

## **M-Theory in Two Nutshells**

**Outlook Magazine, December 12, 2018**

**“Brief Answers to the Big Questions”, by Stephen Hawking, Hachette India, Rs. 650/- (2018).**

On 14<sup>th</sup> March, 2018, Stephen Hawking passed away. Widely recognized as the most famous public figure in science since Einstein, Hawking was not just an extraordinary cosmologist- his decades long fight against a debilitating disease was a testament to indomitable human spirit. In addition, Hawking was also the author of several popular books on science, had appeared in numerous television series and a Hollywood film based on his life had been released in 2014.

In this last book published posthumously, Hawking ponders over not just the mysteries of black hole radiation and spacetime singularities (the subjects of his path breaking research in cosmology) but also attempts to traverse a much wider terrain of human knowledge and experience. Hence the Big in the title of this short book.

As he says in the introductory chapter, “Why we must ask the big questions”, these are questions which have intrigued humanity in some form or the other for millennia. “Where do we come from? How did the universe begin? What is the meaning of it all?” and so on- human beings have always pondered over such mysteries. Hawking has his own list of ten Big questions which he attempts to answer.

The questions range from eternal ones like “Is there a God?”, “How did it all begin?” to specific ones which relate to our modern view of the cosmos. Thus we also have expositions on “What is inside a black hole?”, “Can we predict the future?”, “Is time travel possible?” and “How do we shape our future?” He also ventures into discussing more speculative ideas when he talks about “Will we survive our earth?”, “Is there other intelligent life in the universe”, “Should we colonise space” and “Will Artificial Intelligence outsmart us?”

Hawking was an atheist and thus expectedly, he uses science to answer the questions which have usually been in the domain of religion. As he puts it, “My work is about

finding a rational framework to understand the universe around us". For him, God is the "embodiment of the laws of nature", though he himself admits that is not what most people think of as God. Religion in his view is always based on authority while science is based on observation and reason. For him, science will win because it works.

The question of the origin of the universe can of course be answered fairly satisfactorily within the domain of modern cosmology, the development of which owes much to his remarkable mind. Here, in less than two dozen pages, he gives a brief description of our current understanding of this age old question. Explaining abstruse topics ranging from the Information Paradox, Quantum Gravity and M-theory to the lay audience is difficult enough- to do it in such a limited space turns out to be too challenging even for Hawking.

This tendency to condense vast amounts of information and conceptual knowledge into a few sentences pervades the book. Hawking is too ambitious in trying to simplify extremely complex concepts and ideas from cosmology, quantum mechanics, and even molecular biology in a few sentences and leaves the reader even more mystified and deeply dissatisfied with the explanations.

Hawking was passionately concerned about the future of the human race. The environmental catastrophe, the limited resources of the biosphere as well as the dangers of nuclear war are issues which he talks about in this book. He views the current crisis as a clarion call for humanity to explore colonization of space which he sees as the only way to preserve humanity in the long run. Interestingly, he has a pretty pessimistic view of the human race's capacity to act rationally- "The human race does not have a very good record of intelligent behavior" he rues in a characteristic British understated style!

The book is very readable with humorous tit-bits thrown in. For instance, when talking about time, he refers to himself as some sort of expert on time because of his bestseller "The Brief History of Time". However, in a subtle dig at the Post-Trumpian atmosphere of distrust of experts, he is quick to add that "these days an expert is not necessarily a good thing to be"!

It is clear from the book that Hawking has pondered over and thought deeply about these questions. As his longtime collaborator and friend, the Nobel laureate Kip Thorne says in the Introduction, "He did have the necessary skills, wisdom and self-

confidence”,[ to tackle such big questions]. However, because of the limitations of space and the expansive nature of the subjects, his exposition of the issues is less than satisfying.

Hawking was a firm believer in the power of science, rationality and reason. But he was also fearful of a technological dystopia which the current pace of technological progress might bring about. He sums up his discussion on Artificial Intelligence with these words: “Our future is a race between the growing power of our technology and the wisdom with which we use it. Let’s make sure that wisdom wins”. Coming from one of the cleverest minds of our times, these are prescient words which we can ignore only at our own peril.

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November 20<sup>th</sup>, 2018.