SPACE, TIME AND THE UNIVERSE

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The noble laureate Sir Albert Einstein, the brainiest man in the world, who was declared as a good man for nothing by his teachers in the school, startled the scientists all over the world by his theory of Relativity. The birth centenary of this great scientist has been just celebrated all over the world. He gave the dimensions of the Universe as in Table 1. With regard to its origin, he announced the

Table 1. *Einstein's Dimensions of the Universe*

1.	Mass	2.143×10^{55} gm.
2.	Mean density	1.05×10^{-27} gm./ml.
3.	Radius	1.01×10^{27} cms. or 1068 million light years
4.	Number of electrons in the Universe.	1.29×10^{79}

Cylinder theory according to which this Universe of ours is a four dimensional space continuum consisting of three dimensional space with time as its fourth dimension. This is limited in three dimensions of space like a cylinder but unlimited in the direction of time. In common language, it means that the universe is limited in three directions, but in the direction of time it runs from an infinite past into an infinite future. It is interesting to note that if we regard our universe as infinite, it cannot be stable at the same time, for in that case all our energy would get scattered into the infinity of space and the attractions of myriads of other universes filling this infinite universe would scatter it into the infinity. The picture of the universe as given by Jain Thinkers is very similar to this which we shall develop into the following here. The volume of the Universe according to the Jains is 343 cubic Rajjus, a Rajju[1] being a quantity of the order of 10^{21} miles. The use of the word Brahmāṇḍa (Universe of the ellipsoidal form) by the Hindus for the universe is also suggestive of the finitude of the latter.

The Universe :—The Universe of Jains is composed of six substances. The substance has been defined as that reality which undergoes modifications through permanance. To give one example of such modification, consider an ingot of gold. Suppose we make an ornament out of it. The original mass of gold suffers a modification, the original form is destroyed, a new form is produced but the substance gold persists throughout the change.

The six substances are as below :

(1) Living substance or Soul or Jiva, (2) Non-living substance or Ajīva or Matter and energy, (3) Medium of motion or Dharma, (4) Medium of rest

or Adharma, (5) Space or Akasha and (6) Time or Kala. We will describe them in brief with some details of space at first.

(1) *Space :*—Space is one of the six substances which compose the universe according to Jains. The function of space is to give place to all other substances, i.e. interpenetratability is the characteristic of space or Akasha. For purposes of measurement, space has been divided into space points called Pradeśas. A Pradeśa is the smallest three dimensional volume occupied by an atom or paramāṇu. According to the Rutherford's planetary model of the atom, the positive charge of electricity known as Proton is situated in the center of the atom with a number of planetary electrons moving round it in fixed orbits. The atom of Hydrogen is the smallest and lightest. An estimate of its smallness and lightness can be gathered from the fact that if two hundred million atoms of hydrogen are placed in line, one touching the other, the total length would only be 2.55 cms. and the weight of 4×10^{21} atoms would be equal to the weight of a poppy seed. The number of gold atoms in a single drop of sea water is fifty billion. But this is not the atom of the Jains.

In the last few years, a new model of the atom called the Quark model is emerging in the world of physics. An intensive hunt has been going on all over the world for the search of the "Ultimate particle" of matter called the Quark by the scientists. The hunters are some of the leading physicists. The hunting grounds : almost anywhere from the high atmosphere to the bottom of the sea to the inside of the latest atom smasher. Despite this painstaking search, it has not been possible so far to track down the Quark. The physicists say that the Quark is the simplest particle in the Universe out of which everything is made. The two most prominent workers in this field are Murray Gell Mann and Richard Feynman of the California Institute of Technology and their cellaborators. These people have won high honours for this work including Noble prize in 1965.

From the very start of civilisation, philosophers have wished to find a simple idea that would unite everything we experience in the world around us. So there has been a search for the building block like the cell or gene in biology. The burning questions before the physicists of today are : (a) What are things really made of ? (b) Have we at last come down to the last foundation stone from which we can build anything: a table, a human being or a universe ? or (c) Must we go on looking at smaller and smaller pieces and going deeper and deeper into a bottomless pit ? To answer these questions, very elaborate and expensive experiments were performed in U. S. A. as a result of which the number of new particles emerging from nucleus has increased fantasically. By 1962, their number had been counted upto one hundred. Some of their names are neutrons, protons, pions, positrons, muons, electrons, neutrinos and their anti-particles such as anti-protons and so on. Millions of photographs were taken and even those particles were recorded which lived for as small a period as one-ten billionth of a second – 10^{-11} second and then died but the Quark remains undicovered. We congratulate the scientists for their hard perserverence and uneasing labor. If some day, the Quark is discovered, it

will be the atom of the Jains and the volume occupied by it will be the unit of space, the space point or Pradeśa.

The space has two varieties; Lokakasha and Alokakasha. The constituent elements of the world are the infinite number of Jivas and the infinite number of the physical objects, principles of motion and rest and time-all contained in space—the sixth. The space which is coextensive with these objects is called Lokakasha. But this is only a part of the real space. Beyond this, there is Alokakasha or Anantakasha. This is pure space. Ther e are no objects animate or inanimate is this infinite region.

For measurement of celestial space, two units are in use. They are Yojana and Rajju corresponding to miles and light years. In order to evaluate the magnitude of Yojana, we consider the following table of length given in vedic literature :

24 Aṅgula = 1 Hasta = 18 inches
4 Hasta = 1 Danda or Dhanuṣ = 6 feet
2000 Dhanuṣ = 1 Koṣa = 12000 ft or 25/11 miles
4 Koṣa = 1 Yojana = 100/11 miles or 9 miles 160 yds.

This value is further corroborated from a Sukta of Rigveda, according to which light travels at the rate of 2202 yojanas per half Nimesha. As per Hindu Puranas,

15 Nimeṣas = 1 Kāṣṭhā
30 Kāṣṭhā = 1 Kalā
30 Kalā = 1 Muhūrta or 48 minutes

Thus the value of one Nimeṣa comes to be 1/4 second.

Taking the value of Yojana as 100/11 miles and half Nimeṣa as 1/4 second, the velocity of light comes to be 1,87,670 miles per second.[2] This is the same value as arrived at by modern science.

In order to calculate the value of Rajju in miles, we begin with the quotation given by the German Professor Von Glassnap in his famous book "Der Janismus" on the basis of the famous English astronomer Colebrooke. According to him, Rajju is the distance travelled by a Deva in six months at the rate of 20,57,152 yojanas per Nimesha. Taking the value of Yojana as $2000 \times 100/11$ miles and six months as 1,55,52,000 seconds or $1,55,52,000 \times 4$ Nimeṣas, the distance travelled by the Deva is 2.23×10^{18} miles, Einstein has assumed the universe as spherical and calculated its volume as 1037×10^{63} cubic miles. If we equate it to the volume of the universe given in cubic Rajjus by Jain thinkers, i. e. 343 cubic Rajjus, we obtain a Rajju equal to 1.45×10^{21} miles. Finally, therefore, we arrive at the following space unit distances :

1 Yojana = 100/11 miles
1 Mahayojan = 2000 Yojanas = $2000 \times 100/11$ miles
1 Rajju = 1.45×10^{21} miles.

(2) *Living Substance, Jīva or Soul* :—The soul is the reality that possesses the faculty of knowing and perceiving, in which the sensations of pain and pleasure inhere and through which the volition functions. Modern experimental psycology has already discovered the electrical counterpart of the soul called the Taijas Sharira. This soul has the potency of changing its size by contraction and expansion. It can occupy the smallest possible body of a bacteriophage or the biggest body of a whale fish. Since a body grows from a microscopical size in the mother's womb to its full proportions and contracts again at the end of its earthly career, to reincarnate into a new seed, it follows that the size of the soul cannot remain fixed. Modern science identifies life with protoplasm or the living cell and it is well known that it possesses a remarkable property of contraction under external stimulii. The theory of transmigration of soul is an extraordinary conception also supported by Hindu and Budhist philosophies. According to Jain view, all actions of embodied living beings, whether mental or physical, are followed by influx of fine molecules of energy towards the soul—the former constitutes a fine material body around the soul. It is technically called Karmaṇā Śarīra. To use the modern language, the activities of mind and matter constitute a super radio with the quantillions of living cells sending out their individual waves to be tuned in by quantillions of receiving sets in the brain. Influx of these waves is the influx of subtle karmic matter, which we can call the fourth state of matter, the other three being solid, liquid and gaseous states. Activity of a good kind attracts meritorious while activity of a bad kind attracts the opposite kind of karmic matter. The karmic body is responsible for dragging the soul from one physical body to another, and it keeps the soul bound to the confines of the universe owing to the gravitational forces operating on all sides. When karmic matter is shed off the soul by following the path of liberation, being the lightest substance, the latter rises to the top of the universe and rests there as pure "Effulgence Devine". It cannot travel further on owing to the absence of the medium of motion called the luminiferous Aether by the scientists.

In recent years, the scientists are trying to explain the processes of life, i. e., growth and reproduction in terms of special properties of various kinds of proteins and the two nucleic acids—DNA and RNA. Although the artificial synthesis of a biologically active living cell, which automatically grows by multiplication has been reported, it has not been possible so far to correlate the proteins, DNA and RNA with functions of memory, thought, reason, logic, intution and free will. In other words, consciousness could not be explained on the basis of physics and chemistry and hence the existence of soul remains unchallenged. Its existence and transmigration has been amply corroborated by the recent researches is para-psychology.

(3) *Ajīva or Matter and Energy or Pudgala* :—Ajiva is the second principal constituent of the physical universe. The use of the word Pudgala for matter and energy is quite peculiar to Jain philosophy. This word has been coined from two words—Pud means to combine and Gala means to dissociate. Hence the root meaning of the word Pudgala is a substance which undergoes modifications by combina-

tion and dissociation. One who is familiar with modern developments in atomic physics cannot but admire the choice of this word for denoting matter and energy. We now know ful-well that all atoms are assembly of protons, neutrons and electrons. In the phenomenon of radioactivity, atoms are seen dinintegrating themselves on their own accord into others For instance, an atom of Uranium after undergoing various modifications is ultimately converted into the metal lead. In the phenomenon of artificial radioactivity, the bombardment by alpha particles, protons or neutrons brings about such transformations as the conversions of aluminium or sulphur atoms into those of phosphorous. By bombarding a nitrogen nucleus with alpha particles, it is converted into oxygen. Similarly, by bombarding a berilium atom with alpha particles, it is converted into carbon atoms. Such examples can be multiplied.

The chief characteristic of the substance-Pudgala is that it is the subject of sense perception, it has a form in contrast with other five constituents of the universe which are without form. The physical properties of hardness, density, temperature and either positive or negative charge are associated with it. It has one of the five colors depending on the temperature.

This matter is divided into six subclasses : solids, liquids, gases, energy, fine karmic matter and extrafine matter consisting of the streams of the ultimate particles of matter. Until the beginning of this century, the classical physics of Newton and Galeleo regarded energy as perfectly weightless and without any association with matter. It was the genius of Einstein who definitely proved that every form of energy has mass and that there is no difference between matter and energy but that of the form. According to him, one gram of any kind of matter when fully changed into energy is equivalent to the quantity of heat which would be produced by burning 3000 tons of best variety of coal. It is really wonderful to note that this truth of particulate nature of energy was already discovered several centuries ago by the Jain philosophers. They regarded every form of energy as a manifestation of Pudgala and hence one form of energy could be interconverted into the other. It is really interesting to see that whereas in the history of modern science the nature of heat, light and electricity could not be elucidated for a long time-they being regarded as fluids for several centuries.

The true nature of sound was also known to Jaina thinkers. Unlike the other systems of thought, which associate sound with Aether or space, Jain system explains it as being due to the vibrations of the molecules. This sound is further divided into musical sounds and noises. The musical sounds are given different names depending upon their production by vibrations of strings, reeds, pipes, bells and stretched membranes.

Matter is then thought of as made up of Skandhas (molecules), Skandhdeshas (atoms), Skandhapradeśas (ionised or stipped atoms) and paramāṇus (indivisible elementary particles such as electrons and the positrons). In conformity with the

version of the modern kinetic and electron theories of matter, the Jain philosophy also regards elementary particles inside atom and the molecules in a piece of matter to be in a state of motion.

Although the space-point technically called Pradeśa has been defined as the volume of the space occupied by an atom, but it is mentioned at the same time that an infinite number of atoms can occupy a pradeśa under abnormal conditions.

The modern science has discovered a substance called nuclear matter, first discovered by Adams which is two thousand times denser than platinum, the heaviest metal on earth. The formation of such a matter in certain stars such as the dark companion of Sirius (the brightest star in northern heavens) can be explained in no other way but by saying that somehow a very large number of atoms have become packed in a small compass in nuclear matter. Writing about the nuclear matter, the great astrophysicist Eddington once said that one ton of nuclear matter can be easily carried in a waist coat pocket.

According to Vālmīki Rāmāyaṇa, the bow of Śiva which was broken by Bhagwān Rāma was 13 cms in length and was made of nuclear matter called Vajra.

(4) *Medium of motion or Dharma* :—Dharma has been defined by Jains as the auxiallary cause of motion. As water helps the movement of a moving fish so does the Dharma help the motion of the matter and soul. But it does not move those which are not moving. It should be noted that the word Dharma in Jain cannons has been used entirely in a different technical sense here than it is ordinarily understood to mean. Hindu philosophers have used this word in the sense of duty or righteous deeds only, but here the Jains mean the Aether of space, the medium of motion peculiar although it may seem. It is formless, inactive and eternal. It has none of the qualities associated with matter, i. e. it is devoid of qualities of contact, taste, color, smell and sound. It is a continuous medium pervading the whole universe. It remains unchanged by the motion of objects.

The first problem before the scientists was that if light waves were real waves they must be waves in something. They were plainly not waves in matter, it was necessary, therefore, to invent something else, which was not matter, for them to be waves in. This something they called the Aether and imagined it as an utterly thin and elastic fluid that flowed undisturbed between the particles of the material universe and filled all empty space of every kind.

What was this Aether like ? Material media are penetrated by aether, their molecules being surrounded by it such as the leaves of tree are surrounded by air. But difficulties and contradictions appeared at once. For, it was proved to be : (1) thinner than the thinnest gas; (2) more rigid than steel; (3) absolutely the same everywhere; (4) absolutely weightless; and (5) in the neighborhood of any electron, immensely heavier than lead, It is difficult to imagine the planets as moving with their enormous velocities through aether without any loss of energy. The motions

of the planets are perfectly regular and show no signs of any loss of this kind. In the words of Denton, the Newtonian aether is rigid, yet allows all matter to move about it without friction or resistance; it is elastic but cannot be distorted. It moves but its motion cannot be detected; it exerts force on matter but matter exerts no force on it : it has no mass nor has it any parts which can be identified; it is said to be at rest relatively to the fixed stars, yet the stars are known to be in motion relatively to one another.

A great many phenomena, culminating in the Michelson experiment and the theory of relativity, showed that the aether must be something very different from ordinary terrestrial substances.

Eddington writes about aether in his famous book, "The Nature of the Physical world" that it does not mean from the above that the aether is abolished. We need an aether.. ....In the last century, it was widely believed that the aether was a kind of matter. It would be difficult to say when this view died out. Nowadays, it is agreed that aether is not a kind of matter. Being non-material, its properties are quite unique.

Thus, it seems that science and Jain physics agree absolutely in so far as they call Dharma non-material, non-atomic, non-discrete, continuous, co-extensive with space, indivisible and as a necessary medium for motion and one which does not move.

(5) *Medium of Rest or Adharma :* Adharma is the auxiallary cause of rest to soul and matter. It is the principle which guarantees the permanance of the world sructure. It assists the staying of soul and matter which are stationery just as the shade of a tree helps the staying of travellers. But Adharma does not stay those which are moving. It also pervades the entire universe and has all other characteristics like Dharma. To summarise, it is a non-living, formless, inactive, continuous medium without which equilibrium in the universe would be impossible and the souls and the atoms would have become scattered in infinite space. It is the binding force which is responsible for a stable universe, without it, there would be chaos and no cosmos.

The modern equivalent of Adharma may be looked upon as Newton's force of gravitation. According to Newton's law, all bodies with which we are acquainted, when raised into, the air and quietly abandoned, descend to the earth's surface. They are urged thereto by a force or effort which, although it is beyond our power to trace, we call Gravity. According to law of gravitation[3], every particle of matter pulls every other particle directly as the product of their masses and inversely as the square of the distance between them, i.e. the heavier the bodies are, the greater is the mutual force of attraction and greater the seperation, the smaller is the force of attraction. If the distance between them is doubled, the force of attraction becomes one-fourth and if it is trebled, it becomes one-ninth and so on.

It was the genius of Newton to extend the law of gravitation from the earth to heavenly bodies. He came early to suspect that the force which keeps the moon

in its orbit is none other than the power of attraction of the earth. However, it should be borne in mind that this force of Newton was taken as an active force although acting like an invisible agency. The Newtonian concept of gravitation was modified by Einstein who rendered it quite inactive and thus brought it on the same level as the Adharma of the Jain thinkers.

In the case of atoms, however, gravitational attraction plays no real part. The masses of electrons and protons are too small for that. On the other hand, here there is an incomparably greater electric force, i.e. the force of attraction between oppositely charged protons and electrons. However, the law which governs this attraction is exactly similar in form to the law of gravitation, so that it is merely a change of name. It is again a force of attraction which keeps an electron moving round a proton. Thus, we are led to the conclusion that Adharma corresponds to Einstein's Unified Field of Gravitation and Electromagnetism.

(6) *Time or Kāla* :—Time is also a substance. It is divided in two categories : absolute and apparent; de jure and do facto. The former is made up of Kalanus (grains or quantas of time). Innumerable grains of time reside one in each space-point of the finite universe like heaps of jewels. In other words, the time consists of units which never mix with one another but are always seperate. The whole universe, excluding the pure space is full of these grains of time; no part of the space within it is devoid of them. These grains are invisible, formless and inactive i.e. in a static condition and in countless number. The distinction between absolute and apparent time is that the former is eternal while the latter has a beginning and an end. The scientists also suspect that there is a real time behind the apparent time. Prof. Eddington says, "Whatever may be time de jure, the astronomer's time is time de facto. .....You may be aware that it is revealed to us in Einstein's theory that time and space are mixed up in a rather strange way. This is a great stumbling block to the biginner." One startling conclusion from this theory is that both space and time vanish away into nothing if there is no matter. It is matter in which originate space and time and our universe of perception. So is the conclusion of Jain thinkers. In the infinite pure space extending beyond loka, no other substance exists but space, there is no matter and hence there are no grains of time. The resemblance is striking.

The practical unit of time is two fold-one for the measurement of small intervals and the other for the measurement of extremely long intervals. Earlier, Nimesha has been indicated as the smallest unit of time equivalent to 1/4th of a second. A still smaller unit of time is Prativipalansha which is 1/9000 th. of a second.

According to the Hindu Purāṇas, 43, 20,000 years make a Mahāyuga and 1000 mahayugas make a Kalpakāla. The period of Kalpakāla is the Brahmā's day and an equal interval is Brahma's night. At the end of each Kalpa, Brahma creates a new universe. Thus the number of years in a kalpa is 4,32,00,00,000 (total number of digits is 10). But according to the Jains, the years of Kalpakāla

can be expressed by a number consisting of 77 digits of which 26 are numerals followed by 50 ciphers. The numerals are in the following order :

$$82690526061640635549902438 4 \times 10^{50}$$

Origin and end of the Universe :—In Hindu Trinity, Brahmā, Viṣṇu and Maheśa have been allotted specific functions of creation,[4] preservation and destruction of the universe respectively, i. e. these are the attributes of the Godhood. There are fixed times for creation and destruction. As already stated above, a Mahayug consists of 43,20,000 years and 71 mahāyugas make a Manvantara. The word Manvantara means the time interval between the successive Manus or the law givers. Fourteen Manus are born in a Kalpakāla. Before and after the birth of each of the 14 Manus, the world is submerged under water for a period of years equal to $4,32,000 \times 4$. Thus, the total number of times that the world is submerged under water is 15 and the corresponding total period is $4,32,000 \times 4 \times 15 = 43,20,000 \times 6$ years i. e. 6 mahayugas. Since there are 14 Manus in each Kalapakāla and they are born at intervals of 71 mahāyugas and 6 mahāyugas elapse during the period of floods which occur 15 times in one Kalpa, the total period of a Kalpa is $71 \times 14 = 994 + 6 =$ 1000 mahāyugas. Therefore, corresponding to our 24 hours day, Brahmā's day consists of 8640 million years.

The Purāṇas state that the Brahmā creates the universe afresh at beginning of the day and it is submerged under water during night. The disappearance of the universe in this manner is called Naimittika Pralaya. In this the entire matter of the universe is concentrated in one place but is not destroyed. During one such Pralaya, the great sage Mārkaṇḍeya alone was alive and all other celestial and terrestrial objects ceased to exist. There was water and water everywhere and the sage wandered through empty space. He saw a baby in yogic sleep on a banyan leaf. The baby opened his mouth wide enough for the sage to enter. On entering the mouth, he saw all the three worlds inside the stomach, thus proving that during a pralaya, all objects merge into Supreme being. He then releases all these objects at the time of new creation.

The submerging of the earth under water has occurred about four times since the beginning of the earth. This fact has been accepted by the modern geologists. They have given it the name of "Glacial Epoch" and in Jain terminology, it is called "Khand Pralaya". The scientists have assigned the Deluge due to the melting of ice at the polar caps.

The Mahāpralaya occurs at the end of the life period of the Brahmā, which is of 100 years duration, each day and each night of the year being of 4,32,00,00,000 years. In this absolute pralaya, everything in the universe, material as well as non-materials, is dissolved into atoms and finally absorbed into the body of the Supreme Being. At the time of creation, the process is reversed and our universe can be looked upon as the projection of Lord God himself. The process of dissolution and creation goes on cyclically for eternity.

The concept of Mahāpralaya in Jain theory is a different story. The cycle of time here is divided into two parts called Avasarpiṇī and Utsarpiṇī. During the first, there is a gradual decline while during the second, there is a gradual progress. Utsarpiṇī comes again and so on alternately. Each epoch is further divided into six parts. At the end of Avasarpiṇī, there is a situation like Khaṇḍ Pralaya for 49 days and then creation starts again with the seven day rains of water, milk, butter, amrit and sweet juice respectively[5].

The following points of difference should be noted between the Hindu and the Jain concepts regarding the Universe :

(1) According to the Hindus, the whole earth is submerged under water 15 times during one kalpa whereas according to the Jains, it is only once during each epoch and that too partially.

(2) According to Hindus, at the time of Mahāpralaya, all matter, space and time are engulfed into the Supreme Being and then it is He who unfolds the Universe again, whereas according to Jains, the nature of the Universe is such that after it has completely run down, it regenerates itself by carrying out the cycle in reverse order.

According to modern science, the Universe is gradually running down in the material sense of the word. The scientists say it as that the entropy of the world is tending towards the maximum. This has been proved mathematically by Maxwell from the second law of thermodynamics. In nature, heat is constantly flowing without interruption from a body at a higher temperature to a body at a lower temperature and air automatically flows from a region of high pressure to that of low pressure. Thus, there is tendency towards equalisation of temperature and pressure all over the universe. Efficiency of a heat engine is greater if the difference of temperatures between the source and the exhaust is large, i.e. greater the difference of temperatures, the higher is the efficiency. In other words, we can say that the availablity of energy for doing work is becoming less and less every moment and when the temperature and pressure will become the same everywhere, the available energy for work will become zero and the entire universe will come to a stand still. The sum total of the energy in the universe will be the same as before but it will not be available for work. Living beings will neither be able to move nor to breathe. Blood will not circulate in their veins. Life of all forms will be extinct.

What next ? is a glaring question before the scientists. They believe that the universe cannot end as declared by Einstein in his Cylinder theory referred to in the beginning. Some unknown force must rewind the clock of the Universe so that it may be set running once again. According to Hindu belief, the rewinding is done by the Almighty God whereas according to Jains, the process is automatic.

There is another line of thinking in science. According to this, sun is the source of energy for all life on earth. According to the principle of equivalence

between mass and energy, sun is loosing its mass at the rate of 46,000 tons per second and if it continues to radiate energy at the present rate, its mass will be reduced to zero after a few billion years, when Universe becomes devoid of solar energy, all life on earth will dis-appear and it will be a sort of Pralaya.

In recent years, another interesting discovery has been made. It is well known that the magnetic north pole does not coincide with the geographical north pole. There is an angle between them. Now, it has been found that the magnetic poles of the earth are slowly rotating and a time will come when the north pole will go into the position of south pole and vice versa. In between, there will be a period of 100-200 years when the earth will have no magnetic field at all because when we go from a negative quantity to a positive one, zero comes in between.

The earth's magnetic field acts like an umbrella for the showers of destructive cosmic rays which are coming profusely from inter-stellar space. The earth's magnetic field deflects them to one side and it is only in very small numbers that they are able to reach us. The rotation of the poles has a period of about 7,50,000 years and the last reversal took place some 7,00,000 years back. Thus after 40 to 50 thousand years[6], it is likely to occur again. At the time of zero magnetic field, all cosmic ray showers fall upon the earth with full destructive force and the latter is completely scorched to death. This is Mahāpralaya.

On 30th June, 1908, there was an unusual explosion in Siberia in the Soviet Union. The explosion may be compared to a 30 megaton hydrogen bomb explosion, i. e. equal to 1500 Hiroshima atomic bombs exploding together. American scientists are of the opinion that it was an explosion caused by an antimatter intruder[7] of about one kilogram weight, that entered accidentally into our atmosphere and fell upon the earth. If someday a lump of antimatter weighing about 10 tons enters into our universe, it will create such a violent explosion that the whole world will be reduced to dust. This is the latest view of science on the subject of Mahāpralaya.

References

1. Rajju is very big unit of length like the light year whose magnitude has been seperately discussed.
2. In the measurement of the Universe, Mahāyojana is used, this being 2000 times greater than yojana.
3. Although, the law of gravitation is associated with Newton, it was already known to the great Indian astronomer Bhaskaracharya some six hundred years before Newton. Bhaskara enunciated the law exactly in the same mathematical form as did Newton.
4. The universe is called Brahmāṇḍa which means egg of Brahma. This egg was made of gold. According to Big Bang theory, some five billion years ago, this egg, due to some unknown cause suddenly began to expand and

based on certain evidences, it is claimed that it is still expanding. The Jainas, however, do not believe in the expanding Universe. They believe the Universe has a fixed size of 343 cu. Rajjus. This expansion of universe has been concluded on the basis of feeble red shift of spectral, lines. Deepak Basu has explained it away by saying that it is due to gravitational fleld of galaxies. Similar views have been expressed from many other quarters. There is still another theory running parallel to it with a very large number of followers which believes in continuous creation. In this theory, the universe was not created at any particular time out of nothing but it continues with necessary modifications and will continue to be so forever.

5. Nemcandrācārya, Trilokasāra, Adhikar 6, gathas, 866,868.
6. This is quite in conformity with the Jain view that the next Mahāpralaya will occur after about 39.5 thousand years.
7. The matter of our universe is an assemblage of atoms wherein the positive charge is in the centre and the electrons move round it. In case of atoms of antimatter, the negative charge is in the centre and the positrons move round it. When an atom of antimatter comes in contact with ordinary matter, there is an explosion and both of them are annihilated. It is presumed that beyond our universe, there is its counterpart made up of antimatter and called as the anti-universe.

लेखसार

आकाश, काल और विश्व

प्रो० जी० आर० जैन, मेरठ उ० प्र०

आकाश—जैन मान्यता के अनुसार यह विश्व छह मौलिक द्रव्यों या तत्त्वों से बना हुआ है। इनमें से आकाश भी एक है। यह सभी प्रकार के मूर्त और अमूर्त पदार्थों को अवगाह-दान करता है। इसका मापन प्रदेश-यूनिटों में किया जाता है। प्रदेश सूक्ष्मतम परमाणु द्वारा अधिष्ठित आयतन माना जाता है। आज के विज्ञान ने अभी तक जैनसम्मत परमाणु के समकक्ष विश्व के सूक्ष्म घटक का परिज्ञान नहीं कर पाया है, यद्यपि वर्तमान में **क्वार्क** नामक कण को इसका समकक्ष माना जा सकता है। आकाश के जितने क्षेत्र में मूर्त-अमूर्त पदार्थ पाये जाते हैं, वह लोकाकाश है। इसके बाद शुद्ध आकाश है जो अलोकाकाश कहलाता है।

दूरवर्ती आकाश-क्षेत्रों के मापन के लिये योजन, महायोजन (= 2000 योजन) और रज्जु (= 1.45×10^{21} मील) के यूनिट प्रयुक्त होते हैं। परिकलनों के आकार पर योजन का मान $100/11 = 9.09$ मील पाया गया है। इसके आधार पर प्रकाश का वेग 1, 87, 670 मील प्रति सेकंड निश्चित होता है।

काल—यह भी विश्व के छह द्रव्यों में से एक अमूर्त द्रव्य है जो व्यवहार और निश्चय के भेद से दो प्रकार का होता है। निश्चय काल के सूक्ष्म कालाणु आकाश-प्रदेशों में मणियों के समान विद्यमान रहते हैं। ये कालाणु अदृश्य, अनाकार, अक्रिय और अमिश्रणीय होते हैं। ये अनादि और अनंत होते हैं। इनके विपर्यास में, व्यवहार काल सादि और सान्त होता है। प्रो० एडिंग्टन का अनुमान है कि व्यवहार काल के मूल में निश्चय काल होना चाहिये। सापेक्षवाद के अनुसार, यदि पदार्थ या द्रव्य न हों, तो काल भी नहीं रहता। इसीलिये अलोकाकाश में पदार्थों के अभाव से काल द्रव्य का अस्तित्व नहीं माना जाता।

काल के मापन के लिये दो प्रकार के यूनिट काम आते हैं। समय के लघु अन्तरालों के मापन में **निमेष** (0.25 सेकंड) अथवा **प्रतिविपलांश** (0.00011 सेकंड) काम आते हैं। दीर्घ अन्तरालों के लिये हिन्दू पुराणों में महायुग (43,20,000 वर्ष) और कल्पकाल 1000 महायुग) का प्रयोग किया गया है। जैन मान्यता के अनुसार कल्पकाल में वर्षों की संख्या 77 अंकों की होती है जबकि हिन्दू मान्यता में यह दस अंकों का ही है।

विश्व का आदि और अन्त—हिन्दू पुराणों के अनुसार ब्रह्मा दिन में सृष्टि का निर्माण करते हैं और रात्रि में उसे विलीन करते हैं। इस दैनिक प्रलय को **नैमित्तिक या खंड प्रलय** कहते हैं। इसमें विश्व के समस्त पदार्थ एक स्थान पर केन्द्रित हो जाते हैं। लेकिन ब्रह्मा की प्रत्येक 100 वर्ष की आयु पूर्ण होने पर संसार का **महाप्रलय** होता है जब कि विश्व की प्रत्येक वस्तु अपघटित होकर ब्रह्मा में विलीन हो जाती है। इसके बाद वह पुनः सृष्टि का प्रारंभ करता है। इस प्रकार नैमित्तिक एवं महा-प्रलय तथा सृष्टि-निर्माण की प्रक्रिया का चक्र चलता रहता है।

इस वर्णन के विपर्यास में, जैनों के अनुसार विश्व का यह चक्र उत्सर्पिणी और अवसर्पिणी कालों के रूप में निरंतर प्रकृत्या ही चलता रहता है। अवसर्पिणी काल के अन्त में 49 दिन में खंड प्रलय के समान स्थिति बनती है लेकिन इसके बाद 35 दिन में जीवन पुनः पूर्ववत् हो जाता है।

आधुनिक वैज्ञानिकों के अनुसार, विश्व में एन्ट्रोपी की निरंतर वृद्धि से, सौर ऊर्जा के निरंतर विकिरण के कारण सूर्य के द्रव्यमान के शून्य होने से अथवा उत्तरी ध्रुव या दक्षिणी ध्रुवों के घूर्णन के कारण एक दूसरे का स्थान ग्रहण करने से विश्व में प्रलय संभावित है। उदाहरणार्थ, ध्रुवों के घूर्णन से पृथ्वी के चुंबकीय क्षेत्र में विचलन होता है और जब एक ध्रुव दूसरे ध्रुवों पर पहुँचता है, तब यह क्षेत्र शून्य चुंबकीय शक्ति के माध्यम से आगे विरोधी दिशा में परिवर्तित होता है। ध्रुवों का इस प्रकार का घूर्णन साढ़े सात लाख वर्ष में एक बार होता है। इस प्रकार का पिछला घूर्णन कोई सात लाख वर्ष पूर्व हुआ था। उस समय चुंबकीय क्षेत्र के अभाव में कास्मिक किरणें पृथ्वी पर पड़ी और प्रलय छा गया था। अब 50,000 वर्ष बाद फिर ऐसी ही स्थिति संभव है। जैन शास्त्रों में भी इसी प्रकार का एक अनुमान लगाया गया है। विश्व के इस प्रलय की एक सूचना 30 जून 1908 में रूस में हुये एक विशिष्ट विस्फोट से भी मिलती है जिसमें एक आकाशीय प्रतिपिंड भूतल से टकरा गया होगा। यह पिंड-प्रतिपिंड की टक्कर कभी भी हो सकती है। लेकिन जैन मान्यता के अनुसार यह खंड प्रलय ही होगा, विश्व का अन्त नहीं। इस प्रकार विश्व अनादि और अनन्त है जिसमें सृष्टि एवं खंड प्रलय का चक्र चलता रहता है।