OCT-2023 VOLUME-1 | ISSUE-1

ENTECH

EXLORE YOUR PASSION

FOR ASPIRING
Scientists
Technocrats
Engineers
Mathematicians

Class 8 to Class 12 Students' Career Planning Companion

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About the Magazine

ENTECH is a monthly magazine meant for teenagers, especially in the age group of 13-17 who are fascinated by Science Technology Engineering Mathematics, STEM. ENTECH magazine will help teenagers in exploring areas that spark their interest, discover their passion. The ENTECH magazine is a companion, which can help teenagers to take most suitable and appropriate action to convert passion into their profession. ENTECH magazine intends to publish short articles by experienced professionals, innovators, researchers and faculty.

Magazine Particulars

Title	ENTECH
Frequency	Monthly
ISSN	in process
Publisher	Coneixement INDIA (OPC) Pvt Ltd
Address	Fl 201, BLD A2, Shivsagar City, PH 1, SN 17, Wadgaon Bk
	Pune 411041 Maharashtra INDIA
Editor In Chief	Dr. Charudatta Subhash Pathak
Copyright	www.entechonline.com
Starting Year	2023
Subject	Science, Technology, Engineering and Mathematics (STEM)
Language	English
Publication Format	Online
Email ID	editor@entechonline.com
Mobile Number	+918788123422
Website	https://entechonline.com

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Pune 411041 Maharashtra INDIA

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From the desk of Editor

Dear friends, welcome onboard! I am thrilled to announce and write an editorial message for the launch issue of ENTECH digital magazine, the ultimate destination for teenagers who are passionate about Science, Technology, Engineering, and Mathematics (STEM). Designed specifically for the age group of 13–17, ENTECH digital magazine aims to ignite curiosity, inspire exploration, and guide young minds towards a future filled with endless possibilities.

Esteemed members of the editorial team of ENTECH digital magazine are highly experienced professionals from various fields related to STEM education and careers.

ENTECH magazine understands that teenagers possess a natural inclination towards STEM subjects and endeavors to fuel their interests even further. Our magazine serves as a trusted companion, offering valuable insights, knowledge, and guidance to help teenagers discover their true passions and transform them into thriving professions.

We have taken the decision to make this digital magazine freely available to read; moreover, you will enjoy a completely clean reading experience as you do not need to enter your personal information to read the magazine. No login is required! Your suggestions and feedback are very important to us, and we would love to hear from you to improve ourselves. Although we have taken utmost care to provide error free contents to readers, we will appreciate if readers provide constructive suggestions or points mistakes, if any. Wishing you a fruitful and happy reading experience.

Charudatta Pathak

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“we merely have 6 to 7 years to prevent the global temperatures from breaching that critical mark”

Dr. Chetan Singh Solanki
Solar Man of INDIA

SOLAR ODYSSEY: JOURNEYING TOWARDS ENERGY SWARAJ AND A SUSTAINABLE TOMORROW

Dr. Chetan Singh Solanki

As I reflect on the global challenges we face, it's clear that the climate stands as the most formidable adversary of our time. Its impacts have transformed the abstract notions of rising seas and disappearing species into tangible disruptions that affect our daily lives and economies on a global scale.

This existential crisis now holds a prominent place on scientific, political, and policy agendas. So, I always quote these simple yet powerful lines whenever I meet people, which gives the complete picture of today's scenario. 'Climate is not changing. It has changed, and the change is accelerating.'

The culprit behind this crisis is the reliance on fossil fuels—coal, gas, and oil—which currently satisfy 80% to 85% of the world's needs. The urgency of the situation cannot be overstated. The Inter-Governmental Panel on Climate Change (IPCC) has sounded the alarm for 'drastic" and "immediate" changes in our energy consumption patterns. The clock is ticking, and we merely have 6 to 7 years to prevent global temperatures from breaching that critical mark of 1.5 °C.

The purpose of my Energy Swaraj Yatra transcends mere rhetoric. It is a call for immediate action, irrespective of governmental policies or subsidies. Energy Swaraj can only become a solution when individuals themselves embrace change. The Energy Swaraj Yatra was launched to propagate the wholesome idea of energy swaraj among the masses so that it could be converted into a mass movement.

This solar-powered journey, conducted aboard the Energy Swaraj Yatra bus, lies at the heart of our movement. Stretching over nearly 11 years, from November 2020 to December 2030, this epic voyage merges the synergies of climate change mitigation efforts. It seeks to raise awareness about energy use, combat misuse, and catalyze measurable changes in energy consumption patterns. It has been more than 1,000 days since the Yatra started. The Yatra has covered more than 43000 km, visiting 22 states across India, including Jammu and Northeastern states, meeting more than 2,00,000 people, motivating them to initiate climate corrective actions, and bringing behavioural changes in the current energy use attitude, which is also in line with the Mission LiFE launch by our hon. Prime Minister, who advocates the conscious use of energy. Our goal is to inspire global societies to shift towards 100% solar-powered living by generating their own energy locally and becoming energy-independent.

LiFE
Lifestyle for Environment

Inspired by the timeless principles of Mahatma Gandhi's 'Gram Swaraj', which advocates for self-sufficiency and dignified living, Energy Swaraj emerges as our beacon of hope. It champions energy autonomy, encouraging us to consume energy locally. The root of our energy crisis lies in the carbon emissions associated with fossil fuels, driving environmental degradation, global warming, and climate change.

The antidote is "right energy", clean and sustainable, and its pursuit hinges on two fundamental principles: "limiting consumption" and "localized production". These principles, which I have termed the 'laws of human existence', form the bedrock of Energy Swaraj, offering a sustainable path forward. It is very important to have discipline in anything that we do, so there must be discipline in energy consumption, which everyone should follow for a sustainable future.

In the words of Mahatma Gandhi, "The world has enough for everyone's needs, but not enough for anyone's greed." Our Earth's resources are finite, and it is incumbent on every organization, every individual, and every government worldwide to embrace essential energy consumption. Even as we transition to renewable sources like solar and wind, we must acknowledge their environmental impacts and the looming challenge of recycling.

The Energy Swaraj Yatra bus serves as a testament to our commitment. I, Professor Chetan Singh Solanki, have taken a leave without pay from my position at the Prestigious Indian Institute of Technology Bombay to lead this transformational journey. The bus itself is a marvel, showcasing solar training and demonstration facilities equipped for daily tasks including showers, cooking, work, meetings, and training. With 3.2 kW of solar panels and 6 kWh of battery storage, it powers lights, coolers, cookstoves, water pumps, TVs, ACs, and laptop charging, all while running its engine on diesel. This bus embodies the possibility of 100% solar energy adoption, exemplifying Energy Swaraj's mission.

As the bus embarks on its epic voyage, it becomes a vessel of enlightenment, traversing the bustling streets of urban India, winding through the tranquil countryside, and venturing into the remote corners of the nation. Every mile is a mile towards a brighter, cleaner tomorrow. It is a declaration that energy autonomy, sustainability, and climate resilience are not lofty ideals but achievable dreams.

It is an invitation to all, an urging to join hands, to ride alongside me, to be part of this symphony of change. Along its path, it leaves a trail of inspiration, sparking conversations and igniting imaginations. Every individual's contribution to fossil fuel-driven energy consumption impacts our planet. Our mission is to bridge the gap between governments and individuals, offering solutions for climate correction. Through energy literacy training and the Energy Swaraj Yatra, we aim to raise awareness about solar energy adoption and promote self-reliance in energy needs.

As we navigate the intricate web of global energy production and consumption, one truth emerges: our actions today will shape our tomorrow. The Energy Swaraj Movement, in its relentless pursuit of clean and sustainable energy, calls upon every citizen to become part of the solution. It beckons us to embrace energy consciousness, limit consumption, and transition to distributed renewable energy. Only by uniting in this endeavour can we hope to secure a sustainable future, mitigate climate change, and limit global warming.

Together, we are authoring a story of change, where the sun is our guide and Energy Swaraj is our destination.

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ENTREPRENEURSHIP: A PROFESSION OF CREATIVITY, SELF-EMPLOYMENT, AND EXPLORATION

Prakash Vyavahare

Innovations in product development and research are at the heart of fastest growing and all-inclusive Indian economic developments. The widespread penetration of digital technology in daily use by the Indian population has opened many opportunities for new products and services that are convenient, economically affordable, and energy-efficient [1]. Therefore, many aspiring scientists and engineering graduates wish to be entrepreneurs. It is self-employment with ample scope for creativity and professional exploration. They foresee their ventures in product development as a scalable startup, which could lead to a new company or its acquisition by a corporate sector for production.

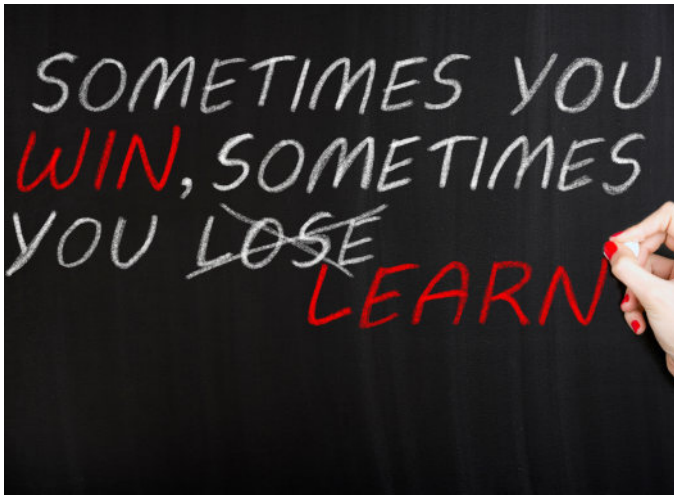
The present decade is most favorable for Indian technocrats to become entrepreneurs for various reasons. The "Atma Nirbhar Bharat" program of the Government of India has opened numerous possibilities to make and promote "make in India" products. The National Education Policy of the Government of India (NEP2020) promotes liberal education in which students can study optional subjects of their interest. Skill development can be obtained by acquiring interdisciplinary knowledge during college education. Atal Incubation Centres, established as Tinkering Laboratories in schools and colleges, provide an opportunity to develop skill sets for youth. Competitions organized by the Maker Bhavan Foundation, the Innovation Foundation, and other regional and national competitions allow an aspiring entrepreneur to test his or her ideas. The technical readiness levels of the product can be checked during competitions by the experts from level one to level ten based on the maturity stage of the product development. [2]

Changing demand patterns

New products with value-added features are being introduced every year due to rapid (and sometimes disruptive) advancements in various technologies like materials, batteries, user interfaces, wireless connections, cloud computing, etc. Today, the average life of various products is much less than a decade for mobile phones, laptop computers, washing machines, TVs, and other consumer electronics items, while it may be just a decade for automobiles. Therefore, becoming an entrepreneur is an exciting profession in terms of creativity and large profits. However, the beginner must consider associated risk factors such as financial limitations, obsolete skill sets, and market competition.

Learning from success and failures

Many accomplished entrepreneurs cultivated their ideas in automobile garages or modest spaces during their early stages. They dared to stand against initial failures and learn from mistakes. **Dr. APJ Abdul Kalam** once said, FAIL is 'First Attempt in Learning'. All of us do not have equal talent, but having equal opportunity to develop our talent is the common belief among potential entrepreneurs.



In the skill development class, the professors advise students, "Try, try, and try. Make as many mistakes as early as possible and learn from them before your competitors". Every failure is a learning experience. One should remember that failing last week does not mean that you will also fail this week. The same is true with success. You have to own your failures and override them for future developments. One should remember that every problem has a solution, and your own motivation and faith will give you the energy and patience to solve it.

However, if one fails in every attempt and at all times, then a large correction factor may be required to change the path and way of thinking, like looking at oneself in the mirror to find and accept the truth. In this respect, there is no one formula for success since continuous corrective measures are needed during the journey since market needs might be changing faster, and as they say, "old maps may not be valid to find the road." Remember, that market, buyers, is full of wise, intelligent, and selective people who would choose the best possible solution among the competitive solutions. They know what they want. Therefore, instead of fighting with the market (or convincing your ideas), ride your way on the market, since the risk-benefit ratio is high in the case of entrepreneurship. Once the pioneering work is done, entrepreneurs should quickly explore and encash the market before the "ready-to-serve" exploiters use their successful ideas to make quick money in a free economic society [3].

Entrepreneurs believe in learning by themselves and have a fire of sustained faith in pursuing their ideas into a product. They are ready to put all of their time, wealth, and sometimes even health into the product to see the light of day. They believe that failures are not bad since there would be blind spots in any first-time activity, and creating a fault is okay. Some people compare their understanding of market needs to a learning experience like riding a horse. The market is a horse, and entrepreneurs are like jockeys. The horse will make you fall many times. Finally, with practice, one will learn to ride the horse, and the journey will be much faster. As market needs are dynamically changing, an entrepreneur may have to change his ideas about developing his product. The design focus could be on a stronger product or in the dimensions of aesthetics, versatility, cost, etc.

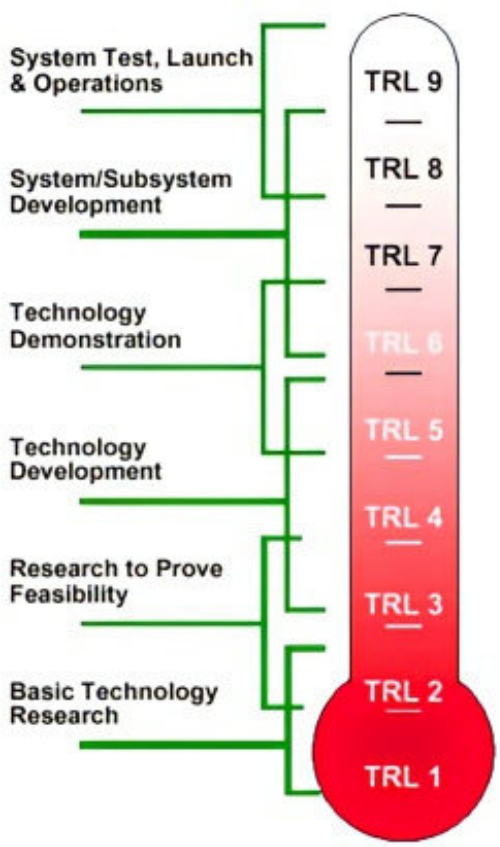
A successful entrepreneur starts by exploring markets by conducting surveys and listening to intended customers. Compared to big companies, entrepreneurs have the advantage of low inertia regarding their existing customer base, factories, and other infrastructure. This resilience is an advantage for an entrepreneur. An entrepreneur is like a dreamer. He or she has to make a story to sell his idea and produce a nice picture of the future. However, sustaining more customers requires a lot of work since the perceived or believed market may be much smarter. It may not welcome the product with the enthusiasm it promised in the initial phase.

Entrepreneurship is also like a problem-solving activity that prioritizes finding the potential of selling the product. Thus, an entrepreneur gives a possible solution to a problem for which the market is in need. Entrepreneurs should realize that everyone has ideas, and each one thinks that his idea is unique and great. One must be creative in selecting an appropriate product from possible solutions for the intended market [4]

Remember that whatever market opportunity he or she is viewing, many people in society have similar visions. In this sense, one should continuously study the market needs and be ready to modify the product rather than saying that I have a great idea and will convince the market later. Your absolute trust and faith in your idea will show the path to success. However, the idea must resonate with the expectations of society for the new product. Therefore, an entrepreneur should be open to changing his ideas instead of being emotionally attached. Successful entrepreneurs realize that their solution is often an incremental development of existing technology. In this sense, it is like a value addition (i.e., plugging a hole) in an already existing system [4].

Technology Readiness Levels (TRL)

The journey from making a toy-like prototype to prove your idea to engineering a field-worthy product is long. The entrepreneur should be aware of the system readiness levels of product development as categorized in the following Technology Readiness Levels (TRL) [2].



Going Solo

Sometimes, entrepreneurship is a lonely and rough personal journey. The personal inner strength of passion, patience, perseverance, practice, and proactivity is tested occasionally. Like successful medical practitioners, entrepreneurs must possess sharp observational qualities, a deep sense of analysis, and be ready to take corrective action. He or she should also have the capabilities of self-learning, using modern software tools, and solving complex multidisciplinary problems with a team spirit of brainstorming sessions and collaborative learning. Handling a team is much more challenging than solving one isolated problem. Since the team would have smart people in their field, each one should respect the views of the other and realize that they have the right to speak and accept each other.

Partnership for progress

Typically, two to three partners in the group have a similar mindset but divergent ways of thinking. There are divided opinions on whether the family members could be part of the team. One could be strong technically, and others in finance, marketing, and related fields could get the full 3D (or 360-degree) view of the various phases of product development. The ultimate aim would be for the product to be accepted by the market. Therefore, instead of being emotionally and lovingly involved with your development idea, it would be better to change your views if they do not match the market reality.

Closing remarks

Finally, a startup's future lies in selling the technology to already established companies or starting their own companies. Some of the entrepreneurs' products will not see the light of day, but for the rest, the return on investment could be at least two to three orders of magnitude greater than the initial investment. On the journey, an entrepreneur may become super famous and rich. Otherwise, since he or she has pursued the dream until dawn, he or she becomes happy and anonymous. He or she can be both, as in the case of Wimbledon champion Stefen Edberg.

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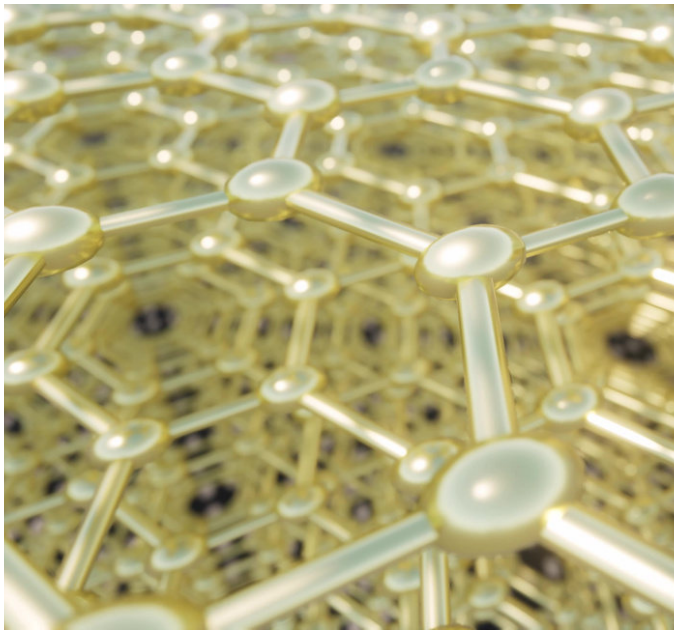
NANO MATERIALS AND TECHNOLOGY: AN INTRODUCTION

Pravin P. Deshpande

The field of nanotechnology is centered around the study and application of materials that are at the nano-scale, which is roughly one billionth of a meter in size. Nano materials and technology are important because they possess unique properties and characteristics that are absent in larger materials. These properties can be used to create novel applications in fields such as electronics, medicine, energy, and more. In this introduction to nanotechnology, we will explore the fundamental concepts and potential applications of this exciting field. Since the dawn of mankind, individuals have utilized resources in their immediate surroundings to enhance their quality of life. As such, the progression of modern materials is intricately linked to the development of civilization. Nano-materials and their accompanying technologies represent the latest discovery in this material timeline.



Nanomaterials are materials that possess at least one dimension within the range of 1-100 nm, and can take the form of metallic, polymeric, ceramic, or composite materials. At the nanoscale, these materials exhibit distinct properties that are neither characteristic of atomic or molecular-level materials nor bulk materials. These properties arise from their small size and structural attributes. Nanotechnology encompasses all methods related to the synthesis, characterization, and processing techniques of nanomaterials.

The most widely accepted definition of nanotechnology, as seen on the NASA website, refers to the creation of functional materials, devices, and systems through the manipulation of matter on the nanometer scale (1-100 nm), and the exploitation of novel physical, chemical, and biological phenomena and properties at that scale.

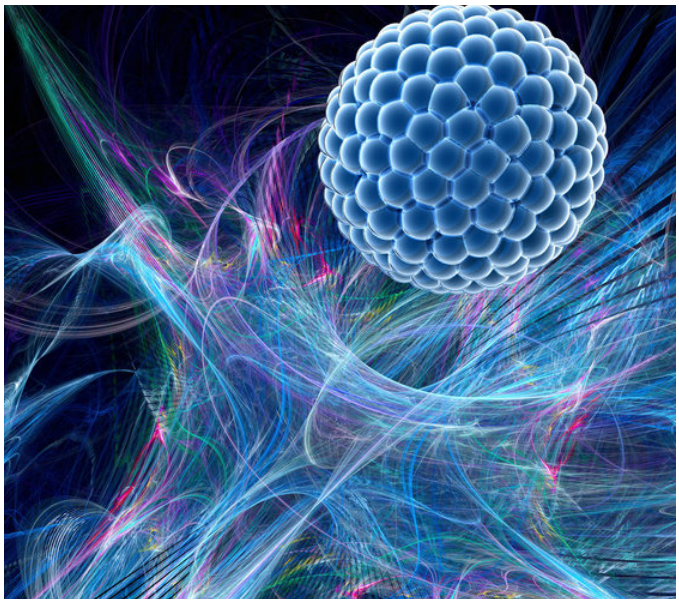
A brief history

Nano-materials have a long history of use, dating back thousands of years. Even ancient glass paintings and medieval pottery unintentionally incorporated nano-particles. In addition, Indian historical steel, referred to as "Wootz steel," was an advanced material that contained carbon nano-tubes. Carbon black, which was discovered during the 1900s, was utilized in automobile tires to both increase their lifespan and give them a darker hue.

Present scenario

The current situation or state of affairs, commonly referred to as the present scenario, is subject to ongoing change and development. It is a dynamic state that is influenced by a variety of factors such as technological advancements, social and economic policies, and global events. The present scenario can be considered as a snapshot of the current state of affairs, which is characterized by a particular set of circumstances, opportunities, and challenges. It is essential to keep a keen eye on the present scenario and analyze it to make informed decisions and plan for the future.

The recent surge in interest towards these materials can be attributed to the advancement of synthesis, characterization, and processing techniques. Nano-particles can now be synthesized using various methods, known as "top-down and bottom-up approaches." The design of these innovative materials relies heavily on fundamental characterization techniques such as X-ray diffraction, scanning electron microscopy, transmission electron microscopy, and atomic force microscopy.

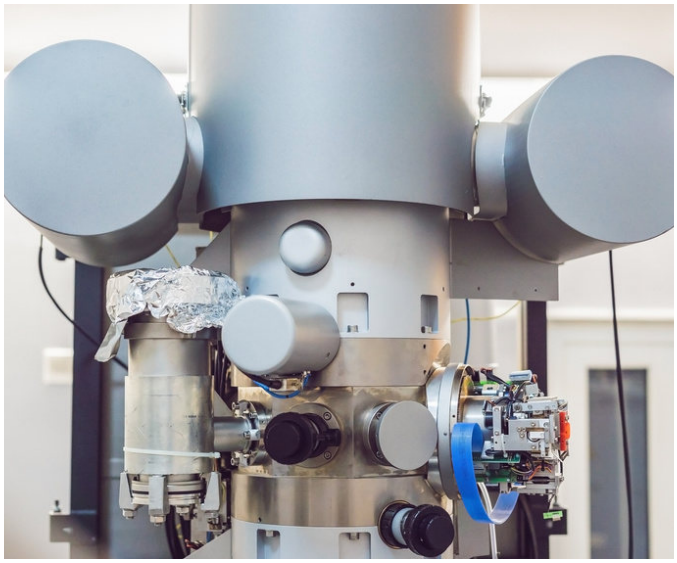


The development of electrical devices has led to significant breakthroughs such as single-electron transistors and field-effect quantum dots, while optoelectronic devices using nano-materials have changed the industry entirely. Wide-band gap nano-structured semiconductors have been widely utilized in the production of sensors and microelectronic devices. Lasers produced from nano quantum dots are currently being fabricated on nano-wires.Aerogels have been found to have practical applications in the creation of smart windows, while smart textiles embedded with functional nano-particles and sensors are being tested for both defense and domestic use. Nano-crystalline carbides are also showing promise as micro-drills, and in the medical field, nano zirconium oxide is a nano-material with significant potential for various applications.Due to its durability, chemical stability, and bio-compatibility, this substance is commonly utilized as a material for implants. Nano-materials can also serve as an additive for coatings that are resistant to both environmental damage and scratches.

Towards career

A career is a journey that requires planning, effort, and steadfastness. It is a long-term pursuit that necessitates determination and the ability to adapt to changes in the job market. To achieve success in one's career, it is essential to have a clear direction and set goals that are both challenging and achievable. With the right mindset, skills, and experience, anyone can progress towards a fulfilling and rewarding career.

The potential applications for these materials in the future are boundless and limited only by one's imagination. However, their widespread use is hindered by their ability to produce cost-effective and efficient goods. The progress made in material science will have a profound impact not only on technology but on all aspects of engineering and industry in the immediate future.



Nano-materials hold great promise in improving the effectiveness of renewable energy technologies, such as solar and hydrogen cells. However, the impact of nano-particles on biological and ecological systems is a matter of utmost importance and requires extensive study. Accordingly, a new course on nano-toxicology has been established. The beauty of nanotechnology lies in its interdisciplinary nature, requiring a strong foundation in physics, chemistry, and engineering. The pursuit of new and superior materials is continual, presenting vast opportunities for emerging students to pursue this profession. ‘Plenty of the room at the bottom’ has paved ‘Plenty of the room at the top' of the career ladder.

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NURTURING TOMORROW'S LEADERS: THE CRUCIAL ROLE OF AI AND ML EDUCATION IN K-12 LEARNING

Ramesha B. S.

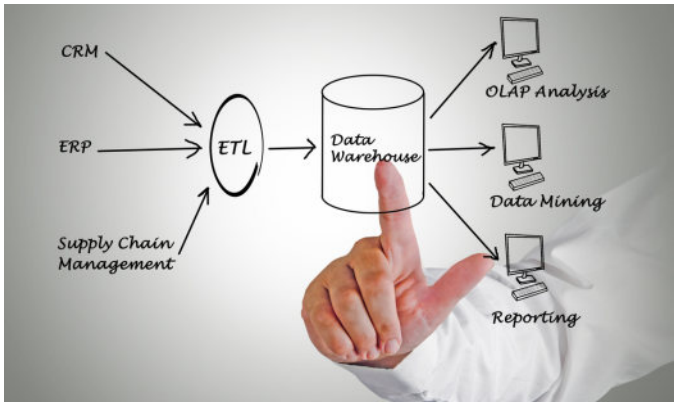
Common sense is a form of data science. In a very simple sense, data science is a computational form of common sense leading to predictive analytics and generative AI. In the technological world, data science is already making headway. Embracing this technological disruption is the need of the hour. Staying informed about rapidly developing technology is essential for personal and professional growth, innovation, global competitiveness, and addressing the challenges of our time.

Learning Artificial Intelligence (AI) and Machine Learning (ML) is incredibly important for STEM (Science, Technology, Engineering, and Mathematics) students as it has strong relevance in modern technology, great career opportunities, innovation, research, development, and creativity. It has already been introduced to STEM students in some of the schools. AI is about computers mimicking human intelligence.

In ancient history, certain aspects of astrology were based on data science. Some proponents of Indian astrology attempted to use data science techniques to analyze astrological data and identify patterns that might correlate with certain life events or traits. It is often done to provide a more empirical basis for astrological claims. Vedic astrology is one of the forms of data science used for predictions. Now, developed countries use data science to track individuals' organizations so that they can predict via patterns and algorithms.

You can see the use case everywhere. Detective agencies use pattern recognition techniques for anomaly detection by analyzing large volumes of data from social media, communication, financial transactions, and travel records. Natural language processing techniques are used for sentiment analysis. You will find many uses of data science in social network analysis, predictive analytics, risk management, and behaviour analysis.

The most important thing in data science is "data." But the question is, do we have the required data? How much data? Real time? What format? Creating relevant features from raw data is essential for building effective machine-learning models. Keeping the data in most cases, like text files and Excel files, will be a catastrophe if you are handling large volumes. You need to extract sufficient data from various sources properly. Data becomes garbage if the required data is not available. We need to keep this data in a proper format that is compactable. Data is not static. It changes over time, and once effective, models may become obsolete as the data distribution shifts. Data scientists often need to work closely with subject-matter experts to understand the data and its context. Data science projects often require significant computational resources, both in terms of hardware and time. A data warehouse is a central repository of integrated and organized data that is collected from various sources within an organization. It's designed to support business intelligence (BI) activities, reporting, data analysis, and decision-making. Popular data warehousing technologies include Amazon Redshift, Google BigQuery, Microsoft Azure SQL Data Warehouse, and Snowflake. These Modern data warehousing solutions often include both on-premises and cloud-based options, and they can also integrate with data lakes to handle more diverse and unstructured data types.



ETL is a critical component of data science and analytics; it stands for Extract, Transform, and Load. It refers to a set of processes used in data integration and data warehousing to move data from source systems to a destination where it can be analyzed, easily queried, and reported.

An ML algorithm is a computational method or procedure that enables computers to learn from data and improve their performance on a specific task over time. These algorithms allow computers to recognize patterns, make predictions, and make decisions without being explicitly programmed for every possible scenario. Ex: linear regression, logistic regression, decision trees, reinforcement learning, random forest, KNN, neural networks, etc. ML algorithms enable data scientists to create models that learn from data, generalize patterns, and make informed predictions or decisions.

These algorithms are at the heart of modern data science, transforming raw data into actionable insights and driving innovation in various domains. These are useful for Data Analytics (DA) interns in automation-of-decision-making, pattern recognition, prediction forecasting, image analysis, anomaly detection, medical diagnosis, and optimization. It forms the basis for AI to handle larger and more complex datasets, extract valuable information from unstructured data, and automate repetitive tasks, allowing us to focus on higher-level analysis and strategy development.

I work at Altair, a global technology company that works on computational science to drive intelligent decisions and innovations for a more connected, safe, and sustainable future. Altair has 30+ years of experience in the data science and data prep fields, with proven data science solutions for customers in BFSI, retail, manufacturing, engineering, and others. Altair RapidMiner, a well-established desktop, new-gen SaaS cloud-based platform, and new-to-market cloud platform (multi-tenant and SaaS-ready), strengthens Altair's current end-to-end data analytics (DA) portfolio, which offers customers the power to understand, transform, act on, and automate their data.

Generative AI refers to a category of artificial intelligence techniques that involve creating new content, such as images, text, music, or other forms of data, using algorithms and models. Unlike traditional AI systems that are rule-based or deterministic, generative AI systems aim to simulate creativity and generate content that is novel and unique.

There are various online platforms for learning different aspects of AI and ML. I was able to find them via quick searches, such as Code.org, aiworldschool.com, the Swift Playgrounds app by Apple, Teachable Machine by Google, CodeCombat, AI4K12, Mimo, Scratch by MIT, etc. Learning should be a gradual process, and it's okay to start with basic concepts and gradually move towards more complex ideas. The key is to keep the learning experience enjoyable and practical so students remain curious and engaged throughout their journey into AI and ML. Engage students with hands-on activities that illustrate AI and ML concepts. For example, you could guide them through simple programming exercises using tools like Scratch or educational platforms like Code.org.

In a very simple sense, data science is a computational form of common sense leading to predictive analytics and generative AI. In the technological world, data science is already making headway. Staying informed about rapidly developing technology is essential for personal and professional growth, innovation, global competitiveness, and addressing the challenges of our time.

The author is working as head of academic initiatives at Altair. He is instrumental in Altair India's academic initiatives, viz., incubators, startups, universities, and industry.
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ROBOTIC AUTOMATION FOR CORE BUILD-UP OF TRANSFORMER LAMINATE SHEETS

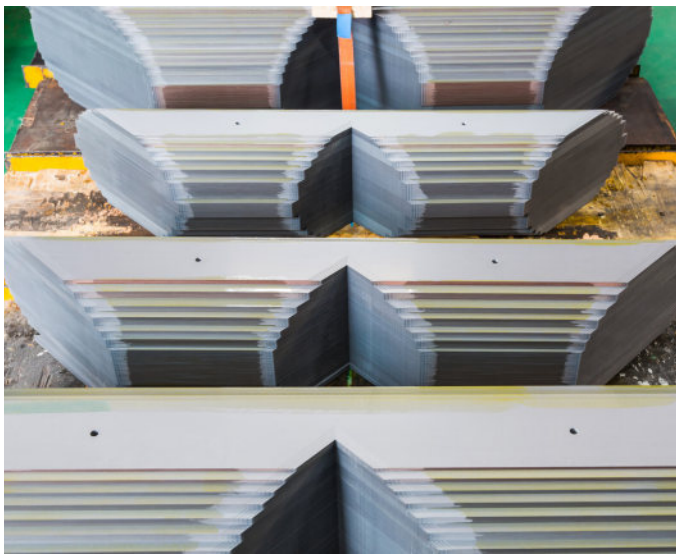
Dharmesh Gala

Introduction

The world's growing demand for electricity has necessitated significant advancements in power distribution and transmission systems. Transformers play a pivotal role in this process by stepping up or down voltage levels, ensuring efficient energy transfer. The core component of a transformer is the laminated core, which is responsible for magnetically coupling the primary and secondary windings. Traditionally, the core build-up process has been labour-intensive and time-consuming. However, the integration of robotic automation in this process is revolutionizing transformer manufacturing by enhancing efficiency, precision, and overall quality.

The Core Build-up Process

Before delving into the benefits of robotic automation, it's essential to understand the core build-up process. Transformer core laminations are typically made of high-quality electrical steel sheets, carefully stacked and aligned to minimize magnetic losses and eddy currents. The laminations are coated with insulating varnish, and the entire core is subjected to pressing and curing processes to ensure structural integrity.



Challenges in Traditional Manufacturing

Labour-Intensive: The manual assembly of transformer core laminations is labour-intensive, requiring skilled workers to align and stack laminations accurately.

Error-Prone: Human errors can lead to misalignment of laminations or the inclusion of defective sheets, compromising the transformer's efficiency.

Slow Production: Traditional methods are time-consuming, limiting the rate of transformer production to meet growing energy demands.

Robotic Automation in Core Build-up

Robotic automation is a game-changer in transformer manufacturing. Here's how it transforms the core build-up process:

Precision and Consistency: Robots are programmed to handle lamination sheets with extreme precision, ensuring accurate alignment and stacking. This results in consistently high-quality transformer cores.

Speed and Efficiency: Robots work tirelessly

24/7, significantly increasing production rates. It is especially crucial in times of high demand for transformers.

Quality Assurance: Robotic systems are equipped with sensors and cameras that can detect defects in lamination sheets. They can automatically reject flawed sheets, reducing the chances of faulty transformers entering the market.

Worker Safety: By automating physically demanding and repetitive tasks, the risk of worker injuries is significantly reduced.

Cost Savings: Although the initial investment in robotic automation is substantial, the long-term cost savings in labour, reduced waste, and improved efficiency make it a financially sound decision.

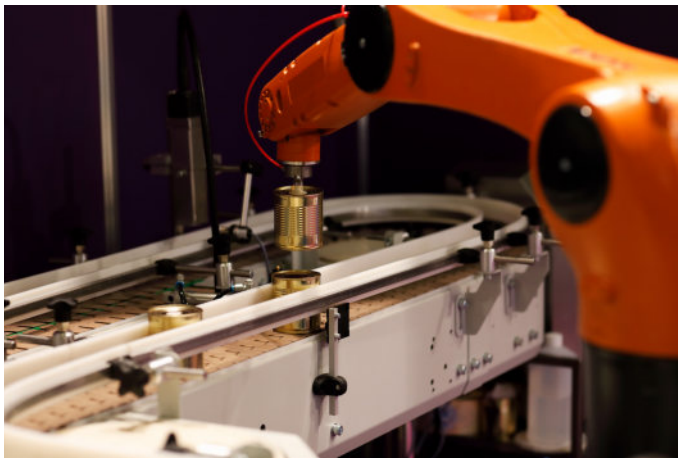
Challenges and Considerations

While robotic automation offers numerous advantages, there are challenges and considerations to address:

Initial Investment: Implementing robotic automation requires a significant upfront investment in equipment, software, and training.

Skilled Workforce: Skilled technicians are needed to program, maintain, and troubleshoot robotic systems.

Adaptability: Robotic systems must be adaptable to handle various transformer core sizes and configurations.



Integration: Seamless integration of robots into existing manufacturing processes is essential for a smooth transition.

Key Robotic Components for Transformer Core-Buildup Automation

Robotic Arm:

At the heart of the automation process is the robotic arm. These arms come in various configurations, such as articulated, cartesian, or SCARA, depending on the specific application. In transformer core-buildup, articulated arms are commonly used due to their flexibility and range of motion.

The robotic arm is responsible for picking up and accurately placing each laminated sheet in the desired position within the core assembly. Precise movements are critical to ensuring the efficiency and quality of the transformer core.

End-Effector:

The end-effector, also known as the robotic gripper or tool, is the component that interacts directly with the laminated sheets. Depending on the size and weight of the sheets, different types of grippers may be employed.

Vacuum grippers are commonly used as they can securely lift and manipulate sheets without causing damage. Magnetic grippers may also be utilized for ferrous laminations.

Vision System:

To ensure accurate positioning and detect defects in the laminated sheets, robotic systems are often equipped with vision systems. These systems use cameras and image processing algorithms to provide real-time feedback.

High-resolution cameras take images of the sheets, which the software then examines to look for any alignment issues or flaws. It ensures that only high-quality sheets are used in the core assembly.

Control Software:

The brain behind the operation, the control software, is responsible for programming and coordinating the movements of the robotic arm and the gripper. It also interfaces with the vision system to make real-time decisions based on the visual input.

The software can be fine-tuned to adapt to different core configurations and sheet sizes, making it a versatile tool in transformer core-buildup automation.

Sensors:

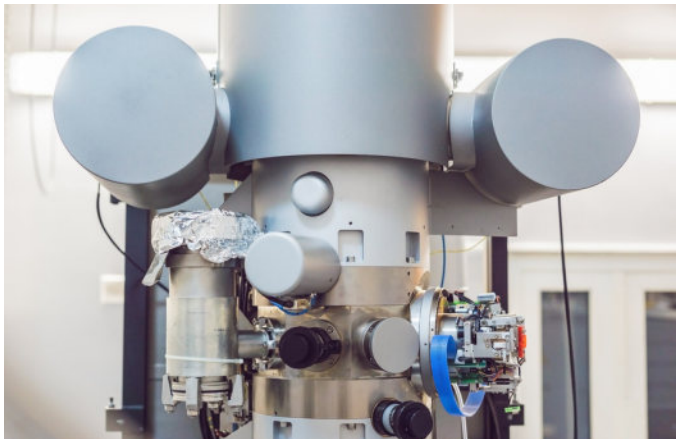
Sensors play a crucial role in ensuring safety and precision. Proximity sensors can detect the presence of objects in the robot's path, preventing collisions.

The robot can adjust its grip to prevent harming the delicate laminated sheets thanks to force and torque sensors, which provide feedback on the pressure the gripper is applying.

The Safety Features:

Safety is paramount when integrating robots into manufacturing processes. Emergency stop buttons, safety cages, and light curtains are standard safety features to protect human workers and prevent accidents.

The synergy of these robotic components is transforming the transformer core-buildup process. With precision, speed, and the ability to work continuously, robots are not just improving efficiency but also enhancing the overall quality of transformer cores. As technology continues to advance, we can expect even more sophisticated robotic systems to optimize transformer manufacturing processes further, contributing to a more reliable and efficient energy infrastructure.



Conclusion

Robotic automation is transforming the core build-up process of transformer laminate sheets, making it more efficient, precise, and cost-effective. As the demand for electricity continues to rise, the adoption of robotic automation in transformer manufacturing is becoming increasingly crucial. With the potential to improve product quality, increase production rates, and reduce labour costs, the future of transformer manufacturing looks promising, thanks to robotics. Manufacturers who embrace this technology stand to gain a competitive edge in the evolving energy landscape.

The author is a passionate researcher in the field AI and Robotics with over 20 years of experience. While working as a Director, AI & Robotics @ Accurate Industrial Controls, he is leading a team of engineers and scientists who develop cutting-edge solutions for industrial automation and process optimization.
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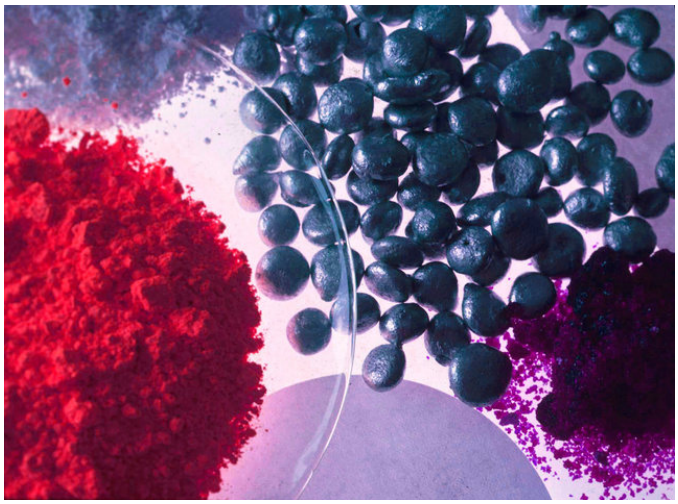
THE FIGHT AGAINST WORLD HUNGER CAN BENEFIT FROM CHEMISTRY

Sunita Singh

Globally, hunger is one of the most pressing challenges facing humanity today. According to the latest report from the Food and Agriculture Organization of the United Nations (FAO), more than 800 million people are malnourished, and nearly 2 billion people suffer from moderate or severe food insecurity. The COVID-19 pandemic has exacerbated this situation as economic losses, lockdowns, disruptions, and inequalities impact livelihoods and food supply systems. In response to this global crisis, the United Nations established the Sustainable Development Goals (SDGs) to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture by 2030. This goal, known as Zero Hunger, requires collective action from all stakeholders, including governments, civil society, the private sector, and academia. hemistry, as the science of matter and its transformation, has a vital role to play in addressing the challenges and opportunities associated with this goal.

In recent years, chemistry has been important in many areas. For example, the discovery of opabactin (OP) and quinabactin, which are similar to compounds of abscisic acid (ABA), has helped some plants become more resistant to drought. These compounds exhibit good water-holding capacity in tomatoes and wheat.



Technologies to recover and reuse phosphorus through the development of new models and mechanisms in livestock and wastewater are also an important development in the fertilizer sector. Nanoscale iron particles are used to increase the bioavailability of phosphate ions and help restore them. One of the studies reported recovering important nutrients such as nitrogen and phosphate from cow manure through hydrothermal carbonization. Hybrid ion exchange is also used as a reuse tool for nutrient recovery. Several methods are currently being used to discover new insecticides for crop protection. Controlling plant pests is an important step in the global food supply.

There are many examples of agrochemicals based on natural products that account for a significant share of the pesticide and fungicide markets. Avermectins and spinosyns, both naturally occurring, are commonly used insecticidal macrocyclic lactones. The synthesis of spinosyn mimics with high insecticidal properties represents a solution and a key aspect for sustainable crop protection, and with the help of chemistry, extending the shelf life of food products is an achievable goal.

The development of edible films using polysaccharides, proteins, and lipids from various natural sources is a potential candidate in the field of food preservation. Researchers have developed a smart film that changes color when exposed to high concentrations of ethylene, a gas that speeds up fruit ripening. Currently, near-field communication technology integrated into smartphones is used to detect meat spoilage, which is directly related to biogenic amine content. The discovery of a dual-color ratiometric composite sensor provides a tool for visually detecting spoilage in seafood products.

Chemistry plays a vital role in achieving the zero-hunger goal by enabling sustainable and efficient agricultural practices. From improving soil fertility and crop protection to food processing and preservation, chemistry offers a range of solutions to increase agricultural productivity, reduce waste, improve nutritional quality, and promote sustainable agriculture. Harnessing chemistry-based innovations and fostering collaboration between scientists, policymakers, and farmers will be key to creating a future where hunger is a thing of the past.

Chemistry can boost agricultural output, minimize waste, improve nutrition, and promote sustainability. A world without hunger requires collaboration between scientists, policymakers, and farmers.

The author is presently working as an assistant professor of chemistry at a government-aided degree college. Her expertise includes essential oils and their applications. She has published 27 research articles in journals of national and international repute. She has authored and coauthored eight book chapters with national and international publishing houses. She has attended a total of 35 conferences and webinars of national and international repute and delivered more than 20 invited talks and oral presentations. She is also an active member of the Association of Chemistry Teachers (India), the International Clinical Aromatherapy Network, and the Global Harmonization Initiative.
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ROAD SAFETY: EVERYONE'S PRIORITY

Pavan Umakant Navade

The Road...! Can we imagine our lives without the road? The use of roads has become an increasingly important part of our daily lives. Road use is an everyday activity. Roads come with road transport, and road transport comes with road accidents. In order to prevent these traffic accidents, the concept of "Road Safety" is important. Road travel is the main means of transportation in India and is crucial to the country's economic development. It supports balanced socioeconomic growth across the nation's diverse regions and eases the transportation of passengers and commodities. Additionally, it is critical to the nation's development and socioeconomic integration. In comparison to other modes of transportation, road transportation accounts for the largest proportion of both passenger and freight transportation due to the ease of access, dependability, and possibility of service expansion to the most remote regions of the nation.

The construction of road infrastructure is what turns the wheels of economic expansion. The total length of roads and highways in India is approximately 60 lakh kilometers, which is second only to the United States of America. The new roads are connecting all the corners of the country. The roads were built at a record speed of about 30 km per day. But there is one black side to this development. A social evil called 'road accidents'.

Road accidents have a bad reputation in India. According to MoRTH, 17 people die every hour on Indian roads. In India, there are about 1.5 million fatal traffic accidents every year. As a result, India is responsible for over 11% of all accident-related fatalities worldwide. India, thus, leads the world in road accidents. The country has about 1% of the global vehicle population but accounts for 6% of the world's road accidents.

According to MoRTH, road crashes contributed to an economic loss of approximately 3% of GDP. The picture is horrible and shameful, too. Road accidents are a human tragedy, and the remedy is road safety.

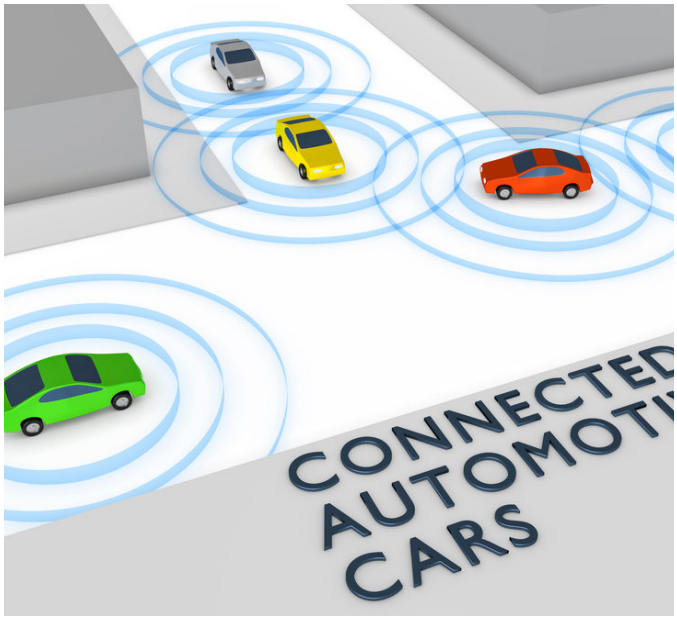
Road safety, in simple terms, is to secure people while traveling on the roads. All road users, including pedestrians, two-wheelers, four-wheelers, and other users of transport vehicles, have to be made safe. Road safety is to ensure safer drivers, the safety of vulnerable road users, safer road infrastructure, and safer vehicles.

Everyone should respect others while driving or walking on the road and take care of their safety. Not only road users, but road safety also concerns various aspects like the maintenance of your vehicle, defensive driving, the condition of the road, preventive measures, related emergency care, and many more.

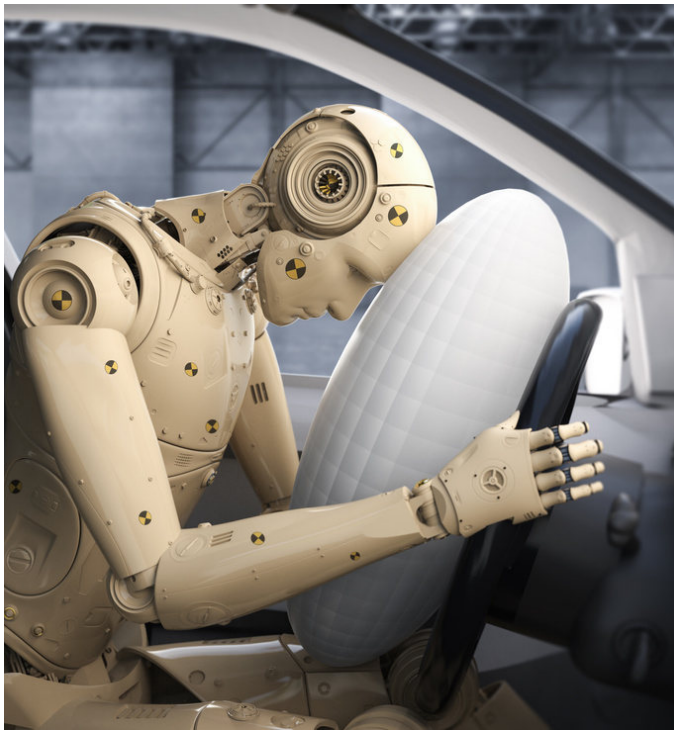
But is everyone concerned about road safety? Is everyone aware of road safety? Unfortunately, the answer is no.

Road safety is a worldwide concern. Stockholm, Sweden, hosted the third Global Ministerial Conference on Road Safety in February 2020. All of the participants in this conference, including India, reaffirmed their unwavering commitment to reaching the targets of decreasing traffic-related fatalities by at least 50% by 2030. Road traffic is still a significant development problem, a public health hazard, and a major source of death and injury worldwide.

So, to curb this social evil, we must teach road safety as a duty as well as a habit in our lives. The main thrust of road safety across the world has been on the 5 E's, viz. Education, Enforcement, Engineering, Environment, and Emergency care of accident victims. The most important requirement is education about road safety. It is a foundation. It includes road users as well as drivers' education. The driver's negligence or fault is to blame for about 80% of road accidents. Improving drivers' skills and behavior is vital for reducing road-related accidents and fatalities. The human aspect of 'driver behind the wheel' is one key area that needs to be addressed. A driver with knowledge of driving rules and regulations and acting according to them will help in achieving the expected target by 2030. It is not the driving skills of drivers but their attitude and bad driving culture on the road that need to be set right.



Children must be taught the basics of road safety right from a young age. Parents must remember that action speaks louder than words. Setting an example of good behavior on the road may save your child's life one day. Children are great imitators; if you break the rules, so will they. Driving habits are based on human behavior. Such human behavior can be mentored, especially at the school and college evel, by teacher and colleague interactions. It can only be achieved if educational institutes take the initiative to conduct a program of training regarding traffic education, defensive driving, and road safety regulations.



The Ministry of Company Affairs has clarified the inclusion of driver training, mass road safety education and awareness, etc., which can be included in CSR.

Engineering is also important for road safety. We have better vehicles and better roads these days. The government is consistently taking measures by developing national highways and urban and rural roads in accordance with international best practices, keeping in view Indian traffic conditions. The Samrudhi Expressway in Maharashtra is the best example. Safer vehicles are also encouraging road safety in their design and functions. ABS technology, mandatory airbags, a speed governor, the introduction of the OBD II system, and artificial intelligence in vehicles make it safer to drive on the road.

Recently, the Bharat New Car Assessment Program, usually known as the Bharat NCAP, was introduced in India. The program will award a star rating between 1 and 5 for the cars tested, with 1 being the lowest.

Emergency care is also essential for road safety. It includes both preventive and curative measures. To reduce the trauma and probability of death and disability associated with road accidents, curative measures such as providing relief and evacuation to the accident victims are vital. As per the reports, nearly 50 percent of road fatalities would not have happened if medical attention had been given within the first hour. This first hour is called the Golden Hour. Everyone should get training in first aid, become a good Samaritan, and help reduce this number. A good Samaritan is a person who, in good faith, without expectation of payment or reward, voluntarily comes forward to administer immediate assistance or emergency care to a person injured in an accident or crash.

For enforcement, we are consciously amending the Motor Vehicles Act to impose stricter punishments. The amendment has increased the penalties for the offenses committed under it. These penalties are expected to act as deterrents. These fines are not taxes, and you are not supposed to pay them if you follow the rules. All these rules are there for the safety of people. If you are someone who trusts statistics, helmets and seat belts save lives. Wearing a good-quality (IS: 4151) helmet can reduce the risk of death from a road crash by almost 45% and the risk of severe injury by over 70%. Wearing a proper seat belt reduces the risk of death by 55 to 65%. There is a misconception among Indians that if it is your day, you are going to die. Still, you must remember that there is a difference between an accident and a suicide.

Road safety is an issue that can only be addressed together with all stakeholders. i.e., government, corporate houses, the auto industry and its associations, universities, educational and other institutions, non-governmental organizations, and society. Schools and colleges can play a vital role in this. Students are prime movers. Educational institutes should engage more students to create awareness about road safety among themselves and carry out road safety advocacy. Every student must know and follow the motor driving regulations, defensive driving, and associated things while using the road. Avoiding overspeeding, drinking and driving, following signals, lane discipline, and using a helmet and seat belt while on the road can be game changers.

Whenever any foreign investors plan their entry into another country, they invariably consider congestion, transportation, road safety, and the environment before venturing. Even tourists do not want to visit cities, however, if they have apprehensions about road conditions, safety, and pollution. Someone has said, "Raste aur drivers desh ki pehchan banate hai."

Road safety should become a mass movement to curb this social menace of road accidents. If we can eradicate Polio unitedly, then definitely we can achieve 'Vision Zero for Road Accidents.' What is needed is that everyone must contribute in their way to curb this social evil 'Road accidents' in India. Road safety must be everyone's first and foremost priority.

Road accidents in India have reached alarming levels, causing immense loss of life and property. It is crucial for individuals, communities, and government bodies to come together and prioritize road safety. By raising awareness, enforcing stricter traffic regulations, and promoting responsible driving habits, we can work towards achieving the goal of 'Vision Zero for Road Accidents' in our country.

"Be the change you wish to see in the world." Mahatma Gandhi

Let us take inspiration from Mahatma Gandhi's words and actively contribute to making our roads safer for everyone.

The author is a proactive supporter of road safety. He is instrumental in increasing awareness about road safety through his talks and workshops on road safety in colleges, schools, and corporations.
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STATISTICS: NOT JUST FOR ACADEMICS ANYMORE

Jaya Ghosh

Have you ever thought that 'Statistics' is only meant for scientists or students trying to get good grades?
If so, think again.
'Statistics' is all around you and plays a bigger role in your daily life than you think. From morning news reports to the latest poll numbers to the chance of rain in the weather forecast to your favourite baseball player's batting average, statistics shape our understanding of the world.

While the topic may seem boring in high school math classes, statistics is anything but boring or irrelevant. Once you know what to look for, you'll find the impact of statistics everywhere. **So get ready to become a master of detecting statistics - your new superpower of detecting statistics is about to awaken**!

'Statistics' are used to analyze data and identify patterns that aid decision-making. Companies use statistics to determine the best prices for items, find target customers, and make data-driven decisions. Statistics also help governments allocate resources and make policy decisions.

In your own life, you probably consider statistics when making a variety of decisions, big and small, like –

- Compare nutritional information to choose healthier cereals.
- Check the weather forecast to decide what to wear.
- Check ratings and reviews to choose new TV shows to watch.
- When deciding to move or travel, consider statistics like the cost of living or crime rates.

Resources to Improve Your Statistical Skills

Online Video Courses

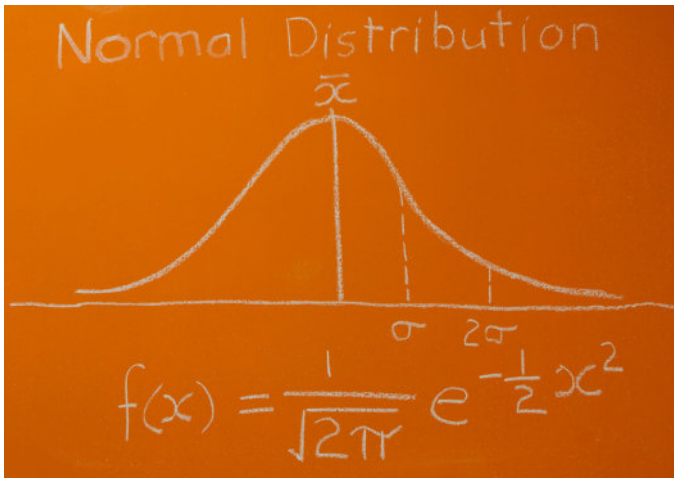
Platforms like Khan Academy, Coursera, and EdX offer video courses on statistics and data analysis. Many of them can be completed at your own pace and are free. In these interactive courses, you'll learn statistical concepts and methods through examples and exercises. Short videos break down complex topics into easy-to-understand explanations.

Infographics

An infographic is a visual representation of data or statistics designed to convey information clearly and quickly. Sites like Visual Capitalist, Information is Beautiful, and Our World in Data offer stunning infographics on business, health, technology, and more. Infographics make statistics easy to understand and even fun to explore. Studying how to visualize data is an education in itself.

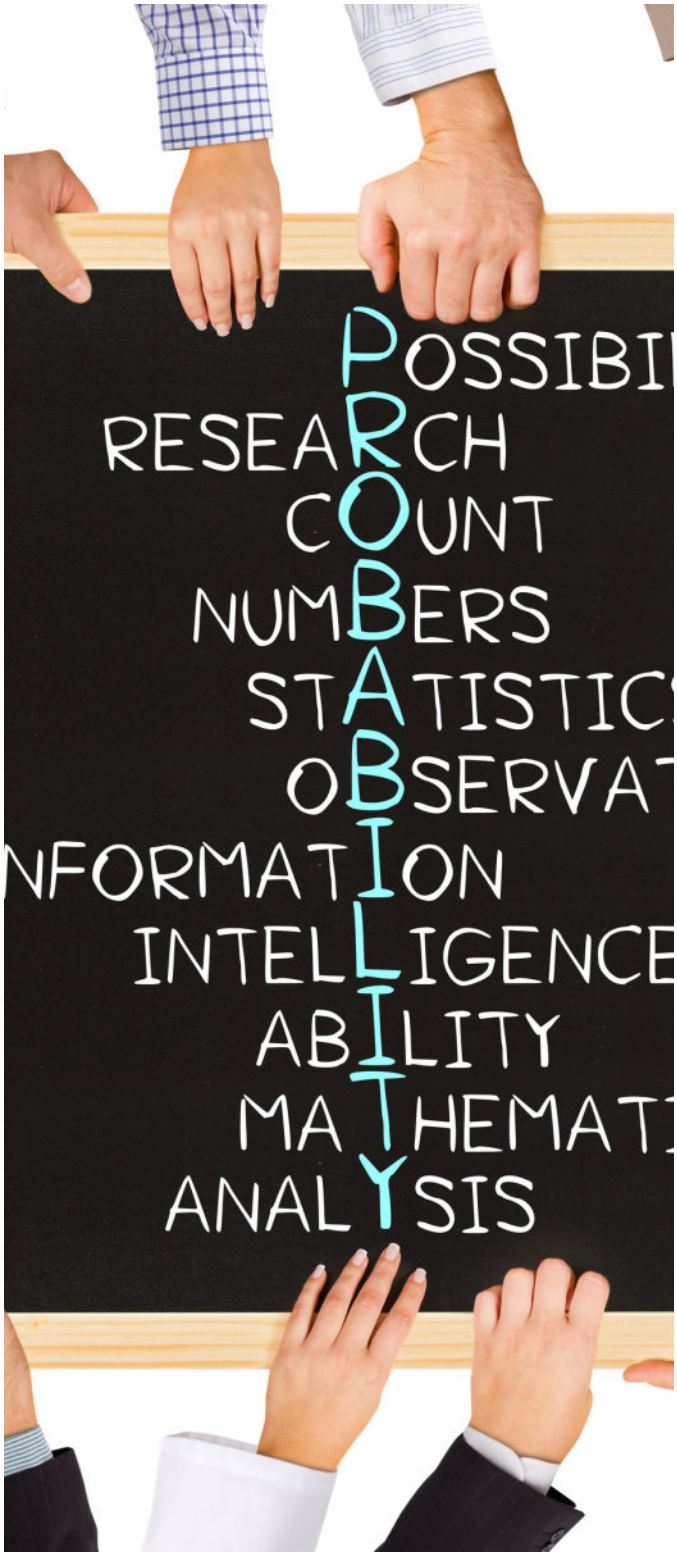
Data Journalism

Many news outlets now have data journalism teams that analyze statistics and trends to discover and explain stories. Follow publications like FiveThirtyEight, The New York Times' The Upshot, and The Guardian's Data Blog. Not only will you learn statistical methods and critical thinking, but you'll also understand important issues through the lens of data.



Online Courses

For those who want a more structured course, Massive Open Online Courses (MOOCs) offer in-depth courses in statistics, data analysis, and visualization. Top universities such as Harvard, MIT, and Cornell offer MOOCs covering everything from basic statistics to machine learning. Although the courses are more demanding, they provide a comprehensive education in statistics that you can complete at your own pace.



Industries with the highest demand for statisticians and data scientists include:

- Technology companies to analyze user data and build recommendation algorithms.
- Healthcare organizations for study of disease patterns, evaluate treatments, and improve patient outcomes.
- Financial Services to detect fraud, predict economic trends, and optimize investment strategies.
- Retail and e-commerce for understanding customer behaviour, personalize the shopping experience, and increase sales.
- Government Agencies for making policy decisions, track demographic indicators, and enhance national security.

Conclusion:

So, there you have it. After all, statistics aren't just for academics and number crunchers. Whether you want to determine the best time to avoid traffic, choose the safest mode of transportation, find the most reliable product reviews, or make good financial investments, statistics can help you. It's time now to go ahead and embrace your inner statistician. The world is full of data—you just have to open yourself up to it. With ample resources at your disposal, you no longer have an excuse not to improve your statistical skills. Choose the resources that fit your needs and learning style, and start building your statistics skills today. Your ability to understand and question the numbers behind the news will be invaluable.

Note: *In the next issue, we will explore the key skills and training required to become a statistician. We will also explore career opportunities for statisticians.*

The author is an educationist and Maths Curriculum Consultant who has acquired 16+ years of experience in the education sector. She has worked on national (CBSE and ICSE) and international (Singapore, USA, Australia and IB boards etc.) school curriculum development, collaborating with renowned educational publishers and Edtech companies. Her bestselling book "Maths Olympiad for IMO Aspirants" is just one of her many accomplishments. Additionally, she is a Mathematics Educator on YouTube with a passion for inspiring children and instilling a love for mathematics. Contact jaya.malik@gmail.com to learn more.
Link: https://www.youtube.com/@jayaghoshmaths

THE POWER OF MULTILINGUALISM: UNLOCKING CAREER OPPORTUNITIES IN A GLOBALIZED WORLD

Chittaranjan Kortikar

Introduction

In today's rapidly evolving world, the ability to communicate effectively across languages is more valuable than ever before. The globalized economy, advancements in technology, and increased international collaboration have made being multilingual a significant asset in both personal and professional spheres. The CK Institute recognizes the importance of multilingualism and aims to provide students with a platform to harness its potential. This article describes the significance of being multilingual today and explores the career opportunities that await those who embrace this skill. This importance can be attributed to several critical factors, including facilitating effective cross-cultural communication, enhanced career prospects, improved cognitive abilities, and preserving linguistic diversity. In this context, exploring the significance of multilingualism is essential to understanding its far-reaching implications in the contemporary world.

Career Opportunities for Multilinguals

The ability to communicate in multiple languages is no longer a mere bonus on a resume; it has become a crucial factor in career success. Multilingualism opens doors to a wide array of career opportunities, and here's why it matters:

1. **Globalization of Business:** In today's interconnected world, businesses are expanding across borders. Multinational corporations seek employees who can communicate with clients.
2. **Enhanced Cultural Sensitivity:** Multilingual individuals tend to have a deeper understanding of different cultures. This cultural sensitivity is highly valued in fields such as international relations, diplomacy, and tourism. It allows professionals to bridge cultural gaps and build stronger relationships on a global scale.
3. **International Career Opportunities:** Speaking multiple languages can open the door to exciting career opportunities abroad. Many countries have programs that encourage immigrants with language skills to contribute to their economies. Multilingual individuals can explore careers as language teachers, translators, or cultural ambassadors in foreign lands.

4. **Competitive Edge:** In competitive job markets, multilingual candidates often have an edge. Employers recognize the cognitive benefits of learning and using multiple languages, such as improved problem-solving skills, better multitasking abilities, and enhanced memory. These skills can set you apart from other candidates in various industries.

Job sectors for a multilingual

Indian students who are multilingual have a wide range of job opportunities available to them. Here are some options:

1. **Translator or Interpreter**: Multilingual individuals can work as translators or interpreters to help bridge language gaps in various industries such as business, healthcare, and government.
2. **Customer Service Representative**: Many companies require customer service representatives who can communicate effectively in multiple languages to serve diverse customer bases.
3. **Language Teacher**: Becoming a language teacher or tutor can be a rewarding career, especially if you are proficient in languages like English, French, Spanish, or other in-demand languages.
4. **Content Writer or Blogger:** Multilingual students can create content in multiple languages, cater to global audiences, and work as freelance writers or bloggers.

5. **International Business:** Multilingual skills are valuable in international business roles such as international sales, marketing, or export-import operations.
6. **Tourism and Hospitality:** In the tourism and hospitality industry, knowledge of multiple languages can be a significant advantage when dealing with tourists from around the world.
7. **Diplomacy and International Relations:** Multilingual individuals can pursue careers in diplomacy, foreign affairs, or international organizations where language skills are crucial for effective communication.
8. **Multinational Corporations:** Large multinational companies often seek employees who can speak multiple languages to facilitate communication with global clients and partners.

Importance of IELTS in today's world as a multilingual benefit

The International English Language Testing System (IELTS) is a widely recognized and important examination for assessing English language proficiency, and its significance extends beyond native English speakers to individuals from multilingual backgrounds. Here are some key reasons why IELTS is important from a multilingual perspective:

1. Global Standard: IELTS is recognized and accepted by over 10,000 institutions and organizations worldwide, including universities, colleges, employers, and immigration agencies. This makes it a globally recognized standard for assessing English language proficiency. For multilingual individuals, having a standardized assessment is crucial because it allows them to demonstrate their language skills consistently across various countries and contexts.

2. Academic Pursuits: For multilingual students looking to study abroad in an English-speaking country, IELTS is often a prerequisite for admission to many universities and colleges. Achieving a

specific IELTS score can determine eligibility for various academic programs, scholarships, and grants. It ensures that students have the necessary language skills to succeed in their studies.

3. Employment Opportunities: Many multinational companies and organizations require employees to have a certain level of English proficiency. For multilingual job seekers, a good IELTS score can be a valuable asset on their resumes, demonstrating their ability to communicate effectively in a global business environment.

4. Cultural Exchange: Multilingual individuals who wish to participate in cultural exchange programs, travel, or volunteer internationally may be required to demonstrate English language proficiency as part of their applications. IELTS can serve as a standardized way to prove their language abilities for such opportunities.

5. Improving Multilingual Skills: Preparing for the IELTS exam can help individuals improve their English language skills, which can be valuable for multilingual individuals who use English for academic, professional, or personal reasons. It can also help enhance their overall communication abilities in a multilingual context.

In summary, IELTS is important from a multilingual perspective because it offers a standardized way for individuals from diverse linguistic backgrounds to demonstrate their English language proficiency. Whether for academic, professional, or personal purposes, IELTS scores play a significant role in facilitating mobility and communication in a globalized world.

The ability to speak multiple languages and excel in proficiency tests like IELTS not only enriches one's personal life by opening doors to new cultures and experiences but also significantly enhances career prospects. Multilingual individuals are in high demand across industries, and their unique skill set allows them to thrive in our interconnected world.

Conclusion

In a world where communication knows no borders, being multilingual is a powerful asset. CK Institute recognizes the importance of multilingualism and offers a wide range of language courses, including comprehensive IELTS coaching, to prepare students for global success.

For further details kindly visit www.ckinstitute.in

HOW IT IS MADE

LEAD ACID BATTERIES: PART 1

(A BRIEF HISTORY)

Introduction

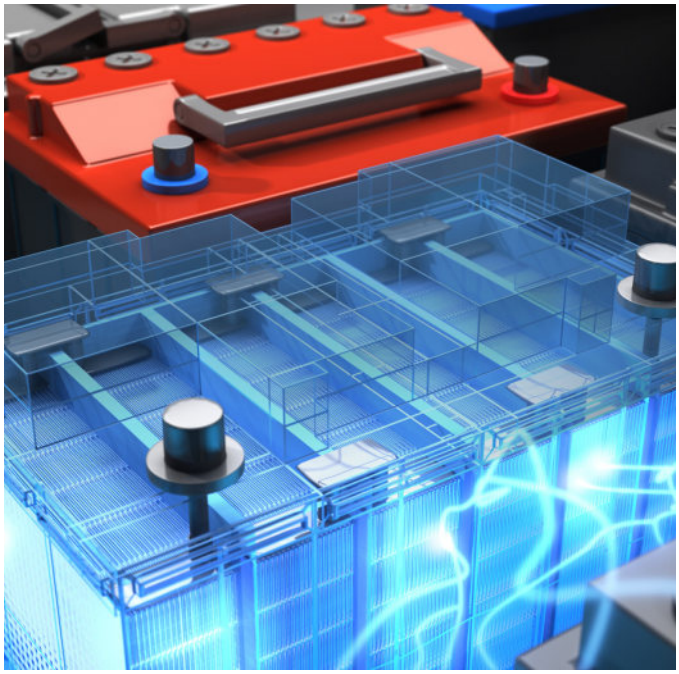
Gaston Planté, a French physicist, developed the lead-acid battery, world's first rechargeable battery, as a result of his research and ideas. The physicist was indeed researching the polarization that exists between two identical electrodes in 1859. Planté employed plates that were submerged in liquid solutions and made of various materials. His plan was to investigate the relationship between the type of electrode material utilized and the highest capacity and voltage that could be produced.

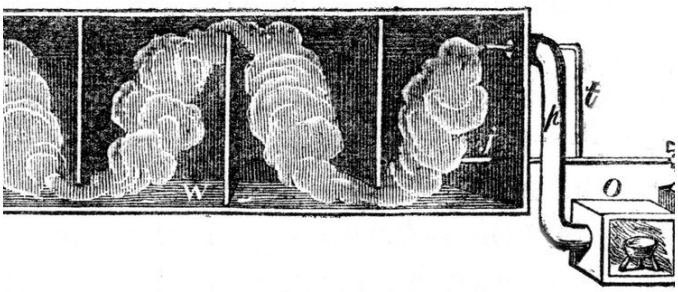
The OPlanté found that the levels of polarization vary according on the substance being used. The French Academy of Sciences released "Research on Voltaic Polarization," which summarized the findings of his research, in 1859.

The French scientist's most important discovery was that the secondary current flowing through a circuit made of lead plates separated by insulating rubber strips and submerged in a sulfuric acid solution was the highest of all the currents found in the different materials used in the experiment.

The lead-acid battery was developed more than ten years prior to the debut of the first mechanical energy generator. The battery needed reasonable assistance to be charged, though, as it was a backup energy source. Zenobe Gramme is credited with creating the first dynamo, a machine that could convert mechanical energy into electric energy and vice versa, which made it simpler to charge the Planté battery.

There was no real-world use for Gaston Planté's discovery of the fundamentals of battery production and operation in 1859. However, nearly two decades later, with the debut of Thomas Edison's incandescent light bulb, Gaston Planté's discovery found the first real-world implementation in 1879. Subsequently, Gustave Trouvé created the first electric tricycle and battery-powered submarine in 1886, which marked a significant step forward in the practical application of the Planté battery.





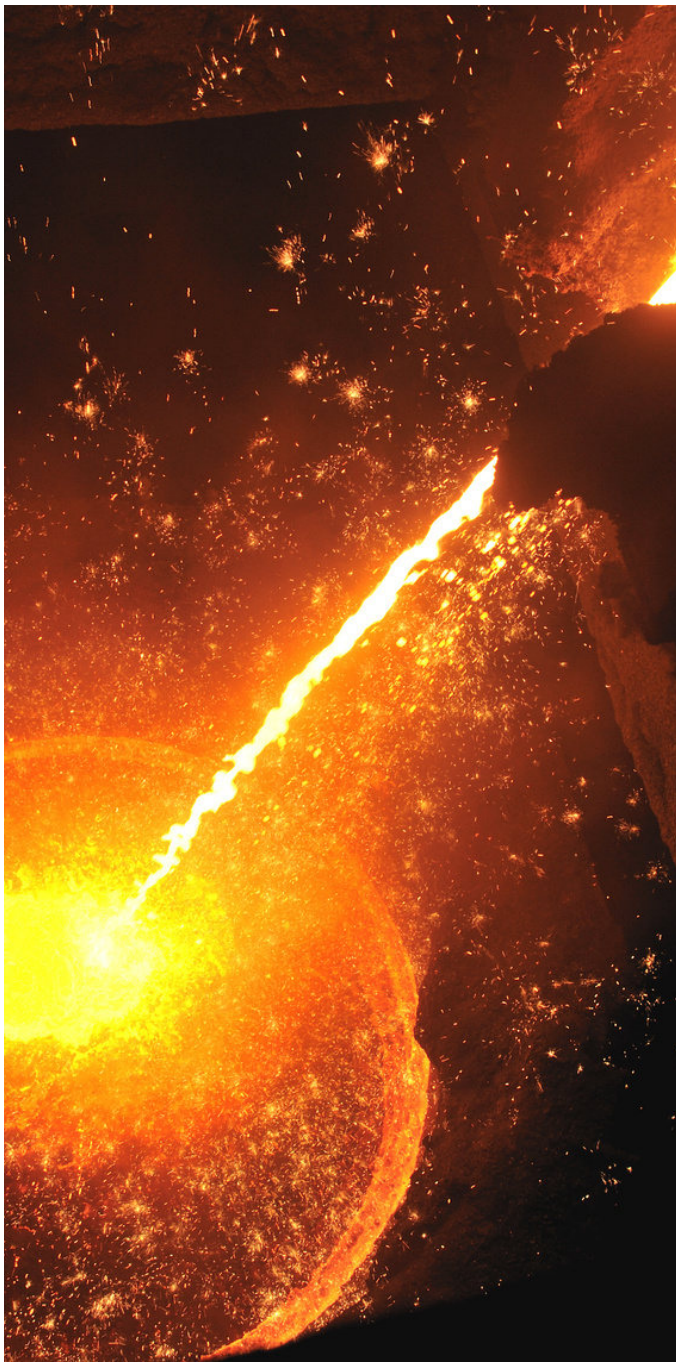
However, the question of how to apply the Planté battery to the production process was still open. Faure's improvements greatly increased the capacity of batteries and led directly to their manufacture on an industrial scale, sometime around 1881. He proposed the new technique, also known as the "mixed plate", in which the lead plates were covered with a paste of oxide, sulfuric acid, and water. The elements were charged until active masses of lead and lead dioxide were obtained.

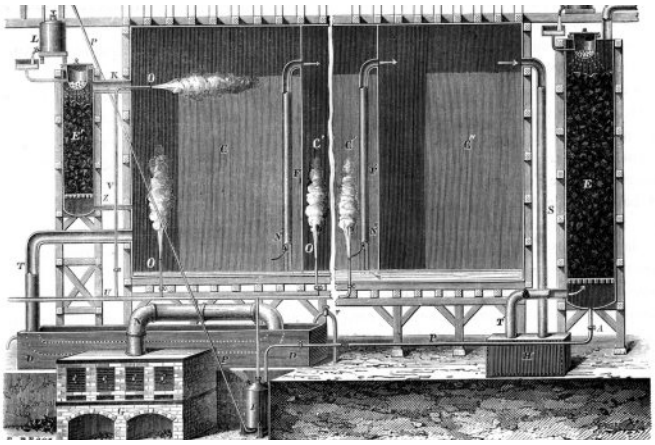
The First Artificial Lighting System

By order of the Austrian Emperor Franz Josef, Gaston Planté installed the first artificial lighting system in history in 1883. The artificial light resulted from the combination of using dynamo motors and Planté batteries. With its use in the Schönbrunn Palace, the invention of the lead-acid battery definitively established itself as one of the leading inventions of the 19th century.

Earlier Attempts of Industrial Production of Lead Oxide

To make lead oxide, it was customary to melt lead in a reverberatory pot. When the molten lead came into touch with the air, oxide began to form on the surface. The amorphous oxides generated were difficult to manage in terms of their chemical compositions and granulometries. The transition from the lead plate to the grid, which was thought up by Ernest Volkmar, was another major development. Antimony alloy grids were eventually introduced to replace the original pure lead grids. The grid increased the percentage of active material while decreasing the percentage of metallic lead.





The Barton Method and the Shimadzu Method, Two Subsequent Advances in Oxide Production:

George Barton developed a novel method of producing oxide and patented it in 1898. The researcher used lead that had already melted (at temperatures between 400 and 450 degrees Celsius). Tiny droplets of liquid lead were dispersed into the heated, oxidizing environment by a mechanical blade within the pot that was revolving. These minute drops reacted with the oxygen in the pot as they travelled through the highly oxidizing environment, eventually reaching the desired degree of oxidation. The powder was transported to the container by an oxidizing airflow.

Following Genzo Shimadzu's work, other advancements in the field of oxidation were accomplished in 1926. The technique basically involved adjusting the pigments' grinding mechanisms to the oxidation process. In a ball mill, lead spheres were put, and the friction produced enough heat to oxidize the surface of the spheres, turning the oxide content into powder.

Shimadzu used lead below its melting point (about 270°), but Barton used molten material, which is the key distinction between the Barton and Shimadzu techniques. These two processes continue to serve as the technical foundation for the manufacture of the raw materials for lead-acid batteries.

Reference

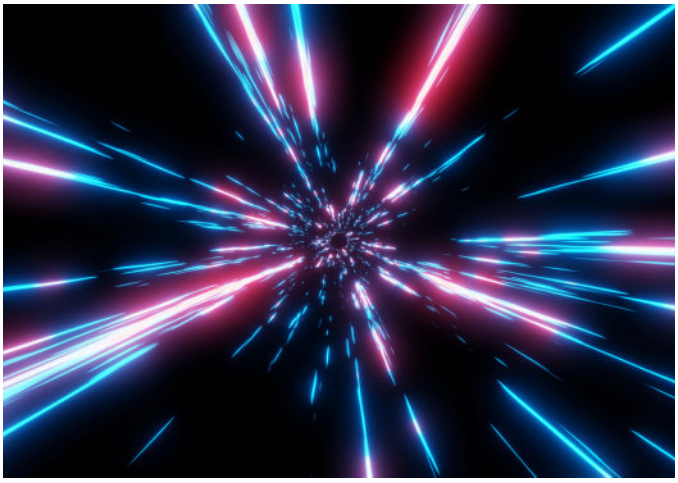
Batteries Step by Step: The Lead-Acid Battery

SOVEMA: Equipment for Lead Acid Batteries.

LIGHT SPEED REVELATION:
NOBEL PHYSICS PRIZE HEADS TO PIONEERS OF ATTOSECOND PULSES

Introduction

Dirac once said, "The measure of greatness in a scientific idea is the extent to which it stimulates thought and opens up new lines of research." This quote still resonates today as a trio of scientists have been awarded the Nobel Prize in Physics 2023 for their ground-breaking experiments with attosecond pulses of light. This achievement, by Pierre Agostini, Ferenc Krausz, and Anne L'Huillier, has paved the way for extraordinary discoveries in electron dynamics in matter. But what does that mean exactly? Let's explore the significance of their work, the underlying concepts, and the potential impact on the future of science.



The Awardees

Pierre Agostini

The Ohio State University, Columbus, USA

Pierre Agostini, a trailblazer in attosecond science, has been tirelessly pushing back the frontiers of our understanding of electron dynamics. His leading research and expertise in the development and manipulation of attosecond pulses of light have not only helped us observe events at an atomic scale but have also revolutionized the field of ultrafast science.

Ferenc Krausz

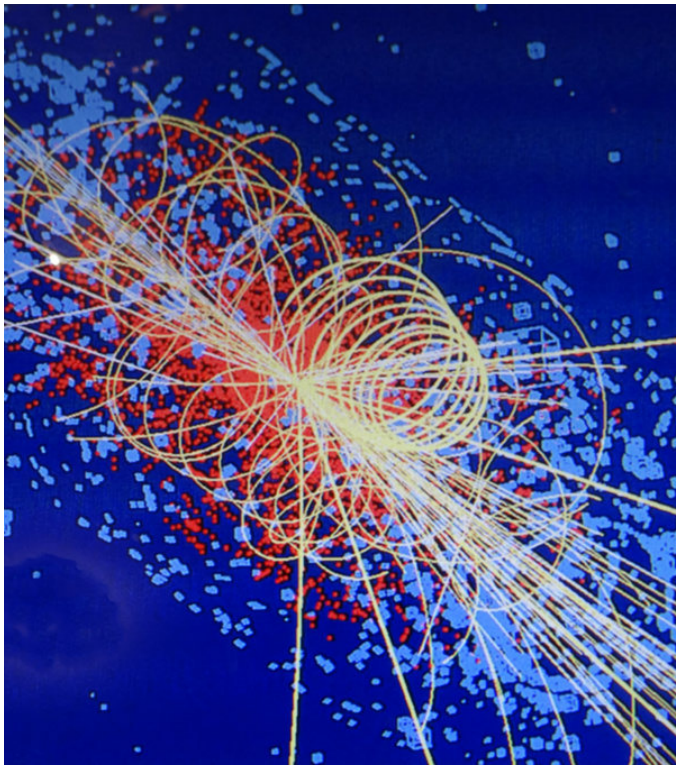
Max Planck Institute of Quantum Optics, Garching and Ludwig-Maximilians-Universität München, Germany

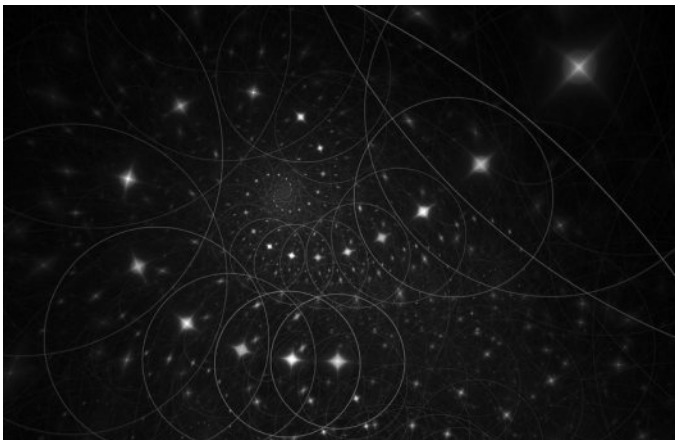
Ferenc Krausz, a genius who skillfully crafted the technology to control and measure light at its fastest, allowing scientists to peer into previously unexplored territories. His pioneering studies in ultrafast laser physics have opened the door for a more profound understanding of some of the fundamental processes in nature.

Anne L'Huillier

Lund University, Sweden

With a passion for quantum optics, Anne L'Huillier's essential contributions to the development of attosecond pulses and the measurement of electron dynamics have been nothing short of transformative. Her study of these ultrafast processes provides a valuable headway into advancing new technologies.





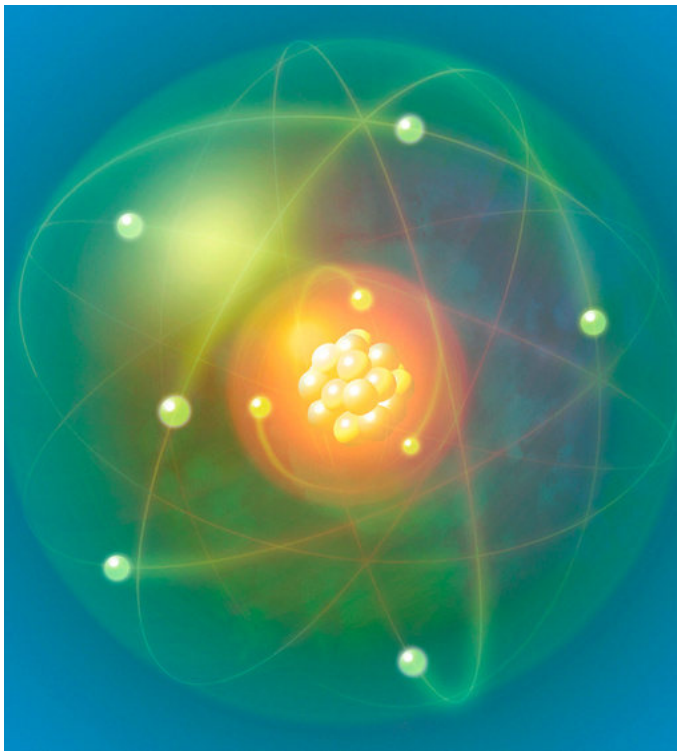
The Power of Attosecond Pulses

An attosecond, to put it simply, is incredibly fast. It's one billionth of a billionth of a second (10^-18 seconds). The technology developed by these three scientists manipulates light to create pulses of this duration, allowing us to study ultrafast events like electron movement. Imagine being able to dissect a second into quintillions of parts and observe the universe on that scale – exciting, isn't it?

The breakthrough of attosecond pulses has made it possible to:

- Understand rapid electron dynamics
- Create clearer images of atomic systems
- Witness quantum mechanical phenomena

The trio's revolutionary method of generating attosecond pulses has provided researchers with a time-window small enough to capture the ephemeral dance of electrons within atoms and molecules in real-time.

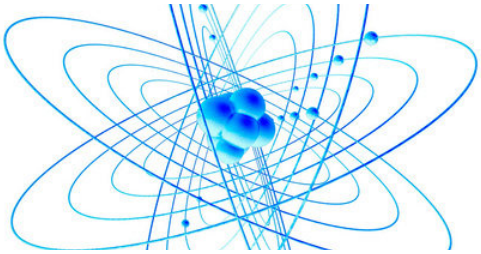


Impact on Future Research

The work done by Agostini, Krausz, and L'Huillier has the potential to foster new lines of investigation and discovery. Their relentless pursuit of knowledge in the realm of attosecond pulse generation will shape future advancements in a diverse range of scientific fields, including quantum physics, molecular biology, and medicine.

"The art of science is more than just discovery. It's about inspiring curiosity, catalyzing change, and brightening the future by illuminating the path and setting the pace."

This quote captures the essence of the Nobel laureates' achievements. Their trailblazing will continue fostering curiosity, improving technology, and inspiring new generations of scientists to explore the universe's wonders in unprecedented detail.



Conclusion

The Nobel Prize in Physics 2023, awarded to Pierre Agostini, Ferenc Krausz and Anne L'Huillier, echoes the essence of science itself. Their work exemplifies determination and resilience in the quest to understand the world around us, and their contributions will unquestionably transform how we perceive and study the universe for many generations to come. Let this achievement be a clarion call to all aspiring scientists and researchers: push the boundaries, defy convention, and let your curiosity lead you into the unknown; it might just be the next breakthrough humanity needs.

Sign off note: The exploration of the scientific world is akin to climbing a mountain. The higher you go, the wider the view and the more you realize how much more there is to explore. Let's take this opportunity to celebrate these laureates' astounding scientific achievement and recognize the limitless potential the field of science holds for the future.

Reference:
https://www.nobelprize.org/prizes/physics/2023/prize-announcement

IMPORTANCE OF MATH PUZZLE IN DEVELOPING OUR BRAIN

Math puzzles are widely known to be an excellent way to exercise and develop the brain. They are an excellent way to engage your mind and challenge your problem-solving skills. Solving math puzzles stimulates your brain by forcing you to approach problems in new and creative ways.

Math puzzles are a great way to improve your logical thinking and reasoning abilities. They help you develop your ability to analyze information and think critically. By solving math puzzles, you can learn to identify patterns and relationships, which can be applied to other areas of your life.

Math puzzles can also improve your memory and concentration. They require you to remember numbers and equations, which can help you develop your memory. Additionally, they require you to focus on the task at hand, which can improve your concentration skills.

Overall, math puzzles are an excellent way to exercise and develop your brain. They can help improve your logical thinking, reasoning abilities, memory, and concentration. So next time you're looking for a fun and challenging way to engage your mind, try solving a math puzzle!

THE PUZZLE TIME CHALLENGE: LET'S SOLVE IT!

1. How many rectangles can you draw with a perimeter of 24 cm when it is given that each side is a whole number?

2. Of a rectangle and square having the same perimeter, which one will have a larger area?

3. A man runs around a square park and covers 1 km in five rounds. What is the area of the park?

4. A photograph is 7 cm long and 5 cm wide. It is surrounded by a border of uniform width. If the area of the border is 64 sq. cm, what is the width of the border?

5. I thought of a number. I added 3 to it and doubled the sum. Then I added 4 to the result and multiplied the total by −5. If the final answer is 100, what number did I start with?

6. Two six-sided dice are rolled. What is the probability that the sum of the numbers rolled on the dice will be a prime number?

7. A man walks at a speed of 150 steps per minute. Each of his steps is 0.7 m long. Find his speed in km/h.

8. In a certain code language, CHANDIGARH is written as DNAHCHRAGI. How is SIKKIM written in that code language?

9. If ÷ means plus, X means subtraction, then find the value of (15 X 9) ÷ (12 X 4) X (4 ÷ 4).

10. The compound interest on a sum for 2 years at 12% per annum is ₹510. What would the simple interest on the same sum at the same rate for the same period.

Answers will be published in the November 2023 (next) issue.

LET'S GET PREPARED FOR UPCOMING BOARD EXAMS

Grade 10 Mathematics

When it comes to math, it is often cited as one of the most feared subjects among students. This is a complex topic with many theories, formulas, and rules, so it requires a lot of critical thinking and hard work. But don't worry; math can be a great subject if you understand the concepts and don't just solve problems mechanically.

Here are some strategies and pointers to help you prepare for the exam, which will assess your analytical, problem-solving, and critical thinking abilities.

1. Get a Grip on the Basics Concentrate on getting a firm grasp of the basics before moving on to more advanced topics. Regular study helps retain information.
2. Practice with Sample Exams and Old Questions This will get you used to the format of the test and prepare you for the questions you may expect to see.
3. Use effective time management to get the most out of your exam time. It's best to tackle the easier questions first, then move on to the more difficult ones.

CBSE Class 10 Mathematics Question Paper Pattern 2024

The 80-mark paper consists of questions with marks ranging from 1 to 5. Question types would be mix of objective and analytical. The CBSE Class 10 Math Theory test lasts for three hours. It consists of 38 questions, all of which are required to answer (with the provision of internal choices)

The questions will be asked in the following format

Section	Number of Questions	Type of Questions	Marks Per Question	Weightage
A	20	MCQs	1	20
B	5	Very Short Answer Questions	2	10
C	6	Short Answer Questions	3	18
D	4	Long Answer Questions	5	20
E	3	Case Based Questions	4	12
Total	**38**			**80 Marks**

Calling for Contributions!

Introducing ENTECH Magazine, a breath of fresh air in the world of STEM publications! Our mission is to nurture the passion for science, technology, engineering, and mathematics among teenagers. We believe that knowledge should be accessible to all without any unnecessary distractions. That's why we are committed to providing a clutter-free reading experience by keeping our magazine free from irritating pop-ups and logins.

At ENTECH Magazine, your privacy is our top priority. We have no intention of collecting any personal information from our readers or monetizing it in any way. We rely on the support of our dedicated readers to keep us alive and provide high-quality content that inspires and educates.

By contributing to ENTECH Magazine, you are not only helping us continue our mission but also ensuring that teenagers across the globe have access to valuable STEM resources. Join us on this exciting journey as we empower young minds and shape the future of science and technology together!

Scan the QR code below and contribute INR 10 or more!

Editorial Team
ENTECH Digital Magazine

Call for Articles

Invitation to Share Your Expertise in ENTECH Magazine

Are you passionate about inspiring and educating the next generation of scientists, technocrats, engineers, and mathematicians?
Do you have valuable expertise that you want to share with young minds?
Look no further than ENTECH Digital Magazine.

ENTECH is a monthly publication that aims to inspire and educate budding scientists, technocrats, engineers, and mathematicians from class 8 to 12. We believe in the power of knowledge and strive to provide engaging content that sparks curiosity and fosters a love for STEM subjects.

We are currently accepting article submissions for our upcoming issues. Whether you have insights on the latest technological advancements, practical tips for aspiring engineers, or fascinating stories from your own scientific experiments – we want to hear from you! Our article word count ranges from 500 to 3000 words, allowing ample space for in-depth exploration of your chosen topic.

To share your expertise with our readership, simply reach out to our editor by filling the form on our website at address:
https://entechonline.com/contact-us/call-for-articles/

Include a brief summary of your proposed article along with any relevant credentials or experience. We value originality and creativity, so feel free to think outside the box when it comes to your submissions.

By contributing to ENTECH Digital Magazine, not only will you be able to showcase your knowledge and passion but also make a positive impact on young minds eager to learn. Join us in shaping the future generation of scientists and technologists by sharing your expertise today!

Warm regards

Editorial Team

Exciting opportunity to join the ENTECH Magazine Editorial Board and inspire future STEM enthusiasts!

ENTECH is an upcoming publication specifically designed for aspiring Scientists, Technocrats, Engineers, and Mathematicians. Our target audience consists of students aged 13 to 17 who are fascinated by careers in Science, Technology, Engineering, and Mathematics (STEM).

We aim to empower and inspire these young minds by providing them with valuable insights, educational resources, and real-life success stories from professionals in the field.

We are currently looking for experts for a valuable addition to our editorial board. Board members will have the opportunity to shape the content direction of ENTECH magazine and contribute their insights on various topics related to STEM education. This opportunity presents a momentous occasion for individuals to exert a substantial influence on the forthcoming cohort of STEM enthusiasts. Additionally, being part of our editorial board will offer exposure within the industry and provide networking opportunities with like-minded individuals who are passionate about promoting STEM education.

Our commitment requirement is flexible and manageable. Editorial board members can contribute articles or reviews while aligning with their existing commitments.

Together, let's inspire young minds towards a bright future in STEM!
If you would like more information about this exciting opportunity, please don't hesitate to reach out by filling out the form on our website at address:

https://entechonline.com/join-us/join-editorial-board/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team

Join ENTECH magazine as a Guest Editor for our Special Issue!

ENTECH is specifically designed for aspiring Scientists, Technocrats, Engineers, and Mathematicians aged 13 to 17. Our mission is to provide them with inspiring content that showcases the endless possibilities and exciting careers within STEM. We aim to empower and inspire these young minds by providing them with valuable insights, educational resources, and real-life success stories from professionals in the field.

Guest editors will have the opportunity to propose a special theme-based issue that aligns with their expertise and our target audience's interests. This is an excellent chance to share insights and contribute directly to shaping young minds' understanding of STEM education and careers.

Guest editors will be featured prominently in the special issue, which will enable them to gain visibility among our readership through their author bios and acknowledgements.

Let’s work together towards inspiring the next generation of STEM enthusiasts! To express interest or discuss potential themes, please fill out the form at link:

https://entechonline.com/join-us/join-as-guest-editor/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team

A Unique Opportunity to Become a Channel Partner of ENTECH Magazine!

ENTECH digital magazine is specifically designed for aspiring Scientists, Technocrats, Engineers, and Mathematicians in the age group of 13 to 17. We understand the importance of fostering curiosity and passion for STEM subjects among young learners.

Currently, we are looking for stakeholders in STEM education like scientific equipment, stationary, laptops, PCs, tablets, and DIY kit manufacturers or suppliers, book publishers, educational consultants, career counsellors, educational camps, tours, and workshop organizers as channel partners of ENTECH digital magazine.

Our esteemed channel partners will be provided a dedicated space on our website and a special mention in our monthly digital magazine. A small contribution from stakeholders in STEM education will help us stay alive and provide quality content to young aspirants in STEM education.

Let's work together towards inspiring the next generation of STEM enthusiasts! If you are interested in becoming a channel partner, please feel free to reach out by filling out the form at our website address:

https://entechonline.com/join-us/channel-partner/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team

ENTECH Exhibition

Exciting Opportunity to Showcase Your STEM Education Initiatives!

ENTECH magazine is specifically designed for aspiring Scientists, Technocrats, Engineers, and Mathematicians in the age group of 13 to 17. We understand the importance of fostering curiosity and passion for STEM subjects among young learners. By organizing this exhibition together, we can provide them with a platform to explore various STEM disciplines and discover exciting career opportunities.

We are seeking organizations that are leaders in the field of STEM education and can propose innovative ideas for the exhibition. The exhibition will not only help to create an impactful event but also give an opportunity to connect with a highly receptive audience that is eager to learn about the latest advancements in Science, Technology, Engineering, and Mathematics.

ENTECH magazine will provide extensive promotion through our online platforms, ensuring maximum visibility for the organization. This collaboration will not only showcase our commitment towards shaping future generations but also position the organization as a thought leader within the industry.

There can be a special track at the exhibition in which students can showcase posters or projects on STEM subjects.

Let's work together towards inspiring the next generation of STEM enthusiasts! If you are interested in volunteering as an organizer or a team member, please feel free to reach out by filling out the form below. We would be happy to provide more information and answer any questions you may have.
please feel free to reach out by filling out the form at our website address:

https://entechonline.com/join-us/submit-exhibition-proposal/

Warm regards

Editorial Team

Join ENTECH Magazine in Organizing a Conference on STEM Education!

ENTECH magazine is specifically designed for aspiring Scientists, Technocrats, Engineers, and Mathematicians in the age group of 13 to 17. We understand the importance of fostering curiosity and passion for STEM subjects among young learners. By organizing this exhibition together, we can provide them with a platform to explore various STEM disciplines and discover exciting career opportunities.

ENTECH is specifically designed for aspiring Scientists, Technocrats, Engineers, and Mathematicians aged 13 to 17. Our mission is to provide them with inspiring content that showcases the endless possibilities and exciting careers within STEM. We are inviting proposals for organizing a conference on STEM education. The objective of the conference is to inspire these young minds by providing them with valuable insights and educational resources to pursue rewarding careers. Individuals, groups, NGOs, organizations, schools, colleges, and other stakeholders in STEM education can propose a conference agenda that encompasses innovative teaching methodologies, emerging technologies, career guidance, and real-world applications of STEM subjects. There can be a special track at the conference in which students can present papers or showcase posters on STEM subjects.

Organizing a conference with us will provide an opportunity to gain exposure among our dedicated readership base and network with other influential professionals in the industry. We are committed to publishing a special issue on proceedings of the conference for the rapidly growing community of aspiring scientists, technocrats, engineers, and mathematicians.

Let’s work together towards inspiring the next generation of STEM enthusiasts! If you are interested in volunteering as an organizer or a team member, please feel free to reach out by filling out the form at our website address:

https://entechonline.com/join-us/submit-conference-proposal/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team

Call for News / Announcements

Calling for News / Announcements for our monthly magazine, ENTECH
ENTECH is a magazine dedicated to inspiring and empowering budding scientists, technocrats, engineers, and mathematicians in the age group of 13 to 17.
Our aim is to provide valuable resources and insights to students who aspire to pursue a career in these fields.

All stakeholders in STEM education can share information with us about new discoveries, technological advancements, upcoming events or competitions, educational opportunities, admission schedule, entrance examination schedule, or any other relevant updates by filling out the form at our website address:

https://entechonline.com/contact-us/submit-news/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team

Advertise with us!

Are you a stakeholder in the world of STEM education, such as
book publishers, EdTech companies,
career counsellors,
higher educational institutes,
universities,
scientific equipment manufacturers/resellers,
scientific DIY kit manufacturers/resellers,
laptop/tablet manufacturers/resellers,
scientific app developers,
computer coding institutes,
summer/winter training camp organizers,
scientific workshop organizers,
vocational training institutes and others alike?
Look no further!

ENTECH is a cutting-edge publication specifically designed to inspire and empower young minds aged 13 to 17 in the fields of science, technology, engineering, and mathematics (STEM).

With a dedicated focus on teenagers and their passion for science, technology, engineering, and mathematics (STEM), ENTECH Magazine offers you a unique opportunity to showcase your products and services directly to this highly influential demographic.

Not only do we offer prime advertising space within our digital publication, but we also provide opportunities for sponsorships and partnerships.
Don't miss out on this unique opportunity to connect with the future leaders of innovation.
Contact us today by filling out the form available on our website at address:
https://entechonline.com/contact-us/advertise-with-us

Let's discuss how we can tailor an advertising package that suits your specific goals and budget.

We would be happy to provide more information and answer any questions you may have.

Warm regards
Director
Coneixement INDIA (OPC) Pvt Ltd, Pune

Calling nominations for “APP of the month”

Don't miss out on reaching the next generation of innovators!

Introducing ENTECH Magazine, the ultimate platform for inspiring and empowering young minds in the fields of STEM! We are calling nominations for proposed "APP of the Month" feature, providing an exclusive opportunity for your product or service to directly reach and engage with the highly influential teenage demographic.

With a dedicated focus on teenagers and their passion for science, technology, engineering, and mathematics, ENTECH Magazine is at the forefront of providing captivating content that educates and excites. Our publication is a trusted resource for young minds aged 13 to 17, offering them a chance to explore the latest advancements in STEM.

By being featured as our "APP of the Month," you will gain unparalleled exposure to a targeted audience hungry for innovative solutions. Imagine the impact your product or service could have on shaping the future of these aspiring scientists, engineers, and tech enthusiasts!

Don't miss out on this incredible opportunity to showcase your offerings directly to this influential demographic. Join us at ENTECH Magazine and position your brand as a leader in inspiring the next generation of STEM enthusiasts. Nominate your app today by filling out the form available on our website at address:

https://entechonline.com/contact-us/submit-app-of-the-month/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team
ENTECH Digital Magazine

Calling nominations for “Book of the month”

Don't miss out on reaching the next generation of readers!

Introducing ENTECH Magazine, the ultimate platform for inspiring and empowering young minds in the fields of science, technology, engineering, and mathematics (STEM).
Our mission is to provide teenagers aged 13 to 17 with valuable content that fuels their curiosity and passion for these subjects.

With a dedicated focus on this influential demographic, ENTECH Magazine offers you an unparalleled opportunity to showcase your publication directly to the next generation of innovators.

We are currently calling for nominations for our “Book of the Month” feature. This is your chance to get your book in front of thousands of young readers who are eager to expand their knowledge and explore new ideas. Our readers trust us to curate the best content that aligns with their interests and aspirations.

Don't miss out on this incredible opportunity! Submit your nomination today and let us help you reach a passionate audience of young minds hungry for knowledge. Together, we can inspire the next generation of STEM leaders.

You can nominate your book by filling out the form available on our website at address:

https://entechonline.com/contact-us/submit-book-of-the-month/

We would be happy to provide more information and answer any questions you may have.

Warm regards

Editorial Team
ENTECH Digital Magazine

Calling nominations for “Project of the month”

Introducing ENTECH Magazine, the leading publication dedicated to nurturing the passion for science, technology, engineering, and mathematics (STEM) among teenagers.
Are you a young innovator with a ground-breaking project? We want to celebrate your achievements and provide you with the recognition you deserve.

With our "Project of the Month" initiative, we invite you to submit your remarkable project for a chance to be featured in our esteemed magazine. Imagine having your work acknowledged by industry leaders and showcased to our extensive network of readers who share your enthusiasm for STEM.

Not only will this opportunity put your project in the spotlight, but it will also serve as a powerful motivation for you to excel in your chosen profession. The recognition you receive from ENTECH Magazine can open doors to future collaborations, funding opportunities, and even potential career pathways.

Join us on this exciting journey as we highlight and celebrate young talents who are shaping the future of science and technology.

Don't miss out on this chance to showcase your project and inspire others with your ingenuity. Submit your nomination now by filling out the form available on our website at address:

https://entechonline.com/contact-us/submit-project-of-the-month/

Warm regards

Editorial Team
ENTECH Digital Magazine

Call us at +91 9307487957

Journey towards excellence

In the world of achieving linguistic proficiency, we're your trusted companions, navigating the path to excellence with you. Together, let's embark on this exciting journey to fluency, where every word you learn opens up new horizons and endless possibilities

Mr. Chittaranjan Kortikar
Founder of CK Institute

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