn't existed, God would have to invent him … just so that everyone can see how wrong his theories are!"

The other essays in the volume are not quite as provocative or lucid as Penrose's. Particle physicist E.C.G. Sudharshan explores the issue of the arrow of time. This might sound pedestrian, (since it is clear to everyone that time does indeed go forward) but it is one of the most profound questions which hits at the basis of theories of the universe, of thermodynamics and even quantum mechanics. Sudarshan outlines the problem which is essentially the question as to where does the arrow of time come from since the underlying physical theories seem to not care about the arrow of time. He then shows how "for the universe as a whole there is no direction of time, although its parts all point the same way. Thus in a universe without parts, there would be no sense of time".

The problem with Sudarshan's treatment of this esoteric problem is that the essential parts of the argument cannot be followed by a layperson. He uses technical terms like analytic continuation and complex spectral decomposition without adequately explaining then for the non-specialist. On the other hand, he explains the elementary concept of resonance in painful detail! One would have liked a more accessible treatment of the fascinating problem of time's arrow as for example is given in Paul Davies' excellent book.

The other three essays are by philosophers and historians of science and have a different focus from the two by scientists. In a well researched and forcefully argued piece, M.Bitbol , the author of the definitive “Schrödinger’s philosophy of quantum mechanics” talks about Schrödinger (one of the founders of quantum theory) and his resistance to one of the central ideas in quantum theory, the idea of an elementary particle! In a short piece, Ranjit Nair discusses the issue of whether science can , even in principle comprehend consciousness. The fundamental contradiction in this is the subjectivity of the spirit which is to be investigated by the objectivity of science. Finally, W. Halbfass elucidates on the concept of akasa (ether) in Indian thought.

Apart from these essays, there are two conversations with Penrose and the Nobel Prize winning chemist, Ilya Prigogine. These unfortunately do not offer any great insights into the thought of these great minds. Interspersed between these pieces are quotations from Einstein; some well known while others not so well known.

The problem with Mind, Matter and Mystery is basically a lack of thematic coherence. Some individual essays are interesting but there is no underlying unifying thread. It would have been nice to have an introduction by the editor which placed these essays in some kind of perspective. As they stand, they are too disjoint. It gives too much of an impression of being a quickie without any substantial inputs from the editor. For the non-specialist, I would recommend reading Penrose and Bitbol in the original in their respective books since there is not much else of use in this volume.