

SPECTRUM

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Departmental Magazine
Department of Physics
Nabajyoti College, Kalgachia



magazine/ autumn 2023



autumn 2023

The **Spectrum** is a departmental magazine holding immense potential that covers a wide range of articles in the natural sciences, including biology, physics, chemistry, and earth sciences. It is a humble attempt on behalf of the department of Physics of Nabajyoti College, Kalgachia and will emerge as one of the leading magazines of the area





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From the Principal's Desk...

Dear Readers,

It is with great pleasure that I extend my warmest greetings to each and every one of you as we gather here to celebrate another year of academic excellence and achievement. This departmental magazine stands as a testament to the collective efforts, creativity, and passion that define our community.

Throughout the year, I have witnessed firsthand the dedication and hard work displayed by our students and faculty. Your unwavering commitment to pushing boundaries, seeking knowledge, and fostering a culture of inclusivity has not only enriched our academic environment but also created a legacy of which we can all be immensely proud.

This magazine serves as a canvas to showcase the diverse talents and accomplishments within our department. From groundbreaking research to innovative projects and artistic endeavours, every contribution reflects the depth and breadth of our community's capabilities.

Let us continue to inspire and support one another in our academic pursuits. Together, we can shape a future where our department continues to be a beacon of intellectual curiosity and a source of positive change in the world.

It is learnt that the department of Physics, Nabajyoti College is going to publish its departmental magazine 'Spectrum' in a couple of days. I feel proud of my favourite teachers and students, those who have contributed writings to the magazine that reflect their inner voice. The readers will find ample information that will pave the constructivism in terms of knowledge. I wish them all the way on their journey towards creative writing.

I extend my heartfelt gratitude to the editorial team and all those who have worked tirelessly to bring this magazine to life. Your dedication to excellence is truly commendable.

I look forward to witnessing even greater accomplishments in the years ahead. Congratulations to all contributors, and may this publication be a source of inspiration for generations to come.

Dr. Shahjahan Ali Ahmed
Principal
Nabajyoti College, Kalgachia



From the Editor's Desk...

Dear Readers,

Welcome to the latest edition of our Departmental Magazine, a testament to the boundless curiosity and relentless pursuit of knowledge that defines our academic community. Within these pages, we invite you to embark on a journey through the captivating world of physics, where imagination meets experimentation, and theory converges with reality.

This edition is a celebration of our collective achievements and a showcase of the diverse articles by our esteemed faculty and dedicated students. From quantum entanglement to celestial mechanics, our contributors push the boundaries of human understanding, unraveling the mysteries that surround us.

In a world inundated with information and innovation, it's easy to overlook the driving force behind all human achievement: curiosity. It's the spark that ignites exploration, fuels creativity, and leads to breakthroughs that shape the course of history. In this editorial, we celebrate the enduring spirit of curiosity and its pivotal role in propelling us towards a brighter future.

Curiosity is the engine of human progress. It's the insatiable desire to know, to understand, and to unravel the mysteries of the world around us. From the earliest days of humanity, our ancestors gazed at the night sky, wondered about distant lands, and sought to comprehend the forces of nature. This innate curiosity propelled us forward, driving us to explore, innovate, and create.

As we peruse these pages, let us not forget the collaborative spirit that thrives within our department. The exchange of ideas, the spirited debates, and the shared moments of insight are what truly define us as a community. It is in these interactions that innovation flourishes and breakthroughs take shape.

We extend our heartfelt gratitude to all the contributors, whose passion and dedication have breathed life into this magazine. Your work inspires us all, reminding us of the profound impact that curiosity-driven research can have on our world.

As we turn the pages, may we be reminded that our pursuit of knowledge is not just an academic endeavour, but a profound human endeavour. It is a journey that transcends disciplines and spans generations, leaving an indelible mark on the tapestry of human achievement.

With warm regards,



Kumaruzzaman

Editor-in-Chief

Departmental Magazine

HoD & Assoc. Prof., Dept. of Physics

Nabajyoti College, Kalgachia



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Preface

In the boundless realm of scientific inquiry, the Physics Department at Nabajyoti College, Kalgachia stands as a beacon of curiosity, exploration, and discovery. This departmental magazine, a testament to our collective pursuit of knowledge, unveils the remarkable articles collection of our esteemed faculty and students.

Within these pages, you will embark on a journey through the captivating world of physics, where theoretical concepts intertwine with practical applications, and the mysteries of the universe yield to human ingenuity. From the intricacies of quantum mechanics to the grandeur of astrophysics, our contributors delve into a diverse array of topics, illuminating the frontiers of human understanding.

The collaborative spirit that permeates our department is palpable in the pages ahead. Through cutting-edge research, innovative experiments, and thought-provoking insights, our community of scholars contributes to the academic discourse and the broader scientific community.

Moreover, this magazine serves as a testament to the multifaceted nature of our department. Beyond laboratories and lecture halls, we witness the vibrant life of our community that fosters intellectual exchange and growth.

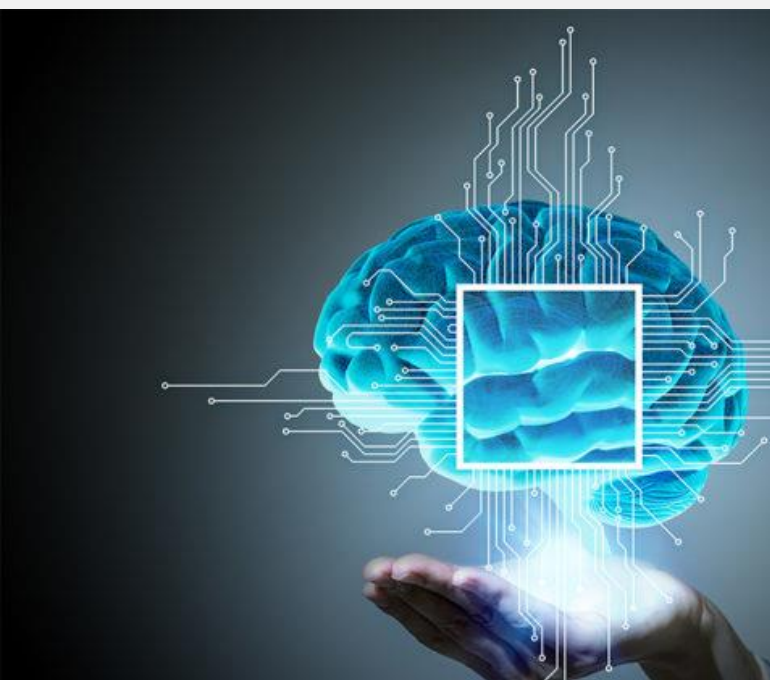
We extend our deepest gratitude to the contributors, whose dedication and passion infuse these pages with vitality. Their work exemplifies the tireless pursuit of knowledge that defines our department.

As you embark on this literary odyssey, we invite you to share in our excitement, curiosity, and unyielding commitment to unravelling the mysteries of the universe.

Dr. Pradhyut Rajkumar
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Artificial Intelligence: Shaping Our Lifestyle

In recent years, artificial intelligence (AI) has become an integral part of our daily lives, profoundly impacting the way we work, communicate, and interact with technology. AI has seamlessly integrated into our lifestyle, offering convenience, personalization, and efficiency across various domains. One of the most noticeable AI-driven advancements is the proliferation of virtual assistants like Siri, Alexa, and Google Assistant. These AI-powered companions have become fixtures in our homes, helping with tasks such as setting reminders, answering questions, and controlling smart

devices. They simplify our lives, transforming the way we interact with technology.

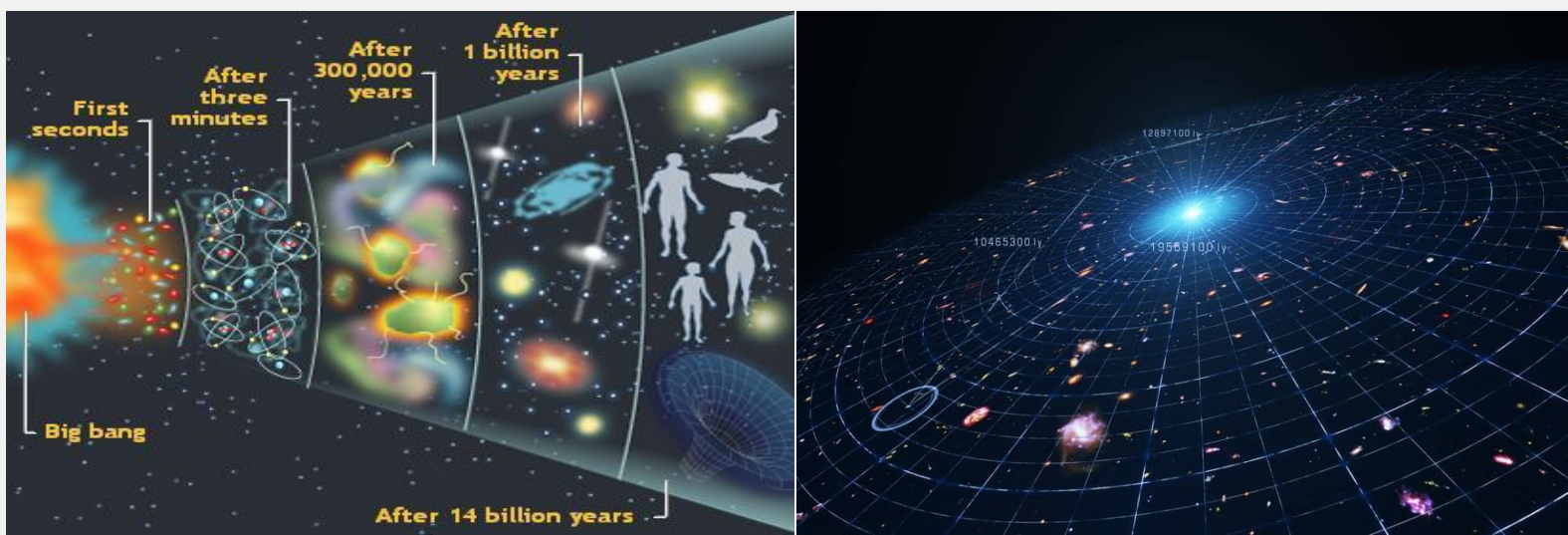
AI's influence extends to the entertainment industry as well. Streaming platforms like Netflix and Spotify use AI algorithms to recommend content tailored to our preferences. These algorithms analyze our viewing and listening habits, making our entertainment choices more personalized and enjoyable.

In healthcare, AI is playing a significant role in disease diagnosis and treatment planning. Machine learning models can analyze medical data, detect anomalies, and even predict patient outcomes. This technology is enhancing the accuracy and speed of medical diagnoses, ultimately saving lives. The impact of AI on transportation is impossible to ignore. Autonomous vehicles, guided by AI systems, are on the horizon, promising safer and more efficient roadways. AI-powered navigation apps optimize our routes, saving time and reducing traffic congestion. AI-driven chatbots are revolutionizing customer service, providing instant assistance and resolving issues round the clock. These virtual agents are employed by various businesses to improve user experiences and streamline support services. In education, AI-driven platforms offer personalized learning experiences, adapting coursework to individual needs and abilities. This technology has the potential to revolutionize how students acquire knowledge, making education more accessible and effective. AI is also helping in the fight against climate change by optimizing energy usage, monitoring pollution levels, and facilitating the development of sustainable technologies.

As AI continues to evolve and integrate further into our lives, it is essential to address ethical considerations, such as data privacy and algorithmic biases. Nonetheless, the transformative impact of AI on our lifestyle is undeniable. From simplifying our daily tasks to enhancing our entertainment and healthcare experiences, artificial intelligence is here to stay, shaping a more connected and efficient future for us all.

Mandal Aasiya
4th Semester
Department of Physics

Big Bang: The Origin of the Universe



The Big Bang theory stands as the most widely accepted and compelling explanation for the origin of our universe. It presents a grand narrative of cosmic birth, expansion, and evolution that has reshaped our understanding of the cosmos. In this article, we delve into the essence of the Big Bang theory and its profound implications for our comprehension of the universe's birth. The Big Bang theory posits that the universe began as an incredibly hot, dense, and infinitely small point, often referred to as a singularity. Approximately 13.8 billion years ago, this singularity underwent a rapid and explosive expansion, initiating the universe as we know it. This momentous event marked the birth of time, space, and all matter and energy in existence.

The evidence supporting the Big Bang theory is vast and compelling. One of the key pieces of evidence is the cosmic microwave background radiation, a faint glow of microwave radiation that permeates the universe. This radiation, discovered in 1965, is considered the afterglow of the early universe when it was hot and dense. It aligns perfectly with the predictions of the Big Bang theory. Another critical piece of evidence is the observed redshift of galaxies. Astronomers have observed that galaxies are moving away from us, and the farther away a galaxy is, the faster it is receding. This observation is consistent with the idea that the universe is expanding from a central point, as predicted by the Big Bang theory.

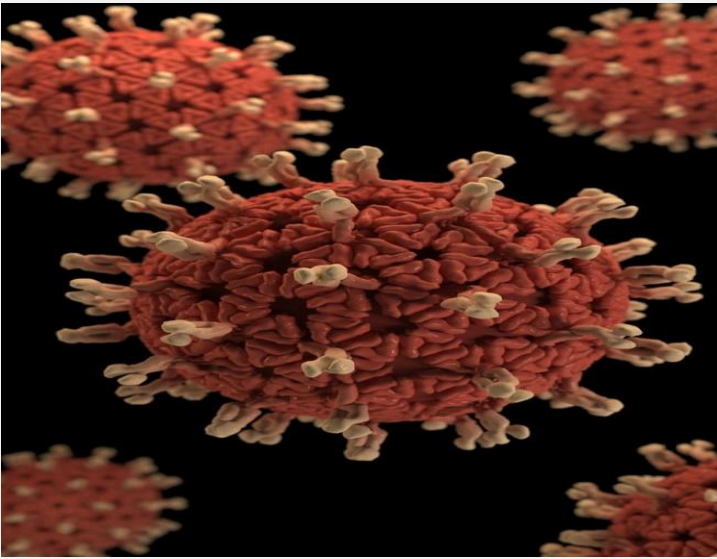
The implications of the Big Bang theory are profound. It explains the formation of galaxies, stars, and planets, as well as the evolution of the cosmos over billions of years. It also offers insights into the abundance of elements in the universe, which can be traced back to the primordial nucleosynthesis that occurred shortly after the Big Bang. Furthermore, the Big Bang theory challenges our

understanding of time and the nature of the universe before its birth. It raises questions about the ultimate fate of the universe, whether it will continue to expand indefinitely or eventually contract in a "Big Crunch."

In conclusion, the Big Bang theory is a cornerstone of modern cosmology, providing a compelling explanation for the origin and evolution of the universe. Supported by a wealth of observational evidence, it has reshaped our understanding of the cosmos and continues to inspire scientists and astronomers to explore the mysteries of the universe's distant past and its uncertain future. The Big Bang theory remains a testament to humanity's unceasing curiosity about the origins of our existence and the grand story of the cosmos.

Kumaruzzaman
HoD & Assoc. Prof.
Department of Physics

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COVID-19: The Role of Science for Mitigation

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has had a profound impact on the world, affecting nearly every aspect of our lives. In this time of uncertainty, science has played a crucial role in understanding the virus, developing vaccines, and guiding mitigation strategies. This article explores how science has been at the forefront of our fight against COVID-19 and why its role remains vital for effective mitigation.

At the outset of the pandemic, scientists worldwide quickly began studying the novel coronavirus to understand its biology, transmission, and impact on human health. This collaborative effort led to the rapid identification of the virus's genetic sequence, which laid the foundation for diagnostic tests and vaccine development. Scientists have since delved deep into the virus's molecular structure, transmission dynamics,

and the way it interacts with the human immune system. This knowledge has been instrumental in shaping public health guidelines and strategies to mitigate the spread of COVID-19.

The rapid development of COVID-19 vaccines is a testament to the power of scientific innovation. Researchers used cutting-edge techniques, including messenger RNA (mRNA) technology, to create vaccines with unprecedented speed and efficacy. Multiple vaccines were developed and rigorously tested in clinical trials, with their safety and effectiveness thoroughly evaluated. Scientific scrutiny and collaboration allowed regulatory agencies to grant emergency use authorizations for these vaccines, providing a ray of hope in the fight against the pandemic. Vaccination campaigns worldwide have demonstrated the pivotal role of science in mitigating the impact of COVID-19, reducing hospitalizations, and saving lives.

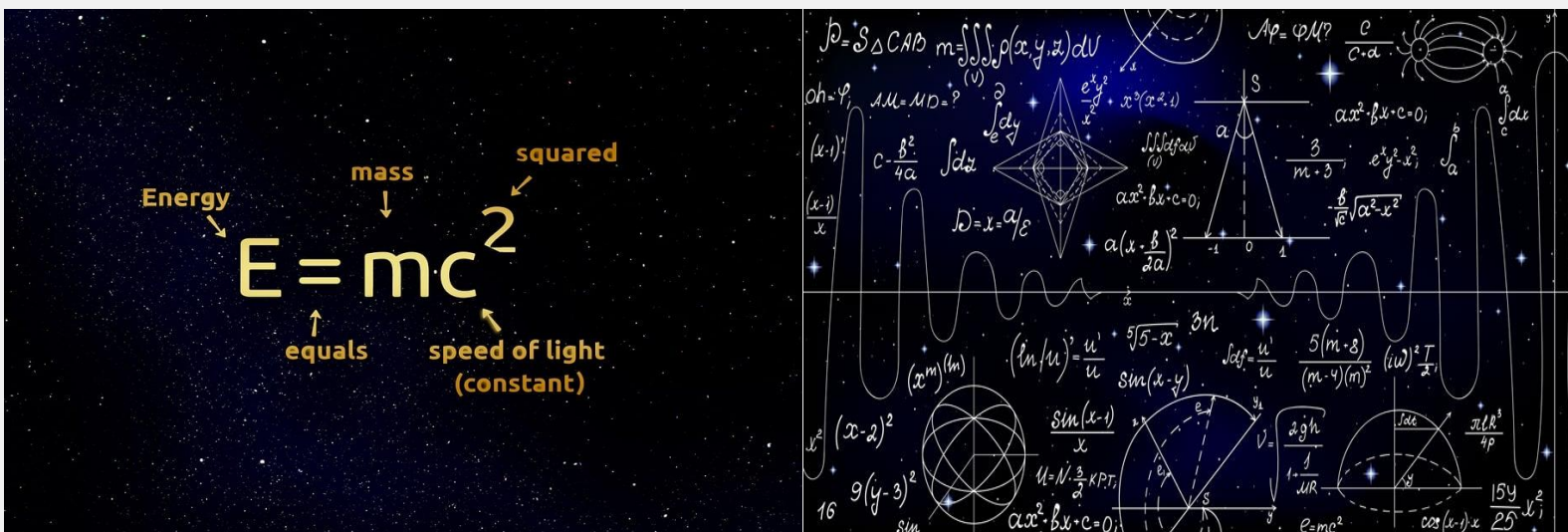
Science has also guided the implementation of various public health measures to slow the spread of the virus. Social distancing, mask-wearing, and hand hygiene recommendations have been based on scientific evidence regarding how the virus is transmitted. Modeling studies, informed by data and scientific expertise, have helped predict the course of the pandemic and inform policy decisions. Furthermore, contact tracing and testing strategies have been essential for identifying and isolating cases, preventing further transmission. Science-driven policies have been instrumental in reducing the spread of the virus and preventing healthcare systems from becoming overwhelmed.

As the virus continues to evolve, scientific monitoring of new variants is crucial. Researchers around the world are closely studying these variants to assess their impact on transmission, severity of illness, and vaccine efficacy. This ongoing research allows for timely adjustments in vaccination strategies and the development of booster shots to address emerging threats. The scientific community has also been actively involved in the search for effective treatments for COVID-19. Clinical trials have investigated various drugs and therapies, and while progress has been made, the quest for more effective treatments continues. Science remains central in identifying and developing therapies to reduce the severity of illness and save lives.

The COVID-19 pandemic has highlighted the indispensable role of science in mitigating the impact of global health crises. From understanding the virus's biology to developing vaccines and guiding public health measures, science has been our beacon of hope in these challenging times. As the pandemic continues to evolve, ongoing scientific research and collaboration will remain crucial. This includes monitoring new variants, improving treatment options, and expanding vaccination efforts globally. The lessons learned from the COVID-19 pandemic reinforce the importance of investing in scientific research, preparedness, and a global response to future health threats. In a world facing unprecedented challenges, science remains our most potent tool for mitigation, offering not only solutions but also hope for a brighter and healthier future. It is a reminder that, together with unwavering commitment to scientific principles, we can overcome even the most formidable of challenges.

Dr. Debashis Saikia
Asst. Prof.
Department of Physics

How Physicists Rely on Mathematics



Physics and mathematics are intricately intertwined, forming the foundation of our understanding of the natural world. From classical mechanics to quantum physics, mathematics is the language that physicists use to describe and predict the behaviour of the universe. In this article, we explore the profound reliance of physicists on mathematics in their quest to unravel the mysteries of the cosmos.

Mathematics as a Universal Language:

Mathematics is often described as the universal language of science, and for a good reason. It provides a precise and unambiguous means of expressing physical laws, relationships, and patterns. Whether studying the motion of celestial bodies, the behaviour of subatomic particles, or the flow of fluids, physicists turn to mathematical equations to describe these phenomena.

Predicting and Testing Hypotheses:

Mathematics plays a pivotal role in predicting the outcomes of experiments and tests of physical theories. Physicists use mathematical models to make predictions about the behaviour of systems under various conditions. These predictions are then compared to experimental results, allowing scientists to validate or refine their theories.

Uncovering Hidden Patterns:

Mathematics also enables physicists to uncover hidden patterns and relationships in nature. For example, the mathematical elegance of Einstein's theory of relativity revealed the interconnectedness of space and time, leading to ground-breaking insights into gravity's nature. Quantum mechanics, with its complex mathematical formalism, unveiled the probabilistic behaviour of particles at the quantum level.

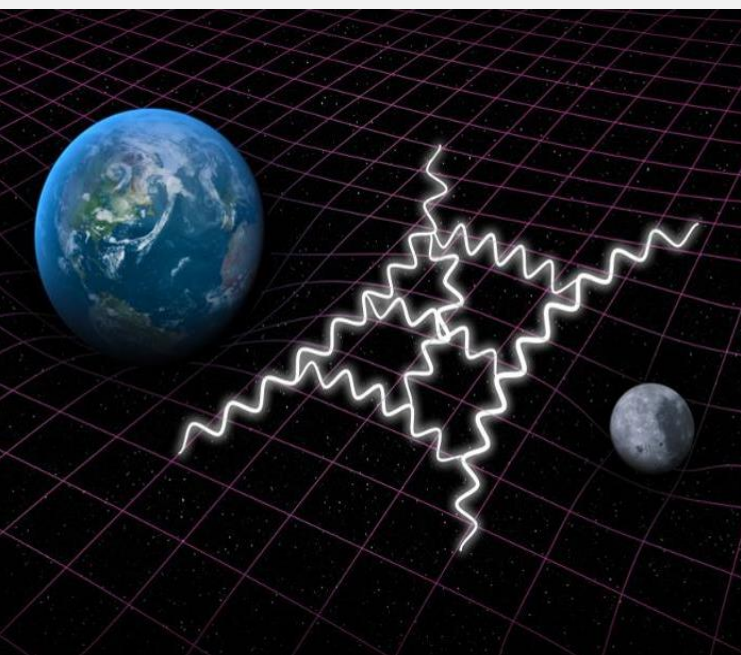
The Quest for Fundamental Laws:

One of the ultimate goals of physics is to discover the fundamental laws that govern the universe. These laws are

often expressed in the language of mathematics, leading to the development of unified theories like the Standard Model in particle physics. These theories bring together diverse phenomena under a single mathematical framework.

In conclusion, mathematics is the indispensable tool that physicists rely on to understand, describe, and predict the behaviour of the physical world. It not only provides a language for expressing physical laws but also enables the exploration of new frontiers in our understanding of the universe. The deep and enduring connection between physics and mathematics continues to drive scientific progress, opening doors to new discoveries and pushing the boundaries of human knowledge.

Soleman Ali
2nd Semester
Department of Physics



Quantum Field Theory: A New Era of Science

Quantum Field Theory (QFT) has ushered in a new era of scientific understanding, fundamentally reshaping our comprehension of the physical world. It stands as one of the most profound and successful theories in the history of physics, offering a framework that unifies quantum mechanics and special relativity. In this article, we explore the significance of Quantum Field Theory and its transformative impact on modern science.

At its core, QFT extends the principles of quantum mechanics to fields, rather than particles. Instead of envisioning particles as isolated entities, QFT treats them as localized excitations within underlying fields. This elegant shift in perspective provides a deeper and more comprehensive understanding of how particles and forces

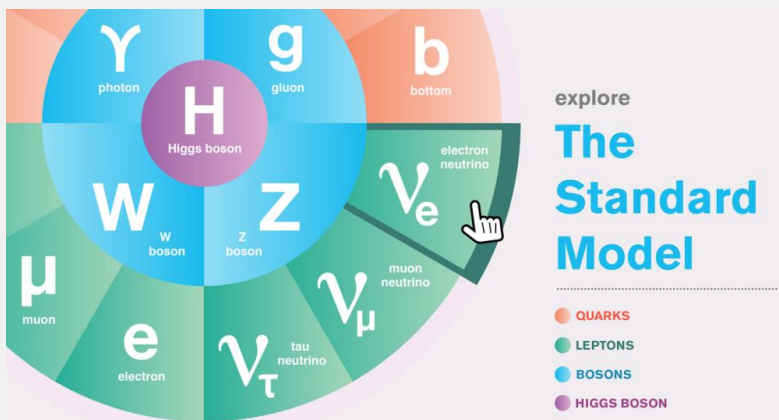
interact. One of the most iconic achievements of QFT is the Standard Model of particle physics. This model successfully describes the behaviour of elementary particles and their interactions through a web of quantum fields, including the electromagnetic, weak, and strong nuclear forces. It unifies seemingly disparate phenomena under a single theoretical framework, making it one of the most successful theories in the history of science.

Moreover, QFT plays a pivotal role in understanding the universe's fundamental building blocks. It has allowed physicists to predict the existence of particles such as the Higgs boson, whose experimental discovery at the Large Hadron Collider (LHC) in 2012 confirmed the accuracy of QFT's predictions. This achievement was a monumental step in our quest to understand the origins of mass and the fundamental forces that govern the cosmos. Furthermore, QFT's influence extends beyond particle physics. It has applications in condensed matter physics, quantum electrodynamics, and quantum chromodynamics, among others. These applications have led to ground-breaking discoveries in various scientific disciplines, impacting technology and industry.

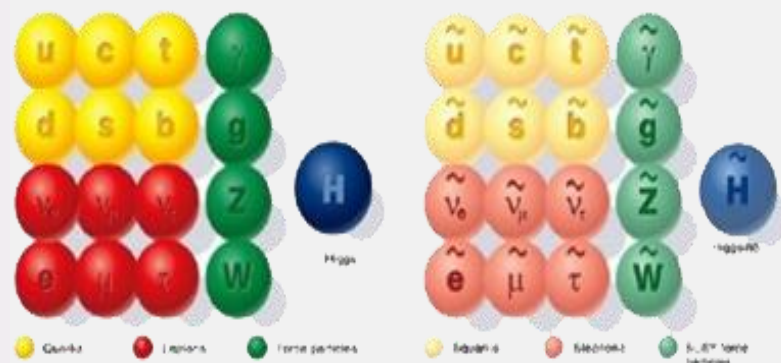
As we delve deeper into the subatomic realm and explore the nature of the universe at its smallest scales, Quantum Field Theory stands as an indispensable tool for physicists. It enables us to probe the mysteries of quantum entanglement, black holes, and the very fabric of spacetime itself. In conclusion, Quantum Field Theory represents a monumental leap in our understanding of the physical world. It unifies quantum mechanics and special relativity, providing a comprehensive framework for describing the fundamental forces and particles that make up the universe. Its influence extends far beyond particle physics, shaping the frontiers of scientific exploration. Quantum Field Theory has propelled us into a new era of science, where the mysteries of the universe are closer than ever to being unveiled.

Dr. Pradhyut Rajkumar
Asst. Prof.
Department of Physics

Supersymmetry: Extending the Standard Model



SUPERSYMMETRY



Standard particles

SUSY particles

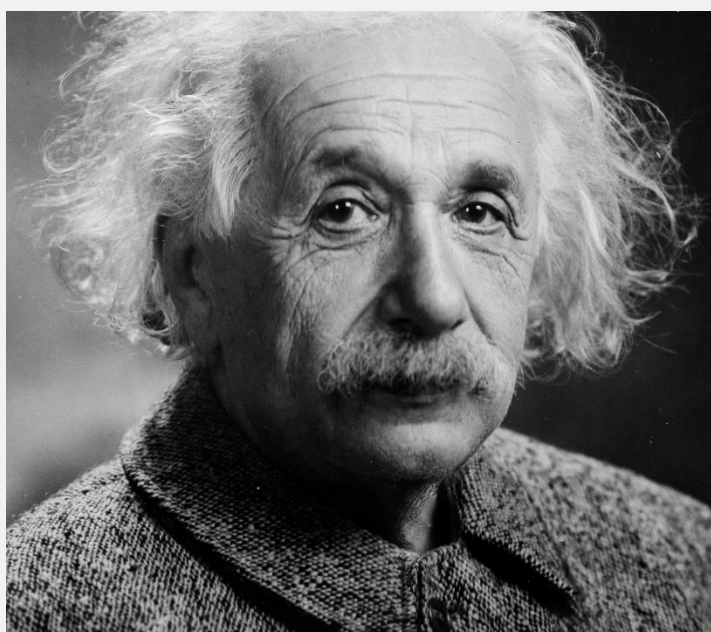
The Standard Model of particle physics has been an astonishing success, providing a comprehensive framework for understanding the fundamental particles and forces that make up the universe. However, it has its limitations and leaves some key questions unanswered. Enter supersymmetry, a theoretical extension of the Standard Model that holds great promise in addressing these gaps in our understanding. At its core, supersymmetry proposes a profound symmetry between particles. For every known particle in the Standard Model, it posits the existence of a corresponding supersymmetric partner with similar properties but differing in mass. This symmetry could have profound implications for our understanding of the universe.

One of the most significant motivations for supersymmetry is its potential to resolve the dark matter enigma. The Standard Model's particles cannot account for the mysterious dark matter that makes up a significant portion of the cosmos. Supersymmetry introduces a candidate for dark matter in the form of the lightest supersymmetric particle (LSP), which interacts weakly with other particles and is stable over cosmic timescales. Moreover, supersymmetry offers an elegant solution to the hierarchy problem, which concerns the vast difference in scales at which the fundamental forces operate. By introducing new particles that stabilize these scales, supersymmetry can provide a more natural explanation for the hierarchy observed in the universe.

Despite its theoretical elegance and promise, experimental evidence for supersymmetry has remained elusive. Physicists have conducted extensive searches for supersymmetric particles at high-energy particle colliders like the Large Hadron Collider (LHC), but direct confirmation has yet to be achieved. Nonetheless, the absence of experimental evidence does not necessarily discredit supersymmetry. It's possible that the supersymmetric particles are more massive than initially thought, making them difficult to produce with current technology. Ongoing experiments and future advancements in collider capabilities may eventually uncover the elusive supersymmetric particles.

In conclusion, supersymmetry stands as an alluring extension of the Standard Model, offering solutions to critical questions in particle physics, including dark matter and the hierarchy problem. While it has not yet been experimentally confirmed, its theoretical elegance and potential impact continue to inspire physicists worldwide. Whether supersymmetry ultimately becomes an integral part of our understanding of the universe or leads to further refinements, its exploration remains a vital pursuit in the quest to unravel the fundamental laws of nature.

Anupam Deka
Asst. Prof.
Department of Physics



Ten Famous Quotes on Physics

1. *"The important achievement of Apollo was demonstrating that humanity is not forever chained to this planet and our visions go rather further than that and our opportunities are unlimited."*

- Neil Armstrong

Explanation: Neil Armstrong, the first person to walk on the Moon, emphasizes the transformative power of space exploration, highlighting that our capabilities extend beyond Earth.

2. *"Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution."*

- Albert Einstein

Explanation: Einstein emphasizes the creative aspect of scientific discovery, asserting that imagination drives progress in ways that sheer knowledge alone cannot.

3. *"What we observe is not nature itself, but nature exposed to our method of questioning."*

- Werner Heisenberg

Explanation: Heisenberg, a pioneer of quantum mechanics, reminds us that our observations are filtered through the tools and methods we use, influencing what we perceive about the natural world.

4. *"The most incomprehensible thing about the universe is that it is comprehensible."*

- Albert Einstein

Explanation: Einstein marvels at the fact that the human intellect can grasp and understand the laws governing the vast complexity of the universe.

5. *"The universe is under no obligation to make sense to you."*

- Neil deGrasse Tyson

Explanation: Tyson's quote serves as a reminder that the universe operates by its own rules, which might not always align with our intuitive understanding.

6. *"Science is not only a disciple of reason but, also, one of romance and passion."*

- Stephen Hawking

Explanation: Hawking suggests that the pursuit of scientific knowledge is not purely logical, but also driven by an emotional connection and fascination with the mysteries of the universe.

7. *"All science is either physics or stamp collecting."*

- Ernest Rutherford

Explanation: Rutherford, a Nobel laureate in physics, humorously contrasts the fundamental nature of physics with other scientific disciplines, implying that physics delves into the fundamental principles that underlie all of nature.

8. *"In physics, you don't have to go around making trouble for yourself - nature does it for you."*

- Frank Wilczek

Explanation: Wilczek humorously notes that the complexities and paradoxes in physics emerge from the fundamental behaviour of the natural world.

9. *"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."*

- Albert Einstein

Explanation: Einstein emphasizes the profound impact that curiosity and the quest for understanding the unknown have on both artistic and scientific endeavours.

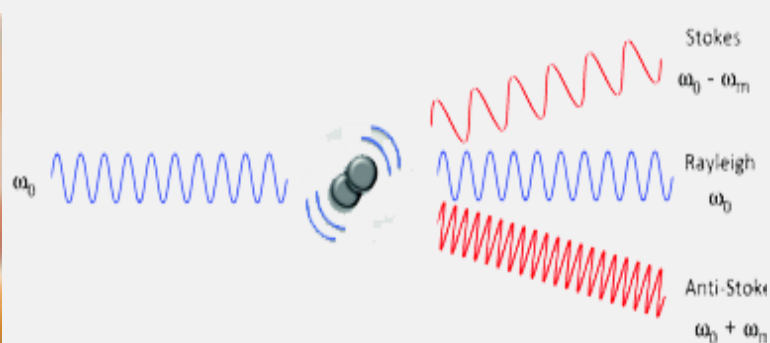
10. *"The good thing about science is that it's true whether or not you believe in it."*

- Neil deGrasse Tyson

Explanation: Tyson highlights the objective nature of scientific truths, which exist independently of personal beliefs or opinions.

In conclusion, these quotes reflect the profound insights and perspectives of some of the most influential figures in the field of physics. They illuminate the beauty, complexity, and wonder of the natural world, as well as the intellectual and emotional journeys that scientists undertake in their quest to unravel the mysteries of the universe.

The Raman Effect: Unveiling Molecular Mysteries



The Raman Effect, a cornerstone of modern physics and chemistry, was unveiled by the Indian physicist Sir C.V. Raman in 1928. This groundbreaking phenomenon revolutionized the study of molecular structures, offering a profound insight into the behaviour of light when it interacts with matter.

The Phenomenon

At its core, the Raman Effect occurs when photons collide with molecules, leading to a scattering of light. Some of these scattered photons undergo a change in energy, resulting in a spectral shift. This shift provides crucial information about the vibrational and rotational modes within the molecule. Essentially, it unveils a unique "fingerprint" of the molecular structure.

Applications

The Raman Effect has found extensive applications across various scientific disciplines. In chemistry, it aids in the identification of compounds, offering a powerful tool for qualitative and quantitative analysis. In biology and medicine, Raman spectroscopy allows for non-invasive examination of tissues and cells, promising advances in diagnostics and drug development. Furthermore, it plays a vital role in materials science, helping researchers understand and engineer a wide range of materials, from polymers to nanomaterials.

Innovation and Future Prospects

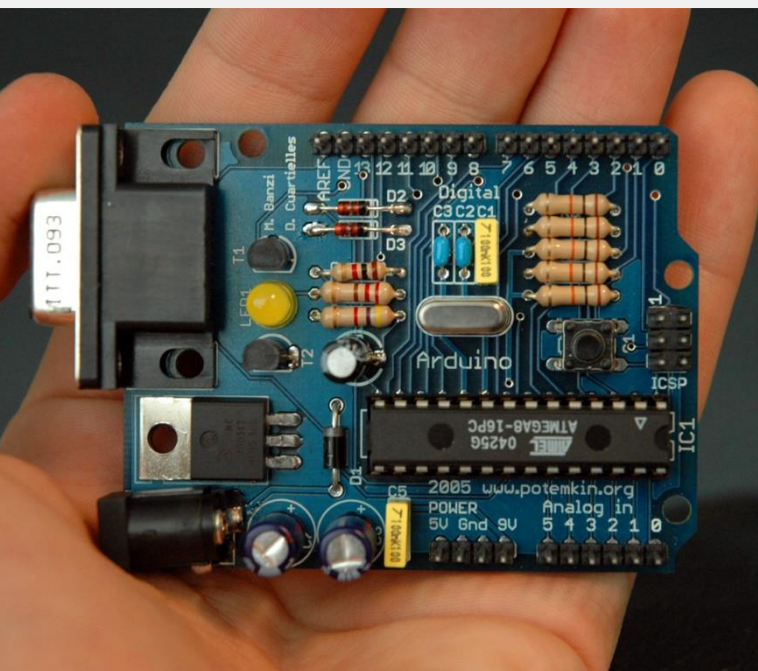
The legacy of the Raman Effect endures, with

ongoing research pushing the boundaries of its applications. Advanced techniques and instrumentation continue to refine the precision and sensitivity of Raman spectroscopy, opening new frontiers in fields as diverse as environmental science, geology, and art conservation.

Conclusion

The Raman Effect stands as a testament to the power of scientific curiosity and the profound impact of a single discovery. Sir C.V. Raman's pioneering work not only enriched our understanding of molecular behaviour but also sparked a revolution in scientific inquiry that continues to illuminate the path of progress in numerous disciplines.

Rahima Begum
2nd Semester
Department of Physics



Arduino: Empowering Innovation on Electronics CS

Arduino, born in the early 2000s, has evolved into a cornerstone of the DIY electronics revolution. It is an open-source platform designed to demystify complex electronic concepts, making them accessible to enthusiasts, students, and professionals alike. This versatile microcontroller-based system has catalyzed a wave of innovation, enabling individuals to bring their ideas to life.

Components and Functionality

At its core, Arduino comprises a microcontroller unit, input and output pins, and power sources. The

microcontroller acts as the brain, executing tasks based on the instructions it receives. Input and output pins facilitate interactions with external components, from sensors to motors, enabling a wide range of applications.

User-Friendly Programming

One of Arduino's strengths lies in its intuitive programming environment. The Arduino IDE (Integrated Development Environment) simplifies coding, employing a variant of C/C++ that is accessible to beginners yet robust for advanced users. This democratizes programming and empowers creators to focus on their ideas rather than struggling with syntax.

Applications Across Disciplines

Arduino's versatility is reflected in its broad array of applications. From robotics to home automation, IoT projects to wearable technology, it serves as a canvas for innovation. Robotics enthusiasts leverage Arduino's compatibility with various sensors and motor controllers, while IoT projects benefit from its ability to connect to the internet.

Community and Collaboration

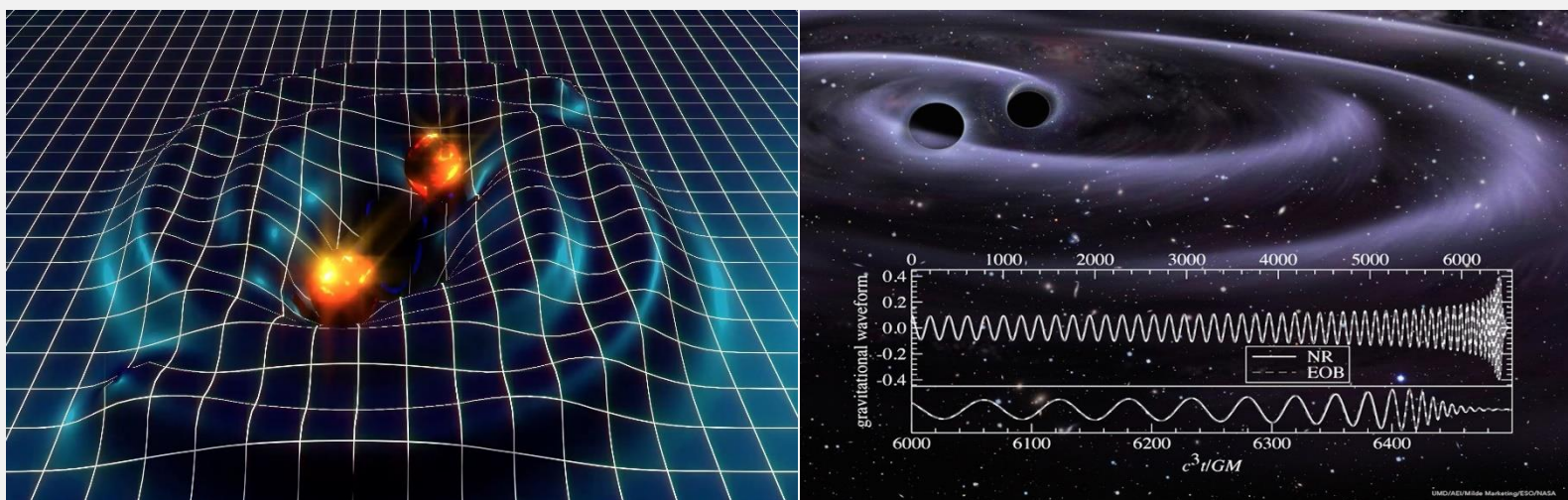
Central to Arduino's success is its vibrant global community. Online forums, tutorials, and open-source libraries foster knowledge sharing, providing a wealth of resources for both novices and experienced users. This collaborative spirit has propelled Arduino to new heights, spurring a continuous cycle of creativity and ingenuity.

Conclusion

Arduino's impact on the world of electronics is undeniable. Its accessibility, versatility, and supportive community have democratized innovation in the field. Whether igniting the passion of beginners or providing a robust platform for seasoned engineers, Arduino continues to be a driving force in the ever-evolving landscape of DIY electronics. It exemplifies the notion that with the right tools and a dash of creativity, anyone can be an inventor.

Omor Faruque
2nd Semester
Department of Physics

Gravitational Waves: Ripples in the Fabric of Spacetime



Gravitational waves, first theorized by Albert Einstein in 1915 as a consequence of his theory of general relativity, are one of the most intriguing phenomena in modern physics. They are ripples in the fabric of spacetime itself, propagating outward from massive cosmic events at the speed of light.

Origins and Detection

Gravitational waves are produced by cataclysmic events, such as the collision of black holes or neutron stars, or the explosive birth of a supernova. These events cause disturbances in the curvature of spacetime, radiating energy in the form of gravitational waves.

In 2015, a milestone was achieved with the first direct detection of gravitational waves by the LIGO (Laser Interferometer Gravitational-Wave Observatory) collaboration. LIGO consists of ultra-sensitive detectors that measure minuscule oscillations in laser beams caused by passing gravitational waves.

Implications for Astrophysics

The detection of gravitational waves has opened a new era in astrophysics. It provides a means to observe the universe in a completely different way, allowing us to explore regions of space that were previously inaccessible through electromagnetic radiation alone. Gravitational waves have offered unprecedented insights into the behaviour of black holes, the dynamics of neutron star mergers, and the nature of the early universe.

Future Prospects

Ongoing and future experiments, such as LISA (Laser Interferometer Space Antenna), will extend our ability to detect gravitational waves across a broader spectrum. This promises to unlock even more secrets of the cosmos, from the mysterious dark energy to the remnants of the Big Bang itself.

Conclusion

Gravitational waves represent a triumph of scientific ingenuity, providing a new lens through which we can observe the universe. Their discovery not only confirms Einstein's theories but also opens a new chapter in our exploration of the cosmos, offering tantalizing glimpses into the most energetic events in the universe.

Shakil Ahmed
4th Sem
Department of Physics



Celebrating Excellence: The Bhatnagar Award

The Shanti Swarup Bhatnagar Prize for Science and Technology, commonly referred to as the Bhatnagar Award, is one of India's most prestigious honours in the field of science and technology. Instituted in 1958 by the Council of Scientific and Industrial Research (CSIR), this award is named after the eminent Indian scientist Dr. Shanti Swarup Bhatnagar, who played a pivotal role in the development of scientific research in India. The Bhatnagar Award is bestowed annually to Indian scientists below the age of 45, recognizing their outstanding contributions to various branches of science, including physics, chemistry, biology, mathematics, engineering, and environmental science. The award serves as a testament to the remarkable talent and dedication of these individuals, as well

as an encouragement for their future endeavours.

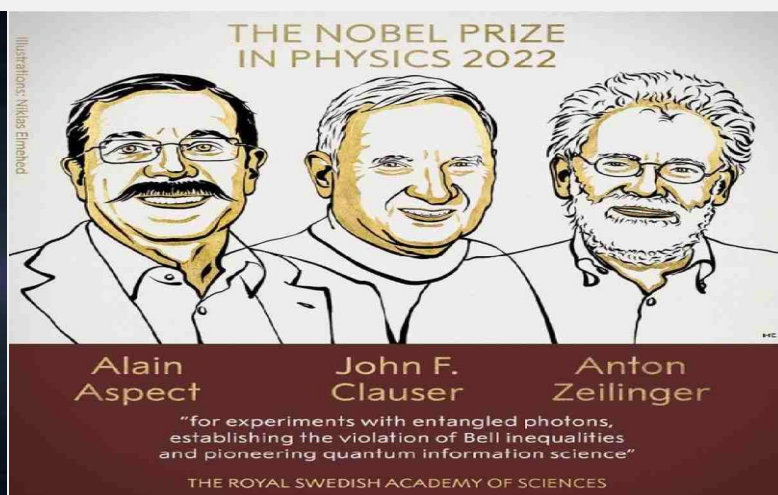
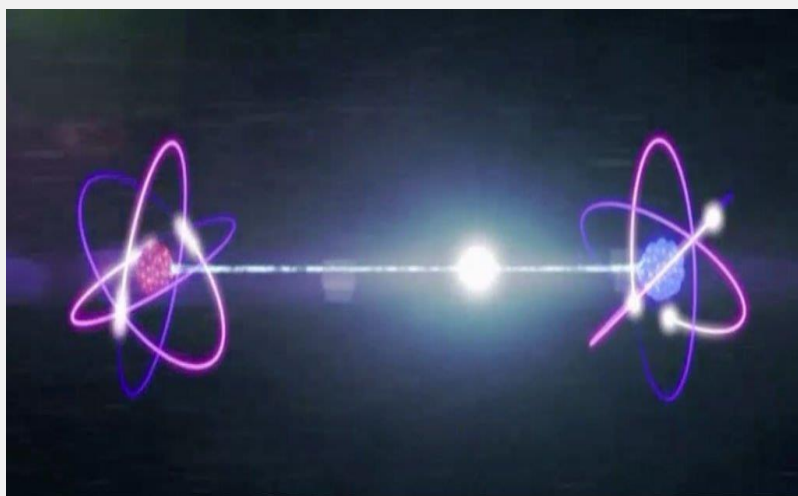
One of the most striking features of the Bhatnagar Award is its multidisciplinary nature. It acknowledges and rewards excellence across a wide spectrum of scientific domains, ensuring that the contributions of scientists in various fields are celebrated and encouraged. This not only promotes innovation but also fosters collaboration among scientists from different disciplines. Winning the Bhatnagar Award is not just a personal achievement; it is also a recognition of the vital role played by these scientists in advancing the frontiers of knowledge and technology. Their work often has a profound impact on society, from improving healthcare and agriculture to developing sustainable energy solutions and innovative materials.

Over the years, many illustrious scientists have received the Bhatnagar Award, and their contributions have continued to shape India's scientific landscape. This award not only serves as a platform for recognizing talent but also inspires the younger generation to pursue careers in science and technology.

In conclusion, the Shanti Swarup Bhatnagar Prize for Science and Technology, or the Bhatnagar Award, stands as a symbol of India's commitment to scientific excellence. It celebrates the achievements of exceptional scientists and encourages them to push the boundaries of knowledge and innovation. As India continues to make strides in the world of science and technology, the Bhatnagar Award remains a beacon of inspiration and recognition for its scientific community.

Somir Ali
6th Semester
Department of Physics

Nobel Prize in Physics 2022



The Nobel Prize in Physics for the year 2022 has once again brought to the forefront ground-breaking discoveries and innovative contributions that continue to shape our understanding of the universe. The Nobel Committee for Physics recognized the extraordinary work of three exceptional scientists, each of whom has made profound contributions to their respective fields.

The Nobel Laureates in Physics for 2022 are Professor Alain Aspect, Professor John F. Clauser (posthumously), and Professor Anton Zeilinger. Their work in the field of quantum physics and experiments involving entanglement and Bell's inequalities has revolutionized our comprehension of fundamental aspects of the quantum world. Professor Alain Aspect, a renowned French physicist, was awarded the Nobel Prize for his pioneering experiments that verified the violation of Bell's inequalities. These experiments demonstrated the phenomenon of entanglement, where the properties of two or more particles become correlated in such a way that they remain connected, even when separated by vast distances. Aspect's work confirmed the predictions of quantum mechanics and challenged classical physics' notion of locality.

Professor John F. Clauser, who sadly passed away in 2020, was honored posthumously for his groundbreaking experiments that laid the foundation for Aspect's work. Clauser's research on the violation of Bell's inequalities provided crucial early evidence for the phenomenon of quantum entanglement and opened the door for further exploration in this field.

Professor Anton Zeilinger, an Austrian physicist, received the Nobel Prize for his pioneering experiments that

pushed the boundaries of quantum entanglement studies. His work included groundbreaking experiments that demonstrated the non-locality of quantum particles and the violation of Bell's inequalities with higher precision and using various physical systems.

The Nobel Prize in Physics for 2022 not only recognizes the remarkable achievements of these three scientists but also highlights the importance of quantum physics in shaping our future. Quantum technologies have the potential to revolutionize computing, communication, and cryptography, with applications in areas like secure data transmission and the development of quantum computers.

In conclusion, the Nobel Prize in Physics for 2022 celebrates the outstanding contributions of Professor Alain Aspect, the late Professor John F. Clauser, and Professor Anton Zeilinger in unraveling the mysteries of quantum physics. Their work has not only deepened our understanding of the quantum world but also opened up exciting possibilities for future technological advancements that could redefine the way we live and interact with the universe.

Nargis Parbin
6th Semester
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Figure 1 Departmental Alumni Meet



Figure 2 Faculty Exchange Program with Bijni College, Bongaigaon



Figure 3 Foundation Day Celebration in the Dept. of Physics, Gauhati University via model presentation entitled "Steam Engine powered by Earth's Mantle"



Figure 4 Foundation Day Celebration in the Dept. of Physics, Gauhati University via poster presentation entitled "Electromagnetic Spectrum"

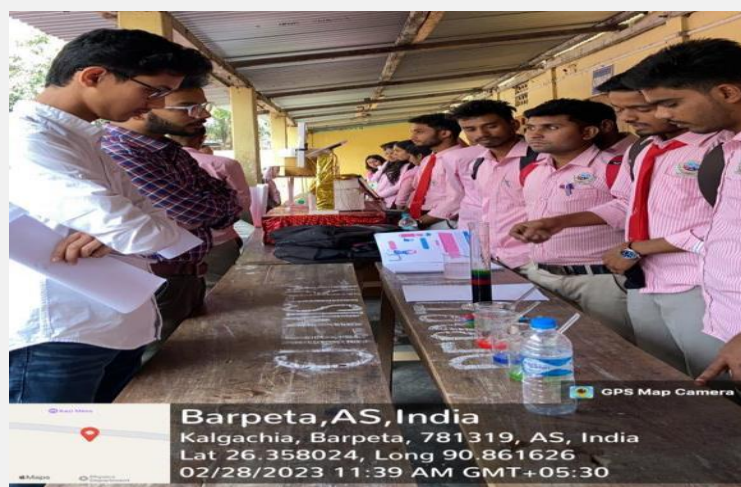


Figure 5 National Science Day Celebration themed "Global Science for Global Wellbeing" on the premises of Nabajyoti College, Kalgachia



Figure 6 Foundation Day Celebration in the Dept. of Physics, Gauhati University via model presentation entitled "Sensor based Water Discharge". This model won the consellation prize

Departmental Activities



1. Celebration of National Science Day 2023 themed “**Global Science for Global Wellbeing**”. Include model demonstration and poster presentation, extempore speech. The 1st and 3rd prize in scientific model demonstration were secured by the students of the Department of Physics.

2. Participation in the **21st Foundation Day 2023** organized by the Department of Physics, Gauhati University, via model demonstration and poster presentation as well as participation in the departmental quiz.

3. Organization of the Friday Seminar series in which every Friday, a student from the Department of Physics of our college, delivers a presentation on the miscellaneous topics of Physics.

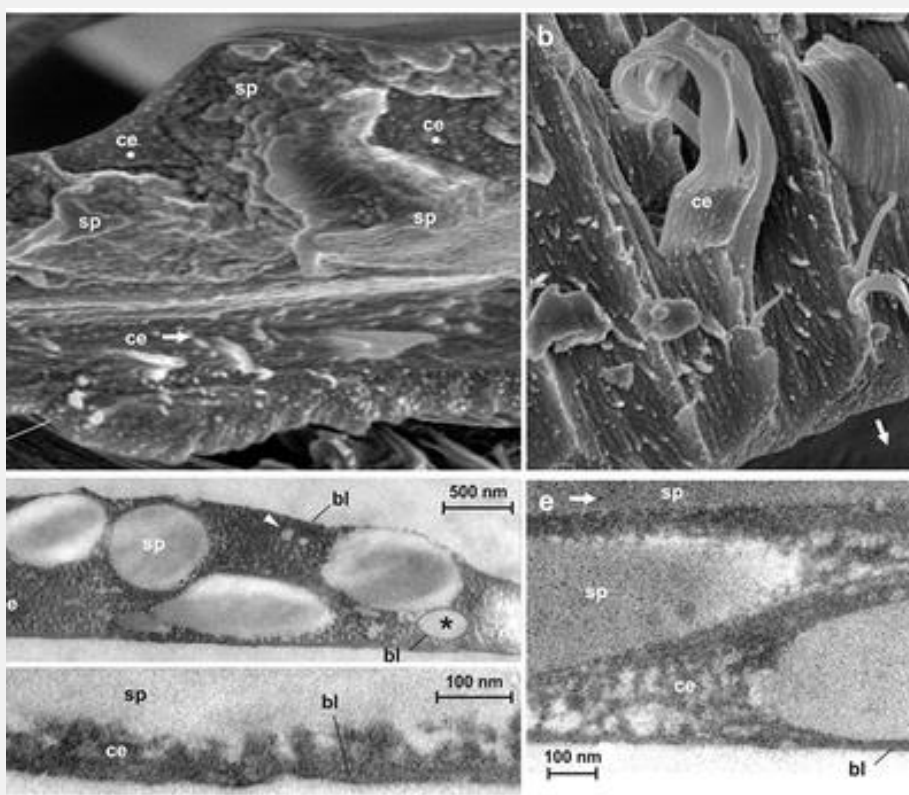
4. Submission of the research project entitled “**Biomimetic Synthesis of Organic-Inorganic Hybrids based on Spider-Silk and Hydroxyapatite**”, to the Assam Science Technology & Environment Council (ASTEC).

5. Inter-departmental and Inter-disciplinary research activity

i. In collaboration with the Department of Zoology for the minor project entitled “**Extraction of spidroin form the local Phocidae species of spider (local name: Daddy Long Legs)**”.

ii. In collaboration with the Department of Mathematics for the minor project entitled “**Use of Raspberry Pi (Single Board Compuetr) for Humidity and Temperature Measurement in Kalgachia via Python Programming**”.

iii. In collaboration with the Department of English for the minor project entitled “**Impact of English as a Medium of Instruction in Higher Education Institutions**”.



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