# EDPHYSICA

*Departmental Magazine*

*of*

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*Issue. 1*

Department of Physics
St. Edmund's College
Shillong


# E D P H Y S I C A

Department of Physics
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# From The Editors' Desk

***It is with great pleasure that we are able to bring out our latest edition of the Department Magazine "Edphysica" . We gladly accepted the responsibility shouldered on us and this edition is special to the Department as the college is celebrating its 100 years journey.***

***As student editors, we are ecstatic to present to you our personal experiences and lessons gleaned, collection of articles, stories, poems, artwork, photographs, that will serve as a window into the contributors' creativity and talent. It is therefore with immense delight that we extend our gratitude to all the contributors who have made this magazine possible.***

***Our heartfelt gratefulness to Sir Lobi Kurbah, who has guided us every step of the way in order to go about this magazine.***

***With regards to the compilation, editing, final preparations and proof reading; we would like to congratulate the editorial team for tirelessly and with great dedication to make this magazine a success.***

***It is our sincere wish that the readers enjoy this edition of our department magazine.***

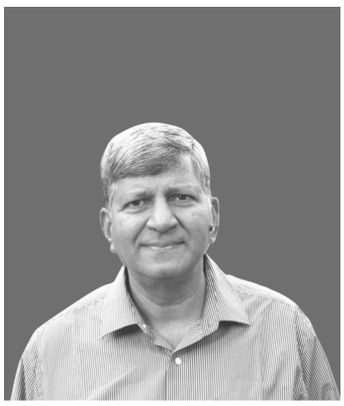
***Thank You and Happy Reading!***

***Editorial board members:***

***Supriti Khatri (6th sem)***

***Anisha Nongrum (4th sem)***

***Moasunep Soyah (2nd sem)***



MESSAGE

St. Edmund's College would like to applaud the efforts of the Physics Department to soon release their department magazine – 'Edphysica'.
We can be sure that the articles of the students compiled in the magazine will not only highlight the current work and achievements of the students but will also give us a glimpse into the dreams that they hold for the future, using the principles of Physics.

Congratulations to the Head of Department, the Faculty and the Students, especially the Editorial Board for their hard work, commitment and creativity in publishing the magazine. We look forward to the magazine, and hope that our students, some day, will be part of the success story behind the new age household appliances or involved in interventions like: FLASH proton therapy for cancer patients.

Wishing the entire Team the very best,

Sd/-
Br. S. Coelho
Secretary

# A Few Words from the Head of the Department

The year 2023 is a year of total freedom and liberation for the whole human race from the enslavement of the dreaded pandemic of Covid19; of course there are still some variants floating around in the air but they are mild and less harmful. Besides all human activities which have been affected by the pandemic education is one of them. Classes were conducted online, thanks to the advent of internet; Examinations also were conducted online. There were problems and difficulties for the teachers and the students alike and the main casualty was the quality of learning. The Department of Physics and its faculties had put all their efforts and devise all kind of ingenious methods to help the students during that crisis. Inspite of being confined in our homes, still the department is bubbling with online activities. One such activity was the celebration of a *"National Science Day"* with the theme *"Future of Science and Technology in India"* on the 28th of February, 2021. On this auspicious day the students of the 1st semester Physics Hons came forward to have a virtual celebration under the guidance of the members of the department. We also conducted a number of webinars, one such webinar was on "*Covid-19 and The Role of Sleep, A scientist's Perspective"* presented by Dr. Nabo Kumar Chaudhury, who is the alumni of the department and Senior scientist, INMAS, DRDO, Govt. of India, New Delhi which was held on the 9th, July, 2021.

The year 2022 saw a Phase transition or we can better say a Face transition as two faces of the Department, Dr. R. Das and Dr. V. R. Rao had retired and replaced with new faces of Dr. Mahesh Ram, Mr. Larry Nongbet and Mr. Dashan Nongkynrih. The university results of our final semester students are always good and consistent as usual with our students occupying top positions in the merit list. The students who passed out are pursuing higher studies in different universities including IITs. This year our 6th semester student, Aniket Chetri secured 101 rank in an All India ranking of a JAM exam, an exceptional feat by itself, and also Dame La-ai Sutnga secured 1654 rank which is also by far an exceptional accomplishment for an ST student. Besides them, Banlambha Dohling also cleared the Jam Exam.

From 2019 onwards, the Department could not come up with the Department news letter *"EDPHYS'*. But thanks to the effort of Dr. L. Kurbah and his editorial team of students, that this year we are able to bring out a new edition of the Department magazine and rechristened as *"EdPhysica"*. The magazine this time covers a wide range of topics from Nuclear energy as a solution to climate change, the emerging technology of artificial intelligence to the most pressing issue of higher education in Meghalaya. Every Physics student will always fancy about the physics of the universe and this time also the magazine has the article on the mystery of Dark matter. Once again I would like to congratulate the editorial team of this new magazine with the new name. Let us hope the junior Physics Hons students will continue the good work of the present team.

**Long Live Physics Department**

# NUCLEAR ENERGY AND CLIMATE CHANGE .

*By Anirban Das , 5th sem*
*Department of Physics*

The year 1909 is very significant for India and the world for it was on the 30 th of October of this very year that Homi Jehangir Bhabha was born into a Parsi family in Bombay. He would later go on to become the "Father of the Indian Nuclear Programme". We shall be talking more about Homi Bhabha later on.

Whenever we hear the term 'Nuclear', we have a predisposition towards thinking about disastrous eventslike the Hiroshima and Nagasaki bombings of 1945 or the Chernobyl Disaster of 1986. To even think that radioactive substances and nuclear energy can be a viable source of energy may be considered outlandish.Yet, use of nuclear energy is not only a good option; it may very well be one of the few viable options for mass energy production.

To put things in a very simple way, nuclear energy is derived from atoms. The atoms are split in a reactor and the energy they release is used to heat water and convert it to steam. This steam is then used to turn turbines and generate electricity. That is a very simplified explanation, but for our intents and purposes, it will suffice. The biggest advantage of nuclear power is that it does not make use of fossil fuels which means there is little to no carbon emission. Now that is a very significant advantage as excessive carbon emission happens to be one of the biggest reasons for global warming and climate change. About 33 Gt CO2 has been given out in the world this year, most of it from coal and oils. This is a huge amount of carbon dioxide that is being pumped into the atmosphere, causing catastrophic effects like global warming. Whilst various innovations are being made in the production of renewable energy, we are facing a brick wall in the form of output. Traditional renewable sources like solar energy, wind energy, biomass etc. are incapable of producing sufficient amounts of electricity. India alone consumed 31.98 exajoules of energy in 2020! And this was after a 5.9% decline in energy consumption due to the pandemic. The rate at which we are consuming energy can only be met by fossil fuels as of now. Therefore it becomes imperative that we find an alternative to fossil fuels for our energy requirements. Nuclear Power may be the required alternative.

The discovery of nuclear fission occurred in 1938 with World War II just around the corner. In 1939, it was experimentally shown that one fission reaction can lead to a chain of fission reactions. This was a groundbreaking discovery as it meant that with controlled, chained fission reactions, energy could be produced. It was the U.S. Navy that first developed practical nuclear power through its S1W reactor to propel its submarines and aircraft carriers. The Obninsk Nuclear Power Plant in the USSR became the first nuclear power plant to generate electricity. It was established on the 27 th of June 1954 and produced about 5 ,

# The Power of Subatomic Exploration:

## How Experimental High Energy Physics Shapes Our World.

*By Dr. Suman Deb, Research Associate,*
*Irène Joliot-Curie lab (IJCLAB),*
*CNRS-IN2P3, Orsay, France*
*{ Ex student, 2012 batch}*

Introduction:
Experimental high energy physics (EHEP) is a captivating scientific field that delves into the study of the fundamental constituents of matter and the forces that govern their interactions. At its core, this discipline aims to unravel the mysteries of the universe by exploring the tiniest building blocks and the vast energies at which they operate. While the primary focus of experimental high energy physics is on expanding our understanding of the natural world, it also generates numerous societal benefits that extend far beyond the confines of the laboratory. This article is a very small attempt to delve into the remarkable ways in which experimental high energy physics positively impacts society.

Advancing Technology and Innovation: Experimental high energy physics pushes the boundaries of technology and fosters significant advancements in various fields. Researchers constantly seek more precise instruments, detectors, and data analysis techniques to probe the complexities of subatomic particles. These advancements often find their way into other sectors, leading to breakthroughs in medical imaging, materials science, and telecommunications, to name a few. For instance, the development of particle detectors with enhanced resolution has revolutionised medical imaging techniques, allowing for more accurate diagnoses and improved treatments.

Fostering Collaborative Research: High energy physics experiments demand large-scale collaborations involving scientists, engineers, and technicians from around the world. This collaborative nature promotes international cooperation, enabling scientists to pool their expertise, resources, and technological innovations. Through shared knowledge and teamwork, experimental high energy physics cultivates a global scientific community that transcends borders. This collaboration often extends beyond the scientific realm and fosters diplomatic relationships and cultural exchanges, contributing to peaceful interactions between nations.

Inspiring Future Generations: The pursuit of understanding the fundamental nature of the universe through experimental high energy physics captures the imagination of aspiring young scientists. The awe-inspiring discoveries and technological achievements in this field inspire future generations to pursue careers in science, technology, engineering, and mathematics (popularly

known as STEM). By nurturing a passion for scientific inquiry, experimental high energy physics helps shape the next generation of innovators, researchers, and problem solvers who will tackle the challenges of the future.

Addressing Societal Challenges: Experimental high energy physics research is not limited to exploring the fundamental laws of nature; it also addresses real-world challenges. The cutting-edge technologies developed for high energy physics experiments often find applications in environmental monitoring, energy production, and sustainable development. For instance, particle accelerator technologies have been adapted for industrial purposes, leading to advancements in materials processing, water purification, and waste management. Additionally, the insights gained from studying particle physics can inform our understanding of the cosmos, shedding light on phenomena such as dark matter, which could have implications for astrophysics and cosmology.

Enhancing Education and Outreach: Experimental high energy physics engages in extensive educational and outreach activities, sharing scientific knowledge and fostering scientific literacy among the general public. Public lectures, exhibitions, and interactive demonstrations not only increase public understanding of science but also inspire curiosity and critical thinking. Furthermore, experimental high energy physics experiments often involve educational institutions, offering unique research opportunities for students and fostering collaborations between academia and industry.

In conclusion, I believe that fundamental sciences serve as a catalyst for scientific progress and societal benefits. But as an Experimental Particle Physicist myself, I think EHEP, beyond its primary goal of unraveling the mysteries of the universe, also caters to the generation of advancements in technology, addresses real-world challenges, and above all inspires future generations. It would not be wrong to say by investing in fundamental sciences, we not only deepen our understanding of nature but also pave the way for transformative innovations and a brighter future for society as a whole.

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# EXPLORING THE MYSTERIES OF DARK MATTER.

*By Calwyn A Suchiang, 4th sem*
*Department of Physics.*

This might be a surprise, but we don't know what *most* of the universe is made of. Seriously, we don't. You might be thinking, "But of course we do! It's made of galaxies, stars, planets, black holes, etc., and all the other cool interesting space stuff!"

*"Dark matter is like a huge cosmic gorilla: it's there, you can feel its presence, but you can't see it."*
*- J. Richard Gott, Princeton University astrophysicist.*

Yes, there is a lot of amazing space stuff, but if we add it all up, it's just a very small part of the entire universe. There's a lot more out there. And we don't fully understand what it is.

This article will take a closer look at dark matter and see what we know, its history, experiments that are

being conducted to shed light on their nature, and the potential implications of our findings for our understanding of the universe as a whole.

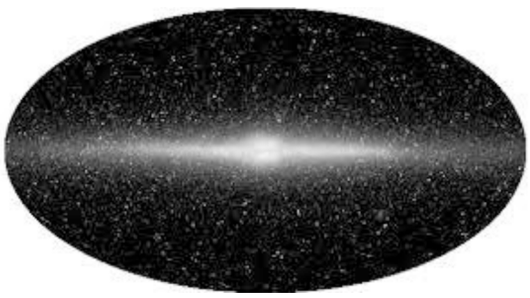

Fig2: Matter and Dark Matter in the universe.

**Overview**

It is thought that dark matter, an enigmatic and elusive element, accounts for 27% of all the universe's matter. Dark matter may be common, but it has never been directly detected, and little is known about its characteristics. When they found that galaxies were revolving far faster than predicted based on the quantity of observable stuff they contained, scientists first became aware of its existence in the 1930s. This gave rise to the hypothesis that there must be some sort of extra, invisible substance producing the stronger gravitational force. Many indirect measurements throughout the years have established the existence of dark matter, but it is still unknown what makes it up.

According to some hypotheses, it could be made up of strange particles like Bose-Einstein condensates, while other theories contend that it could be made up of primordial black holes. Whatever its make-up, dark matter is a vital component in the universe's structure and influences the growth of galaxies.

**History**

The Swiss astronomer Fritz Zwicky first used the term "dark matter" in the 1930s. He studied the so-called Coma galaxy cluster and, specifically, how fast it revolves. Clusters are like merry-go-rounds: Their speed of revolution depends on the weight and position of the objects in the clusters, like the weight of the objects and their positions on a merry-go-round. The speed he measured implied the cluster had much more mass than the observable light suggested.

In the 1970s, U.S. astronomer Vera Rubin and her colleagues confirmed this result by studying galaxy rotation. They also discovered single galaxies, not just clusters, have more mass than their observable light suggested. The work of Rubin and her team helped to firmly establish the notion of dark matter.

**Experiments that are being conducted on it**

Dark matter is believed to make up a large portion of the universe, has not been directly detected yet. Therefore, most experiments aimed at detecting dark matter are indirect, looking for its effects on visible matter. Some of the most popular experimental techniques include:

WIMP (Weakly Interacting Massive Particles) searches: These experiments look for weakly interacting particles that could make up dark matter through their interactions with normal matter.

Axion searches: Axions are hypothetical particles that are believed to make up dark matter and are being searched for in laboratory experiments.

Gravitational lensing: This technique looks for evidence of dark matter's gravitational effects on visible matter, such as distortions in the light of distant galaxies.

Cosmic ray detectors: These experiments look for high-energy particles that could be the result of dark matter interactions.

Direct detection experiments: These experiments aim to directly detect dark matter particles through their interactions with normal matter in underground detectors.

These experiments are still ongoing, and while they have provided some interesting results, no definitive evidence of dark matter has been found yet.

**Implications of our findings**

Our understanding of dark matter is still limited, but its presence has farreaching implications for our understanding of the universe as a whole.

Firstly, dark matter helps explain why

galaxies hold together and have the observed distribution of stars.

Secondly, dark matter has been shown to play a crucial role in the formation and evolution of structure in the universe, including the largescale distribution of galaxies.

Finally, the discovery of dark matter has led to the development of new theories and models of the universe, including the concept of dark energy, which is thought to be responsible for the observed acceleration of the universe's expansion.

**Conclusion**

Dark matter is one of the universe's most intriguing and mysterious aspects. Despite ongoing research, much remains unknown about these enigmatic phenomena, making them an exciting topic for astrophysicists to investigate.

In conclusion, our understanding of dark matter has contributed to a more complete and accurate picture of the universe's history, structure, and evolution. However, much research is still needed to fully comprehend the nature of dark matter and its role in the universe.

# What is the future of AI in India?

*By Pronab Barman, 2nd sem*
*Department of Physics*


India has proved to be a new global leader in economic forum as well as in the technological sector ,it has been a new hub for all sorts of new innovation and technological advancements for our near future. India had proved to be a new emerging global leader in this 21st century within a decade.

Artificial intelligence is now on a boom in the entire world as well in India too, AI is still in its infancy in India, but it is increasingly being used to create innovative answers to complex problems in all sectors of the economy well as in India too, shortly it is being termed as AI and in this modern era mostly all of the fundamental to all of the advanced work is most likely to be handled by an AI because it assures help to humans and moreover it provides ease of work to humans, as the technology is advancing at a rapid pace AI had also evolved.

In the current scenario AI in India has a crucial step in order to build up a developing nation and moreover it is being used in variety of vast interest namely

- AI MEDICAL SYSTEMS:

Artificial Intelligence in medical sector provides a safe and sound environment to the patient because it reduces the probability of any fault during operations because it is much more precise compared to any human hand one such example is AI robots in

hospitals which functions according to the given tasks. AI also could help and have more exposure to the patients living at rural areas because it reduces the dependency of regular doctors even for a minor problems such as common cold , fever etc.

- AI FOR TEACHERS:

In India , AI could be extensively used to train new learnings to the teachers as well as create more interactive sessions in the classrooms . AI learning is the new shape of future learning which also reduces the dependency of teachers ;as in in India where the students to per teacher ratio is awful AI could help in order to fulfil the need , it also provides an opportunity to the Teachers to work upon their weak fields with the judicious use of Artificial Intelligence .

- AI FOR ROADSAFETY:

In India, we have one of the most enormous road traffic across the globe and the highest road deaths worldwide. India is facing a difficulty in road safety, and we must confront this issue to solve it as AI has already been profoundly used in cars it already plays an important role in maintaining the road safety hazards as well as passengers life and the pedestrians as well. In the near future India has already planned to introduce AI vehicles to reduce the death toll in our country .

- JOB OPPURTUNITIES IN AI:

The first steps toward preparing India for the expanding AI space and adapting to it, and to taking advantage of the economic benefits that AI can bring to India, are training and events that prepare professionals and graduates for work in the field of emerging technologies like AI, Data, Cloud, Robotics, and the Metaverse.

- USE OF AI IN EVERYDAY LIFE:

We use technology based on artificial Intelligence in our day to day life for example there have been an extensive use of voice assistant in our smartphones and several new innovative products like Ok Google , Alexa , Cortana are also such examples. They use voice recognition intelligent assistant employ which uses machine learning and algorithms to identify the user and to perform the given task inquired by the user such as to play music , notify weather temperature , online purchase , and solve any given query by the user.

# THE BEAUTY IN PRECISION

Man and their creations have come a long way, the ingenious methodologies and ideas have transformed our species to become this overwhelming force planet earth has ever witnessed. Over the course of history we have evolved time and time again, and through each stage we have introduced new ways of survival, machinery and overall advancement and all of it can be accredited to our high cognitive abilities. What makes our cognitive abilities so remarkable and different from the rest is that, for one we can coordinate well in large numbers, the second is that our mental capabilities allow independent and logical thinking.

The second aspect may have taken us hundreds of thousands of years of evolution, but once at this stage we have had much more of an affect as a civilisation than in any period over the last 4 billion years of human evolution. To give an indirect observation onto our human minds, let us step into a more modern perspective, we have a tool that has persistently helped us in understanding the universe as we see it and that tool is referred to as mathematics, an unpopular and quite at times, a hated topic by many, but for the ones who choose to be

the beholder, mathematics is an insight into the deepest questions that surpass all of us and the strangest thing is that it was invented by us, not because we knew it could help us calculate the mass of a star, situated 10,000 light years from us, we originally devised it as a means of helping us to keep track of things. It was only because throughout time we finally started asking bigger questions that we eventually realized that numbers and symbols could mean more.

Counting began as early as the stone age with the use of tally markings, these were used to keep track of animals, supplies and so forth.As civilisation progressed we came up with different ways of writing down numbers, many of these systems included the use of Greek,Egyptian and Hebrew numerals.The long used tally markings were now obsolete as it was difficult to note down large numbers using them.Today we make use of positional notations(one's, ten's, thousand's) which makes keeping track of large numbers that much easier. Now how do numbers tie up in this grand construct we call life? Well back when Aristotle reigned supreme and his philosophies characterised the basic mechanics of the universe, justification of natural phenomena was derived from mere observations and less from abstract theories and ideas.It was eons later, when Newton stepped into the scene that the often hard to explain observations were now tied to the abstract ideas that govern them, " is still considered as one of the most important scientific books ever published, in it the equations of motion proposed by Newton were so concise and true that most phenomenon even the ones that govern the planets could now be easily explained and more, even predicted.Isaac Newton is regarded as such a monumental icon even today, not because he termed the phenomenon known as gravity, Newton is considered as the genius because he stood upon nothing more than just his pure idea and intellect.Now centuries later we are still propelled forward by the basis that he had laid, he was the first to employ mathematics in explaining the complicated patterns that nature follows, then followed the other great men and women, Srinivasa Ramanujan, Michael Faraday, Max Planck, Albert Einstein, Stephen Hawking and many more whose contributions have changed the world.

It's often strange to think that we started off by literally counting sheep and today we use these principals to calculate the size of an accretion disk surrounding a black-hole situated 26,000 light years away! To say that we have come a long way is an understatement, instead I say that we have thought for so long and today our thoughts are employed to the extent that we now answer questions that not only determine our survival but questions that define our place in the universe. All great ideas start with a thought, thought turns into action and action results in change, either good or bad, but irrespective of all the human atrocities our thoughts have fumed over the past centuries or in fact our whole human existence there is still beauty in our ideas, beauty in our perspective and beauty in the abstract minds, it is what makes us who we are, the imperfect products of a sensitive process, creation.

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# A World Made of Strings.

*By Kevisetuo Sekhose , 2nd sem*
*Department of Physics*

Imagine I have an apple and I asked myself What is the apple made of, how do I answer that question? Well, I want to look deeply inside the apple. So I Magnify it and I magnify it again and if I keep on doing it deep inside sooner or later I begin to see molecules come into view but molecules are not the end of the story because the molecules can be enlarge and if I make them big enough deep inside, I begin to see Atoms, atoms are not the end of the story too because we have electrons moving around the nucleus deep inside mostly empty space in the atom, but deep inside We see the nucleus. So, if I grab that and magnify it I see that the nucleus is itself made of particles neutrons and protons and if I grab one of the neutrons and magnify it I find yet further particles little tiny quarks inside. Now that is where the conventional idea stopped String theory comes along and suggests that inside these particles there is something else So if I take a little quark and I magnify it conventional idea says there's nothing inside but string theory says I'll find a little tiny filament, a little filament of energy, a little string like filament and just like the string on a Guitar, I pluck it and it vibrates and creates a little musical note that I can hear the little strings in string theory when they vibrate They don't produce musical notes. They produce the particles themselves so what quark is nothing but a string vibrating in one pattern an electron is nothing but a string vibrating in a different pattern a neutrino is nothing but a string vibrating and different patterns still so if I take all of this back together I have my ordinary apple and if these ideas are right, they are speculative But if they are right deep inside the apple or any other piece of matter There's nothing but a dancing vibrating cosmic symphony of strings That's the basic idea of string theory.

During the last thirty years of his life, Albert Einstein sought relentlessly for a so-called unified field theory--a theory capable of describing nature's forces within a single, all-encompassing, coherent framework. Einstein wanted to illuminate the working of the universe with a clarity never before achieved, allowing us all to stand in awe of its sheer beauty and elegance.

However, Einstein never realized this dream, in large part because the deck was stacked against him: In his days, a number of essential features matter and the forces of nature were either unknown or, at best, poorly understood.

But as time went on, new generation physicists slowly and steadily began to fit and starts and diverge down blind alleys-and been to steadily build on the discoveries of their predecessors to piece together an ever fuller understanding of how the universe works.

For many years physicists have tried to merge general relativity with quantum mechanics in-order to find to find a unified theory but come up short due to their different nature. General relativity implies that the absence of mass means the space is flat but quantum mechanics changes this conclusion radically. If we magnify a small region of spatial fabric, at first, we see no change but as we keep on magnifying the space, the space get subjected to quantum fluctuation {A quantum fluctuation is the temporary change in the amount of energy in a point in space} inherent in the uncertainty principle-even gravitational field. As gravitational field are reflected by curvature, these quantum fluctuations manifest themselves as increasingly violent distortion of the surrounding space. The notion of a smooth spatial geometry, the central

principle of general relativity, is destroyed by the violent fluctuations of the quantum world on short distance scales.

Until the discovery of superstring theory which attempt to explain all of the particles and fundamental forces of nature in one theory by modelling them as vibrations of tiny supersymmetric strings.

Reference: Brian Greene, "The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory", Vintage Series, Random House Inc., February 2000 ISBN 0-375-70811-1

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# HOMO SAPIENS — A SPACEFARING SPECIES?

*By Amit saharia 4th sem*
*Department of Physics*

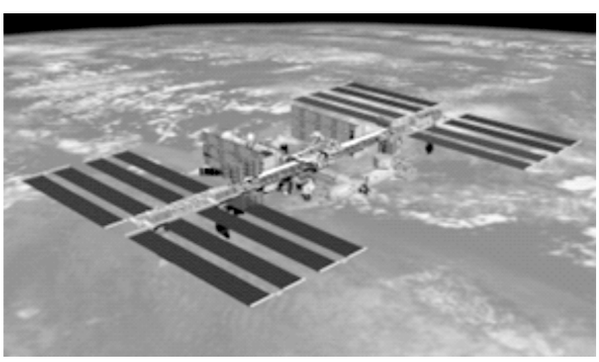
Homo sapiens or Humans have been curious and fascinated about Space from time immemorial. From the Aztecs, Mayans, pre-historic Egyptians, pre-historic Indians, etc to modern day humans, the curiosity to look up at the sky and wander about the unknown has remained the same. The Astrolabe was one of the earliest astronomical devices ever made, it was a handheld device that used rotating disks and a sighting mechanism to measure the altitude and position of stars and celestial objects. It was used widely by Astronomers, Navigators, Astrologers, etc during the ancient and medieval period. Other early astronomical devices were "The Armillary Sphere", "Sextant" and "Telescopes", which were developed and improved over time. And here we are now with high end astronomical devices that help us study and learn about space in great detail. Some examples are Space Telescopes, Interferometers, Spectrographs, Supercomputers etc. Also Orbiters and Rovers which are mostly unmanned Spacecraft that get quite close to a planet or any other celestial body and transmit information back to Earth. Unlike Orbiters which observe planets and other objects from above, rovers land in these planets and other celestial objects and collect samples and data from the surface. The modern space age began during the early days of cold war between The U.S and The Soviet Union. From then on tens of thousands of satellites have been sent to space and hundreds of astronauts also have been to space with 24 astronauts visiting the Moon till date. Though it's been half a century since the last time humans went to the moon, the progress for the next round of visiting celestial objects has never been stagnant.

During these past 50 years numerous achievements have been made in this field. Some of the most significant ones are:-

International Space Station (ISS): A space station hovering above the Earth proving a unique environment for scientific research and also serves as a stepping stone for future deep space exploration.

Faraway Spacecrafts: Spacecrafts that that have travelled to the outer parts of our solar system such as Voyager 1 and 2,Pioneer 1 and 2, New Horizons Spacecraft and Cassini-Huygens

Fig 2: International Space Station



Reusable Rockets: Rockets cost millions of dollars to make and a new one had to be made again and again after every mission. Since there was a lot of wastage of money, the commercial Space venture "Space X" made the perfectly functional reusable rockets that just needed to be fuelled up and maintained a little to be made reusable for the next mission.

Mars Exploration: After Moon it was time for

Mars, which is the most favourable planet to be our second home. In the last 50 years The Viking landers, Spirit and Opportunity rovers, the Curiosity rover, Mangalyaan-1, Perseverance rover and Ingenuity helicopter are missions that helped us understand the geology and history of the red planet and also provided insights into the potential for life in mars.

These successful missions are great milestones in our journey to becoming a real SPACEFARING SPECIES. So what does a Spacefaring Species mean? A spacefaring species is an intelligent species that has the ability to travel and explore space beyond its home planet. These species are capable of building spacecraft and technologies that allow them to travel vast distances, explore new worlds, build settlements, extract natural resources and interact with other possible intelligent species. We humans are already on the right path to be a real Spacefaring Species, the word 'real' is added here to tell us that we humans right now are just imitating our possible future selves and that we haven't reached the summit yet.

Billions of dollars are being spent every year on the space industry, so it's normal for people to question the spendings. Many people question the need for Humans to become a Spacefaring Species. There are many reasons for Humans to become a Spacefaring Species.

Exploration: Humans are naturally curious, and space provides an endless frontier for exploration and discovery. Venturing beyond our planet, we can learn more about the universe, our place in it, and the origins of life itself.

Colonization: As humans continue to increase in numbers, we may eventually need to establish permanent settlements beyond Earth to not suffer from the problems that come with overpopulation. Also this could serve as a backup plan in case of any catastrophic event on Earth like Asteroid impact, Pandemics, Massive Shift of Tectonic Plates etc.

Research: Space provides a unique environment for scientific research that cannot be replicated on Earth. By studying space, we can learn more about the physical properties of the universe, the behaviour of particles, and the effects of radiation.

Resource utilization: As the Earth's population continues to grow, we have to find new sources of natural resources to sustain ourselves. Space provides access to valuable resources like water, minerals, and energy that could be used to support the human civilization. Space mining is a hot topic in science right now; benefits of space mining include the ability to access resources that are rare on Earth, as well as the potential to support long-term space exploration and

Colonization. Many space related organisations are researching ways to extract and transport resources from one place to another in space. Apart from government funded organisations, private companies like Planetary Resources and Deep Space Industries are also focused on developing technologies for space mining.

Planetary Defence mechanism: Spacefaring technology can be used to detect and potentially prevent catastrophic events like asteroid impacts or solar flares that could threaten life on Earth.

Technological advancement: The challenges of space exploration and colonization require the development of new technologies, which can then be applied to other fields and benefit humanity as a whole. Many of the technologies we use today, such as GPS and satellite communication, all were invented for space exploration.

International Cooperation: Space exploration has the potential to bring people from all over the world together in a common goal, fostering international cooperation and collaboration. If humans do avoid conflicts amongst themselves and work towards a common goal of development and prosperity of our species then a Utopian future is not impossible.

In conclusion, becoming a real spacefaring species is essential for the long-term survival and advancement of our species. As Carl Sagan once quoted, "All civilizations become either Spacefaring or Extinct". By venturing into space we can access new insights, new resources, develop new technologies, and establish colonies on other planets, ensuring our survival. It is a challenging and ambitious goal, but it is also one that holds great potential for the future of our species

# HIGHER EDUCATION IN MEGHALAYA: ISSUES, CHALLENGES AND SOLUTIONS

*By Anirban Das, 6th sem*
*Department of Physics*

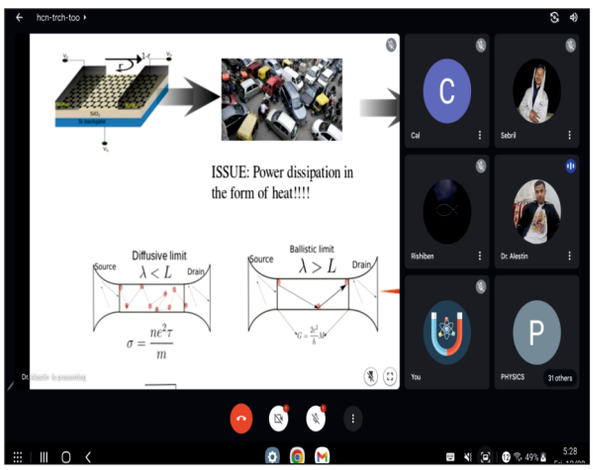
MEGHALAYA – The abode of clouds. A land filled with scenic beauty, lush green forests, beautiful hills and exotic plant and animal life. Anyone who has known Meghalaya would very affectionately give it the title, "God's own country". This beautiful North-Eastern state of India is well known for its tranquil beauty. However, something that Meghalaya cannot really boast of is its education system. According to the Performance Grading Index of the Ministry of Education for the year 2019-20, Meghalaya ranks at Grade IV in school education. That is among the worst rankings in the country! This is a rather disparaging note to begin on, but I hope that come the end of this essay, we all shall have a more optimistic outlook on the situation.

A big issue which impedes students wanting to go for higher education is the unavailability of reputed, premier institutions. This is in no way an attempt to impugn the prestige of the institutions already established in the state. From my personal experience, I know better than to do that. However, it is common knowledge that with the "big name" institutes, come big opportunities and exposure, critical to the overall development of a student. Another issue, that I feel is plaguing the state's education system, is the general mindset of students and teachers. I have always seen Meghalaya as a wonderful respite - a holiday destination where people come to relax and have a good time. As such, I feel like there is a lack of competitive mindset in our students. This proves to be a hindrance in competitive examinations where focus and attention to detail is key.

In my opinion, development of proper infrastructure is the biggest challenge that we face in the promotion of better higher education. It is very difficult to build good colleges and provide them with quality laboratories, classrooms and other amenities in an area which is known to be earthquake prone and often hit by landslides. Another challenge lies in the procurement of quality home grown talent in the form of teachers and other staff to run the colleges, as they themselves may have been part of an already crippled education system. However, not all hope is lost.

The colleges and universities in Meghalaya have shown time and again that they not only posses the determination, but also the competence to produce qualified, competent students. What is required is perhaps a slight change in curriculum, focusing more on the practical aspects of subjects rather than just theory. We, as students can also make it a point to bring in consistency and dedication in what we are studying. The Governments can actively invest in higher education schemes for Meghalaya and bring in the so called premier institutes to the state to indulge in healthy competition with the already present institutes.

The potential of Meghalaya is infinite. All that is required is a combined effort from everyone to "fly in the abode of clouds".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ISSUE: Power dissipation in the form of heat!!!!
Diffusive limit
$\lambda < L$
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Drain
$\sigma = \frac{ne^2\tau}{m}$
Ballistic limit
$\lambda > L$
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Rishiben
Dr. Alestin
You
PHYSICS
31 others


Department of Physics
St. Edmund's College, Shillong


GPS Map Camera
Shillong, Meghalaya, India
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Meghalaya 793001, India
Lat 25.576249°
Long 91.890088°
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# ST. EDMUND'S COLLEGE SHILLONG CARRIES MEMORY OF NETAJI SUBHAS CHANDRA BOSE

*By Uma Purkayastha*

St. Edmund's College Shillong has completed its glorious hundred years, which had its humble beginning in October, 1916. It is the scecond oldest college in Northeast India, behind Cotton College, Guwahati, which was established in 1901. It is worth mentioning that, during the span of hundred years, this celebrity college has produced hundreds of illustrious students. Hats off to the Christian Missionary Brothers and the faculty who took the steering efforts in bringing up the institute and the pain and strain to reach the institute to the height as it is today.

'The history of St. Edmund's College, Shillong is intermingled with the brave efforts of the Germans and the Irish. The Christian Brothers were invited to Shillong in 1915 and St. Edmund's College was founded by the Irish Christian Brothers in 1916 as a higher secondary school and was recognised by the Cambridge University for examination up to Higher School Certificate level. Bro. Luke Aherne was the first director and Bro. M. S. O' Brian, the first sub-director. The college finally opened on October 6, 1916 by the Chief Commissioner of Assam. When the Government of India Act 1919 was passed, the college got affiliated with Calcutta University for Intermediate Arts (I.A.) and Intermediate Science (I.Sc.) courses in 1923. Bro. J.E. McCann was the first principal of the College ( he was also the Principal of the School at this time ). Bro. I.O ' Leary was the first Principal of the College ( separate from the School ). Bro. J.C. Roe conceived the idea of opening up university classes up to B.A. and B.T. standards and extension of these affiliation was granted on 14th September 1935. This was the first time when a non-government college in the Assam Province got affiliation up to B.A. and B.T. standards and gradually the college opened up courses for B.Sc. With the genesis of Gauhati University on 26th January, 1948, the college got affiliated with it, and later on the college came under NEHU in 1973 for which till today its associated with. [ Collected from https://en.wikipedia.org ]

During October 1938 , while Rev. Bro. I.O' Leary was the Principal of the college, Netaji Subhas Chandra Bose, President of Indian National Congress had a sojourn to Shillong to form a Congress Ministry in Assam, under the premiership of Gopinath Bordoloi. It is an historical event of erstwhile Assam. Shillong was then the capital of undivided Assam and Subhas Chandra was lodged at a private house, named as Ashly House ( near Wards Lake, adjacent to present Earl Sanitarium ).

During that stay, other than his very important political activities, Subhas Chandra had a very close interaction with the people of Shillong. He was warmly felicitated in different public gatherings ; and

one of the most important reception was arranged by the St. Edmunds College Shillong, which is an untold story to many of the present Shillongites.

Rev. Bro. J . I . O ' Leary, the then Principal of St. Edmunds' College, Shillong cordially invited Subhas Chandra Bose to grace the College. He was an ardent admirer to the great patriot Subhas Chandra Bose. It is learnt from the description of (L) Bro. Viera, the next Principal of the college that, other than the students and faculties of the college, some important British officers were also present in that gathering. Prof. Nalini Kanta Mishra , one of the senior most professors of the then St. Edmund's college described that the Principal, students and faculties of the college and school, with flowers in hands, stood on both side of the college-gate to offer a hearty welcome to Subhas Chandra Bose, and Subhas Chandra was greeted warmly and brought to the college auditorium by the Principal. Professor Nalini Kanta Mishra added, 'Perhaps it was for the first time that a missionary college, always careful to maintain its educational sanctity, hosted a meeting in hounour of a dominant political figure like Subhas Chandra Bose. This reveals the very anti British and therefore anti-imperialist attitude during the war years'.

In that gathering, Subhas Chandra in his speech, said ..... ' The Government loves to put me behind the bars as it feels, I am a Terrorist. Would you please tell me, do I really look like a Terrorist? But yes, it is true that I sincerely love my country. It patriotism and terrorism are synonyms, then I would never object to be abused as a Terrorist. We are not enemy to the British. We have received a lot from them. Even in past, India too contributed a lot to the world. My only question is why should our country remain under the yoke of a foreign rule ? Freedom is the birth right of an individual. So, as far as possible, the British should quit our country. We ourself will rule our own country ; and that is normal. The Americans are of same religion and culture as the British ; then why did they take up arms to fight against the British ? It was required for the sake of freedom. Even, we shall have to take up arms, and plunge into the fight against the British rule. I reteorite, we do not have any enimosity against the British ; they can stay in our country at ease, but not as a ruler , but as an Indian, a citizen of India'.

[ The version is translated from a researched essay in Bengali, titled as, 'Shillong - e – Netaji Subhas Chandra Bose ,' by (L) Dr. Purnendu Bhattecharjee, Professor, St. Edmund's College and Prof. Shyamadas Bhattecharjee Lady Kene College Shillong ].

There was pin drop silence in the audience. Everybody was mesmerised at his maganetic personality and outstanding oratory ; even the British officers, present in the meeting, highly appreciated his logical speech. ! It was a valiant gesture of Bro. O' Leary to invite a revolutionary like Subhas Chandra Bose in the educational institution, braving the royal wrath of the British Administrators, a rare example in the history of Shillong.

The Edmundians greeted him with a garland of 'Forget Me Not' flowers which indicated, ' *We shall never forget you* ':

It is worth mentioning that Netaji Subhas Chandra Bose visited Shillong twice. His first visit was on 12$^{th}$ June 1927, while he was under house arrest. He was sent from Mandalaya Jail as his weight was abnormally reduced, and under advice of Dr. Bidhan Chandra Roy of Calcutta, he was sent to Shillong to recover his health. During that sojourn he stayed at 'Kelsal Lodge', Shillong for 4 months 6 days ( from 12$^{th}$ June 1927 to 18$^{th}$ October 1927 ) and was under medical supervision of Dr. Pulin Bihari Dev, the first M.B.B.S of Shillong.

Netaji Subhash Bose's visit to Shillong, September 1938
Above photo courtesy of Sri. Hiranmoy Dhar

( Ref . Page 176 – 177 'ajo nityab' by Kaverri )

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1. From https://en.wikipedia.org ( Google )
2. [ 'Netaji Bose : A Legendary Patriot' by Satis Ch. Kakati ]
3. ( Ref : Golden Jubilee Souvenir, Netaji Pathagar Shillong 1997 )
4. Shillong – er - Bangali by Prof. Shyamadas Bhattecharjee.
5. ' ajo nityab ' by Kaverri. Published by Kasturi DasGupta 2011,


# WISDOM OF NATURE

By Yengkhom Anjita Devi , 4th sem
Department of Physics

Nature is the storehouse of all the ideas and mothers of all inspirational resources. To cite a few examples in the course of a river, in the life cycle of a butterfly and even in a tiny seed - nature has the message of inspiration.

The birth of a plant is one such inspiring event the root and shoot of a germinating seed exert considerable force to burst open the seed coat and break through the hard ground to begin its life. Each time a tiny seedling pushes its way through the soil, the inspirational /wisdom nature send gives us that the'' roots of success are formed through hard work.''

Another important wisdom of nature is the transformation of a caterpillar to a butterfly. Through the transformation of a tiny insect that once crawled to a brilliantly coloured creature that can fly nature wisely unfold the message. Good things come to those who wait and inspire us to persevere.

Thus, each time a seed drives its way through

the soil in order to survive, each time a river overcomes a big rock on its path, each time a wiggly caterpillar transforms itself into a beautiful butterfly, nature is inspiring us to excel. So, if we want to be inspired all we have to do is to look deeper into the natural world and hear the message nature sends.

THE UNWORLD CHARTER FOR NATURE says ''Life depend on the uninterrupted functioning of natural systems which is rooted in nature which had shaped human culture and influence all artistic and scientific endeavour''. Nature touches authenticity by giving us opportunities to be alone with ourselves in a truly non-judgemental environment. Most people want for them or what society deems important, rather than what is in their heart.

Nature is an inspiration source for human being Albert Einstein once said ''We know less than one thousandth of one percent of what nature has to reveal to us''. Nature gives us the showers that clears our mind and clean our thinking. While society means many things deal with busy life, society means many things deal with busy life, a chaos, competition, anger, sadness, disappointment nature however can present equality, encouragement, peace dignity, hope and honour. If we see nature, it means we feel the creation of God, there is an almighty of God in it.

But, Man is the most insane species. He worships an invisible God and slaughtered a visible nature without realizing that this nature he slaughters is this invisible God he worship So, to find the meaning of life enjoy the journey let's save, preserve and conserve nature don't forget –Nature heals and gives strength to the body and soul.

# My Favorite Musical Artist

Music is something everyone loves and listens to. It has been a part of human culture for thousands of years, and will continue to do so for a long time. It has the ability to evoke emotions, memories, etc., it allows one to express himself freely and even have the ability to overcome language barrier. Now I'm no music expert, but I want to share about my favorite music artists 'The Beatles'.

The Beatles are widely regarded as one of the most influential and iconic music bands in history. They were formed in Liverpool, England in the early 1960s, it consisted of four members: John Lennon, Paul McCartney, George Harrison and Ringo Starr. Together, they created music that revolutionized the industry and paved way for many artists that followed.

One of the thing I love about The Beatles is their versatility and ability to continuously evolve in their music. They had the ability to create a wide variety of music, from pop and rock and roll to psychedelic. Their music evolved as they did and they always managed to keep their music fresh and exciting.

The Beatles were also known for their incredible songwriting ability. The Lennon-McCartney partnership is widely regarded as one of the greatest songwriter duo of all time. Their music is timeless, and the themes they explored in their songs are still relevant today. Also their music became a symbol of peace, love, and social change.

Personally, some of my favorite Beatles songs include “Nowhere Man,” “Something,” “Hey Jude,” and “In My Life”. Each song is unique in its own right and showcases the band's exceptional talent, uniqueness and creativity.

The Music 'The Beatles' had produced has brought joy and inspiration, and their influence on the music industry will always be immeasurable. Their music and legacy will continue to inspire and influence generations to come, and their music will always hold a special place in my heart.

# STORY TELLING : THE MOST POWERFUL TOOL

By Sungdiakum Amer , 2nd sem
Department of Physics

The earth is a unique place filled with fauna and flora ranging from the millions to the billions, from the colossal whales, inhabitants of the mighty oceans to the meek microorganisms, hidden but minacious. Among this vast array of life forms, lie the ultimate form, human race, to whom has been granted the power to shape entire ecosystems, to thwart or fabricate the entire faunas and floras but how did humans manage to acquire such power when the earth is populated with creatures which are much stronger and in some cases more intelligent than humans? The answer, lies in the unique ability of humans to unionize and form groups consisting of thousands and millions, who, can together work in unison to achieve great feats and accomplish unattainable exploits.

So how did humans master the ability to organize themselves into such integrated communities of millions? The answer- simply by telling stories.

Stories are depictions or accounts of events either fictitious or real, the tales of past exploits of wars, of the current Meta and of glorious futures. Stories can be of different and distinct forms, from the latest and most surreptitious gossips to the epics of old and ideological tales of sacred religious and political thoughts, in fact, all ideas, religion and philosophy can be considered to be stories. These stories are spread through different mediums, a simple conversation at the local bar, through a college crash course on ancient Mesopotamian history or from the chapels of churches and temple halls. These stories, if convincing enough, helps spread and propagate different ideas and philosophies, which influences and coerces our minds towards achieving a specific goal collectively as a community as long as everyone believes in the same story. For example, say a king wants to expand his territory, how does he achieve that, he needs to have a large army, capable soldiers and enough provisions for war but most importantly how does he instigate his people? He simply tells them the story of a future where their "barbarous" neighbors will destroy their towns, loot their belongings and take over their lands and take their sons and daughters as slaves. The only way to stop this is by invading them first before they make the first move. The king hands over the local priest a few shards of gold and the following congregation, the priest starts to foretell tales and stories of prophesies, warnings of a coming invasion. The people now swayed by these stories start to prepare and organize themselves for war, doing their best to rid themselves away from the "dark" future that the priest foretold.

Through this powerful tool, religious leaders, political thinkers and economist have been shaping and influencing human societies into a constant state of evolution which has led us to evolve from small, family focused groups to community, state

focused groups which consist of millions. It has led to the development of a growing trend of globalist and neo liberal society which resulted all because someone once told the people the "glorious story" of capitalism and the story of democracy , a story of a utopian, egalitarian world where you will live the most comfortable and happy life, devoid of poverty and oppression.

Stories therefore are not just simple bedtime tales but are rather tools of tremendous and formidable potential which can help us attain heights of achievements but can also be a dangerous tool when employed for the wrong propaganda. In the end the fate of the world ultimately depends on who the best storyteller is.

"Humans think in stories, and we try to make sense of the world by telling stories"

- Yuval Noah Harari

# Progressing and Awaiting

*By Anisha Nongrum, 4th sem*
*Deparment of Physics*

Nervousness and excitement kicks in as the thought of joining college dawned on me. Having to make new friends and encounter new people was what I was most excited about. Unaware of what the future holds, I was filled with anticipation. Although going into college was full of uncertainty; yet I was hopeful that along the way, things would turn out to be pretty different and purposeful.St.Edmund's garnered in gold, maroon and green with its firm motto, "Facta Non Verba" became my second home, the institution which would embed all the knowledge, i.e, both academics as well as non-academics for the next three years. I must say, St.Edmund's is full of surprises! It is here that I was introduced to countless and varied events. From indoor,outdoor events to competitions which help develop our communication skills namely debate, extempore speech; singing and dancing competitions , painting/sketching/drawing,photography , film-making, food-fests, to holding seminars of diverse spectrum to organizing science melas; you name them all, St.Edmund's is a bombshell of extra-curricular activities!It caters students from all walks of life, and encourages one to engage in activities they are most interested in. Winning or losing was never in the chart, but the spirit of participation drove every Edmundian to be enthusiastic and active.Personally, I was extremely ecstatic to join the outdoor curriculum, although it was not exactly my forte. From running around convincing my friends to join whichever event fits best, to becoming a victim of being "forced" to join such, it will forever be a core memory instilled in my heart as well as snapshots in my phone camera.However, the thrill of it all was bunking classes as an excuse that we had a game just to ease and calm our minds as a getaway from the long, tedious lectures or practical classes."Oh! to turn back time and relive the moment", was a common phrase used by every Edmundian after all the jubilant moments had passed. Such moments of exuberance reminded me that we must live in the present and grab every

opportunity thrown along our way; to prepare ourselves to take the 'once in a lifetime' ride creating history and memories, forging new friendships and alliances all to bring out the best that every Edmundian has to offer in their different respectives.As far as I am concerned, its definitely a pat-on-my-back because Edmund's opened new avenues for me that I would have never imagined joining or participating.Alongside my studies, I would be humbled to carry with me the moral values and impeccable knowledge imparted by my teachers. The recollection of all the jovial moments with my friends; and, nonetheless the stressful and challenging days that in turn taught me to be stronger, braver and wiser.In no time, I will be graduating and I sincerely hope that the upcoming days, with its series of ups and downs will be full of reminiscence that I will cherish and treasure to eternity!

# AN ANECDOTE OF A JUVENILE

*By Sataveek Das , 2nd sem*
*Department of Physics*

It's my story of how I spent my college first year with a lot of gloominess, ascend issues, and pleasure-adorable and unimaginative moments in this short period of my journey in my college. Without further a do let's begin, there is always a rush & uncertainty in our life what shall we do when all of us are done with our schooling at senior high, just like that I was also having lots of doubts about where should I enroll myself, through which I would be like to get not only knowledge but also a path of wisdom to follow for myself to excel in my life.

So folks what do you think happened next, as to know what occurred keep reading to the narrative of my tale, let's resume as it goes when I get slowly getting hold of what to do next in the following phase of my viability, as usual just a like a standard teenager which we know scroll around my social media handles, got astonished after peeping into one my senior's social media stories.

I rigorously built a state of question hour where was this place located likely as a teenage mind. Then I scrutinize the reframing feeds of my senior, I finally got to know the discovery behind this feed which was an alluring and ravishing part of the nation; Meghalaya. The place that made my thoughts enchanted with great motive is none other than the magnificent Shillong. But-but the life of a standard teen is not so charming and insurable, there are always some hurdles; gigantic or miniatures, so as we all vaticinate that it also didn't leave me untouched with its grasp of might. While moving further I wanna remind my reader that, if we are thinking distinctly from a different person it doesn't mean we are heading toward the wrong path, it simply means you are doing things differently and ensuring to have a trait of taking calculated risks or building that trait of any of ours or others mistakes that had been occurred earlier in the phase of life.

Returning to the topic, the grace of nature brought me to the abode of clouds. The journey of traveling from my home to Shillong was equally painful, dramatic, and

life-changing. The first thought that came to my mind, was that it's literally a paradise in between mankind. I may not have visited the entire Shillong but the time I spent with my friends and cheerful seniors, it's a real blessing for me. So the reader as the subject turns toward friends and colleging, as my journey took a station named Saint Edmund College, a space (site)which is not only beautiful from its infrastructure but also takes priority to its natural aspects and manages & maintains it, moving further a head when I at first went to my college, Readers! I was not getting amazed but also it was pleasant, confiscate me with good vibes, as I headed towards my classmate I was getting mesmerized by the gardening of the college think so Edmunds had created its wonders to captivate the interest of the students to come regular basis, but jokes apart Edmunds is doing a great job for shaping the real-valued human being. As I was saying earlier, when I was exploring my classroom, it will sound funny; Reader! that I almost made five rounds, even though when I remember it I bust out with laughter, but finally after the five and a half rounds I was able to find out someone in this dome seriously I still greatly admire to him, brother if you uncannily discover my disquisition it's my small token of gratitude towards you. As some days were resonant, I started getting more inquisitive, sky-timid, ambivert, extrovert, and with a lot of individual qualities.

Going to our teachers, are supportive, helpful, encouraging, so genuine, and generous with every student in the college. As I remembered sometimes Readers! When I got or made up a parliament of specialized people/ friends we all were convincing each other for an outing; while planning the outing we felt so tormented as we were not able to decide the date for it, after a lot of recurring trials we finally able to celebrate the victory on our decision making & preplanning. Henceforth, it's better to have an instant plan or to plan so precisely that does not leave a mark of disappointment, but planning or not planning is subjective and varies from person to person sometimes unplanned outings/ tours become remarkable in one's life. So Readers! We came up to the conclusion of my section of the anecdote as it's not the end of my anecdote, before signing off I would add on some of my after completing a full semester over here, like that try building a social bond more substantial than abstract even the bond is feasible or not, perhaps that small-small milestone will eventually lead to us our crew mates, henceforth never let down a newcomer on board who know the newcomer is well skilled but don't get a place to showcase his/her talent, so manage be the podium even though the lights are off the talents will be turned up lights automatically. There is often said that having a good one better than having dozens, but gaining a group of friends is like having a joint family in an early dubious place with no basic whereabouts. One small tip guys always embrace your seniors, teachers and cheer up among the friends around you & respect the elderly staff eventually you start resonating with the good vibes from them and detox your unhealthy dues within yourself last but not least always stay careful on whom to befriend and whom to not, because an abominable person is enough to contaminate one's self and similarly a great mind/ minds will always encourage one to choose the path of enlightenment. As Reader! if feel felt happy, touched, or explored emotion in your heart and brain keep track of the digest, and see you all with the carry-on of the part of my anecdote. Till then stay healthy, safe keep enjoying without guilts.

# Smile

Nabashisha Nongshli
B Sc 2nd sem


Smile is the best and the most beautiful assets that we all have. When we smile it makes our face shine, as a smiling face is a beautiful face and a smiling heart is a happy heart. Acoording to science also it say's that when we smile it lower our stress and boost our immune system. Of course in life there are times when we are unable to smile because I life we have to go through ups and downs. But we should try to smile because sometimes we don't know just by the way we smile we can make other smile. So be the reason for someone smile. Like Charlotte Bronte say's in her poem 'Life"

" Oft a little morning rain
Foretells a pleasant day.
Sometimes there are clouds of gloom,
But these are transient all;
If the shower will make the roses bloom,
O why lament its fall? "

We should always stay positive and put a smile in our face even in our most difficult time. As I grew up , I learnt one lesson in life particularly not to show our weakness to others. Since they might take advantage of it. Sometimes smile doesn't necessarily mean we are happy it exclusively means we are strong. Even thougth there are times which is so hard to smile we should embrace small things that us smile. I am a person who find happiness in every small things. I have experienced that when we smile even for a little reason , we tend to forget everything we were upset about five minutes ago. If we get a chance to smile and be happy grab it don't waste . because its so precious to get that thing. Life is like a mirror we get the best result when we smile.

Keep smiling beautiful people
Make every efforts and everything will be fine
As smile is a friend maker.


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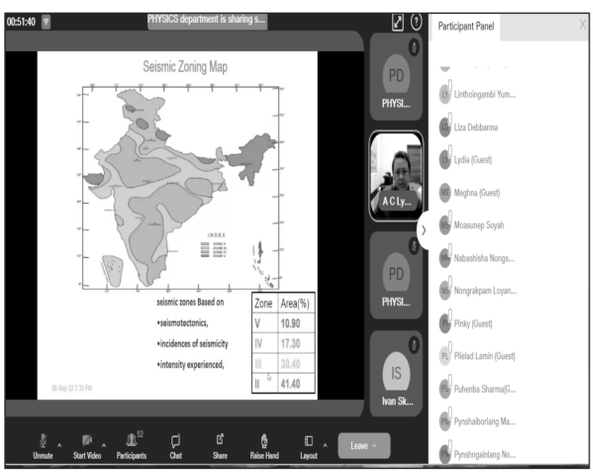
PHYSICS department is sharing s...
Seismic Zoning Map
seismic zones Based on
•seismotectonics,
•incidences of seismicity
•intensity experienced,
Zone | Area(%)
V | 10.90
IV | 17.30
III | 30.40
II | 41.40
Participant Panel
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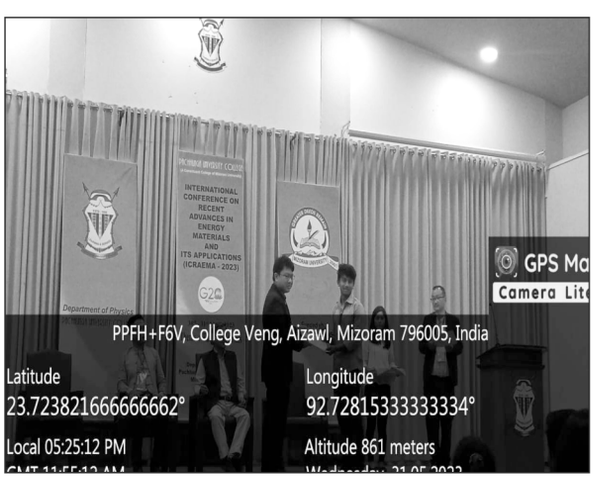
INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN ENERGY MATERIALS AND ITS APPLICATIONS (ICRAEMA - 2023)
PPFH+F6V, College Veng, Aizawl, Mizoram 796005, India
Latitude
23.723821666666662°
Longitude
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Altitude 861 meters

# Poem On Physics

Physics....What is it exactly .
Talk about matter,
Talk about space,
Talk about the universe,
And the darken ways.

To everything in the universe degree
By Physic's laws we have to abide.
Even though we are yet to explain
From the truth they cannot hide.

Physics has no bounds
And it doesn't have any range
Light comes from infinity
To sub-atomic particles –
Being infintesimally.

An object might have stress
Other times it might be strain
But just because a string has tension
Doesn't mean we should have those in our brain.

# Maims and Cries of Mother Nature

Nature is a mother and father to every human beings,
Nature is a Doctor who provides us with all kinds of Medicines,
Nature is all Beauty and gives us Happiness,
And a paradise Place for God to live among Humans.
Nature's grenery fills one with life and vigour,
Nature is a comforter and a consoler in our life anger,
Nature is our Second Mother who gave birth to us,
It is God's wonderful creation and God's given gift to all of us.
But mankind has change the nature for its satisfaction,
Damaging its valuable properties through Scientific Technologies.
Are we aware of the facts that these changes
Make our Nature to bleed in pain ?
Nor could we payheed to the cries and maims of our mother nature.
Nature from human's thirst of greed?
When Human's suffer Nature suffers too
Nature feels the same as Humans do.
But if we less care for the Nature;
Can you expect her to come to us to Nurture?
If we kill Our Mother Earth: is there anyone to feed her Chicks?
Or else will they'll be dried up in sandy desert.

Fidelia Sangma

# For Venus and her moons

Should I buy something worth forever ?
Flowers are too gentle , chocolates melt
Ice cream cones are gone by dawn.
Love is here and now but not forever .
Anything lustrous fades,
Gems and stones break,
One fine morning ,
Ford engine stops.
Body stoops lower day by day
Until welcomed by the six feet abyss.
What's forever ?
Took 9 years for a place to hang our portraits.
Lilies been gaining weight over the months.
Mr &Mrs Duck Goose swims daily in the pool we invested.
White to brown , ivys wild , pine to sequoia.
Three labradors ,four chihuahuas and five corgis
Only memories of them remains.
Movies and popcorn on a rainy day, but without company.
Autumn and pumpkins ,but infested.
Spring; flowers and butterflies , then hundreds of lepidopterist.
Winter and chimneys ,but shivering to death.
At ease on Sundays, but sunsets bring mondays.
Something worth forever ?
Everything falls apart ,
Defeat is lurking everywhere,
Failure cries for more,
Death is but a greedy tyrant.
What then am I left with ?
New frame of perspective,
Dollar filled pockets,
Cents clink away.
Empty handed,
A lesson learnt;
I bought then for you TODAY.
Moasunep Soyah

# POOR LIVES

The war ravaged country
Striving and struggling,
Lose their jobs,
Selling a wide variety,
Driving the auto,
Collecting leftover cardboards,
Gathering plastic bottles,
A robust man pleading.
A nun dress in pink,dark saffron
A boater hat with pink ribbon
Praying for the people whomever she goes to.
The mother and little daughter
Selling jasmine's garland
Left the sweet aroma
Filling up the dusty air.
Guys puffing green cigarettes
In early morning.
Then,there he sat
In the afternoon
On a wooden bench like platform
Bending, crawling hard
As if he is trying to see a pin point
Oddly enough in the public,
'He is taking drugs'
'Really?'
Now, he laid on his back on the platform
Hands spread like wings,
Flying everywhere he could
When he can,
The insulin plunger holding air.
The stray local cows

# MY BEAUTIFUL SUNSET

After a busy day, I wait to see you
Oh How beautiful you are going to be
When everyone else talks about starry nights.
I longed to see you ' my beautiful sunset'
When people dont know how to wait for others
You taught me how to wait for you.
And when everything else disappoint me
You are the only one that pleases me.
When life get harder
And cannot find peace in this world
Full of cruelty and fake people.
You've been the reason to live on.

Going to each and every door
Begging for food

I longed to see you ' my beautiful sunset'
When people dont know how to wait for others
You taught me how to wait for you.
And when everything else disappoint me
You are the only one that pleases me.
When life get harder
And cannot find peace in this world
Full of cruelty and fake people.
You've been the reason to live on.

By Linthoingambi Yumman
B.Sc 2nd sem

# EIDETIC MEMORIES

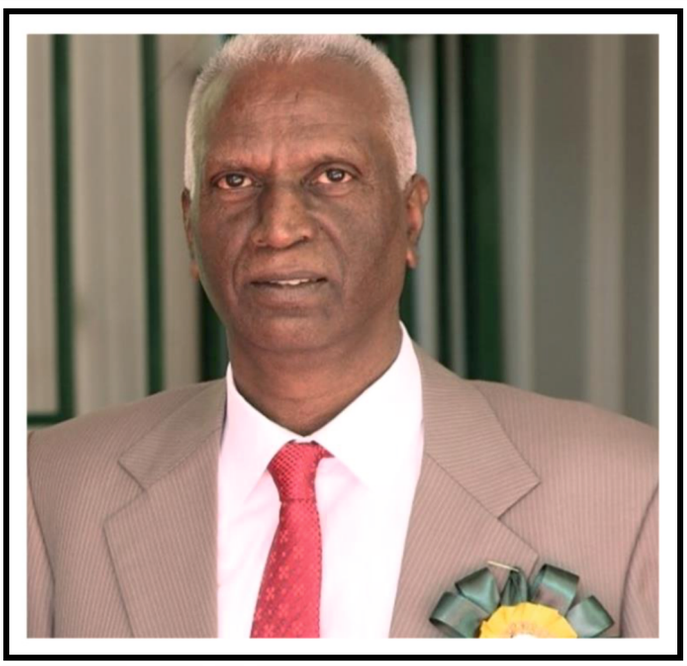
Early morning calls; as i could see from the wall
And the bed spread from my couch fall.
To come alive after a drowsy  forty-winks
Beholding hues the heaven is imparting
O listening to chirping and whistle;
Assemble my heorte on cloud nine and thrilled.
The soft transient winnowing wind that breeze
Lay down a heart felt, de-stress  instinct at ease.

The crowing of the cockerel at the crack of dawn
Reminisce me of the time that have gone;
Commemorating and cherishing with my grandpa;
The immature, greenness , callowness, infancy flow
The time, as if it seems in perpetuity
And yet death step in swiftly
And call my best away from me
But still, life sunny hours flit by rapidly

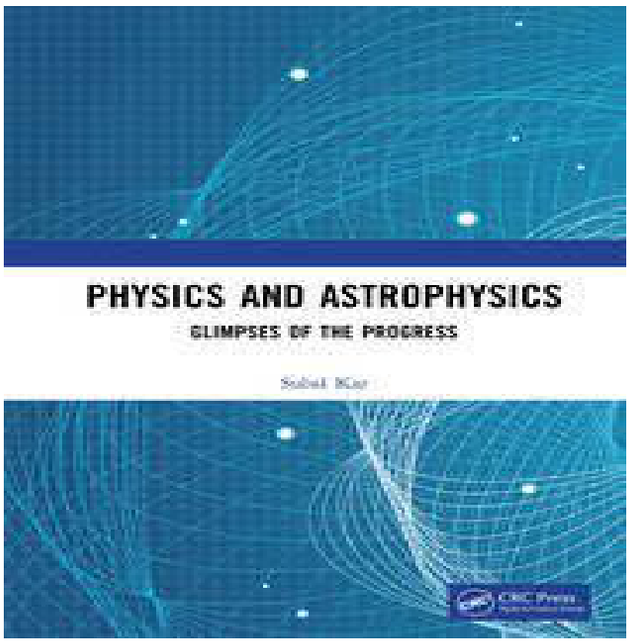
During the break of the day, in tandem with my kins;
Working in the field with the mohkhiew as we begin.
Sowing and seedling, foreseeing  to grow.
Diverse breed of harvest; collectively each one knows.
Likewise chanting and huming  humorous strain.
That one would laugh o'er it again and again.
At times listening to the melody of nature
The overflowing music engraved our care forever.

## Teachers from the Department who retired in 2022

*Dr Radhendu Das joined the Department on 1st of Oct, 1986 . He took over as Head of Department from 2004 after the retirement of Prof K.P Bhattacharjee. Sir remain the Head of Department till his retirement in 2022.*



*Dr. V. Raghunatha Rao joined the Department on 1st of June , 1991. He took over as Head of department from 2022 after the retirement of Dr Radhendu Das. Sir continue as Head of Department till his retirement.*




**Physics and Astrophysics 'Glimpes of the Progress'** was authored by renowned Professor Subal Kar and published by Taylor and Francis group , CRC press London in 2022. Professor Subal Kar was one of the illustrious alumni of the Department of Physics , St Edmund's college , Shillong. He graduated from the college in 1973 with honours in Physics.

He is a former Professor and Head of the Institute of Radio Physics and Electronics, University of Calcutta, Kolkatta, India.

On the right Professor Subal Kar presented the book to the teachers of the Department of Physics, St Edmund's college , Shillong during his visit to the institute on 16th September, 2022.

Professor Subal Kar is also working on another book " Metamaterials and Metasurfaces". The department extended our best wishes to Sir for the successful completion of the book.

**Some of the distinguished Alumni of the Department.**

1. (Late) Prof. Ramendu Bhattacharjee, former Pro V. C, of Assam University, Silchar
2. Prof Joydeep Dutta, Chairperson, Functional materials at KTH Royal institute of Technology Stockholm, Sweden
3. Prof. Subal Kar, retired HoD Institute of Radio Physics & Electronics, University of Calcutta
4. Col (retd) Proloy Sengupta, Retired Colonel, Corps of Signals
5. Dr. Nabo Kumar Chaudhury, Scientist, INMASS, DRDO, Delhi
6. Joydeep Roy Choudhury, Director Technomedia Solutions, Bangalore
7. Dr. Bruno D Cajee, Deputy Director, Directorate of Higher & Technical Education, Govt of Meghalaya, Shillong
8. Shah Zamal Ahmed, Sr. Engineer, M/S Bharat Electronics Ltd.
9. Prof. Ayon Bhattacharjee, former HoD, Physics, NIT Meghalaya.
10. Dr. Alestine Mawrie, Assistant .Professor, IIT, Indore

# Activities in the Department

Physics in particular and science in general has seen a tremendous growth in recent years. To keep the students inform of the emerging and current fields of research the department regularly organised seminars, talks, guest lectures by academicians as well as scientists from different fields. The students are encouraged to participate in other academics activities organised by different institutions and also to organise activities in the department and college as well. Some of the programs organised by the department and the activities participated/organised by the students are listed below.

**Programs organised by the Department**:

1. " Bro M.G Shannon Memorial Lecture" entitled 'by Prof R. H Duncan former Head Department of Chemistry, N.E.H.U , Shillong on the 9th of May, 2023.
2. Guest lecture cum Demonstration on "Physics of Plasma" by Dr. Rakesh Moulick, Dr. Bipuljyoti Saikia and Dr. Ngangom Aomoa from Center for Plasma Physics-Institute of Plasma Research, Sonapur on the 6th- March 2023.
3. Talk on spintronics entitled "Towards molecular spintronics" by Dr. Lalmin Kipgen a researcher from the Institut für Experimental Physik Freie Universität , Berlin on the 9th November, 2022 [Ex Student].
4. Webinar on " Understanding Earthquakes" by Dr. A. C. Lyngdoh, Scientist and Head of Central Seismological Observatory, National Centre for Seismology, Shillong on the 6th of September 2022 .
5. Webinar on "Materials for Quantum Technology" by Dr. Alestine Mawrie, Asst. Professor of Physics, IIT Indore on the 12th August, 2022. [Ex-student]

## Programs participated by students :

1. Mr Aniket Chetri from 4th sem Physics Honours and Dr Mahesh Ram participated in the " International Conference on Recent Advances in Energy Materials and its Application" (ICRAEMA-23) organised by the Department of Physics, Pachhunga University college, Mizoram . Aniket Chetri was awarded the best presenter in poster presentation.

2. Miss Supriti Khatri and Miss Dwiteimon from 6th sem Physics honours students won the 1st prize in the poster competition in the National Science Day organised by the State council of Science, Technology and Environment, Meghalaya on the 22nd and 23rd of March, 2023.

3. Miss Anisha Nongrum, Mr Amit Saharia, Mr Calwyn A Suchiang and Mr Daniel Marwein from 4th sem Physics honours students presented their science model in the National Science Day organised by the State council of Science, Technology and Environment, Meghalaya on the 22nd and 23rd of March, 2023.

4. Mr Anirban Das from the 6th sem won the 2nd prize in the poster presentation in "International Pi Day 2023" organised by the Department of Mathematics , St Edmund's college, Shillong on 14th of March, 2023.

5. Ayush Viswakarma, the 5th sem Physics Honours student has successfully completed a the program of JENESYS 2022 India from January 25th to February 1st , 2023.

6. Mr. Calwyn. A. Suchiang and Mr Amit Saharia from 4th sem Physics Honours had completed a one month long internship program at the Centre of Plasma Physics-Institute for Plasma Research(CPP-IPR), Sonapur , Assam. The duration of internship was from 1st to 31st January 2023.

7. Miss Mismita Datta , Mr Sabastian Sangar, Mr Rishav , Mr Sudarshi and Mr Ayush Viswakarma from the 5th sem participated in a one day interactive session for "Development of Scientific Research Culture" organised by the Department of Physics, National Institute of Technology, Meghalaya on 26th October, 2022.

8. Mr Anirban Das from the 5th sem won the 3rd prize in the Essay Writing Competition organised by North Eastern Electric Power Co-operation Limited, Shillong on the theme " Corruption free India for a developed Nation" on the 2nd of November, 2022.

9. Mr Anirban Das from the 5th sem won the 1st prize in the Essay Writing Competition organised by the college on the "75 Independence Day" celebration on the 15th

# Edscientia 2022

Edscientia is an annual event that provide a platform to students from different science streams to showcase their innovation/ talent in different areas like science model , poster presentation, seminars on the theme of the event. The Science mela also have events like debates, quiz, painting, sketching, photography etc. It is organised by the Science club of the college. The theme for Edscientia-2022 is "Science and Technology for the Betterment of the Society" . The students from the department enthusiastically participated in the event. The list of events participated by the students from the department are given below.

| Category | Topics | Students name | Semester | |
|---|---|---|---|---|
| Model-Innovation | LI-FI | Rishabh Tiwari | 5th sem | 1st prize |
| | | Aniket Chetri | 5th sem | |
| | | Sudarsh Dutta Choudhury | 5th sem | |
| | | Mismita Datta | 5th sem | |
| | | Poby Chhetri | 5th sem | |
| Model | Piezoelectric sensors: Concepts and applicatio | Calwyn A Suchiang | 3rd sem | Participated |
| | | Daniel Marwein | 3rd sem | |
| | | Amit Saharia | 3rd sem | |
| | | Anisha Nongrum | | |
| Poster presentatio | Steps towards Sustainability | Supriti Khatri | 5th sem | 3rd prize |
| | | Deiwitawon N Syiemlieh | 5th sem | |
| | | Chonmihor Huileng | 5th sem | |
| | | Rimiki Syiem | 5th sem | |

| | | | | |
|---|---|---|---|---|
| Poster | Artificial Intelligence: Creating the Future | Charisma | 3rd sem | Participated |
| presentation | | Thumaya | 3rd sem | |
| Quiz | Inter department | Anirban Das | 5th sem | 1st prize |
| | | Ayush Vishwakarma | 5th sem | |
| Debate | Inter department | Rishiben Walling | 5th sem | 2nd prize |
| Sketching | Inter department | Animesh Puryakastha | 3rd sem | 3rd prize |
| Photography | Inter department | Pronab Barman | 3rd sem | Participated |
| | | Mismita Datta | 5th sem | |

## Institutional Visits:

The Astronomy club of the Physics Department organised a one day visit to North Eastern Space Applications Centre [ NESAC ], Deptt of Space Govt of India, Umiam Meghalaya, on the 12th of May,2023. Calwyn A Suchiang from 4th semester was the co-ordinator. The members of the club includes students from the 6th semester and 4th semester students from Physics Department and also students from other department. The facilities visited are i) Remote Sensing (RS) , ii) Geographical Information System (GIS), iii ) Satellite communication and iv) Space & Atmospheric Science Research and v) UAV Lab.

## Department results:

This batch of students due to the pandemic had to face many challenges in all fronts. In learning especially they have to quickly adapt to the new method of teaching [online mode] which is force upon them. Yet, inspite of all these challenges the students of the department had managed to keep their focus on their study which is reflected in the results.

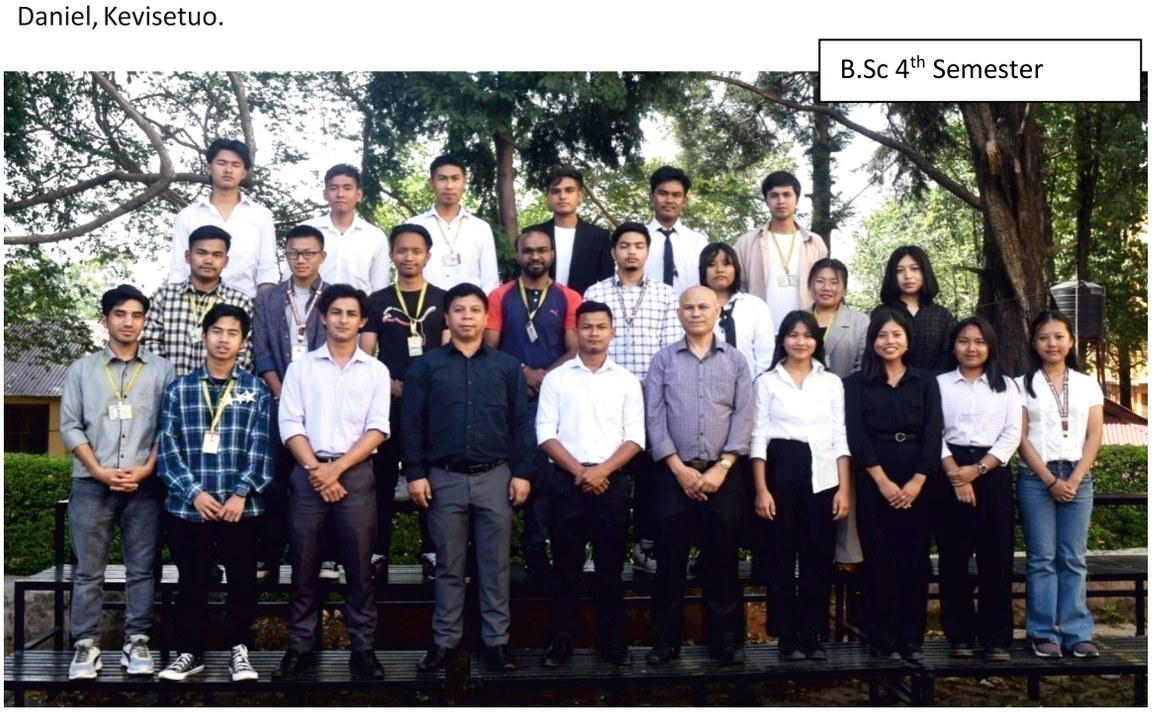
No. of Students Appeared : 34
No. of Students Passed : 33
No. of Position in the University : 08

**Position Holders**

| Position | Name of Student | Percentage |
|---|---|---|
| 1st Position | S Debala Devi | 94.75 % |
| 2nd Position | Suman Barua | 93.25 % |
| 3rd Position | Nehal Rai | 90.00 % |
| 4th Position | Senorita Benedict | 88.25 % |
| 4th Position | Shristi Chakraborty | 88.25 % |
| 7th Position | Hiinyo Antum | 86.25 % |
| 8th Position | L. Lalmuanpuia | 86.13 % |
| 9th Position | Chandana Chakraborty | 85.88 % |

No. of 1st class : 33
No. of 2nd class : Nil
No. of Simple Passed : Nil
Department Pass Percentage : 97.05%

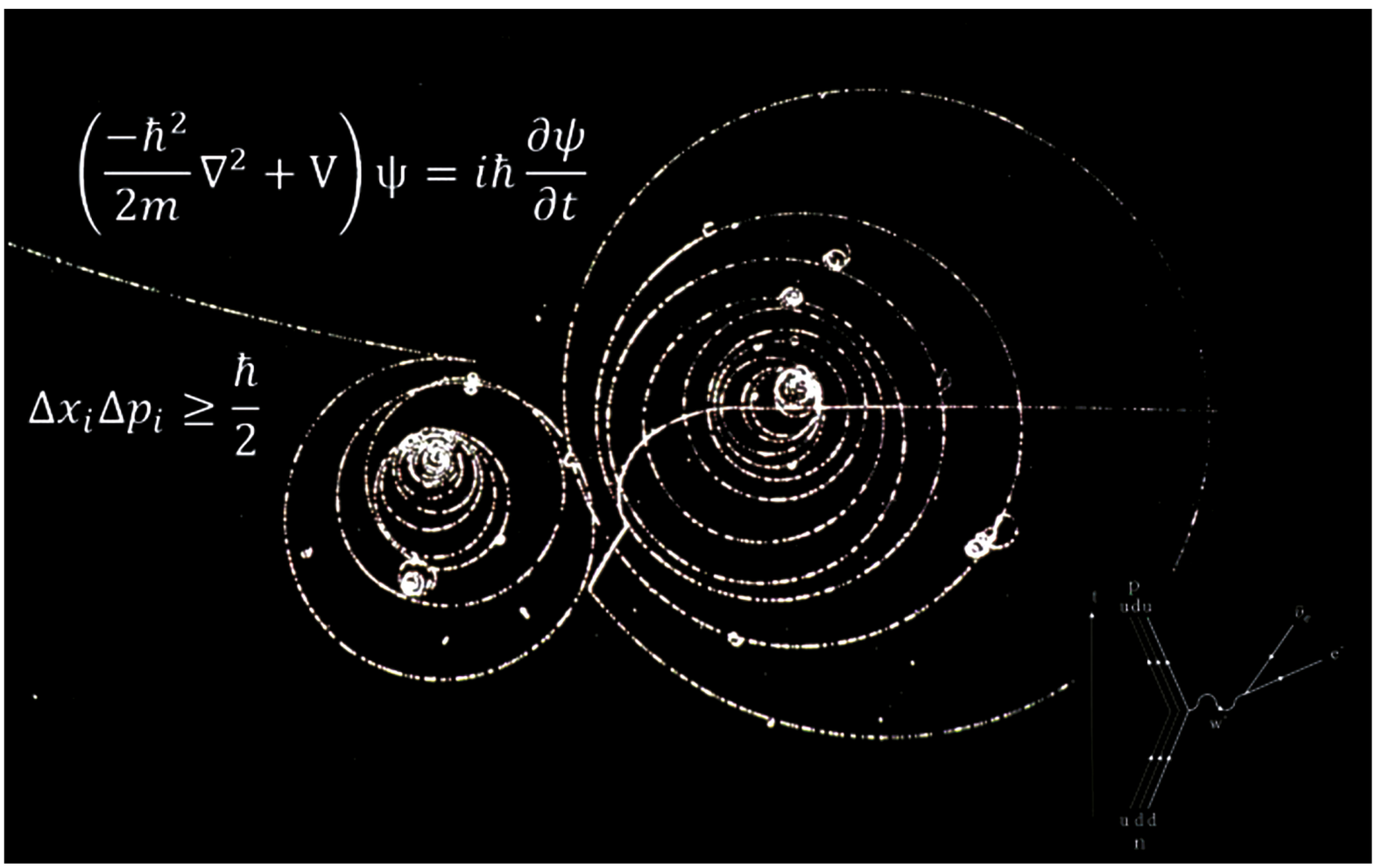

First row: Sataveek, Sir Larry, Dr L.Kurbah, Sir Dashan ,Dr M .LyndemLinthoi, Nabashisha, Phibaniada. Second row: B.Puhenba, Moasunep, Robert, Sungdiakum, Wasim, H. Lairamthanglura, Azele, Taiyam. Last row: Vanlalremsiama, R. Lalratpuia, Pranab, Himal Roka, Daniel, Kevisetuo.




First row: Thmumaya, Ashish, Sir Larry, Dr L.Kurbah, Sir Dashan ,Dr M .Lyndem, Anisha, Pinky, Liza, Tessa. Second row: Coralson, Kiudunang, Daniel,Debapriyo, Tynshain, Kasanchea, Lydia, Anjita. Third row: Durbar, Manish, Latpiuchui, Amit , Luckytush, Calwyn


First row: Rishiben, Chonmihor, Supriti, Sir Larry, Dr L.Kurbah, Sir Dashan ,Dr M .Lyndem, Poby, Deiwitamon, Pynshngain, Sudarshi. Second row: Mismita, Rishabh, Aniket, Ayush, Anirban, Kamlalchung, Sebastian, Dame La Ai, Daniel, Banlamphang.


Atul , Sir Larry Kupar Nongbet, Dr L.Kurbah, Dr . Lyndem, Dr M. Ram, Sir B. Giri, Sir D. Nongkynrih


$\left(\frac{-\hbar^2}{2m}\nabla^2 + V\right)\psi = i\hbar\frac{\partial\psi}{\partial t}$
$\Delta x_i \Delta p_i \geq \frac{\hbar}{2}$
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