

Sci-Tech

Newsletter

Departments of Physics, Chemistry & Mathematics



Volume 5

Issue 1

December 2020

Vision and Mission of the Institute

Vision

To be one of the premier Institutes of Engineering and Management education in the country

Mission

- To provide Engineering and Management education that meets the needs of human resources in the country
- To develop leadership qualities, team spirit and concern for environment in students

Department of Physics

Vision

To impart the concepts of Physics for Engineering students to comprehend its Applications in Engineering Solution

Mission

- To provide knowledge of Engineering Physics needed for understanding Engineering courses
- To provide a platform to keep abreast with current happenings in Science & Technology
- To engage faculty members in research, to enrich teaching-learning process

Department of Chemistry

Vision

To impart concepts of engineering chemistry for students to comprehend its applications in engineering solutions

Mission

- Provide understanding of applications of Chemistry in Engineering
- Develop concern for environmental issues and responsibility for preserving green environment
- To engage faculty members in research, to enrich teaching-learning process

Department of Mathematics

Vision

To mould the students to acquire skills required for strengthening Mathematics the back bone of Engineering education

Mission

- Provide platform to acquire abilities to evaluate problems using analytical/numerical/graphical techniques
- Provide a back ground for relating mathematical techniques to solve real life problems
- To involve faculty in research which enriches teaching-learning process

Contents

- About the Department
- Remembering Srinivasa Ramanujan... A Stalwart of Mathematics
- Article Gallery
- The Achievements of Faculty
- Science Department Activities



Vidyayāmruthamashnuthē

B. N. M. Institute of Technology

(Approved by AICTE, Affiliated to VTU, Accredited as grade A Institution by NAAC)

All UG branches - CSE, ECE, EEE, ISE & Mech.E Accredited by NBA for academic years 2018-19 to 2020-21 & valid upto 30.06.2021)

Post box No. 7087, 27th Cross, 12th Main, Banashankari II Stage, Bengaluru-560070, INDIA

Ph: 91-80- 26711780/81/82 Email: principal@bnmit.in, www. bnmit.org

Editor's Desk

Dear Readers,

We are delighted to present this current issue of Newsletter titled 'Sci-Tech' before the readers. It is the outcome of the concerted efforts of prodigious students and erudite faculty members who think differently and laterally to carve a new path in the field of Science. Sci-Tech brings forth the achievements of the students and faculty members along with the creative and constructive activities, conducted by BNMIT Science Forum. This Newsletter gives a deep insight and enhances the mental horizon in the field of Science. We wish you a very happy reading to make every moment a momentous one.

- Editorial Team

About Departments

The Department of Physics aims in training future engineers with various aspects of fundamental Physics that makes them understand develop and innovate, contributing to the advancement of technology. The Department has a well-established laboratory to provide hands on experience in Physics experiments to students and a dedicated research laboratory where faculty members are actively engaged in research activities in the areas of Photophysics and Materials Science. It has full-fledged Research Centre, recognized by Visvesvaraya Technology University, Belagavi.

The Department of Chemistry aims to impart high quality Education by inspiring students to compete globally. The Department has a well-equipped laboratory to provide individual attention on the students. It also has academically rich experienced and research oriented faculties in the areas of Corrosion, Medicinal Chemistry, Nano Technology and Pharmaceuticals. It has a well-equipped Research Centre, recognized by Visvesvaraya Technology University, Belagavi.

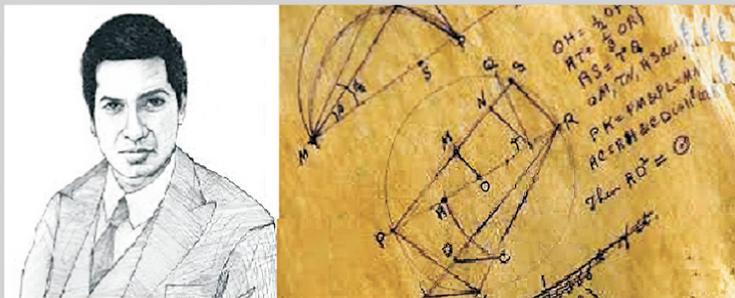
The Department of Mathematics has experienced, academically rich and research oriented faculties in the areas of Fluid Mechanics and Graph Theory among others. The Department is producing excellent results every year. Many students are scoring cent percent marks. It also has a full-fledged Research Centre, recognized by Visvesvaraya Technology University, Belagavi.

Dedication



“Sci – Tech” from the Science Department is dedicated to Dr Swati Mohan, an Indian-American Scientist, who spearheaded the development of attitude control and the landing system for the rover in the historic mission of launching the Perseverance Rover on Mars from Cape Canaveral Air Force Station, Florida on July 30, 2020. It spends one Mars year(equal to two years on Earth) and the rover will search for signs of ancient microbial life to explore the history of habitability in Mars.

The Man Who Knew Infinity



In 1913, the English Mathematician G. H. Hardy received a strange letter from an unknown person in Madras. The ten-page letter contained about 120 statements of theorems on infinite series, improper integrals, continued fractions, and number theory. At the first glance, Hardy didn't pay heed to the letter, but something about the formulae made him to take a second look and showed it to his collaborator J. E. Littlewood. After a few hours, they concluded that the results

must be true Thus Srinivasa Ramanujan (1887-1920) was introduced it to the mathematical world.

Born in South India, Ramanujan was a promising student, winning academic prizes in high school. But at the age of 16, his life took a decisive turn after he had obtained a book titled "A Synopsis of Elementary Results in Pure and Applied Mathematics". The book was simply a compilation of thousands of mathematical results, most set down with little or no indication of proof. It was written as an aid to coach English mathematics students, facing the notoriously difficult Tripos examination, which involved a great deal of wholesale memorization. But in Ramanujan, kindled mathematical activity, as he worked through the book's results and beyond. Unfortunately, his total immersion in mathematics was disastrous for Ramanujan's academic career: Ignoring all his other subjects, he repeatedly failed his college exams.

As a college dropout from a poor family, Ramanujan's position was precarious. He lived off the charity of friends, using notebooks with mathematical discoveries and seeking patrons to support his work. Finally he met with the modest success when the Indian Mathematician Ramachandra Rao provided him first a modest subsidy, and later a clerkship at the Madras Port Trust. During this period, Ramanujan had his first paper published, a 17-page work on Bernoulli numbers that appeared in 1911 in the Journal of the Indian Mathematical Society.

With the encouragement of friends, he had written to the mathematicians in Cambridge, seeking validation of his work. Twice he wrote with no response; on the third try, he found Hardy. Hardy wrote enthusiastically back to Ramanujan and Hardy's stamp of approval improved Ramanujan's status almost immediately. Ramanujan was named a research scholar at the University of Madras, receiving double his clerk's salary and required only to submit quarterly reports on his work. But Hardy was determined to bring Ramanujan to England. In March 1914, Ramanujan boarded a steamer for England.

Ramanujan's arrival at Cambridge was the beginning of very successful five-year collaboration with Hardy. In some ways, the two made an odd pair: Hardy was a great exponent of rigor in analysis, while Ramanujan's results were (as Hardy put it) arrived at by a process of mingled argument, intuition, and induction, of which he was entirely unable to give any coherent account. He was amazed by Ramanujan's uncanny formal intuition in manipulating infinite series, continued fractions, and Hardy stated that a single look was enough to show they could only have been written by a mathematician of the highest calibre, comparing Ramanujan to mathematical geniuses such as Euler and Jacobi.

Ramanujan's years in England were mathematically productive, and he gained the recognition for it. Cambridge granted him a Bachelor of Science degree by research in 1916, and he was elected a Fellow of the Royal Society - the first Indian to be so honored in 1918. During his short life, Ramanujan independently compiled nearly 3,900 results (mostly identities and equations). Many were completely new, such as the Ramanujan prime, the Ramanujan theta function, partition formulae etc.

Besides his published work, he left behind several notebooks, which have been the object of much study. Nearly all his claims have now been proven correct. The Ramanujan Journal, a scientific journal, was established to publish work in all areas of mathematics influenced by Ramanujan, and his notebooks containing summaries of his published and unpublished results...

VACCINES - A GIFT TO FIGHT INFECTIOUS DISEASES

Vaccines are dead or inactive parts of an infectious agent that are injected into humans to help develop a robust immune response before man is exposed to the real infectious agent. When the real infectious agent attacks man, he has a good immune response that would prevent him from contracting the disease. The dead or inactive infectious agent in a vaccine is toothless and cannot bite but makes the immune system smart enough to fight against the actual infectious attack later in life. Vaccines are usually administered as a part of an immunization program in children, usually from birth to 12 year. It's believed that this is the right time to administer the vaccine as the immune system is simultaneously maturing as the child grows. Today, vaccination is mandatory for all children as a part of country specific immunization programs and is responsible for eradication of many deadly infectious diseases. Vaccination is the single most important cause to improve infant and child mortality and morbidity across the world. Many



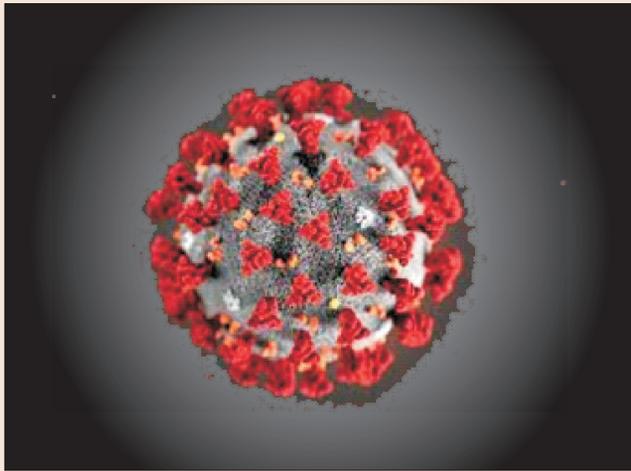
Edward Jenner Vaccinating the First Patient an 8-year-old boy

children now live to celebrate their first birthday because of robust vaccination programs across the world. The recent COVID 19 pandemic has renewed the world's interest in vaccination. Vaccination is even more important today, as many infections once thought to have been eradicated are back with a vengeance. Thanks to the ignorance of people against vaccination. The classical example is the outbreak of mumps in the US due to many mothers refusing to vaccinate their children. Mother were of the misconception that the MMR (Mumps, Measles and Rubella) vaccine is associated with childhood autism. Pakistan and Afghanistan are unable to eradicate polio like India and other developed countries. They believe that pulse polio campaign to eradicate polio is an effort by the Western Governments to collect DNA sample in an effort to spy their people in the war against terrorism in their countries. This is the biggest challenge for the WHO to declare the world polio free due to repeated incidence of polio in children in Pakistan and Afghanistan.

Edward Jenner, the renowned British Physician, is known as the father of vaccination. This was based on the famous experiments he conducted to treat smallpox. Smallpox was the scourge of civilization that is known to have wiped out populations in the early years of civilization. It affected rich Pharaohs and is said to have wiped out entire populations across continents. It spread due to war and travel and African slaves brought the infection on the shores of American and England.

Edward Jenner power of observation and serendipity that milkmaids who contracted a similar but milder viral infection cowpox that inflict cows when milked in the form of blister on their fingers. This protected them from the more deadly smallpox later in life. His observation that cowpox was virologically related to, smallpox and provided immune protection against the deadly smallpox. He conducted several experiments on vaccination that proved vaccination most effective way to treat infectious diseases. Prevention is better than cure is the often-quoted phrase, suits vaccination the best. Thus he coined the term vaccination. Later Louis Pasteur perfected the art and help develop numerous vaccines against several diseases.

Today, the world has vaccines against several bacterial and viral infections like polio, diphtheria, tetanus, mumps, measles, rubella, rotavirus, tuberculous, hepatitis A & B, herpes, dengue, varicella, pneumonia, meningococcal and influenza. With the vaccines against these diseases today either children do not suffer or suffer with milder forms of the disease. The concept of vaccine has extended beyond children and is also used to protect adults against infections. For example, pneumococcal and influenza vaccines are adult vaccines, given in older people so that they do not suffer from severe forms of pneumonia and influenza during winter. The concept has also changed



Novel Corona Virus Responsible for the COVID 19 Pandemic



3-Dimensional Structure of the Spike Protein developed by AI that led to rapid development of the Covid

from one-time vaccination to continued booster doses (like influenza), which is smart and keeps changing its form from time to time and needs repeated vaccination every year to take care of newer forms of the virus. Despite these advances in modern medicine the world still struggles to develop vaccines against ancient disease like tuberculosis, malaria and HIV. This is because these agents are smart and follow a very clever art of hiding and changing its shape constantly so that they may not be detected by the immune system.

Today, technology plays a major role in the development of vaccines. The classical example is the COVID - 19 vaccines. The rapid development of the COVID vaccine from WHO, declaring the outbreak in January 2020 to the approval of the first vaccine in late December 2020. Never in the history of modern medicine has a vaccine been developed so fast. It normally takes over 10 year and billions of dollars to develop a vaccine. Technology like Artificial Intelligence and Machine Learning has played a significant part. For example, machine learning was used to sequence the entire genome of the COVID - 19 virus is less than 21 day.

Artificial intelligence was used to develop the 3-dimensional free structure of the spike protein from early infections like SARS and MERS. The spike protein is the most important component of the COVID 19 vaccine. Another role of cloud computing in vaccine manufacture was demonstrated by Moderna in its approved COVID 19 vaccine. Moderna transferred the entire vaccine manufacturing technique and process via the cloud to Lonza a Swissvaccine manufacturer and the entire technology transfer occurred within a few days when it could have taken years of technology transfer and validation to make the vaccine. Scientist are also using AI to develop the next super vaccine against all known forms of the 2000 to 3000 odd corona viruses in bats and other animals that could potentially jump to man in the next pandemic. Modern medicine is using the combination of the biological science and power of computing to make the world free of infections through vaccination.

Mrithika K
I Sem., 'A' Section CSE

ARTIFICIAL INTELLIGENCE FOR AGRICULTURE

Farming is one of the oldest and most important professions in the world. Worldwide, agriculture is a \$5 trillion industry and has a very important role in economic sector. According to a recent survey (2021), agriculture contributes 19.9% to GDP of our country. In India, more than 58% of the population depends on agriculture directly or indirectly as its primary source of livelihood.

Why should we actually concentrate on Agriculture sector?

The global population is expected to reach more than nine billion by 2050 which will require an increase in agricultural production by 70% to fulfill the demand. As the world population is increasing due to which land, water and other natural resources are becoming insufficient to continue the demand-supply chain. So, we need a smarter approach to become more efficient about how we farm and how productive we can be.

Though agriculture is the most important sector for life to sustain, are people interested in going for it? No! Most of us will never be interested in working hard under the sun and still face losses. By looking at the condition of today's farmers none of the ones in future generation would love to work for agriculture. Yes, there are some great people among us who is choosing agriculture with passion. It is indeed appreciable. But that black mark that farming is a least paid profession should be erased somehow from the young minds who will rule the world tomorrow. And now comes the next concern, the change in climatic patterns is nowadays at its peaks, nothing is being like how it used to be and this turns out to be a problem for traditional farmers while farming. Another statement which is being heard from everyone is that one of the main reasons for the strength of the mankind coming down and decrease in the life span of human beings is due to the food we eat. Are we eating food which can support our life? Is it really natural or processed or filled with toxic chemicals which were used while growing the crops? Does it have the nutrients that it is supposed to have? Apart from filling our stomachs, many other industries like textiles, sellers and mills also depend on this sector. So, for all these problems our one of the best revolutionary idea of usage of Artificial Intelligence in Agriculture can answer with effective solutions. Let us now first speak about Artificial Intelligence to know about how it can be useful to us.

Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the simplest to those that are even more complex. The goals of artificial intelligence include learning, reasoning, and perception.

“We're at beginning of a golden age of AI. Recent advancements have already led to invention that previously lived in the realm of science fiction – and we have only scratched the surface of what's possible”- says Jeff Bezos, CEO of Amazon.

It is indeed making a huge impact in all domains of the industry. Every industry is looking to automate certain jobs through the use of intelligent machinery and also find out better tools for higher productivity.



Harvester CROO Robotics' Robotic Harvester Drones scanning acres of land



Harvesting ripened Strawberries

So how can Artificial Intelligence help us in Agriculture?

1. Soil analysis- AI can analyze the soil and tell about what plants can be planted and what fertilizers can be used for the particular soil after analysing microbes in the soil. With this the hazards caused by bad food with so much of processing and chemicals can be prevented. Farmers also can have better helping hands from the AI.
2. Usage of herbicides can be decreased comparatively- Blue river technology are working on an automated machine called “See and Spray” which can differentiate between plants and weeds and the herbicides can be sprayed only where it is needed instead of spraying on entire farms where it may not be required as well. It has a potential to decrease the usage of herbicides by up to 90%. “See and Spray” utilizes artificial intelligence, machine learning, and big data in conjunction with sophisticated sensors and cameras. It leverages computer vision to solve numerous problems also keeping environmental sustainability in mind and will also decrease expenses for the producers at the same time.

3. Crop analysis- AI can make detailed health report and drone imagery of a farm if its healthy or is getting any problem due to any pests or weeds and whether they are in need of any herbicides or pesticides at any particular area of the farmland.

4. Decreasing crop losses due to climatic changes- 90% of the crop losses globally is due to climate and weather events which can be prevented by using AI which uses information from satellites and advises about what has to be done.

5. Maintaining the farm more efficiently- Sky squirrel Technologies claims to scan 50 acres of fields and to check if everything in the farm is fine with a health report of the plants which is 95% accurate in just 24 minutes.

6. Fruit picking - Harvest CROO Robotics, based in Florida, USA - founded in 2012 is already using a harvester with robotic pickers for harvesting fruits (strawberries in specific) from the farms and it has a capacity of harvesting strawberries same as that would be by 30 human beings per day. And it has the camera system which can recognize if the berries are ready to be harvested or not.

This clearly shows that throughout the process of farming Artificial Intelligence can help us out from knowing what to sow to getting healthy yields effectively.

But how will this affect the economy of the farmers?

Due to precise usage of crop protection there is around 90% reduction in the usage of herbicides as there will be accurate usage in required area instead of spraying to whole of the farmlands. It will definitely save a lot of money for the farmers who depend on this as a source of income for their livelihood because with this it is like cutting down their major expenses to buy the costly herbicides and pesticides. Fertilizers can also be cut down to a great extent because after soil analysis only the crops will be grown accordingly and there will be no more misunderstanding about what can be suitable to grow in a particular land. Moreover, there is no risk for them to fail in earning aspect and assurance can be given that the productivity will be more because the usage of Artificial Intelligence from soil analysis to health report. As always said, we should be working smart to achieve.

There will also be a problem in the initial stages while trying to adopt to this because it will be new for the people to start using Artificial Intelligence tools or get aware of what is being invented out in the world even prior to that. But, with time after the initial stages pass by everyone on one fine day will adopt to the tools comfortably which will boom up the health of mankind and meet the requirements of food for the exponentially increasing population because we are now increasing productivity in a healthier way.

Let us hope that this revolutionary idea brings a great development in the field of agriculture on which the whole world is dependent both directly and indirectly.

Kotta Snigdhasree
I Sem., 'A' Section AI&ML

IS TECHNOLOGY A BOON OR BANE?

What is technology?

We live in a world driven by technology. Technology, literally means the 'Science of Craft'. It refers to the collection of techniques, skills, methods, and processes used to produce goods or services or for accomplishing objectives such as scientific investigation. Technology can be embedded in machines, enabling them to be used by people even without a detailed knowledge of their working mechanism.

Technological growth is closely linked to the expansion of scientific research and knowledge. In the last 50 year, there is an exponential increase in computing power and microchip design and manufacture. There has been unprecedented innovation and technological growth in nearly every field of human endeavour from health and transport to industrial production and education.



Modern Day Technology



Latest Trends or Latest Fields of Technology

Technology in Daily Life:

It is technology that drives today's electric and hybrid cars, which will drive tomorrow's driverless cars, hover-taxis and space cabs. It is technology that drives the ubiquitous mobile phones that one can now find in the hands of even the poorest of the world's poor. It is technology that creates hybrid seeds that resist inhospitable climatic conditions and difficult terrain, giving higher yields in shorter times. It is advancing medical technology that makes remote surgery, minimally invasive surgery and life-saving cures using stem cell transplants. Technology puts spacecrafts on asteroids and distant planets and let us see new world.

Technological growth: good or bad?

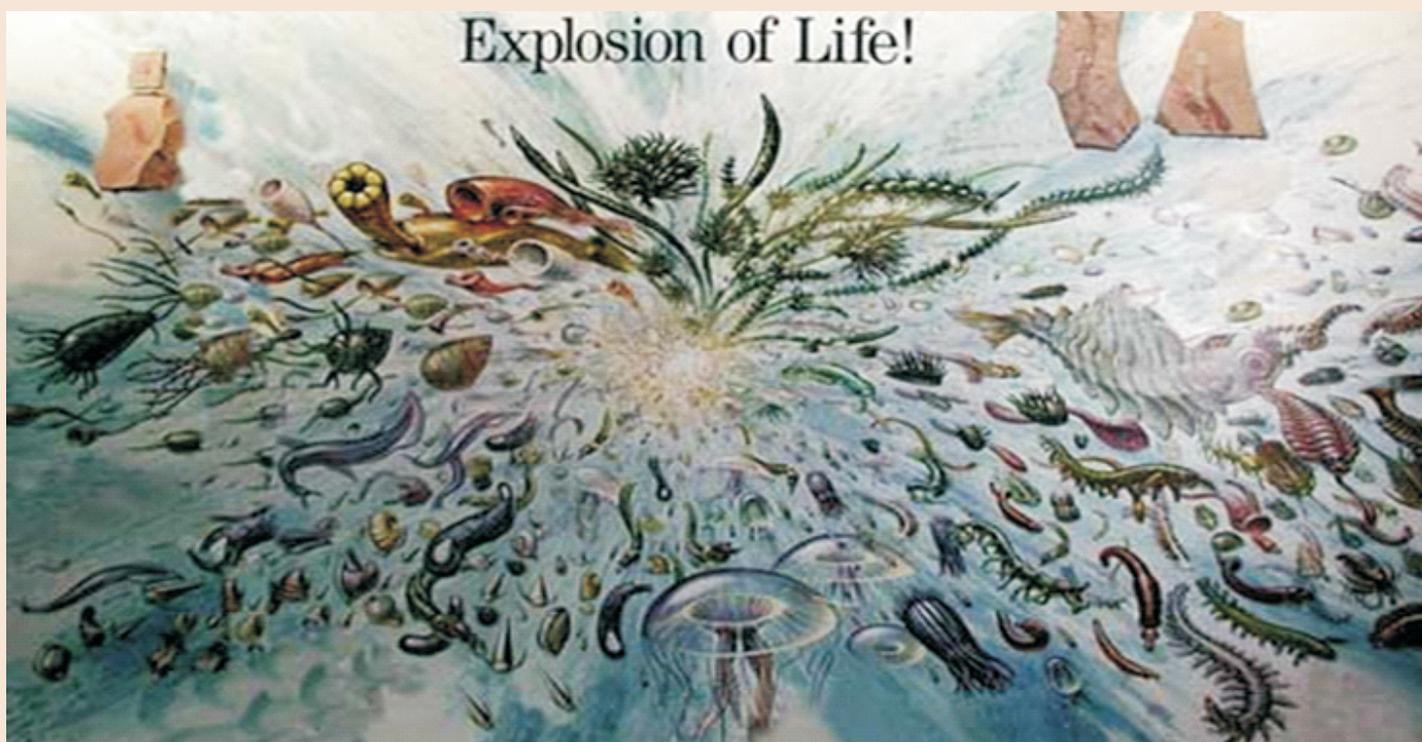
There are people who strongly oppose technology and claim that it spells the death of 'humanity', and that we are approaching the day when machines will rule everything. They refer to fans of technology as 'techies' or sometimes 'geeks'. Is technology really a curse disguised as a blessing? In the last five decades, two areas in particular have grown faster than the rest, powered by research and advances in computing power. One is artificial intelligence or AI; the other is biotechnology. Many believe that the convergence of biotechnology and AI might be the most consequential development of all. Huge benefits have emerged from each of them for human beings in general, such as self-driving cars which will dramatically reduce the death rate from road accidents and robotic surgery, which enables precise, highly efficient and targeted surgical interventions.

Technology is the result of human imagination. It reflects our evolutionary heritage. We are neither strong like gorillas or tigers, nor fast like cheetahs and hawks, but our brains and thinking powers have given us the greatest edge of any species on the planet. Technology is either inherently good or bad; it is how we use it that makes it so. The splitting of a hydrogen atom is technology at work. As history has shown us, technology can equally be used to make a nuclear bomb that kills millions - or generate electricity that lights up a million homes.

B.K. Krutin
I Sem., 'A' Section, ECE

CAMBRIAN EXPLOSION

We know the beginning of the universe was from the Big Bang about 13.8 billion years ago, and the formation of the earth was nearly 4.54 billion years ago. The one thing that we are not sure about was something which took place about 530 million years ago. This incident was known as Cambrian Explosion. We did study that Earth initially had only simple organisms, but we have no idea as to how they turned into the complex organism of today. This event was coined as Cambrian Explosion since it took place in the Cambrian period when all major animal phyla started appearing in the fossil record.



While the explosion was rapid in terms of geography, it took place over millions of years. Consequently, the ecosystems became more complex. As the number and variety of organisms increased, they occupied new marine environments and habitats. This sudden change in the ecosystem paved a way for the present day ecosystem. The organisms either survived in the ocean floor or constantly swam in the water. The organisms on land was not yet formed.

The early record of the Cambrian Explosion is solely based on fossils, the mineralized skeletons which was the only way of determining the complexity of the creatures. The organisms were minute in size in comparison to today's creatures but were still considered as complex since they had a skeletal and a nervous system.

We know a lot about the world around us but we don't know about the beginning of life on earth. We have only determined the date of origin of life and who were the first habitants of earth. We have barely scratched the surface in this subject, but answers lies in its depth about how dinosaurs were born, how humans were born and every other living creatures that we can see around us. This may also provide the answer for why we look the way we look.

Scientists have come up with many theories but none of them could explain the rapid development to such large and distinct creatures from those tiny organisms. All we ended up learning was that we are due to millions of years of evolution of these creatures. In the end, our creation will remain nothing but a mystery.

Shreyas N M
I Sem., 'B' Section, AI&ML

DARK MATTER – DISCOVERY AND IMPORTANCE

Our universe is a mystery of so many elementary particles and celestial objects. One of them is a Dark matter. Scientists still only proved that they exist, but couldn't really determine what they are composed of. In fact scientists believe that, 95% of the universe is composed of Dark matter and Dark energy. If we consider the previous statement, then all the ordinary matter like neutrons, electrons, protons, are composed of less than 5%.

What is Dark Matter?

Dark matter is a unique type of matter present in the universe which is known to exist because of the gravitational influence and effect it has on huge celestial bodies. It is thought to be composing 25% the mass of the universe, along with the dark energy composing 70% and ordinary matter composing less than 5% the mass of the universe.

Scientists have not yet observed dark matter directly. It doesn't interact with normal matter and it's completely invisible to light and other forms of electromagnetic radiation, which makes dark matter completely impossible to detect with existing instruments and technology. But scientists are confident that it exists because of the gravitational effects, it appears to have on galaxies and galaxy clusters.

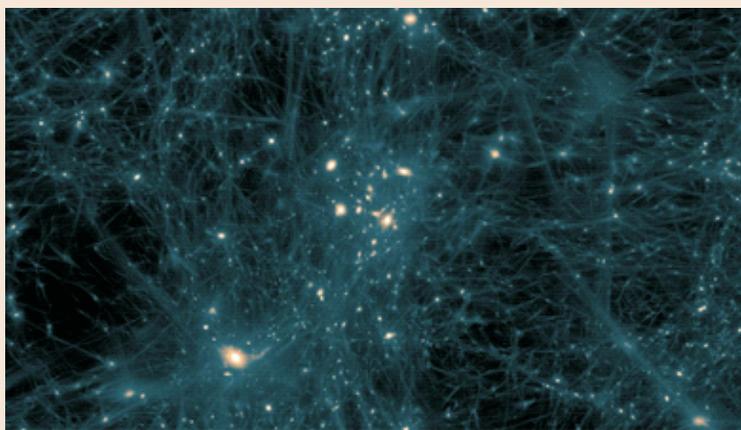
How was Dark matter discovered?

Dark Matter was originally known as “missing matter”. It was noticed by a Swiss American astronomer known as Fritz Zwicky. In 1933, he found that the mass of all the stars in the Coma cluster of galaxies provided only about 1 percent of the mass, needed to keep the galaxies from escaping the cluster's gravitational pull.

The authenticity of this missing mass has remained in question for many decades. After in 1970s two Astronomers Vera Rubin and W. Kent Ford confirmed its existence by the observation of a similar phenomena. They found, the mass of the stars visible within a typical galaxy is only about 10 % of that required to keep those stars orbiting the galaxy's center. Hence, this confirmed an unknown huge mass of matter is present inside the galaxy, which is acting as a gravitational influence on all the stars, present within that galaxy. Since, it doesn't absorb or emit electromagnetic radiation they named it ‘Dark matter’.

What makes up this 'missing matter'?

Based on the clues from astrophysics, cosmology, and particle physics, progress is now being made in the search for the dark matter particles in the laboratory. After a decade of effort, scientists were able to predict these three main elements Neutrinos, Neutralinos and Axions.



Artistic illustration of Cosmic web and Galactic clusters



Artistic illustration of Dark matter

Why is Dark matter is important?

The dark matter problem can also be viewed as a question of the nature of clustering matter. It must be the basic building block of the largest structures in the universe: galaxies and clusters. Without dark matter, the universe would be a very different place, according to current theories.

Dark matter is not just for explaining the behavior of distant bodies in the cosmos, but is abundant within our galaxy as well. It is estimated that our solar system is passing through a fine sea of dark matter particles with a density as high as roughly 105 per cubic meter. We may hope to detect the flux of dark matter passing through the Earth, and even to detect the seasons of dark matter, corresponding to the times of year when the Earth is moving with, or against, the flow of dark matter orbiting the center of the Milky Way.

On the whole the dark matter is a type of matter which scientists discovered due to its effect on other celestial bodies nearby it. It doesn't interact with normal matter and radiations, that is why scientists still couldn't determine what they are composed of and why they have only gravitational influence on other objects. This is still a mystery. It will take time to unveil the curtain to know the truth.

Sachin
I Sem., 'B' Section, AI&ML

Department of Physics

Research publications

- **Dr. Deepa H R**, Enhanced 1.53 μm emission of Er^{3+} in nano-Ag embedded sodium-boro-lanthanate glasses, Journal of Alloys and Compounds, Elsevier, 856 (2020)158212.
- **Dr. Deepa H R**, Effect of temperature on fluorescence quenching and emission characteristics of laser dyes, J. Phys.: Conf. Ser. 1473 01204, 2020.
- **Dr. K N N Prasad**, Investigation of biological activity of 2,3-disubstituted quinazolin-4(1H)-ones against Mycobacterium tuberculosis and DNA via docking, spectroscopy and DFT studies, New Journal of Chemistry 45(1) 403-414 (2020) [Publisher – Royal Society of Chemistry]
- **S Chandrasekhar, Dr. H R Deepa**, Quantum chemical and solvatochromic studies of biological active 1, 3, 4-thiadiazol coumarin derivatives, Chemical Data Collections, 29, 100516 (2020) [Publisher –Elsevier]

Department of Chemistry

Research publications

- **Dr. B. K. Jayanna**, Functionalization and partial grafting of the reduced graphene oxide with p-phenylenediamine: An adsorption and photodegradation studies. FlatChem. (2020) 100210.
- **Dr. B. K. Jayanna**, Comparison of the photocatalytic, adsorption and electrochemical methods for the removal of cationic dyes from aqueous solutions. Environmental Technology & Innovation. 17 (2020) 100612.

Patents filed

- **Dr. Prashanth M K and Dr. B. K. Jayanna**, Novel Method Calix[4]arene Anchored WS_2 as a Versatile Nanocatalyst for Alkyne-Azide Cycloaddition Reaction. Patent No. 202041056566. 28/12/2020
- **Dr. B. S. Prathibha**, Manufacturing method of cost effective water filter using industrial fly ash waste. Patent No. 2020104359. 28/12/2020
- **Dr. B. S. Prathibha**, Sustainable greenhouse for crops & drying of herbal medicinal plants. Patent No. 2020104340. 24/12/2020

Department of Mathematics

Research publications

- **Dr. Leena N Shenoy**, Laceability in the Interleaver Graph of Brick Product Graph $C(2n, 1, n)$, International journal of Mathematics trends and Technology, ISSN: 2231-5373, Volume 66, Issue 12, 10-16, December 2020

Mysterious World



Constructed between 2589 and 2504 B.C., the Egyptian pyramids have been wonders of engineering and physics. How did those ancient people living in the ancient desert manage it? Even Scientists say that, aliens from another planet must have been involved and few scientists believe the answer lies in ramps, wet sand, and pulleys. How'd any of this happen without help from intelligent life from somewhere beyond our own planet? The whole thing remains a mystery...

