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Know the Mystery of creation

UNIVERSE & LIFE

Pillars Of Creation

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DARWINISM

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Cover Image : M16, Eagle Nebula, NGC 6611 These pillars are a small region within the Eagle Nebula, a vast star-forming region 6,500 light-years from Earth.
Credit : NASA, ESA, CSA, STScI, Hubble Heritage Project (STScI, AURA)

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Editorial :

Who is scared of **Darwinism**

A reproduction by the London Stereoscopic & Photographic Company of a portrait of **Charles Darwin** by photographer Ernest Edwards (1837-1903), circa 1866.

The deletion of Darwin's theory of evolution by the Central Board of Secondary Education(CBSE) from its class 10 syllabus has triggered controversies. This deletion has been put in effect following the recommendation of the National Council of Educational Research and Training (NCERT). Previously, during the pandemic, the syllabus had been rationalized to ease academic pressure on students. The chapters that were removed from the exam curricula at that time have now been deleted from the printed books.

It's not only the theory of evolution that has been axed. In Mathematics polynomial divisions, certain theorems, and cross multiplication method of solving equations have also been removed. A fundamental chapter in chemistry-Periodic Table has also been deleted.

However, the controversies that have been raging are essentially around the deletion of Darwin's evolutionary theory and the chapter on the Mughal court (theme 9). The decision to surreptitiously remove references to the Gujarat riots without prior notice has added more fuel to the fire.

Unsurprisingly the controversies and debates

have been made to deviate from the crucial question and have been deflected elsewhere to score political brownie points.

The critics of the exclusion argue that the Central Government, guided by the ideology of the Hindutvaite RSS, is cunningly getting rid of all the topics from the curriculum they dislike. The committee members entrusted with the task of setting the curriculum are mostly affiliated with staunch Hindutvaite organizations like the Hindu Education Foundation, Vedic Foundation, etc.

The proponents of the change, emboldened by government support, come up with rebuttals like: " Darwin is being taught in class 12", and " Many chapters on the Mughals are still in place in the syllabuses of the lower classes till class 12."

In the wake of this disputation, an entire army of adherents of this ideology-including ministers, office bearers, political leaders, educationists, even scientists, and heads of scientific research institutes-have joined the fray.

They assert, "The change is absolutely justified. India has been the mother of knowledge-science-democracy. The Vedic rishis discovered and invented everything known to modern science a long time ago. The rest of the world was enlightened by India. The glory lost during the 1000-year domination of outsiders must be revived." Such arguments muddle the significance of the issue in question. Such a murky environment disrupts the tasks of truth-seeking and awareness-building through campaigns.

Insofar the matter of Darwin's evolutionary theory, about two thousand scientists, teachers, and pedagogists have sent a letter to NCERT opposing such a move.

In that letter, they asserted, "An understanding of the process of evolution is crucial in building a scientific temper and a rational worldview. The way Darwin's painstaking observations and his keen insights led him to the theory of natural selection, educates students about the process of science and the importance of critical thinking..." This statement deserves attention.

At the same time, it's necessary to highlight the history of the dogged opposition Darwin and later the adherents of evolutionary theory, faced in their efforts to establish the theory (known as Darwinism) among students and the general populace. The origin of today's opposition to Darwinism will remain unclear If this task remains incomplete. Charles Darwin published his revolutionary treatise 'On the Origin of Species' in 1859. His age was fifty years at that time.

But before publishing only 1250 copies of the first edition of the book he had waited for two long decades. He had no doubts in his mind that the inferences he drew from his observations would face vehement resistance and provoke hostile reactions in 19th-century Europe.

The Darwinian theory was not only critiqued by religious institutions, authorities, and conservative politicians. Darwin had to endure the taunts and sarcasm of scientists like William Herschel and a thinker like John Stuart Mill. The reason behind this was before the advent of the evolutionary theory scientists did not have any evidence-based theory. All they had in their arsenal was the established truth: "Divine powers were the only source of all creation."

Dispelling all the fog, Darwin showed how nature acted on organisms. He explained how species came into being and became extinct. Therefore Darwin's theory not only opposes the biblical theory of the origin of mankind, it also refutes similar origin theories mentioned in the earlier Jewish and latter-day Islamic scriptures.

The Indian subcontinent-based eternal religion (Sanatan Dharma), now known as the Hindu dharma, does not say anything different about the creation of organisms and humans. In their bid to establish the Hindu dharma as the state religion in India the present-day ruling dispensation has trained their gun against Darwinism along with numerous other issues. Only five years ago the then Central Human Resource Development Minister of State,

Satyapal Singh had said: "Darwin's theory is scientifically wrong". "It needs to change in the school and college curriculum. "Since man is seen on Earth, he has always been a man. Nobody, including our ancestors, in written or oral, said they ever saw an ape turning into a human being." A less discussed issue in comparison to the debate around Darwin should also be brought to the fore. In their effort to oppose the decision by CBSE to delete Mughal history- Gujarat riot- evolution etc, the CPIM-led Kerala government decided to teach complementary school texts which would include the abovementioned topics and hold exams on them.

However, the announcement of this decision by the Kerala state school Education minister has provoked strong resistance on the part of the authorities of the schools run by Christian and Muslim religious organizations. Their opposition, though, is confined to Darwinism. The Kerala Catholic Bishop's Conference has also registered there strong protest against the proposed complementary text.

Today the Darwinian evolutionary theory is banned as an academic subject in Israel, Turkey, Saudi Arabia, Pakistan, Oman, and Egypt. The Tennessee state of the United States of America promulgated a law in 1925, forbidding the teaching of any theory that ran contrary to the human creation theory described in the Bible, like the theory of evolution. 22-year-old John Scopes was charged with the violation of this law and arrested. This incident made the headlines and was widely understood as primarily a tussle between 'Bible versus Darwin's theory'. Finally, Scopes was slapped with a fine of 100 dollars for breaking the law. Despite the outcome of the trial, the body of scientific evidence corroborating evolution was widely publicised.

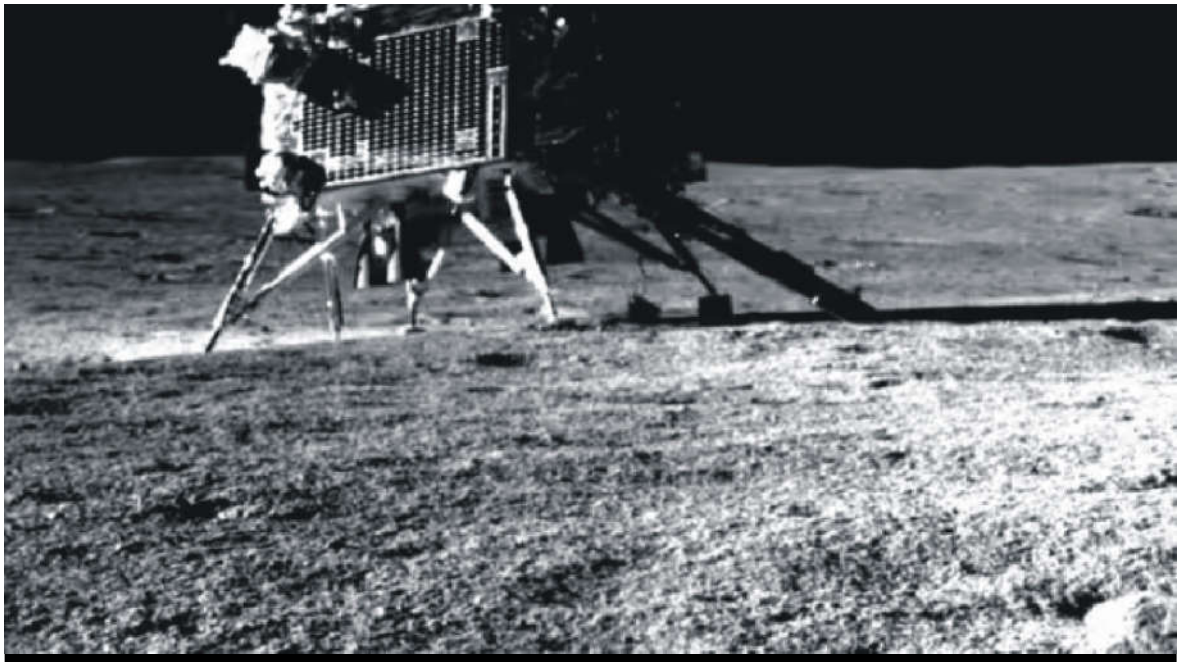
This conflict is still very much alive in the seat of modern science, the United States. From 2017 an effort has been ongoing to establish institutions that will offer legal protection to teachers of creationist theory in eight States including Texas Alabama, Arkansas, and Florida. Paradoxically though, the modern-day human society dependent on state-of-the-art science and technology cannot choose to ignore any discipline of science including Biology. On the contrary, it must depend on its continued development. Hence it has to accept and make use of the two elementary pillars of zoology,i.e evolutionary theory and genetics.

One must also take into account the fact that the Museum of Natural History situated in Paris, France houses an exhibition spanning four floors to highlight the independence between evolution and genetics. But today's society which has been termed a capitalist society uses science and technology as a tool for producing marketable commodities and services.

On one hand, there exist a handful of people possessing enormous wealth. On the other side of the divide, there are hundreds of millions who languish without food, clothes, shelter, medicare, education, and livelihood. This happens due to the inherent laws of capitalist production and exploitation. The use of science and technology to maximize profit widens the divide between the haves and have-nots.

Naturally it begs the question: who is responsible for this? It's impossible for the owners-rulers of the present system to give a scientific answer to this question. Hence they rely on the philosophy of fate/destiny and supernaturalism of the olden days. This philosophy peddles doctrines like: 'God is the creator of everything', 'As you sow so will you reap", "You cannot change your destiny." These ideas strike at the roots of scientific temper and consciousness, thus crippling and disarming society. Darwinian evolutionary theory hits hard at the foundations of fatalism and supernaturalism. Therefore the fight against Darwinism is actually being conducted by the ruler-owner classes of our society under the garb of religious robes. Hence it is incumbent upon science workers to expose the real reason behind this opposition of Darwinism along with establishing the essential doctrine of Darwin in society. ■

The successful landing of the Chandrayan-3
Science keeps marching ahead triumphantly



Photograph of Lander BIKRAM from rover PROGYAN on lunar surface. Image : ISRO

In tune with the research-based prediction of scientists, on 23rd August, 40 days after its launching, Chandrayan-3 landed successfully on the surface of the Moon, the only natural satellite on the earth. The landing occured exactly at the scientifically calculated time and place. After the USA, the erstwhile Soviet Union and China India became the fourth country to execute the successful landing of its spacecraft and the first to achieve it in the South Polar region of the Moon.

Man has had infinite curiosity and countless fanciful notions about the Moon since the very inception of human civilization. What used to be a blue canopy above the head at the dawn of civilization, has transformed into an ever-expanding infinite space with the progress of civilization. In all probability Astronomy is the most popular discipline in science. The innumerable specks of light dotting the night sky overwhelm our minds and stimulate our curiosity. Last, but not the least, the Moon happens to be our closest neighbour in space. We have always been emotional about it in many ways one has kept an account of the numberless poems, stories, and anecdotes written about it. There's hardly any baby who hasn't heard lullabies featuring the Moon sung by their mothers while they rocked them to sleep! And this is how our close bonding with the Moon has been transmitted from one generation to the next.

Moon exploration has been the outcome of the cumulative tireless efforts of innumerable scientists. The development of science and technology in tandem with societal development created the towering ladder which made it possible for man to reach the Moon. The Indian ruling class, by naming the landing place 'Shivashakti' and by

characterizing this scientific success as the 'battle cry of a developed and new India' has been fanning ultranationalism and the Hindutva doctrine. So it's important that any delusion on this matter should be dispelled and the truth unfolded by presenting the perspective of the success of Chandrayan-3.

One needs to keep in mind that science and scientific discoveries and inventions have never been national issues. Therefore no one terms the discoveries and inventions of Galileo, Newton, Faraday, Einstein, Darwin, or Satyendranath Basu as contributions to Italian, British, German, or Indian sciences.

Moreover, almost all important scientific research and discovery of the modern era is international in every sense. Thousands of scientists from different corners of the world work in a coordinated manner on these projects. Space research is international in its entirety. Long before the launching of Chandrayan-3 on 14th July 2023 different international space research organizations have been standing by ISRO, the Indian space research organization.

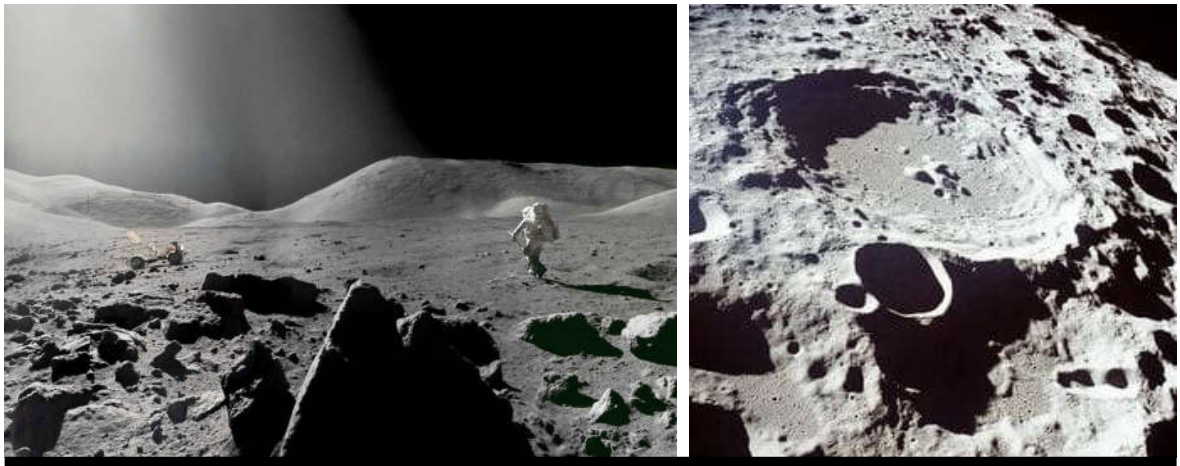
Chandrayan-3 journey in sketches. Image : ISRO

ISRO, likewise, has been cooperating and coordinating with research projects elsewhere.

The National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) have consistently provided terrestrial assistance to ISRO in ensuring the successful landing of Chandrayan-3.This is vital because space explorations, especially landings require backup support.

Otherwise, it becomes impossible to monitor the second-by-second positions of the spacecraft and maintain contact with it from any particular point on the Earth. It would be a huge burden for any one organization to bear the enormous cost of constructing massive antennae and control centres around the globe. During the Chandrayan-3 mission, ESA continuously monitored the progress of the spacecraft with the help of the 32 meter and 15-metre antenna of the UK based Goonhilly Earth station and the French Guiana-based Kourou station respectively. Data and telemetry sent back by Chandrayaan-3 arriving via Kourou and Goonhilly were forwarded to the European Space Operation Centre(ESOC). From there, they were sent to ISRO for analysis. ESA's 35-metre antenna in New Norcia, Australia, provided additional tracking support during the lunar landing, serving as a backup for ISRO's own ground station. Seconds before the landing, when the entire country was overwhelmed with emotions, watching and listening to the live telecast, we were not told that the ESA space antenna was involved in transmitting live data on the lander Vikram's health, position, and landing trajectory. NASA's Deep Space Network (DSN) provided similar assistance at crucial moments through its deep space communication complexes based in Canberra and Madrid.

Likewise, these organisations are now helping the Sun-bound Aditya L-1in its ongoing mission to the Sun. So, there's not a grain of truth that only the Indian government and Indian scientists can claim credit for the success of Chandrayan-3.



SURFACE OF THE MOON (Image: NASA)

In today's capitalist world order, scientific research, discoveries, inventions, and innovations are mere tools for investing capital and reaping profit. Hence, space science has been termed space industry/space business by the capitalist class. It's being said that in 2023 the size of this business is 546 billion US dollars (1 billion= 100 crores,1 dollar= 80 rupees approx.). By 2025 its projected size in India will be around 13 billion dollars. Globally, ISRO has been playing a pioneering role in reducing costs. NASA had to incur Rs 20,637 crore on its Mars mission project (Curiosity).In comparison, the cost of the Chandrayan-1 project was 450 crores.Chandrayan-2 cost 978 crores while the amount spent on Chandrayan-3 was a paltry 615 crores. For this reason, ISRO has been continually receiving commissions from different parts of the world for launching satellites. Recently in an interview to 'India Today' the ISRO scientist Nambi Narayanan said: It's not only the Chandrayan mission, I have a dream which I would like to share with everyone. Just like the USA has NASA, the Europeans have ESA, similarly, I want an Asian Space Agency (ASA) for this region.

In 2021, as powerful players in the space industry and space business Ross Cosmos of Russia and China's National space administration have declared the initiation of the international lunar research station project. Various organizations around the world have joined this project, while others are in the process of joining it. United Arab Emirates, Pakistan, and Venezuela have already joined it. The primary survey will be completed by 2025. Construction work is slated to be carried out through 2026-2035. Utilization will begin in 2036. Similarly the United States and Europe are taking steps to accomplish similar goals on the Moon and other areas of the space.

While ISRO was thumping its back for having sent a spacecraft to the moon at the lowest cost and expecting applause from the rest of the world, the miserable situations of some of the architects of the successful Chandrayaan-3 mission came to light. In a report published in the Hindu titled: "PSU engineers who built equipment for ISRO await salary" It was revealed that the technicians who built various parts of Chandrayaan-3 had not received salaries for 20 months. Around 3,000 employees of Heavy Engineering Corporation (HEC), including technicians and engineers,who had built equipment for Chandrayaan 3 had for the last 20 months been building the launching pad for the spacecraft without having been paid any salary. The workers whose technical skills and labour made it possible for Vikram and Pragyan to make it all the way to the moon were living from hand

to mouth. Having withdrawn their provident funds and exhausted the money, they were being forced to sell samosa gulch and readymade garments after working hours.

In all religious beliefs, the Moon has been imagined either as god/ goddess or as the abode of god. Thanks to the unceasing efforts of scientists through the centuries, the secrets of the moon and other planets and satellites of space have been uncovered by mankind. Scientists have gradually been able to gather various information about the moon. Knowledge about the atmosphere, days and nights gravitational force, soil, hills, mountains, the plains, and mineral resources of the Moon have come to man's possession bit by bit. In the future, by building permanent space stations on the Moon, humankind will seek suitable settlements for mankind in the numerous planets, planetoids, and satellites of outer space. Yet during every space exploration including the Moon mission, we notice the heads and high officials of scientific organizations get involved in un-scientific and pseudo-scientific activities which no lover of science can accept. A large number of the ISRO directors sought the blessings of gods before the launch by cracking open coconuts in various temples including Tirupati, by placing models of the rocket at the feet of idols, and by organizing yagnas.

Earlier expressions of such superstitions were fewer. The more science and technology are developing, the more ignorance is being dispelled, and the more the proliferation of unscientific and pseudo-scientific activities with the direct patronage of the state. Most professional or carrer scientists lack the erect spines required to confront these superstitions and religious activities encouraged and facilitated by the state and governments. Their goal in life is to enhance their careers as bureaucrat-scientists, while the State wants the broad working masses to remain steeped in the darkness of superstitions, no matter how much science and technology develop.

Taking into account the widespread inequality and misery prevalent in society some intellectuals and political personages observe: When our countrymen are deprived of food -education, what's the point of spending so much money on space research and exploration? This money could be utilized to alleviate the suffering of the poor. In response it could be argued: Why talk about only 615 crore rupees? When the capitalists loot thousands of crores and enjoy luxurious extended vacations abroad, when they amass enormous wealth by sucking the sweat and blood of the working masses, why don't these intellectuals organize rallies? Just a few members of the ruling class have become Billionaires and Trillionaires by exploiting 94% of the working masses of the country. Only the United-class conscious struggle of the working class can end this inequality and difference. The struggle of mankind to conquer nature is being impeded due to this inequality and class difference.

Hence it is impossible to do away with this inequality and class difference by putting an end to scientific research which aims at knowing the unknown and attaining victory over nature. The development of science and technology on one hand enhances the development of the productive forces, while on the other ripens the social consciousness that it's "class division that poses obstacles in the path of all kinds of development including scientific research". The development of science deals a crushing blow to the darkness that pervades the consciousness of all walks of people living in society. It helps the masses to develop a scientific temper. Hence progressive people having scientific temper never raise the demand to stop scientific research. On the contrary, they demand further development of scientific research. They engage in struggles to ensure that the fruits of science are made available to everyone, and most importantly they hold the struggle to open the door of unbridled development of society by eradicating once and for all the exploitation of man by man. ■

The Mystery of Origin of Life on Earth

Panchanan Mandal

Today, life is established in every habitable place on earth. But people are endlessly interested about how life originated on earth. There is no bigger question than this ! It's amazing to think that our earth was once a fiery gas ball that today is teeming with life. Earth's biodiversity amazes us. We are very curious to know how life originated on earth? How did life begin? Many scientists and researchers have discovered the mystery of the origin of life on earth through many studies. But there was a period when most of the people of the world believed that some God or Allah had created some advanced creatures including humans at his own will with his great power! But the lower classes of organisms like insects, frogs, reptiles etc. are formed spontaneously . A few centuries ago, the scientific concept of the origin and evolution of life was beyond the reach of human thought. Some progressive people then came forward to experimentally disprove the idea of spontaneous creation. Among them are **Francesco Redi**, an Italian doctor (1668), Italian scientist **Lazzaro Spallanzani** and others. Arguments over possible explanations for how life arose continued into the 19th century. **The Frenh Academy of Sciences** (French Academie des Sciences) came forward to arrive at a final decision on the matter.

Alexander Oparin

They announced that a prize would be awarded to any scientist who could test and confirm which of the current theories about the **origin of life** was acceptable in all respects. This was a big challenge for scientists. Most of the scientists had not the courage to take up this challenge. But scientist **Louis Pasteur** accepted this challenge. He was the first to completely disprove the theory of spontaneous creation by experiment. He proved with the help of experiments that there is no way that any living thing can be created by itself. In 1858, by blowing air through gun cotton used for exploding gunpowder, he observed that many microorganisms were trapped in the cotton. These are the microorganisms that are growing in the soup in the open-mouth flask experiments of **John Needham** and **Spallanzani**. The micro-organisms in the open-mouth flask are not collecting 'life force' from the air, rather they are collecting micro-organisms already present in the air. **Pasteur** organized an incredible experiment to prove his idea. Through this experiment, Pasteur re-

J B S Haldane

jected the **spontaneous theory of the origin of life**. **The French Academy of Science**s honored Pasteur with **Alhumbert Prize** as they promised. There is no reason to think that after Pasteur's experiments the debate over the origin of life ceased completely or that his theory has since been accepted by everyone! How life appeared on Earth has been studied by many scientists over the past few centuries and continues to this day. However, the debate continues.

The basic premise of modern theories is that no supernatural God created life or organisms or that organisms did not suddenly appear on Earth, that the emergence of life on Earth was an ***evolutionary periodic event***. Scientists have even been able to test how life evolved on earth by artificially creating an environment in the laboratory similar to the one that existed at the beginning of creation. However, the current progress in these researches is not the result of a single effort of any scientist, but the result of the relentless pursuit of science by many scientists. Many scientists today are researching the origin of life and they are confident that they are on the right track and their confidence is based on the results of many years of experiments and experience by many scientists.

Some of the breakthrough discoveries of modern science surrounding the mystery of the origin of life is filled with immense enthusiasm, struggle and extraordinary creativity. Among the many curiocities of human, the main enquiry is about the origin of life on earth . Therefore, scientists have to work outside of traditional beliefs to find the secret of the origin of life.

Life appeared billions of years ago. Dinosaurs are probably the most famous extinct animals that roamed the earth about 250 million years ago. But to find the origin of life we have to go billions of years back. The oldest known fossil was about 3.5 billion years old, which is 14 times older than the oldest dinosaurs. But fossils of even earlier days is not absurd. For example, in August 2016, researchers discovered fossils of microscopic micro-organisms about 3.7 billion years old. But our world itself is not very old. Earth was formed about 4.56 billion years ago. If we assume that life originated on this earth then it seems logical and much more acceptable. Because we have yet to find life anywhere else in the universe that we know of. The record of the earlier fossils tell us a time after formation of the earth upto 4.5 billion years ago. Therefore we can get a scientific idea what it was like at the time of creation if we go back closer to the time when life evolved.

Since the 19th century, biologists have known that all living things are made up of 'cells', which are essentially aggregates of tiny living particles of various shapes and sizes. During 17th century ,the first cell was discovered ;after the invention of the modern microscope. But it took almost a century to realize that cells are the basis of all life forms. So the scientists came to know that in order to creat a cell we require environment condition and composition of earth 3.5 billion years ago.

You may think ,you look completely different from a fish but a microscope will find a cell in a fish's body and a cell in yours are very similar! That means the fish and you are made of almost the same type of cells! Same can be said regarding various type of plants.

Mostly forms of life are microorganisms - each made up of only one cell. They are unicellular. Bacteria are the most common microorganism found in almost all biospheres on Earth. And every multicellular advanced organism has evolved from a single-celled organism. This means we can define the problem of the origin of life more precisely. We can creat a cell by replicating the condition and composition of earth 3.5 billion years ago.

Even a few centuries ago it was not really considered necessary to ask how life began, because the religious answer to this question was

quite clear. The great God gave life to living beings.

Before 1800 AD, most people believed in "vitalism". It is the intuitive idea that living things were endowed with special, magical properties that set them apart from inanimate objects.

Vitalism was tied to the religious beliefs then cherished. The Bible says that God used "the breath of life" to animate the first man and that man's immortal soul is a form of vitality.

But in the early 1800s, scientists discovered substances that were thought to be indispensable for life. One such chemical was **urea**, which is found in our urine.

But, it was consistent with vitality. Only living things were thought to be able to make these chemicals, so they were probably mixed with vital force and that's what made them special.

Nevertheless, scientists after 1828 AD had legitimate reasons to seek a miracle-free scientific explanation as opposed to the theory of 'Creature of God' regarding how life originated. But they could not do it properly. Although there was enough reason to explore it then, in reality we had to wait decades to know the secret of the origin of life. Perhaps the vitalism doctrine was embraced too emotionally!

In the 19th century, the greatest advance in the mystery of the origin of life was the theory of evolution. One of the cornerstones of which was laid by Charles Robert Darwin. Darwinism or the theory of natural selection, which was explained by Darwin in his book ' The Origin of Species by Means of Natural Selection' in 1869. He showed how great diversity of life could have arisen from a single common ancestor; rather than each of the different species being created individually by God. All living organisms today have evolved from their primordial ancestors.

Darwin's **natural selection theory** has proven highly controversial, as it contradicts what the Bible says about the origin of life. Darwin and his evolution theory explained biological evolution based on observations and experimental results as opposed to traditional religious ideas.

However, Darwin's natural selection theory explained biological evolution, but it did not elaborate on how the first life originated or how the first organisms appeared on Earth. Although not elaborated, it states that the emergence of life is a gradual process of evolution.

Although Darwin knew that the origin of life was a vital question, he was perhaps a little hesitant to start another fight with the Church. That's why despite writing his book **'The Decent of Man**' on human evolution, he did not publish it during his lifetime to avoid controversy. In 1871 he wrote a a letter to **Joseph Hooker** *"But if (and oh what a big if) we could conceive in some warm little pond with all sorts of ammonia and phosphoric salts, light, heat, electricity etcetera present, that a protein compound was chemically formed, ready to undergo still more complex changes [..] "*

In other words, if somehow a small warm pond water, filled with simple organic compounds, were exposed to sunlight, some of these compounds could combine to form a protein-like substance, which could then evolve and become more complex.

But this was a general idea of Darwin's, with no experimental results, yet it became the basis for the first hypothesis of how life originated. That is why later Alexander Oparin expressed his opinion about the origin of life inspired by Darwin's theory.

Alexander Oparin studied organic chemistry in Moscow, Russia, in a conflicted atmosphere. He was able to continue his work independently because the country in which he was born or studied was largely free of religious influence at that time. In 1924, Oparin published his book **'The Origin of Life**'. In this book he set out a view of the origin of life that was strikingly similar to Darwin's warm little

pond.

Oparin was clear that the emergence of life on Earth was not an isolated event or a random event. There is no scientific basis for the prevailing religious theory that life suddenly appeared by chance through some supernatural power or God's great majesty. Rather, the process of the emergence of life should be seen as part of the overall process of the evolution of the universe.

Oparin wondered what the Earth was like when it reached an environment favorable to the origin of life. According to him the surface was very hot then, because hot rocks from space were raining down on the earth, its effect was not very small. The scattered semi-molten rocks contained large amounts of chemicals - many of which were carbon compounds.

Eventually Earth cooled enough for water vapor to condense into liquid water. It was raining. Earth long ago had oceans, which were hot and rich in carbon-based chemicals.

Now two things may happened -

First, different chemicals can react with each other to form many new compounds, some of which will be more complex. Oparin hypothesized that carbon compounds such as carbohydrates and amino acids, the basic molecules of life, could form in Earth's water.

Second, some chemicals begin to form microscopic structures. Many organic chemicals do not dissolve in water - like oil forms a layer on top of water. But when some of these chemicals chemically combine with water, they form spherical structures called "**Coaservates**."

If you look at coacervates under a microscope, they behave like living cells. They grow and change shape and sometimes split into two. They can take up chemicals from the surrounding water, so life-like chemicals can be concentrated inside them. Oparin proposed that coacervates are the ancestors of modern cells.

In 1929, five years after the publication of Oparin's 'Origin of Life', the English biologist **J B S Haldane** independently proposed some similar ideas on the origin of life in a short article published in the Rationalist Annual.

Haldane had already made great contribution to evolutionary theory, helping to integrate Darwin's ideas with the fledgling science of genetics. Haldane was also one of the leading figures in explaining the origin of life on Earth.

Like Oparin, Haldane outlined how organic chemicals could form in water, but he did not know about Oparin's theory. According to Haldane, the primordial oceans reached a **Hot Dilute Soup** in Earth's primitive environment. Organic molecules that appeared in the primitive environment mixed with seawater to create a favorable environment for life. **Haldane's theory** is also called **chemical evolution**. Creation of organic compounds before the origin of living things is the key to this doctrine.

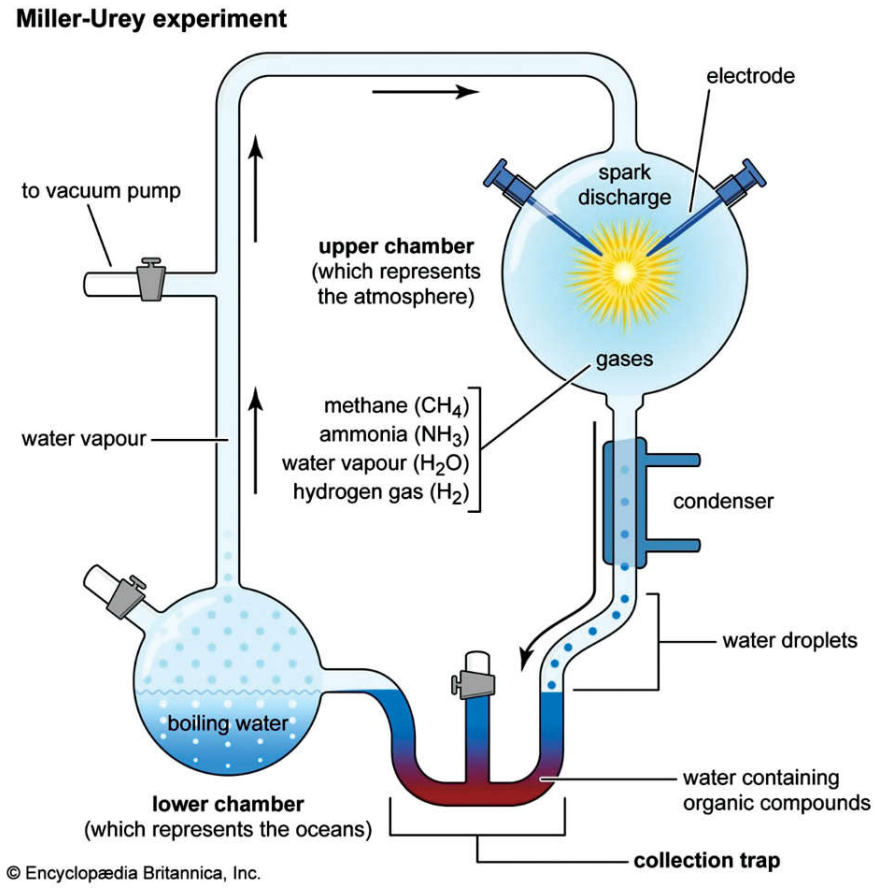
Among all the biologists in the world, Oparin and Haldane proposed almost the same theory about the **origin of life**. They were the first to give a clear idea of the origin of life by purely chemical means without any God or even "vitalism".

Haldane's theory was less criticized because it coincided with Oparin's theory. Especially the then Soviet Union and its leaders were keen enough to support materialist explanations for such profound events as the origin of life; and Haldane was also a materialistic man.

Armen Y. Mulkidjanian, an 'Origin of Life' expert at the University of Osnabrück in Germany, said, "At the time, accepting Oparin and Haldane's idea was largely a matter of personality. Those who were religious did not accept this explanation, while those who were atheists or materialists supported this explanation. This doctrine was gladly accepted in the Soviet Union at that time because they did not need a god.

The idea of the origin of life in a primordial

hot dilute soup of organic chemicals, proposed by Oparin and Haldane separately, is collectively known today as the **Oparin-Haldane theory**. This theory was very effective in explaining the origin of life and was easy for everyone to understand. But even so there was a problem! Because there was no experimental evidence to establish this theory. But that was later proved through a world famous breakthrough experiment by Harold Urey, a teacher and his student Stanley Miller.



Professor Harold Urey was very interested about the origin of life on Earth. He had already received the Nobel Prize in Chemistry in 1934. He also became interested in space chemistry during this time, especially what happened during the formation of the solar system. At a meeting he told that the Earth's atmosphere probably had no oxygen when it first formed. So Oparin and Haldane proposed ideal conditions for the formation of primedial soup. If there was oxygen in the primitive environment, the chemicals would have been destroyed by exposure to oxygen.

A doctoral student named Stanley Miller was in the audience at that meeting. He later approached Urey with a proposal.- 'Can't we prove the Oparin-Haldane theory by an experiment? Urey was skeptical but agreed to the experiment.

Stanley Miller, under the supervision of Harold Urey performed that historic experiment in 1952 AD. Stanley Miller proved the first step of the Oparin-Haldane chemical evolution theory by a pretty simple experiment. Miller experimented creating Earth's primordial climate in the laboratory to demonstrate that Earth's primitive environment has produced water vapour, methane, amino acids, or other complex organic molecules. From these experiments, Miller and Urey proved that the terrible electric discharge on the primitive Earth resulted in the formation of different types of amino acids and various complex organic molecules, which can be called the prime step in

the origin of life on the earth.

The experiment set up was very simple. Miller attached a series of glass flasks. It contained four types of chemicals, which he assumed were present on the primitive Earth – boiling water, hydrogen gas, ammonia and methane. He repeatedly gave electric sparks to the gases, to repeat the lightning-like phenomena on the **primitive Earth** that had been a common occurrence on Earth so long ago.

Miller found that after the first day the water in the flask turned noticeably pink, and by the end of the week the solution had turned dark red and turbid. It is evident that new chemical compounds were created. When Miller analyzed the solution, he found that it contained two types of amino acids: **glycine** and **alanine**. These amino acids are generally considered the building blocks of life because they are used to make proteins that control most of the biochemical processes in our bodies. Through this experiment, Miller and Urey were able to show that the chemicals necessary for the origin of life can be naturally produced in nature. The results of Miller's experiment were published in the journal, Science in 1935. Although the experiment was supervised by scientist Urey – very generously he withdrew his name to give Miller all the credit for the experiment. Nevertheless, we often refer to this historical study as the **Miller-Urey experiment**. Miller and Urey were thus able to produce many of the organic molecules essential to the development of life through simple experiments under near-normal atmospheric conditions.

Inspired by **Miller-Urey experiment** many scientists began to find ways to make simple biological molecules on their own. Many within the scientific community seemed to have reached the solution of the mystery of the origin of life.

But then it became clear that the origin of life was more complicated than it had been thought. Even today there is a debate among scientists about the appearance of life on Earth. In the wake of Miller's experiment, the question that raised intense debate among scientists at the time was which organic compound was created first and where was it created to lead to the origin of life ? However, according to most scientists, the first life originated in sea water and amino acids are the first organic compounds. Shortly after Miller-Urey's experiment, biochemist **Sidney Fox** said that after the formation of various amino acid compounds in the primitive environment of the earth, these compounds joined together to form a very common primitive type of protein. Gradually these proteins become more complex and were able to perform various functions. One of them is **enzyme**. Because without enzyme no biochemical process is possible. Then another question came to be widely discussed among scientists: the role of the formation of proteins in the origin of life. Because by then we had learned that the main molecule of life is not protein but nucleic acid, basically DNA. Many scientists has begun to say that life on the primitive earth began when nucleic acids were formed. And RNA preceded DNA. However, many scientists consider RNA to be complementary to DNA. And if RNA is considered as the first nucleic acid from the primordial source of life, then we should find another process, which is essential for life.

However, the nucleic acid then takes shelter in the protein coat and a wall forms around the protein and nucleic acid to form the cell. At first the nucleus was scattered and the cell organelles were not grouped together. Organisms composed of these type of primitive cells are called prokaryotic. Later the cell organelles aggregated and many nuclear materials came together to form the true nucleus and eukaryotic organisms arose. ■

Lunar Ark

Scientists have no clear idea about the total number of species that came into being and went extinct since the early days of the evolution of life on our planet. A lot of flora and fauna that once existed on the earth left without leaving evidence of their existence. The evidence is widely distributed all over land and water. The scientists are tirelessly searching for the evidence to tease out information about their appearance, existence, and extinction. The list is quite long – from tiny unicellular organisms to mighty dinosaurs. In 1796, Georges Cuvier, the French environmentalist-cum-biologist was the first scientist to bring the facts of the emergence and disappearance of species in the field of science. Cuvier collected various fossil samples from different regions of Europe and helped to establish it as a scientific theory, consequently known as paleontology. These findings afterward became enriched with Charles Darwin's theory of evolution. This disappearance or extinction is irreversible. Once a species disappeared no evidence of its reappearance was found. All forms of life keep adjusting themselves to the ever-changing environment for their survival. This process is known as adaptation. Adaptation and evolution take place hand in hand. The species that fail to adapt to the environment ultimately become extinct. Events of Mass extinction are not at all improbable when a wide range of species disappear due to natural calamities e.g. earthquakes, volcanic eruptions, floods, avalanches, meteor strikes, etc. These natural phenomena happened long before the appearance of humans on Earth. So, extinction is not anthropogenic, i.e. it's not a fallout of human activities. Species including human beings presently exist on the earth and will become extinct one day in their natural course.

After the extinction theory came under the scanner t of science, scientists started to identify the stages of evolution of different species. The species whose numbers are decreasing alarmingly are considered to be endangered species and some are identified to be at the ultimate stage of their evolution. Hence the idea of conservation of endangered species to protect the bio-diversity of species on earth occurred to scientists. The motive of conservation is to delay the extinction process by eliminating the causes behind it. So, for the conservation of endangered wildlife, the conservation of their habitat i.e. forest was considered. This idea prompted the governments of several countries to frame forest and wildlife conservation acts. The embargos stipulated in those acts resulted in creating new contradictions between people and the governments. The rights of the people who live on the edges of forests to access animal and plant resources have been slashed drastically due to the implementation of the law. Along with bio-diversity, total forest volume and the distribution of forests on earth are continually changing. This change is largely natural and minimally anthropogenic. Nowadays, due to several reasons forest volume is reducing remarkably. Under the circumstances, with the development of different branches of science, the idea of conservation has acquired new dimensions. Due to the development of biological science in general and genetics in particular, scientists prefer to conserve the genetic materials of species than to conserve the entire ecosystem for a very long period. Presently gene conservation is considered to be the best and the most convenient scientific process.

This method of conservation of genetic materials is known as 'gene banking'. For animals, the conservation of stem cells, tissues, organs, sperm, ova, etc. is done in 'cryobanks'. On the other hand, in vitro banks, seed vaults pollen grain conservation, etc. are related to plant conservation. Among those, seed conservation is the most ancient practice. Since the dawn of agro-civilization, humans have been preserving seeds to sow for the next season. Due to incompetence in preservation, most of the previously used seeds have been lost in nature. Scientists are toiling hard to procure the seeds

that have been lost during the long history of agricultural civilization. Seed vaults have been set up in almost all countries in the world. The present number of such seed vaults is about 1750. An international seed vault named 'Svalbard Global Seed Vault' has also been set up by collecting conventional seed grains from all over the world. Almost all the countries made their contribution to the seed vault. The seeds here are so secure that they will remain as a lifeline of civilization even if a deluge destroys our planet. This international seed vault is built inside a tunnel on the island of Spitsbergen, Norway, at a depth of 130 metres from sea level.

The temperature inside the vault is maintained at -180°C, where 10,80000 seed samples are preserved. But it is interesting to mention that no GM seed (genetically modified) has found a berth in this vault. It can accommodate about 45 thousand samples of seed. If atmospheric temperature soars up resulting in the melting of all the ice deposited on the mountaintop, the technology will maintain the temperature of the vault around 0°C for a further 200 years and will keep the seeds intact and active. On one hand, this seed conservatory is a symbol of seed diversity and on the other, it is a living embodiment of the march of 13,000 years history of agro-civilization of mankind.

Despite the multi-layered technical fidelity used for setting up the national seed vaults all over the world, some incidents of destruction and spoilage of seeds have taken place. The National Seed Conservatory of the Philippines was damaged by flood water due to the onset of a typhoon. Afterward, all the seeds that had been preserved were gutted when an inferno broke out. The national seed vaults of Afghanistan, Syria, and Iraq have been destroyed by war. No backup seed samples from these countries are stored in the global seed vault. The major seed companies all over the world keep on battling to capture the global market and establish hegemony over the seed vaults. Half of the global seed market is occupied by the big three seed companies. Among those Monsanto (presently called

Bayer) a USA-based company, occupies 23% of the global market.

Recently, scientists expressed their worry about the stability of the global seed vaults in the distant future. They suspect the occurrence of several accidents that may destroy any such depositories along with the global seed vault. The scientists of the Robotic Exploration Department of Arizona University have noted as many as seven reasons behind its destruction. Those are super-volcanic eruptions, droughts, meteor strikes, nuclear wars, pandemics, effects of solar storms, and climate change. According to the researchers, no place on the Earth is safe. So they proposed to set up a huge gene bank on the moon, the next-door neighbor of our planet. Earth has about 87 lakh species in all. Animals and fungi make up 67 lakh of these. These species have been proposed to be preserved in secured cabinets on the moon named 'Lunar Ark'. 'Lava Tubes', the naturally formed tunnels on the moon's surface were the first choice of scientists for preserving the biodiversities of the earth. Scientific studies revealed that these lava tubes were formed at the time of formation of our natural satellite. Scientists have identified as many as 200 such tubes on the moon's surface where the arks may be hidden safely. Genetic materials of the species, if preserved inside the tubes will be protected from minor meteor strikes and radiations. Naturally, there is no question of a flood incident on the moon. But the question is how to carry these genetic materi-

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The Martyr Scientists of Leningrad

Vivolov Institute of Leningrad

In 1921, Russia had unchained herself from the oppression of the Tsarist Regime. The country was passing through a steady socialist upsurge. The world had never seen such a society which truly belonged to common peoples in every respect. The inherent motto of the society was, 'give according to your capacity and take according to your need'. There had never been a society before where each and every member was the owner of the society. As Rabindranath Tagore wrote after visiting Russia, 'we are all kings in the kingdom of our king ...' To ensure the food security of the people, Russian botanists established the famous 'Vavilov Institute of Plant Industries', a huge seed bank. The seed depository of Leningrad had about 40,000 seeds of food crops out of one lakh eighty seven thousands plant seeds. People all over the world were amazed to see how the Russians were overcoming the impediments on the path of social progression. The depository was a real pride of the Russians because it not only ensured food safety for Russia but the social revolution showed the world how to overthrow the enemies. On the other hand, the triumph had demolished the vanity of the exploiters all over the world. So, the beasts were seeking opportunities to pound on the newly born socialist state.

In September 1941, during the Second World War II, under the leadership of Hitler, Nazi forces attacked Russia and Leningrad was totally surrounded by the German military. The seed bank was right in the middle of the Russian Capital. The city was sealed from all sides. 28 scientists who were working inside the depository at that time were trapped. Continuous shelling forced them to stay inside. There were confrontations between the Red Army and the Nazi force outside and in-

●*The Martyr Scientists of Leningrad*

side the bank the scientists kept battling to protect the seeds. They had to check on the doors and windows and repair them immediately if they got damaged due to bombardments. They had to fight against contamination of the specimens due to moisture, insects, rodents and to test the robustness of the seeds every day. The scientists were able to smuggle out a little portion of the specimens to the nearest conservatory which was about 1500 km away. As the siege continued, there was hardly any food for survival. Moreover, winter temperature was dropping steadily. It was cold and damp inside the building. They burnt wood and paper to fend off the cold but soon they ran out of them. They gradually fell ill while struggling against dampness, cold and starvation. 'While facing starvation, the botanists refused to eat the specimen seeds. Rice crops researcher Dimitri S Ivanov died of starvation while guarding several thousand packs of rice. A peanut specialist Alexander Stchukin starved to death while the samples under his care remained intact. Liliya M Rodina, M Steheglov, Georgi K Kriyer, G Kovalesky, N Leontjevsky, A Malygina and A Kozrun were among the others scientists who starved to death.'- according to an article that appeared in The Washington Post published in 1992. They fought to preserve the biodiversity of the species and to save the future of mankind as well. The walls of the Vavilov Institute of Plant Industries still remind us of the self-sacrifice of the martyr scientists. No other such example is there in the history of the mankind. ■

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Lunar Ark

als to the moon. Scientists have estimated that to carry the genes of about 67 lakh species to the moon, 250 launches of special rockets will be required. Before that, lava tubes have to be compatible for this purpose. The whole remodeling process of the tubes may be done by specially designed robots, scientists suggested. The entire power source will be solar energy and the whole process will be remotely controlled from the earth. In the upcoming moon expedition to be conducted jointly by NASA and ESA (European Space Agency), the feasibility of the project may be examined, Scientists suggest.

The 'lunar ark' resembles the backup files often used to preserve important data in the computer. Data from the backup files can be retrieved if the computer fails to work. Similarly, if the biodiversity of the species is destroyed due to unwanted catastrophes, the Lunar Ark may appear as a lifeline for mankind. While explaining the project, scientists cited the story of Genesis mentioned in the Bible. In the parable, God instructed Noah, a pious man: "The world is full of evil. I'll send a huge flood to wash all sins. Build a huge ship and get into it with all the members of your family. Also, take one male and a female specimens from all the creatures under the sky and bring them into the ship. I'll destroy all the creatures except those inside the ship. When the flood recedes, you, along with all, will come out of the ship and will live happily ".

All the seed depositories around the world bear testimony to the superb progress in skills and innovations made by agricultural civilization. Each food grain in the seed vault tells the story of the toils of the peasants. The peasants, who do not have the right to their produce, are the architects of the foundation of the society. The story of the exploitation of the feudal lords, zamindars, and capitalists is written on every seed grain. No matter where in the universe the seeds are stored, toilers are the real owners of it and they will be the owners of the whole universe as well. That is the infallible destiny of the society. ■

Behind Plastic Pollution

Nowadays, the word plastic has become entwined with the word pollution to such an extent that hearing the word conjures up images of dirty abandoned plastic products littering streets and beaches. A polar bear is sitting helplessly on a mound of ice floating in the middle of artic sea. Does this familiar picture on the pages of the school environment textbook strategically positioned to drive home the imaginary horrors of global warming give rise to scientific ideas in the child's mind?

Again, to illustrate air pollution, the book shows rows of factories in the middle of a desolate, barren desert with black smoke billowing out of their chimneys. Below the picture it's written 'Carbondioxide pollution in the atmosphere'. However, in science texts it is clearly written that carbon dioxide is a colorless gas. Why is the environment presented in this way before the children get the opportunity to develop a close relationship with nature? Does this reckless effort on the part of the education officials make people really aware of the environment? Does it contribute to the development of a scientific approach towards the environment?

Is there any other game behind the slogan of 'endangered environment'? Warnings have been issued worldwide to protect the environment. It's a 'Global emergency' according to them. This year ahead of World Environment Day on June 5, the United Nations had made an appeal to rid the world of plastic pollution. Now let's take a look at what plastic pollution really is.

From the end of the 19th century until today, among all the discoveries of science that have impacted the practical existence of people and have made life easier, the discovery of plastics and polymers is undoubtedly one of them. Artificial and semi-synthetic polymer articles have taken over people's daily lives, gradually replacing those made of stone, glass, metal and wood. The silent penetration of this polymer has happened everywhere, including in the manufacture of windows, doors, chairs and tables, various furniture, car tyres, toys, clothes, toys, paints, films, bags. And why shouldn't it? Compared to natural products, plastic is much cheaper, its productivity and usability are much higher. This long journey of synthetic polymers starting from the 19th century is quite eventful.

What is a polymer?

Polymers are chemical compounds of high molecular weight, the smaller units of which are called monomers. The word 'poly' means many, and 'mono' means single. That is, large compounds formed by the chemical association or synthesis of a large number of monomer units are generally called polymers. For example, the polymer formed from the monomer called Ethylene is polyethylene, which is commonly known as polythene. The monomer of PVC or Polyvinyl Chloride is Vinyl Chloride. If a polymer molecule is made up of the same type of monomers, it is called a homopolymer and if two or more types of monomers are present, the polymer is called a co-polymer. Polymers can be divided into three categories based on their sources; 1) Natural 2) Artificial and 3) Semi-artificial. Natural polymers are natural products such as cellulose, wool, silk etc. Synthetic polymers are man-made, such as various types of plastics such as Polyethylene, Polypropylene, Polystyrene, Nylon, PVC, Teflon, etc. Semi-synthetic polymers such as nitrocellulose, vulcanized rubber, celluloid etc. are produced by converting natural polymers through physico-chemical processes.

Nature itself is a storehouse of various polymers. As civilization progressed man came to understand the physico-chemical and molecular structures of natural polymers. Their sources are mainly animals and plants. Cellulose is the main structural component of plant body e.g; stem, leaves etc.

Wood is prepared by drying the stems of trees, so the main component of wood is cellulose, which gives wood its hardness. Carbohydrates produced by plants through photosynthesis are products of the biosynthesis of glucose-like monomers. All the sugars (polysaccharides), proteins and fats contained in plant-based grains such as rice, pulses, wheat, barley, sorghum, millet, maize, potatoes, various vegetables, fruits, oilseeds etc. are contained with polymers. On the other hand, animal proteins, animal fats, nucleic acids are all different types of polymers. The bodies of all animals, including humans are reservoirs of hundreds of thousands of polymers.

Monomers of polysaccharides are glucose, monomers of proteins are amino acids and large fat molecules are composed of fatty acid molecules. Natural polymers are much more complex and diverse in terms of structure and composition than synthetic polymers. Synthetic polymers are composed of one or two monomers, but natural polymers consist of many types of monomers. For example, protein molecules can contain about twenty different types of amino acid monomers.

Polymer cycles in nature

Like other cycles in nature, the biochemical cycle of polymers is continuous. This cycle is an integral part of nature's food chain. Decomposition of polymer compounds occurs along with the decomposition of dead plant and animal bodies. Microorganisms living in nature play a major role in this decomposition. Through the process of decomposition, on the one hand, microbes collect their own nutrients, on the other hand, they break down large polymer molecules into smaller molecules that mix with the soil and increase soil fertility. These nutrients are absorbed from the soil and enter the plant body and complete this cycle.

All living beings including humans are inextricably linked with this cycle. Through food, all living things take plant and animal polymers from nature and convert the polymers into monomers and small molecules with the help of digestive juices and enzymes. Again, by combining those small molecules or monomers in the biochemical process, organisms and plants synthesize various types of polymers. In the body of each living organism, countless polymer cycles are ceaselessly taking place through metabolism. Protein breaks down and builds up again, the same thing happens with fat.

Thousands of enzymes are engaged in this activity of breaking down polymers. Enzymes are primarily proteins, i.e. polymers. They are found in larger numbers in advanced animals. A typical bacterial cell may contain about a thousand enzymes. There are about 1300 enzymes present in the human body. However, it is unable to break down important natural polymers like cellulose. The enzymes needed to break down cellulose are present in the bodies of cows, goats and other herbivores, they are naturally absent in the human body. Therefore, while cellulose is food for herbivores, it is not for humans.

Although the natural polymer cycle is completed naturally, synthetic polymers cannot penetrate the natural polymer cycle. This is so because the elements necessary to break down synthetic polymers in nature have not yet been identified. Synthetic polymers or plastics do not dissolve in water, do not oxidize in contact with air, and are not accepted as food by any organism or plant on earth. Scientists are looking for bacteria that eat plastic, but so far have not had much success.

As a result, following human use, various types of plastic waste accumulate in nature and remain undegraded for a long time. Fields, canals, banks, rivers, drains, seashores - from the top of the Everest to the Mariana Trench have become susceptible to plastic pollution today. This has had very tragic consequences in the daily life of common people. Fine plastic particles are continuously entering our bodies and damaging our health. The long term consequences of this is disastrous.

The inception of plastic use and Controversy surrounding it

The first man-made plastic was called nitro-

cellulose. It was a semi-synthetic polymer. In 1862, Scientists created nitrocellulose by chemical reaction with cellulose obtained from nature. Shortly after this, celluloid was made by making camphor react with nitrocellulose. Celluloid was used in large quantities in the production of photographic plates and motion picture films. Since the beginning of the 20th century, celluloid began penetrating the motion picture industry. Then in 1907, the Belgian chemist Leo Baekeland was able to prepare Bakelite from phenol and formaldehyde. In fact, this was the first man-made artificial plastic. Bakelite quickly gained a foothold in the electrical industry due to its inability to conduct electricity and greater heat tolerance.

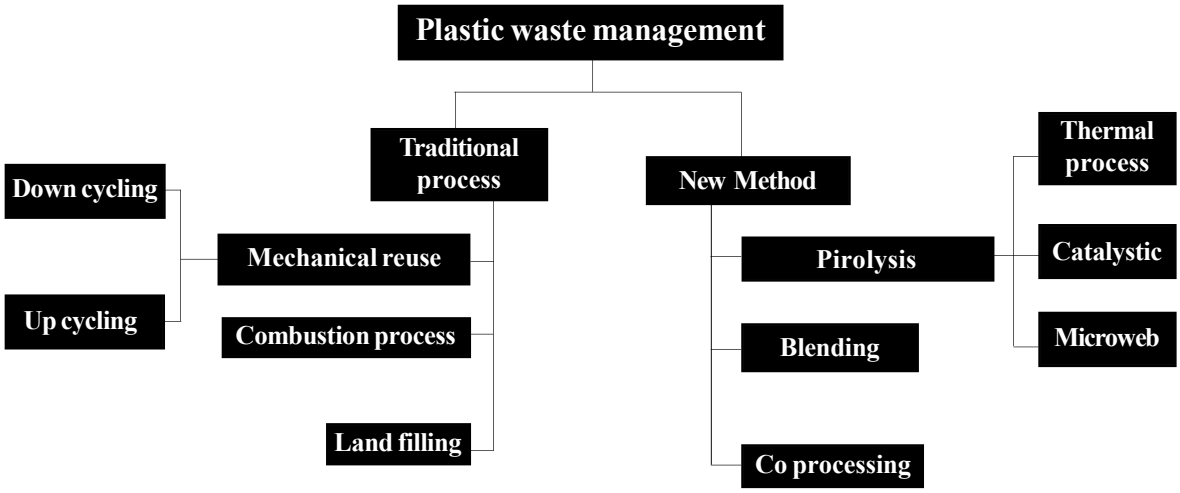
From the end of the 19th century, manufacture of small useful items from the thick gum of the rubber tree began. Thanks to the efforts of Michael Faraday and later other scientists the composition of rubber came to be known.Charles Goodyear prepared vulcanized rubber by making natural rubber react with White Lead and Sulfur, which greatly increased its practical application. After the discovery of the molecular structure of natural polymer, different types of plastic began to be synthesized by imitating the structure and subsequently marketed.Constant new research in the field of Polymer chemistry is rapidly improving the practical value of Polymers. The emergence of Polymers in daily life is, in a word, revolutionary. This is a unique discovery in the world of science.

In the 1920s, a debate began over the unbridled use of and ethical justification of production of polymers. But, the universal validation of plastic's utility, productivity and its low purchasing cost undermine the arguments of environmentalists.A sizeable number of small and large companies began engaging in plastic production within a short span of time.During the Second World War, plastic began to be used extensively by the troops. Tents, clothing, shoes, armour, helmets, etc. used in the battlefield are made of artificial polymers . Today, polymers are being used to build even weapons, tanks, jet planes, bulletproof clothing As a result, the global demand for plastic has skyrocketed. In America alone, plastic production increased by 300% at one go. Even after the end of the war, the production of plastic, instead of decreasing, began to increase in every country. This happened because the common people were targeted as potential consumers by manufacturers and traders. Exhibitions were organized in different countries under the supervision of the manufacturing companies to make the common people aware of the utility of plastic products. People are naturally attracted to plastic items. With the arrival of other plastics such as polyethylene, polyvinyl chloride, polypropylene etc. in the market, plastic took over various industries and almost every household. To date, about a hundred synthetic polymers are in the possession of technologists and traders.

In 1950, the world's total plastic production was only 1.5 million metric tons. At present, according to 2022 figures, plastic production has soared to 457.73 million metric tons. Its business volume is about 439.28 billion US dollars. Of these, only 20 multinational companies produce about 55% of plastic. The branches of these multinational companies are spread in almost all countries of the world. Major oil companies in the world, such as ExxonMobil, Dow, Sinopec,Lyondellbasell,BASF etc., occupy most of the world's markets. The main reason for the dominance of the oil companies is that the raw materials required in the plastics industry i.e. the monomers (eg, ethylene, propylene, butadiene etc.) are mainly by-products of the petroleum industry.

Plastic pollution and its remedy

A group of marine scientists first noticed the issue of plastic pollution in the environment. In 1960, a group of scientists went under the sea and noticed a lot of plastic waste. Since the 1970s, various organizations of environmentalists have been formed who raise their voice against dump-



ing of plastic waste around the world. But the production, use and pollution of plastic continues to increase. In 1976, there was talk of recycling plastics but due to the lack of effective recycling technology and the waste recycling industry being unprofitable, industrialists did not take much initiative.

Great progress has been made in plastic waste management since the late 1980s. A picture of modern waste management is roughly like this :

There are three types of technologies in use in plastic recycling management;

1) Conventional technologies, out of which the most significant are plastic molding and recycling by mechanical means, open burning of waste (which is currently put on hold) and low-lying landfilling with plastic waste.

2) New technologies, among which the dominant ones are, pyrolysis, plastic blending etc. and

3) Biochemical methods to convert plastic into other useful materials with the help of plastic-eating bacteria. Recently, researchers have discovered a bacterium called Ideonella sakaiensis which is known to be able to degrade plastic into soil through its enzymes.

Man made artificial polymers are also a part of the natural cycle

It has been prophesied for a long time that, since man-made polymer is not biodegradable it will deal a crushing blow to ecological balance.

But man is not outside the bounds of natural environment. He is, unarguably,an integral part of it. Man made artificial polymer has been processed from nature.Through thousands of processes prevalent in nature artificial polymers will eventually return to nature and become part of it.

Recently geologists have noticed a special kind of soil accumulating in seawater. It has been named Plastiglomerate- a layer of soil comprising sand,clay and grit.Such

rock-like soil formations are noticed in areas that experience high subterranean heat flow and are prone to volcanic activites,like India's Andaman and Nicobar Islands.

The plastic/ polymer particles accumulated in seawater bind the soil in high temperature, and under these circumstances the semi- molten polymers act as a cementing material.

Scientists are of the opinion that the soil deposition in the form of Plastiglomerate in the Pacific and Indian Oceans will remain as an anthropologenic evidence of the Quartenary period in the annals of geology.

The presence of Plastiglomerate in seabeds bear testimony to the fact that a part of the artificial polymer is becoming a part of the rock cycle through a natural process (oceanic precipitation).

T**he significance of this is artificial poly-**

mer is being trapped in sedimentary rocks

According to the laws of the rock cycle, this plastic enriched sedimentary rock will be transformed into metamorphic rock and eventually turn into Magma once it reaches the Asthenosphere. In other words artificial polymer endowed with natural elements will return to nature.

Therefore natural processes are giving a befitting reply to the misleading propaganda about plastic.

A world- wide trap has been laid

Among the technologies mentioned above, modern technology especially pyrolysis method is very profitable. In this,polymer is converted into liquid and gaseous fuel by applying high heat in vacuum. That is, plastic is turned into that very fossil fuel from which plastic is synthesized . The first method is called polymerization and the second is de-polymerization. Since pyrolysis technologies are less hassle-prone than traditional mechanical technologies and incredibly profitable, multinational companies have embarked in this business around the world.

Ironically,companies that are involved in the business of manufacturing plastics are making mountains of profits out of the waste recycling business.The productivity of liquid and gaseous fuel productivity ranges from 30% to 95% in the state-of-the-art pyrolysis technology. Several monopoly companies are engaged in the technology business of plastic recycling equipment such as compressor machines, molding machines, pyrolysis plants, microwave plants etc.

In 2022, alone, waste management industry made a turnover of 35.25 billion US dollars in plastic waste management worldwide.

By 2026, the target for this business has been slated at USD 41.39 billion. To Serve the interests of these companies, the governments of all the countries join hands to enact pollution laws, nurture environmentalist organizations as rewards for implementing their programs, and design curricula in schools and colleges that are in line with their goals in the name of environmental education. What will be the definition of environment, how many microns of plastic is environmentally friendly, how to store plastic waste at home, who is the friend and enemy of the environment, these are decided by them.

So it is quite clear that they have no plan to stop or control the production of pollution-causing plastic. For this reason, no government or environmentalist clamours to stop or regulate plastic production to prevent plastic pollution. On the contrary, advertisements are often seen showing politicians walking around on the streets or on the beach cleaning dirty plastic with their own hands. As the saying goes, 'Profess what you preach'.

Plastic buckets to prevent plastic pollution

A few years ago, ragpickers could be seen on the road. They used to go around the whole day collecting scrap iron, paper, broken plastic products, polythene bags, discarded computers, TVs etc. from around the streets and deliver them to their owners for a nominal cost. From there sheds the plastic materials were sorted by various hands and sent for mechanical recycling. Now the ragpickers are not seen much anymore. Since the introduction of pyrolysis technology, the management of plastic collection has changed radically.

Municipalities, Panchayats have taken on the role of collecting paper. In 2016, the Ministry of Environment of the Central Government enacted the Plastic Waste Act. The law, which was amended twice in 2018 and 2021, extends to the municipal and panchayat levels. According to this law, two plastic buckets are being distributed free of charge to every house in the municipal areas in urban areas and panchayats in rural areas.

It is recommended to collect biodegradable waste such as paper, grain husks etc. in one and non-biodegradable domestic waste mainly plastic materials in the other. Agencies appointed by municipalities or panchayats collect this waste from every house and transport it to various plants

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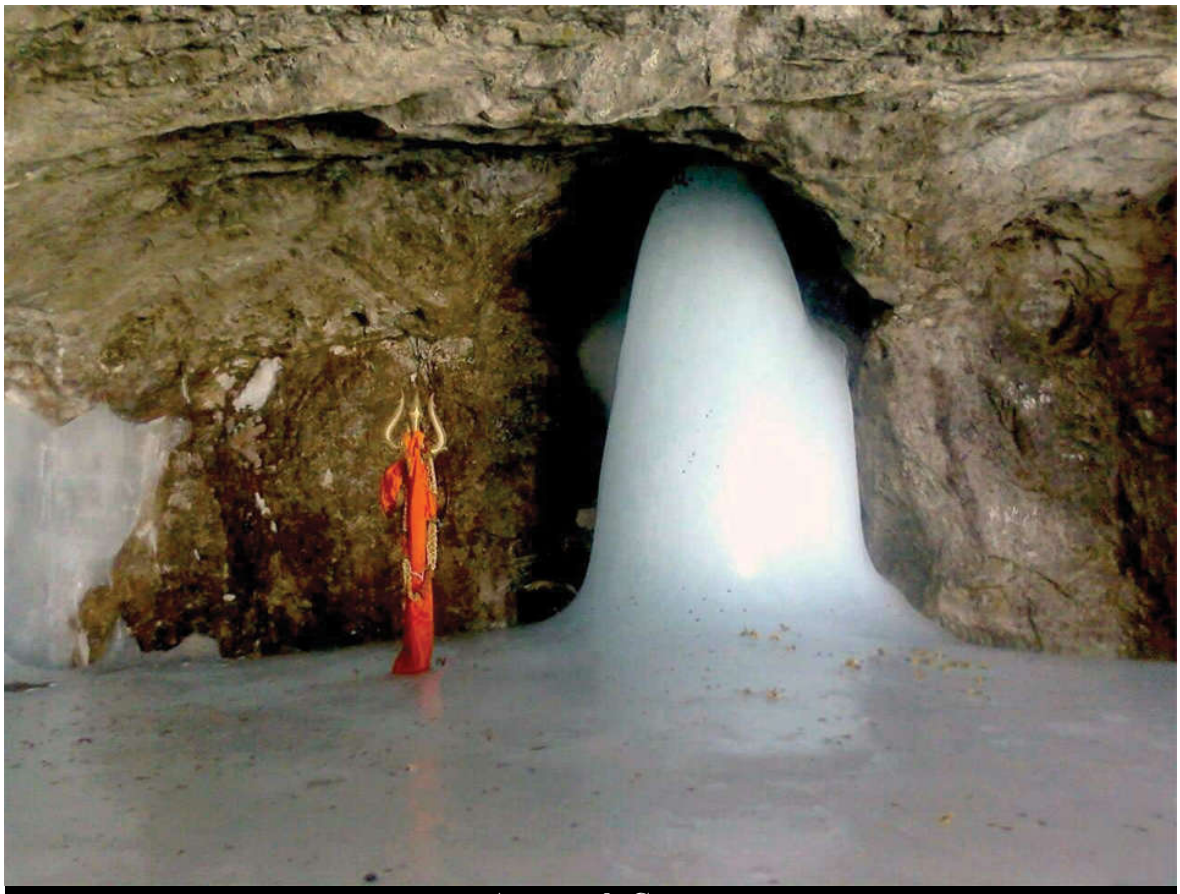
Does the Shivling of the Amarnath cave in Jammu-Kashmir bear proof of supernaturalism?



Amarnath Cave

Accessible only by an arduous mountain road, at a height of 3888 m (12,757 ft)the Amarnath cave of Jammu and Kashmir lies 141 km from Srinagar.

There is a shivling made of ice inside this temple. This place is regarded as an amazing holy site of supernaturalism by traditional Hindu devotees. This temple remains open for worship from May to August every year. There are countless anecdotes surrounding this icy phallus-shaped landform or shivling. As ancient scriptures will have it Amarnath cave was discovered by the sage Bhrigu.

According to historians, a Muslim shepherd Buta Malik alerted his master of its existence after having stumbled upon this cave and the shivling shaped mound of ice inside it. In 1663, a French doctor, Francois Bernier, during his travel to Kashmir, visited this cave and give an account of it in his travelogue: "Travels in Mughal Empire".

In 2011 a debate erupted over the Amarnath temple and its shivling. Renowned civil society and human rights activist Swami Agnivesh commented that the icy heap in Amarnath cave is not a god,

Ice stalagmite, Salzburg province, Austria, Europe

but an object whose existence can be explained scientifically in a simple straightforward manner. The low temperature inside the cave at such a great height naturally enables the accumulation of water to seep through the ceiling of the cave in the form of an icy heap. Every year devotees come to this cave to offer their prayers. During the pilgrimage, many people lose their lives. He also said that the deployment of troops during the Amarnath pilgrimage is tantamount to encouraging superstitions by the state.

This comment made by Swami Agnivesh sparked an uproar- lawsuits were also filed. Advocates of Hindutva heckled Swami Agnivesh in various ways and issued murder threats against him. The Supreme court observed that one should not hurt religious sentiments. Swami Agnivesh retorted that the Amarnath pilgrimage is disturbing Himalayan ecology and contributing to climate change so this pilgrimage should be banned. The controversy was buried after Swami Agnivesh died on 11th September 2020 at the age of 80.

Anyway, Swami Agnivesh's comment or the controversy and political question that emerged from the said comment are not the points of discussion in the present article.

Our intention is not to hurt anyone's faith. Our objective is to free ourselves of ignorance-induced superstition by determining whether that shivling-shaped object had a supernatural origin or was created naturally.

Geologists assert that it is a naturally created landform. Two types of landforms can be seen in mountain caves: stalactites and stalagmites.

A stalactite is an icicle-shaped formation that hangs from the ceiling of a cave and is produced by the precipitation of minerals from water dripping through the cave ceiling.

A stalagmite is an upward-growing mound of mineral deposits that have precipitated from wa-

ter dripping onto the floor of a cave. Most stalagmites have rounded tips.

Stalactites or stalagmites created from water containing dissolved chemicals in mountain caves are usually carbonates (found in the Araku valley caves in Andhra Pradesh, Opal, Chalcedony(both varieties of silica), Limonite(an iron mineral) and various sulphide minerals.

The end of a suspended stalactite is invariably pointed while the tip of the stalagmite could be rounded or flattened. Chemical solutions formed as a result of volcanic action could also cause landforms in mountain caves and caverns. Stalactites and stalagmites can not only be formed by chemical minerals but could also be constituted by ice. Search formations are called ice stalactites and ice stalagmites. Ice stalagmites are stalagmites formed seasonally or throughout the year in caves situated at high altitudes.

In this case, water drips from cracks in the cave, and the ceiling drops on the cave floor. To ensure the freezing of this water the cave floor temperature should be under zero degrees Celsius while the outside temperature as well as that of the cracks must be above zero degrees.

Apart from this, ice granules formed due to sublimation of water vapour could also cause ice stalagmites to form.

Therefore, geologists characterize the Amarnath shivling as an ice stalagmite.

During the height of winter, it could rise to a height of 30 feet. As atmospheric temperature rises it gets shortened gradually and eventually disappears. Every year climatic change determines the height and with of this ice heap.

Geologists think that such ice stalagmites are neither supernatural (inexplicable) nor rare. In caverns of many high mountain ranges, such ice stalagmites can be found. The biggest ice stalagmite (ice shivling in the eyes of orthodox Hindus) is found in the Salzburg province of Austria, Europe. This stalagmite is a lot taller (75 feet or 25 metres) than the Amarnath one. It was discovered by an Australian explorer Alexander Von Mork in 1879. Austrian inhabitants are predominantly Christians. They are generally unaware of Santana Hinduism and subscribe to its belief system. They do not worship this ice stalagmite as shivling. Neither do they project it as a supernatural phenomenon. So it's evident that the cult of the supernatural originates from ignorance.

Scientific explanations dispel such belief. ■

Continued from page 23

Behind Plastic Pollution

through a well-organized network. Hundreds of such agencies have sprung up overnight in every municipality. According to the law, it is the responsibility of those agencies to collect domestic waste, and if they fail to do so, the responsibility lies with the municipalities and panchayats because they are the ones who appoint the agencies. This Act has banned the production of certain plastics. It is not the responsibility of the general public to monitor it, but that of the administration. If the production of banned plastic continues, it will come to the market and people will use it. What is the logic behind blaming or fining the common people instead of fining the manufacturer? Any owner being punished for environmental pollution is an unheard of thing.

Pro-government organizations including environmentalists hide science and truth from the eyes of the masses. People are being asked to be environmentally aware for the sake of profit interests. The general populace is the main supplier of raw materials for profitable recycling methods in plastic waste management. This truth has come out in the open today.

If society demands compensation for this should it be considered unjust? ■

The inhuman religious ritual 'Chooral Muriyal' continues to be observed in the 21st century

Chooral Muriyal

Nibedita Hajra

Kerala: A state that proudly flaunts its highest literacy rate.

A state where a leftist government has been in power for a long period.

A state where a brutal religious festival has been observed with great pomp for over 250 years.

Every year in the first half of March at Chettikulangara temple in Alappuzha district of Kerala a festival is observed on the 'auspicious lunar day' of Kumbh Bharani.

This festival can be termed the Kumbh Mela of South India. Medieval savagery runs amok amid a gathering of thousands of men and women.

The Chooral Murial custom is practised to appease the Bhadrakali Mata idol of the temple. During the observance of this ritual 8-14-year-old boys are killed. The blood of these children quenches the thirst of Devi Bhadrakali.

In response to protests against this hideous cruelty from different quarters the Kerala State Commission for Protection of Child Rights finally slapped a ban on this ritual in November 2016 for violating the Juvenile justice act.

Kerala High court upheld the validity of this ban. Unfazed by the court order, the temple committee in March 2018 symbolically sacrificed 24 boys on the altar of their goddess Devi Bhadrakali.

The correspondents of newspapers like 'The Deccan Chronicle', 'The Hindu' etc later reported that in 2019 26 children were ritually killed. Even in 2020, this religious carnage was carried out in secrecy.

In 2020, in reports published in newspapers, it was claimed that during early March some young boys had been kept hidden in a secret location so that they could be used for the performance of Chooral Murial.

Responding to a petition by an individual Kerala High court reiterated the ban. But it could not put an end to symbolic child-killing. The government has not arrested the authorities, sages and patrons of the temple, and nor has the temple been shut down. As a result, the performance of this

ritual news continues with the usual fanfare in this era of astounding scientific progress!

As far as this 250-year-old child sacrifice ritual is concerned, it is said that this tradition of sacrificing one's male child on the altar of Devi Bhadrakali is practised to ensure the prosperity and well being of family and society.

But curiously, devout, prosperous individuals have never sacrificed their children. Instead, they have either used force or money to 'adopt' (illegally) children from extremely poor families before this festival.

After adoption, the young boys are taught elaborate dance steps and songs which describe in great detail the demon-slaying deeds of the goddess. The boys are also known to undertake a strict 'vratham' (vow), desisting from meat, in the days leading up to the festival.

On 'Bharani' day, the boys are dressed as kings with paper crowns and plantain leaves. Then, the skin on either side of the child's midrib is pierced with a needle and golden strands are inserted by an Asan (master). Blood spurt through those wounds and others in fountains.

Thereafter, the children are paraded to the temple. Their cries of pain are drowned in the slogans of the cheering devotees and a cacophony of flutes and other instruments. This hysteria induced by the opium of religion becomes so intense that it squeezes out the last drop of sympathy for the children from the hearts of the wild gathering. When they reach the temple, the Brahmin priests pull out the strings from the bleeding fissures and offer these to the temple.

Thus, eventually 'Punya' or religious virtue is earned by sacrificing the hapless children, utterly weakened due to bloodletting on the altar of Bhadrakali.

The bloodthirsty goddess, having slaked her thirst in the blood of these children blesses the foster parents whose lives supposedly blossom with happiness and prosperity. This medieval savagery has been running wild for the last 250 years in the name of religion. The sacrifice of children has continued unabated even during the tenures of self-styled 'progressive and leftist governments. Is this ritual any less barbaric than the practice of Sati?

Even in the observance of this devilish cruelty, the seeds of heinous torture and oppression of the exploited by the exploiters in a class-divided society are embedded. Through coercion and the lure of money, the propertied classes abduct children of starving, exploited- oppressed parents and sacrifice them to satisfy their hunger for prosperity and authority. The state either remains a mute spectator or absolves itself of the crime by passing new legal strictures.

The agonized cries of these children in the backdrop of brutish religious hysteria do not hurt the conscience of the heads of our society.

Leaders- ministers are often seen offering donations while banging their heads in a show of devotion. Not only are the murderers allowed to get off the hook, but their powers and authority also keep increasing.

Can individuals who haven't yet lost their humanistic values still keep their mouths shut, even after witnessing such atrocities in the name of religion? No, they can't. It's not as if protests are not voiced. Yet such heartlessness persists. Not only in Chural Murial, but in different religions, various types of inhuman practices and oppression prevail. Not only in our country but in others as well. It's impossible to eradicate such barbarity merely through legislation. A scientific-minded person cannot imagine a scenario wherein savage customs like Chural Murial will disappear within the framework of a class-divided society. The annihilation of its source can only ensure its destruction. And that is the target the science movement should set for itself. ■

A universe of atoms, an atom in the universe

Richard P Feynman

There are the rushing waves
mountains of molecules
each stupidly minding its own business
trillions apart
yet forming white surf in unison.

Ages on ages
before any eyes could see
year after year
thunderously pounding the shore as now.
For whom, for what?
On a dead planet
with no life to entertain.

Never at rest
tortured by energy
wasted prodigiously by the sun
poured into space
A mite makes the sea roar.

Deep in the sea
all molecules repeat
the patterns of one another
till complex new ones are formed.
They make others like themselves
and a new dance starts.

Growing in size and complexity
living things
masses of atoms
DNA, protein
dancing a pattern ever more intricate.

Out of the cradle
onto dry land
here it is
standing:
atoms with consciousness;
matter with curiosity.

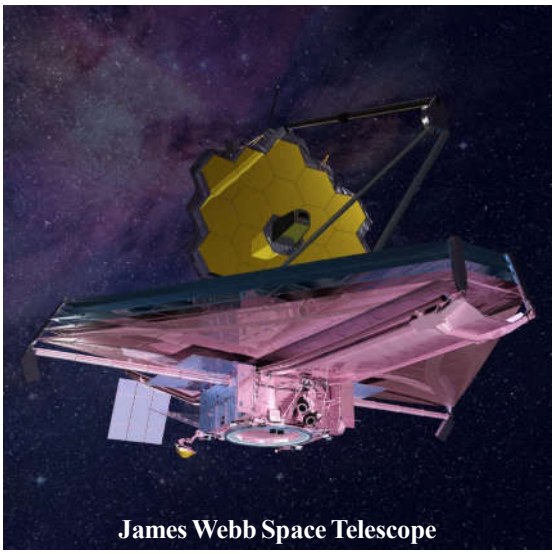
Stands at the sea,
wonders at wondering: I
a universe of atoms
an atom in the universe.

From webb.nasa.gov

James Webb Space Telescope

WEBB KEY FACTS

The James Webb Space Telescope (sometimes called JWST or Webb) is an orbiting infrared observatory that will complement and extend the discoveries of the Hubble Space Telescope, with longer wavelength coverage and greatly improved sensitivity. The longer wavelengths enable Webb to look much closer to the beginning of time and to hunt for the unobserved formation of the first galaxies, as well as to look inside dust clouds where stars and planetary systems are forming today.



James Webb Space Telescope

Mission Goals

Search for the first galaxies or luminous objects formed after the Big Bang

Determine how galaxies evolved from their formation until now

Observe the formation of stars from the first stages to the formation of planetary systems

Measure the physical and chemical properties of planetary systems, including our own Solar System, and investigate the potential for life in those systems

Key Questions

Webb is addressing several key questions to help us unravel the story of the formation of structures in the Universe such as :

When and how did reionization occur?

What sources caused reionization?

What are the first galaxies?

WEBB'S Role In Answering These Questions

To find the first galaxies, Webb will make ultra-deep near-infrared surveys of the Universe, and follow up with low-resolution spectroscopy and mid-infrared photometry (the measurement of the intensity of an astronomical object's electromagnetic radiation). To study reionization, high resolution near-infrared spectroscopy is needed.

The Era Of Recombination

Until around a few hundred million years or so after the Big Bang, the universe was a very dark place. There were no stars, and there were no galaxies.

After the Big Bang, the universe was like a hot soup of particles (i.e. protons, neutrons, and electrons). When the universe started cooling, the protons and neutrons began combining into ionized atoms of hydrogen and deuterium. Deuterium further fused into helium-4. These ionized atoms of hydrogen and helium attracted electrons turning them into neutral atoms. Ultimately the composition of the universe at this point was 3 times more hydrogen than helium with just trace amounts of other light elements.

This process of particles pairing up is called "Recombination" and it occurred approximately 240,000 to 300,000 years after the Big Bang. The Universe went from being opaque to transparent at this point. Light had formerly been stopped from traveling freely because it would frequently scatter

off the free electrons. Now that the free electrons were bound to protons, light was no longer being impeded. "The era of recombination" is the earliest point in our cosmic history to which we can look back with any form of light. This is what we see as the Cosmic Microwave Background today with satellites like the Cosmic Microwave Background Explorer (COBE) and the Wilkinson Microwave Anisotropy Probe (WMAP). Following this are the cosmic dark ages - a period of time after the Universe became transparent but before the first stars formed. When the first stars formed, it ended the dark ages, and started the next epoch in our universe.

The Epoch Of Reionization

Another change occurred after the first stars started to form. Theory predicts that the first stars were 30 to 300 times as massive as our Sun and millions of times as bright, burning for only a few million years before exploding as supernovae. The energetic ultraviolet light from these first stars was capable of splitting hydrogen atoms back into electrons and protons (or ionizing them). This era, from the end of the dark ages to when the universe was around a billion years old, is known as "the epoch of reionization." It refers to the point when most of the neutral hydrogen was reionized by the increasing radiation from the first massive stars. Reionization is an important phenomenon in our universe's history as it presents one of the few means by which we can (indirectly) study these earliest stars. But scientists do not know exactly when the first stars formed and when this reionization process started to occur.

The emergence of these first stars marks the end of the "Dark Ages" in cosmic history, a period characterized by the absence of discrete sources of light. Understanding these first sources is critical, since they greatly influenced the formation of later objects such as galaxies. The first sources of light act as seeds for the later formation of larger objects.

Additionally, the first stars that exploded as supernovae might have collapsed further to form black holes. The black holes started to swallow gas and other stars to become objects known as "mini-quasars," which grew and merged to become the huge black holes now found at the centers of nearly all massive galaxies. ■

Webb Telescope & The Big Bang

A SHORT Q&A WITH NOBEL LAUREATE DR. JOHN MATHER

[*Excerpts*]

The concept of the Big Bang is both simple and easy to misunderstand. Dr. John Mather, Nobel Laureate and James Webb Space Telescope Senior Project Scientist, answers some commonly asked questions about the Big Bang, and about JWST's role in understanding the early history of the universe.

What Is The Big Bang?

The Big Bang is a really misleading name for the expanding universe that we see. We see an infinite universe expanding into itself. The name Big Bang conveys the idea of a firecracker exploding at a time and a place - with a center. The universe doesn't have a center. The Big Bang happened everywhere at once and was a process happening in time, not a point in time. We know this because 1) we see galaxies rushing away from each other, not from a central point and 2) we see the heat that was left over from early times, and that heat uniformly fills the universe.

Why Do We Want To See The First Stars And Galaxies Forming?

The chemical elements of life were first produced in the first generation of stars after the Big Bang. We are here today because of them - and we want to better understand how that came to be! We have ideas, we have predictions, but we don't know. One way or another the first stars must have influenced our own history, beginning with stirring up everything and producing the other chemical elements besides hydrogen and helium. So if we really want to know where our atoms came from, and how the little planet Earth came to be capable of supporting life, we need to measure what happened at the beginning. ***webb.nasa.gov***

From webb.nasa.gov

About the first images of James Webb

[*See the images in the back cover page*]

1. Deep Field: SMACS 0723

NASA's James Webb Space Telescope has produced the deepest and sharpest infrared image of the distant universe to date. Known as Webb's First Deep Field, this image of galaxy cluster SMACS 0723 is overflowing with detail.

Thousands of galaxies – including the faintest objects ever observed in the infrared – have appeared in Webb's view for the first time. **This slice of the vast universe is approximately the size of a grain of sand held at arm's length by someone on the ground.**

The image shows the galaxy cluster SMACS 0723 as it appeared 4.6 billion years ago. The combined mass of this galaxy cluster acts as a gravitational lens, magnifying much more distant galaxies behind it. Webb's NIRCam has brought those distant galaxies into sharp focus – they have tiny, faint structures that have never been seen before, including star clusters and diffuse features. Researchers will soon begin to learn more about the galaxies' masses, ages, histories, and compositions, as Webb seeks the earliest galaxies in the universe.

2. Exoplanet: WASP-96 B

NASA's James Webb Space Telescope has captured the distinct signature of water, along with evidence for clouds and haze, in the atmosphere surrounding a hot, puffy gas giant planet orbiting a distant Sun-like star.

The observation, which reveals the presence of specific gas molecules based on tiny decreases in the brightness of precise colors of light, is the most detailed of its kind to date, demonstrating Webb's unprecedented ability to analyze atmospheres hundreds of light-years away.

While the Hubble Space Telescope has analyzed numerous exoplanet atmospheres over the past two decades, capturing the first clear detection of water in 2013, Webb's immediate and more detailed observation marks a giant leap forward in the quest to characterize potentially habitable planets beyond Earth.

3. Stellar Death: Planetary Nebula NGC 3132

NASA's Webb Captures Dying Star's Final 'Performance' in Fine Detail.

Some stars save the best for last.

The dimmer star at the center of this scene has been sending out rings of gas and dust for thousands of years in all directions, and NASA's James Webb Space Telescope has revealed for the first time that this star is cloaked in dust.

Two cameras aboard Webb captured the latest image of this planetary nebula, cataloged as NGC 3132, and known informally as the Southern Ring Nebula. It is approximately 2,500 light-years away.

Webb will allow astronomers to dig into many more specifics about planetary nebulae like this one – clouds of gas and dust expelled by dying stars. Understanding which molecules are present, and where they lie throughout the shells of gas and dust will help researchers refine their knowledge of these objects.

4. Interacting Galaxies: Stephan's Quintet

NASA's Webb Sheds Light on Galaxy Evolution, Black Holes

Stephan's Quintet, a visual grouping of five

galaxies, is best known for being prominently featured in the holiday classic film, "It's a Wonderful Life." Today, NASA's James Webb Space Telescope reveals Stephan's Quintet in a new light. This enormous mosaic is Webb's largest image to date, covering about one-fifth of the Moon's diameter. It contains over 150 million pixels and is constructed from almost 1,000 separate image files. The information from Webb provides new insights into how galactic interactions may have driven galaxy evolution in the early universe.

With its powerful, infrared vision and extremely high spatial resolution, Webb shows never-before-seen details in this galaxy group. Sparkling clusters of millions of young stars and starburst regions of fresh star birth grace the image. Sweeping tails of gas, dust and stars are being pulled from several of the galaxies due to gravitational interactions. Most dramatically, Webb captures huge shock waves as one of the galaxies, NGC 7318B, smashes through the cluster.

5. Star Forming Region: NGC 3324 In Carina Nebula

NASA's Webb Reveals Cosmic Cliffs, Glittering Landscape of Star Birth

This landscape of 'mountains' and 'valleys' speckled with glittering stars is actually the edge of a nearby, young, star-forming region called NGC 3324 in the Carina Nebula. Captured in infrared light by NASA's new James Webb Space Telescope, this image reveals for the first time previously invisible areas of star birth.

Called the Cosmic Cliffs, Webb's seemingly three-dimensional picture looks like craggy mountains on a moonlit evening. In reality, it is the edge of the giant, gaseous cavity within NGC 3324, and the tallest 'peaks' in this image are about 7 light-years high. The cavernous area has been carved from the nebula by the intense ultraviolet radiation and stellar winds from extremely massive, hot, young stars located in the center of the bubble, above the area shown in this image. ■

Imagine

Imagine there's no heaven,
It's easy if you try,
No hell below us,
Above us only sky,
Imagine all the people
living for today...

Imagine there's no countries,
It isn't hard to do,
Nothing to kill or die for,
No religion too,
Imagine all the people
living life in peace...

You may say I'm a dreamer,
but I'm not the only one,
I hope some day you'll join us,
And the world will live as one.

Imagine all the people
Sharing all the world...

You may say I'm a dreamer,
but I'm not the only one,
I hope some day you'll join us,
And the world will live as one.

Imagine no possesions,
I wonder if you can,
No need for greed or hunger,
A brotherhood of man,
Imagine all the people
Sharing all the world...

You may say I'm a dreamer,
but Im not the only one,
I hope some day you'll join us,
And the world will live as one.

Joey Nissen

From the official website of ***CERN***

How did we discover the Higgs boson?

The Higgs boson was discovered, almost 50 years after first being proposed, by the ATLAS and CMS collaborations at CERN in 2012. But why did it take so long to find it?

With a mass of more than 120 times that of the proton, the Higgs boson is the second-heaviest particle known today. This large mass, combined with an extremely short lifetime (10-22 seconds) means that the particle cannot be found in Nature – its existence can only be verified by producing it in the lab.

The first particle collider in history capable of producing Higgs bosons in significant numbers is the Large Hadron Collider (LHC), which started its high-energy collision programme in 2010.

Needle in a haystack

Producing the new particle is only the first step, however. Given its lifetime, the Higgs boson almost immediately decays – or transforms – into other particles. So it is not possible to observe it directly. The particles from the boson's decay are the only traces that it leaves behind. These traces have to be detected and precisely measured by particle detectors.

Once the decay products have been detected, the next step is to determine whether we can say that the Higgs boson was produced. The problem is that the particles that the Higgs decays into are the same kinds of particles that are copiously produced in particle collisions. Simply seeing a pair of photons (one of the final states from the Higgs boson decay) is hardly any indication that the Higgs boson exists and is being produced in the experiment. Especially since the Higgs boson is only produced about once in a billion of these collisions.

Scientists thus need some way of determining when a pair of photons (or four muons or a different final state that the Higgs decays into) is coming from a Higgs boson decay and when it's not.

This needle-in-a-haystack problem can be solved, but not directly. In other words, it's not possible to find the needle but it is possible to verify that the needle is in the haystack somewhere.

A roll of the dice

Specifically, it's not possible to know in which collision the Higgs boson was produced, but the fact that it is being produced can be confidently established after analysing enough collisions. Here's how:

When all of the decay products are detected and their properties measured, a quantity called invariant mass can be calculated from these measurements.

This invariant mass is equal to the mass of the Higgs, but only for particles coming from the Higgs decay (or almost equal, taking into account the precision of the measurement in the particle detector).

The Higgs boson

You and everything around you are made of particles. But when the universe began, no particles had mass; they all sped around at the speed of light. Stars, planets and life could only emerge because particles gained their mass from a fundamental field associated with the Higgs boson. The existence of this mass-giving field was confirmed in 2012, when the Higgs boson particle was discovered at CERN.

What is the Higgs boson?

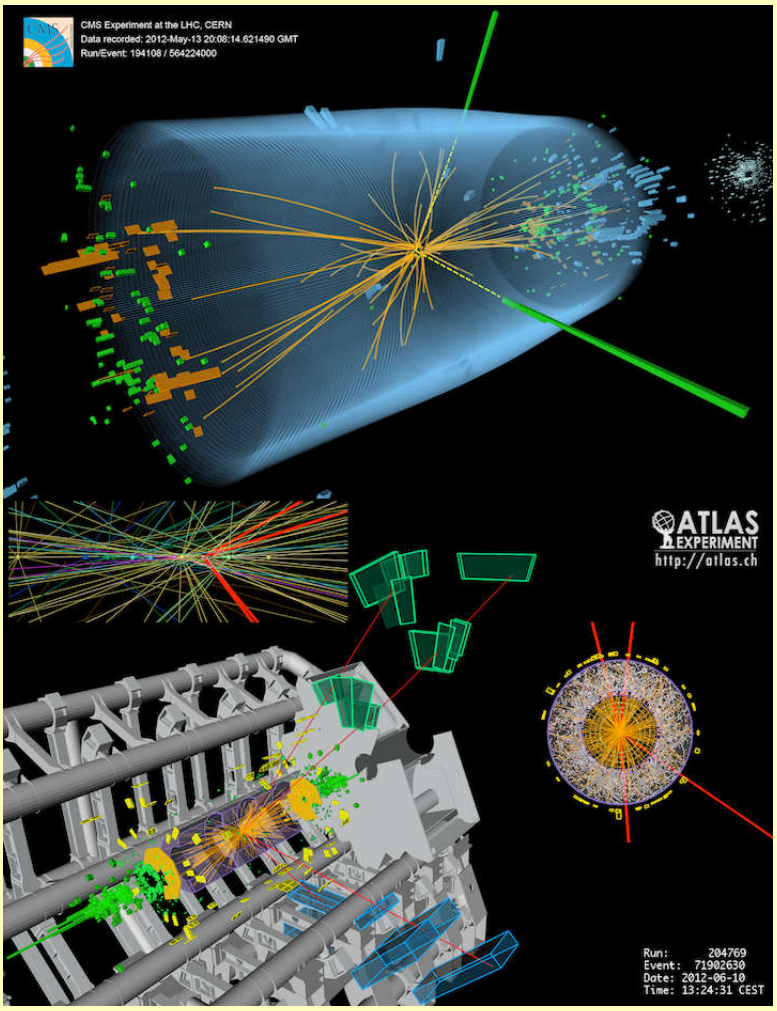
In our current description of Nature, every particle is a wave in a field. The most familiar example of this is light: light is simultaneously a wave in the electromagnetic field and a stream of particles called photons.

In the Higgs boson's case, the field came first. The Higgs field was proposed in 1964 as a new kind of field that fills the entire Universe and gives mass to all elementary particles. The Higgs boson is a wave in that field. Its discovery confirms the existence of the Higgs field. [https://home.cern]

For particles coming from other sources, this mass is going to be different every time. In general, it will be a random number from a range of possible masses.

This creates a unique mix of results: in the majority of cases the mass is a random number, but in some – very few – cases it is not random but instead a fixed, always the same, value. Imagine rolling the dice a large number of times, but with a small caveat: most rolls are normal, but every once in a while someone stealthily manipulates the die such that it shows a predefined number chosen by that someone. Three for example. If we do this many times, the fact that someone is interfering can be observed just based on the results. Normally we would expect all the six possible results of a dice roll to have the same probabilities, but in this situation one of them will have a probability slightly higher than the others.

The final element needed is statistical analysis of the results. Whether we think of invariant masses or dice rolls, the signal that we're looking for can be visualised by plotting a histogram of the results, on which the signal will appear as an excess, or "peak", in one specific spot. To be able to tell that the peak is there, two conditions need to be satisfied: the peak needs to be big enough and the total number of results need to be big enough.



Candidate Higgs boson events from collisions between protons in the LHC. The top event in the CMS experiment shows a decay into two photons (dashed yellow lines and green towers). The lower event in the ATLAS experiment shows a decay into four muons (red tracks) (Image: CMS/ATLAS/CERN) Taken : 20 Nov 2013 Uploaded : 20 Nov 2013

Five sigma

How much is enough? The answer is given by statistics: for a given excess in a given data sample it is possible to calculate the probability that an excess of this size would appear purely by chance.

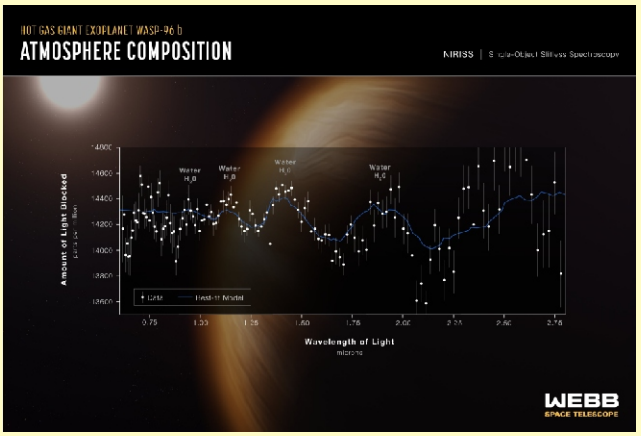
The common agreement is that an excess is called a discovery when this probability is about 1 in three and a half million, which corresponds to an excess of five standard deviations above the expected value – the famous "five sigma".

On 4 July 2012, the ATLAS and CMS collaborations reached this five sigma threshold - a new particle consistent with the long-sought Higgs boson had been discovered. [https://home.cern]

Registration No.: SO197407 of 2012-2013

First Images of James Webb

1. Deep Field: SMACS 0723



2. Exoplanet: WASP-96 B

3. Stellar Death: Planetary Nebula NGC 3132

4. Interacting Galaxies: Stephan's Quintet

To know the detail about these images See page 32

5. Star Forming Region: NGC 3324 In Carina Nebula