SCIENCE FACTORS.

INSIGHT, DISCOVERY, LEARNING, INNOVATION, AND IMPACT

By
Rosalind Franklin
Council of Scientific Research (RFCSR)
October 15, 2025

AGRICULTURE

THE SEEDS OF SURVIVAL!

RF001251O

Scientific Research Empowers Social Progress !

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Science APPLY PROGRAM

Scientific programs are structured initiatives designed to promote research, education, and innovation across various fields of science. They provide opportunities for hands-on learning, collaboration, and the development of critical thinking skills. These programs play a vital role in advancing scientific knowledge and solving real-world problems.

Prof. Eliora Z. Ron

Emeritus Professor
The Shmunis School of Biomedicine and Cancer Research | Tel Aviv University

"In a world flooded with information, *Science Factors* stands out for its clarity, creativity, and commitment to truth. It brings the latest discoveries from top global journals into classrooms, cafés, and conversations—without losing the wonder that makes science so human. I believe this magazine will inspire not just students, but scientists too, to see their work through fresh, curious eyes."

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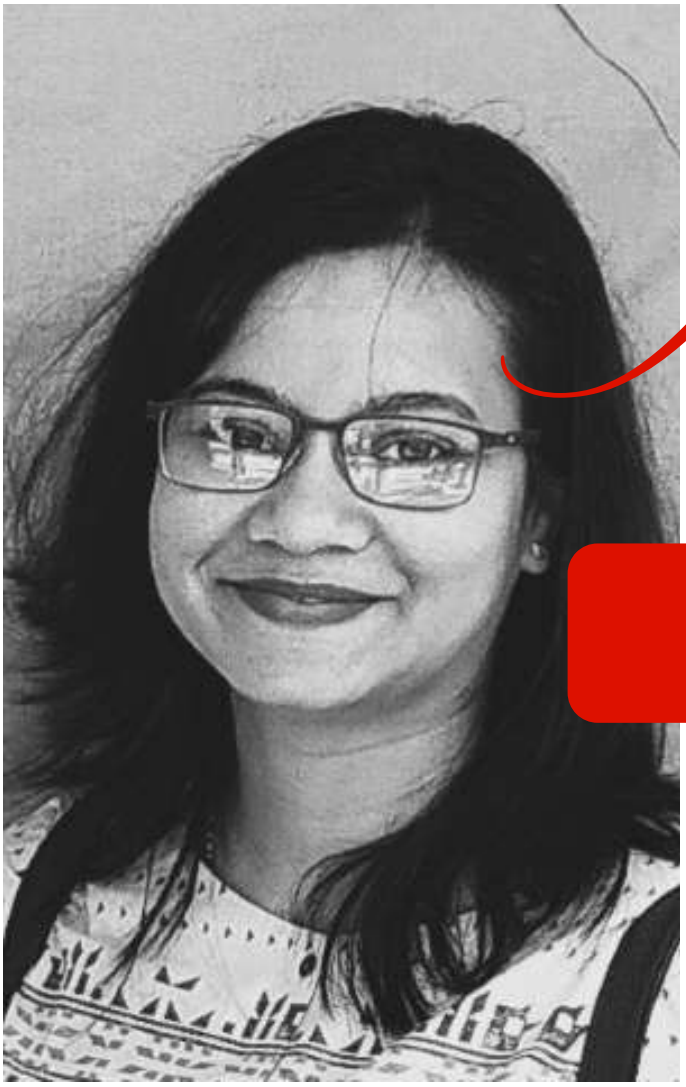

LETTER *from the* EDITOR

Dr. Animesha Rath
The Editor-in-Chief

Dear Readers,

As we prepare this October issue of Science Factors, we turn to agriculture the enduring foundation of human civilization and the seed of our survival. Every grain carries within it nourishment, resilience, and innovation. Today, agriculture is more than food: it is climate resilience, health, biodiversity, technology, and the future of our planet.

This issue brings you landmark studies on agriculture's global role. From evidence that shifting rice diets can reduce climate-induced crop losses in India to urgent warnings about threatened crop diversity at low latitudes, the message is clear: agriculture must adapt swiftly in a warming world. We also explore deepening water scarcity in breadbasket nations, biodiversity pressures from fruit and vegetable production, and the fragile future of traditional crops in the Trans-Himalaya. Together, these stories show how choices in fields and at tables echo across ecosystems, economies, and generations.

Agriculture is also about people. Perspectives on diabetes care and India's urgent need for mental health reform remind us that diet, health, and wellbeing are inseparable. Advances in evolutionary and biomedical science reveal how shared ancestry and biodiversity shape disease risks and opportunities for better health.

Our Patent & Innovation section showcases breakthroughs from virus-resistant crop kits to stem-cell hydrogels building resilience and progress. We are also delighted to introduce new features in this issue Expert Viewpoint, Science Desk, Discovery Highlights, and Science in Focus designed to bring readers closer to scientific ideas and discoveries shaping our world.

We dedicate this issue to agriculture as a vibrant web connecting climate, technology, health, and culture. Agriculture is not only the seed of survival but also of innovation.

Happy reading!

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SCIENTIFIC RESEARCH EMPOWERS SOCIAL PROGRESS !

The CONTRIBUTORS

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FEATURED RESEARCH

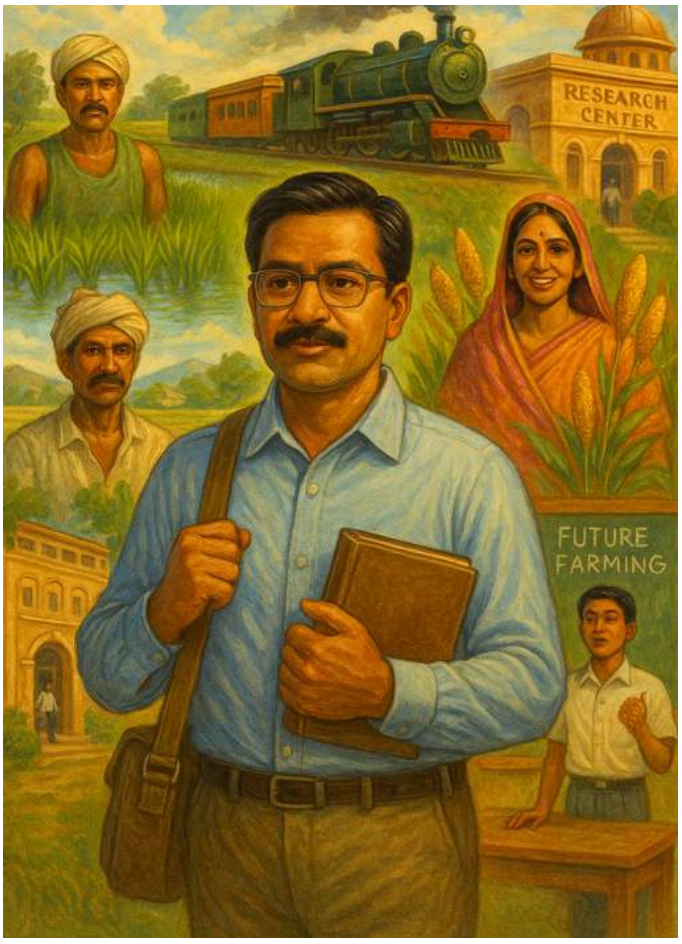
Behind every discovery lies a story of curiosity, perseverance, and wonder. Science unfolds through relentless research and bold explorations into the unknown. These are the journeys that shape our understanding of the world—and beyond.

| By Dr. Avijit Das

THE 11 PERCENT PROMISE

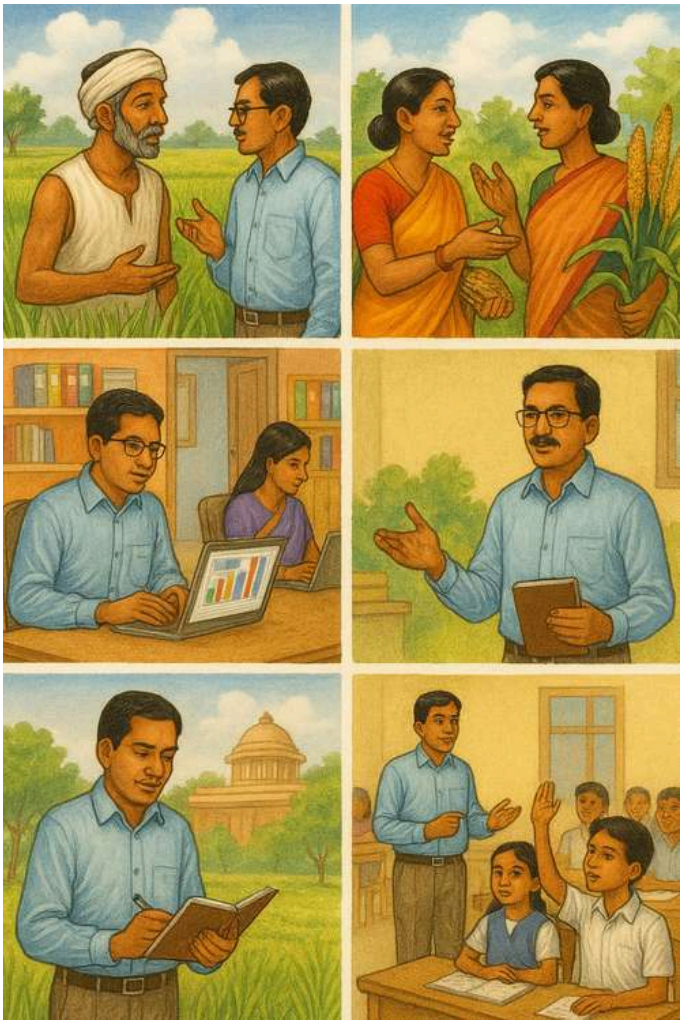
FEATURED

Dr. Anil had always trusted data, but he also knew that numbers made more sense when connected to people's lives. Charts and graphs could tell a story, but the voices of farmers revealed their heartbeat. To understand how climate change was reshaping Indian farming, he decided to travel across the country. His journey took him from the rice belts of Bihar to the millet fields of Karnataka, the research centers of Andhra Pradesh, the offices of Delhi, and finally the schools of Odisha. Along the way, he spoke to farmers, checked records, and listened to young voices who would inherit the future of farming.



His first stop was in Bihar. There he met Ramesh, a rice farmer who had spent his whole life planting the crop his father and grandfather had grown. Ramesh pointed to his fields, where one half was flooded and the other half lay cracked and dry. The contrast was painful. "Rice has always been our lifeline," he told Anil. "The government buys it every year, so we feel safe planting it. But the rains are not the same anymore. Some years we drown, other years we starve. My harvest is never steady. If the climate keeps changing, will rice still protect us?" His voice carried both pride and fear, a reminder of the delicate thread farmers walk between tradition and survival.

From there, Anil traveled south to Karnataka. In a small village on the Deccan plateau, he met Meena, who grew finger millet. Dressed in a bright sari, she spoke with quiet confidence. "People call millet the poor man's food, but in my house, it never fails us. Even when the skies betray us, millet stands strong. It may not yield as much as rice, but it gives us something steady. The problem is that markets don't value it. The government doesn't buy it like rice, and so farmers hesitate. But if millet had the same support, more of us would plant it. Climate change has taught me that strength matters more than prestige." Her words gave a glimpse of resilience born from necessity.



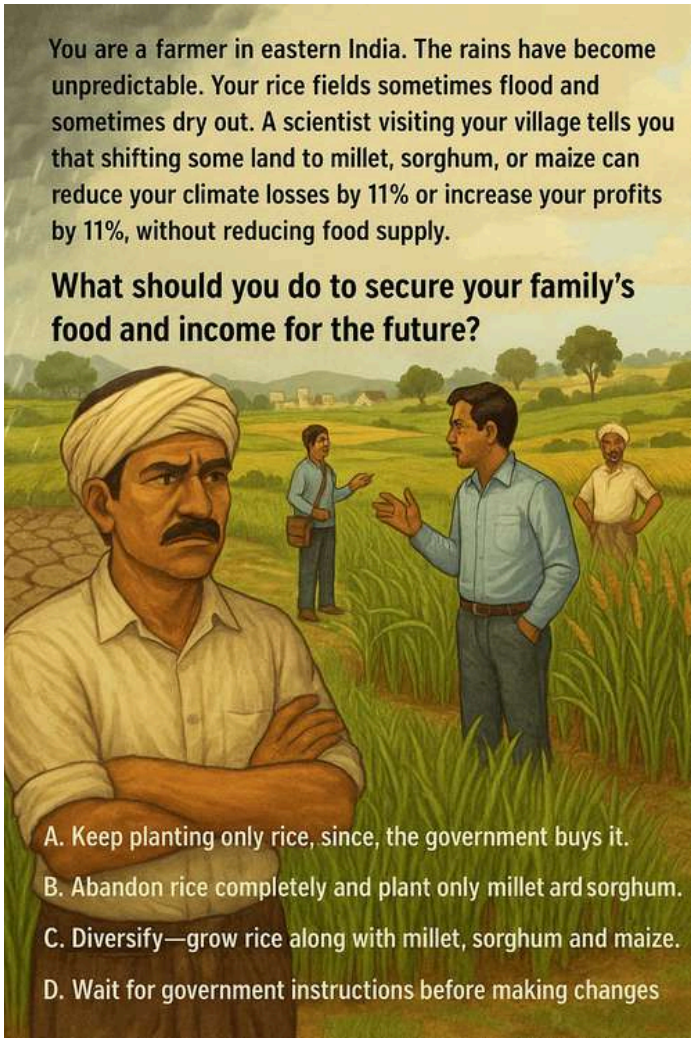
| By Dr. Avijit Das

Back in Andhra Pradesh, Anil sat in a research center surrounded by decades of records. For forty-five years, the data told the same truth: rice was fragile in the face of climate extremes. Its yields dropped sharply under floods or droughts, while crops like millet, sorghum, and maize held up better. Running simulations on his computer, Anil tested different scenarios. The results were striking. If farmers shifted even part of their land from rice to other cereals, climate-related losses could fall by 11 percent, or farmer profits could rise by 11 percent. No new land was needed. No food calories would be lost. The math was clear diversification was the key.

Anil carried his findings to Delhi, where he met Priya, a government officer. She studied his charts carefully and nodded. “Decades ago, rice and wheat saved India from famine,” she said. “It was right then to favor them. But now, the climate makes rice too risky. If we depend on it alone, farmers like Ramesh will suffer. Your study shows us a new path. If we include millet, sorghum, and maize in school meals, guarantee fair markets, and support them with subsidies, we can protect both farmers and food security.”

On his final stop in Odisha, Anil shared his work with students in a village school. A boy named Arjun stood up. “My parents are farmers,” he said softly. “I want to be one too, but I don’t want to risk everything on one crop. Farming is like preparing for exams you cannot study just one subject and hope to pass. If we grow rice along with millet and sorghum, we will have both food and income. Diversification is like carrying an umbrella you don’t need it every day, but when the storm comes, you’ll be glad you have it.”

As Anil boarded his train home, he looked out at the patchwork of fields passing by. His diary was full of numbers, but more importantly, it was full of voices. Ramesh’s fear, Meena’s resilience, Priya’s responsibility, and Arjun’s hope all told the same story. Rice would remain important, but India’s future lay in balance. The strength of its fields lay not in one crop, but in many.



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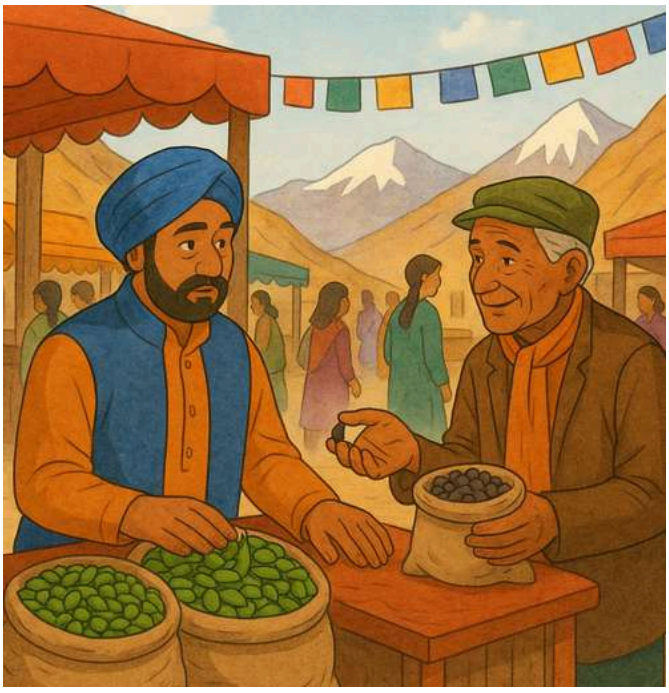
| By Dr. Manas Ranjan Pustry

THE TRADER'S LESSON

FEATURED

Ramesh was a busy trader in the bustling market of Kaza, high in the Indian Trans-Himalaya. Every summer, when the passes opened and the valley came alive with visitors, he would buy sacks of fresh green peas from ocal farmers. Tourists loved them for their bright, shiny, and quick-to-cook qualities. Shopkeepers stocked them too, since green peas were well known outside the valley. They always fetched a good price, so Ramesh never thought of selling anything else. To him, green peas meant profit, and profit was all that mattered.



One afternoon, as the market slowed, an old farmer named Dorje walked up carrying a small sack of wrinkled, dark seeds. His hands were weathered, his pace steady.

"Would you like to try these?" Dorje asked.

Ramesh frowned. "Black peas? No one buys these anymore. People want green peas."

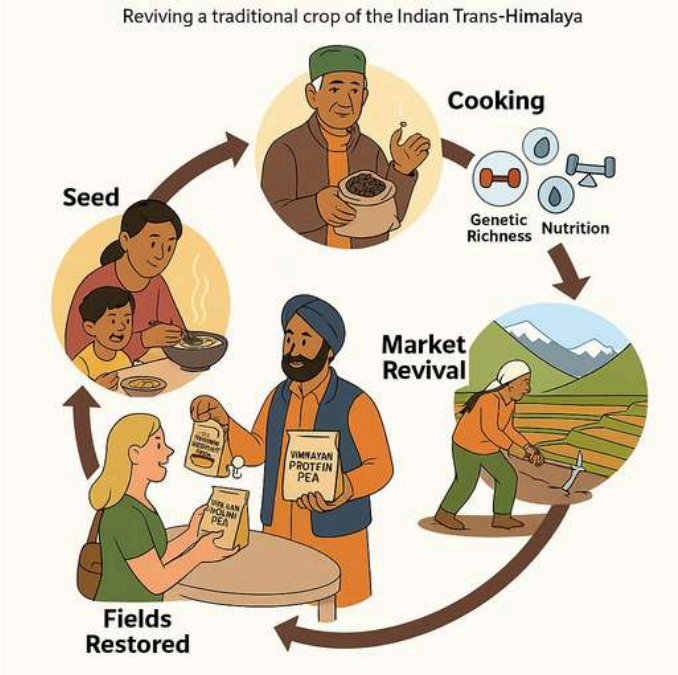
Dorje smiled gently. "These have fed our families for centuries. They grow when the rains fail and when the cold bites. Just taste them once you will understand."

Out of respect for the elder, Ramesh carried the sack home. That evening, his wife soaked a handful and cooked them into a simple curry. As the peas simmered, they softened into a rich texture, filling the kitchen with a nutty aroma. When Ramesh tasted them, he was surprised. They were earthy, hearty, and more filling than the green peas he was used to selling. His young son, usually a picky eater, finished his plate quickly and even asked for more.

The next day, Ramesh began asking questions. Why were farmers like Dorje still holding onto black peas when almost everyone else had switched to green peas? Slowly, he uncovered a story he had never considered.

The black pea was not just another crop it was a survivor of the mountains. Farmers explained that it needed less water, tolerated poor soils, and still produced at the highest altitudes where even barley sometimes failed. Researchers who had visited the region recently had tested these peas under tough conditions: less water, higher elevation, stronger winds. The black pea and barley survived, but the green pea wilted and failed.

Ramesh also discovered their hidden nutrition. A scientific report showed that black peas carried about 21% protein more than common green peas and were rich in iron, calcium, and fiber. In mountain regions where diets often lacked protein and minerals, this humble seed was both food and medicine.



By Dr. Manas Ranjan Pustry

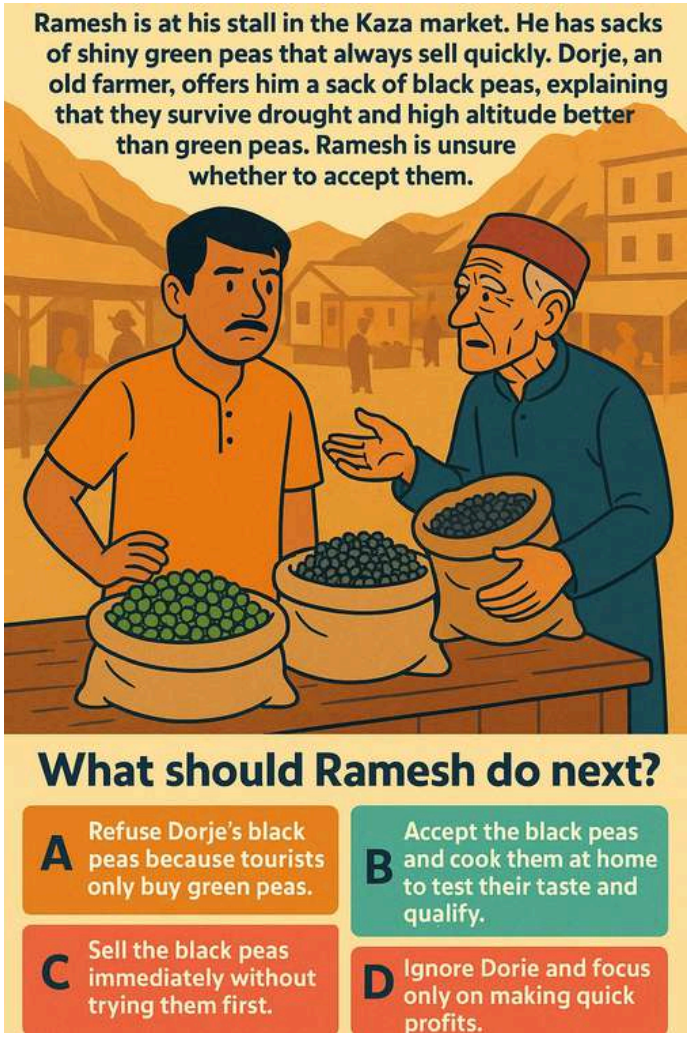
There was more. Scientists had sequenced the DNA of black peas and found them genetically distinct from other peas. They were a unique resource, shaped by centuries of careful farming in the cold desert of the Himalaya. Losing them would mean losing both genetic diversity and a piece of cultural history.

Ramesh began to see the black pea differently. It was no longer just a sack of wrinkled seeds; it was a treasure. He decided to take a risk. He cleaned and packed the peas into small bags, printed a simple label *"Himalayan Protein Pea: Traditional Strength for Modern Times"* and displayed them at his stall.

At first, customers hesitated. Few recognized the peas, and some laughed at the idea of paying for what their grandparents once ate in poverty. But when Ramesh offered small tastings, people were won over. Tourists loved the authentic flavor of the mountains. Local families remembered the taste from childhood and bought bags to cook at home. Slowly, demand grew.

Within two years, black peas returned to more fields. Farmers who had nearly abandoned the crop now found it profitable again. Dorje and others thanked Ramesh, not because he had made them wealthy, but because he had reminded the valley of the strength hidden in its own traditions.

One evening, as he closed his stall, Ramesh reflected on the journey. Profit, he realized, does not always come from chasing something new. Sometimes it comes from restoring what was nearly forgotten from honoring a seed, a story, and a way of life that had quietly endured the storms of time.



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| EXPERT OPINION |

REFLECTIONS ON RESEARCH, OPPORTUNITIES, AND THE FUTURE OF STATISTICS IN INDIA

GLOBAL TOP 2% SCIENTIST

Prof. Debasis Kundu

| Department of Mathematics & Statistics, IIT Kanpur, India

| Scientific Profile | | Organization Link |

Areas of Expertise: Statistical Signal Processing | Distribution Theory | Reliability & Survival Analysis

Ex-Dean, IIT Kanpur | Fellow, NASI | Member, National Statistical Commission

My research journey has been guided by a fascination with how mathematics and statistics can reveal structure and meaning from seemingly chaotic data. Over the years, my interests have evolved around statistical signal processing, distribution theory, and reliability and survival analysis. These areas, though distinct in scope, share a unifying objective-to develop reliable, interpretable, and computationally efficient methods that bridge theoretical statistics with real-world applications. Much of my work has dealt with developing new distributional models such as the generalized exponential family and improving statistical inference under complex censoring and life-testing schemes. These ideas have found applications in fields as varied as communications engineering, reliability assessment, and biomedical research. The satisfaction comes not only from theoretical development but also from seeing how these methods assist in solving practical problems. Looking ahead, I believe the next decade will be transformative for the statistical sciences. The emergence of data science, machine learning, and artificial intelligence has created vast new opportunities, but also demands renewed emphasis on the core principles of inference and uncertainty quantification. Modern statisticians must strike a balance between computational innovation and theoretical soundness. Integrating classical probability models with data-driven learning approaches-particularly in reliability and survival studies-will be an exciting challenge. At the same time, we must recognize the ethical and interpretational challenges posed by the abundance of data. As models grow in complexity, transparency and reproducibility become essential. The future statistician will not only need technical expertise but also the discernment to judge when a model truly explains, and when it merely fits. For young scientists in India, this is an especially promising time. Our country is rich in mathematical tradition and is now emerging as a global hub for data-intensive research. I would urge the next generation to cultivate both theoretical depth and computational skill. Learn the mathematics that underpins the methods you use, and at the same time, embrace new computational tools fearlessly. Be patient with research-it often rewards persistence more than brilliance. Most importantly, remain curious, question assumptions, and do not be afraid to cross disciplinary boundaries. The future of statistics in India depends on this spirit of curiosity, collaboration, and integrity. If young researchers can combine creativity with scientific rigor, Indian statisticians will continue to make lasting contributions to global science and technology.

> *"The future statistician must balance computational innovation with theoretical soundness, ensuring models not only fit data but truly explain it"*

| EXPERT OPINION |

EVOLUTION TO SOLUTION: TRANSLATING MOSQUITO MOLECULAR PHYSIOLOGY BEYOND VECTOR CONTROL TOWARDS "TRANSLATING PHYSIOLOGY TO PHILOSOPHY: RESEARCH FOR PEACE"

Dr. Rajnikant Dixit, Scientist-E
| ICMR-National Institute of Malaria Research, New Delhi, India
| Scientific Profile | | Organization Link |

Areas of Expertise: Malaria Mosquito Biology | Functional Genomics | Host–Microbe Interactions

My research redefines mosquitoes as evolutionarily adaptive biological systems, integrating molecular physiology, microbiome ecology, and neuro-behavioral regulation to explore innovations beyond vector control. The discovery of Plant-Like Transcripts (PLTs) in Anopheles culicifacies a hallmark of horizontal gene transfer revealed mosquitoes as holobionts, capable of genetic and metabolic integration with their environment. This breakthrough catalyzed a paradigm shift from studying disease transmission to exploring adaptation, cognition, and resilience as biological traits. Through tissue-specific transcriptomics across salivary glands, hemocytes, reproductive tissues, and sensory organs, we uncovered cross-organ communication networks coordinating immunity, metabolism, and behavior. The identification of the Microbiome-Gut-Brain Axis (MGBA) further demonstrated bidirectional microbial signaling governing neuro-metabolic balance and decision-making. Guided by Indian philosophy, especially the Bhagavad Gita, this work interprets physiological intelligence through mind-body-soul integration, offering a biological foundation for peace and mental harmony.

The next decade offers India a historic opportunity to lead a new paradigm of integrative science the Rishi–Muni Convergence, where scientific inquiry (Rishi) meets spiritual wisdom (Muni). This vision aligns with the National Education Policy (NEP) and Indian Knowledge Systems (IKS) to promote transdisciplinary innovation blending genomics, neuroscience, AI, and Adhyatma (spiritual sciences). A key aspect is the Solution Framework for Research for Peace, which seeks to balance Artificial Intelligence (AI) driven by logic and automation with Adhyatmik Intelligence (SI) rooted in consciousness, ethics, and empathy. The journey of decoding the path from OM to GENOME symbolizes the integration of spiritual vibration (OM) with molecular expression (GENOME), validating the vision of Hypothesis Evolution to Solution. This continuum unites science and spirituality, ensuring that AI-led innovation is guided by SI-based wisdom, creating "Intelligence with Integrity." The challenge ahead lies in fostering evidence-based convergence, developing cross-domain mentorship, and embedding ethical balance within technology and discovery transforming science into a force for peace, sustainability, and universal harmony.

> *"The journey from OM to GENOME symbolizes the union of science and spirituality, creating intelligence with integrity"*

Young scientists must embody the Rishi Muni ethos combining analytical precision with inner reflection. Approach research as service to life, respecting every organism as a collaborator in discovery. Pursue purposeful science that nurtures society, ecology, and spiritual growth. Learn from Indian philosophical texts as frameworks for ethics, creativity, and resilience. Cultivate Adhyatmik Intelligence alongside AI literacy to ensure innovation remains humane and holistic. The next generation must advance knowledge with compassion, transforming India into a global beacon of integrative, peace-oriented science grounded in the eternal harmony of OM and the GENOME.

| EXPERT OPINION |

BACTERIOPHAGE BASED THERAPIES AND IMMUNOTHERAPY FOR A POST-ANTIBIOTIC ERA

Prof. Hari Mohan Saxena
| National Level Monitor, DAHD, Ministry of Fisheries, Animal Husbandry & Dairying
| Scientific Profile | | Organization Link |

Areas of Expertise: Immunotherapy & Phage Biology | Diagnostics Innovation | Therapeutic Advances

Ex-Dean & Professor of Immunology | Former S&T Counsellor, Embassy of India (Moscow)

The growing resistance of bacteria to antimicrobial agents worldwide presents a serious challenge. While antibiotic resistance continues to rise, development of new antibiotics is slow and resource-intensive. Bacteriophages are viruses capable of selectively eliminating specific bacteria. They replicate in bacteria as long as the target bacteria are present in the host. They offer an alternative cost effective treatment for bacterial infections in both humans and animals. Bacteriophages can infect their target bacteria without adversely affecting the normal microbial flora. The replication process continues until the targeted pathogen is completely eliminated. In the absence of their target bacteria, bacteriophages exist as simple, non-living entities composed of protein-coated DNA. Lytic bacteriophages replicate within live bacterial cells and lyse the bacteria without affecting other bacterial species. Phage lysed bacterial preparations are highly immunogenic and exhibit greater protective efficacy compared to regular vaccines produced by heat or chemical inactivation. Phage lysates have been shown to be non-toxic and safe for immunization without adverse reactions. The self-replicating nature and specificity of bacteriophages in targeting bacteria makes them choicest alternative to antibiotics.

The use of bacteriophages is a practical strategy for managing important bacterial diseases. Clinical trials in animals and humans have demonstrated that phages are safe and well-tolerated. Phages have the potential to cure bacterial infections and eliminate carrier states in both animals and humans. Live attenuated vaccine organisms can serve as a carrier vehicle to deliver phages to phagocytes in the body where virulent pathogens evade antibodies and immune cells. Once engulfed along with the attenuated organisms, the phage lyses the vaccine organism and is released inside the phagocyte, subsequently infecting and lysing the virulent pathogenic organisms.

> *"Bacteriophages are nature's precision weapons against bacteria, offering a safe, cost-effective alternative to antibiotics in the fight against antimicrobial resistance"*

We have employed Brucellaphages for therapy in Brucellosis-affected cattle in three ways - Phage alone, phage targeted in vivo employing attenuated bacteria as a carrier, and phage lysate. Our study on simple phage therapy showed that phage stimulates immune responses in host. In another study, we employed live attenuated B. abortus vaccine organisms to deliver a lytic Brucellaphage in vivo, targeting intracellular virulent Brucella organisms. The phage-pulsed organisms induced significantly high titers of anti-Brucella antibodies. We have also reported successful immunotherapy of bovine Brucellosis using phage lysates of attenuated *B. abortus* organisms.

Experience with phage based therapies confirm their promise as an alternative to antibiotics and must be supported, strengthened and promoted urgently at global level for empowering humanity to face the impending catastrophe of antimicrobial resistance.

IDENTIFY Your SKILL

SCAN HERE **Try It!**

THE FIRST STEP TOWARD DOING WHAT YOU LOVE

Have you ever felt stuck, even while working hard? Or found yourself wondering why someone else seems to thrive in the same environment where you're struggling?

The truth is, when we work in line with our natural strengths, everything becomes easier. We solve problems faster, feel more motivated, and even enjoy challenges. On the other hand, even the most intelligent person, if placed in the wrong field, may struggle to shine.

That's not about intelligence. That's about fit.

Identifying your core skills is like discovering your internal compass. It helps you:

- Set clear goals
- Work more efficiently
- Make smarter career or subject choices
- Feel confident in your abilities
- Enjoy what you do, every day

Here, we bring you a set of thought-provoking scenarios and self-assessment questions. These aren't tests—they're mirrors to help you see what you're good at, and what excites your mind. So go ahead. Explore, reflect, and unlock your potential. Your strengths may surprise you—and guide you to your future.

| SCIENCE DESK |

FIGHTING VIRUSES WITH RNA SCIENCE

Dr. Soma Chattopadhyay |
Scientist F, DBT-Institute of Life Sciences (ILS), Bhubaneswar
| Scientific Profile |
| Organization Link |

Areas of Expertise:
Virology Research | Host-Virus Interactions | Diagnostics & Therapeutics

Why is RNA biology so critical in viral infections?

Most major pathogens like influenza, HIV, and coronaviruses use RNA as their genetic material. Unlike DNA viruses, RNA viruses replicate with error-prone RNA-dependent RNA polymerases, lacking proofreading. This leads to frequent mutations, enabling rapid evolution, immune escape, and cross-species transmission. Understanding RNA biology is thus central to mapping viral replication, tracking mutations, and designing diagnostics and vaccines. For example, qRT-PCR relies on detecting viral RNA, while the success of mRNA COVID-19 vaccines reflects decades of RNA research. RNA also shapes host responses through molecules like microRNAs that regulate immunity which viruses can hijack. Studying these interactions is not only science, but a survival strategy.

How do host-virus RNA interactions affect disease and treatment?

Viruses hijack host RNA machinery to replicate, disrupting cell functions and weakening immunity. Our work on Chikungunya virus has shown how viral proteins manipulate host factors to persist and spread. Host microRNAs can fight infection, but some are exploited by viruses to hide from defenses. By targeting these RNA pathways blocking harmful microRNAs or mimicking protective ones we can design RNA-based therapies. These molecules may also serve as biomarkers, aiding in diagnosis and predicting disease severity.

How promising are repurposed drugs and plant extracts?

Repurposing existing drugs and testing plant extracts offers quicker, cost-effective options alongside new drug discovery. Our Telmisartan and ibuprofen conjugates showed strong anti-Chikungunya activity, reducing replication and interacting with viral proteins. Since ibuprofen is already approved, modified forms can move faster through clinical pipelines. Similarly, extracts of Hypericum gaitii showed activity against both Chikungunya and SARS-CoV-2. While natural variability poses challenges, plant-based antivirals rooted in Ayurveda offer affordable alternatives, especially for resource-limited settings. Together, synthetic compounds, repurposed drugs, and plant extracts form a complementary antiviral strategy.

How should India strengthen preparedness?

India needs virus and emerging pathogen-focused infrastructure BSL-2/3 labs, sequencing, and training in molecular virology and computational biology. Building a national RNA virus surveillance network under the one-health concept is critical to track emerging strains. Interdisciplinary collaborations like virologists with botanists, chemists with data scientists can accelerate discovery of natural and synthetic antivirals. Investing in RNA research ensures rapid response to outbreaks and builds resilience against future pandemics.

What is your vision for your lab's contribution?

Our lab aims to uncover the molecular conversations between RNA viruses and their hosts to identify therapeutic targets and diagnostic markers. We also focus on natural antivirals, offering accessible treatments for underserved communities. Collaboration with clinicians, industries, and public health experts ensures our findings translate into real-world impact. Ultimately, we envision a future where India leads in outbreak preparedness, and viral diseases are no longer met with panic but with preparedness and effective solutions.

SCHD Lab

| SCIENCE DESK |

BRIDGING SCIENCE AND FIELDS: GENOME EDITING FOR INDIAN WHEAT

Dr. Davinder Sharma | Thapar Institute of Engineering and Technology (TIET)

| Scientific Profile |
| Organization Link |

Areas of Expertise:
Plant genome editing | Wheat Biotechnology | Functional Genomics & Molecular Breeding

Why is genome editing in crops a hot topic today, and how is it different from normal breeding?

Genome editing is transforming agriculture because it enables precise, targeted changes to plant DNA, making crop improvement much faster and more accurate than traditional breeding. Conventional breeding requires years of crossing and selection, often mixing desirable traits with unwanted ones. In contrast, CRISPR-Cas allows scientists to directly modify or disable specific genes that control traits such as yield, stress tolerance, or disease resistance. This precision is vital in tackling challenges like climate change and food security. Importantly, many countries, including India, now distinguish genome editing from transgenic genetic modification, which is accelerating its adoption.

What problems in Indian wheat can genome editing solve?

Indian wheat faces three major challenges: diseases, climate stress, and nutrition. Rust diseases particularly yellow and brown rust cause serious and recurring yield losses. Climate-related stresses such as drought and heat are also becoming more common and threaten production in key wheat belts. Genome editing can deliver varieties resistant to rusts and tolerant to heat or drought without compromising yield. It also holds potential for nutritional improvements, including enhancing micronutrients and protein composition to combat malnutrition. An additional opportunity is to reduce or modify gluten proteins, paving the way for wheat safe for people with gluten sensitivities or celiac disease, which is prevalent in northern India.

Is genome editing more difficult in wheat than other crops?

Yes. Wheat's genome is hexaploid, meaning it has six sets of chromosomes, making it complex to edit. To achieve a desired trait, edits must target all copies of a gene, which is technically demanding. Wheat regeneration and transformation systems also remain less efficient and highly genotype dependent. In contrast, rice, with its smaller diploid genome, is much easier to edit. For instance, the genome-edited rice variety Kamala was developed for improved yield and stress tolerance using well-established protocols. To advance wheat editing, India must invest in specialized platforms, speed breeding tailored to wheat, and strong sequencing facilities. Training scientists in molecular biology, bioinformatics, and phenotyping is equally important, alongside regulatory clarity and stronger public-private partnerships.

How many labs in India are working on wheat genome editing, and when might farmers see results?

Currently, fewer than 10 labs in India are actively working on wheat genome editing, and success rates remain modest (1–10%). Given the stages involved—from editing to field validation and regulatory approval it may take 5–7 years before farmers access genome-edited wheat varieties. The first lines are expected to feature rust resistance and stress tolerance, where genes are well characterized. Nutritional traits may follow, though they require longer validation. Testing across India's diverse growing conditions will be essential before release.

What role is your lab playing in improving wheat for Indian farmers?

At Thapar Institute, we have developed facilities for genome editing, tissue culture, speed breeding, and phenotyping. Our work focuses on two key problems: Stripe rust resistance: This disease affects nearly 10 million hectares in northern India. By editing genes linked to host-pathogen interactions, we aim to create resistant lines suited to Punjab, Haryana, and western Uttar Pradesh. Nitrogen use efficiency (NUE): Fertilizer use in Punjab and Haryana has surged from 37 kg/ha in 1970–71 to 241 kg/ha in 2023–24, leading to diminishing returns, soil damage, and pollution. We are editing regulatory genes for NUE to develop wheat that yields well under lower nitrogen inputs.Through these efforts, we aim to support farmers with improved varieties that reduce costs, boost sustainability, and strengthen India's food security.

SCIENCE STORIES RESEARCH & EXPLORATIONS

Behind every discovery lies a story of curiosity, perseverance, and wonder. Science unfolds through relentless research and bold explorations into the unknown. These are the journeys that shape our understanding of the world—and beyond.

| By Dr. Animesha Rath

THE FLIGHT OF KAVI AND TARA

High above the wheat fields of northern India, two vultures Kavi and Tara circled in the fading sunlight. Their wings stretched wide, they rode the warm thermals, speaking to each other in quiet, rasping tones that only their kind could understand.

“Have you noticed?” Tara asked, her keen eyes fixed on the fields below. “The places where our kin once gathered are silent. Carcasses lie untouched, and the sky feels emptier each season. Fewer of us remain.”

Kavi nodded, remembering the days when hundreds of vultures had flocked together, their sharp beaks stripping bones clean within minutes. Back then, the land smelled of life, not decay. “It is the medicine,” he said bitterly. “Diclofenac, they call it. A cure for cattle, but a poison for us. One drop in the flesh of the dead, and we follow them into silence.”

The two friends wheeled higher, catching a strong wind that carried them far beyond their home. They had decided to journey across the world, to see whether other scavengers still fared better.

Their first stop was the Serengeti in Africa. They soared over golden grasslands where wildebeest herds grazed and lions lounged in the shade. At dusk, they watched hyenas prowl, their eerie laughter echoing through the night. “Here, the hyenas still thrive,” Tara said with a trace of hope. “Their jaws crush bones that even we cannot break. They are the cleaners of the plains.” But Kavi noticed something troubling shrinking grasslands fenced off for livestock, poisoned carcasses left to kill lions, and humans pushing deeper into wild territory. “Even the hyenas,” he whispered, “are being hunted by hunger and fear.”

From there, they crossed the seas to the vast forests of South America. Beneath them, jaguars slipped silently through the shadows and harpy eagles watched from towering trees. Yet carrion lingered on the forest floor, untouched. “Few come to clean it now,” Tara observed sadly. “The great hunters vanish, roads split the forests, and the balance falters.”

Their wings grew weary as they reached the cold, rolling oceans. Here, sharks had once ruled as the ultimate scavengers of the deep, consuming what sank beneath the waves. But as the vultures peered into the waters, Kavi saw empty nets drifting like ghosts. “Humans take the fins, leaving the sea rulers broken,” he said grimly. “Even here, the carrion waits, and the waters grow foul.”

Tara’s heart ached. “Everywhere we fly, the great cleaners are gone. What happens when the carcasses remain?”

Kavi recalled the stories from their homeland. When the vultures of India declined, stray dogs multiplied in their absence. With the dogs came rabies thousands of human lives lost, millions of dollars drained from poor families. “Without us,” he said quietly, “disease rises. The dogs and rats spread what we once prevented. The people do not yet see how deeply their fate is tied to ours.”

At dawn, they rested on a cliff, gazing at the awakening world below villages, cities, fields, forests. Yet something deeper was missing.

By Dr. Animesha Rath

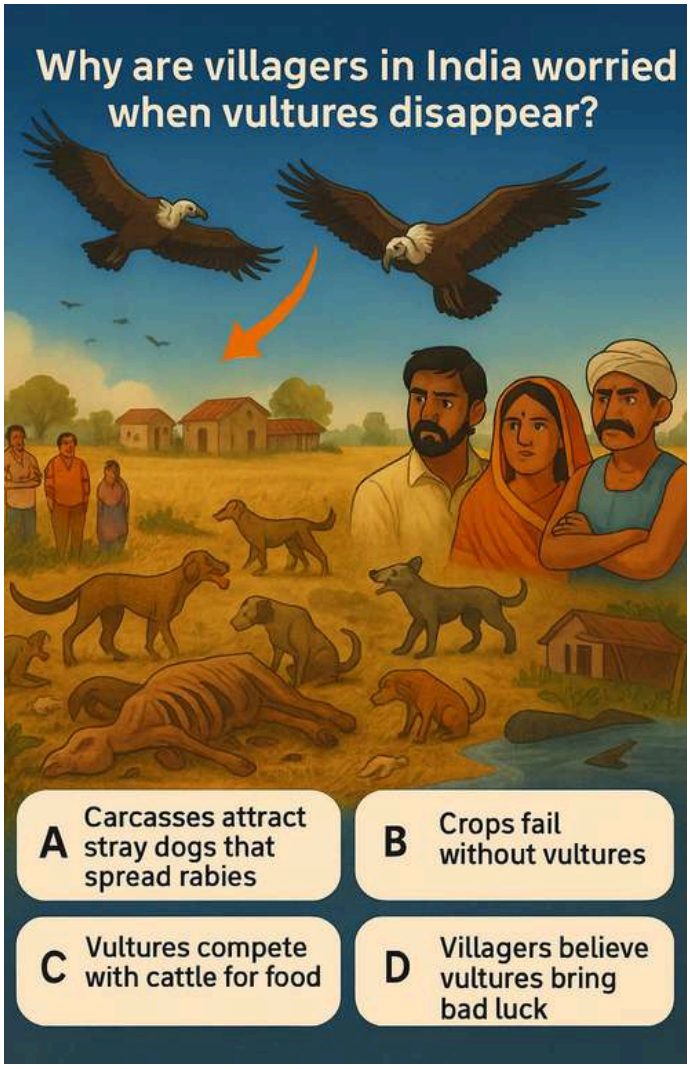
"We are not just birds," Tara murmured. "We are guardians. When we vanish, the earth grows sick, and humans pay the price."

"But not all is lost," Kavi replied. "In India, diclofenac has been banned. Some of our kin survived. In other places, laws now protect condors, crocodiles, and even wolves. Perhaps, if humans remember, they can still act."

They spread their wings once more, rising into the morning light.

"Then let us keep flying," Tara said. "Let us bear witness. From savanna to sea, from mountain to plain, we will tell the story: Protect the scavengers, and you protect yourselves."

And with that, Kavi and Tara soared toward the horizon two shadows against the rising sun carrying a message as old as life itself: carrion must be cleared, or life falters. Their journey was not only their own, but a call to all who would listen: the health of vultures, hyenas, sharks, and humans is the same.



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| By Dr. Preeti Sharma

THE SILENT WEIGHT OF OUR PLATES

In Maharashtra, India, Ravi worked on his tomato farm near the forest. Parrots pecked at the red fruits, frogs croaked in the irrigation channels, and deer wandered along the field edges. For Ravi, this was normal. Farming meant feeding his family and selling at the market. He never thought his tomatoes were part of something bigger than his farm and his income.

One day, Dr. Meera visited his village. She carried maps filled with bright colors, each showing where crops and wildlife overlapped. “Ravi,” she said, “your tomatoes overlap with the homes of many species. Compared to the UK, tomatoes here create much higher biodiversity pressure.”

She explained further. Scientists measure biodiversity pressure using the richness of animals like birds, reptiles, frogs, and mammals. They calculate how much farmland overlaps with these species’ habitats. This overlap is called the Affected Species Range (ASR). Then they divide this by the tonnes of crops produced to see the pressure per unit of harvest. Ravi realized that in India, tomatoes put more pressure on nature because yields are lower and more land is needed land that shares space with many wild creatures.

That night, Ravi thought about the frogs, parrots, and deer near his fields. Clearing more forest suddenly felt like stealing from them. Instead, he chose a different path. He planted beans and marigolds alongside his tomatoes. The beans enriched the soil, and the marigolds helped repel pests. He also began using improved seeds that gave higher yields from the same area of land. Soon, his harvests improved, but the parrots and frogs still lived around his fields. At a village meeting, Ravi shared what he had learned. “A tomato is never just a tomato,” he said. “It also carries the lives of the creatures around it.”

Meanwhile, in London, Amara, a dietician, encouraged families to eat more fruit for better health. She often recommended mangoes and avocados, proud to give exotic choices. But one evening she read a research paper that compared India, the UK, and South Africa. The findings unsettled her. Imported fruits like mangoes often carried higher biodiversity pressure than local fruits. The UK, being less self-sufficient, “outsourced” much of this pressure to tropical countries. For vegetables, the pattern was different sometimes, local vegetables carried higher biodiversity pressure than imports, depending on yields and habitats.

Amara felt conflicted. “I’ve been giving good advice for health,” she whispered, “but at nature’s cost.”

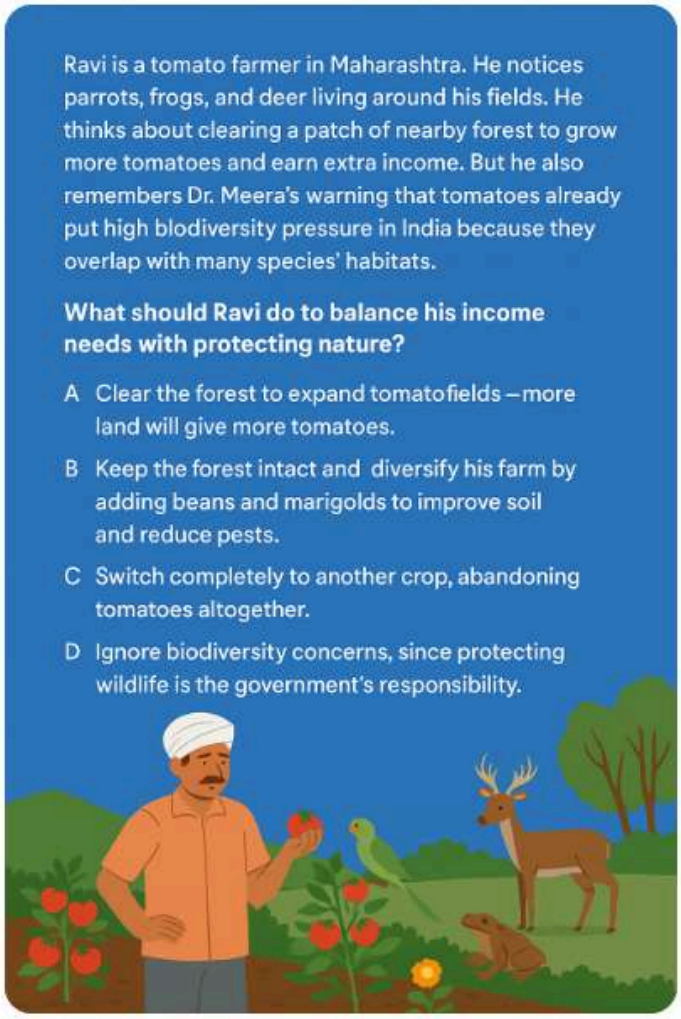
The next week, she changed her advice. She told families to eat more local apples, pears, and berries. She explained that even crops with low biodiversity pressure per tonne could harm nature if eaten in very large amounts. It was not only about the type of crop, but also about where it was grown and how much people consumed. Amara launched a campaign called “Eat Local, Protect Global.” Children in schools traced mangoes and avocados on maps, seeing how forests in faraway countries were linked to their fruit bowls. Amara realized that nutrition could connect personal health with the health of the planet.

| By Dr. Preeti Sharma

Far away in Durban, South Africa, Sipho sold oranges at his small fruit stall. They were cheap, popular, and always in demand. One day, an ecologist explained, “Oranges here create nearly three times more biodiversity pressure than bananas. Orchards push lizards and birds from their homes.” Sipho was stunned.

The next season, he began selling more bananas and shared the story with his customers. At first, people laughed at the idea of choosing fruits for the sake of wildlife. But over time, curiosity grew. His stall became more than a shop it became a place where people learned how their choices touched the natural world.

Ravi in India, Amara in the UK, and Sipho in South Africa all discovered the same truth. Our food choices ripple far beyond the plate. The type of crop, where it is grown, global trade patterns, and how much we consume all decide whether forests, rivers, and wildlife survive or vanish. Protecting health and protecting nature are not separate goals. They are part of the same web of life, woven together with every bite.



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| By Dr. Dhanashree Mundhe

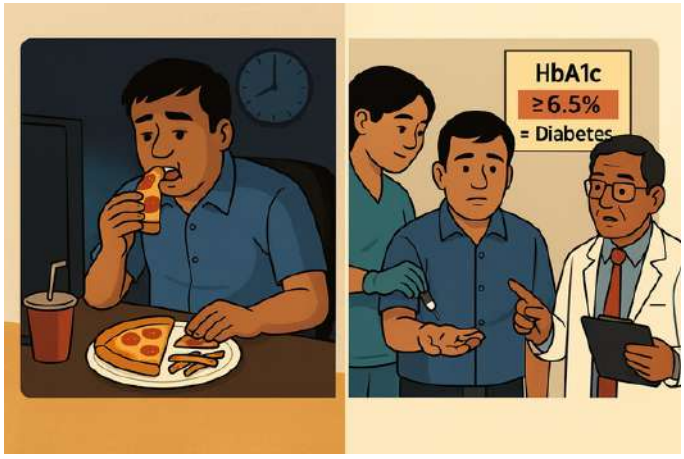
ARJUN'S WAKE-UP CALL

Arjun, a 47-year-old IT professional in the bustling city of Bengaluru, had always thought of himself as relatively healthy. His days were long and sedentary often more than ten hours at his desk and his nights were fueled by takeaway meals: fried snacks, pizzas, and sugary drinks that kept him awake through stressful deadlines. Like many of his colleagues, he rarely exercised. He knew diabetes was common in India, but he believed it was a disease that happened to "other people."

That illusion was shattered one Monday morning when his office arranged a free health camp as part of a corporate wellness program. Curious but unconcerned, Arjun signed up. A nurse checked his weight, blood pressure, and collected a blood sample. When his results came back later that afternoon, he was stunned: his HbA1c was 7.5%. Anything above 6.5% indicated diabetes. Arjun had no symptoms, yet the numbers told another story.

The company doctor explained what this meant. "Many Indians live with diabetes without knowing it," she said gently. National surveys showed that nearly 20% of adults over 45 had diabetes, but almost 40% were undiagnosed. In cities like Bengaluru, the prevalence was even higher close to 30%, nearly double the rate in rural areas. Arjun was not alone; he was one of millions hidden in plain sight.

Awareness, the doctor stressed, was the first step. "Only about 60% of people with diabetes in India know they have it. Of those diagnosed, less than half achieve proper control. Blood pressure management is slightly better, but use of cholesterol-lowering medicines is extremely low, around 6%." These statistics, once abstract, suddenly felt personal.

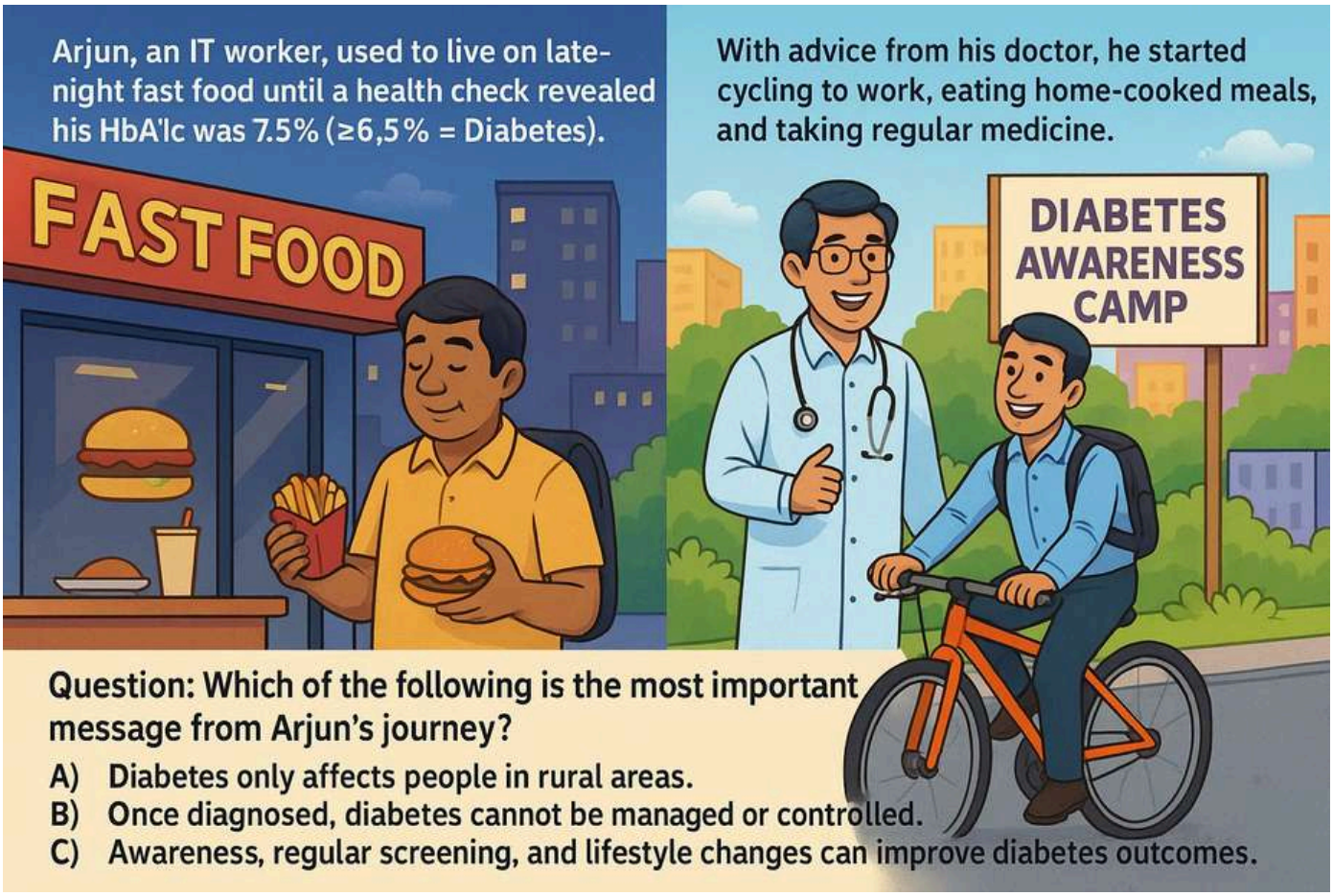


Arjun listened with growing clarity. Diagnosis brought shock, but also opportunity. If nearly half of those diagnosed could reach good control with treatment and lifestyle change, he could too. The doctor advised three priorities: daily exercise, balanced meals, and regular medication.

The next morning, Arjun made a bold choice. Instead of his scooter, he pulled out his long-neglected bicycle. The 4-kilometer ride to the office was tough sweating in work clothes and weaving through traffic but it left him feeling strangely energized. At lunch, he skipped the greasy canteen meal and unpacked a simple box of chapatis, vegetables, and dal prepared at home. His wife joined the mission, cutting sugar in tea and experimenting with millet-based recipes.

Gradually, small changes added up. His blood pressure readings improved, and he felt lighter on his feet. More importantly, his doctor reminded him that diabetes management was not just about lowering blood sugar; it was about reducing the risks of heart disease, kidney failure, and stroke. Controlling blood pressure and cholesterol mattered just as much. Encouraged, Arjun stuck to his routine. At his next follow-up, his HbA1c had begun to fall.

| By Dr. Dhanashree Mundhe



His quiet transformation did not go unnoticed. Colleagues who had skipped the health camp now queued for screenings. Inspired by Arjun, some formed a cycling group, while others began bringing homemade lunches. Slowly, the workplace culture shifted. The office that once thrived on late-night snacks and energy drinks was turning into a community where wellness was celebrated.

Arjun's journey mirrored the national picture: prevalence was high, awareness was improving, but true control required persistence. His story proved that statistics could translate into hope that lifestyle shifts, medical care, and community support could help India face its diabetes challenge head-on.

For Arjun, what began as a frightening diagnosis became a turning point. Each pedal stroke, each homemade meal, was more than a personal choice it was an act of resilience and a reminder that change, however small, could ripple outward to inspire others.

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By Dr. Sivan Friedman

A PACT OF RIVERS

At sunset, three giants India, China, and the USA sat beside a mighty river that split into three streams. Each stream fed their fields, powered their cities, and nurtured their people. Yet the river trembled, weakened by decades of relentless demand. India dipped her hands into the water, watching ripples scatter into the twilight. “My fields are thirsty,” she admitted softly. “Rice and sugarcane drink too much. Every year, in more than sixty percent of my basins, the water runs short for at least four months. I have pleaded with my rivers for more, but they are falling silent.”

China lowered her gaze, her reflection trembling in the current. “Since 1980, I have demanded seventy percent more water,” she confessed, placing wheat, maize, and rice seeds gently on the bank. “In many of my basins, I now withdraw twice what can be sustained. Some of my rivers fail to reach the sea. I see the harm, yet the hunger of my people pushes me forward.”

The USA adjusted his wide-brimmed hat, his eyes fixed on the parched western horizon. “I, too, have stretched my rivers,” he sighed. “Alfalfa, grown for cattle, gulps more than I ever imagined. Nearly a third of my sub-basins now live with recurring scarcity. Since 1980, my overall demand has risen only twenty-two percent, yet unsustainable use has still grown by half. My Colorado and Rio Grande are shadows of their former selves.”

The river, ancient and wise, spoke with a trembling voice that echoed through their hearts. “I cannot give more. Your demand grows faster than my flow. Remember: scarcity is not only about supply it is about how you use me. In many of your lands, it is demand, not climate alone, that drives me dry.”

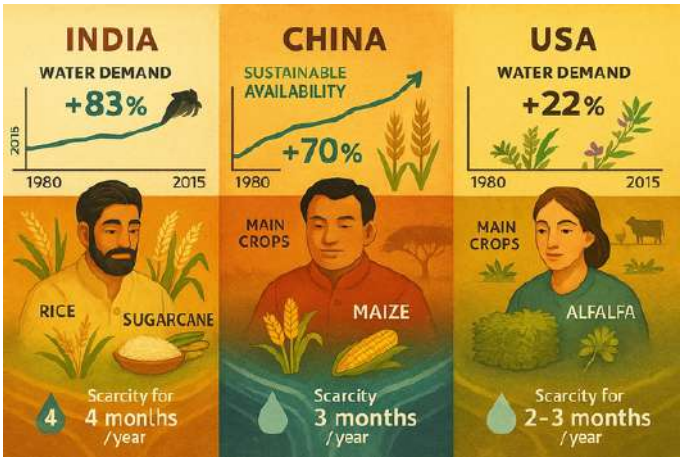
The giants bowed their heads. The river’s words carried the weight of truth. The numbers of Deng et al. were etched into their minds: India’s demand had risen eighty-three percent, China’s seventy percent, and the USA’s twenty-two. Unsustainable withdrawals had surged even more: eighty-two percent, one hundred and one percent, and forty-nine percent, respectively.

Seasonal rhythms weighed heavily upon them. India whispered, “Every July, my rice planting collides with weak monsoon rains. The stress is sharpest in the summer months when I need you most.”

China added, “In my northwest dry and fragile the clash of wheat and maize demand with scant rainfall leaves rivers gasping. Even in my northeast, where water once seemed abundant, the flow now strains.”

The USA nodded. “In my west, irrigation peaks with the hot season. Annual reports hide the truth, but month by month, the crisis bares its teeth.”

The giants realized the hidden truth: yearly averages masked pain. Only by looking season to season, month to month, could they see the full extent of scarcity.



By Dr. Sivan Friedman

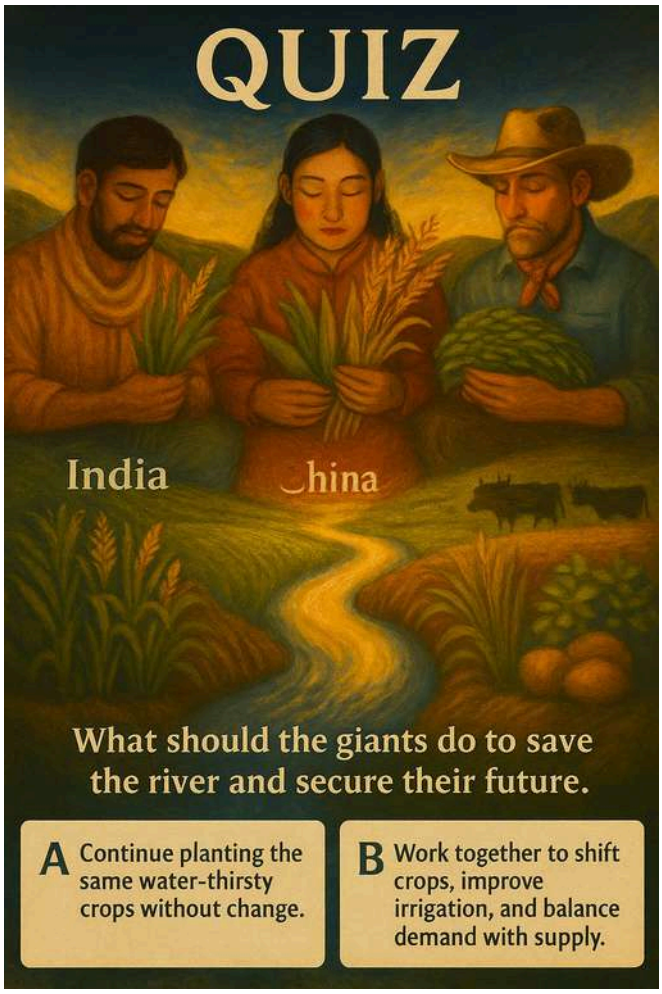
The river shimmered faintly, awaiting their reply. At last, India spoke: “I will try millets, crops that ask for less. My farmers must learn that resilience matters more than tradition.”

China stepped forward. “I will irrigate wisely. Precision, timing, efficiency these must guide my hand. I will reduce losses in canals and deliver water only where it is needed.”
The USA sighed deeply. “I will plant less alfalfa. My cattle will adjust, or my markets will shift. Export profits cannot come at the cost of dying rivers.”

Together, they swore a pact not of dominance, but of humility. They pledged to balance demand with the river’s flow, to respect environmental needs, and to govern water across borders and basins. For they knew water was not endless, and without change, their breadbaskets would wither, their ecosystems collapse.

The river brightened, its streams glowing with promise. “Keep your word,” it said. “And I will carry your hope forward for you, and for the world.”

Their story was not only about survival. It was about a future where giants could walk gently, crops could thrive with less, and rivers could sing again.



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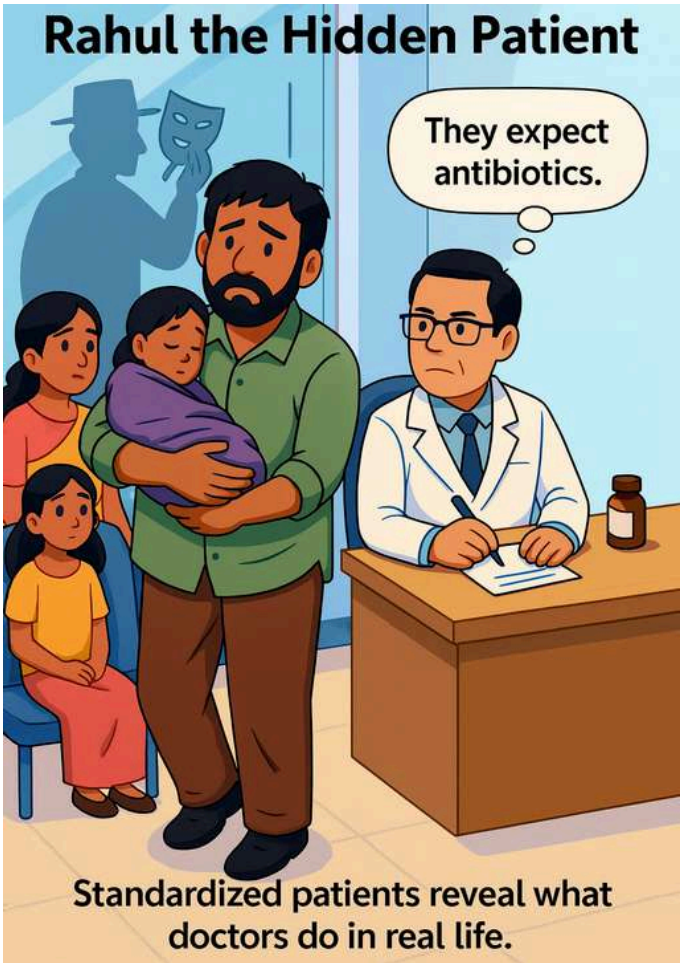
| By Dr. Jnana Ranjan Prusty

THE FAKE PATIENT

Rahul was no ordinary patient. He was a trained actor, but instead of dazzling crowds in theaters, his stage was the narrow corridors of government hospitals, the waiting rooms of private practices, and the dimly lit cabins of small-town clinics across India. His role was unusual and secretive he pretended to be the father of a sick child.

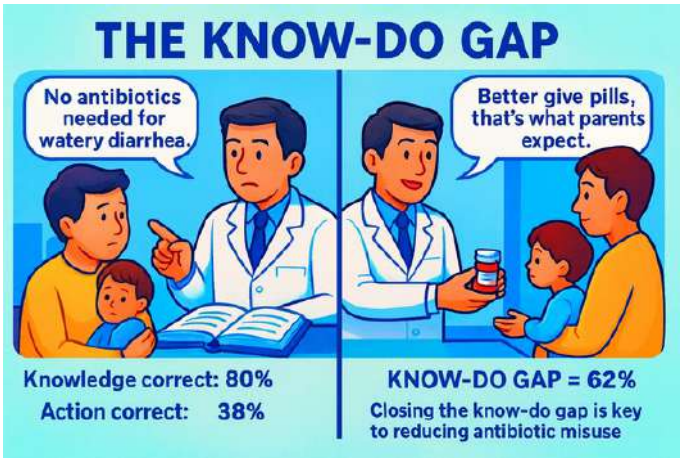
In his story, his son had watery stools but no fever, no blood, and no signs of dehydration. Any doctor trained in even the basics of pediatric care would know: this was not a case for antibiotics. The child simply needed oral rehydration and care at home. Antibiotics would do nothing to help.

Rahul, however, had rehearsed his lines with the precision of a seasoned actor. “Doctor saab, my child has loose motion since yesterday,” he would begin, his tone heavy with worry. His eyes carried the weight of a sleepless



father, his shoulders slouched in fatigue. Everything about him was convincing. His job was not to seek medicine but to reveal what doctors actually did when faced with a textbook case where antibiotics were unnecessary.

The project he was part of was enormous. Along with fellow actors, Rahul visited over 2,000 healthcare providers across towns and villages. Behind the effort was a group of researchers determined to answer a troubling question: why are antibiotics prescribed so frequently when they are not needed?



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Previous surveys had already shown something puzzling. When asked in exams or hypothetical case vignettes, most doctors answered correctly: no antibiotics for watery diarrhea without danger signs. On paper, knowledge was not the problem. Yet in reality, prescriptions told another story. The scientists suspected a wide gap between what doctors knew and what they actually did. They called it the know-do gap.

Rahul’s quiet performances exposed the truth. In more than 70 percent of his encounters, doctors prescribed antibiotics even though his “child” clearly did not need them.

| By Dr. Jnana Ranjan Prusty

Even more striking was that among doctors who had earlier given the correct answer in knowledge tests, 62 percent still reached for the prescription pad in real practice. Awareness and guidelines were not enough. Something else was shaping their decisions.

Was it profit? The researchers tested this by creating scenarios where doctors had no financial incentive to sell antibiotics. But the overprescribing barely budged. Was it a lack of alternatives? No, because doctors had oral rehydration salts and other safe treatments readily available.

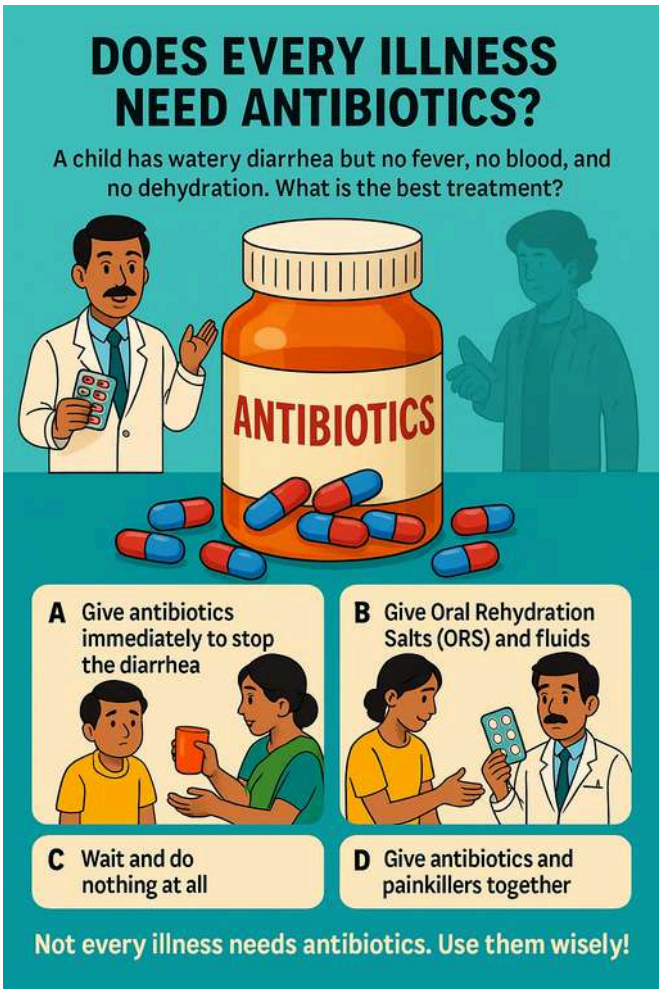
The real culprit turned out to be perception. Many providers simply believed that patients expected antibiotics. They feared that if they did not prescribe, families like Rahul's would leave unsatisfied, doubting the doctor's competence. Ironically, this belief was not supported by evidence.

To prove it, the researchers conducted a discrete choice survey with real patients. The results were illuminating. Parents did not prefer doctors who prescribed antibiotics unnecessarily. Instead, they valued providers who listened carefully, explained clearly, and recommended supportive care. The mismatch was startling while doctors thought families wanted pills, families actually wanted trust.

When Rahul learned of the findings, he smiled. His small but carefully crafted role had helped uncover a silent epidemic of overprescription. His "performances" demonstrated that solving the antibiotic crisis was not just about closing the knowledge gap it was about bridging the know-do gap.

The lesson was powerful. Training programs and guidelines alone will not stop antibiotic misuse. The real change will come when doctors see that trust matters more than a prescription slip, and that safe care often means resisting the urge to medicate.

Rahul realized he had been part of a much bigger play. Not one staged under bright theater lights, but one unfolding quietly in the world of public health. Sometimes, the stage for change is a crowded clinic. And sometimes, it takes actors to reveal reality.



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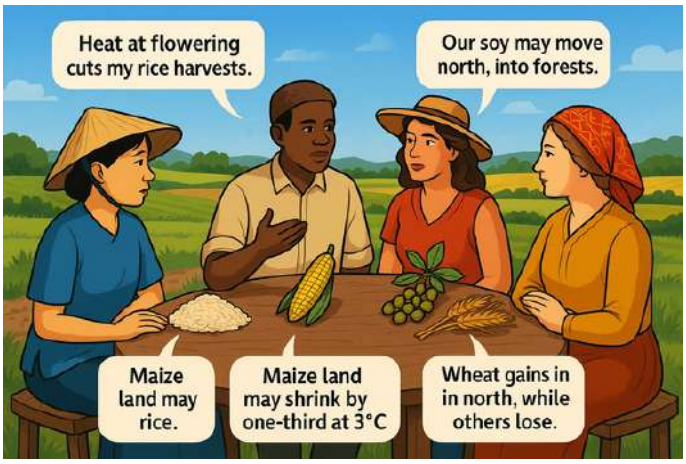
| By Dr. Ipsita Mohanty

THE BROKEN RHYTHM

In Sundarpur, a village in eastern India, rice is more than food. It is ritual, livelihood, and memory woven together. Each summer, families wade barefoot into shimmering paddies, bending low to transplant seedlings in straight rows. As they work, they whisper prayers for the monsoon to arrive on time. For generations, this rhythm guided life in the village. But in recent decades, the rhythm has faltered. Rains come late or not at all. Heatwaves sear the young plants. Harvests feel lighter. Farmers shake their heads and say, "the rains have changed."



A recent study published in *Nature Food* sheds light on what Sundarpur's farmers are experiencing. Scientists examined the climatic limits of the world's 30 most important crops. For each crop, they defined what they call a Safe Climatic Space (SCS) the range of temperature, rainfall, and aridity in which that crop currently thrives. By combining global climate models with maps of crop production, they projected how these safe zones will shift under different levels of global warming. Then they asked a pressing question: under 2 °C, 3 °C, or even 4 °C of warming, how much of today's farmland will remain within safe limits?

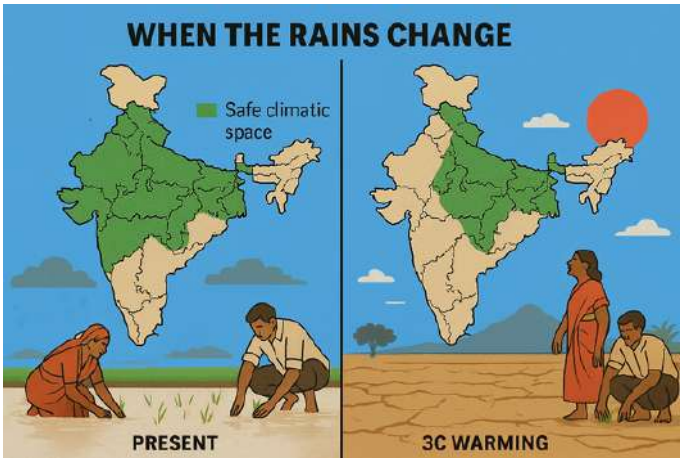
The answers were sobering. At 2 °C warming, more than half of global croplands are expected to lose crop diversity meaning fewer kinds of crops can be reliably grown in those places. At 3 °C, the picture darkens: up to one-third of low-latitude farmland could fall outside safe zones for staples such as rice and maize. For Sundarpur, at the heart of Asia's rice belt, these are not abstract percentages. They are a direct threat to the food on every family's plate.

Rice is especially at risk. The study highlights that even a few days of extreme heat during the flowering stage can devastate yields. As warming accelerates, much of South Asia's rice-growing land risks crossing thresholds where successful harvests can no longer be guaranteed. For Sundarpur, this could mean centuries of tradition unraveling within a single generation.

Yet the story is uneven. The same models suggest that mid-latitude and northern regions including Canada, Russia, and northern Europe may gain safe climatic space for crops such as soybeans, wheat, and maize. In these regions, crop diversity could even increase, creating new opportunities. But this global reshuffling raises stark questions: should the world gamble on new agricultural frontiers in the north while historic breadbaskets in the tropics collapse?

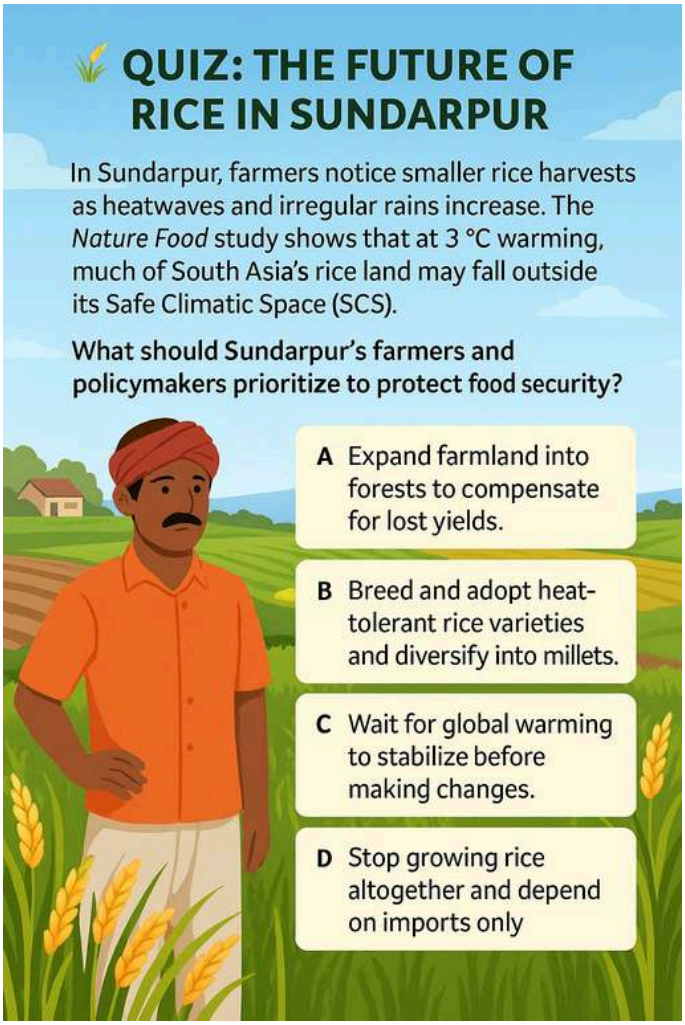
For farmers in Sundarpur, migrating north is not an option. Adaptation must happen where they live. The study points to several strategies: breeding rice varieties that tolerate higher heat, diversifying into more resilient crops such as millets, investing in irrigation to buffer rainfall shifts, and strengthening local support systems. None of these are simple. They require access to technology, financial investment, and supportive policies. Without them, the shrinking of safe climatic space risks trapping farming communities in a cycle of loss.

The researchers emphasize one final message: every fraction of a degree matters. At 1.5 °C of warming, much of Sundarpur's rice land remains within its safe climatic zone. At 3 °C, vast stretches slip out. The village's future depends not only on local innovation but on global choices about emissions, energy, and equity.



By Dr. Ipsita Mohanty

As the sun sets over Sundarpur, farmers still look to the sky, unsure whether tomorrow will bring nourishing rain or scorching heat. The *Nature Food* study reminds them they are not alone. Their struggle is shared across the tropics. But it also holds a glimmer of hope: if the world acts with urgency, perhaps the rains will remember the fields again.



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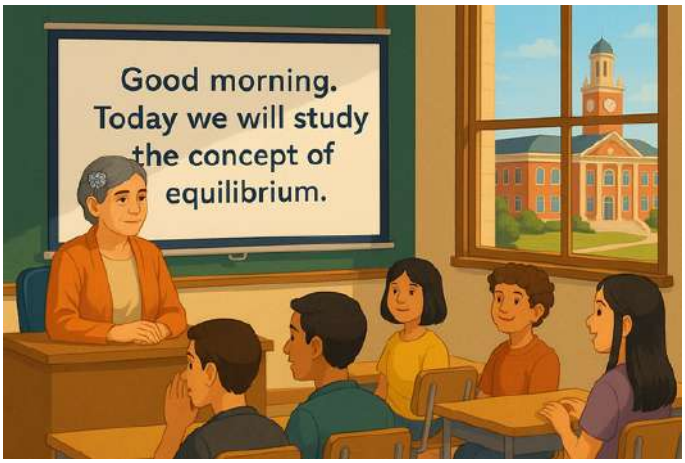
| By Dr. Priyanka

THE SILENT CLASSROOM

The classroom had fallen quiet for months. Once, Professor Meera's voice had filled it weaving equations, ideas, and anecdotes into lessons her students carried long after class. But after a severe stroke, her vocal cords no longer obeyed. She sat in silence, her mind brimming with lectures, yet unable to share them. Her students, though devoted, struggled to follow her shaky notes on the board or decipher her fragmented gestures. The essence of her teaching her rhythm, her explanations, her personal touch seemed lost.



When a research team approached her, they carried something new: hope in the form of a neural interface. A tiny array of electrodes, gently implanted into her motor cortex, could detect patterns of brain activity normally involved in speaking. Even if her voice could not emerge, perhaps her brain was still rehearsing words internally. This "inner speech," once thought too faint to detect, might now be decoded.

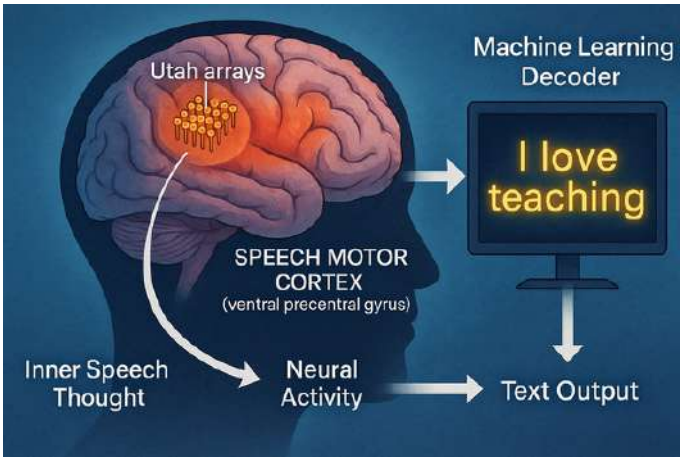
The inspiration came from a groundbreaking study. Scientists had worked with four participants who, like Meera, had lost the ability to speak due to ALS or brainstem stroke. Using intracortical microelectrode arrays in the precentral gyrus the brain's speech motor hub they recorded neural signals as participants attempted speech, listened to words, or silently imagined saying them. The surprising finding: inner speech produced recognizable neural patterns. Though weaker than overt attempts to speak, the signals followed a similar rhythm, like a whisper inside the brain.

Meera began training with the system. At first, she silently imagined short words or syllables. The decoder a machine learning model tried to map her brain signals to text. Mistakes were frequent: "book" might become "cook," or "yes" might flicker as "less." But with repetition and adaptive algorithms, the system improved. To protect her control, the researchers even built in a mental password a phrase she could think privately to activate the decoder, ensuring her communication was always intentional.

Weeks of practice passed. Then one bright morning, she faced her class again. Students shifted uneasily, unsure what was about to happen. Meera closed her eyes, concentrated, and thought: Good morning. A second later, the words appeared on the projector screen. Gasps rippled through the room. She continued: Today we will study the concept of equilibrium. Line by line, her thoughts turned into text.

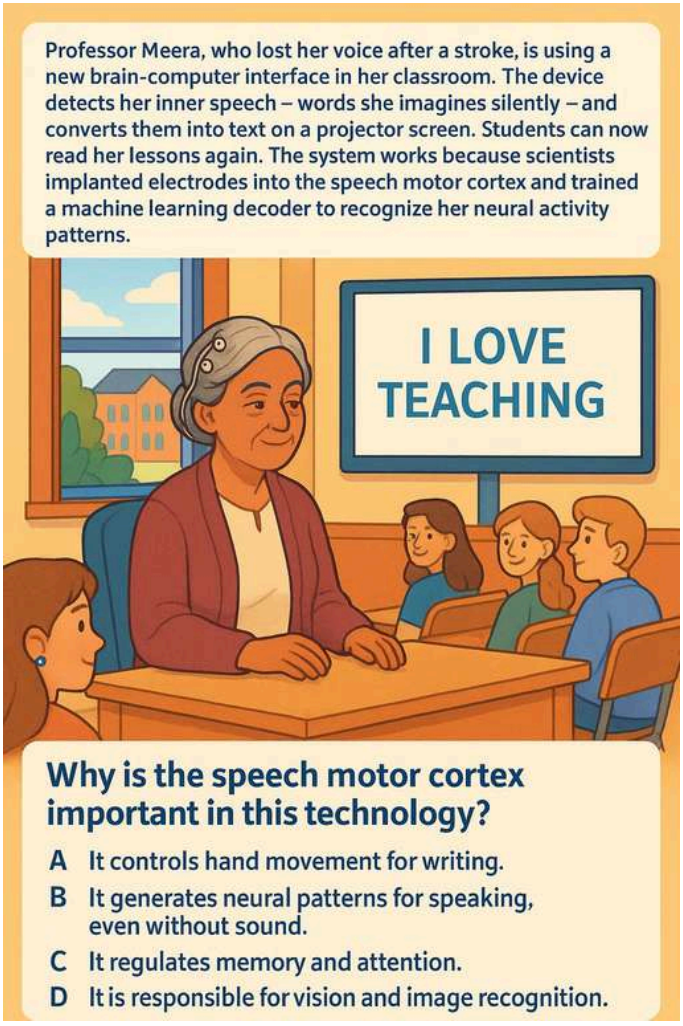
Her students leaned forward, captivated. What struck them wasn't the computer or electrodes, but the return of their teacher's essence. The phrasing was hers, the humor was hers, the teaching style unmistakable. The boundary between silence and speech had been bridged.

The research that made this possible had proven more than feasibility. It showed that inner speech decoding could handle vocabularies of up to 125,000 words though with higher error rates and that users could reliably control when to "speak" through thought alone. For people like Meera, this was not just a communication tool. It was the restoration of identity.



By Dr. Priyanka

As her lecture ended, the class erupted in applause. Not only for the technology, but for the return of their teacher's voice. Silence, they realized, was no longer the end of communication. It was the beginning of a new dialogue one where thought itself could find words again.



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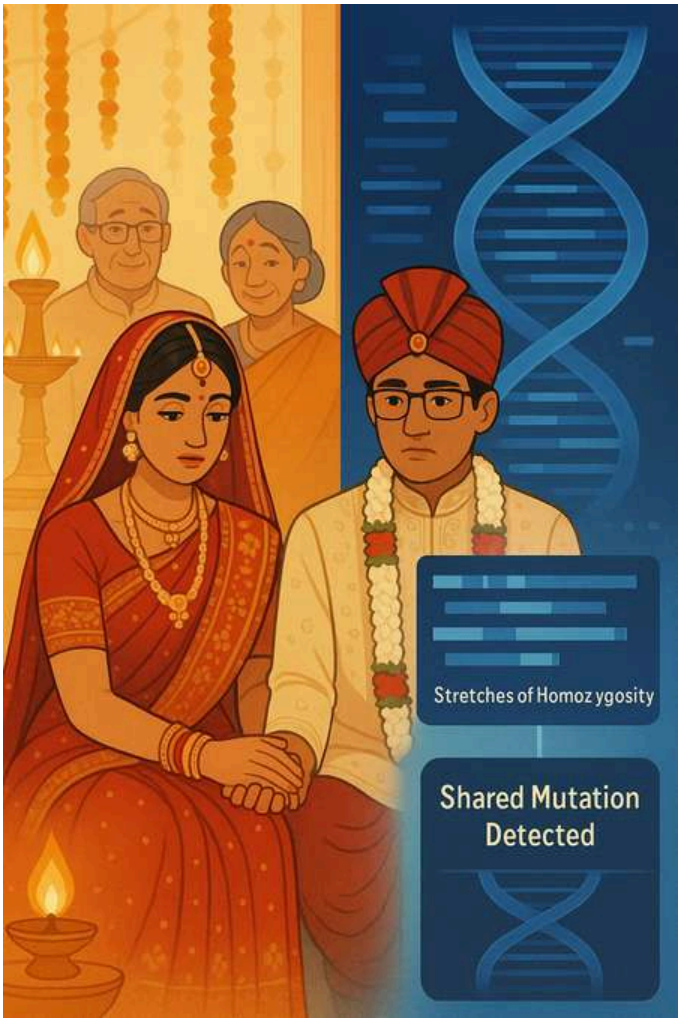
Department of Electrical Engineering, Wu Tsai Neurosciences Institute & Stanford University, Stanford, CA, USA

| By Dr. Priyangana Deb

THE BRIDE'S QUESTION

The wedding hall glowed with light, alive with laughter, ritual chants, and the weight of centuries-old traditions. Anjali adjusted her jewelry nervously not because of the ceremony itself, but because of a question that had been haunting her ever since the counseling session a month ago.. At the community health center, the counselor had spoken carefully, choosing words that would not offend: "Genetics matters in close marriages. When families marry within their community for generations, the risk of certain diseases in children rises."



Anjali's first reaction had been disbelief, even anger. For centuries, her family had followed the practice of marrying within their caste. It was more than a rule it was identity, pride, and continuity. To suggest it was dangerous felt like an insult to her heritage. But curiosity tugged at her, and she began to read.

The timing was uncanny. Headlines across the country were discussing a new landmark study: **2,762 Indian genomes sequenced** across castes, tribes, linguistic groups, and regions. The results were striking. India's genetic history was revealed as a mosaic hunter-gatherer ancestry layered with Neolithic farmers and Eurasian pastoralists. Yet, the deep traditions of endogamy had fractured this diversity into countless genetic islands.

The scientists showed that many groups carried unusually high **homozygosity** long stretches of DNA where both copies were identical, passed down from common ancestors. This, they explained, was the hidden cost of generations of marrying within one's group. And it mattered. If both parents carried the same rare mutation, their child could inherit two defective copies, leading to devastating recessive diseases. Communities shaped by strong founder effects were found to carry heavier burdens of these deleterious variants.

By **Dr. Priyangana Deb**

Anjali read the findings again and again. It was unsettling to realize that customs meant to preserve culture also carried silent genetic risks. When she shared the study with her fiancé, Rohan, he brushed it off. “Our parents and grandparents lived fine,” he said. “If it were such a problem, wouldn’t we have seen it by now?”

But Anjali persisted. “Science doesn’t erase tradition. It only shows us what we carry. Don’t we at least want to know?” Eventually, Rohan agreed to genetic screening.

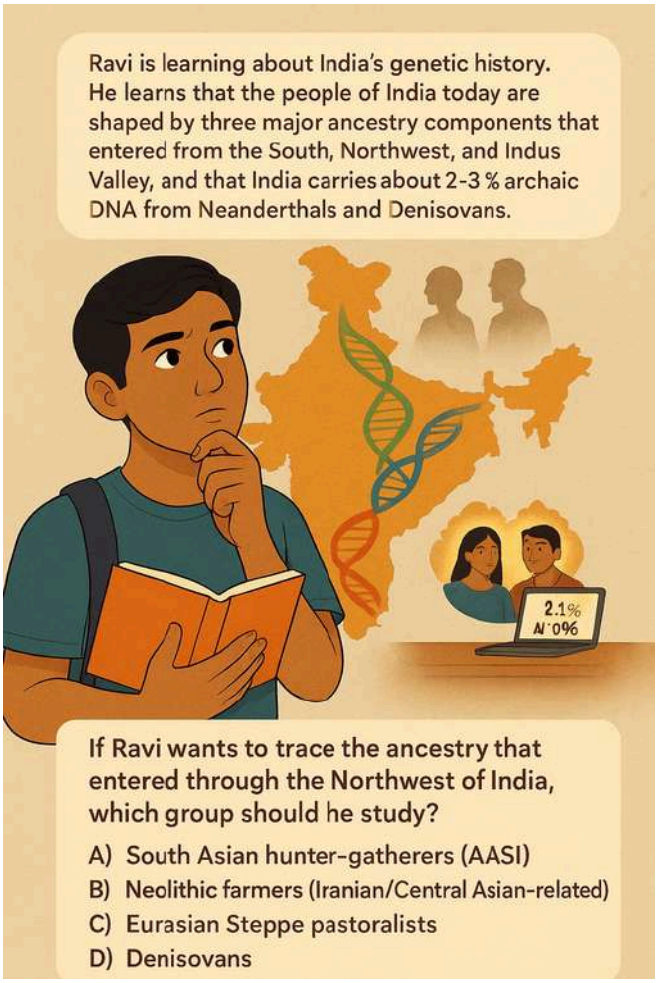
The results arrived one week before the wedding. Both Anjali and Rohan were carriers of a mutation in the same gene, linked to a serious metabolic disorder. For them, the mutation was harmless. But together, with every pregnancy, there would be a one-in-four chance of having an affected child.

Anjali felt the weight of history pressing on her. Generations had unknowingly passed down this silent burden, preserved by the very customs designed to protect identity. Now the risk was no longer hidden. Science had given it a name and a number.

The counselor explained their options. They could proceed with awareness, choosing early diagnosis for children. They could consider in-vitro fertilization with embryo screening. Or they could join genetic counseling programs designed for communities with strong founder effects. The message was clear: science was not asking them to abandon tradition. It was offering knowledge, a way to merge heritage with health.

On her wedding night, surrounded by rituals binding her to the past, Anjali’s thoughts stretched toward the future. She realized that her ancestors’ choices were etched into her DNA, but so were her opportunities. Tradition and genetics did not have to be enemies. They could guide her together, shaping a new legacy that honored both culture and health.

The study’s message echoed in her mind: India’s 50,000-year history is not only a tale of migrations and admixture, but of how culture and endogamy shape today’s health. For Anjali, it was no longer distant science. It was her personal story a bridge between the old and the new, between identity and destiny



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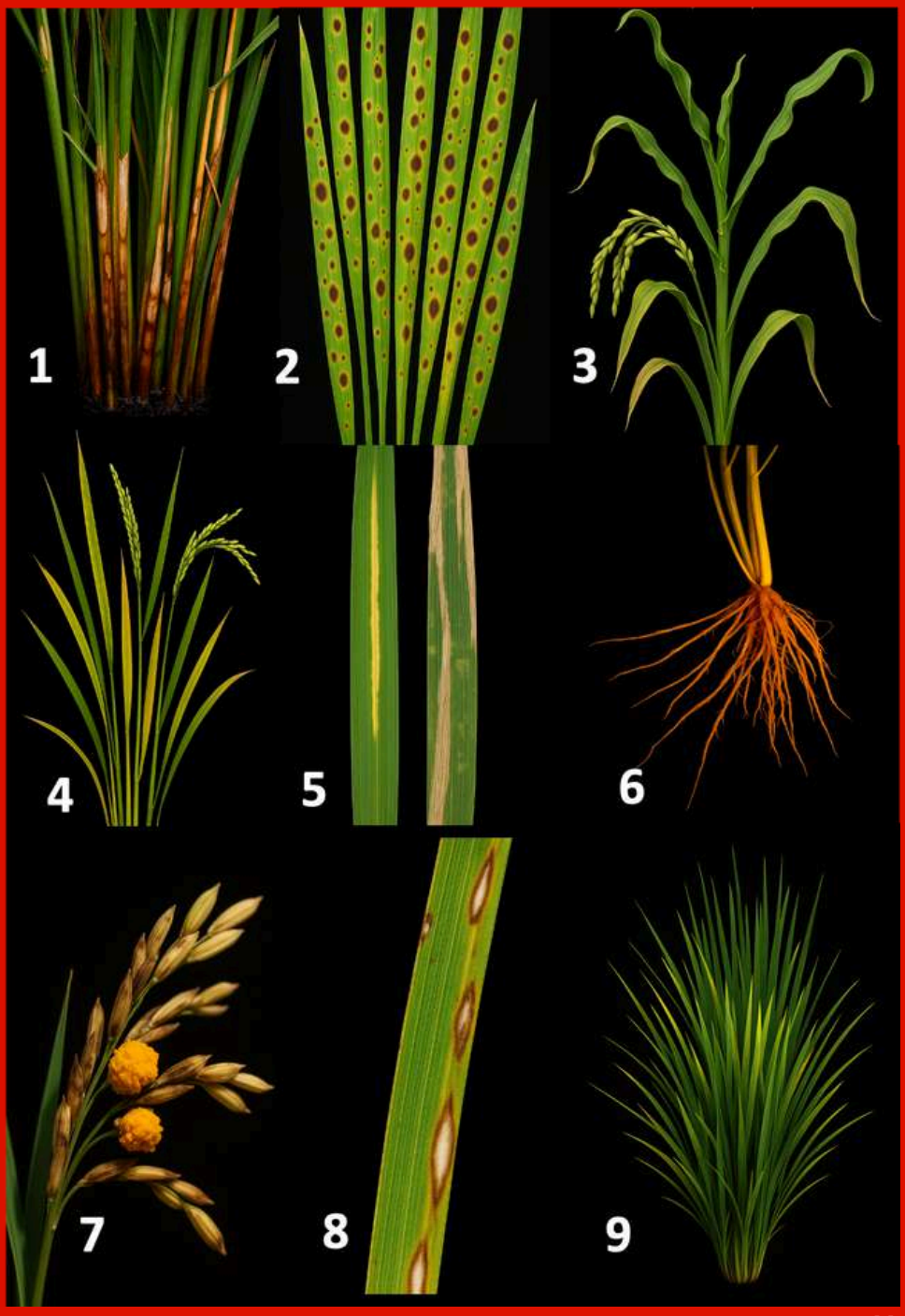
"Rice Under Attack: Can You Name the Culprit?"



Yellow dwarf Virus
Tungro virus
Sheat Blight
False Smut
Leaf Blight
Root-knot Nematode
Leaf Blast
Brown spot
Rice Ragged Stunt Virus

p 41

DISCOVERY HIGHLIGHTS

ONCOLOGY & MEDICINE

SMOKING AFTER CANCER: A DEADLY HABIT PERSISTS

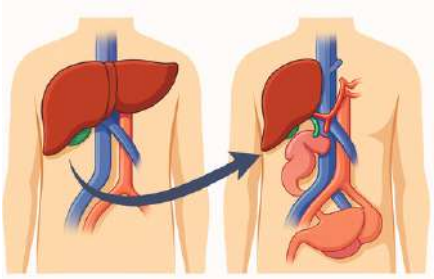
You might think that a cancer diagnosis would be enough to make people quit tobacco for good. But a new study shows that in India, many patients continue smoking or chewing tobacco even after being told they have cancer. Researchers reviewed 20 studies covering more than 75,000 people. Shockingly, they found that nearly three out of four cancer patients in India kept using tobacco after their diagnosis. Half of them smoked, while more than a third used smokeless forms like chewing tobacco. This is troubling because tobacco not only causes cancer but also makes treatment less effective and increases the chance of the disease coming back. The study's authors say hospitals should routinely check patients for tobacco use and offer help to quit as part of cancer care. If acted on, such steps could save lives, reduce healthcare costs, and improve survival for thousands of people battling cancer in India.

J. Cancer Policy, 100605, (2025)

LONG LIFE: INDIA'S 700 CHILDREN WITH NEW LIVERS

Liver transplantation for children in India was once rare, slowed by high costs, infections, and limited expertise. But in just 13 years, doctors at a single center have performed 700 pediatric liver transplants the largest series ever reported from an emerging nation. The results are striking. Survival after surgery was 94% at 90 days, 90% at one year, and still 85% a decade later. Outcomes were similar whether children weighed less than 5 kilograms or more than 10, and survival rates remained steady across the program's early and later years evidence that the team overcame the usual "learning curve" quickly. The median follow up for patients was more than five years, showing that children are not just surviving but living long after their surgery. The study highlights a shift: in India, the focus of liver transplant programs has moved beyond short term survival toward long term care and quality of life.

Transplantation, 10.1097, (2025)

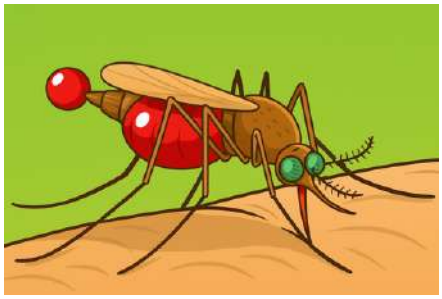


INFECTIOUS DISEASES & IMMUNOLOGY

MALARIA GAP: INDIA'S NUMBERS DON'T ADD UP

India has pledged to eliminate malaria by 2030, yet a puzzling gap persists between official case counts and World Health Organization (WHO) estimates. A new study finds that from 2010 to 2022, India's reported cases were often more than ten times lower than WHO's estimated burden. Researchers examined the Estimated to Reported Ratio (ERR), which remained consistently high across South East Asia (above 6) and particularly in India (above 10). They point to unclear assumptions in WHO's modeling, alongside serious gaps in national reporting especially from the vast private health sector, where malaria cases often go unrecorded. Independent field studies add weight to the concern: microscopy tests in India showed malaria positivity rates 3 to 55 times higher than what official data suggested. Unless these discrepancies are resolved by improving private sector reporting and clarifying WHO's estimation methods the real burden of malaria may remain hidden, threatening elimination goals.

BMJ Glob. Health 10, e019170 (2025)



DENGUE RISK: INFANTS LOSE PROTECTION TOO SOON

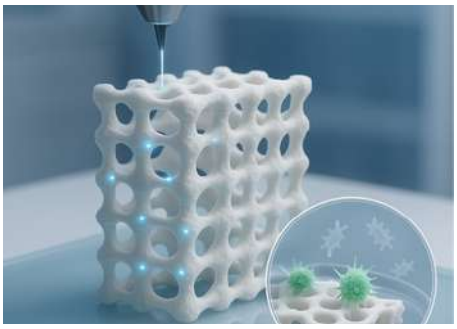
Dengue, the world's most widespread mosquito borne viral disease, poses a hidden risk for India's youngest children. A new study shows that while most babies are born with protective maternal antibodies, these defenses decline rapidly in the first year of life leaving infants vulnerable before vaccines can be given. Researchers tested more than 600 infants in Pune, tracking dengue specific antibodies over time. At birth, 71% of babies had protective antibodies, but by 6 months this fell to just 14%, and by 9 months only 3%

DISCOVERY HIGHLIGHTS

remained protected. Alarmingly, some infants as young as 3 months already contracted dengue, showing positive IgM results. At birth, many babies carried antibodies against three or four dengue virus serotypes, but neutralizing titers dropped sharply by 9 months. The findings suggest that Indian infants become susceptible to dengue infection much earlier than expected an insight that could guide the optimal timing of dengue vaccination programs in the country.

Am. J. Trop. Med. Hyg. tpmd240214 (2025)

MATERIALS SCIENCE & NANOTECHNOLOGY



3D PRINTED BONE SCAFFOLD: STRONGER, SAFER, AND FIGHTS GERMS

Bone implants often face problems like corrosion, the growth of harmful bacterial biofilms, and the need for repeated surgeries. To solve this, scientists have created a new type of 3D printed bone scaffold using a special nanocomposite material. The scaffold was made from chitosan (a natural material), hydroxyapatite (HAP) (the main mineral in bone), and Ti MXene nanoparticles. Together, these materials mimic the structure of soft bone tissue. The version containing 0.3 mg/mL of Ti MXene worked best. It had high strength (23.3 MPa in tensile tests), Low swelling and slow degradation, meaning it stays stable, Less bacterial biofilm growth, especially against Staphylococcus aureus (a major cause of bone infections), Good cell compatibility cells grew well on the scaffold without signs of toxicity. In simple words, this 3D printed scaffold is strong, safe, and resistant to infections, making it a promising option for bone repair and healing in patients.

Sci. Rep. 15, 33762 (2025)

ILVER NANOCHITOSAN: A NATURAL DEFENSE FOR HEALTH

Scientists have developed silver chitosan nanoparticles (Ag Chi NPs) using chitosan extracted from the cuttlebone of Sepia pharaonis (a marine species). These tiny particles, measuring just 15–40 nanometers, were confirmed through advanced tests that showed they were round in shape and contained crystalline silver. The nanoparticles showed powerful antioxidant activity, helping to neutralize harmful free radicals. They also proved to be strong antimicrobials, effectively stopping the growth of bacteria like Streptococcus mutans, *Staphylococcus aureus*, and *E. coli*. However, they did not work against the fungus Candida albicans. Importantly, when tested on human cancer cells, the nanoparticles were mostly safe at low concentrations but showed anticancer effects at higher doses. Overall, this study highlights silver nanochitosan as a sustainable and versatile material with great promise for wound healing, antimicrobial coatings, and even cancer related therapies.

3 Biotech 15, 345 (2025)

TECHNOLOGY & AI

SMARTER AI: FASTER AND MORE ACCURATE OBJECT DETECTION

Artificial intelligence (AI) is now widely used to recognize objects in real time for example in self-driving cars, security systems, and smart cameras. A new study improves on the popular YOLO NAS (You Only Look Once – Neural Architecture Search) model to make it even faster and more accurate.The researchers added two key upgrades:MISH activation function – this helps the AI "learn" better by improving how information flows during training.

Artificial Bee Colony (ABC) optimization – a nature inspired algorithm that mimics how bees search for food, used here to fine tune the AI's parameters.

They trained and tested their improved model on a custom dataset. The results showed that this version of YOLO NAS outperformed other YOLO models (YOLOv6, YOLOv7, and YOLOv8). It achieved higher accuracy (98%), precision, recall, F1 score, and mean average precision (mAP) across different benchmarks. In simple terms, this means the upgraded system is better at correctly spotting objects and works more reliably in real time making it useful for future computer vision applications in industry, transport, and security.

Sci. Rep. 15, 32903 (2025)

DISCOVERY HIGHLIGHTS

ECOLOGY & BIODIVERSITY

CLOUDED LEOPARDS: SAVING THEIR FOREST PATHWAYS

The clouded leopard (Neofelis nebulosa) is a rare and vulnerable wild cat found in the forests of Northeast India. Its survival is threatened by human activities like deforestation, farming, and road building, which break up its forest home. Scientists used computer models to map where clouded leopards can still live and how different forest patches are connected. They found that only about 7% of Northeast India's landscape is highly suitable for these cats. Key factors were forest cover, forest loss, human population density, and distance from protected areas. The study identified 30 core habitats linked by 64 movement corridors. Some of these corridors are especially important, like the one between Dehing Patkai (Assam) and Fakim (Nagaland). But "pinch points" narrow stretches of forest were found between Namdapha National Park and Intanki National Park, where even small amounts of forest loss could cut off connections. Protecting these corridors and pinch points is crucial so clouded leopards can move safely between forests, find mates, and keep healthy populations.

Without this, further habitat loss could isolate groups of leopards and push the species closer to extinction.

Sci. Rep. 15, 33373 (2025)

LIFE AT HIGH ALTITUDE: HOW HUMANS AND ANIMALS ADAPT

High mountains like the Himalayas, Andes, and Ethiopian highlands are tough places to live. The air has less oxygen (hypoxia), it's very cold, and there's strong UV radiation. Yet, people and animals have managed to survive here for thousands of years through special genetic adaptations.Scientists reviewed many genetic studies and found that certain genes like HIF1A, EPAS1, EGLN1, VEGFA and others help the body adjust to low oxygen by improving blood production, blood vessel growth, and energy use. In humans, these genes allow better oxygen transport in the blood. In livestock like yaks, sheep, and cattle, similar or related genes play the same role. Even though humans and animals have different evolutionary histories, they show similar traits for survival an example of convergent evolution, where different species find similar solutions to the same problem. The review highlights that both humans and livestock at high altitudes have been shaped by natural selection, keeping only the gene variants that improve survival in harsh mountain environments.

These insights are valuable for evolutionary biology, medicine, and livestock breeding in extreme climates.

Mamm. Genome (2025)

TURTLE TROUBLE: PLASTIC POLLUTION THREATENS OLIVE RIDLEY HATCHLINGS

The Rushikulya rookery in Odisha is one of the world's most famous sites where Olive Ridley sea turtles come ashore in huge numbers to lay eggs. But new research shows that the beaches here are now heavily polluted with plastic litter and abandoned fishing nets, creating deadly risks for baby turtles. Scientists studied four nesting beaches and recorded over 1,100 pieces of litter. Shockingly, 85% of the waste was plastic from bottles and bags to synthetic ropes and nets. Pollution indices classified all the beaches as "dirty" to "extremely dirty. "The impact on turtles was severe. Researchers found 237 dead hatchlings and another 121 entangled in fishing nets and ropes, unable to reach the sea. Much of the plastic was transboundary, meaning it drifted in from outside India, adding to local waste. The study warns that without urgent action such as removing derelict nets, enforcing fishing bans during nesting season, and regional cooperation on plastic waste this globally important turtle rookery could face even greater losses.

Mar. Pollut. Bull. 222, 118673 (2025)

| SCIENCE IN FOCUS |

SCIENCE IN FOCUS

On a warm July morning in 2025, a rocket thundered off the launchpad at Sriharikota. Tucked safely inside was a very unusual satellite, one that carried the hopes of two nations. This was NISAR the NASA–ISRO Synthetic Aperture Radar mission born from a partnership between India and the United States. Its task: to watch Earth in a way no other satellite has done before.

NISAR does not carry ordinary cameras. Instead, it sends out pulses of radio waves that bounce back from Earth's surface, creating radar "pictures." Unlike regular photographs, radar images can be taken day or night, through clouds, haze, or even thick forest cover. And NISAR is the first satellite in history to use two radar bands at once L-band, provided by NASA, and S-band, built by ISRO. This double vision lets it look deeper, past the tree canopy and into the ground, while still capturing fine details on the surface.

After its launch, NISAR unfolded a giant golden mesh antenna, nearly 12 meters wide, the largest of its kind ever built by NASA. From its orbit 747 kilometers above Earth, it can sweep a strip 240 kilometers wide in a single pass. Every twelve days, it flies the exact same path, allowing scientists to spot even the tiniest changes movements smaller than a centimeter.

And the first glimpses are already stunning. In late August, NISAR's radar scanned forests, towns, and wetlands with striking clarity. Trees glowed in shades of green, while towns and bare land appeared magenta. In another image, the patchwork of farms and irrigation circles in North Dakota popped into view, showing how precisely the satellite can map human activity on the land.

But the real excitement lies in what comes next. Over the next three years, NISAR will monitor Himalayan glaciers as they retreat, track the swelling of volcanoes before eruptions, watch farmlands breathe in and out with the monsoon, and measure how much carbon forests hold. It will help forecast floods, landslides, and earthquakes. It will even map wetlands, the hidden lungs of the planet, with an accuracy never seen before.

What makes NISAR even more special is its open-data policy. Every radar image it collects will be freely shared worldwide. From disaster managers to farmers, from

NISAR Satellite (Image credit: NASA)

NISAR: The Satellite That Sees What We Cannot

climate scientists to schoolchildren, everyone will be able to learn from its eyes in the sky.

For India and the U.S., NISAR is more than just a satellite. It is a symbol of what global partnerships can achieve a shared tool to help humanity understand and protect our restless, changing Earth.

Reference

NASA. (2025, September 25). *NASA-ISRO satellite sends first radar images of Earth's surface*. NASA.

NASA Jet Propulsion Laboratory. (n.d.). *Mission concept – NASA-ISRO SAR Mission (NISAR)*. NASA/JPL.

NASA Jet Propulsion Laboratory. (n.d.). *Quick facts | Mission – NASA-ISRO SAR Mission (NISAR)*. NASA/JPL.

| SCIENCE IN FOCUS |

SCIENCE IN FOCUS

In September 2025, India reached an important milestone in space technology. At the Semicon India 2025 event, the government announced Vikram 3201, the country's first fully homegrown 32-bit microprocessor designed especially for rockets and satellites. For decades, India's launch vehicles relied on an older 16-bit chip called Vikram 1601. While it served well, space missions are becoming more complex and need faster, stronger, and safer processors. The new Vikram 3201 is a big step forward.

What makes this chip special is that it is space-grade. Normal computer chips cannot survive in space. They get damaged by radiation, extreme heat and cold, and strong vibrations during launch. Vikram 3201 has been built to handle all of these. It can work between –55°C and +125°C, conditions that would destroy ordinary electronics. Even more impressive, this is not just a lab experiment. The chip has already been tested in space. A batch of Vikram 3201 chips flew on the PSLV-C60 mission earlier this year and worked successfully on board. This gives engineers confidence that the chip is ready for real missions.

Technically, Vikram 3201 can perform much faster calculations than its predecessor, including advanced floating-point operations needed in rocket guidance and satellite control. It also supports Ada, a trusted programming language used in aviation and defense systems worldwide. The chip was built using a 180-nanometer technology process at the Semiconductor Laboratory (SCL), Mohali.

But making a chip is only part of the story. ISRO scientists and engineers also developed the software tools like compilers and simulators that help program and test it. This complete ecosystem means India can design, test, and use its own chips without depending on foreign suppliers.

Why does this matter? Until now, India often relied on imported microchips for its rockets and satellites. This created risks: delays, export restrictions, or sudden shortages. With Vikram 3201, India becomes more self-reliant in a critical area. It supports the vision of Atmanirbhar Bharat (self-reliant India) and shows that the country can master advanced technologies on its own.

Vikram 3201: India's Own Space Microchip

In short, Vikram 3201 is not just a chip. It is the "brain" that will guide future rockets, satellites, and deep-space missions. It marks a proud step toward India's independence in space technology and opens doors for even more powerful processors in the years to come.

Reference

Indian Space Research Organisation. (2025, September). ISRO & SCL develops 32-bit microprocessors for space applications (VIKRAM3201).

Business Standard. (2025, September 2). What is the Vikram 32-bit processor? India's first indigenous space chip.

INNOVATIONS & PATENTS

Every great invention begins with a bold idea—and a patent to protect it. Innovations drive progress, and patents turn breakthroughs into lasting impact. From lab benches to the marketplace, this is where creativity meets protection.

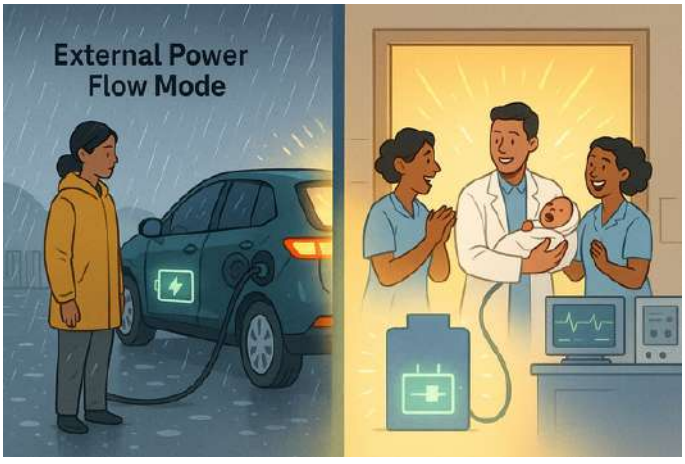
| By Dr. Sivan Friedman

A LIFELINE IN THE STORM

During a heavy monsoon blackout, the clinic was filled with silence. Lights went off, machines stopped, and the doctors worried. Just then, Asha drove up in her electric vehicle (EV). But her car was not just a vehicle, it carried a new kind of smart power system. She parked beside the clinic and switched her EV into "external power flow mode." Inside the car, a small controller clicked, contactors shifted, and the battery began sending electricity through the same motor circuits that usually moved the wheels. Instead of driving, the inverter now worked like a generator. The clinic's monitors blinked alive, fans turned, and nurses quickly sterilized their tools. A baby cried as it was delivered safely, and cheers filled the room.

The beauty of this system is its simplicity. Normally, EVs need a bulky on-board charger to pull energy from the grid and a separate system to send energy outward. But in this design, the existing drive unit is reused for many jobs: charging, regeneration, and powering external loads. The motor windings and converter-inverter do double duty, reducing cost, weight, and space. A small "phase leg" with switches and inductors ensures the voltage always matches what's needed whether charging the battery or powering outside equipment.

This means the EV can take in electricity from single-phase or three-phase grids, capture energy when braking downhill, and even give back power to homes, appliances, or another car. The same contactors that guide current for driving now guide it for survival.



Later, when the rain eased, Asha drove home quietly. She knew her car had carried more than passengers it had carried light, resilience, and hope. This innovation showed that tomorrow's EVs could be more than transport; they could be lifelines.

INNOVATION

Reference:

Kulkarni, S. S., & Joshi, S. (2025). Method and system for managing charging and traction power flow in an electrical vehicle .

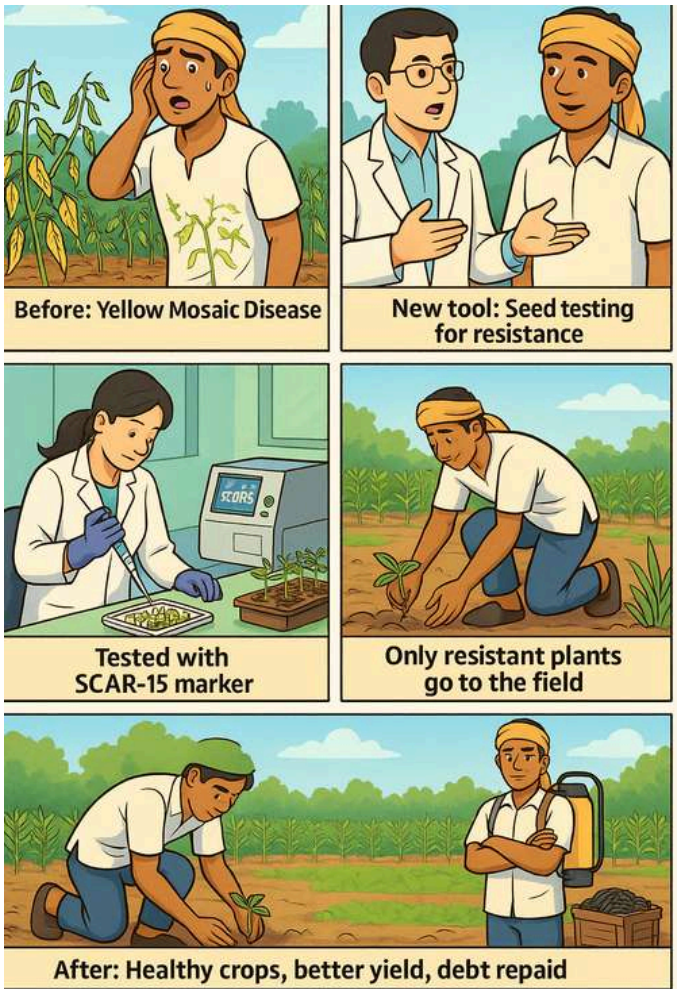
📄 ***Patent Number***: 202421026418
📅 ***Developed by***: TATA Passenger Electric Mobility Limited.

| By Dr. Manas Ranjan Prusty

THE HIDDEN CODE OF RESISTANCE

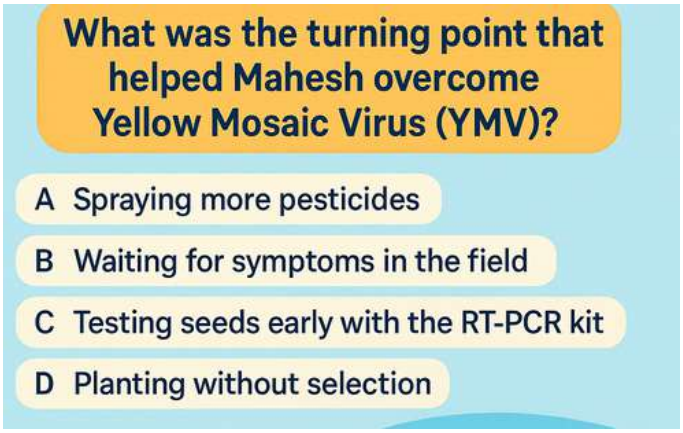
Mahesh, a blackgram farmer, had been struggling for years. Every season, yellow mosaic disease would spread through his fields. The leaves turned yellow, plants grew weak, and pods came out small and shriveled. Many times, Mahesh lost almost his entire harvest. He tried spraying pesticides, but it cost too much money and did not always work, since whiteflies kept spreading the virus. His debts grew, and hope seemed far away.

Then, he heard about a new tool developed by scientists at Anand Agricultural University a Real-Time PCR (RT-PCR) kit for blackgram. This kit was different from older methods. Instead of waiting for plants to grow and show symptoms in the field, the kit could test seedlings in the lab and quickly tell which plants carried resistance to Yellow Mosaic Virus (YMV). The test worked by checking the copy number of a special DNA marker (SCAR-15).



If the copy number was 0.1 or higher, the plant was resistant; if lower, it was susceptible.

Mahesh sent samples of his seeds to a local lab trained to use the kit. Within a few days, he got the results. Out of his batch, many were marked resistant. He planted only those. For the first time, he felt confident going into the season. When harvest came, Mahesh was amazed. The resistant plants grew strong and green, even when neighbors' crops were yellowing. He sprayed less pesticide, saved money, and harvested a healthy crop. His yield improved, his costs went down, and he finally managed to repay his loan on time. For Mahesh, this kit was more than a scientific invention – it was a lifeline. It showed how modern molecular tools can reach small farmers, protect their crops, and bring stability to their families' lives.



INNOVATION

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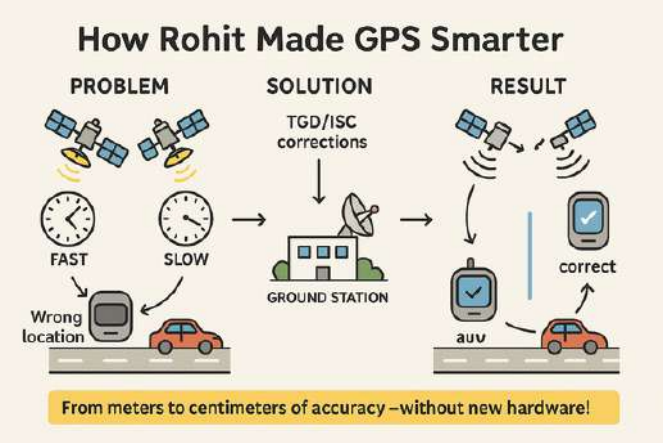
Patent Number: 202421005027
Developed by: Anand Agricultural University.

By Dr. Poulami Chakraborty

THE SECRET FIX BEHIND PERFECT NAVIGATION

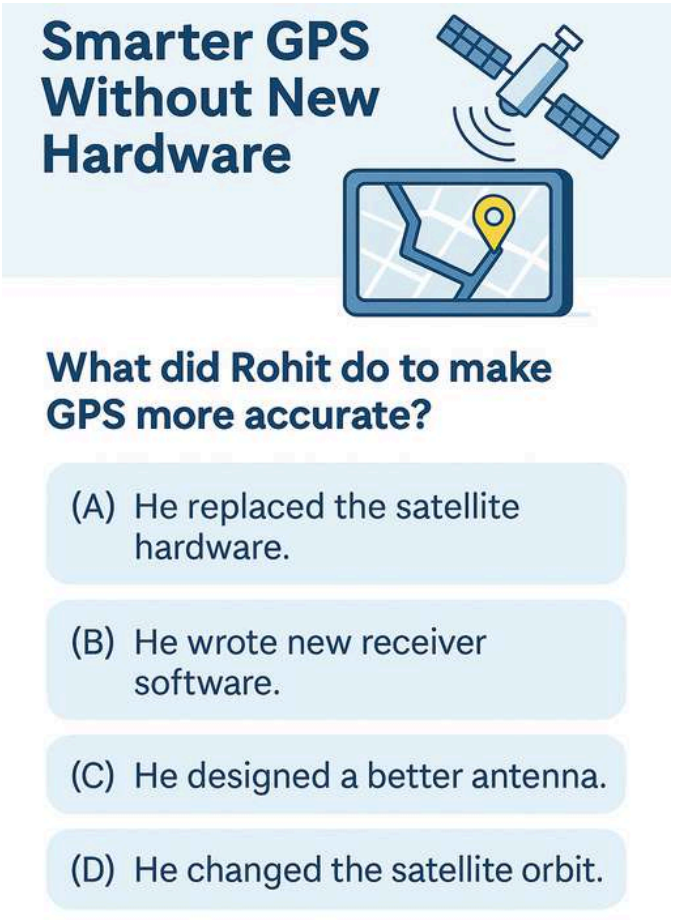
Rohit is an engineer who works on GPS receivers. These are the small devices inside our phones, cars, and surveying tools that read signals from satellites to tell us where we are. One day, Rohit faced a big challenge: satellites had started using new kinds of signals that were created using different clocks. These clocks were not simple multiples of each other, so their timing didn't match perfectly. Even a tiny mismatch in timing just a few billionths of a second could cause errors of several meters in location.



Normally, engineers would solve this problem by redesigning the hardware inside the satellite or the receiver, but that would be very expensive. Instead, the new innovation offered a smarter way. Satellites were updated to add "waiting cycles" so that the faster and slower clocks could stay in step. Any leftover delay was measured using a special common clock. That information was sent down to Earth, where ground stations calculated correction values, called TGD (Total Group Delay) and ISC (Inter-Signal Correction). These corrections were then uploaded back to the satellites and broadcast in the navigation messages.

Rohit realized he didn't need to change the receiver hardware at all. He only needed to update the receiver's software so that it could read and apply these correction values. Once his software was updated, the receiver could automatically fix the timing differences between the different signals. When Rohit tested the receivers in the field, the results were impressive. The devices locked onto satellites much faster, and the location readings became far more accurate sometimes improving from a few meters down to just a few centimeters.

For everyday users, this meant smoother maps, more precise navigation, and reliable performance even in busy city streets without them even noticing the complex science behind it.



INNOVATION

Reference:

Ammali, P., Roy, A. M., Kadam, V. V., Mishra, N., Khot, G. R., & Mishra, D. (2025). System and Method for Time Delay Compensation of Multi-Clock Domain Satellite Signals.

Patent Number: 202541014035
Developed by: ISRO – Space Applications Centre (SAC), Ahmedabad, India.

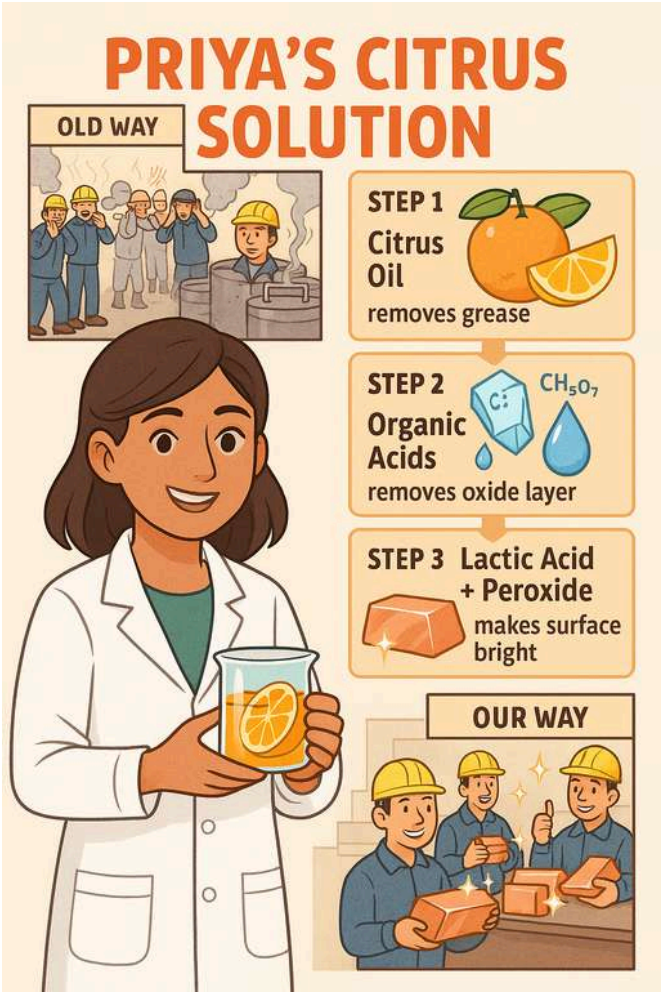
| By Dr. Sudha Shankar

THE SECRET SHINE INSIDE AN ORANGE

Priya was a young engineer who often worried about the cleaning process used in her factory. Copper castings had to be cleaned before they could be silver-plated, but the method was old and harsh. Workers handled strong acids like hydrochloric and nitric acid every day. The fumes were dangerous, and the cleaning tanks had to be heated, wasting a lot of energy.

Priya thought there must be a better way. She began testing natural and safer materials in the lab. After many trials, she created a new three-step process that worked just as well, but without the dangers.

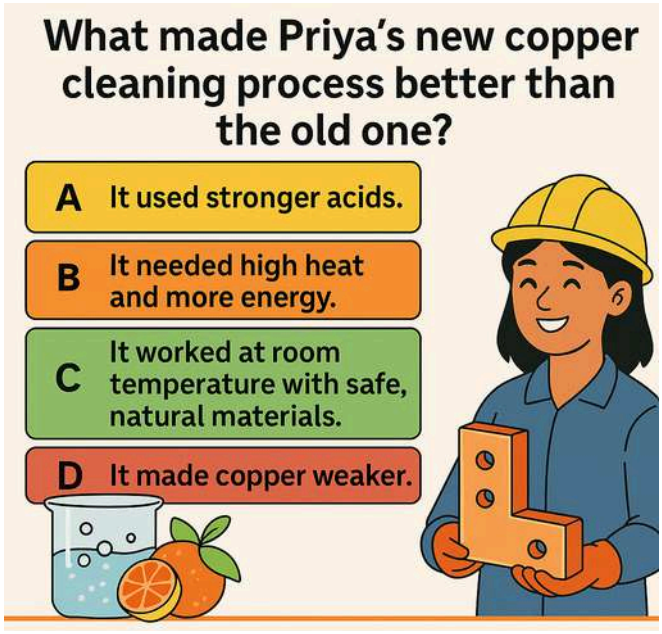
The first step was degreasing. Priya used citrus oil from oranges and lemons, mixed with small amounts of mild solvents and additives. This solution could remove oil and dirt at normal room temperature, without any heating.



The second step was descaling. Instead of strong mineral acids, Priya used natural acids like citric and phosphoric acid, along with biodegradable soap-like surfactants. This gently removed the oxide layer on copper that reduces conductivity.

The final step was brightening. Priya used a mix of hydrogen peroxide and lactic acid, followed by pure lactic acid, to make the copper surface shiny and ready for silver plating. Ultrasonic cleaning made the results even better. When Priya showed the results, everyone was impressed. The castings were cleaner and brighter. The process produced much less polluted water, used far less electricity, and created no harmful fumes. Workers felt safer, and the company saved money on waste treatment.

Priya's "Citrus Solution" soon replaced the old method. Her idea proved that industries can protect both people and the environment while still keeping high quality in their products.



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Reference:

Kartik, R. (2025). A Process for Cleaning a Copper Casting.

Patent Number: 202441059929

Developed by: Rapsri Brakes and Fuel Systems Pvt. Ltd., Karnataka, India.

By Dr. Animesha Rath

THE HEALING GEL: ANANYA'S SECOND CHANCE

Ananya had lived with hip pain for many years. Walking even short distances was tiring, and climbing stairs felt almost impossible. Doctors had suggested surgery, but the risks were high, and the success of using donor stem cells was always uncertain. Many times, these cells were rejected by the body, making recovery harder.

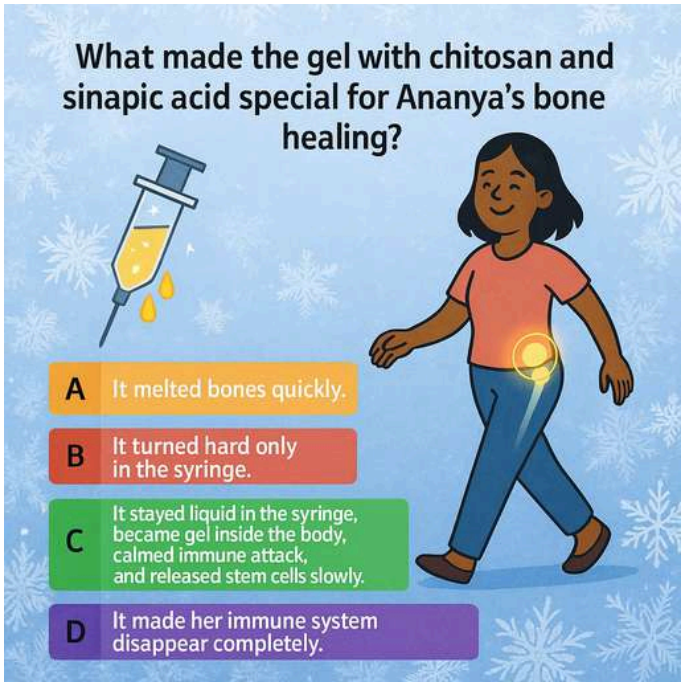
One day, her doctor offered her something new a special healing gel. This gel was made of chitosan, a safe material from natural sources, and sinapic acid, a plant-based compound known to calm the body's immune system. Together, they formed an injectable hydrogel. What made it special was that it stayed liquid in the syringe at room temperature but turned into a soft gel once inside the body.

The doctor explained that this gel acted like a protective home for donor stem cells. Normally, when donor cells were placed into the body, the immune system attacked them as "foreign." But the sinapic acid in the gel reduced this attack. It also encouraged the growth of "regulatory" immune cells, which told the body to stay calm instead of fighting. This gave the donor stem cells a better chance to survive and slowly repair the damaged bone.

The gel also worked as a slow-release platform. Instead of losing the cells quickly, it released them little by little, directly at the injury site. This meant the stem cells had more time to attach, grow, and help rebuild bone tissue.

For Ananya, the results were clear. After weeks, the swelling reduced, and her steps became steadier. She could walk longer without pain and started climbing stairs again. The new hydrogel didn't just heal her hip it gave her back her freedom and confidence.

This innovation showed how science and nature could combine to create **"**The Healing Gel**"**, a gentle yet powerful tool to fight pain and rebuild lives.



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Selvaraj, V., Sudhakar, S., Ramakrishnan, S., & Sekaran, S. (2024). Immunomodulatory Hydrogel Composition with Sinapic Acid to Prevent Allogeneic Stem Cell Rejection

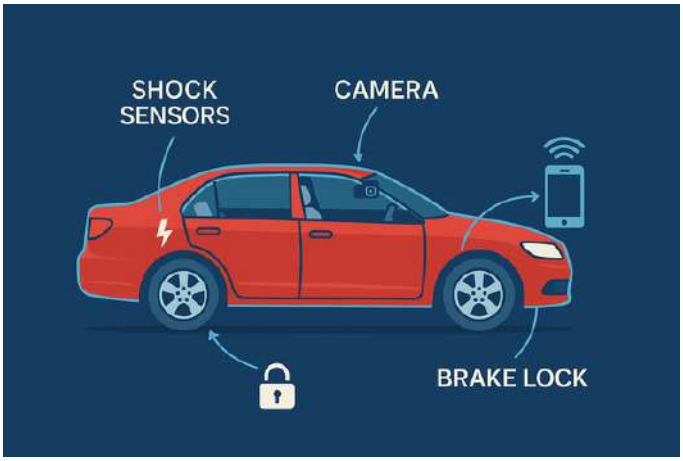
Patent Number: 202441054739

Developed by: Indian Institute of Technology Madras (Department of Applied Mechanics and Biomedical Engineering), Chennai, India.

By Dr. Avijit Das

THE SMART GUARDIAN

It was well past midnight when a thief quietly moved toward a parked car on a lonely street in Srinagar. He pressed his tool against the car's door, thinking it would be an easy job. But the car had its own guardian.



Inside the vehicle, tiny shock sensors (SW-420) instantly felt the impact. A small computer the microcontroller woke up from its power-saving sleep. Within seconds, a camera (OV7670), mounted on a moving arm, turned to capture the full 360° view. Clear images of the thief's face and even the number plate of his bike were recorded and sent to the cloud.

As the thief tried harder to open the door, another layer of protection switched on. A small motor powered a worm-gear and rack-and-pinion brake lock, which pressed down on the brake pedal. The car became completely immobile. No matter what the thief did, he could not drive it away.

At the same time, distance sensors (VL53L1X) placed at the corners of the car measured the thief's movements around the vehicle. A motion unit (MPU-6050) tracked sudden movements, confirming suspicious activity. All this information triggered a quick alert through a mobile app (Blynk platform) straight to the owner's phone. The owner received photos, time stamps, and the exact location of the event evidence safely stored online.

Startled by the sudden lock and knowing he was being watched, the thief panicked. He abandoned his attempt and ran away. The car remained untouched, its secret defender silent once again.

This story shows how modern sensor fusion, smart cameras, and mechanical locks can transform an ordinary car into a self-defending machine.

What stopped the thief from stealing the car?

A A loud siren scared him away

B The brake-lock system immobilized the car

C The fuel supply was cut off

D The owner pressed a panic button

INNOVATION

Reference:

Rasool, A., Ateeb, S., Qureshi, A. B., Munshi, D. M., & Zargar, A. A. (2025). Intelligent driving aid system for enhanced vehicle protection

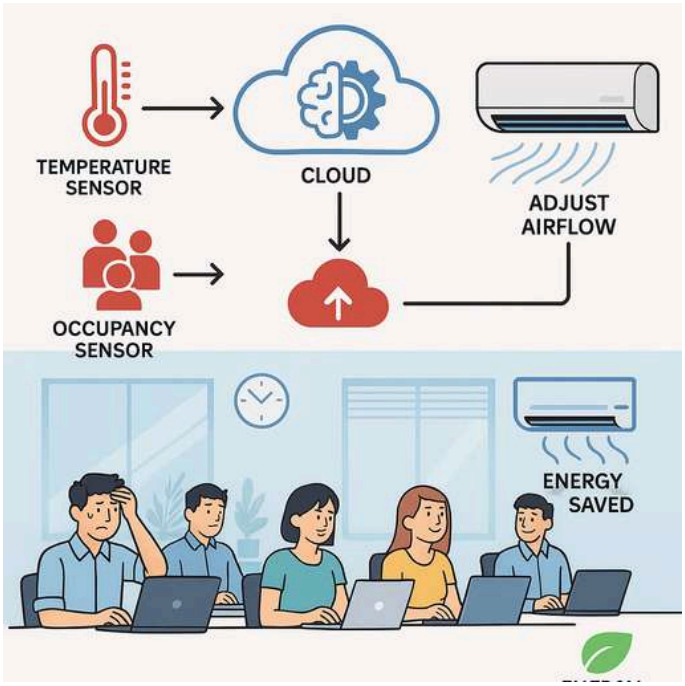
Patent Number: 202411051853

| By Dr. Sourav Kumar

THE OFFICE HEATWAVE

It was a very hot summer afternoon. Inside the office, people started feeling sweaty and uncomfortable. Papers were used as fans, and workers sighed because the air conditioner was too slow to react. In most buildings, this happens because the systems are old and need many connections, called gateways, which cause delays.

But this office had a new smart system. It was a special Building Management System (BMS) that worked without those extra gateways. Instead, it had a controller unit that talked directly to the air conditioner, lights, and sensors in the building.



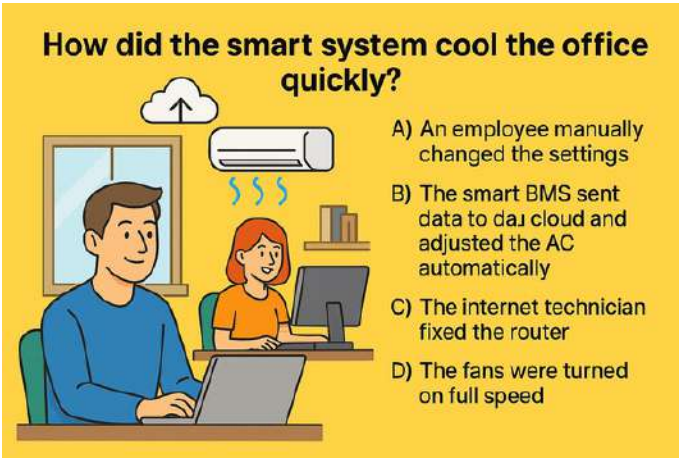
As the heat rose, temperature sensors noticed it right away. The system also saw that many people were in the room and that the air quality was dropping. All this information was sent straight to the cloud through the system's communication module.

In the cloud, smart programs studied the data in seconds. The programs decided the best way to cool the room quickly. The control module then sent back a message to the air conditioner: "Blow more cool air." Very soon, the office became comfortable again. The workers were happy, and they could focus on their jobs.

aEven if the internet had stopped working, the building would still have been fine. The system carried a copy of the rules in its memory module, so it could keep the air comfortable until the network came back.

The system also made sure it didn't waste energy. The feedback module kept the cooling safe and balanced, while the discovery module could easily add new devices without long setups.

This smart BMS showed how technology can keep people comfortable, save electricity, and make offices future-ready.



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Reference:

Bharadwaj, G., & Bali, G. (2025). A building management system for wireless control of equipment and a method thereof

📄 ***Patent Number***: 202321079743
🏢 ***Developed by***: ENLITE RESEARCH PRIVATE LIMITED

By Dr. Ipsita Mohanty

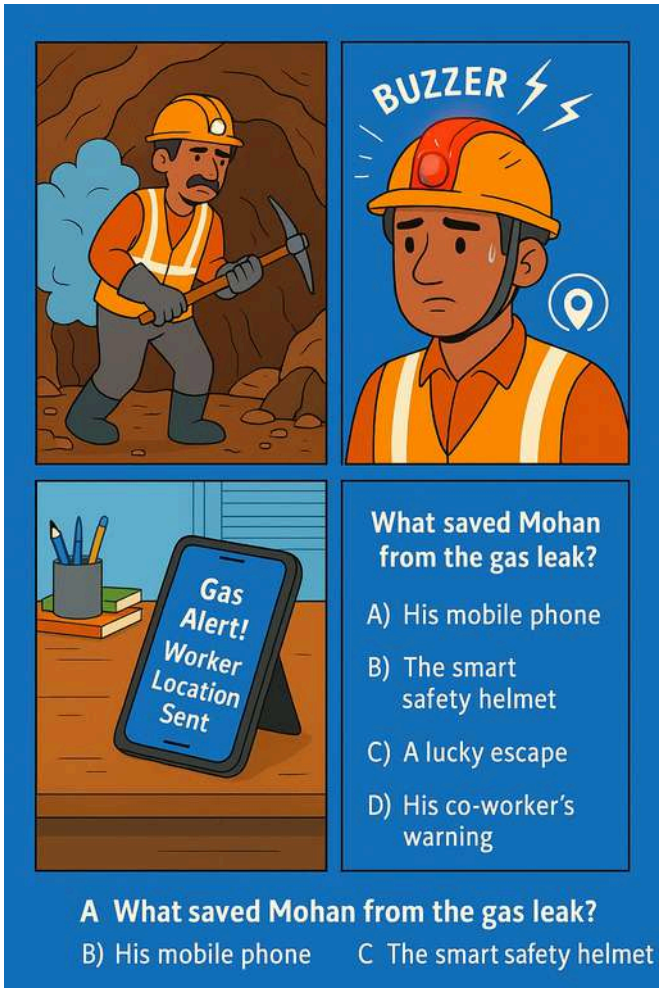
THE GAS LEAK

Mohan was working inside a mine one morning. Everything seemed normal until he suddenly started feeling dizzy and weak. In the past, such situations often ended in accidents because no one noticed the danger on time. But Mohan was wearing a new smart safety helmet that could sense problems before they became serious.

This special helmet has many tiny sensors inside it. One of them is a gas sensor that keeps checking the air around the worker. When the sensor found that there was too much methane gas, it quickly rang a loud buzzer alarm to warn Mohan and the people nearby. At the same time, the helmet's GPS module found Mohan's exact location inside the mine. Within seconds, the helmet's GSM module sent a message with his location to the supervisor outside.

The smart helmet is not only for gas detection. It also has other useful parts. A temperature and humidity sensor checks the air conditions, a heartbeat sensor watches the worker's health, and a tilt sensor can detect if the worker has fallen. An infrared sensor makes sure the helmet is worn properly, and there is even an SOS button that the worker can press to ask for help.

Because of this helmet, the rescue team reached Mohan quickly. They saved him before the gas could do serious harm. A simple helmet, when made "smart" with electronics and internet technology, can save lives and make dangerous jobs much safer.



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Patent Number: 202321070805

Developed by: Vishwakarma Institute of Technology, Pune

By Dr. Preeti Sharma

AI YOGI

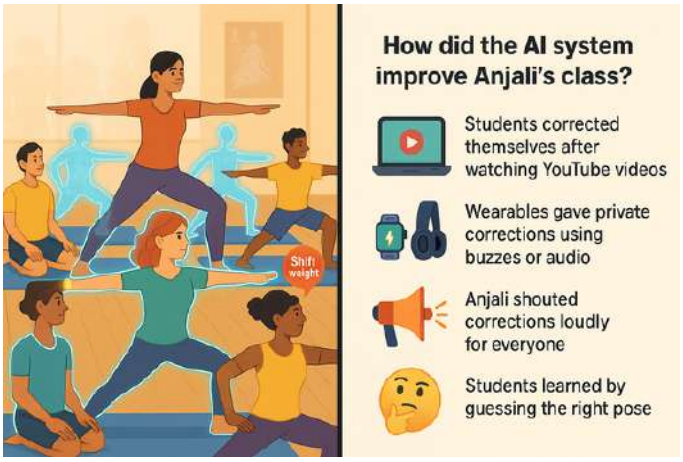
Anjali loved teaching yoga. She was passionate, energetic, and always wanted her students to feel the peace and strength that yoga could bring. But in her large class of thirty students, the task was never easy. Some students bent too far, others wobbled in balancing poses, and a few felt uncomfortable being corrected in front of everyone. Anjali wished she had many pairs of eyes and hands to guide each student individually.

Then, her studio introduced a new AI-powered yoga guidance system. The setup was simple but powerful. Several smart cameras were placed at different angles in the hall. These cameras, connected to a small IoT computer, captured every student's movements. Using machine learning (ML), the system studied each body position and compared it with Anjali's demonstration or with a pre-trained "master" model.

The best part was the wearable devices. Each student wore a smartwatch or ear-pods that gave private feedback. If a pose needed correction, the wearable would respond instantly. A gentle buzz on the wrist or a soft voice in the ear would say, "Straighten your back" or "Shift weight to your left foot." No one felt embarrassed, and everyone could quietly improve.

For Anjali, the change felt magical. She no longer had to run from one side of the hall to the other, correcting students individually. Instead, she focused on creating flow in the class, guiding breathing, and motivating everyone. The AI acted like her assistant, handling posture corrections in real time.

Even better, the system worked offline for a limited set of poses, perfect for places with poor internet. It also kept logs of each student's progress, helping them track improvements over weeks. Anjali realized she now had a true teaching partner—technology that made her classes safer, smarter, and more joyful.



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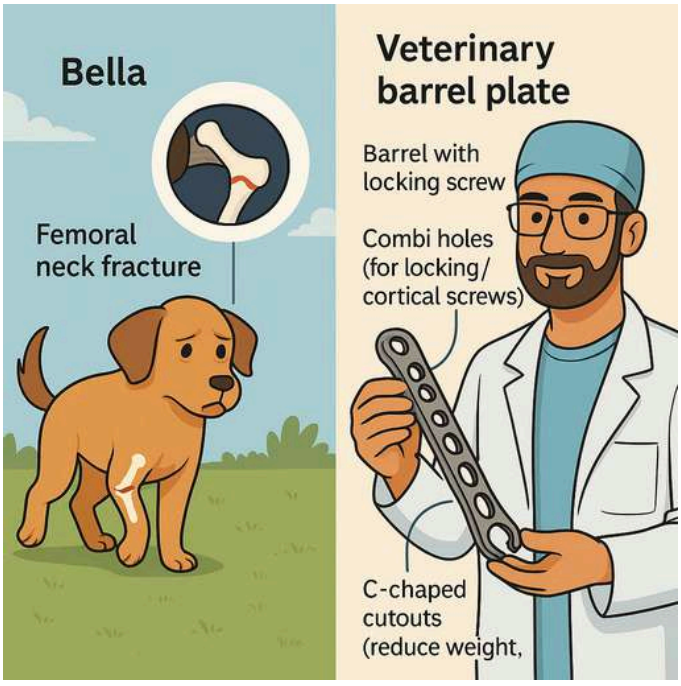
Harimurugan, D., Jain, A., Yadav, A., Gupta, A., Aggarwal, G., Prince, Chadha, R., & Singh, V. (2023). An artificial intelligence (AI) based system for personalized yoga guidance to multiple users

Patent Number: 202311067307
Developed by: Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, Punjab, India.

| By Dr. Priyangana Deb

BELLA'S SECOND CHANCE

Bella was a gentle street dog who lived near a busy market. One day, while chasing after scraps of food, she was hit by a speeding car. The accident left her with a serious femoral neck fracture, a break near the top of her thigh bone where the leg connects to the hip. This kind of injury is very dangerous for dogs because it affects the stability of the leg and the blood supply to the femoral head.



In the past, doctors would try to fix such fractures using straight plates, multiple screws, or even external frames. But these methods often had problems they were too invasive, caused extra pain, or failed to keep the bone stable. Bella's chances looked uncertain.

Luckily, her veterinary surgeon had access to a new invention the Veterinary Barrel Plate. This plate was specially designed for dogs. It had a barrel with locking threads at one end, placed at the right angle to hold a special screw firmly inside the femoral neck. Along the shaft of the plate, there were combi holes that could take either locking screws or cortical screws, giving the doctor flexibility.

What made the plate even more unique was its C-shaped cutouts on the underside. These reduced the weight of the implant and, more importantly, protected the blood vessels around the bone, helping it heal faster. The plate also had a curved design to match the shape of a dog's femur and was made of biocompatible stainless steel (316LVM) so it was safe inside Bella's body.

The surgery went smoothly. Bella's fracture was fixed securely with fewer implants, less tissue damage, and better stability. Within weeks, she was walking again without pain. Soon after, Bella was adopted by her rescuers finally finding a safe, loving home.

INNOVATION

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Patent Number: 202331046226
Developed by: Dr. Kiran Pattanaik, Bhubaneswar, Odisha, India.

| OBITUARY |

Shivram Baburao Bhoje

On 16 September 2025, India lost one of its most respected nuclear scientists, Shivram Baburao Bhoje, who passed away in Kolhapur at the age of 83. Known as the architect of India's fast breeder reactor programme, Bhoje's career epitomized the nation's quest for scientific self-reliance at a time when international restrictions severely limited access to nuclear technologies.

Born in 1942 in Kasaba Sangaon, a small village in Maharashtra, Bhoje showed early aptitude for science and mathematics. After studying mechanical engineering at the College of Engineering, Pune, he joined the Bhabha Atomic Research Centre (BARC) in 1965. Soon after, he was deputed to France, where he worked on the design of a fast breeder test reactor at Cadarache. That experience shaped his conviction that India too could master this advanced technology independently, even under conditions of technology denial.

At the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, Bhoje became the driving force behind the Fast Breeder Test Reactor (FBTR). Faced with restrictions on fuel imports, his team boldly adopted carbide fuel, a world first. Under his leadership, the FBTR reached criticality in 1985, demonstrating India's ability to run a closed nuclear fuel cycle and use plutonium efficiently. This achievement placed India among a handful of nations with breeder reactor expertise.

Bhoje rose through the ranks to become Director of IGCAR in 2000, a role he held until 2004. During this period, he shepherded India's most ambitious nuclear project, the Prototype Fast Breeder Reactor (PFBR), a 500-megawatt plant at Kalpakkam. He secured government approval for the project, initiated construction, and helped establish Bharatiya Nabhikiya Vidyut Nigam (BHAVINI), the public sector enterprise set up to build and operate breeder reactors. The PFBR remains central to India's long-term nuclear energy strategy.

Beyond India, Bhoje was an influential figure in international nuclear forums. He contributed to advisory groups at the International Atomic Energy Agency (IAEA) and published more than 200 papers on nuclear technology and safety. His contributions earned him the Padma Shri in 2003, along with the H.K. Firodia Award and the VASVIK Industrial Research Award. Yet he remained remarkably humble. Colleagues remember his ability to explain complex reactor physics in simple terms and his dedication to mentoring younger scientists. Many recall his patience and generosity, often spending long hours with students to ensure they felt inspired rather than intimidated.

ARCHITECT OF INDIA'S FAST BREEDER REACTOR PROGRAMME.
(1942–2025)

After retirement, Bhoje returned to Kolhapur, where he served as an educational advisor to Shivaji University and supported rural development initiatives through the Aamhi Sangaonkar organisation. Despite his global stature, he lived simply and maintained deep connections with his roots.

Bhoje's legacy lies not just in the reactors he helped design but in the confidence he instilled in India's scientific community. At a time of global technology embargoes, he demonstrated that ingenuity and determination could overcome barriers. Today, as India confronts rising energy demands and climate challenges, his vision of sustainable, indigenous nuclear power continues to resonate.

With his passing, the country bids farewell to a pioneer whose work illuminated laboratories and inspired generations. Shivram Baburao Bhoje's life remains a testament to the power of persistence, humility, and the belief that science can shape a nation's future.

By
Rosalind Franklin
Council of Scientific Research
(**RFCSR**)

SCIENCE NEWS & OPPORTUNITIES

"Science News & Opportunities" keeps you updated with the latest scientific breakthroughs and opens doors to exciting careers, scholarships, and research programs.

“Dr. Niels Bohr: The Quantum Pioneer”

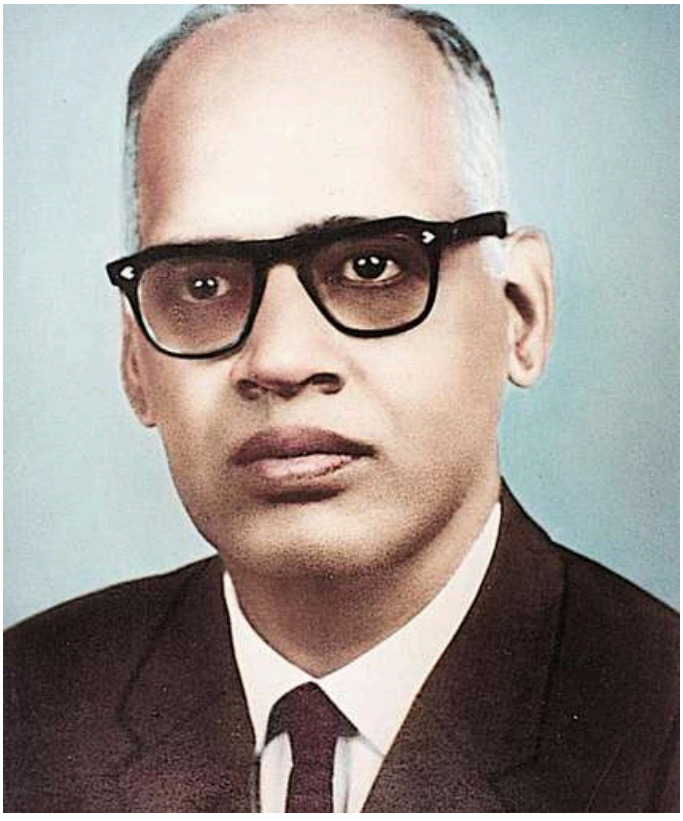
01

Oct 7: Born in 1885, Dr. Niels Bohr (1885–1962) revolutionized our understanding of atomic stability with his quantum model of the atom, introducing quantized electron orbits that explained why atoms don’t collapse and how they emit light. This breakthrough laid the foundation of quantum mechanics, powering advances from semiconductors to nuclear energy. A philosopher as well as a physicist, Bohr proposed the principle of complementarity, showing that particles can act as both waves and particles, reshaping our view of reality. Winner of the 1922 Nobel Prize in Physics, founder of the Copenhagen interpretation, and mentor to pioneers of the atomic age, Bohr’s influence endures in science and education worldwide.

“Dr. G.N. Ramachandran:The Architect of Protein Structure”

02

Oct 8: Dr. G.N. Ramachandran (1922–2001) was a pioneering physicist whose insights reshaped biology. He created the Ramachandran Plot, a fundamental tool in protein structure prediction, and proposed the triple-helix model of collagen, explaining the strength of connective tissues. By applying Fourier transforms to crystallography, he advanced molecular visualization and set global standards in structural biology. Founder of the Molecular Biophysics Unit at IISc, Ramachandran championed interdisciplinary science in India and mentored generations of researchers. Honored with the FRS and Padma Bhushan (1971), his legacy proves how bold curiosity can unlock the architecture of life itself.



"Dr. A.P.J. Abdul Kalam :The Missile Man of India"

03

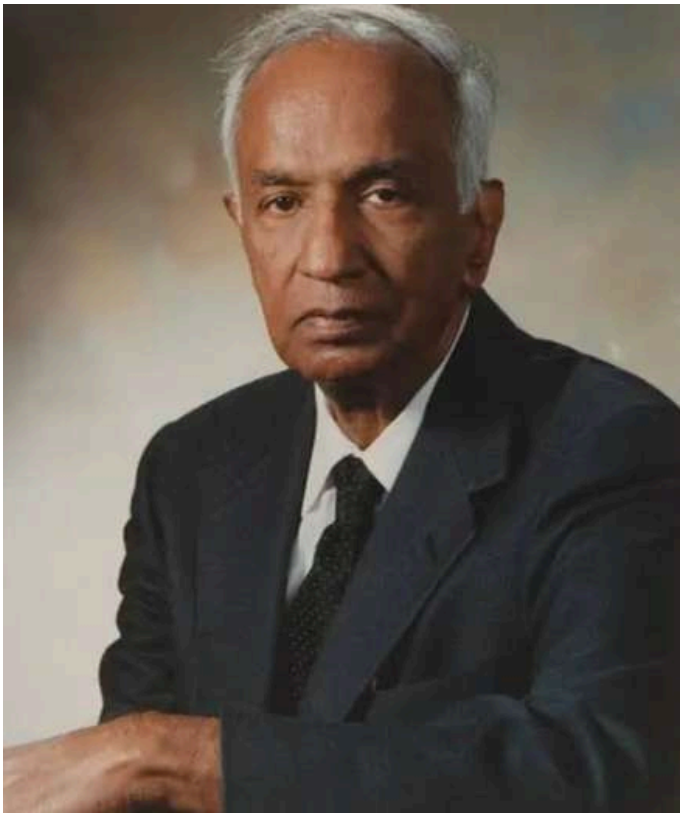
Dr. A.P.J. Abdul Kalam (1931–2015), born in Rameswaram, Tamil Nadu, rose from modest beginnings to become the "Missile Man of India." Fascinated by flight, he pursued aerospace engineering, joining DRDO and later ISRO, where he led the SLV-III project, launching India's first satellite in 1980. He guided the Agni and Prithvi missile programs, strengthening India's defense, while his humility and passion for education made him a national icon.As architect of the IGMDP, he advanced missile technology, envisioned Vision 2020, and inspired millions through books and mentorship. Serving as the 11th President of India (2002–2007), he brought science into governance. Until his final moments addressing students, Kalam championed youth and innovation his dream truly lifted a nation.

"Dr. Subrahmanyan Chandrasekhar: The Star Who Measured the Limits of the Cosmos"

04

Born in 1910 in Lahore, Subrahmanyan Chandrasekhar was captivated by the question of what happens when stars die. At just 19, he formulated the Chandrasekhar Limit, showing that stars under 1.4 solar masses end as white dwarfs, while heavier ones collapse into neutron stars or black holes. Initially dismissed, his theory revolutionized astrophysics and earned him the 1983 Nobel Prize in Physics.

Chandrasekhar's brilliance extended to stellar atmospheres, radiative transfer, general relativity, and black hole theory, combining mathematical rigor with physical insight. Despite skepticism from giants like Eddington, he persevered with precision and humility. As an Indian-American scientist, he inspired generations across continents his legacy proving that daring to question the stars can reshape our understanding of the universe.

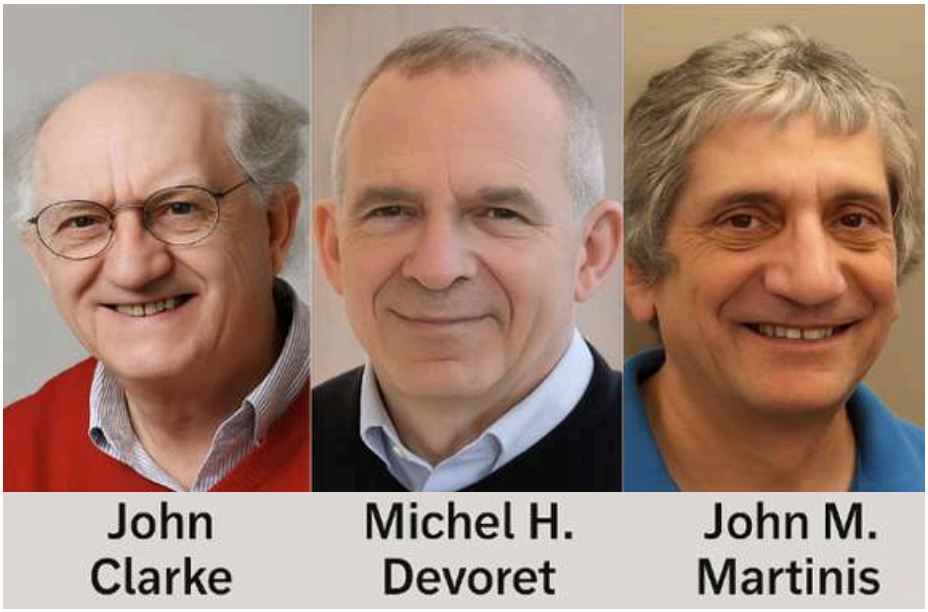


Things YET TO BE DISCOVERED

From the dark depths of our oceans to the farthest reaches of the cosmos, countless mysteries remain unsolved. Science continues to push the boundaries of the known, revealing just how much is still left to uncover. What lies beyond our current understanding may reshape the future of humanity.

By Dr. Ravi Kumar

Quantum Circuits Win the 2025 Nobel Prize



The Nobel Prize in Physics for 2025 was awarded to John Clarke, Michel H. Devoret, and John M. Martinis. They showed that quantum mechanics, the strange rules that normally describe atoms and tiny particles, can also control large electrical circuits that humans build. Their discoveries of macroscopic quantum tunneling and energy quantization in superconducting circuits turned difficult theory into the starting point for today's exciting quantum technology.

John Clarke was one of the first to prove that superconducting circuits could act in a quantum way. In normal physics, if an electric current is trapped behind an energy barrier, it should stay there forever, just like a ball stuck in a valley. Clarke discovered that the whole current could "tunnel" through the barrier, something that normally only very small particles can do. This meant that even systems made up of billions of electrons could behave as one big quantum object. He also invented devices called SQUIDs (Superconducting Quantum Interference Devices), which are the most sensitive magnet detectors in the world. These tools are now used in brain imaging, medical research, and even to study the Earth.

Michel H. Devoret took this further by showing that superconducting circuits can have energy levels just like atoms. He introduced the idea of the "artificial atom" a man-made circuit that behaves like a real atom but can be designed and adjusted as needed. These artificial atoms could absorb and emit light particles (photons), link with other circuits, and work as the first superconducting qubits, the basic units of quantum computers.

John M. Martinis helped transform these ideas into working machines. He worked on scaling up qubits so they became more reliable. Leading the Google team, he achieved "quantum supremacy" in 2019, when a superconducting quantum processor solved a problem faster than the best classical supercomputer. This proved that these quantum circuits could power real technologies.

Still, there is much work to be done. One major problem is decoherence: qubits quickly lose their delicate quantum states because of noise from the environment. Scientists need to make them last longer. Another issue is error correction. Unlike normal computers, you cannot simply copy quantum information, so correcting mistakes is very difficult. Most quantum computers today spend much of their energy just fighting errors. Building a truly reliable, or fault-tolerant, quantum computer is still out of reach. Scaling up is also a huge task. Current quantum processors have only hundreds of qubits, but real applications in medicine, climate, or cryptography may need millions.

Beyond technology, these superconducting circuits may even help us discover new physics. Artificial atoms could allow scientists to study exotic states of matter, explore the link between quantum entanglement and space-time, and test the very foundations of quantum theory.

In short, this Nobel Prize honors not just past success but also a future full of promise. Clarke, Devoret, and Martinis proved that macroscopic quantum mechanical systems can be built and engineered. The next challenge is to control it at a much larger scale, turning fragile experiments into powerful quantum machines that could change science, technology, and our understanding of reality.

Reference

Nobel Prize in Physics 2025. *NobelPrize.org*. Nobel Prize Outreach 2025. Tue. 7 Oct 2025.

SEARCH OPPORTUNITIES

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A Researcher Showcase is a platform designed to highlight the innovative work and contributions of researchers across various fields. It provides an opportunity for scholars to present their findings, exchange ideas, and foster collaborations. RFCSR's showcases helps researchers with networking opportunities to celebrate and support academic and scientific progress.

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RFCSR considers science experts' advice & directions as the foremost priority to impact the science research community. The organization maintains strong connections with over twenty thousand PhD and post-PhD experienced scientific researchers, including scientists, advanced researchers, and both national and predominantly international experts across diverse fields of expertise. Nominate the experts to advise RFCSR. Scientific advisors are specifically focused to advise RFCSR to build and initiate innovative activities.

ARE YOU A RESEARCHER ?

JOIN RFCSR ASSOCIATES

Education and research are the foundation of social progress.

A community grows stronger when everyone has equal access to knowledge, quality education, and the benefits of research. At our organization, we believe in creating opportunities where learning and innovation are accessible to all. By associating with us, you'll help bridge the gap—empowering individuals, supporting education, and contributing to a more inclusive and developed society.

JOIN RFCSR MEMBERS

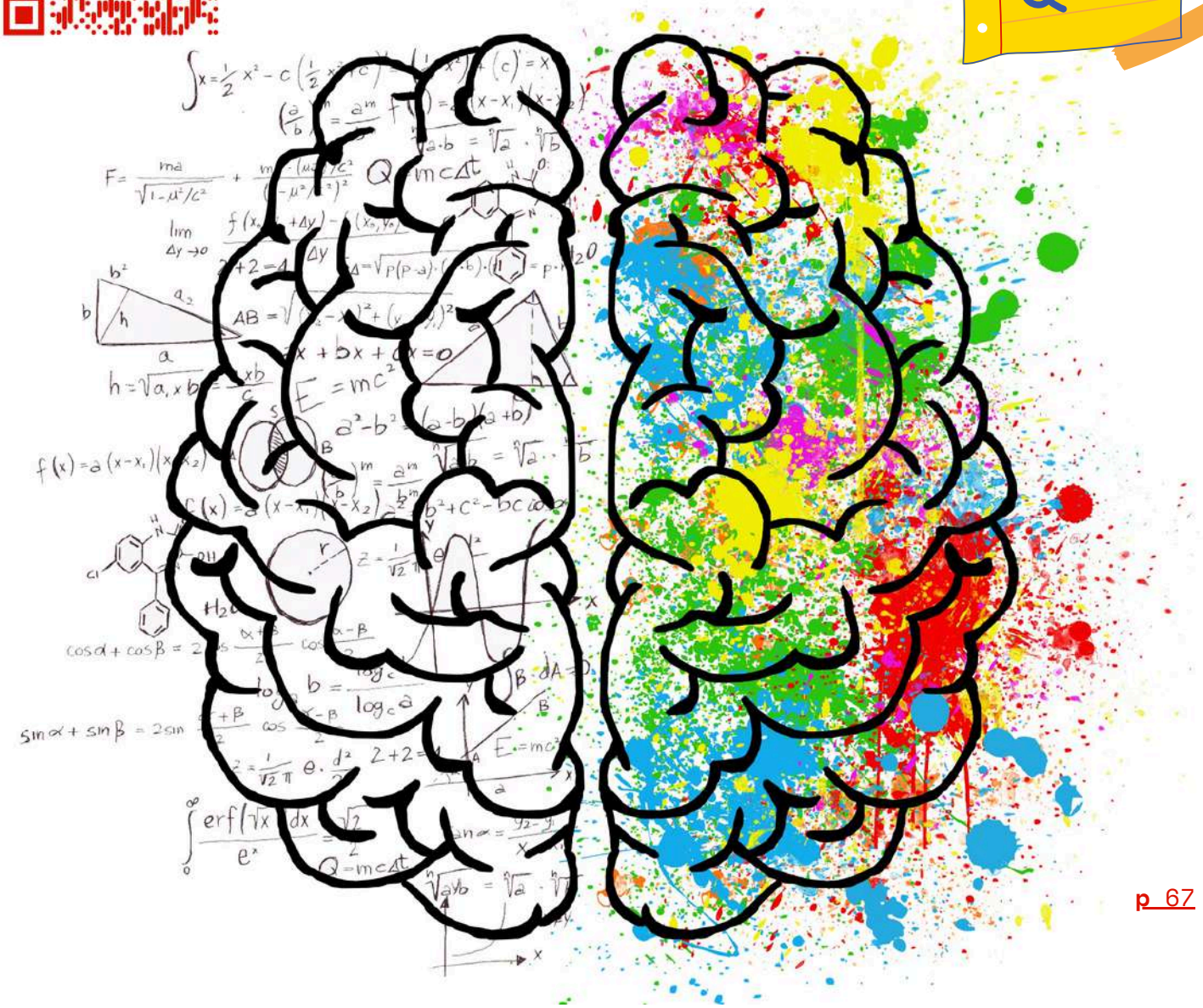
Global Outreach members are individuals currently residing full time in a resource-constrained country studying or working in sciences and research.

SCAN HERE !

BE A PART OF GLOBAL SCIENTIFIC COMMUNITY

At Rosalind Franklin Council of Scientific Research (RFCSR), we recognize that the pursuit of science is both inspiring and demanding. Alongside the excitement of discovery, researchers often face unique challenges—intense workloads, high expectations, uncertainty about the future, and at times the discouraging experience of non-cooperation within their professional field or the feeling of being stuck in their career path. Such moments can leave even the most dedicated scientists questioning their way forward.

RESEARCHERS LIFELINE RESEARCH HEALTH



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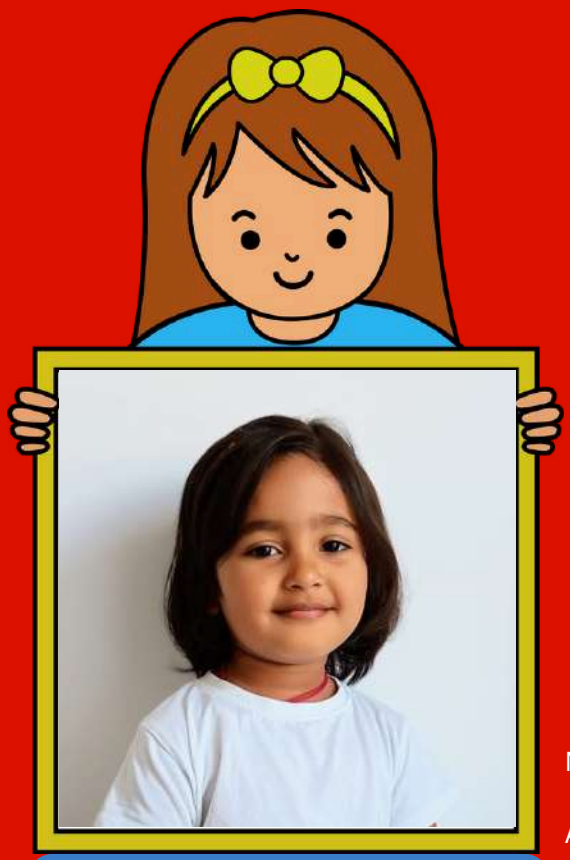
back to school



CURIOUS KID'S

NAME: **Ayukta Das**

Age: **5 Years**

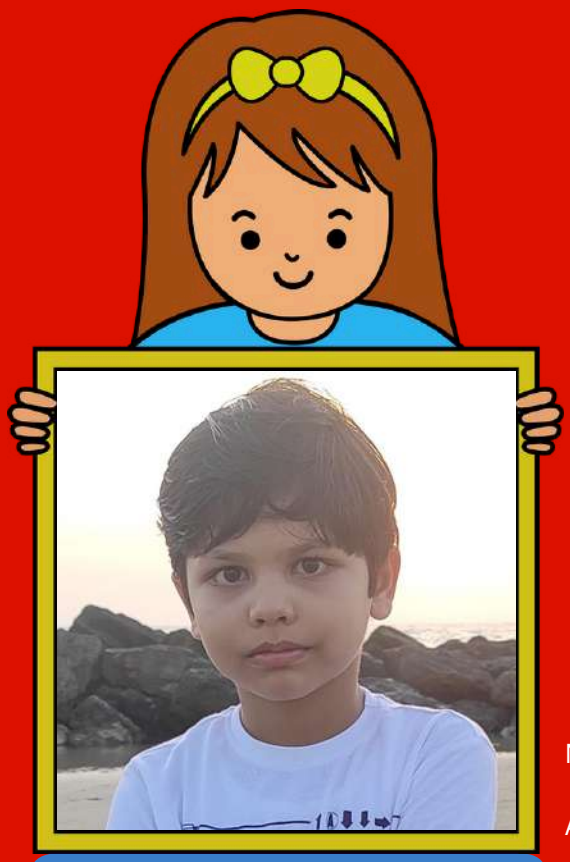
SCHOOL: **KTPP Junior High School (E.M.), India**

FOCUS:

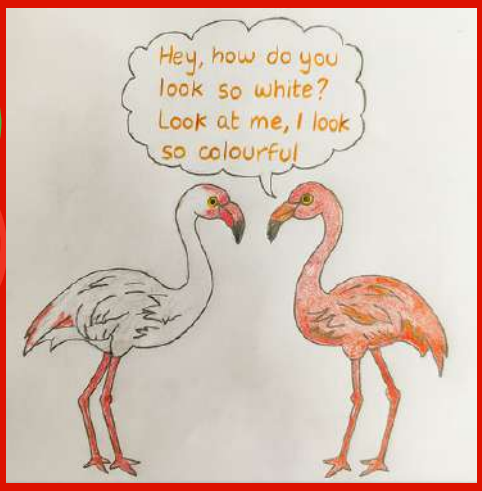
The Lion's Mane – My Crown

"Hi friend! Do you see the big hair around my face? That's called my mane. It's not just for looking nice. My mane helps me in many ways. It keeps me safe if I fight and makes me look bigger and stronger, so other animals get scared. A thick, dark mane shows I am healthy and strong. That's why people call me the King of the Jungle—my mane is my crown!"

back to school



CURIOUS KID'S



NAME: **Jiyansh Hada**

Age: **6 Years**

SCHOOL: **Moshe Smilansky School Rehovot, Israel**

FOCUS:

Why I Am White

"Hey buddy, let me tell you why I look so plain. You eat lots of shrimp, algae, and other tiny creatures from the water. These foods have special natural colors called carotenoids. When you eat them, the colors move into your feathers and make you look bright pink and orange. But I don't get that kind of food. I mostly eat carrots and simple plants, and they don't have enough of those colors. That's why my feathers stay white while yours look so colorful. It's all because of what we eat!"

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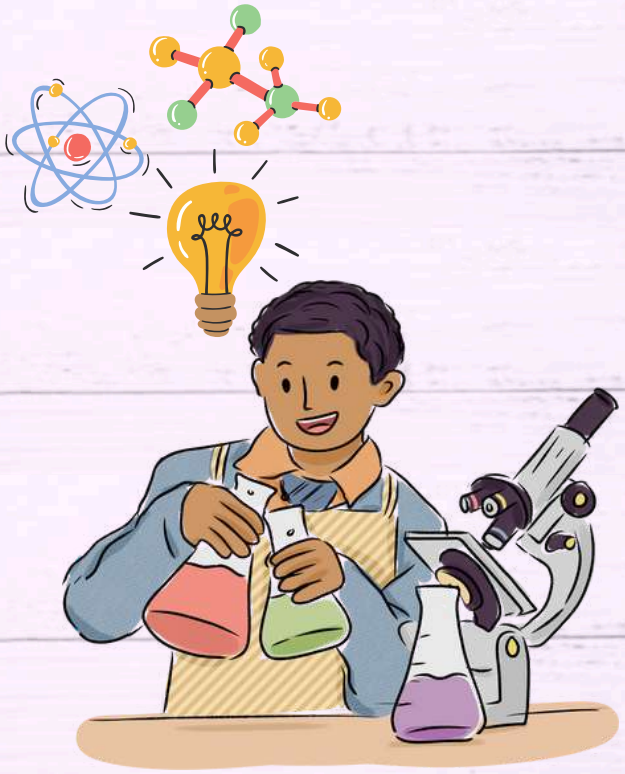
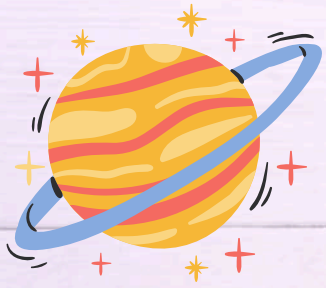
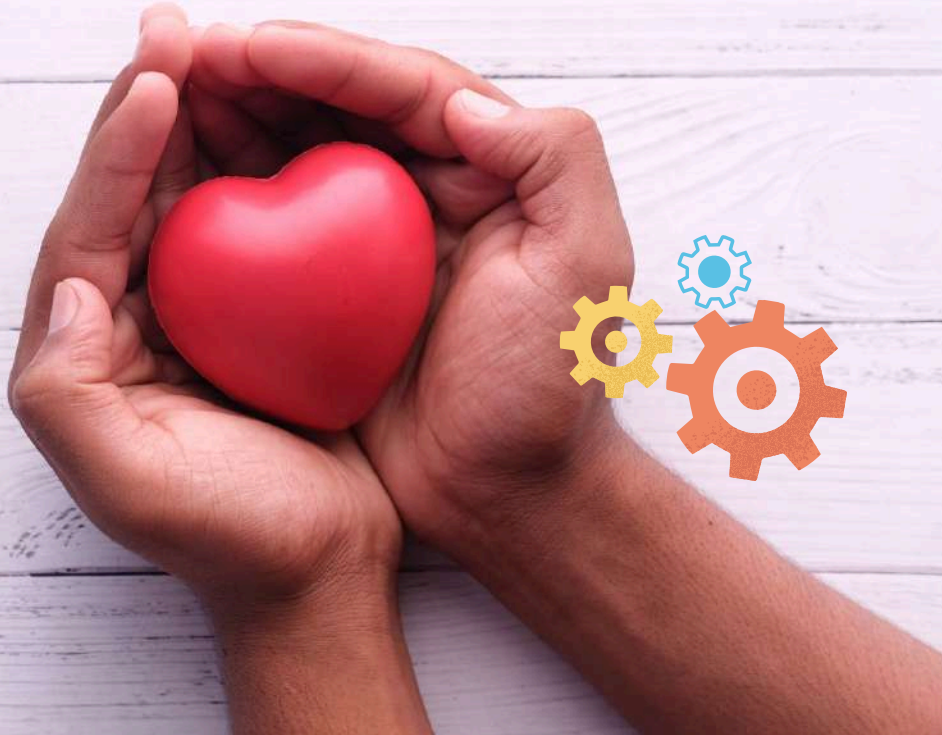
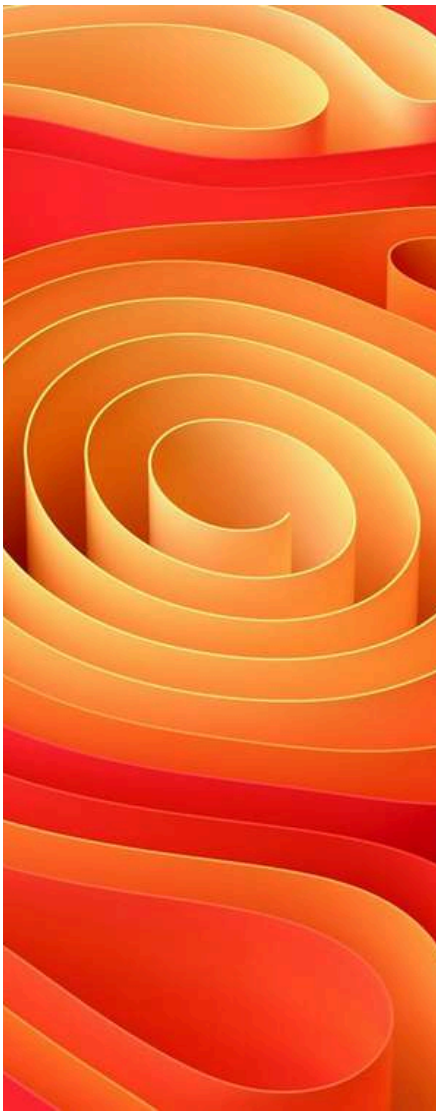
Support the future of science by contributing to groundbreaking research and education. Your donation helps fund scholarships, research projects, and scientific outreach through our platform. Give today—empower discovery, innovation, and the next generation of scientists.









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