



The Grand Design. Stephen Hawking and Leonard Mlodinow. Bantam Books, New York. 2010. 208 pp. Price: US\$ 28.

Explaining science to the layman is a task in itself and is typically referred to as *popular science*. Stephen Hawking, a living legend of our times, 'reigns supreme' in the field of 'popular science', be it either through television shows or through authoring various books on science. Presented here is a review of one of his recent books *The Grand Design*, co-authored along with another expert of popular science Leonard Mlodinow. At this stage, one must keep in mind that one of the aims of metaphysics is to prove or disprove the presence of God, and thereby explain scientifically the origin of this Universe.

Imagine an hour-glass in such a way that the top half is a mirror image of the bottom. Let the top half represent 'religion (theists)' and the bottom half 'science (atheists)'. The point where these two halves touch, for the present, let's call it as 'God' or 'a supreme designer' or a 'designer superior to human intelligence (HumInt)'. This point is best defined by the Edward Harrison line: *No cosmologist knows exactly what is Universe, and no theologian knows exactly what is God*¹.

Stephen Hawking and Leonard Mlodinow (SHaLM) in their book, *The Grand Design* summarize the entire physics of the present day². And in this process, they bring out the positive side of the same, while highlighting the drawbacks in the current understanding of the Universe. One way, this book is best described as explaining science/summarizing science to the layman. On the other hand, it is subtle *metaphysics*.

Talk about metaphysics, in general, and science, in particular, many of us (including SHaLM) believe that what we observe in day-to-day life is governed by certain laws (The laws of nature – as SHaLM put it) and 'thumb-rules'. As this nature and the Universe are said to be the products of 'God' or 'the designer superior to HumInt', studying or formulating the laws of nature is like trying to understand the 'psyche' of God, thereby behaving like the psychologist. Tinkering nature as per these laws for the betterment of human life is acting like the psychiatrist.

Putting in a layman perspective, a psychiatrist is one who defines what is normal and what is abnormal, as far as human behaviour is concerned. Psychiatrists' other duties include treating abnormality, and if possible, to bring the affected person into the realm of normal perspective. If the number of incurable cases is more, a redefining of normality is done, appropriate measures taken. Similarly, whenever an exception arises to the laws of nature or to the thumb rules, they are either discarded or modified to include the exceptions. Sometimes, we try to come up with alternative set of laws and thumb rules; and in the process perhaps even rewrite the texts. The person who rewrites the laws of nature and thumb rules is our next Aristotle, Galileo or Newton..., until the next exception is discovered or invented. Then the whole process repeats. Put simply, the first instance of an exception occurring to our laws of nature is in itself an indication for the presence of a 'designer superior to human intelligence (HumInt)'.

*The element of conflict ceases when a person realizes that 'I', the observer, am the observed*³.

In the hour-glass imagined earlier, religion is always at the top, with huge amounts of mythology, isolated episodes and anecdotes from the same being borrowed by science. Compare this to the sand in the hour-glass. Volumes have been written by people all over the world trying to prove either the absence of God or the presence of a designer superior to HumInt. The approach as to 'how' may vary. In reality, this process of proving the presence or absence of God is literally not different from various religions that are in vogue today which believe in existence of God. Invert the hour-glass,

religion uses isolated episodes/items from science to convince the gullible about their respective Gods. Igniting objects by the slight of hand while chanting hymns, and similar antics by religious mystic is a popular example here.

David A Shiang, in his treatise 'God does not play dice', takes on 'entropy' proving that $S = 0$, interpreting the same as *there never was any disorder*, representing one approach or school of thought in Metaphysics⁴. SHaLM, on the other hand *begin at the very beginning* of the Universe and the associated 'Big Bang', whence, while discussing the theory of everything, taking the aid of Heisenberg's uncertainty principle say *Space is never empty* existing in a state of minimum energy called vacuum (see note 1). By the time they discuss 'The grand design' in the final chapter, the authors claim to answer a series of questions without 'invoking any divine beings'. Then, SHaLM do a volte-face in saying the 'energy of empty space' and 'continuous world' would remain constant. Agreed... They also add these entities are 'independent of time and position', which means either they do not want to invoke the 'uncertainty principle' or they reached a point wherein 'invoking the divine beings' becomes an obligation if not mandatory. Put simply, at this point of 'energy of empty space', i.e. vacuum, as described by SHaLM, the value of every parameter should theoretically equal zero: time = zero, position = zero (independent of time and position? Why?) And $S = \text{zero}$ (no chaos)⁴. Ideologically wrong? Given the fact that the science of theology and metaphysics, *per se*, rely not only on scientific observations, but also on logical arguments, for once we may not be wrong. Why discard these parameters of time, position and chaos. In other words, why only one dimension, when as per the popular scientific opinion we live in at least a three-dimensional world? Despite this, let's call this 'empty space' as 'point zero', if not 'event horizon' (not the popular sci-fi movie please). Are the authors biting more than they can chew? Or is this the present state of science, in the sense that when we include every aspect, it starts disintegrating on its own or becomes self-contradictory? In other words, are we being observed? Needless-to-say, in the chapters preceding, an interesting summary of science is presented leading to a crescendo in chapters on 'The theory

BOOK REVIEW

of everything' and 'Choosing our universe' of *The Grand Design*.

*Idea of nothingness or Shunyata: Zero, a number that denotes the presence of an absence*⁵.

Despite the above mentioned major drawback of Metaphysics, SHaLM does a commendable job in generating a slice of the psyche of ... God or the superior intelligence (supint). They also accept another major drawback of present-day physics. Laws and thumb rules in physics are essentially developed based on what is visible in the 'human visible spectrum of light'. And an alien that has capability to see in 'X-rays' or in any other wavelength, may be a supint or has a better usage in airports. In this regard, I am tempted to bring to the attention of the readers an item which appeared in one of the Indian national dailies, in the Ripley's Believe it or not column, that *individuals who have their eye lenses surgically removed achieve the ability to see some UV light*⁶. Add to this the Echolocation capability of some mammals other than humans, viz., fluttermice, dolphins... These arguments gain prominence as our current understanding of 'dark matter' is literally zilch. And as SHaLM reiterate that 70% of the Universe seems to be made of dark matter, speculating in this direction may not be of any use... Nevertheless, *The Grand Design* takes us through the basics of 1D → 2D → 3D → 4D (Space-Time) → 10D (String Theory) → 11D (M-Theory). Between 4D and 10D, to serve as a missing link, and to make the arguments spicier, the authors should also have included S. R. Hadden's interpretation of the alien messages (see note 2).

In *The Grand Design*, SHaLM describe CMBR (cosmic microwave background radiation), theoretically suggesting/hinting at CMBR may serve as 'fingerprints of time' since 'Big Bang' occurred. Presence of the same is a subtle indication of the aftermath of 'Big Bang', which is yet to settle down. Some more description of 'static' that is typically observed in attempts at contacting extra-terrestrials would have made this book a bit more interesting.

Throughout the grand design, our psychiatrists SHaLM give the impression that they are the ones who'll eventually cure this world of the religion and God. Their hands-up kind-of-a-situation at the end, wherein they also give a description

of Conway's 'Game of Life', takes away the punch from the entire arguments presented earlier in their book. Needless-to-say, the rules of Conway's 'Game of Life' appear to be loosely based on game of chess and some principles of immune-computing.

Any sufficiently advanced technology is indistinguishable from magic

– Arthur C. Clarke

Science fiction (SciFi) has aided 'real science' in technological advances, in the sense that many concepts presented in Sci-Fi precede their actual development and acceptance in science. As an example, the concept of submarine was originally presented in Jules Verne's 'twenty thousand leagues under sea'. In recent times, Issac Asimov, Ray Bradbury, Arthur C. Clarke, Carl Sagan, Michael Crichton and others have taken Sci-Fi to unprecedented heights. Garnish this with Hollywood making the written Sci-Fi as visible; the distinction between real science and Sci-Fi becomes blurred. Of course, astronomy and planetary sciences have taken a real beating with many of the concepts being pulped as a consequence of our ignorance perhaps in 'dark matter'. Any good scientist or academic should take note of this. Stephen Hawking, having hosted the television series 'Masters of science fiction', aims this time to quell the popular cult sci-fi 'Star Wars'. In 'The apparent miracle', SHaLM discuss the possibility of Earth being part of a binary system (c.f., planet Tatooine of Star Wars) or a multi-star system, and in the process discuss how various different elements could have evolved starting from hydrogen. Since this book, 'The Grand Design' presents all arguments with reference to light; a note on sun-dog phenomenon would have added credence to the discussions and mythology presented.

Let me take this opportunity to present a concept here as to how Earth could be part of a binary (if not multi-star system). Consider 'Sun' to be a 'Yo-Yo' and Earth's revolutions in a plane perpendicular to the up and down moving (the revolutions plus rotations of sun) Yo-Yo. Throw in loads of dark matter. Net result, for an observer on planet earth, the sun would appear as one big ball of fire with occasional 'sun-dogs'. A good picture of sun-dog appears in wikipedia, which will give the classic binary sun rise scene of 'Star Wars – A

new hope', a run for its money. Am I trespassing Chinese mythology when I say three-legged Sun-crows traverse the sky and ten suns are included in the fables? Is mythology taking an upper hand for once? Nevertheless, this concept of Earth being part of a binary or a multi-star system is worth giving a thought for the drawbacks of physics mentioned in *The Grand Design*.

In spite of all these, *The Grand Design* is one book that must be in the personal library of every literate person, as it offers a one-time snapshot of present-day physics. And SHaLM continue to reign supreme among all those scientists who successfully brought 'science' to the layman through 'the grand design'. This article would be incomplete without a salute to the cartoons and photographs that are included in the book. Some of them are 'simply brilliant', just as the book is...

Notes

1. Certain pairs of physical parameters pertaining to a single aspect cannot be measured simultaneously and precisely. E.g., measuring speed of an object obliterates the precision of other parameters, viz. position, and time; and uncertainty increases. This is referred to as Heisenberg's uncertainty principle. In general (humorously speaking) everything is uncertain.
2. One of the characters in Carl Sagan's sci-fi classic 'Contact' and movie by the same name. <http://wikipedia.org> (accessed 9 and 10 May 2012).
1. Harrison, E., *Masks of the Universe – Changing Ideas on the Nature of Cosmos*, Cambridge University Press, UK, 2003.
2. Hawking, S. and Mlodinow, L., *The Grand Design*, Bantam Books, UK, 2010.
3. Krishnamurthi, J., *The Best of Speaking Tree*, Times Group Books, Bennett Coleman & Co, Ltd, New Delhi, 2006, vol. I.
4. Shiang, D. A., *God Does Not Play Dice*, Pustak Mahal, New Delhi, India, 2008.
5. Kashinath, T., *Maths & Theology in Search of God*. In the book *The Best of Speaking Tree*. Times Group Books, Bennett Coleman & Co, Ltd, New Delhi, 2006, vol. I.
6. Leisure column – Ripley's Believe it or not. *The Times of India*, 8 May 2012, p. 14.

CHETAN DATTA PODURI

Flat-501, Highlight Haveli,
Street-6, Habsiguda,
Hyderabad 500 007, India
e-mail: cdpoduri@gmail.com