



ENTECH

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EXPLORE
YOUR
PASSION

**First
Anniversary
Issue**

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VOLUME-2 | ISSUE-10**

ENTECH

EXPLORE YOUR PASSION

October -2024 | VOLUME-2 | ISSUE-10
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for aspiring
Scientists
Technocrats
Engineers
Mathematicians

CAREER PLANNING COMPANION FOR GRADE 8 TO 12 STUDENTS

About the Magazine

ENTECH is a magazine that comes out every month. It is for teenagers between the ages of 13 and 18. The magazine focuses on Science, Technology, Engineering, and Mathematics (STEM). It helps teens find out what they are interested in and what they love. ENTECH shows them how to turn their passion into a career. The magazine has short articles. These are written by professionals, innovators, researchers, and teachers.

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From the desk of Editor

As we celebrate the first anniversary of **ENTECH STEM Magazine**, it's a good time to reflect on our journey together. Over the past year, we have explored science, technology, engineering, and mathematics. These fields spark curiosity and passion in our young readers. This milestone is more than a celebration of achievements. It's also a time to think about the future. It is needed for early-stage career planning. This is especially true for the fast-changing areas of artificial intelligence and quantum computing. This change is creating new career opportunities.

AI, or artificial intelligence, is a powerful tool. It is not just a trendy topic. AI is changing industries, driving new ideas, and changing the skills people need for work. Similarly, quantum computing is coming soon. It promises to solve complex problems. These problems are too hard for regular computers to handle. As these technologies grow, our way of planning careers must change too.

Why is early-stage career planning important?

The answer is the need for flexibility and looking ahead. When teens start thinking about career paths early, they make decisions based on good information. These decisions match their interests and strengths with skills needed in the future. This active approach helps young people create their own paths in the STEM field. It also builds their ability to handle changes that come with new technology.

Jobs of the Future

Think about this: the jobs of the future might not exist today. Some roles involve AI ethics, designing algorithms for quantum computers, and organizing data for machine learning. These are just the start. Students can start learning about these ideas early.

They can use classes, activities outside of school, and practical projects. By doing this, they can prepare better for a job market that values new ideas and creativity.

Early-stage career planning encourages exploration. It invites teenagers to dive into diverse fields. The combination of AI and quantum computing creates a unique platform for thinkers who love innovation.

As you receive this anniversary issue, take a moment to think about your own goals. Consider how you can control your career path. Remember, the choices you make today can create a bright and meaningful future.

Thank you for being a part of our ENTECH Online community. Let us inspire one another. We should embrace change. By doing this, we can create a path for the innovators of tomorrow.

With excitement for the journey ahead,

Sincerely yours,

Dr. Charudatta Pathak

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"WE SHOULD ENCOURAGE
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CARS SAFER. THEY CAN EXPLORE
EDUCATION IN FIELDS LIKE
MECHANICAL ENGINEERING,
AUTOMOTIVE ENGINEERING,
COMPUTER SCIENCE, AND MATERIALS
SCIENCE. "





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Editorial Team
ENTECH Digital Magazine



Is Your Body Electric? The Amazing World of Bioelectricity

**Dr. Pandit Vidyasagar
Dr. Sagar Jagtap**

Bioelectricity is the concept that our bodies vibrate with tiny **electric currents**, a **dance of energy** that drives our **lives**. Our **cells** communicate using these **pulses**, like lightning, which are like telegraphs. Nerves send these pulses, which cause hearts to beat, eyes to blink, and muscles to move. Our brains are also electric, powerhouses of thought and emotion. They use this energy for **self-healing**, healing cells, and causing skin to tingle. Our bodies are like hidden **eels** with currents flowing inside—a secret power that is silent but strong. Electricity is the spark of life, a constant presence in every **heartbeat**, thought, and move. Our bodies act as batteries, storing and releasing energy, which powers our lives. Understanding bioelectricity opens a new world where we are not just alive but electric.

Brief History

For ages, people have been aware of

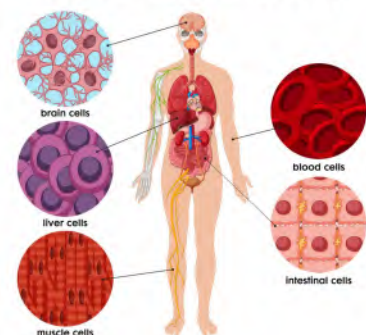
electricity in the form of lightning. In the past, humans were able to generate electricity through the use of **saltwater cells**. Volta developed presence of electricity in living systems. This was possible because electronic devices in the form of valves became available. Then it was possible to measure small currents of the order of microamperes. Placing electrodes on the **skull**

advancement has taken place in this field over the last century.

Cells of the Human Body

Now we know that every cell in the living system shows the presence of **electric potential**. However, **nerve** and **muscle** cells exhibit special **electric** characteristic properties. They form the basis of **brain** function. In the human being, the

Cells of The Human Body



Scientific medical illustration of cell types

nervous system is the most advanced and possesses many characteristics not found in other animals. We will present a brief account of this extraordinary phenomenon in the present article.

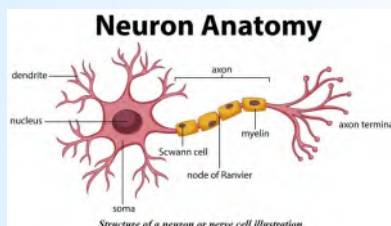
Electric brain signals illustration allowed for the recording of **electric brain signals**. Since then, a lot of

The vertebrate nervous system is made up of the **central nervous system** (CNS), which includes the brain and spinal cord, and two **peripheral nervous systems** (PNS) that encompass all sensory nerve cells and local ganglia (clusters of nerve cells). This system facilitates communication between different parts of the body, controlling reactions to stimuli, processing information, regulating behavioral patterns, and enabling adaptation. It primarily communicates by transmitting electrical signals through the fundamental building blocks of the nervous system, called **neurons**.

Nerve Cell or Neuron

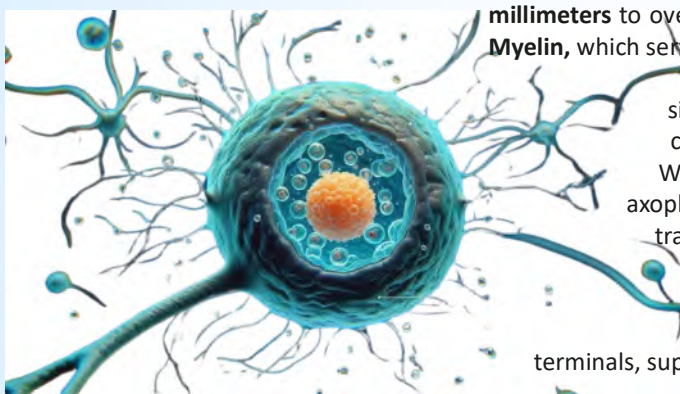
A **nerve cell**, or neuron, serves as the brain's primary unit for processing information, responsible for receiving, sending, and transmitting electrochemical signals throughout the body. Recent research indicates that the human brain contains about 86 billion neurons (Herculano-Houzel, 2009). These cells are different from other cells. After birth, they cannot reproduce. They cannot regenerate either. They do not grow back or multiply, despite being fully grown at birth.

Structure of Neuron



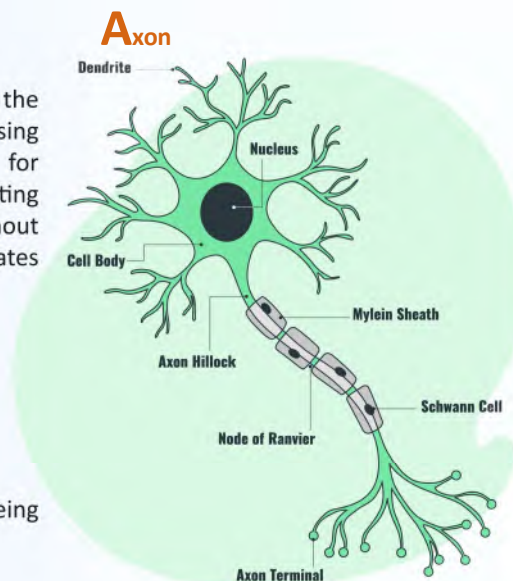
A neuron essentially consists of a cell body (soma), long neuron fiber (axon), and dendrites.

Cell Body (Soma)



The **soma**, or **cell body**, is the central part of the neuron, housing the nucleus and surrounding cytoplasm. Its primary function is to ensure the efficient operation of the neuron (Luengo-Sanchez et al., 2015).

A protective membrane encircling the soma engages with its immediate surroundings. The nucleus within the soma produces genetic information and regulates **protein** synthesis, which is essential for the functioning of other parts of the **neuron**. Additionally, the soma's membrane integrates signals received from other neurons.



The axon, also known as a **nerve fiber**, is a long, tail-like extension of a neuron that connects to the cell body at a region called the axon hillock. Its primary function is to transmit signals away from the cell body to terminal buttons, enabling communication with other neurons, muscles, or glands. Axons can also receive signals through dendrites and transmit them back toward the cell body. Most neurons have a single axon, which can vary greatly in length, from as short as **0.1 millimeters** to over **91 centimeters**.

Myelin, which serves as an insulator and speeds up signal transmission, covers some axons. Within the axon, the axoplasm facilitates the transport of proteins and organelles between the cell body and synaptic terminals, supporting the axon's

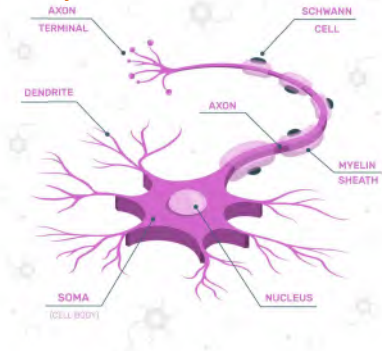
function. The release of neurotransmitters at synapses at the end of the axon enables communication with target cells.

Dendrites

Dendrites are parts of a neuron. They look like the roots of a tree. Dendrites are usually shorter than axons. Neurons have more dendrites than axons. Neurons are cells in the nervous system that send and receive information. Their main function is to receive information from other neurons and transmit **electrical signals** to the cell body. **Synapses**, which allow for the receiving of signals from nearby neurons, connect dendrites. While some neurons have short dendrites, others feature longer ones.

In the central nervous system, neurons often have long, complex dendrite branches that enable them to gather signals from many sources. For example, **Purkinje** cells in the **cerebellum** possess highly developed dendrites, allowing them to receive signals from thousands of other cells.

Myelin Sheath



The myelin sheath is a fatty layer that encases the axons of neurons, serving to insulate one nerve cell from another and preventing interference between impulses. It also enhances the speed of nerve **impulses** along the axon.

Glial cells, specifically **oligodendrocytes** and **Schwann** cells, wrap around the axon to form the myelin sheath. This insulation allows for much faster signal transmission compared to unmyelinated neurons. The myelin sheath contains gaps known as nodes of **Ranvier**, where

electrical signals can jump between nodes, further accelerating signal transmission.

Axon Terminals

At the end of the neuron, **axon terminals** (or terminal buttons) transmit signals to other neurons. Each terminal button contains vesicles filled with neurotransmitters. When electrical signals arrive at the buttons, they trigger the release of neurotransmitters. The **synapse** is a small gap between nerve cells where they can pass messages. **Neurotransmitters** are chemicals that help send messages across this gap. This process changes the **electrical signals** into chemical ones. Additionally, the terminal buttons reabsorb any extra neurotransmitters that the following neuron doesn't receive.

Types of Neurons

The human brain contains **billions** of neurons. Neurons are nerve cells that transmit information. There are many different types of neurons. We can categorize them into

three basic groups based on their function. The first group is **sensory neurons**. These have **long dendrites** and **short axons**. Dendrites are branches that receive signals from other cells. Axons are long fibers that send signals to other cells. The second group is **motor neurons**. These have short dendrites and **long axons**. The third group is **relay neurons**. These have **short dendrites** and **either short or long axons**.

Synapse

In neuroscience, a **synapse** is a place where two **neurons** meet. Neurons are nerve cells in the brain. The synapse is the point where one neuron sends information to another. It consists of the **axon**

terminal of the transmitting (pre-synaptic) neuron, the synaptic cleft (a small gap), and the dendrite or cell body of the receiving (post-synaptic) neuron. Neurotransmitters help neurons **communicate** with each other. There is a small gap between these neurons. **Neurotransmitters** move across this gap. They carry signals from one neuron to another. Although neurons don't physically touch synapses, they come close enough for a synapse to form, allowing them to communicate. This synaptic connection is essential for signal transmission, as signals traveling through a neuron must pass through a **synapse** to reach the next neuron.

At the **pre-synaptic** terminal, terminal buttons contain **vesicles** filled with neurotransmitters, which are key to passing signals to other neurons. When a neuron generates a signal, such as an action or graded potential, it triggers the release of **neurotransmitters** from these

vesicles. The neurotransmitters then diffuse across the synaptic cleft to reach and activate the post-synaptic neuron.

When a nerve impulse reaches the end of a neuron, it causes the release of chemicals called neurotransmitters. These neurotransmitters come from the terminal buttons of the **pre-synaptic**

neuron. The **pre-synaptic** neuron is the neuron that sends the message. The neurotransmitters move into a small gap called the **synaptic cleft**. They then attach to special proteins called receptors. These receptors are on the surface of the next neuron. The **post-synaptic** neuron is the neuron that gets the neurotransmitters. Neurons can receive signals from multiple terminal buttons, and similarly, the terminal buttons of a single neuron can form synapses with many other neurons.

A synapse is a combination of the following:

- **Presynaptic axon terminal** –

which contains the neurotransmitters (chemical messengers).

- **Synaptic cleft** – which is the gap between the two neurons, typically about 20 to 30 nanometers wide.
- **Postsynaptic dendrite** – which contains the sites for receptors (molecules that receive signals for a cell).

Synapses are critical for overall **neural** activity and are fundamental to many cognitive functions, such as learning and memory formation. Neuroscientists recognize that synapses enable communication between neurons, facilitating the transmission of signals necessary for brain function.

Synapse Transmission

Synaptic transmission can occur through **chemical synapses** or **electrical synapses**, each with distinct characteristics:

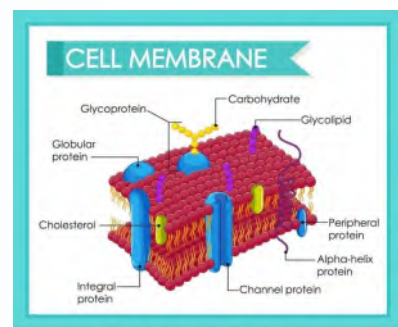
Chemical Synapses

- Gap between cells: approximately 20 nanometers
- Transmission speed: several milliseconds
- Can be either excitatory or inhibitory
- Signal strength remains constant throughout transmission

Electrical Synapses

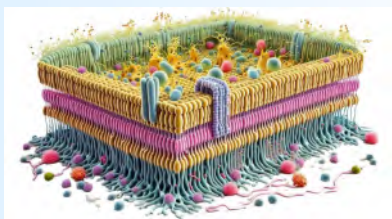
- Gap between cells: approximately 3.5 nanometers
- Transmission speed: nearly instantaneous
- Can be either excitatory or inhibitory
- Signal strength weakens over time and distance

Membrane Potentials



Cell membranes consist of a **fluid** mosaic of lipid and **protein** molecules. As shown in the figure,

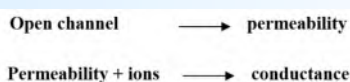
the lipid molecules are arranged in a **bilayer of 6 nm thick**, with their polar hydrophilic heads facing outward and their hydrophobic tails extending to the middle of the layer. The **lipid is sparingly permeable** to water and **virtually impermeable to ions**. Embedded in the lipid bilayer are protein molecules—some on the extracellular side, some facing the cytoplasm, and some spanning the membrane. Many of the membrane-spanning proteins form ion channels. Such channels allow ions like potassium, sodium, calcium, or chloride to move passively as a result of concentration gradients and the electrical potential across the membrane.



Conductance of Channel Human Cell for Bioelectricity

The conductance of a channel depends on two factors: The first is the ease with which ions can pass through the open channel; this is an intrinsic property of the channel known as the channel **permeability**. The second is the concentration of the ions in the region of the channel. Thus, if there are no potassium ions in the inside or outside solution, there can be no current flow through an open **potassium channel**, no matter how large its permeability or how great a potential is applied.

One way to think these relations is as follows:



Potassium current through the channel depends on both the electrical potential across the membrane and the potassium concentration gradient, i.e., on the electrochemical gradient for potassium. The difference in potential that just balances the potassium concentration difference is called the potassium equilibrium potential **E_K**. The equilibrium potential depends only on the ion concentrations on either side of the

membrane—not on the properties of the channel or on the mechanism of ion permeation through the channel.

Thus, in living cells, an electrical potential difference across the plasma membrane does exist, arising out of the unequal distribution of ions inside and outside the membranes. This potential difference between the inside and outside the **membrane** is called membrane potential. Several factors contribute to the existence of **membrane potential**, which includes:

1. Donan potential
2. Selective membrane permeability to solute
3. Active transport (chemical potential gradient) to maintain a concentration gradient

Nernst Equation:

If you measure the potential difference (voltage) across a membrane at equilibrium, this equation shows how the concentrations of an ion on each side of the membrane relate to each other. The membrane is perfectly selective for that ion. The Nernst equation is:

$$E_K = \frac{RT}{zF} \ln \frac{[K]_o}{[K]_i}$$

Where,

[K]_i - Inside concentration

[K]_o - Outside concentration

R = Gas constant, 8.135 J K⁻¹ mol⁻¹

T = Temperature in K

z = Valency of ion (Na⁺ is plus one, Ca²⁺ is plus two and Cl⁻ is minus one)

F = Faraday's constant, 9.684 x 10⁴ C mol⁻¹

This is the Nernst equation for potassium. The factor $\frac{RT}{zF}$ has the dimensions of volts and is equal to about 25 mV at room temperature (20 °C). It is sometimes more convenient to use the logarithm to the base 10 (log) of the concentration ratio, rather than the natural logarithm (ln). Then $\frac{RT}{zF}$ must be multiplied by ln (10) or 2.31, which gives a value of 58 mV.

$$E_K = 25 \ln \frac{[K]_o}{[K]_i} = 58 \log \frac{[K]_o}{[K]_i}$$

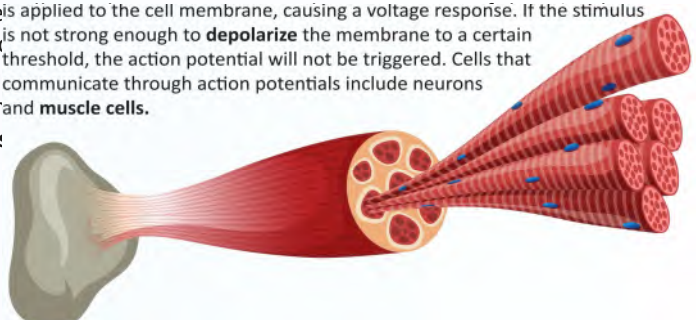
At mammalian body temperature (37 °C), 58 mV increases to 61 mV. It is negative with respect to the outside.

Action Potential

A surface membrane that surrounds nerve cells serves as a **barrier** to the diffusion of ion species (and polar solutes). Selective changes in the cell membranes' permeability to solute molecules (Na⁺, K⁺, Ca⁺, and Cl⁻) are what cause the majority of electrical signals in nerve cells. Electrically excitable cell membranes contain voltage-gated ion channels, which are responsible for the generation of action potentials.

An action potential is a rapid change in voltage, or membrane potential, across a cellular membrane, following a specific pattern. It occurs when sufficient stimulus is applied to the cell membrane, causing a voltage response. If the stimulus is not strong enough to **depolarize** the membrane to a certain threshold, the action potential will not be triggered. Cells that communicate through action potentials include neurons and muscle cells.

and **muscle cell**:



1. A stimulus initiates the rapid change in voltage, known as the action potential. In patch-clamp experiments, enough current must be applied to exceed the threshold voltage, triggering membrane depolarization.
2. Depolarization occurs when sodium channels in the membrane open, causing a rapid rise in membrane potential due to the influx of sodium ions.
3. Repolarization follows as sodium channels close and potassium channels open, leading to an efflux of potassium ions, which helps restore the membrane potential.
4. Hyperpolarization occurs as the membrane potential temporarily drops below its resting level due to the continued efflux of potassium and the closing of potassium channels.
5. Finally, the resting state is restored when the membrane potential returns to its original resting voltage before the stimulus.

Compound action potentials

Compound action potentials are the name for electrical signals produced by collections of nerve or muscle cells. Keeping electrodes primarily on the body's surface allows for the recording of these. Some of these signals, such as electrocardiogram (ECG) and electroencephalogram (EEG) are generated without any stimulus. Whereas (ENG), electromyogram (EMG), and evoked potentials need external stimulus. Compound action potentials provide useful information about the system from which they originate. For example, ECG provides information about the structure and function of the heart. EEG provides information about epileptic conditions and also about sleep patterns. EMG and ENG

signals can be used to find out muscle weakness and nerve degeneration. Evoked potentials provide information about visual, auditory and sensory system.

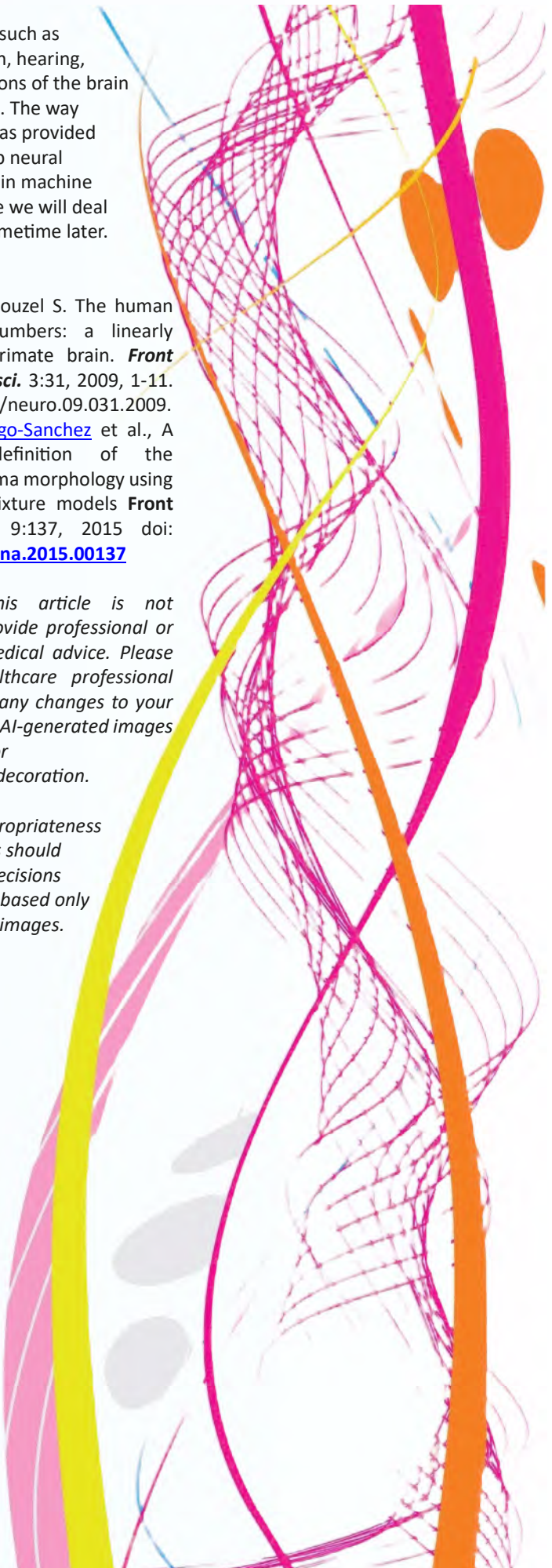
In short, the study of electricity in a living system is a very vast and emerging field. It is used to study

brain functions such as memory, speech, hearing, cognitive functions of the brain and many more. The way neurons work has provided clues to develop neural networks, used in machine learning. Maybe we will deal with aspects sometime later.

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Want to Build Safer Cars? This engineer's story will drive you to STEM education and a career!

**An interview
with Lakshmi
Prasad Bhatta
By Editor**

Designing and building **safer cars** is essential today. Recent global crash and accident data shows a concerning picture. The [World Health Organization](#) says that more than **1.3 million people die** each year in **road traffic crashes**. This makes it a leading cause of death worldwide. Additionally, **20–50 million** people have non-fatal injuries each year. **Non-fatal** means these injuries do not cause death, but many lead to lifelong disabilities. These **shocking numbers** show the urgent need to focus on **vehicle safety**. It is essential for creating a healthier and **safer society**.

The **automotive** industry must create and improve **cars** to keep everyone **safer**. This includes drivers, passengers, and pedestrians. It is important to make progress in features that protect people during **accidents**. Structural integrity refers to the strength and durability of a vehicle's frame. Accident-avoidance technologies help prevent crashes before they happen. By focusing on **safety**, the industry can save many lives. It also allows people to travel

feeling more **secure and calm**. To tackle this urgent challenge, the **automotive** industry needs a constant supply of young professionals. These professionals should be **passionate** about [STEM subjects](#). **STEM** stands for science, technology, engineering, and mathematics. We should encourage teenagers who want to make **safer cars**. They can explore education in fields like **mechanical** engineering, **automotive** engineering, computer solutions that align with safety regulations, aesthetics, and performance, integrating knowledge from crash engineering, materials science,

and aerodynamics. Ultimately, my best designs emerge from meticulous engineering that combines creativity with **safety and functionality**, ensuring the vehicle performs at its maximum potential.

Can you explain the importance of vehicle testing and validation in the design process for Safer Cars?

Vehicle testing and validation are crucial for ensuring my vehicle's **safety** and effectiveness in real-world conditions. I conduct simulations and **real-world** trials to



gather data that simulations alone cannot fully replicate. For instance, during **crash** testing, I lead the team to perform physical tests to validate the vehicle's behavior in actual accidents. Tools like **LS-Dyna** help me identify potential weaknesses in the design before physical testing begins. I also evaluate non-crash factors such as durability, noise, vibration, and harshness (**NVH**) to ensure smooth and comfortable performance throughout its lifecycle. Validation is important to me, as I ensure that virtual results align with physical test outcomes, taking real-world variables into account. I carefully calculate **airbag deployment** space to ensure proper functionality during impacts. This iterative process allows me to deliver a reliable and **safer car** on the

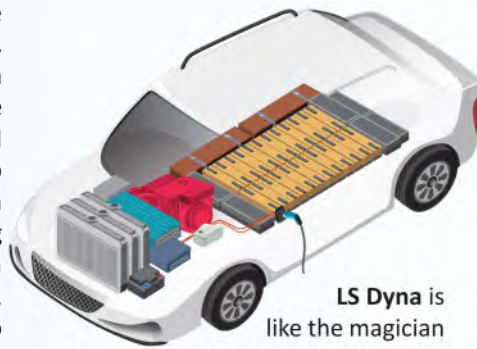


How do you set design guidelines to ensure that vehicles meet safety regulations and crash safety requirements?

Setting **design** guidelines to meet safety regulations and crash requirements is complex but essential in my vehicle engineering work. I analyze safety standards to protect occupants during accidents, establishing targets like **structural limits**. I also address the unique challenges of **electric vehicles** by designing an energy absorption structure to minimize **battery intrusion**. Continuously assessing designs with real-world data and simulations, I ensure compliance with evolving **safety standards** while enhancing overall performance and safety for occupants.

Technology and tools

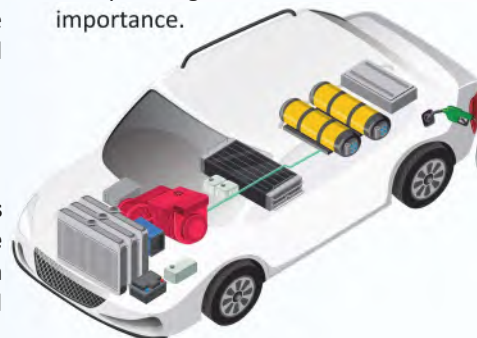
You have experience with various engineering tools. How do software applications like LS-Dyna and Ansa enhance vehicle design and analysis?



LS Dyna is like the magician of simulation software, just like other physics-based solvers—it uses advanced physics and mathematics to predict how materials will behave in a crash. It considers everything from material strength to how they fail under high-speed impacts. On the other hand, **Ansa** serves as a pre-processor, assisting us in building finite element models that feed into **LS-Dyna**. Together, they streamline the process, helping us design better cars faster while cutting down on development time and costs.

What are the key differences in developing internal combustion engines versus battery electric vehicles?

The difference is night and day! In internal combustion engine (**ICE**) vehicles, you've got fuel, exhaust systems, cylinders, and pistons. In electric vehicles (**EVs**), you're dealing with high-voltage battery packs and cables. EVs tend to be heavier, which can pose a significant risk during crashes. From a crash safety perspective, in **ICE** vehicles, you have to protect the fuel system to avoid fires. In EVs, it's all about protecting the batteries from thermal runaway—a fancy term for when they overheat and catch fire. Since highly **flammable** materials make up **batteries**, ensuring their safety during a crash is of utmost importance.



Challenges and Innovations

What are some typical challenges you face in vehicle design and development, and how do you overcome them?

From a **crash** and **safety** perspective, one of the most difficult challenges is dealing with variations in material behavior. Even small differences in the **forming** process or assembly can change how a car behaves in a crash. **test-to-test** variations also occur due to the non-linear behavior of materials, inconsistent sensor signals, and equipment. To overcome these, we build a **margin of safety**—typically 10–20% above the target performance for some sensitive testcases—in our virtual simulations. This gives us some breathing room when dealing with real-world variations.

How do you see the role of autonomous driving features evolving in the automotive industry?



Autonomous driving is changing the way cars work, making them smarter every day! In the future, cars will take over more driving tasks, like steering and braking. Currently, there are features like **automatic emergency braking (AEB)**, lane-keeping, and adaptive cruise control that help make driving safer. About 12 years ago, I implemented my idea for **AEB** in the Jeep program. It helps the car stop automatically if it detects a **collision** coming. It was one of the early steps toward making cars smarter and safer.

In the future, cars will be able to drive themselves without any help from a human driver! They'll use artificial intelligence, **sensors**, and machine learning to figure out how to drive in all situations. This will not only make driving safer, but it will also reduce traffic accidents caused by human mistakes. As these technologies get better, we'll have



cleaner, **safer roads** and more efficient transportation, which could change how cities work and help reduce pollution. It's an exciting future where cars might just do everything for us!

Teamwork and leadership As someone with excellent project management skills, how do you keep your team motivated and aligned with common goals?

dynamics knowledge with cutting-edge technology to design faster, safer, and environmentally sustainable vehicles.

What are some of the most significant projects you've worked on during your 20 years in the industry?

The key to a successful team is communication, trust, and recognition! Whether I'm leading a project to design a safer car or creating new **electric vehicle** technology, I always start by making sure everyone knows what we're working on and why it matters. This way, everyone is on the same page.

I also let my team members lead in different parts of the project, giving them the freedom to explore **creative** solutions. That's when the best ideas come out; everyone feels proud of their work. This kind of teamwork has led to some of the safest, most innovative cars on the

road today! Lastly, recognition is key to maintaining morale and motivation. Throughout my career, I've made it a point to celebrate every achievement, regardless of its size. Recognizing hard work fosters a positive and productive atmosphere. For instance, **FCA** awarded me for leading The **LATAM** programs and managing safety design improvements, which directly contributed to achieving higher **vehicle safety** standards.

Can you share an example of a complex task you managed and how you approached it with your team?

One of the hardest projects I worked on was making sure **electric vehicle** batteries stay safe in crashes. We needed to prevent the battery from catching fire during side impacts, which is a big challenge. To solve this, I broke the task into small steps. We first studied how the battery would react in different crash situations using simulations.

Then, I brought together a team of experts in materials, crash safety, and electrical systems. Together, we designed a new protection system that included energy-absorbing materials to stop the battery from breaking. After testing our designs through both **computer** models and physical crash tests, we found a solution that kept the battery safe even in the toughest crashes. This collaboration and careful planning helped us improve electric car safety!

Data analysis and future trends

Data analysis and future trends
How important is data analysis in the development of vehicles, and

what kind of data do you typically focus on?

Data plays a crucial role in my car design process, guiding my decisions before any physical builds. I focus on data from **crash simulations**, handling tests, and various forces to ensure passenger **safety** during collisions. I also analyze data from sensors and cameras for advanced driving features like lane assistance and automatic braking. As cars become smarter, I use more data to predict **maintenance** needs and traffic behavior. Ultimately, leveraging data allows me to design safer, more efficient, and reliable vehicles that meet global standards.

What upcoming trends in automobile engineering excite you the most, particularly regarding sustainability?



One of the most exciting trends I see is the rapid evolution of energy storage and propulsion systems, including solid-state batteries and hydrogen fuel cells, which promise longer driving ranges and cleaner energy for carbon-neutral transportation. The advancements in autonomous technologies and advanced driver assistance systems (ADAS) that improve safety and fuel efficiency also fascinate me. The emergence of **vehicle-to-everything (V2X)** communication aims to create smarter traffic systems, reducing congestion and emissions. Additionally, the push for lighter, recyclable materials in vehicle design addresses environmental concerns. Innovations in energy, materials, and smart technology are driving the future of automobile engineering, resulting in cleaner and more sustainable transportation.

Advice for Teens

What advice would you give to teens interested in pursuing a career in STEM, particularly in the field of automobile engineering?



First and foremost, I embrace curiosity in **automobile engineering**, constantly asking “**why**” and “**how**” to foster innovation and problem-solving. A strong grasp of mathematics and physics is essential, as these core subjects help me think critically and tackle problems creatively. I also prioritize hands-on learning, whether it's tinkering with **car** parts or experimenting with electronics. Staying updated on trends like electric vehicles and automation gives me an edge in the field. Perseverance is crucial, and I find satisfaction in overcoming challenges, collaborating with others, and continuously learning. Now is the perfect time to dive in, as the future of automobiles focuses on **sustainability** and **cutting-edge** technology.

Are there any specific skills or experiences that you believe are essential for young engineers entering this field?

As I embark on my journey in **automobile** engineering, I understand that building a solid foundation in physics, mathematics, and materials science is critical. Grasping the interactions of forces, motion, and energy helps me manage complex systems effectively. I value hands-on experience, applying classroom knowledge through internships and projects to solve real-world challenges. Being adaptable is essential in this fast-changing industry, so I make it a priority to stay updated on technologies like **electric** vehicles and autonomous systems. I also

recognize the growing significance of **data** analysis skills in developing smart vehicles. Lastly, I know that strong problem-solving and **teamwork** abilities are crucial; effective collaboration and clear communication are just as important as my technical skills. This blend of knowledge and **soft skills** will pave the way for my **success** in the field.

Closing Thoughts

How do you envision the future of automobile engineering in the next decade?

In the next decade, I'm excited to witness incredible changes in car technology! I envision cars that drive themselves, avoid accidents, and communicate with each other to prevent traffic jams. Electric vehicles will become incredibly common, with **faster charging** eliminating long wait times. We'll also see cars constructed from lightweight, recyclable materials, making the industry more **eco-friendly**.

Additionally, cars will become **smarter**, featuring personalized recommendations, smart navigation, and the ability to anticipate my needs. We are focusing on creating **safer**, greener, and more connected vehicles than ever before in the future!

What hobbies or activities outside of work do you believe complement Your skills as an engineer?

Outside of work, I love working on **DIY projects**. Whether fixing things around the house or designing solutions for everyday problems, this hands-on work keeps my engineering **mindset** sharp. I also enjoy biking, which gives me time to clear my mind and come up with new

ideas for my projects. I'm always reading about the latest tech trends, too, especially in **AI and electric vehicles**. Staying updated on new technologies inspires the innovations I bring to my work, like safety improvements for **Mahindra** vehicles. These hobbies help me stay creative and continue embracing innovative approaches in my professional life.

To stay updated with the latest developments in **STEM research**, visit [ENTECH Online](https://entechonline.com). This is our digital magazine for science, technology, engineering, and mathematics.

At [ENTECH Online](https://entechonline.com), you'll find a **wealth of information**. We offer insights and resources to fuel your curiosity. Our goal is to inspire your passion for new scientific discoveries.

[Everything a teen wants to know for career planning](https://entechonline.com)





AI and GPT Skills A Must-Have for Teens in Today's World

AI and GPT are rapidly changing the world. Technology is becoming an important part of our daily lives. AI is revolutionizing every industry, ranging from [healthcare](#) to finance, education to entertainment. Considering the technological landscape, the question arises: why is it crucial for individuals, especially teens, to learn technology?

The World Runs on Tech

The modern world is undoubtedly technology-driven. Tech plays a huge role in everything from diagnosing a patient to designing a bridge to creating digital art. The [automation](#) of patterns is becoming increasingly prevalent.



And those who can understand and apply will have a significant advantage. It's similar to learning to count, read, and write in the past. These fundamental skills will determine your position in the pyramid of importance in society. As you move higher, the more significant you are. The more significant, the better compensated.

Programming: The New Literacy with AI and GPT

Computer scientists have viewed programming as a complex skill

throughout human history. The truth is that programming is evolving into a fresh form of fundamental training. Writing code is not the only thing that matters. It's about solving problems, thinking logically, and being imaginative. Whether you're using a programming language like [Python](#) or just learning how to use artificial intelligence, it doesn't matter. Effectively interacting with technology is about asking the right questions and providing the correct prompts. Consider Google Search. [Google Search](#) revolutionized the way we find information when it first launched. But to get the best results, you needed to know the correct questions to ask, the appropriate keywords, and the right symbols to include. Similarly, with AI tools like [GPT](#),

understanding the mechanism of composing effective prompts is essential. It's crucial to understand the appropriate Vocabulary and the correct sequence of questions to ask.

The Open Book Test World

Imagine a world where all tests are open-book. It sounds like a dream, right? However, there's a catch: you must understand how to locate the **answers** you require. This is the world we're heading toward. With AI and technology at our fingertips, the key skill is not memorization, but the ability to use these tools effectively. In such a world, those who can



Navneet Karnani

leverage technology to their advantage will be able to achieve more in less time. It's not just about having access to information; it's about knowing how to use that information to solve problems and make [informed decisions](#).

Learning the appropriate content

Traditionally, education has been structured to introduce all students to a given set of topics. This is a beneficial idea since it lets the students explore the world with open eyes. Competitive economies evaluate these children based on their comprehension and proficiency in all the topics they have learned. This really goes against the intent. No one in the world is equally proficient at all kinds of knowledge.

The industry will soon start leveraging these AI tools to find the people who fit their organizations' goals.

A Perspective for Teens

For teens, learning technology is not just about future work prospects. It's about equipping themselves with the skills necessary to thrive in a tech-driven world. By understanding technology, teens can:

- **Develop critical thinking and problem-solving skills.** Tech-related activities, not only programming, can help teens develop these essential skills, which are valuable in all areas of life. Being able to use the CAD software to design a good building compliant with local government rules can become a breeze with this.

- **Become digital citizens:** Learning about technology empowers teens to use it responsibly and ethically, making them informed and engaged members of society. Just like “let the pedestrian pass” is an ethical choice that some individuals make, the teens who are introduced to AI early will develop their own code of conduct.
- **Pursue creative endeavors:** Technology offers countless opportunities for creativity, from coding to digital art. Teens can express themselves and explore their passions through technology. They will become less reliant on the diverse range of individuals required to construct a movie or a wheelchair in the modern era. This will facilitate a significant increase in the variety of creations available. This will consequently lead to an enhanced standard of living for all.
- **Gain a competitive edge:** Being more productive and better at skills that you have aptitude for will give the teens an edge. As they grow, they can specialize in their niche.

If you're a teen interested in learning to use technology, there are many resources available:

- **DIY projects:** Start by creating simple coding projects on your own to get a feel for what coding is all about.
- **Be an early adopter:** Be an early adopter of technologies that startups are creating in various fields. This will enable you to understand the use cases they are catering to, and more importantly, it will empower the teen to utilize these technologies creatively without the fear of failure.
- **Start early and experiment more:** Start building ideas in your area of choice. Build more. Even if they seem ridiculously unbelievable, try more combinations.

The Importance of Digital Literacy
It's essential for teens to develop digital literacy skills. Digital literacy involves understanding how to use technology effectively, safely, and responsibly. Here are some key aspects of digital literacy:

- **Online safety:** Teens should learn how to protect themselves online, including safe password practices, avoiding scams, and being mindful of personal information sharing.



- **Privacy protection:** Teens need to learn how privacy and personal information can be instrumental in ensuring a safe future.
- **Information literacy:** Teens should develop the ability to evaluate the credibility of information found online and distinguish between fact and fiction.
- **Digital etiquette:** Teens should learn how to communicate respectfully and appropriately online, following netiquette guidelines.
- **Problem-solving and troubleshooting:** Teens should be able to identify and solve common technological problems.

How to Get Started



Overcoming the Digital Divide

While the benefits of technology education are clear, it's important to address the [digital divide](#). Not everyone has equal access to technology and education. To ensure that everyone has an equal opportunity to succeed, it's essential to provide equitable access to technology and education. This includes:

- **Investing in technology infrastructure:** ensuring that schools and communities have access to reliable internet and computers.
- **Offering affordable technology:** providing discounts or subsidies for technological devices and internet access.
- **Providing digital literacy training:** offering programs to teach people how to use technology effectively.

The Role of AI in Education

AI can play a significant role in enhancing education. Here are some applications for AI:

- **Personalized learning:** AI can tailor educational content to individual students' needs and learning styles.
- **Intelligent tutoring systems:** AI-
- **Automated grading:** AI can automate the grading process, freeing up teachers' time to focus on more meaningful tasks.
- **Language learning:** AI-powered language learning tools can make language learning more effective and engaging.

The Future of Technology Education

As technology continues to evolve, the importance of tech education will only grow. Here are some trends to watch:

- **Increased emphasis on computational thinking:** computational thinking involves problem-solving and logical reasoning skills that are essential for the digital age.
- **Growth of online learning:** Online learning platforms are becoming increasingly popular, offering flexible and accessible education options.
- **Integration of AI in education:** AI will play an increasingly important role in education, providing personalized learning experiences and automating tasks.

Conclusion

In the age of AI and GPT, learning technology is not just an option; it's a necessity. It's about empowering individuals with the





From Ground to Orbit: What You Will Learn in the Aerospace Engineering Course

A. A. Arah
A. P. Parashotambhai
Dr. S. A. Hashim

Aerospace engineering is a specialized field. Many potential students do not know its scope. Unlike other courses, the opportunities in aerospace are not widely known. This can leave students unsure about career paths and possibilities. This article aims to fill that knowledge gap. It helps students understand aerospace engineering better. It guides them in choosing the right direction for their future. The article gives an overview of the four-year course. It provides a breakdown of the core subjects. These subjects are **aerodynamics**, **aerospace propulsion**, aerospace structures, and **flight mechanics and control**. It also covers specializations. Gaining practical experience is important to becoming a skilled professional. This article aims to provide a clear picture of the course. It shows job opportunities in aerospace engineering. It helps students find a path that suits their interests and goals.

What is Aerospace Engineering?

And those who can understand and apply will have a significant advantage. It's similar to learning to count, read, and write in the past. These fundamental skills will determine your position in the pyramid of importance in society. As you move higher, the more significant you are. The more significant, the better compensated.

Programming: The New Literacy with AI and GPT

Computer scientists have viewed programming as a complex skill. Aerospace engineering is about

designing and building aircraft and spacecraft. Imagine building rockets! This field combines creativity with **science**. Teens who love **math** and **physics** will thrive. But it's not just about numbers. It's about dreaming big. The excitement of launching a **rocket** is palpable. Boom! The thrill is unmatched.

Educational paths are varied. Many **universities** offer programs in **aerospace engineering**. They teach the basics. Students learn about aerodynamics, propulsion, and materials. It's challenging but rewarding.

Introduction Undergraduate courses in Space Science and Technology

There are three main undergraduate courses in Space Science and Technology. These are **Aerospace Engineering**, **Aeronautical Engineering**, and **Aircraft Maintenance Engineering (AME)**. This article focuses on aerospace and aeronautical engineering. Aeronautical engineering focuses on vehicles that move within the Earth's atmosphere. These vehicles include airplanes and helicopters.

This field involves the design, construction, and upkeep of these vehicles. Aerospace engineering includes more space-related subjects and specialized labs. Aerospace engineering is a broader field. It includes everything in aeronautical engineering. However, it also covers space vehicles. These are vehicles like rockets, satellites, and spacecraft. They operate **outside of Earth's atmosphere**.

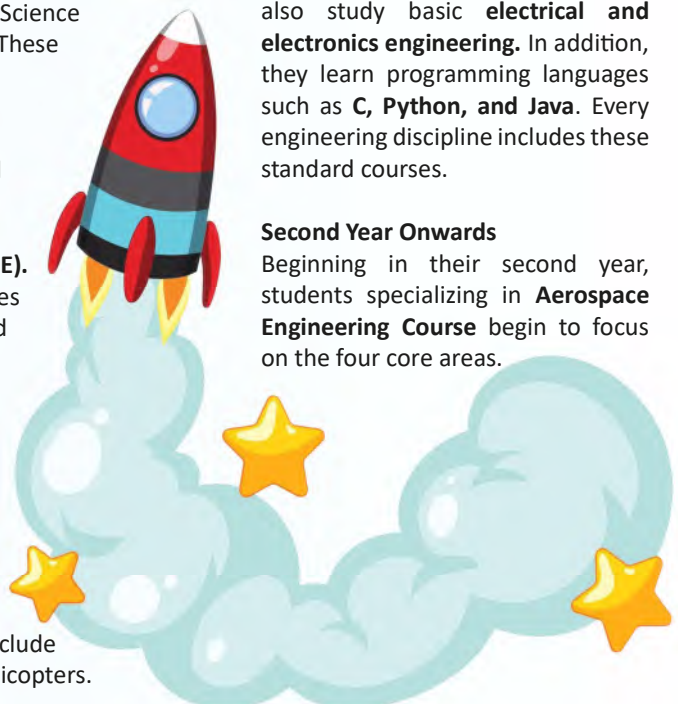
Core subjects of Aerospace Engineering Course

First Year

Students need to complete basic courses in their first year of engineering. These courses include **engineering mathematics**, **engineering physics**, and **engineering chemistry**. Students also study basic **electrical** and **electronics engineering**. In addition, they learn programming languages such as **C**, **Python**, and **Java**. Every engineering discipline includes these standard courses.

Second Year Onwards

Beginning in their second year, students specializing in **Aerospace Engineering Course** begin to focus on the four core areas.



1. Aerodynamics
2. Aerospace Structures
3. Aerospace Propulsion
4. Flight Mechanics and Control

Competitive economies evaluate these children based on their comprehension and proficiency in all the topics they have learned. This really goes against the intent. No one in the world is equally proficient at all kinds of knowledge.

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A Perspective for Teens

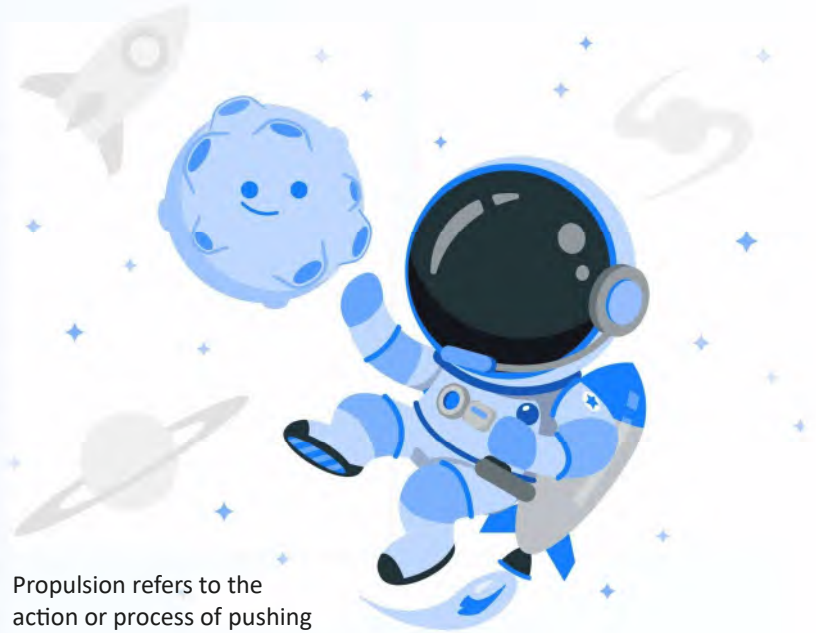
For teens, learning technology is not just about future work prospects. It's about equipping themselves with the skills necessary to thrive in a tech-driven world. By understanding

Visualization of aerodynamics with fluid dynamic simulations around a high-speed jet, showing airflow and pressure points

Aerodynamics refers to the study of how air flows around objects, particularly **aircraft and spacecraft**. It helps engineers design how vehicles can fly smoothly, improve fuel efficiency, reduce drag, and increase lift.

Aerospace structures are about design and building. They focus on making **strong and large parts**. These parts can handle forces without breaking. At the same time, they must be light.

A process of building a space rocket engine at NASA



Propulsion refers to the action or process of pushing or pulling to drive an object forward.

Aerospace Propulsion deals with the study of how to propel aircraft and spacecraft. This includes jet engines for planes and rocket engines for spacecraft.

These systems help keep the vehicle steady. They also help in maneuvering the aircraft and ensuring it flies smoothly.

The study of flight mechanics and control looks at the forces on an aircraft or spacecraft. These forces affect how stable and well it performs in the air and in space. Engineers design cockpit control systems to help pilots or autopilots.



The following table outlines specific topics within core areas of an aerospace engineering

Aerodynamics	<p>Introduction to Aerospace Engineering Overview of the field, covers basic aerodynamic concepts</p> <p>Fluid Mechanics The foundation for comprehending airflow, essential for studying aerodynamics</p> <p>Aerodynamics Branch of physics that deals with the movement of air and the forces that result from the interaction of air with solid objects used in aircraft, such as wings</p> <p>Aircraft Performance Application of aerodynamic principles to assess and improve flight performance</p> <p>Viscous Flows Advanced topic focusing on the effects of viscosity in aerodynamic flows</p> <p>Fluid Dynamics To understand the behavior of fluids under various conditions and their types</p> <p>Aerodynamics Lab To study the behavior of airflow and pressure distributions over objects though a wind tunnel</p>
Aerospace Structures	<p>Material Science and Metallurgy Study of materials used in aerospace structures</p> <p>Strength of Materials Fundamentals of stress, strain, and material behavior under loads</p> <p>Theory of Mechanisms Basic principles of mechanisms and machine design</p> <p>Aircraft Structures -1 and 2 It involves design, analysis and testing of the structural members of an aircraft so that they can resist the loads they experience during flight</p>

	<p>Composite Materials and Structures The study of materials used in aerospace applications, emphasizing the selection and testing of materials that can withstand extreme conditions</p> <p>Finite Element Analysis Numerical method for analyzing complex structural components</p> <p>Aero Elasticity Study of the interaction between aerodynamic forces and structural elasticity</p> <p>Aerospace Drawing Lab Design software like CATIA, AutoCAD, Fusion 360, etc. is used to create several mechanical and aerospace models</p> <p>Material Testing Lab Tests are performed to determine the hardness, strength and durability of several materials</p> <p>MATLAB Lab Creation and mathematical models and to run simulations to solve complex aerospace problems</p> <p>Computational Lab Ansys, Fluent and Abaqus are taught for simulations in aerodynamics, structures, and thermal analysis</p> <p>Aircraft Structures Lab Concepts like shear center are studied, and the aircraft components are tested for strength and stability</p>
Aerospace Propulsion	<p>Thermodynamics Basic principles of energy transfer, critical for understanding propulsion</p> <p>Heat and Mass Transfer It involves the study of energy transfer, heat flow, and the thermodynamic principles that are critical in the design of engines and thermal systems</p> <p>Gas Dynamics Understanding high-speed flows, which is crucial for propulsion systems</p> <p>Aircraft Propulsion Detailed study of jet engines and other aircraft propulsion systems</p>

	<p>Rocket Propulsion Focuses on propulsion systems used in spacecraft, rockets, and other advanced propulsion systems such as electrical, nuclear rockets and solar sails</p> <p>Thermodynamics Lab It provides experimental exposure to heat exchangers, piston engines, heat transfer properties of different materials, the operation of air conditioners and refrigerators, specific heat, and fuel combustion heat</p> <p>Aircraft Propulsion Lab Focuses on several engines, study of free and wall jet setup, free and forced convection, combustors, and propeller tests</p> <p>Heat and Mass Transfer Lab Focuses on concepts like conduction, convection and different types of heat exchangers</p>
<p>Flight Mechanics and Control</p>	<p>Space Mechanics Focuses on the motion and control of spacecraft, including orbit dynamics, attitude control, and navigation in space</p> <p>Vibrations Study of oscillatory motion, important for analyzing aircraft stability and control</p> <p>Control Engineering Study of systems control, essential for maintaining flight stability and performance</p> <p>Avionics Deals with the electronic systems used in aircraft, including navigation, communication, and control systems, as well as the integration of various subsystems</p> <p>Control Engineering Lab Explores systems that control and maintain the flight stability with control systems</p>

Experiential Learning through Project

During the eighth semester, students are required to complete a **final year project**. Students can either complete this full-time in college or in collaboration with the industry.

In most cases, an **aerospace engineering course** groups the core subjects and offers them on a **semester** basis. This structure enables one to **systematically** learn to succeed. The first and

second semesters begin with relatively basic information, while subsequent semesters progress toward more specialized information.

The following table outlines semester-wise subjects of an aerospace engineering course

Semester I	Engineering Mathematics I
	Engineering Physics I
	Engineering Chemistry I
	Technical English
	Problem-Solving using C
	Basics of Mechanical Engineering
	Basics of Civil Engineering
	Environmental Engineering
	Engineering Physics Laboratory
Semester II	Basic Engineering Workshop
	Engineering Mathematics II
	Engineering Physics II
	Engineering Chemistry II
	Career Development Program - I
	Problem-Solving Using Python
	Basics of Electrical Engineering
	Engineering Graphics
	Basics of Electronics Engineering
Semester III	Engineering Chemistry Laboratory
	Electrical and Electronics Laboratory
	Engineering Mathematics III
	Introduction to Aerospace Engineering
	Fluid Mechanics

	<p>Material Science and Metallurgy</p> <p>Strength of Materials</p> <p>Thermodynamics</p> <p>Fluid Mechanics Laboratory</p> <p>Machine Drawing Laboratory</p> <p>Career Development Program II</p>
Semester IV	<p>Engineering Mathematics IV</p> <p>Space Mechanics</p> <p>Aerodynamics</p> <p>Theory of Mechanisms</p> <p>Heat and Mass Transfer</p> <p>Aerodynamics Laboratory</p> <p>Material Testing Laboratory</p> <p>Career Development Program III</p>
Semester V	<p>Aircraft Performance</p> <p>Gas Dynamics</p> <p>Composite Materials and Structures</p> <p>Aircraft Structures I</p> <p>Aircraft Propulsion</p> <p>Modelling and Simulation using Simulink</p> <p>Propulsion Laboratory</p> <p>Career Development Program IV</p> <p>Design Thinking I</p>
Semester VI	<p>Aircraft Stability and Control / Spacecraft Stability and Control</p> <p>Finite Element Analysis / Viscous Flows</p>

	<p>Aircraft Structures II</p> <p>Rocket Propulsion</p> <p>Vibrations</p> <p>Professional Ethics and Constitution of India</p> <p>Aircraft Structures Laboratory</p> <p>Finite Element Analysis Laboratory</p> <p>Career Development Program V</p> <p>Design Thinking II</p>
Semester VII	<p>Aircraft Navigation and Guidance / Spacecraft Navigation and Guidance</p> <p>Control Engineering</p> <p>Aircraft Design / Spacecraft Design</p> <p>Aero Elasticity</p> <p>Intellectual Property Rights</p> <p>Control Engineering Laboratory</p> <p>Industry Internship</p> <p>Design Thinking III</p>
Semester VIII	<p>Project Work</p> <p>Entrepreneurship Management</p>

Subjects for Specialization

In the third semester, students can choose a subject that broadens their knowledge and improves their interdisciplinary training. The student can choose to focus on **specialized** areas of aerospace engineering like **structures, avionics, or propulsion**.



This lets the student learn more about a specific part of **aerospace engineering**. This opportunity enhances the learning processes of students by providing them with co-curricular exposures that extend beyond the conventional curriculum specializations.

Following are some of the key electives offered in the Aerospace Engineering Course.

- Digital Signal Processing
- Introduction to Avionics
- Control System Engineering
- Aircraft Navigation Systems
- Radar Technology
- Satellite Communication
- Avionics System Design
- Theory of Elasticity
- Finite Element Analysis
- Composite Material and Structures
- Fatigue and Fracture
- Advanced Materials
- Aircraft Design
- Vibrations and Aeroelasticity

The courses might look different at different places. Students have the option to pursue flexible programs by pursuing the listed electives as **major subjects** at certain educational institutions, while others may make them optional. This allows institutions to tailor the curriculum to match the college's niche or student demands.

Career Opportunities

Career opportunities are vast. **Aerospace engineers** work on planes, helicopters, and satellites. They innovate. They solve problems. Every day is a new challenge. The global demand for these engineers is growing. They are needed everywhere. From the U.S. to Japan. Opportunities are endless.

The field is not just for men. Women are soaring high too. Many **female engineers** are making waves. They inspire others. Their stories are powerful. "The sky is not the limit. It's just the beginning," said [Amelia Earhart](#). Her words resonate. They motivate young girls to pursue their dreams.

Closing Remarks

Aerospace engineering is more than a **career**. It's a passion and pushing boundaries. It's about exploring the unknown. The universe is vast. There's so much to discover. Every star is a possibility. The night **sky** is a canvas. Paint it with dreams.

Technology is advancing fast. **Drones, electric planes, and space tourism** are the future. **Aerospace engineers** are at the forefront. They shape the future. They are innovators. The possibilities are

endless. The future is bright. Challenges exist. The field is competitive. It requires dedication. But the rewards are worth it. The satisfaction of seeing a project take flight is immense. It's a feeling like no other. It's magical. The journey is worth every step. In conclusion, **aerospace engineering** is a field of endless opportunities. It's a world where dreams take flight. For **teens** with a **passion** for science and exploration, it's the perfect path. The sky is not the limit. It's just the beginning. So, spread your wings and soar. The universe awaits. To stay updated with the **latest** developments in **STEM** research, visit **ENTECH Online**. This is our digital magazine for science, technology, engineering, and mathematics.

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Creating Immersive Experiences: The Tech Behind VR and AR Systems

Larry Waters

In the huge world of tech, Virtual Reality (VR) and Augmented Reality (AR) stand out as two of the most game-changing ideas. These tools let people dive into digital worlds or add digital info to their real-world views, changing how we play, learn, and talk. As we stand on the edge of a new time, where the lines between the virtual and the real mix are blurred, it's key to grasp the complex technology that powers these experiences. This article, from ENTECH, aims to give a close look into the world of VR and AR, exploring how these immersive experiences are made possible.

The Essence of Immersion in VR and AR

The idea of immersion is central to the VR and AR experience. It's the feel that you're "inside" the digital space, fully involved and present.

Achieving this level of immersion needs a mix of technologies working together. From high-quality screens that cover our field of view to sensors that track our every move, the goal is to make the digital feel as real as possible. But what does it truly mean to be immersed? It means that our senses are so convincingly engaged that we forget the physical world and accept the digital one as our current reality. This level of engagement is what makes VR and AR so compelling and transformative.

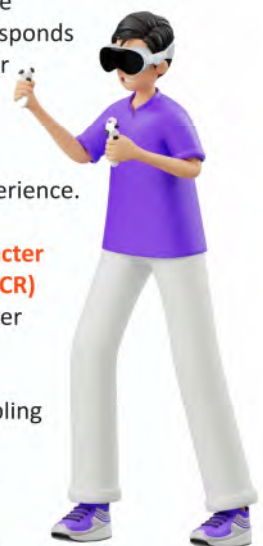
Sensors: The Unsung Heroes

Behind the magic of VR and AR lie sensors, the unrecognized heroes that make immersion possible. These small, often ignored parts play a huge role in making believable virtual worlds. From detecting the tilt of your head as you look up at a virtual sky to sensing the movement of your arm as

you reach out to touch a digital object, sensors are constantly at work. They gather lots of data, which is then processed in real-time to adjust the virtual environment. This continuous feedback loop ensures that the digital world responds instantly to user actions, creating a seamless and interactive experience.

Optical Character Recognition (OCR)

Optical Character Recognition enhances VR and AR by enabling real-time text recognition in immersive environments.



Learning more about this technology will help you understand OCR software and its role in these platforms. In AR, OCR allows users to scan and interact with real-world text, overlaying digital information or translations directly onto physical objects. For VR, OCR can digitize printed text or signs within the virtual space, allowing for dynamic content integration. This technology improves user engagement by seamlessly blending physical and virtual elements, creating more interactive and informative experiences.

The Role of 3-Axis Systems

3-axis systems are an important subset of MEMS technology. These systems can measure movements in three dimensions: up and down, left and right, and forward and backward. This tri-dimensional tracking is crucial for VR and AR experiences. It ensures that every nod of the head, every tilt, and every gesture is captured and mirrored in the virtual environment. By offering a comprehensive view of a user's movements, 3-axis systems ensure that the virtual world is always in sync with the user's actions, making the experience feel natural and intuitive.



and even finger positions. This allows users to interact with the virtual environment in more nuanced and intricate ways. For instance, a user could "grab" a digital object, "push" a virtual button or even "wave" to a digital character. By recognizing and responding to these gestures, VR and AR systems offer a richer, more interactive experience.

Challenges in Achieving Seamless Immersion

The path to perfect immersion in VR and AR is full of challenges. From ensuring accurate tracking in diverse settings to minimizing the latency that can break the feeling of immersion, developers face a myriad of hurdles. There's also the challenge of making these experiences accessible to a broader audience, ensuring compatibility across different devices, and optimizing power consumption for longer usage. However, with each challenge comes an opportunity for innovation, and the VR and AR community is continuously pushing the boundaries to enhance the user experience.

The Future: What Awaits VR and AR?

The horizon of VR and AR is full of possibilities. As technology continues to advance, we can envision even more immersive experiences, perhaps even engaging senses beyond sight and sound. Haptic feedback, which allows users to "feel" digital objects, is just one avenue of exploration. There's also the potential for multi-user virtual

spaces, where users can interact with each other in real-time. As AI and machine learning integrate further with VR and AR, we might even see virtual environments that can adapt and respond to individual users' emotions and preferences.

Conclusion: The Dawn of a New Digital Era

The merging of VR and AR technologies represents a big shift in how we interact with digital content. No longer are we passive consumers; with VR and AR, we become active participants, fully immersed and engaged. As things stand at this exciting juncture, it is clear that the developments and advancements in VR and AR will shape the future of digital interaction. The dawn of a new digital era awaits, and it promises to be nothing short of transformative.

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Gesture Recognition: Beyond Basic Tracking

While tracking a user's position and orientation is fundamental, recognizing their gestures adds another layer of depth to the VR and AR experience. Gesture recognition technology can identify specific hand movements



ENTECH Magazine



AI in High School Education: Why It May Not Be the Best Fit

Shilpa Kamble

In today's technology-driven world, we cannot avoid using **AI** in high school education. **Teens** are aware of the Internet and its vast resources. Students often use the Internet for school projects and assignments, but is it safe for them to rely on **AI (artificial intelligence)**? What exactly is AI, and why is everyone talking about it? From the term "**artificial**," we can infer that AI involves machines or something non-human. But why do people have different opinions about AI, especially in education?

My views as a tutor

As an online **biology** tutor, I frequently encounter students from various grades working on different topics, assignments, and projects. While it might be simple to direct them to AI for quick answers, I am truly helping them learn.

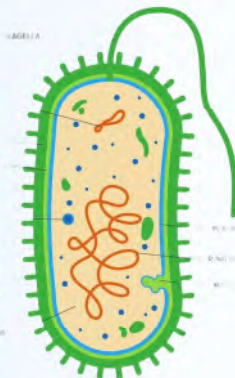
Typical test case

For example, in biology, understanding a topic like **cell biology** requires more than just reading a definition. A student might ask AI what a cell is, and **AI** might correctly respond that a cell is the basic unit of life. Does this help the **students** truly understand the concept? Many students need more detailed explanations, often with diagrams. As a tutor, I can gauge when a student is confused, and accordingly, I adjust my teaching approach. AI, however, lacks this ability to **adapt** based on a student's understanding.

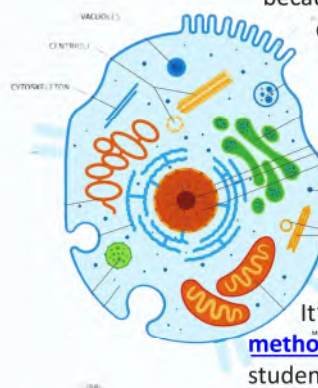
Intuitive use of AI in High School Education

While I agree that AI provides accurate information and helps scientists solve complex problems quickly, should we rely on it as a primary teaching tool? My teaching method is based on the scholastic approach, which encourages students to think critically and find answers on their own. Instead of directly providing answers, I guide students through the problem-solving process.

PROKARYOTIC CELL



EUKARYOTIC CELL



Students will search for another membrane in a **eukaryotic** cell and will understand that eukaryotic cells lack a cell wall.

Result

In the end, the students will be able to find the 3–4 differences between prokaryotic cells and eukaryotic cells.

Improved method for slow learners

The scholastic method is also unsuitable for slow learners because the guiding questions may confuse them. However, as a tutor, I would use diagrams and ask guiding questions, encouraging students to discover the answers themselves. This process fosters more profound learning and critical thinking.

It's true that the **scholastic method** may not work for every student, especially those who struggle with complex concepts. In such cases, it's the teacher's responsibility to adapt the approach, ensuring **students** grasp the material. Can we expect **AI** to provide this level of personalized support? **AI** is designed to deliver quick, direct answers, but it lacks the flexibility to change methods based on individual learning needs.

Role of internet in self-study

Parents, teachers, and researchers all understand the value of **self-study**. However, in today's busy world, with both parents working and teachers **overwhelmed** with

For instance, when students ask about the difference between **prokaryotic** and **eukaryotic** cells, AI might instantly provide 3–4 differences.

Tutor's way of explanation

However, as a tutor, I will share a few diagrams of **prokaryotic** cells and **eukaryotic** cells and will ask students what differences they noticed in these two structures. I will assist students by posing guiding questions. For example, I will ask students if they find two outer membranes in a **eukaryotic** cell.

responsibilities, the **internet** often serves as a source of encouragement for students seeking help. As **AI** and Internet access become more prevalent, it's likely that students will rely more heavily on these tools. I only hope that AI will not replace schoolbooks altogether.

Another concern is the notion that to develop **AI** in high school education requires only the **brightest** minds—those with top grades and academic records. What about average or above-average students? If these students constantly rely on **AI** for answers, are they getting a fair chance to develop their own **intelligence** and creativity? Imagine a scenario where students find it too time-consuming to read entire chapters and instead turn to AI for quick answers. This reliance could diminish their ability to think critically and solve problems on their own.

Closing remark

We cannot expect that **students** will suddenly stop using the **internet** or **AI**, but perhaps future technology could include safeguards—such as recognizing a user's age and limiting access to certain resources—to ensure that young learners are not over-relying on AI.

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Science News



Non-Fluorinated Battery Technology: Way towards a Greener Future

In a significant breakthrough for sustainable energy, researchers from South Korea have developed a non-fluorinated battery technology. This innovative approach aims to replace traditional batteries that rely heavily on harmful fluorinated compounds. The new technology promises enhanced performance, longer lifespan, and a reduced environmental impact.

The Need for Eco-Friendly Batteries

Batteries are essential in powering modern devices, from smartphones to electric vehicles. However, conventional batteries often contain fluorinated materials [like polyvinylidene fluoride \(PVDF\)](#) and lithium hexafluorophosphate (LiPF₆). These substances pose environmental risks and can release toxic byproducts, such as hydrogen fluoride (HF), during their lifecycle.

As environmental regulations tighten, particularly in the European Union, the demand for safer alternatives has surged. The EU plans to ban per- and polyfluoroalkyl substances (PFAS), including PVDF, by 2026. This regulatory shift has prompted researchers to explore non-fluorinated solutions that comply with upcoming standards.

Also Read: [Green Safe Water Batteries](#)

Innovative Developments in Battery Technology

The team from Pohang University of Science and Technology and Hansol

Chemical has created a novel battery system called the APA-LC system. This system features a new electrolyte made from lithium perchlorate (LiClO₄), replacing the fluorinated LiPF₆ electrolyte. Additionally, they developed a non-fluorinated aromatic polyamide (APA) binder.

“This innovative APA-LC system is entirely free of fluorinated compounds,” said Soojin Park from POSTECH. “We haven’t just replaced fluorinated systems; we’ve proven high-capacity retention and outstanding stability.”

The APA binder plays a crucial role in enhancing battery performance. It strengthens the bond between the cathode’s active material and the aluminum current collector, reducing electrode corrosion and significantly extending battery life.

Performance Metrics of Non-Fluorinated Batteries

The APA-LC system demonstrates impressive performance metrics:

It maintains 20% higher capacity retention after 200 cycles at a rapid charge/discharge rate of 1 C.

The system exhibits greater oxidation stability compared to the conventional PVDF-LP system.

Researchers successfully created a high-capacity 1.5 Ah pouch cell using this new technology.

These advancements indicate that non-fluorinated batteries can compete

with traditional systems while providing enhanced safety and sustainability. thought impossible for machines.

Environmental Benefits of Non-Fluorinated Systems

Switching to non-fluorinated battery technology offers several environmental advantages:

Reduced Toxicity: By eliminating harmful fluorinated compounds, these batteries minimize toxic emissions during production and disposal.

Biodegradability: Non-fluorinated materials are more likely to decompose naturally, reducing long-term environmental impact.

Compliance with Regulations: As regulations become stricter, adopting non-fluorinated technologies positions manufacturers ahead of compliance deadlines.

Future Implications for the Battery Industry

The successful demonstration of the APA-LC system marks a pivotal moment in battery technology. It opens doors for further research into scalable and practical solutions that prioritize both performance and environmental health.

As Soojin Park noted, “Our solution will advance the sustainability of the battery industry, facilitating the shift to non-fluorinated battery systems while ensuring environmental

compliance.”

This innovation could reshape how industries approach energy storage solutions. With growing awareness of climate change and sustainability, non-fluorinated batteries may play a crucial role in meeting future energy demands without compromising ecological integrity.

Conclusion

The development of non-fluorinated battery technology represents a significant step towards a greener future. By prioritizing sustainable materials and reducing environmental risks, researchers are paving the way for safer energy storage solutions. As this technology continues to evolve, it holds promise for transforming various sectors reliant on battery power.

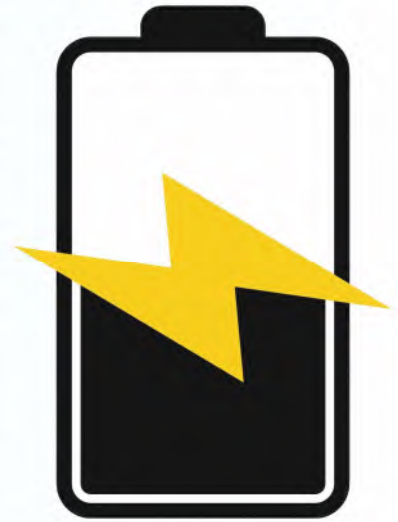
In summary, non-fluorinated batteries not only enhance performance but also align with global efforts toward sustainability. The future of energy storage looks brighter with innovations like these leading the charge.

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Science News

Future Earth? The Discovery of KMT-2020-BLG-0414

Astronomers have made a groundbreaking discovery that offers a fascinating glimpse into the possible Future Earth. The exoplanet, known as **KMT-2020-BLG-0414**, orbits a white dwarf star located approximately **4,000 light-years** away in the Milky Way galaxy. This finding suggests a scenario that mirrors what Future Earth may look like in about **8 billion years from now** when our Sun transforms into a white dwarf.

The Planetary System

The **KMT-2020-BLG-0414** system consists of a rocky planet, referred to as **KB200414Lb**, which is about **1.9 times the mass of our Earth**. It orbits its host star at a distance of **1 to 2 astronomical units**, roughly twice the distance between Earth and the Sun. The system also contains a brown dwarf, which is approximately **17 times the mass of Jupiter**. Brown dwarfs are often described as **"failed stars"** because they do not ignite nuclear fusion in their cores.

This discovery was made possible through a technique called **gravitational microlensing**. When KMT-2020-BLG-0414 passed in front of a more distant star, it temporarily magnified that star's light, allowing astronomers to detect Future Earth. The event was first observed in 2020 by the **Korea Microlensing Telescope Network**.

Interested in Astrobiology? Take a look [here](#).

What Lies in Future of Earth?

In about **5 billion years**, our Sun is expected to enter its red giant phase, expanding and potentially engulfing Mercury and Venus. There is uncertainty regarding whether Earth will survive this transformation. If it does, Earth could eventually resemble KMT-2020-BLG-0414, drifting further from the remnants of our dying star.

Lead author **Keming Zhang**, an astronomer at the University of California, San Diego, stated, "We do not currently have a consensus on whether Earth could avoid being engulfed by the red giant sun in 6 billion years."

He added that Earth will only be habitable for another **billion years** due to the runaway greenhouse effect, which will vaporize our oceans long before any risk of being swallowed by the red giant arises.

Read more about Cosmology [here](#).

Implications for Life in Future of Earth

The future of life on Earth during these cosmic changes remains uncertain. Scientists are still investigating whether life could survive through the red giant phase. However, if humanity can adapt, there may be opportunities for migration to other celestial bodies.

Zhang thought that moons like Europa and Enceladus might one day support life. Europa orbits Jupiter, and Enceladus orbits Saturn. These moons could turn into ocean worlds in the future. This could happen when the

Sun gets older.

"As the sun becomes a red giant, the habitable zone will move to around Jupiter and Saturn's orbit," Zhang explained. "I think, in that case, humanity could migrate out there."

Advancements in Exoplanet Research

The discovery of KMT-2020-BLG-0414 highlights important progress in exoplanet research. Astronomers are using **gravitational microlensing** as a powerful tool to find distant planets. This method works well for detecting planetary systems that traditional techniques, like the **transit** or **radial velocity** methods, may miss.

Astronomers are now exploring new avenues for studying exoplanets through microlensing events. This method opens up possibilities for discovering worlds previously thought to be unreachable.

Conclusion

The discovery of KMT-2020-BLG-0414 reminds us of our planet's potential future. It also shows how rocky planets can survive in tough cosmic environments. Scientists are still studying this faraway system. Their work helps us understand what may happen to Earth and other planets in our galaxy.

In summary, there are many things we don't know about the future of Earth. But new discoveries, like KMT-2020-BLG-0414, give us hope. They also make us curious about what might happen next for our planet.

We can also wonder about humanity's place in the universe.

Related News: [2 Moons for next 2 Months: Earth's new mini-moon](#)

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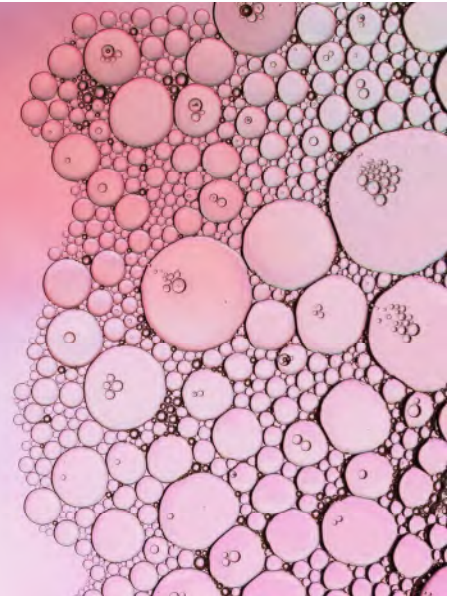
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Science News

Soft Cells: Nature's Efficient Geometric Shapes



In a groundbreaking discovery, mathematicians from the [Budapest University of Technology and Economics](#) and the University of Oxford have unveiled a new class of [geometric shapes](#) known as **soft cells**. This research, published in [PNAS Nexus](#), reveals how these shapes, which are characterized by their **curved boundaries** and **minimal sharp corners**, are prevalent in nature and can provide insights into both **biological structures** and **architectural designs**.

Understanding Soft Cells

Soft cells are unique in that they tile space seamlessly without **sharp angles**. In two dimensions, they feature curved edges with two pinched corners, while in three dimensions, they can exist without any corners at all. This innovative concept challenges **traditional geometric** models that rely heavily on straight lines and sharp angles.

Characteristics of Soft Cells:

- **Curved boundaries with minimal sharp corners**
- **Ability to tile surfaces without gaps or overlaps**
- **Observed in natural forms such as nautilus shells, zebra stripes, and onion layers**

The research team, including [Gábor Domokos](#), [Krisztina Regős](#), and [Alain Goriely](#), identified that nature tends to favor these soft shapes due to their structural efficiency. As

Domokos noted, "Nature not only abhors a vacuum; she also seems to abhor sharp corners." This preference for soft cells may help organisms save energy by minimizing deformation energy associated with **sharp angles**.

Implications for Architecture and Biology

The implications of this discovery extend beyond mathematics into the realms of architecture and biology. Architects like [Zaha Hadid](#) have intuitively employed soft cell designs to create structures that avoid harsh angles. The fluidity and elegance of these designs can be seen in iconic buildings such as the **London Aquatics Centre** and the in Baku.

Architectural Applications:

- Use of soft cells in modern architectural designs
- Inspiration drawn from natural forms to create aesthetically pleasing structures
- Potential for innovative building materials that mimic biological efficiency

In biology, understanding soft cells could provide insights into processes such as tip growth, a mechanism observed in various organisms including **algae** and **fungi**. By studying how these shapes form and function within biological tissues, researchers can uncover why certain patterns are favored by nature.

The Mathematical Journey

The mathematical journey to

discover soft cells involved creating an [algorithm](#) that transforms traditional geometric shapes into their softer counterparts. This process allows for the exploration of new classes of tiling previously unrecognized properties.

Key Findings:

- Soft cells can fill volumetric space without any corners
- The softest shapes tend to develop saddle-like features with flanged edges
- CT imaging confirmed natural occurrences of soft cells in nautilus shells

This [research](#) expands our understanding of geometry and emphasizes the interconnectedness of mathematics with natural phenomena.

Conclusion: A New Perspective on Geometry

The [discovery](#) of soft cells represents a



significant advancement in the field of mathematics and its application to the natural world. By redefining how we understand tiling and shape formation, this research opens up new avenues for exploration in both **biological sciences** and **architectural design**.

As we continue to study these elegant forms, we may uncover further secrets about the efficiency of nature's designs. The study highlights a profound truth: geometry is not just an abstract concept but a fundamental aspect of life itself.

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Science News

Revolutionary Stem Cell Treatment Reverses Type 1 Diabetes in World First



A 25-year-old woman from Tianjin, China has become the first person in the world to have her **type 1 diabetes** successfully reversed using a pioneering **stem cell treatment**. This innovative procedure involved reprogramming her stem cells to produce insulin and marks a significant milestone in **diabetes research and treatment**.

The Procedure: A Leap Forward in Diabetes Treatment

Dr. Deng Hongkui from **Peking University** led a team of researchers who conducted the treatment. Unlike traditional methods that rely on external insulin, this novel approach uses the patient's own stem cells. The process began with harvesting stem cells from her body, which were then reprogrammed into insulin-producing islet cells.

The team injected these cells into her abdominal muscles, allowing better monitoring and management of their activity through **magnetic resonance imaging (MRI)**.



Remarkably, within just two and a half months post-treatment, she began producing sufficient insulin independently. This eliminated her need for external insulin injections altogether.

Understanding Type 1 Diabetes

Type 1 diabetes is an autoimmune condition where the **immune system attacks** and destroys insulin-producing beta cells in the pancreas. This leads to an absolute deficiency of insulin. Patients must manage their blood sugar levels through regular insulin injections and careful dietary control.

- **Key Challenges:** Many patients find it impractical to rely on donor organs for islet cell transplants. Existing treatments often require lifelong use of immunosuppressants to prevent rejection of donor cells.

Patient's Remarkable Journey

After undergoing the stem cell treatment, the patient expressed her newfound freedom: **"I can eat sugar now!"** She shared her joy about enjoying foods she previously had to avoid, such as hotpot.

This highlights the profound impact this treatment has had on her quality of life. This success story is not just about one individual; it opens doors for future research and potential treatments for millions suffering from diabetes worldwide.

Also Read: [Blood Sugar Monitors DoYou Really Need Them?](#)

Expert Opinions on the Breakthrough

Expert Opinions on the **Breakthrough** James Shapiro, a transplant surgeon at the University of Alberta in Canada, described the results as **"stunning."** He emphasized that this treatment completely reversed diabetes in a patient who once relied heavily on insulin.

Daisuke Yabe, a diabetes researcher at Kyoto University, praised the study's potential impact: "If this can be applied to other patients, it will be revolutionary."

Future Implications and Research Directions

While researchers find this initial success promising, they remain cautious about its long-term implications. The patient was already on immunosuppressants due to a previous liver transplant. This raises questions about whether her newly produced islet cells might eventually face targeting by her immune system again.

The research team plans to expand their trials later this year to include more participants. If they replicate successful outcomes across a broader population, they could signify a monumental shift in how type 1 diabetes is treated.

- **Next Steps:** The patient will soon reach a critical two-year post-treatment milestone. If her

condition remains stable at that point, this innovative approach to diabetes management could receive further validation.

Conclusion: A New Dawn for Diabetes Treatment

This groundbreaking development in stem cell therapy represents hope for those living with type 1 diabetes. As researchers continue to explore and refine these techniques, we may witness the dawn of a new era in diabetes treatment—one where patients regain control over their health and enjoy life without constantly managing their condition. For more information on this revolutionary study and its implications for diabetes treatment, refer to the original publication in Cell.

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Diabetes





Revolutionary Wastewater Bacteria: Nature's Solution to Plastic Pollution

In a groundbreaking discovery, researchers from Northwestern University have identified a bacterium that can break down [polyethylene terephthalate \(PET\)](#) plastic. This plastic is a significant contributor to global pollution. The newly discovered tough plastic bacteria eating offer a promising solution to the growing crisis of plastic waste that affects our oceans, rivers, and landfills.

The Plastic Pollution Crisis

The world faces an unprecedented challenge with plastic pollution. Each year, millions of tons of plastic waste are generated. PET is particularly problematic due to its durability and resistance to degradation. Commonly found in food packaging and beverage bottles, PET can persist in the environment for decades. As a result, it poses severe threats to wildlife and contaminates water sources.

Discovery of the Bacterium

Recently, the research team isolated a bacterium named [Comamonas testosteroni](#), which thrives in urban waterways and wastewater. Notably, this microorganism has demonstrated an extraordinary ability to degrade PET plastic through a combination of physical and biochemical processes.

Mechanism of Action

The breakdown process begins as the bacterium chews the plastic into tiny fragments. Subsequently, it releases an enzyme that further

degrades the material. Consequently, this allows the bacterium to absorb carbon atoms as nutrients.

"We have systematically shown, for the first time, that a wastewater bacterium can take a starting plastic material, deteriorate it, fragment it, break it down, and use it as a source of carbon." ~ [Ludmilla Aristilde](#), the lead researcher.

This capability highlights the potential for optimizing this enzyme to effectively combat environmental plastic waste.

Implications for Environmental Sustainability

The implications of this discovery are profound. As plastic pollution continues to escalate globally, utilizing bacteria to break down plastics presents an innovative approach to waste management.



Potential Applications

Wastewater Treatment: Integrating *Comamonas testosteroni* into wastewater treatment facilities could enhance the breakdown of plastics before they enter natural ecosystems. **Bioremediation:** Furthermore, this bacterium could be used in bioremediation efforts aimed at

cleaning contaminated sites where plastic waste has accumulated.

Enzyme Optimization: Additionally, further research may focus on optimizing the identified enzyme for industrial applications in recycling processes.

Future Research Directions

Ongoing studies will delve deeper into understanding the genetic and metabolic pathways involved in this bacterium's plastic degradation capabilities. By elucidating these mechanisms, researchers aim to enhance the efficiency of this natural process.

Collaboration with Industry

Moreover, collaborative efforts between academic institutions and industries focused on waste management could pave the way for practical applications of this research. The potential for developing biotechnological solutions to tackle plastic waste is vast and could lead to significant advancements in environmental sustainability.

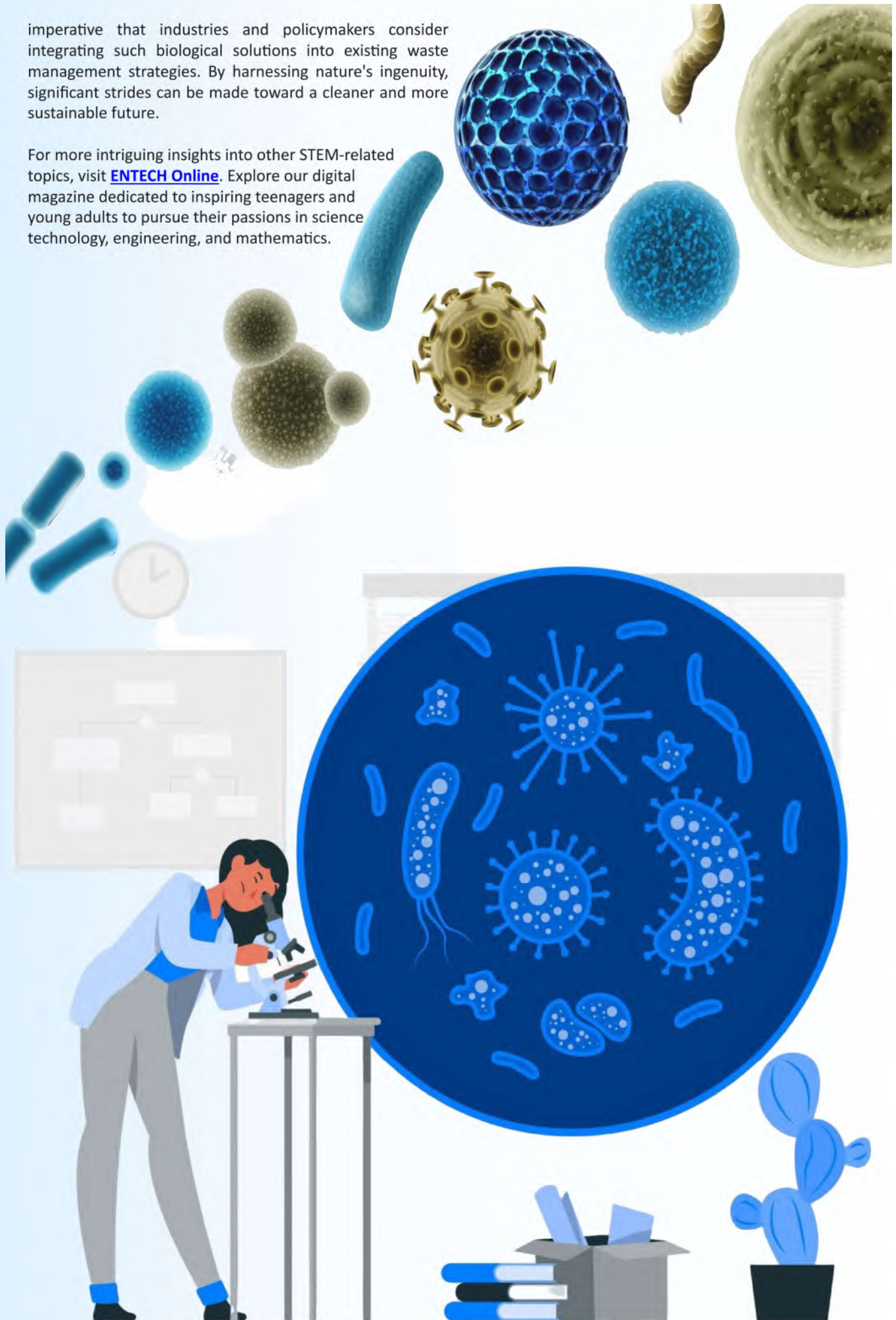
Conclusion

In conclusion, the discovery of this tough plastic-killer bacterium represents a pivotal moment in addressing the global plastic pollution crisis. As researchers continue to explore its capabilities, there is hope for innovative solutions that could transform how society manages plastic waste.

In light of these findings, it is

imperative that industries and policymakers consider integrating such biological solutions into existing waste management strategies. By harnessing nature's ingenuity, significant strides can be made toward a cleaner and more sustainable future.

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Science News



Physics Nobel Prize 2024

Celebrating John Hopfield and Geoffrey Hinton

The Physics Nobel Prize 2024 is an impressive tribute to the transformative power of machine learning and artificial intelligence (AI) in the field of physics. This year, we highlight the outstanding prize given to two distinguished pioneers, John Hopfield and George Hinton. Their outstanding achievements have created the groundwork for breakthroughs in artificial neural networks, revolutionizing different applications across industries.

Physics Nobel Prize 2024 and Its Legacy

Alfred Nobel started the Nobel Prize in Physics. It is a highly respected award in the field of science. This prize honors people whose creative ideas have greatly helped humanity. The tradition of awarding continues in 2024. The honorees this year made significant discoveries in machine learning. Machine learning is a type of artificial intelligence that enables computers to learn from data. Their work has changed how we explore science and use technology.

Nobel's goal was to reward people who make important progress in their fields. He wanted to encourage new areas to explore. John Hopfield and Geoffrey Hinton's work shows this spirit. They combined ideas from neuroscience and physics. Neuroscience is the study of the brain and nervous system. Their

spirit Alfred Nobel wanted.+

Who Are the Esteemed Winners?

To understand the brilliance of John Hopfield and Geoffrey Hinton, we need to look at their backgrounds and how their groundbreaking work began. John Hopfield was born in Chicago. He is a respected professor at Princeton University. Geoffrey Hinton is a distinguished scholar. He works at the University of Toronto. Their academic journeys, marked by relentless curiosity, have driven the field of machine learning forward.

Geoffrey Hinton's innovation, the Boltzmann machine, added another layer of complexity. It introduced the concept of hidden layers, allowing the network to create more abstract representations of data. This ability to uncover more in-depth insights into information marked a significant progression in AI's analytical prowess, enabling it to tackle tasks previously thought impossible for machines.

The Practical Magic of Machine Learning

The work of Hopfield and Hinton has countless practical implications. Today, machine learning is a ubiquitous technology, shaping industries and everyday experiences alike. From recommending a movie to identifying faces in a crowd, the applications are numerous and growing rapidly.

universe with unprecedented precision. For instance, in the search for exoplanets—planets orbiting stars outside our solar system—machine learning algorithms sift through vast datasets, identifying potential candidates faster and more accurately.

Moreover, the ethical dimensions of deploying AI systems continue to invite robust discussion. As Geoffrey Hinton underscores, ensuring the responsible development and application of AI is crucial. The potential challenges to human values must be navigated with care, as these technologies reshape society in unpredictable ways.

Neuroscience Meets Physics: A Powerful Union

The synergy between neuroscience and physics is at the heart of the breakthroughs made by John Hopfield and Geoffrey Hinton. Their research into artificial neural networks reflects a in-depth understanding of brain-like processing and its physical analogs, which is both fascinating and promising. firsthand, emphasizing the importance of safety and hygiene in scientific experiments.

Artificial neurons in a network settle into various states akin to the atomic spins in magnetic material, a cue borrowed from physics. This analogy

problems.

The pursuit of understanding the brain's workings through physics-based models offers manifold benefits, not least of which are devices and systems that mimic cognitive functions. These advancements hint at an exciting convergence of neuroscience and physics, fueling progress in both fields.

The Extraordinary Boltzmann Machine

Geoffrey Hinton's Boltzmann machine stands as a monumental achievement. At its essence, it is a type of neural network specifically crafted to learn and represent complex data patterns without explicit supervision. With its dual-layer structure, it processes and interprets vast amounts of information.

This innovative architecture allows the Boltzmann machine to autonomously discover features within data, making it a powerful tool for tasks such as image recognition and pattern classification.

The Boltzmann machine plays a central role in the machine learning landscape today. It classifies intricate data and generates new data, building on what it 'learns'. This capability is at the heart of technologies now central to our daily lives, from voice assistants to image recognition systems.

The conceptual leap that the Boltzmann machine made is a significant factor in the current AI renaissance, which emphasizes Hinton's crucial role. With ongoing refinements, the significance of these networks continues to grow, heralding further profound changes.

AI: Today's Reality and Tomorrow's Promise

As we venture into a digital age, the achievements of Hopfield and Hinton invite us to larger reflections on artificial intelligence. Their pioneering efforts in neural network research signal promising horizons, with machine learning poised to revolutionize myriad fields. From

healthcare to finance, the interoperability of AI systems is becoming critically relevant.

The unfolding of AI is as much about addressing opportunities as it is about confronting challenges. While the benefits of AI's ascendancy are palpable, ethical considerations must align with progress. Discussions about the responsible creation and implementation of those powerful technologies are more timely and vital than ever.

In the rich story of science and innovation, visionaries like John Hopfield and Geoffrey Hinton play a key role. Their works promise to inspire new discoveries. These discoveries happen where different fields of study meet.

Machine Learning's Role in STEM Careers

For teens captivated by the possibilities of STEM, the laureates' stories offer motivation and guidance. The increasing integration of AI into educational curricula signals expanding avenues for young minds. Exposure to concepts in machine learning can affect both academic interests and career choices. It emphasizes the increasing need for innovative thinkers in a digital economy.

Artificial intelligence (AI) is becoming an essential part of many fields. Careers in science, technology, engineering, and mathematics (STEM) will probably change because of this shift. Jobs will focus more on making decisions based on data. The groundwork laid through early education will be crucial in manifesting these opportunities, making nurturing the next generation's curiosity pivotal.

For students pondering futures in technology or science, a commitment to continuous learning and adaptability will be crucial. The Nobel Foundation's recognition of emerging fields underscores the impact that innovation can have. Engaging with STEM initiatives, robotics clubs, and coding hackathons are avenues for students to explore

their burgeoning interests.

Why This Nobel Prize Matters Now

The Nobel Prize in Physics 2024 doesn't just commemorate outstanding academic achievement. Instead, it highlights a profound shift in the landscape—machine learning is becoming integral to our lives and industries. This accolade emphasizes a broader movement toward intertwining technology with traditional fields, a trend visible across various sectors.

The transformative potential of AI technologies continues to expose the ways in which interdisciplinary collaboration enhances our collective capabilities. Whether in developing sustainable technologies, exploring the boundless universe, or diagnosing diseases, the technologies born from AI research are poised to tackle the world's pressing issues.

A New Era of Discovery

The journey of John Hopfield and Geoffrey Hinton illustrates the intersection of two worlds—neuroscience and physics—resulting in profound technological advances. As we stand on the brink of a future defined by AI, the possibilities stretch infinitely before us.

Understanding these foundations and engaging curiously with emerging technologies will shape not only careers but whole societies. The achievements of these laureates will inspire future discoveries. They



will energize research paths. This inspiration invites the next generation of scientists. These new scientists will continue exploring and asking questions.

The Final Thoughts

As we celebrate the endeavors of John Hopfield and Georgeborn Hinton, we reflect on the incredible journey of machine learning, from its conceptual infancy to its realization as a transformative force. Their story is a testament to curiosity, perseverance, and the relentless pursuit of understanding—a narrative especially meaningful to teens eyeing STEM careers.

In closing, let us remain inspired by the innovations at the forefront of AI research. May the legacies of our 2024 Nobel laureates ignite an unyielding quest for knowledge, curiosity, and a willingness to push the boundaries of understanding. The world of science awaits, ripe with discoveries and innovations just over the horizon.

Did You Know?

John Hopfield and Geoffrey Hinton's contributions went beyond academia, directly influencing the commercial AI systems used by the biggest technology companies today, such as Google's search algorithms and Facebook's facial recognition software.

The Boltzmann Machine is named after Ludwig Boltzmann, the physicist who developed statistical mechanics and the Boltzmann distribution, which heavily influenced Hinton's models.

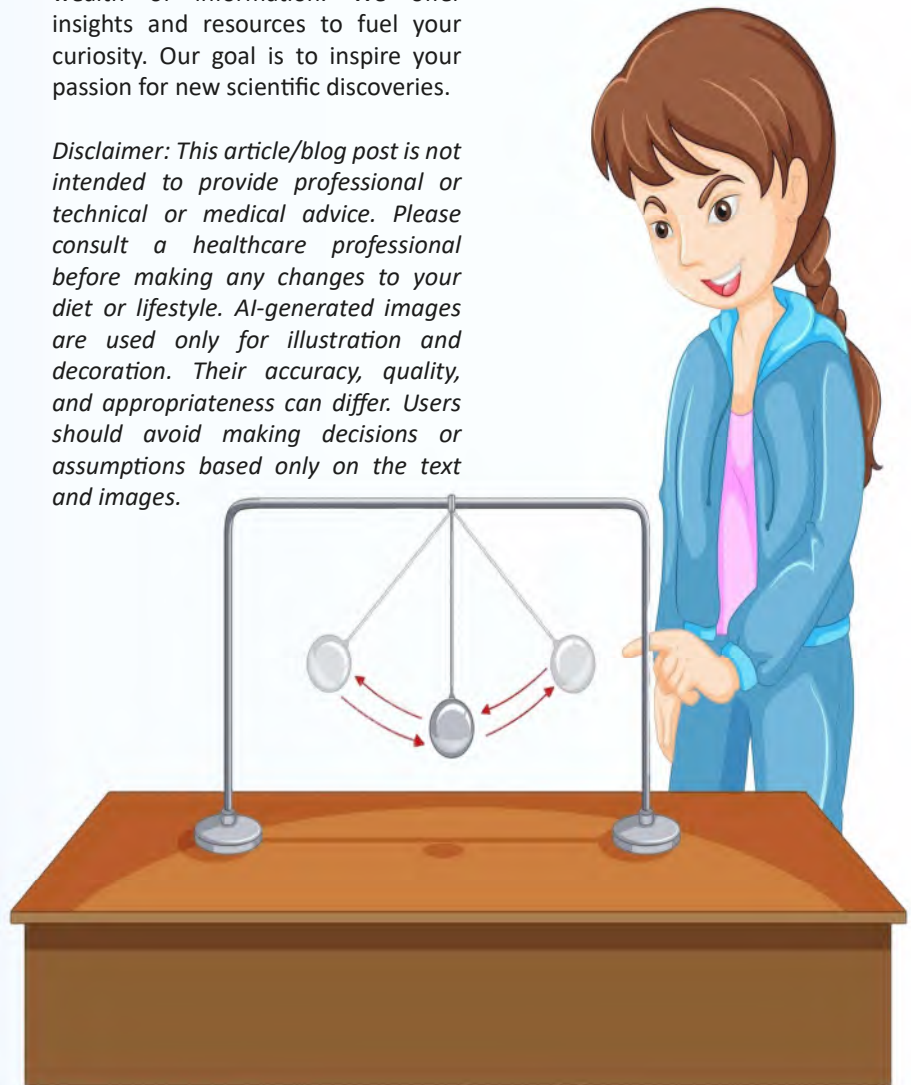
Various AI-based innovations in today's daily life, such as smart virtual assistants—like Siri and Alexa—trace their conceptual origins back to the pioneering models developed by Hopfield and Hinton.

For further reading on these fascinating subjects and a deeper dive into the intersection of physics and AI, do visit EnTech Online.

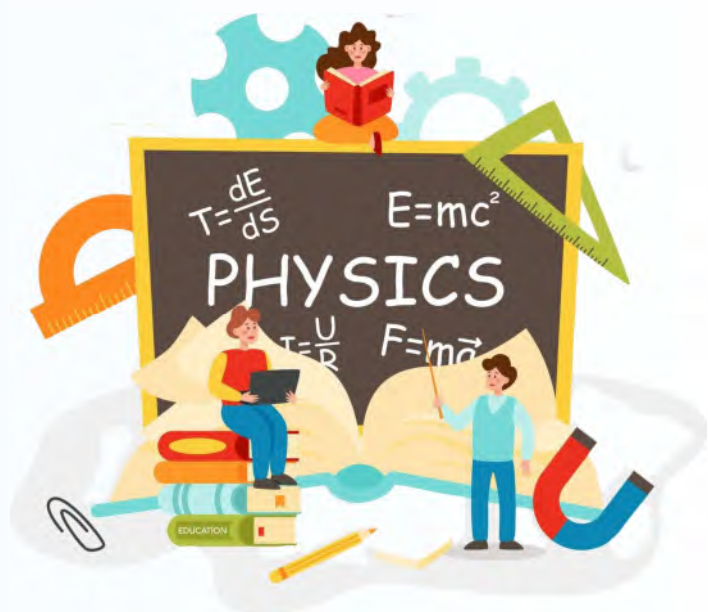
At ENTECH Online, you'll find a

wealth of information. We offer insights and resources to fuel your curiosity. Our goal is to inspire your passion for new scientific discoveries.

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Physics



Science News

2024 Nobel Prize in Chemistry: Transformative Work on Protein Structures



The Nobel Prize in Chemistry stands as a beacon of scientific achievement. In 2024, the chemistry [Nobel prize 2024](#) celebrated groundbreaking work on protein structures. Understanding protein structures is crucial in scientific research. Proteins play vital roles in biological processes. The 2024 Nobel Prize recognized the transformative contributions of David Baker, Demis Hassabis, and John Jumper. Their work has opened new avenues in drug development and biotechnology. The [Royal Swedish Academy of Sciences](#) awarded this prestigious honor, highlighting the significance of their achievements in the field.

Protein Inspired 2024 Nobel Laureates

Background of the Awardees Academic and Professional Achievements

I find it fascinating to explore the backgrounds of the [2024 Nobel Prize winners](#) in Chemistry. **David Baker**, a renowned scientist, has made significant strides in computational biology. He leads the Institute for Protein Design at the University of Washington. His work focuses on designing new proteins with specific functions.

Demis Hassabis and **John Jumper** have also made remarkable contributions. They are key figures at DeepMind, a company known for its cutting-edge AI research. Their collaboration has pushed the boundaries of artificial intelligence in biology.

Previous Contributions to Protein Chemistry

Before receiving the chemistry Nobel prize 2024, these scientists had already left their mark. David Baker's earlier work on protein folding laid the groundwork for his current achievements. His innovative approaches have transformed how we understand protein interactions.

Demis Hassabis and John Jumper tackled a long-standing challenge in biology. Their AI model, AlphaFold, predicts protein structures with remarkable accuracy. This breakthrough has revolutionized the field, earning them recognition in the scientific community.

Specific Contributions to Protein Structures

Innovative Techniques Developed

The laureates' work stands out for its innovative techniques. David Baker developed methods to design proteins from scratch. These techniques allow scientists to create proteins with desired properties, opening new possibilities in drug development.

Demis Hassabis and John Jumper's AlphaFold model represents a leap forward. It solves the complex problem of predicting protein structures from amino acid sequences. This achievement connects the sequence of amino acids to the [protein's structure](#), as noted by **Heiner Linke**, Chair of the Nobel Committee for Chemistry:

"[The award honored](#) research that made connections between amino acid sequence and protein structure."

Key Discoveries and Findings

Their discoveries have profound implications. David Baker's work enables the creation of novel proteins that can target specific diseases. This approach has the potential to revolutionize medicine.

AlphaFold's predictions have accelerated research in various fields. Scientists can now understand proteins' roles in biological processes more clearly. This understanding paves the way for [advancements in biotechnology](#) and drug discovery.

The Nobel prize 2024 celebrates these transformative contributions. The laureates' work not only advances our knowledge but also inspires future research in chemistry and biology.

Historical Context of Protein Structure Research Evolution of Protein Studies

Early Discoveries of Proteins

I find the early days of protein research fascinating. Scientists first began to unravel the mysteries of proteins in the early 20th century. They discovered that proteins are the building blocks of life, essential for various biological functions. The first [three-dimensional models](#) of proteins marked a significant milestone. These models helped researchers understand how proteins fold and function.

Milestones in Protein Research

Over the years, several breakthroughs have shaped our understanding of proteins. Frederick Sanger's work on protein structure

and DNA sequencing earned him [two Nobel Prizes](#) in Chemistry. His achievements laid the groundwork for modern biochemistry. The development of [tools for designing](#) and studying proteins has transformed the field. These advancements have made proteins the chemical workhorses of life.

Impact of Past Nobel Prizes

Previous Laureates in Protein Chemistry

The Nobel Prize has often recognized groundbreaking work in protein chemistry. For instance, James Rothman, Randy W. Schekman, and Thomas C. Südhof received the award for their discoveries related to vesicle traffic in 2013. Their work revealed the machinery that regulates cellular processes. Such achievements highlight the importance of proteins in life sciences.

Influence on Current Research

Past Nobel Prizes have significantly influenced current research. The chemistry Nobel prize 2024, awarded to David Baker, Demis Hassabis, and John Jumper, builds on this legacy. Their work on predicting and designing protein structures represents a transformative impact on biochemistry. By connecting amino acid sequences to protein structures, they have unlocked new possibilities in molecular biology. The Nobel prize 2024 continues to inspire scientists to explore the vast potential of proteins.

Methodologies and Techniques



In the world of protein research, I find the methodologies and techniques used by the 2024 Nobel laureates truly fascinating. Their work has reshaped our understanding of protein structures.

Cutting-edge Technologies Used

AI Models for Protein Prediction

The [AlphaFold system](#) stands out as a revolutionary tool. Developed by

Demis Hassabis and John Jumper, this AI model predicts protein structures with remarkable accuracy. It uses deep learning algorithms to solve a problem that puzzled scientists for decades. The model's predictions rival those obtained through traditional methods like X-ray crystallography. This breakthrough has [enhanced our understanding](#) of protein function, as noted in Science News.

Computational Protein Design

David Baker's contributions to computational protein design are equally impressive. He developed the Rosetta software suite, which allows scientists to predict and design protein structures. This tool enables the creation of proteins with specific functions, opening new possibilities in drug development. The precision of these models has transformed how we approach protein engineering, as highlighted in Jagran Josh.

Challenges Overcome

Technical Hurdles

Overcoming technical hurdles required innovation and persistence. The complexity of predicting protein structures from amino acid sequences posed significant challenges. AlphaFold's success in this area represents a [stunning breakthrough](#), as described by the Nobel Prize committee. The model's ability to decode protein structures has set a new standard in the field.

Scientific Barriers

Scientific barriers also demanded creative solutions. Designing proteins from scratch involves understanding intricate biological processes. David Baker's work in computational design tackled these barriers head-on. His methods have enabled scientists to create novel proteins, paving the way for advancements in medicine and biotechnology.

The chemistry Nobel prize 2024 celebrates these achievements. The laureates' innovative techniques have not only advanced our knowledge but also inspired future research. Their work exemplifies the transformative impact recognized by the Nobel prize 2024.

Implications of the Research

The 2024 Nobel Prize in Chemistry has profound implications for both medicine and broader scientific fields. I find it fascinating how the laureates' work on protein structures opens new doors for innovation and discovery.

Impact on Medicine

Drug Development

In drug development, the ability to design proteins with specific functions revolutionizes the field. [David Baker's research](#) on computational protein design allows scientists to create proteins tailored for pharmaceuticals. These proteins can target diseases more effectively, leading to the development of [new drugs and treatments](#). For instance, innovative proteins designed for pharmaceuticals and vaccines have the potential to address complex health challenges. This advancement marks a significant leap forward in personalized medicine.

Disease Understanding

Understanding [protein structures enhances our knowledge](#) of diseases. The AlphaFold model, developed by Demis Hassabis and John Jumper, predicts protein structures with remarkable accuracy. This capability allows researchers to explore how proteins function in biological processes. By understanding these processes, scientists can identify the root causes of diseases and develop targeted therapies. The insights gained from [accurate protein structure predictions](#) pave the way for breakthroughs in disease prevention and treatment.

Broader Scientific Impact

Influence on Other Fields

The impact of the chemistry Nobel prize 2024 extends beyond medicine. Protein research influences various scientific fields, including biotechnology and nanotechnology. The [creation of proteins](#) for sensors and nanomaterials demonstrates the versatility of protein engineering. These innovations have applications in environmental monitoring, energy production, and materials science. The ability to [tweak existing proteins](#) for specific functions opens

new possibilities across industries.

Future Research Directions

The nobel prize 2024 inspires future research directions in protein science. The achievements of the laureates encouragescientists to explore new frontiers in protein design and engineering. AI-driven approaches, like those used in AlphaFold, offer opportunities for further advancements. Researchers can leverage these technologies to tackle complex biological challenges and develop innovative solutions. The future of protein research holds promise for transformative discoveries that will shape the scientific landscape.



Societal and Global Impact

The 2024 Nobel Prize in Chemistry has far-reaching implications for society and the global scientific community. I find it fascinating how the laureates' work on protein structures not only advances science but also benefits people worldwide.

Benefits to Society

Health Improvements

The chemistry nobel prize 2024 highlights significant health improvements. [David Baker's research group](#) has created proteins for pharmaceuticals and vaccines. These innovations have the potential to revolutionize medicine. By designing proteins with specific functions, scientists can develop targeted therapies. This approach leads to more effective treatments for diseases. The ability to create novel proteins opens new possibilities in personalized medicine. Patients can receive treatments tailored to their unique needs, improving health outcomes.

Economic Implications

The economic implications of this research are equally profound. [Protein engineering](#) contributes to advancements in technology and industry. Proteins designed for sensors and nanomaterials have applications in various sectors. These innovations drive economic growth by creating new markets and industries. The development of pharmaceuticals and vaccines also boosts the economy. As new treatments become available, healthcare costs may decrease. This reduction benefits both individuals and society as a whole.

Global Collaboration

International Research Partnerships

Global collaboration plays a crucial role in the success of the nobel prize 2024 laureates. Scientists from different countries work together to advance protein research. International research partnerships foster innovation and knowledge sharing. These collaborations lead to breakthroughs that benefit the global community. By working together, researchers can tackle complex challenges more effectively. The chemistry nobel prize 2024 exemplifies the power of international cooperation in science.

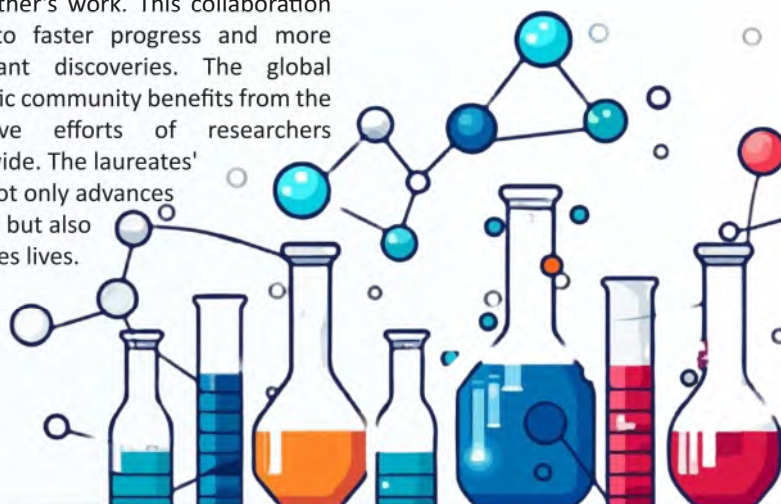
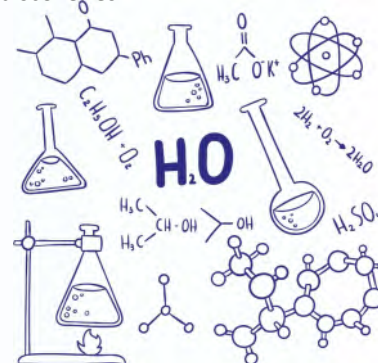
Shared Knowledge and Resources

Shared knowledge and resources enhance the impact of protein research. Scientists around the world can access the findings of the nobel prize 2024 laureates. This access accelerates research and development in various fields. By sharing data and resources, researchers can build on each other's work. This collaboration leads to faster progress and more significant discoveries. The global scientific community benefits from the collective efforts of researchers worldwide. The laureates' work not only advances science but also improves lives. Their

achievements inspire future research and highlight the importance of global collaboration. The 2024 Nobel Prize in Chemistry highlights the transformative impact of protein research. I see how the laureates' work has revolutionized our understanding of protein structures, paving the way for advancements in medicine and biotechnology. As we look to the future, [ethical challenges in proteomics](#) must be addressed to make this technology more mainstream in clinical research. It serves as a reminder of the importance of global collaboration and shared knowledge. It inspires future generations to explore new frontiers in protein science, ensuring continued progress and innovation.

To stay updated with the latest developments in STEM research, visit [ENTECH Online](#). This is our digital magazine for science, technology, engineering, and mathematics.

At [ENTECH Online](#), you'll find a wealth of information. We offer insights and resources to fuel your curiosity. Our goal is to inspire your passion for new scientific discoveries.



Science News

New Heart Attack Drug Inspired by Spider Venom Aims to Reverse Tissue Damage

Spider venom can cure heart tissues! Yes, you heard it right. The human body is an amazing machine. Scientists always look to nature for inspiration. They try to develop new treatments and therapies. One exciting breakthrough is a new heart attack drug. The Australian funnel-web spider's venom served as the source of inspiration for this drug. This spider's venom provided unexpected help in creating the medicine.

Researchers have been working on a molecule called **Hi1a**, which mimics a natural compound found in the **spider's venom**. This small protein might help protect heart tissue. It could protect against harm from a heart attack. Scientists are preparing to test this protein in human clinical trials. Human clinical trials are studies where scientists test new treatments on people to see if they work.

Tackling the Acid Problem

The key to **Hi1a's** potential effectiveness is its ability to target a specific process during a heart attack. During a heart attack, blood flow to the heart muscle is reduced. This lack of blood flow means the heart muscle gets less oxygen. When this happens, a chain reaction occurs. This reaction causes extra acidity to build up in the affected tissue.

Regulating Acid-Sensing Ion Channels

Acid-sensing ion channels, or ASICs, play a crucial role in this process. These tiny passageways allow charged molecules to flow in and out of heart muscle cells, and their activation during a heart attack contributes to the tissue becoming too acidic. This acidity ultimately leads to the death of the heart muscle cells. Too acidic. This acidity ultimately leads to the death of the heart muscle cells. That's where **Hi1a** comes in. This molecule is designed to block the **ASIC1a**

channel, short-circuiting the Process that leads to excessive acidity and cell death. **Hi1a** has the potential to shield The heart from the devastation a heart attack causes by Preventing this chain of events.

Promising Results in Animal Studies

Preclinical studies on **Hi1a** have yielded promising results. In a 2023 study published in the [European Heart Journal](#), researchers showed that injecting **Hi1a** into mice could effectively protect the heart from damage caused by a lack of blood flow during a heart attack. Similar beneficial effects were also observed in human heart muscle cells in a laboratory setting.

These findings suggest that **Hi1a** could be a game-changer in the treatment of heart attacks. **Hi1a** appears to possess a unique mechanism of action that directly targets the underlying tissue damage resulting from a heart attack. Unlike other drugs that have failed to make the leap from animal studies to successful human trials,

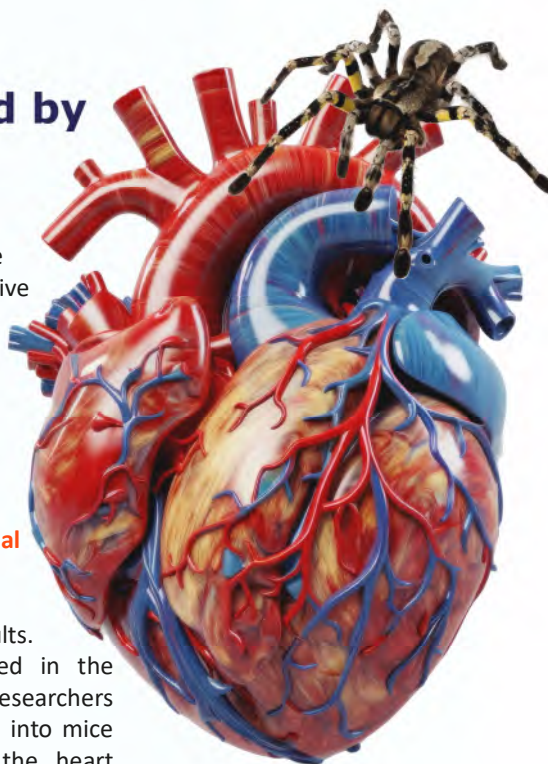
Advancing Toward Clinical Trials

With the promising preclinical results in hand, the research team is now preparing to take the next

step - testing trial. Starting next summer, the safety of **Hi1a** in a clinical they plan to launch a study in Australia to evaluate the drug's safety and tolerability in human participants.

Expanding the Potential Applications

The researchers have high hopes for **Hi1a's** potential beyond just treating heart attack patients. They believe the drug could also be used to increase the number of donor hearts available for transplantation. By protecting donor hearts from damage that can occur during the retrieval process, **Hi1a** could help expand the pool of viable organs for life-saving transplants.

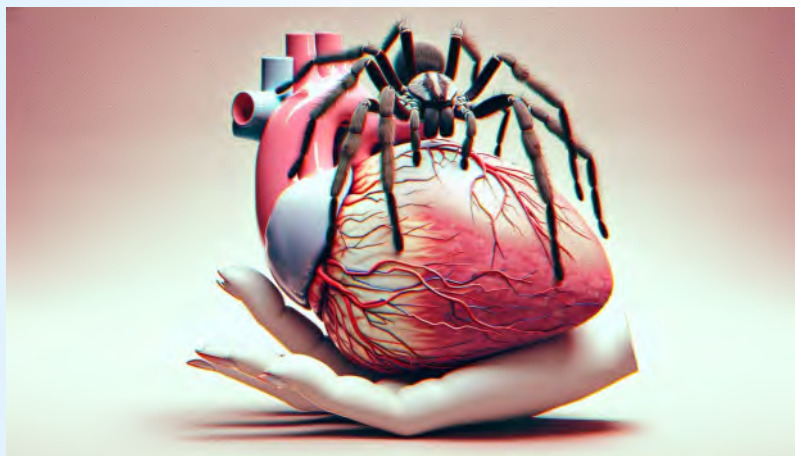


Of course, it will still be some time before we see **Hi1a** in the hands of healthcare providers. Clinical trials are a lengthy and rigorous process, and it may take several years to fully determine the drug's safety and efficacy. The first results caught the interest of the scientific community. Scientists are very interested. There could be a new treatment. This treatment can directly fix tissue damage. Tissue damage happens after heart attacks. This is an exciting development.

Turning to Nature for Inspiration

The story of **Hi1a** underscores the incredible potential that lies in exploring the natural world for medical breakthroughs. Researchers are studying spider venom. They have discovered something promising. This could help treat a major cause of death and disability around the world. Spider venom has unique properties. Researchers are focusing on these properties for treatment development. Harnessing the Power of Nature

As you continue your journey in the **STEM** fields, keep an open mind to the wonders of nature. You never know what incredible discoveries might be lurking just beneath the surface, waiting to be harnessed for the betterment of humanity. Stay curious, stay determined, and who knows - you might just be the one to



uncover the next game-changing innovation. To stay up-to-date on the latest developments in **STEM** education and careers, be sure to visit [ENTECH Online](https://www.entechonline.com). There, you'll find a wealth of resources, including our monthly digital magazine, to help you explore your passions and turn them into a fulfilling career.

References -

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Science News

Science Class is BORING! This is How They're REALLY Teaching It Now

In today's fast-paced world, technology and innovation lead the way. It is very important to focus on **experiential learning** in **STEM education**. STEM stands for Science, Technology, Engineering, and Mathematics. **Experiential learning** means learning through real-world experiences and hands-on activities. "Learning Life Sciences through Experiments," a recent workshop at **Wilson College** in Mumbai, showed how hands-on learning can change lives.

This is a story
That **STEM**
fans of the
future should
hear.

Bringing Science to Life

Imagine learning about **cells** in a fun way. Instead of only reading about them in a textbook, you can watch them under a **microscope**. Or, picture yourself separating plant pigments using **chromatography**, a technique you've only heard about in theory. This is the magic of **experiential learning** – a

hands-on approach that makes science come alive.

Wilson College and the **Bombay Association for Science Education (BASE)** organized this workshop. They wanted to help teachers gain practical skills. Teachers could then share these skills with their students. This would make **science** more engaging and relevant. They hope this will inspire a new generation of young scientists. These scientists will be eager to explore the wonders of the natural world.

Overcoming Challenges in STEM Education

Many schools and colleges face challenges in providing adequate laboratory facilities. Some institutions lack the necessary equipment, while others don't even have a functional **science lab**. Teachers often focus mainly on **theoretical knowledge**. This usually happens when they prepare students for competitive exams. These exams include JEE, NEET, and CET in India. These exams emphasize theoretical excellence, which can overshadow the importance of practical learning.

The workshop addressed these issues by giving teachers the tools and techniques to incorporate hands-on experiments into their teaching. By doing so, they can help students connect theoretical concepts with real-world applications, fostering a deeper understanding of life sciences.

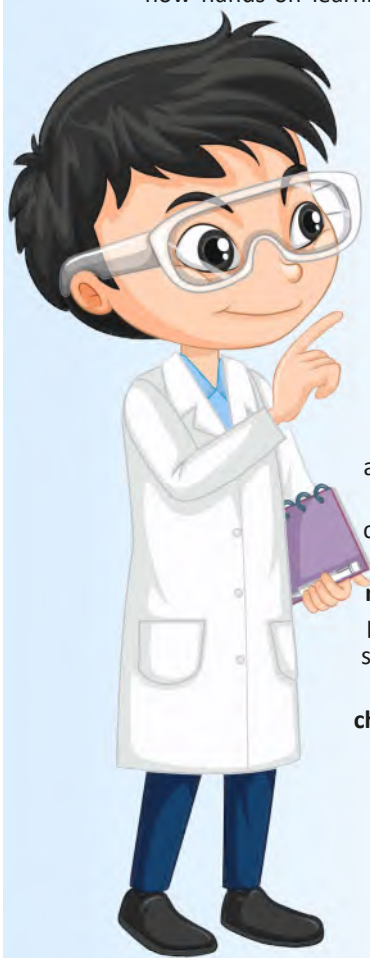
Hands-On Experiences: Case Studies from the Workshop

The workshop featured a variety of engaging experiments that highlighted the power of experiential learning. Here are some key activities that took place:

1)Zoology: Observing Red Blood Cells Teachers learned how to observe the structure of **red blood cells (RBCs)** using a simple solution of salt water. They discovered how everyday substances like salt can help maintain the biconcave shape of RBCs, making them visible under a microscope. Participants even drew their own blood to see the process firsthand, emphasizing the importance of safety and hygiene in scientific experiments.

2)Botany: Separating Plant Pigments In the Botany session, teachers conducted ascending paper **chromatography** to separate plant pigments. This experiment allowed them to see how different solvents can create colorful bands, a technique they had only known theoretically. This hands-on experience not only deepened their understanding but also equipped them to teach this fascinating concept to their students.

3)Microbiology: Exploring the Microscopic World The Microbiology session introduced teachers to the world of **microorganisms**. They used crystal violet dye to stain samples, making it



shape and arrangement of bacteria. Another experiment involved monitoring the movements of microorganisms in pond water, demonstrating how science is present in everyday life, such as in the process of baking bread using yeast.

4)Career Guidance: Discovering STEM Opportunities The workshop concluded with a career guidance session that opened teachers' eyes to various career paths in biological sciences. While many students aspire to become doctors or enter the healthcare sector, the session highlighted other exciting fields like forensic science, biotechnology, and environmental science. This discussion encouraged teachers to inspire their students to explore diverse career options in STEM.

The Transformative Power of Experiential Learning
The feedback from the 30 participating teachers was overwhelmingly positive. Many expressed that the workshop not only enhanced their understanding of life sciences but also reignited their passion for teaching. One teacher remarked, "This program has given me the tools to make biology more exciting and relevant for my students." Such enthusiasm is crucial for inspiring the **next generation of scientists**.

Why Experiential Learning Matters for You

As a teen interested in **STEM education**, embracing the power of experiential learning can be a game-changer. Here's why you should consider this approach:

Real-World Applications: Hands-on learning helps you see how scientific concepts apply to real-life situations, making the subject matter more relevant and engaging.

Enhanced Understanding: Engaging in experiments allows you to grasp complex ideas more easily. You'll remember what you learn because you've experienced it firsthand.

(with inputs from **Dr. D. V. Prabhu** and **Ms. Sanchi Gaikwad**)

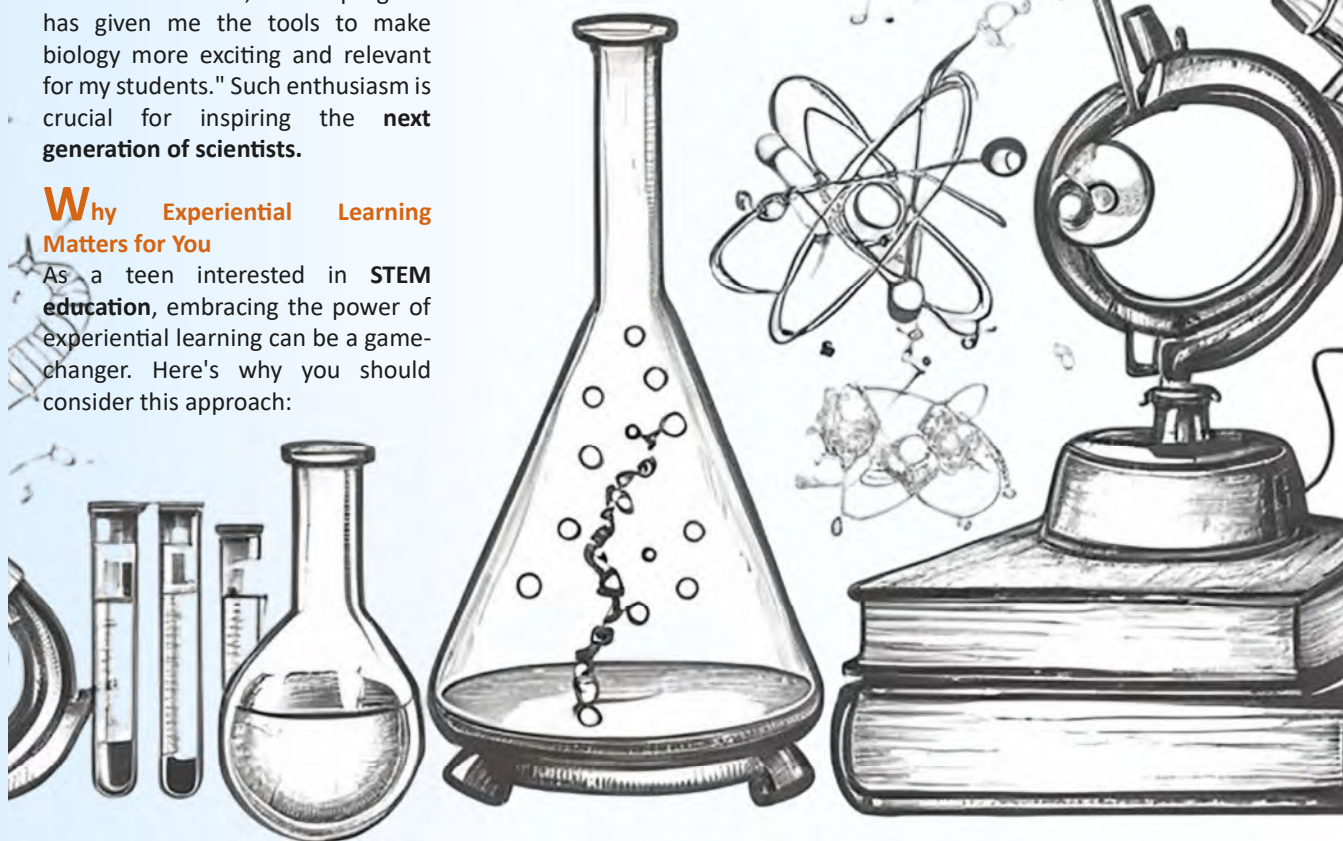
Feature image

Daphnia seen at 100X magnification by MarekMiś - Own work, CC BY 4.0,

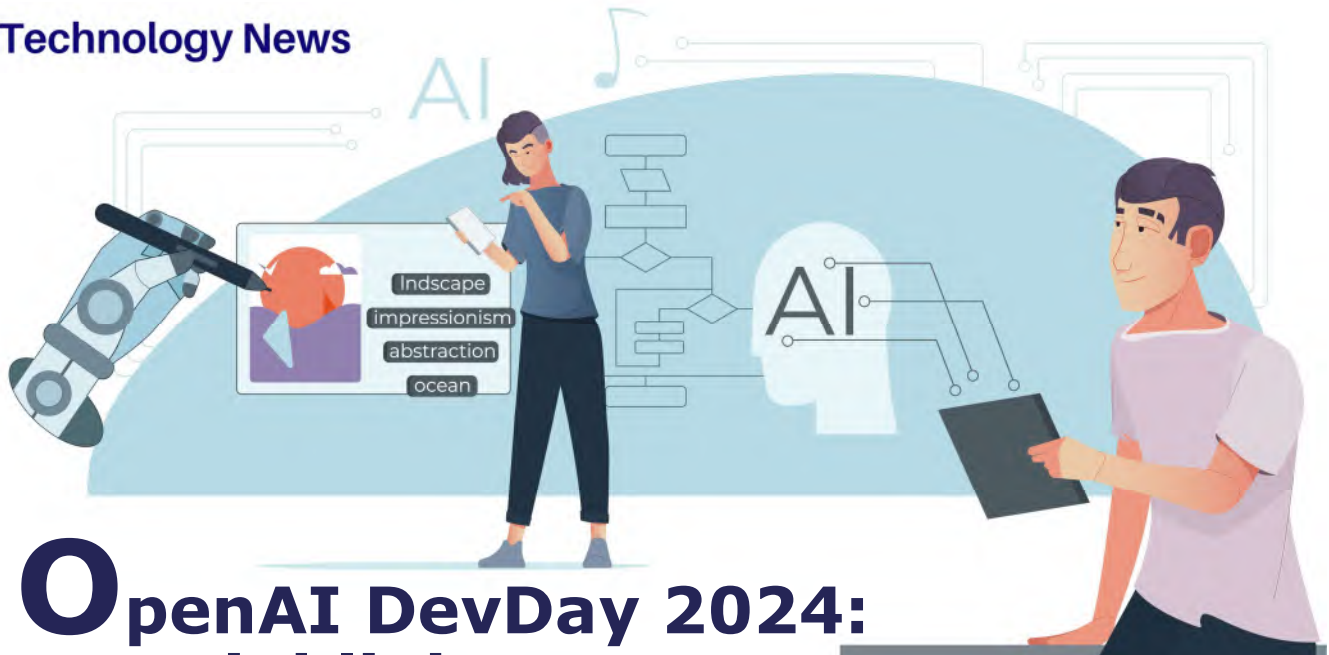
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Technology News



OpenAI DevDay 2024: Key Highlights

Open AI recently hosted its **DevDay2024**, showcasing significant advancements in AI technology. The event focused on empowering developers with innovative tools and resources. Here are the key highlights from this exciting event.

Read more: OpenAI o1 Launched.

Realtime API Launch

OpenAI launched a public beta of its **Realtime API**. This new tool enables low-latency voice applications, making it easier for developers to create engaging user experiences. The API supports six unique voices, allowing for natural conversations with AI. For instance, users can interact with AI during travel planning, enhancing the overall experience.

Introduction of GPT-4 Turbo

Another major announcement was the introduction of **GPT-4 Turbo**. This model features a **128K context window** and comes with reduced pricing. The enhancements allow developers to build more complex and interactive applications efficiently. With these capabilities, developers can push the boundaries of what is possible in AI-driven solutions.

Vision Fine-Tuning Features

OpenAI also unveiled vision fine-tuning capabilities. This feature

allows developers to leverage images alongside text, improving the model's visual understanding. By integrating visual data, developers can create innovative applications that require both textual and visual inputs, opening new avenues for creativity and functionality.

Also Read:

[AI explained for Beginners!](#)

Impact of New Tools on Developers

The tools introduced at DevDay 2024 significantly impact how developers approach their projects. OpenAI emphasized its commitment to building a robust developer ecosystem.

Building a Developer Ecosystem

OpenAI aims to empower developers by providing cutting-edge tools and resources. This focus ensures that developers can thrive in today's competitive tech landscape. The company believes that nurturing developer relationships is crucial for long-term success.

OpenAI's Competitive Edge

Amid increased competition from tech giants like **Meta** and **Google**, OpenAI reassured its developers about the viability of its platform. The company seeks to maintain its competitive edge through a commitment to innovation and developer satisfaction. In the words of OpenAI, "We aim to empower developers with cutting-

edge tools to create innovative applications."

Conclusion

OpenAI DevDay 2024 marks a significant pivot towards nurturing developer relationships and enhancing tools that support their growth. Developers can find more insights from the event and continue to engage with the evolving platform. As OpenAI continues to innovate, it remains dedicated to providing resources that help developers succeed in their endeavors.

For more intriguing insights into other STEM-related topics, visit [ENTECH Online](#). Explore our digital magazine dedicated to inspiring teenagers and young adults to pursue their passions in science, technology, engineering, and mathematics.



Technology News



Is India Sitting on a Lithium Goldmine? This Could Change Everything!

India is about to start a big energy change, and the secret to it might be underground - [Lithium Goldmine](#). As the world moves fast towards electric cars and green energy, the need for lithium—important for batteries—has gone up a lot.

For a place like India, rich in nature but still buying a lot from other countries, finding **lithium** at home is important to make its green dreams come true and depend less on others. The good news is India might find good lithium spots, showing a bright energy future.

Mining Lithium: From Problems to Opportunities

The Lithium Problem - India's path to having its own lithium has had issues. In the past years, India had problems finding lithium, with auctions for places in Jammu & Kashmir and Manipur stopped because no one was interested or people there didn't want it.

But things might be changing. In Korba, **Chhattisgarh**, one lithium spot is ready for auction, and another has shown good signs of the valuable stuff. This is a big step as India tries to catch up with leaders like China, which makes 77% of the world's lithium batteries.

Lithium Goldmine in India

Unlocking India's Lithium chance to use its lithium well, India must fix some problems. One big issue is the country's not-so-good mineral reports, which have unclear

numbers on lithium, scaring off investors.

Another problem is India's lithium is mostly in **hard rocks**, making it harder to get than the liquid ones in places like Chile and Argentina.

Alternative to Lithium

Changing the Battery But India is not just waiting. It is looking at other battery ideas that might need less lithium, like **metal-air** batteries using air and metals like aluminum, zinc, and iron. These can be light, cheap, and recyclable, but they can't be recharged like lithium ones.

China, a battery leader, is also putting money in **sodium batteries**, and India wants to do the same. To do this, India must work more on battery research and keep up with new mining tech.

Closing Remarks

India wants to be a leader in electric cars and green energy. This is very important. To achieve this, India needs its own source of lithium. Lithium is a metal used to make batteries. If India has its own **lithium**, it won't need to buy as much from other countries. This will make electric cars and

energy storage cheaper.

A strong lithium industry could also create many jobs. These jobs will be in mining, manufacturing, and building batteries. This will offer new opportunities for young science enthusiasts like you.

India is searching for and using its own lithium. This could change the country's energy landscape in a big way. To succeed, India must solve technology and transportation issues. It also needs to invest heavily in battery research. By doing this, India can become a leader in the clean energy movement.

The path might not be easy, but the rewards are big. With your love for science and your interest in the future, you can help India use lithium. You can play a big part in using lithium to help India switch to cleaner energy sources. You can help make green changes that last for many years.



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