IQAC

Science Bulletin

National Science Day, 2023

Volume-I, Issue 1

THEME: GLOBAL SCIENCE FOR GLOBAL WELLBEING

Science Forum and Eco-Club

B P Chaliha College, Nagarbera

Messages

From Principal

It gives me pleasure to know that the Science Forum and Eco Club of B. P. Chaliha College, Nagarbera is contemplating to publish a Science Bulletin on the day of National Science Day on 28.02.2023. This is an honest venture for which Science Forum and Eco Club have craved for. I wish all round success for which it is meant for.

Dr. Kamal Chandra Pathak
Principal, B P Chaliha College, Nagarbera

From President, Science Forum

Science Forum an integral unit of Extension Education Centre (EEC) under Internal Quality Assurance Cell (IQAC) of B. P Chaliha College, Nagarbera was established in the year of 2003. Science Forum was formed with the following objectives:

- Popularising Science Education & Research.
- Knowledge of recent trends in scientific research.
- Organising programme to inculcate scientific temper to stakeholders.
- Organising International / National event on science.
- Awareness programme on Environmental issues.
- Publications of scientific creations.

Science Forum constituted with faculty members of eight departments such as – Physics. Chemistry, Mathematics, Zoology, Botany, Geography, Statistics & Economics of the college.

Science Forum since its inception regularly organised National Science Day (28 February), International Environment Day (5 June) every year with different agenda. This year also the organisers are going to celebrate National Science Day, 2023 on 28/02/2023 with a day long programme. It gives me immense pleasure to know that an e-Bulletin has also to be published by Science Forum in connection with the celebration of National Science Day, 2023.

I extend my heartfelt best wishes for the success of the befitting endeavour of Science Forum, B. P Chaliha College, Nagarbera

Dhiresh Chakravarty

Dr. Dhiresh Chakravarty
Associate Professor & Head
Department of Chemistry

From Coordinator, IQAC

With heartfelt pleasure I greatly appreciate the Science Forum and Eco Club of B. P. Chaliha College, Nagarbera for this addition of value to the greater flow of knowledge as they are going to publish one Science Bulletin Vol.I on the occasion of National Science Day. Obviously it would provide a space for the generation of knowledge and would be a practice of holistic growth of education for the teaching fraternity.

I take the opportunity to congratulate all those people who are associated with this work for their hard work and dedication that has resulted in the publication of this issue of the Bulletin and I wish them in continuation of this process in newer heights in coming days. My best wishes for the entire endeavour and for their future initiatives.

Dr. Alaka Hujuri
Coordinator, IQAC,

Editorial

In India, "National Science Day" or "C.V. Raman National Science Day" is observed annually on February 28th to commemorate the breakthrough discovery of the Raman Effect by the renowned Indian physicist, Sir C.V. Raman, on this day in 1928. The National Council for Science and Technology Communication (NCSTC) requested the Government of India in 1986 to declare 28February as "National Science Day". The then Government of India accepted and declared the day as National Science Day in 1986. The first National Science Day was celebrated on February 28, 1987. Since then, this day has been celebrated across India in various educational, scientific, technical, medical, and research institutions, including schools, colleges, and universities.

Theme for National Science Day 2023

Union Ministry of Science & Technology released the theme for the "National Science Day 2023", titled "Global Science for Global Wellbeing" at the National Media Centre. The theme reflects the important role science plays in promoting global well-being and India as a rapidly developing nation recognizes the importance of using scientific research and innovation to address global challenges.

The Science forum and Eco-Club of B.P. Chaliha College, Nagarbera is organizing National Science Day program on 23rd February 2023 to mark the occasion at B.P. Chaliha College. In this regard a science bulletin is published in both on Print and digital format by the Science forum and Eco-Club jointly. Main aim of the program and the bulletin is to promote scientific temper among the student community.

Dr. Biman Lahkar
Convener,
Eco-Club,

Dr. Manash Jyoti Deka
Secretary,
Science Forum,

B.P. Chaliha College, Nagarbera

Science & Spirituality in Education

Dr. Dhiresh Chakravarty
Associate Professor & Head
B. P. Chaliha College, Nagarbera

The last few centuries and the last few decades in particular have witnessed an explosive growth in Science & Technology. On the other hand, faith and interest of human beings in spirituality have decreased. Whereas, both science and spirituality are necessary for happiness and mankind.

Modern people assume themselves as rationalists and hold scientists in high esteem. They think that spirituality is unverifiable subjective ideas. Thus, gradually there arose widespread belief that science and spirituality are mutually contradictory. However, a deeper study into science and spirituality will show that they do not contradict each other but rather reinforce each other.

In Bhagavad Gita, Lord Krishna revealed to Arjuna, knowledge about the creator and creations. Modern people have been taking great interest in the study of creation (science) and not trying to know about the creator (spirituality). However, researches in science have led the scientists very near the creator and these researches have paved the way for the scientists to appreciate spirituality.

From ancient times, philosophers had speculated that gross matter is made up of a few basic entities which they called "element". Traditionally, these were taken to be: ether, air, fire, water and earth. Later, speculated that atoms were the basic building block of matter. Chemists used the atomic concept to explain the wide diversity of chemicals. Physicists were viewing bulk matter as some kind of homogeneous jelly. However, J. J. Thomson (1897) managed to chip the atom and extracted a tiny particle called electron from it. In the early of last century (1910) Rutherford clarified atom was like a mini solar system with the atomic nucleus at the centre and the electron spread around it in some fashion. Finally, it was discovered that Newtonian laws were not held good with this system inside the atom. There was research to find laws applicable to the atomic domain. Hence an area of study "Quantum Mechanics" was developed. In the mid of twenties (1948) with the effort of a group of scientist such as Heisenberg (Germany), Schrodinger (Austria) and Dirac (England) were developed a superb subject called "Quantum Electro- Dynamics (QED). Whereas, this theory of QED came close to the observations made by the spiritualities long ago.

QED theory linked with electron and the photon. There is a background substratum of energy called the field, whose lowest state is known as the vacuum. Conceptually, it is an infinite ocean of nothingness and yet is capable of giving birth to an endless number of photons and electrons. Thus, matter and radiations are both born out of the infinite vacuum and when the particles are destroyed or annihilated, they return to the vacuum.

One of the burning issues in science that, what is the origin of the universe ! But it was explained through Einstein's theory of relativity with the relationship between matter and energy. All scientist now agree that the universe originated in a Big Bang about twenty million years ago. Many scientists believe that, from an incredibly tiny drop the universe swells to astronomical proportions and finally it will shrink back again to an inconceivably small drop.All these scientific discoveries form only a part of the relations made by the spiritualists. Vedanta present a more complete picture of the creation. Awareness is the key and through a consideration of all states of mind one (Vedantic Philosopher) can deduce the existence a background. This substratum, which is intangible and not so evident is nothing but ATMA. It is eternal, all pervading devoid of quality and bears an interesting similarity to the vacuum of state Quantum Theory. Scientists who have genuine quest for truth experiences spirituality. This is an indefinable mysterious power that pervades everything, we can feel it though can't see.

We can sum up Science and Spirituality as–

Science looks outwards whereas spirituality directs attention inwards.

Science relies on experimentation whereas spirituality is based on experiences.

Science depends entirely on perception through the senses whereas spirituality takes one beyond the sense to higher level of perception.

Science limits itself to the framework of space time whereas spirituality transcends space time.Science digs deep into differences whereas spirituality seeks transcendental unity in diversity.Science is where the mind ends and spirituality is where the heart begins.The modern civilisation has been unidirectionally depending on science for removing the miseries of man and to give him happiness along with some unhappiness as by-products. Whereas, spirituality is the remedy for all such unhappiness giving contentment and peace. Spirituality teaches code and conduct of happy life.

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Fibonacci numbers and the golden ratio

Dr. Deepjyoti Borgohain
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B P Chaliha College

In 1202 Fibonacci an Italian mathematician studied a very interesting problem. He investigated how fast rabbits could breed in ideal circumstances. The problem is as follows:

Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month on. How many pairs will there be in one year?

1. At the end of the first month, they mate, but there is still one only 1 pair.
2. At the end of the second month the female produces a new pair, so now there are 2 pairs of rabbits in the field.
3. At the end of the third month, the original female produces a second pair, making 3 pairs in all in the field.
4. At the end of the fourth month, the original female has produced yet another new pair, the female born two months ago produces her first pair also, making 5 pairs.

The number of rabbits at the start of each month is 1,1,2,3,5,8,13,21,.... I hope everyone can see a pattern (addition of consecutive numbers gives the next number, for example 1+1=2,1+2=3,2+3=5 and so on). This simple problem of immortal rabbits has far reaching consequences in nature. We call this sequence of numbers as Fibonacci numbers.

If we calculate the ratio of consecutive terms (i.e 1:1, 2:1,3:2,5:3,...) they seem to settle at a particular value 1.618034. We call this number the Golden Ratio. This number can be easily found in our day to day life. Let us proceed with a construction. We start with two square of side 1 next to each other. We can now draw a new square - touching both a unit square and the latest square of side 2 - so having sides 3 units long, and then another touching both the 2-square and the 3-square (which has sides of 5 units). We can continue adding squares around the picture, each new square having a side which is as long as the sum of the latest two square's sides.

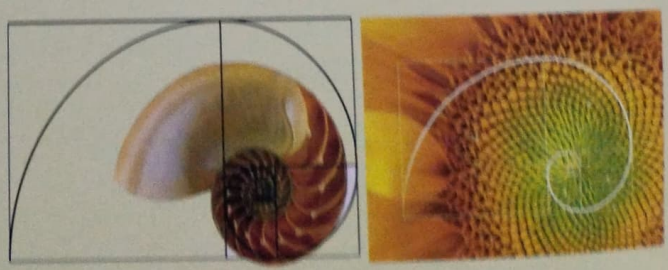
This sequence of squares create a spiral called as the Golden spiral. This spiral shows up everywhere in nature including flowers, hurricanes and even in huge spiral galaxies in space.

Nautilus shell

Such a huge presence of Golden ratio in nature (though unnoticed by many) has made it favorite among artists, architects and even astronomers (and mathematicians obviously). Even the biologists (the classical ones) with their dislike of the mathematical sciences have found this ratio extremely useful. The images above are testimonial to that.

Overall, this an example of abundance of mathematics in nature. Even the most mundane objects in everyday life can be seen through the lens of mathematics. As the famous quote the great Ramnujan goes:

"An eqution for me has no meaning unless it expresses a thought of God"



We are here to serve you: a dialogue for microbes

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Microbes are ultra-structured living organisms that can be seen under a microscope only. Although they are smallest in structure, greater in function than all the other living organisms existing on the planet. They are omnipresent in their habitat and play important roles in the ecosystem. However, this concise article attempted to discuss how microbes are playing important roles in human welfare from different perspectives as the following.

Medicine: Microbes have been contributing to the treatment of hundreds of human diseases since the discovery of the antibiotic Penicillin from the fungus Penicillium notatum by Alexander Flemming (1929), to date. They are the storehouse of different bioactive compounds including antioxidants, anticancer, anti-inflammatory, antiparasitic, antidiabetic, and many others that are crucial for drug manufacturing in the present global health crisis.

Foods: All living organisms depend on microbes for food as they are kept at the bottom of the food chain. They provide mineral nutrients to the producers of the tropic level which animals can obtain. Besides, they serve as a master chief that makes different food items. For instance, bacteria prepare curd from milk, wine from sugar, pickles from vegetable, soy sauce from soybeans, vinegar from different fermented materials, chocolate from cocoa beans through the fermentation process, etc.

Oxygen: We typically think of plants as producing the oxygen we breathe. But plants are only part of the story. Photosynthetic bacteria (called cyanobacteria) living in lakes, ponds, and shallow oceans produce 50% of the oxygen we breathe. Our oxygen-filled atmosphere is the legacy of microbes that lived billions of years ago. Before the evolution of photosynthetic bacteria, ancient earth lacked oxygen and carbon dioxide was much more prevalent. Cosmetic: A wide range of biological compounds, such as bio-surfactant, vitamins, antioxidants, pigments, enzymes, and peptides have been isolated from bacteria, fungi, and microalgae that are important to produce cosmoceutical products.

Figure: Role of microbes in human welfare.

Plastic bags: Certain bacteria such as Alcaligenes eutrophus, Pseudodonghicola xiamenensi, etc. produce polyhydroxy butyrate (PHB), a biodegradable and renewable biopolymer that is used in the production of bioplastic.

Cleaning dirt: The earth would be filled with corpse without microbes. They break down or decompose dead organisms, animal waste, and plant litter to obtain nutrients as well as recycle it.

In conclusion, microbes are at work to serve human beings and other living entities on earth which reflect that "There are many other great workers and not all are human".

Reference: https://learn.genetics.utah.edu/content/gsl/microbes. Accessed on 23 February 2023

The Non-Coding RNAs: are they functional or just junk?

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The term non-coding RNA (ncRNA) is commonly referred as those RNA molecules that does not encode a protein, but this does not mean that such RNAs do not contain information nor have function. Despite the common belief that proteins carry the majority of genetic information, current research indicates that the majority of the genomes of mammals and other complex organisms are actually transcribed into ncRNAs, many of which are then processed into smaller products. These ncRNAs include circRNAs, microRNAs (miRNAs), siRNAs, and probably other classes of small regulatory RNAs that have not yet been identified. Moreover, there are tens of thousands of longer transcripts, or long non-coding RNAs (lncRNAs), whose activities are also mostly unknown.

The existence of so many different ncRNA species may therefore prompt the logical query, "What is all of this stuff doing?" In the early days of ncRNA discovery, they were merely viewed as waste. Nonetheless, the scientific community is now gradually realizing that many or all of these expressed RNAs may significantly influence cellular processes and behaviour, despite this notion. It's crucial to note that a fraction of these transcripts controls how much and in what form each gene gets translated into protein..

Given that ncRNAs are an essential component of the cellular regulatory system, it has been discovered that they have the ability to control the level of gene expression. By interfering with translation or degrading the mRNA itself, for example, miRNA and siRNAs can lower the expression level of a protein coding transcript (PCT). LncRNAs can also affect the expression level PCTs by acting as precursor to the small ncRNAs. Whereas on the other hand, the lncRNAs can act as miRNA sponge, thus blocking the miRNAs and siRNAs, eventually allowing the target mRNA to express.

One such major finding is that many ncRNAs show abnormal expression patters in cancerous tissue. Recently, studies on mutation in miRNA precursor gene, an overlapping miRNA and screening of several miRNAs have been proved to be directly linked with leukemia, lung carcinoma and breast cancer respectively. Disease such as Alzheimer's disease, hearing loss, mental health issues have also been discovered to be connected in some way to the ncRNAs' differential expression.

Ultimately, it is clear that till date only a few numbers of ncRNAs have been biologically and functionally validated and as others have pointes out, even if 10% of current ncRNAs turn out to be functional, this would constitute a treasure of new biology. RNA regulatory networks may control the majority of complex traits, have a big impact on disease, and represent a universe of genetic variation that hasn't been fully investigated both within and between species. However, given our current understanding of their biochemistry, biogenesis, evolution and proper function, it is hard to draw conclusions about the functionality ncRNAs, although this is just the beginning of understanding the hidden RNA world.

" Nanomedicine": The Future medicine

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Nowadays, all of us heard the word "nano" in our day-to-day life. Interestingly some common people also know the word but they don't know the exact meaning of it. The largest automobile manufacturer in India, "Tata company" long back also launched one car named "tata nano". So the word nano is very familiar and interesting. The word "nano" originates from the Greek word "Nanos" which means dwarf. A nanometer (nm) is equal to 10-9 meters. Nanotechnology is the understanding and control of matter at dimensions between approximately 1 and 100 nm, where unique phenomena lead to novel applications. The term "Nanotechnology" can be defined as the science and engineering of small things, in particular things that are less than 100 nanometers in size (in one direction). Nanotechnology combines physics, chemistry, biology, engineering, biochemistry, biophysics, earth and environmental science, and materials science. It is a highly interdisciplinary area meaning that it involves ideas integrated from many traditional disciplines.

What is Nanomedicine?

Nanomedicine is the medical application of nanotechnology. Nanomedicine ranges from the medical applications of nanomaterials and biological devices, to nanoelectronic biosensors, and even possible future applications of molecular nanotechnology such as biological machines. Current problems for nanomedicine involve understanding the issues related to toxicity and environmental impact of nanoscale materials (materials whose structure is on the scale of nanometers, i.e. billionths of a meter).

Functionalities can be added to nanomaterials by interfacing them with biological molecules or structures. The size of nanomaterials is similar to that of most biological molecules and structures; therefore, nanomaterials can be useful for both in vivo and in vitro biomedical research and applications.

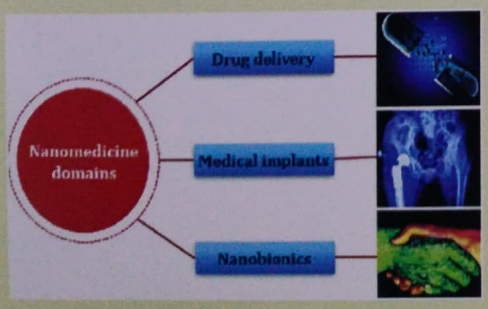

Figure1. Schematic representation of the use of nanomedicine in different domains

Thus far, the integration of nanomaterials with biology has led to the development of diagnostic devices, contrast agents, analytical tools, physical therapy applications, and drug delivery vehicles depicted in Figure 1.

Nanotechnology in medicine

Nanomaterials can be applied in nanomedicine for medical purposes in three different areas: diagnosis (nano-diagnosis), controlled drug delivery (monotherapy), and regenerative medicine. A new area which combines diagnostics and therapy termed theranostics is emerging and is a promising approach which holds in the same system both the diagnosis/imaging agent and the medicine. Nanomedicine is holding promising changes in clinical practice by the introduction of novel medicines for both diagnosis and treatment, having enabled to address unmet medical needs, by (i) integrating effective molecules that otherwise could not be used because of their high toxicity (ii) exploiting multiple mechanisms of action (e.g., Nanomag, multi functional gels), (iii) maximizing efficacy (e.g., by increasing bioavailability) and reducing dose and toxicity, (iv) providing drug targeting, controlled and site-specific release, favoring a preferential distribution within the body (e.g., in areas with cancer lesions) and improved transport across biological barriers

The reformulation of pre-existing medicines or the development of new ones has been largely boosted by the increasing research in nanomedicine. Changes in toxicity, solubility, and bioavailability profile are some of the modifications that nanotechnology introduces in medicines. The research in nanomedicine is in initial stage I think in the future it will bring a revolutionary change in medical field.

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Sustainable Development: Agenda 2030

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ıe need for Sustainable Development

rapid population growth, fast urbanization and industrialization have sed enormous pressure on water, land and other natural resources, resulting climate, environmental quality and natural resource degradation, and also the s of life forms. Anthropogenic greenhouse gases include carbon dioxide from ning fossil fuels, methane from decomposing livestock and landfills, nitrous le from agricultural fertilizers, and fluorinated gases. These compounds rb atmospheric radiation and thereby capture heat and insulate the osphere, intensifying the greenhouse effect, which leads to an increase in Earth's temperature. This increase in global temperature causes rising sea ls, changes in water temperature and climate change, which cause sporadic severe weather conditions and events such as acid rain, ozone layer etion etc. and disturbs the whole ecosystem. These forces contribute to the stating problems associated with climate change, including loss of versity, loss of people, and inequality in socioeconomic livelihoods. All factors lead to think the world leaders about some alternatives and then y came up with the vision of sustainable development.

What is Sustainable Development?

e definition of sustainable development from the Brundtland report is ustainable development is a development that meets the needs of the present hout compromising the ability of future generations to meet their own 's". To achieve sustainability, it is important to harmonize three main rs: economic growth, social inclusion and environmental protection. These ients are interrelated and all are essential for the well-being of individuals societies.

stainable Development: Agenda-2030

term sustainable development first appeared in the World Conservation tegy in 1980. However, at that time, sustainable development was used to r to ecological sustainability to argue for the conservation of biological urces. The concept of sustainable development has gained much attention r the publication of Brundtland report in 1987 "Our Common Earth" under support of the World Commission on Environment and Development. G. H. ndtland was the Norwegian Prime Minister as well as the director of world lth organization. This report mainly focuses on social and economic elopment along with the maintenance of the environment.

re 1 17 goals of sustainable development- Agenda 2030

e sustainable development concept got further boost and attention after the ited Nations Conference on Environment and Development (UINCED) held Rio de Janerio in June, 1992. This conference also known as "Earth Summit" inly focuses on some important aspect such as 27 principles of sustainable velopment, a detailed action plan for sustainable development and the nvention on Biological Diversity. A large number of national and ternational programs were organized with the aim of achieving the goals of arth Summit. In 2015, the leaders from all over the world adopted the 17 ıstainable development goals (SDG) at the historic United Nation summit nown as "Agenda 2030" and in 2016 it came into force. All the 17 goals of genda-2030 are listed in the Figure 1. The agenda 2030 mainly focuses on radication of poverty and hunger, foster peace, fighting with all kinds of nequalities, protect the rights and dignity of all people, tackle the climate change, protect the planet and also ensuring that no one is left behind.

New Threats to Child Health – An overview of Key facts from WHO

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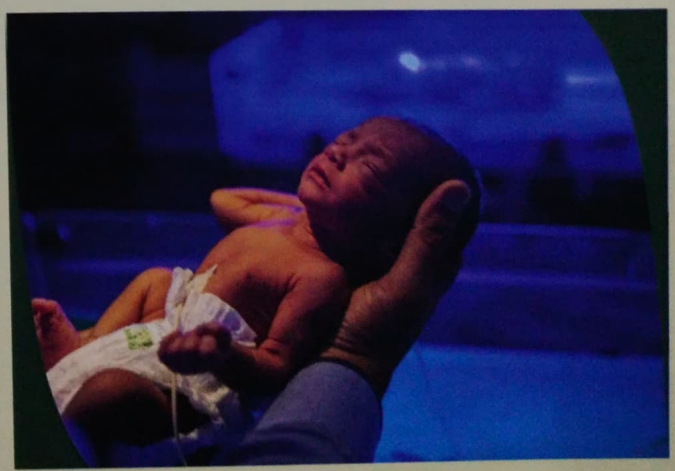
According to the report of World Health Organization (WHO) 2020 children are at greater risk of their health. Over the decades it has been observed that survival of children along with nutrition and education has improved dramatically. Along with that the progress of indicators on child health and well-being is not up to the mark. It has been observed that almost all the countries are unable to provide the required conditions that needed to support every child to grow up a healthy future. Children (aged 0 to 18 years) today face a host of new threats linked to climate change, pollution, harmful commercial marketing, unhealthy lifestyles and diets, injury and violence, conflict, migration and inequality. Their very future is uncertain, and urgent action is needed to address these threats. According to WHO the key facts of child health are:

- Greenhouse gas emissions leading to climate change and ecological degradation existentially threaten the lives of all children.
- Children are vulnerable to adverse health effects from indoor and outdoor air pollution which causes an estimated 7 million deaths per year (2016).
- Over 250 million children are at risk of not meeting their development potential (2017).
- There are 124 million children and adolescents affected by obesity (2016).
- Children are frequently exposed to commercial marketing promoting addictive substances and unhealthy commodities.
- Road injury is the leading cause of death for children and young people; more than 1 billion children are exposed to violence every year.

As a part of global wellness that we can take some of the most important actions to protect children which will also ensure their future. Child health should be priority in every policy which linked to the Sustainable Development Goal agenda. To fight the climate crisis greenhouse gas emissions should be reduced urgently. National and International regulations should be enacted to curb harmful commercial marketing. Along with that we should very careful while reporting of data on child health and well-being. And above all while taking the decision at the highest level of government multisectoral action should be well coordinated. Investing in children's health, education and well-being brings substantial returns for societies. Improving health and well-being in childhood benefits the individual throughout the life course and for generations to come.

(NB: the write-up is based on the information available on WHO site: https://www.who.int/news-room/fact-sheets/detail/children-new-threats-to-health)



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SATELLITE TECHNOLOGY FOR MASS EDUCATION

Dr. Biman Lahkar
Assistant Professor, Department of Geography

"GSAT-3, known as EDUSAT is meant for distant class room education from school level to higher education. This was the first dedicated "Educational Satellite" that provide the country with satellite based two way communication to class room for delivering educational materials. This is a Geo-synchronous satellite developed on I-2K bus. GSAT-3 was co-located with METSAT (KALPANA-1) and INSAT-3C at 74° E longitude." (https://www.isro.gov.in/EDUSAT)

EDUSAT AS EDUCATIONAL SATELITE

EDUSAT started revolutionizing the way in which distance education is carried out for teacher training and for providing support to remote classrooms. The DoS has activated one National Hub to support national level networks. The initial focus of EDUSAT has been on teacher training at the BRCs.

The SSA supports EDUSAT initiatives in seven states: Madhya Pradesh, Chattisgarh, Bihar and Uttar Pradesh, and Tamil Nadu, Karnataka and Haryana. In the first group of four states, the Rajiv Gandhi Project for EDUSAT supported Elementary Education (RGPESEE) is in its pilot phase. One district in each state has been taken up for the creation of infrastructure in schools and academic support structures to receive satellite signals and for the development of educational content.

The main purpose is to provide education to all people primarily children from remotes areas of the country who cannot go to school or colleges. In July 2005 former President A.P.J. Kalam inaugurated the first phase of EDUSAT operations by connecting 15 teacher training centres and 50 government schools in Kerala. Since then, this satellite-based learning programme has expanded to cover a large number of schools. Institutions like IGNOU, UGC, IITs, NIOS, and NCERT are among the many that benefit from the EDUSAT facility.

Top engineering colleges were launched the tale-education services by ISRO and IIT-Bombay. This initiative offers 13 fully-fledged degree courses of 50 engineering colleges country-wide with the Visvesvaraya Technological University, Karnataka, becoming the largest satellite connected technical university in India with all its 113 engineering colleges and 120,000 students connected by satellite.

Some snapshots of our joint activities

Some snapshots of our joint activities