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COSMOLOGY IN SCIENCE AND RELIGION

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Since time immemorial, the philosophers and scientists of the world have been concerned with the three basic problems i.e. origin of life, origin of man and the origin of earth and universe at large. Science has been able, to certain extent, to find solution to the first two problems but it fails to give satisfactory solution of the third, i.e. creation of the Universe. Theologians have high hopes of resurrecting God at least in this domain.

Cosmology deals with problem of creation of Universe. By its special position, it has played a decisive role in the struggle between science and religion. Cosmology is the long-sought link between these two fundamental disciplines on which lie all the hopes of mankind to know the Reality.

Various cosmological theories and models have been put forwards in both science and religion to explain the creation and evolution of the universe. Newton's approach towards cosmology was metaphysical because of his theological beliefs and background. He considered the creation of the universe as an act of God. In his system, space and time appear as absolutes and the earth occupies a unique position in the universe. The philosophers criticized the Newtonian theories, but such was their wonderful success that the scientists paid no heed.

It was Kant who first tried to investigate the silence of Newton as regards the creation of the Universe. He employed the term particles for the primevel nebular medium out of which the solar systems and galaxies were created. More than one century later, Laplace put forward his Gas cloud hypothesis. It is interesting to recall the remark made by Napoleon when the manuscript 'La mecanique celeste' was presented to him "You have not even once mentioned the creator of

the Universe in your work". "Sir, I can do without that hypothesis" said Laplace.

Kant and Laplace's hypothesis together is known as Gas dust hypothesis. It considers the creation of Universe out of gases and vapours such as hydrogen, water, methane, carbon dioxide and cynogen. They suppose that planets and sun were created out of the same nebular gas medium. However, they could not explain the angular momentum of planets on gas cloud hypothesis.

Simple Relativistic Models of the Universe

The real investigation of the cosmological problem begins with the advent of Einstein's theory of relativity in 1905. His general theory presented in 1915 is in reality a cosmological theory. Each cosmological solution of the field equations of Einstein gives us a model of the Universe, by which is meant an account of the history of the Universe. Of the many models available, only one can be correct, as we have only one actual universe. We will describe several models here as due to lack of observations we cannot decide as yet which model is the orrect one.

A cosmological model is intended to represent the positions and motions of the clusters of galaxies. The basic feature in the history of the universe is the expansion. For relativistic cosmological models, the expansion curve is obtained from solutions of Einstein's equations.

Let us fix attention on two typical galaxies A and B, and suppose that at a certain moment the distance between A and B is 1 unit: the unit could be any large distance, say 100 million light years. Before this moment the distance AB will be less and afterwards it will be greater. If R is used to denote the distance AB, then R depends on the time. Different models give different graphs for the dependence of R on the time. Accordingly we get these models :

(1) Einstein-De Sitter model (2) Cycloidal model (3) Hyperbolic model.

1) **The Einstein-De Sitter model :** It is the simplest relativistic model which starts from a 'singular state'. This means that function R is Zero in the beginnine so that distance AB was zero, and the distance between all pairs of galaxies was zero. Matter was so closely packed that denaity was infinite in. In this model, R increases rapidy

3. **Hyperbolic model :** This model has an expansion curve similar to that of the Einstein-de Sitter model, but it rises rather more steeply. The model starts from a singular state and expands for ever; its volume is infinite.

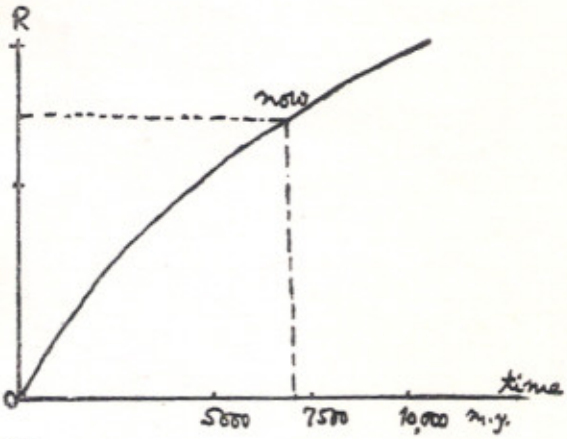

Fig.3

We can sum up all the ~~there~~ Three models as (i) parabolic (ii) elliptic and (iii) hyperbolic case respectively.

Singular State and a job for God : The three models of the universe described above all start from a condition of infinite density which is called a singular state. What happened before the expansion started? Einstein's equations break down at the singular state and our models to fail explain the history of universe backward.

The creation or expansion of the universe from singular state is referred to as 'Big Bang'. Its most ambitious and detailed theory is that of Gamow and collaborators, known as $\alpha\beta\gamma$ theory. They suppose that universe started from a very dense, hot mass of neutrons which decayed into protons and electrons. These combined to form complex nuclei. The temperature during this phase was 10,000 million degrees, and most of the heavy elements were built up in the first 30 minutes of the expansion. The $\alpha\beta\gamma$ theory fails to explain the production of heavier elements after helium. Lemaitre explains the big bang from a primeval atom—an atom which contained all the matter of the universe.

If we identify the start of expansion with the creation of the universe, we will have to bring in God as creator of the universe to explain the singular state. To avoid this dilemma, some cosmologists have put forward the steady state model based on the assumptions of perfect cosmological principle.

Oscillating model : To get rid of the singular states, the oscillating model has been proposed. Each contracting period in the universe's history ends in a smooth transition to subsequent period of expansion.

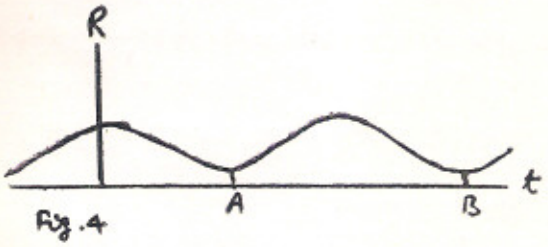

Fig. 4

The universe is infinite in time but finite in space. There are no singular states and hence no need of bringing in creator. The universe continues for ever following the cycles of expansion and contraction.

Relativistic Models with Cosmic Repulsion

1. **Einstein model :** This was the first cosmological model. To overcome gravitational attraction, Einstein introduced a λ term in his field equations to bring in repulsion at cosmological distances. This models is static with its space curved and of finite volume.

2. **Eddington's model :** This model follows the discovery that the Einstein model is unstable by the suggestion that the universe as we know it started from a disturbance of the Steady state. This model had already been announced by Lemaitre in 1927.

3. **Lemaitre's model :** This model starts from a singular state at O,

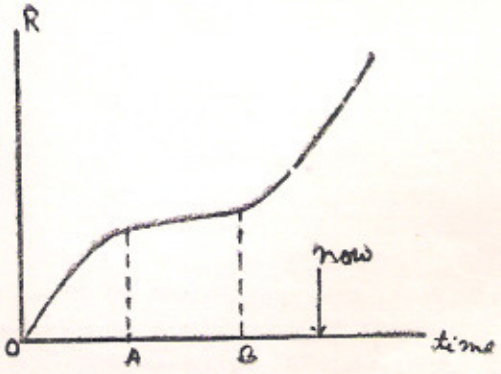

Fig. 5

and begins to expand rapidly. The expansion slows down and for a period AB the conditions are almost static as the gravitational attraction is being balanced by cosmical repulsion. After AB, the repulsion predominates and the universe expands continuously for ever under the influence of the λ term alone. If there is no cosmic repulsion, Lemaitre model would be similar to cycloidal model with its curved space and a finite volume.

Lemaitre believes his model to be a correct representation of the real universe. In particular, he has pictured the initial singular state as being the explosion of the 'primeval atom' as mentioned earlier.

Steady State model : It is important to understand that steady state universe is not static. Change is going on all the time, but the overall picture does not alter. There is continuous creation of matter and unceasing motion. But the amount of matter created is so small, that it has not been detected by any experiment so far.

The most controversial feature of the theory is the creation of matter. It is created not out of radiation or something else, but out of 'nothing'. The rate of creation is so small and the universe so large that

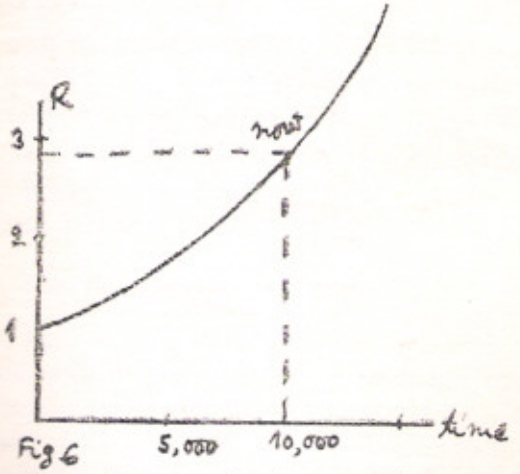

Fig 6

if one hydrogen atom is supposed to be created in a room of normal size every 5000 years, there will be enough matter for 50,000 Suns every second.

This model is based on cosmological principle 'universe is same for all observers, for all the time and space to come'. There is no singular state to be explained. The main objections to this model are :

(1) It does not obey law of conservation of energy, and (2) no explanation is given of why the universe is expanding as there are no field equations as in relativistic models with or without λ term. To detect creation of matter would be a final test in cosmology.

Hoyle and Narlikar (1962-63) have introduced field equations to explain for expansion of universe. The observations of M. Royle of Cambridge University on distant radio galaxies contradict the predictions of Hoyle and his group.

Recently Dr. Kursunoglu of Miami University has suggested a new model of the universe. He considers that the creation took place from the collision of two black holes of matter and anti-matter respectively and the expansion is still going on after the big bang.

All these theories differ in their line of attack of the problem but their results about the riddle of beginning of universe can be categorised as follows :

(i) The beginning is a singular point on the border of realm of physical science. Any question which refers to antecedents of the beginning or its nature can no longer be answered by Physics (Newton's cosmology belongs to this category).

(ii) The beginning was a particularly simple state. It contained within itself the seeds of growth and evolution which resulted in our present universe. (This is tone in case of Relativistic models).

(iii) There was no 'beginning'. The universe is either unchanging or possibly going through cyclical changes but is of infinite age (Steady state theory supports this claim).

B. Cosmology in Religion

Almost every religion has its own theory of creation. The Hindu religion and Semitic religions have more than one theory thereof. Many of those theories are perhaps wrong, as they are inconsistent with the present known facts of science. But science through its investigations has partly or wholly confirmed many essential theories of Religion, especially in the domain of cosmology.

Science has traced the creation of the world to some gaseous matter coming from the interstellar space and its gradual cooling down and conversion to water, earth and stone. Therefore by a process of evolution, all inanimate and animate things have come into existence.

The same view has been expressed in religion : 'God created the air, from air came water and from water the world was created. God spirit permeates all the beings'.[1]

Hindu Religion

Let us examine the approach of Hindu religion to the problems of cosmology. The world's most ancient text of religious literature viz. *Rg Veda* deals with the problem of creation of universe in its famous chapter '*Nāsdiya Sukt*'. The vedic seer sang in *Rg Veda* thus :

> Who here can tell us surely,
> From what and how this universe has risen ?
> And whather or not till after it the gods lived ?
> Who then can know from what it has arisen ?
> The source from which this universe has risen
> And whether it was made or uncreated,
> He only knows, who from the highest heaven
> Rules, the all-seeing Lord—or does not He know ?[2]

Upnishadas, the great treatises on Indian Philosophy, also dea l with the cosmological problem. According to Dussen there are four views of creation in Hindu philosophy based on Upnishadas.

1. Matter is eternal and *Purusha* (creator) has always been independent of God. God does not create the matter but moulds it into creation as a potter maketh the earthen pots.

2. *Purusha* is the cause and creator of matter. But after the creation, God does not interfere in its working and it continues according to its own fundamental laws.

3. God himself transforms into creation, i. e., changing his *Nirguṇa* form into *Saguṇa* form.

4. Creation is a play of Maya. It is a mere illusion. Only God is real.

The age of the universe according to the Hindu view is infinite. There are innumerable *Brahmās* who are employed in the process of creation. Each *Brahmā* has a life-time of 100 years. On astronomical time scale the year is much bigger than our solar year. Some of the units are given below :

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[1] ਸਾਚੇ ਤੇ ਪਵਨਾ ਭਇਆ ਪਵਨੈ ਤੇ ਜਲੁ ਹੋਇ ॥
ਜਲ ਤੇ ਤ੍ਰਿਭਵਣੁ ਸਾਜਿਆ ਘਟਿ ਘਟਿ ਜੋਤਿ ਸਮੋਇ ॥ *Guru Granth*, p. 19

[2] *Rg Veda*, X, 129-7

1 *Maha Yuga* = S+D+T+K (Four *Yugas*)
= 432 × 10^4 Solar Years
1000 *Maha Yugas* = Kalp=Day=Night (of *Brahmā*).
1000 *Maha Yugas* = 14 *Manvantar*+15 Junctions.
After working out the above relation we can get,
1 *Manvantar* = 71×432×10^4 Solar years.

For an analogy if we represent the cosmological time as still water in a pond, then the cycles of creation can be represented by the surface ripples which coutinue for ever. Thus the age of universe in this system is infinite and the creation (*Utpat-Parlo*) is a mere phase in it.

Semitic Religions

According to the Holy Bible, the creation of universe is the manifestation of God. The whole process of creation was completed in six days. The first book of Moses, called Genesis, opens with the lines : In the beginning God created the heaven and the earth.

In 1650, Bishop Usher of Ireland calculated the date of creation as 4004 B.C. according to the 'Genesis' story of the Bible. This date has been pushed back by a long span that has elapsed since the appearance of man on earth confirmed by recent archeological finds (Neanderthal man in Europe).

The end of the world too is envisaged in the Bible : "The heavens shall pass away with a great noise, the elements shall melt with fervent heat, the earth and the rocks that are therein shall be burned up" (II Peter, 3, P. 964, Old Testament.)

The Holy Koran speaks of creation as a big bang. When Allah spoke the word '*Kun*' there was creation all around. According to Islamic view, there are seven upper regions and seven nether regions and Earth is at the centre.

Sikh Religion

There are numerous verses in the Holy *Guru Granth* (the sacred text of the Sikhs) which prove that though the basic approach of Sikh metaphysics to cosmology remains the same as given in the Upanishadas but there is a clear Impact of Islamic thought too. There is a beautiful commentary given on all the previous approaches to cosmology in various other systems in this text.

In *Japujī*, Guru Nanak sums up his ideas about creation of universe which he explains in greater detail in *Mārū Solhe*. I quote some verses to explain his ideas about the origin of universe.

Creation : God created the world by uttering a word[3]

Guru Nanak poses the next question :
What was the time and the moment,
the day and the month,
when the world was created ?[4]

In the next stanza he comments and gives his own view :

Neither the Pandit can predict this date
by looking through the Purana texts,
Nor do the quazi can tell from the Koran,
Neither the Yogi nor any one else knows
the day, week, season and month of creation.
The creator who creates the world,
He Himself knows the time.[5]

In *Mārū Solhe* the Guru versifies his thoughts about the 'epoch' before creation which is referred to as '*sunya*', a concept at variance with the *sunyata* philosophy of Buddhism which means void. The Guru envisages creation out of this '*sunya*' phase.[6]

"The creator was all alone. He created the air, water, earth and the sky; even the sun and the moon from this *sunya*'[7]''. Guru Amar Das, the third Guru of Sikhs, gives the age of this 'epoch' as 36 *Yugas*.[8]

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[3] ਕੀਤਾ ਪਸਾਉ ਏਕੋ ਕਵਾਉ ॥ *Guru Granth*, p. 3

[4] ਕਵਣੁ ਸੁ ਵੇਲਾ ਵਖਤੁ ਕਵਣੁ ਕਵਣ ਥਿਤਿ ਕਵਣੁ ਵਾਰੁ ॥
ਕਵਣਿ ਸਿ ਰੁਤੀ ਮਾਹੁ ਕਵਣੁ ਜਿਤੁ ਹੋਆ ਆਕਾਰੁ ॥ *Ibid.*, p. 4

[5] ਵੇਲ ਨ ਪਾਈਆ ਪੰਡਤੀ ਜਿ ਹੋਵੈ ਲੇਖੁ ਪੁਰਾਣ ॥
ਵਖਤੁ ਨ ਪਾਇਓ ਕਾਦੀਆ ਜਿ ਲਿਖਨਿ ਲੇਖੁ ਕੁਰਾਣ ॥
ਥਿਤਿ ਵਾਰੁ ਨ ਜੋਗੀ ਜਾਣੈ ਰੁਤਿ ਮਾਹੁ ਨ ਕੋਈ ॥
ਜਾ ਕਰਤਾ ਸਿਰਠੀ ਕਉ ਸਾਜੇ ਆਪੇ ਜਾਣੈ ਸੋਈ ॥ *Ibid.*

[6] ਸੁੰਨ ਕਲਾ ਅਪਰੰਪਰਿ ਧਾਰੀ ॥
ਆਪਿ ਨਿਰਾਲਮੁ ਅਪਰ ਅਪਾਰੀ ॥
ਆਪੇ ਕੁਦਰਤਿ ਕਰਿ ਕਰਿ ਦੇਖੈ
ਸੁੰਨਹੁ ਸੁੰਨੁ ਉਪਾਇਦਾ ॥ *Ibid.*, p. 1037

[7] ਪਉਣੁ ਪਾਣੀ ਸੁੰਨੈ ਤੇ ਸਾਜੇ ॥
ਸ੍ਰਿਸਟਿ ਉਪਾਇ ਕਾਇਆ ਗੜ ਰਾਜੇ
ਸੁੰਨਹੁ ਚੰਦੁ ਸੂਰਜੁ ਕੈਟਾਰੇ ॥
ਸੁੰਨਹੁ ਧਰਤਿ ਅਕਾਸੁ ਉਪਾਦਿ ॥ *Ibid.*

[8] ਜੁਗ ਛਤੀਹ ਗੁਬਾਰੁ ਕਰਿ ਵਰਤਿਆ ਸੁੰਨਾਹਿ, *Ibid.*, p. 555

Guru Nanak continues the same theme to elucidate this point further by explaining the '*sunya*' phase as follows :

"For billions of year, there was nothing but utter darkness. There was neither day nor night, nor moon, nor sun, but the Lord alone sat in profound trance Neither there was creation, nor air, nor water. There were no continents, nor underwords, nor seven oceans, nor rivers nor the flowing of water.
There was neither death nor time. There was no *Brahma*, nor *Vishnu* or *Shiva*.

When He so willed, He created the world and supported the firmament without support. He created *Brahma, Vishnu and Shiva* and extended the love of mammon. He founded the continents, solar systems and underworlds, and from the absolute self He became manifest.[9]

The fifth Guru Arjan Dev describes of '*Sukhmani*' :

There are millions and millions of galaxies and solar systems in the universe.

The phenomenon of creation has occurred so many times. But the one Lord remains ever and ever.[10]

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[9] ਅਰਬਦ ਨਰਬਦ ਧੁੰਧੂਕਾਰਾ ॥
ਧਰਣਿ ਨ ਗਗਨਾ ਹੁਕਮੁ ਅਪਾਰਾ ॥
ਨਾ ਦਿਨੁ ਰੈਨਿ ਨ ਚੰਦੁ ਨ ਸੂਰਜੁ
ਸੁੰਨ ਸਮਾਧਿ ਲਗਾਇਦਾ ॥
ਖਾਣੀ ਨ ਬਾਣੀ ਪਉਣ ਨ ਪਾਣੀ ॥
ਓਪਤਿ ਖਪਤਿ ਨ ਆਵਣ ਜਾਣੀ ॥
ਖੰਡ ਪਤਾਲ ਸਪਤ ਨਹੀਂ ਸਾਗਰ
ਨਦੀ ਨ ਨੀਰੁ ਵਹਾਇਦਾ ॥
ਦੋਜਕੁ ਭਿਸਤੁ ਨਹੀ ਖੈ ਕਾਲਾ ॥
ਨਰਕੁ ਸੁਰਗੁ ਨਹੀ ਜੰਮਣੁ ਮਰਣਾ
ਨਾ ਕੋ ਆਇ ਨ ਜਾਇਦਾ ॥

ਬ੍ਰਹਮਾ ਬਿਸਨੁ ਮਹੇਸੁ ਨ ਕੋਈ ॥

ਜਾ ਤਿਸੁ ਭਾਣਾ ਤਾ ਜਗਤੁ ਉਪਾਇਆ ॥
ਬਾਝੁ ਕਲਾ ਆਡਾਣੁ ਰਹਾਇਆ ॥
ਬ੍ਰਹਮਾ ਬਿਸਨੁ ਮਹੇਸੁ ਉਪਾਏ
ਮਾਇਆ ਮੋਹ ਵਧਾਇਦਾ ॥

ਖੰਡ ਬ੍ਰਹਮੰਡ ਪਾਤਾਲ ਅਰੰਭੇ
ਗੁਪਤਹੁ ਪਰਗਟੀ ਆਇਦਾ ॥ *Ibid*. p. 1036

[10] ਕਈ ਕੋਟਿ ਖਾਣੀ ਅਰੁ ਖੰਡ ॥
ਕਈ ਕੋਟਿ ਅਕਾਸ ਬ੍ਰਹਮੰਡ ॥
ਕਈ ਬਾਰ ਪਸਰਿਓ ਪਾਸਾਰ ॥
ਸਦਾ ਸਦਾ ਇਕੁ ਏਕੰਕਾਰ ॥ *Ibid*., p. 276

The tenth Master, Guru Gobind Singh, besides being a great warrior, was a great scholar and a poet. In his writings known as *Dasam Granth*, he sums up his views :

> "When the creator started the expansion, the universe was created, when there will be contraction all the bodies will merge unto Thee".[11]

As yet there is no final word in cosmology. Let us hope the cosmologists find a solution to this riddle. About the present theories, I may conclude with the verse from the *Dasam Granth* :

> "Everyone explains the creation process according to his intellect, But no one can tell O Lord ! how you first created the universe'.[12]

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[11] ਜਬ ਉਦਕਰਖ ਕਰਾ ਕਰਤਾਰਾ ॥
ਪ੍ਰਜਾ ਧਰਤ ਤਬ ਦੇਹ ਅਪਾਰਾ ॥
ਜਬ ਆਕਰਖ ਕਰਤ ਹੋ ਕਬਹੂੰ ॥
ਤੁਮ ਮੈ ਮਿਲਤ ਦੇਹ ਧਰ ਸਭ ਹੂੰ ॥ *Dasam Granth*, p. 1387.

[12] ਆਪੁ ਆਪਨੀ ਬੁਧਿ ਹੈ ਜੇਤੀ ॥
ਬਰਨਤ ਭਿੰਨ ਭਿੰਨ ਰੁਹਿ ਤੇਤੀ ॥
ਤੁਮਰਾ ਲਖਾ ਨ ਜਾਦਿ ਪਸਾਰਾ ॥
ਕਿਹ ਬਿਧਿ ਸਜਾ ਪ੍ਰਥਮ ਸੰਸਾਰਾ ॥ *Ibid.*