SCIENCE FACTORS.

INSIGHT, DISCOVERY, LEARNING, INNOVATION, AND IMPACT

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

AIR POLLUTION

THE BREATH WE ALL SHARE!

RF0012509

Scientific Research Empowers Social Progress !

Rosalind Franklin Council of Scientific Research (RFCSR)
Kolkata WB INDIA 721137
www.rfcsr.org
hello@rfcsr.org & hello.rfcsr@gmail.com

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

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"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

Dear Readers,
Welcome to the September issue of Science Factor! This month we explore how science shapes the world we live in from the air we breathe to the food on our plates, from the survival of tigers in India to new inventions born in the lab.

Dr. Animesha Rath
The Editors-in-Chief

Our cover story focuses on air pollution the breath we all share. Two new studies from India reveal how coal emissions reduce crop yields and how dust carried across regions shapes pollution domes over fast-growing cities. These findings remind us that air connects us all, and protecting it is vital for health, food, and climate.

We also bring you a wide range of discoveries: the hidden origin of the crimson pigment in lac insects, new therapies for hypertension, quantum states in bilayer graphene, and a fascinating study showing how social dominance in rats influences vulnerability to stress. Even conservation finds its place here the hopeful story of tiger recovery amid people and poverty proves coexistence is possible.

Our innovation section highlights ten remarkable patents from biodegradable antimicrobial packaging and landslide prediction systems to dissolvable microneedles, gaming tools for mentally challenged people, and lab-on-chip devices for measuring biofilms. Each invention shows how science can move from idea to impact.

This issue is about one simple truth: science is for everyone. It touches our air, food, health, and future. We hope these stories spark your curiosity and inspire you to see science not just as knowledge, but as a force for change.
Happy reading!

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(RFCSR)
Kolkata WB INDIA 721137
www.rfcsr.org
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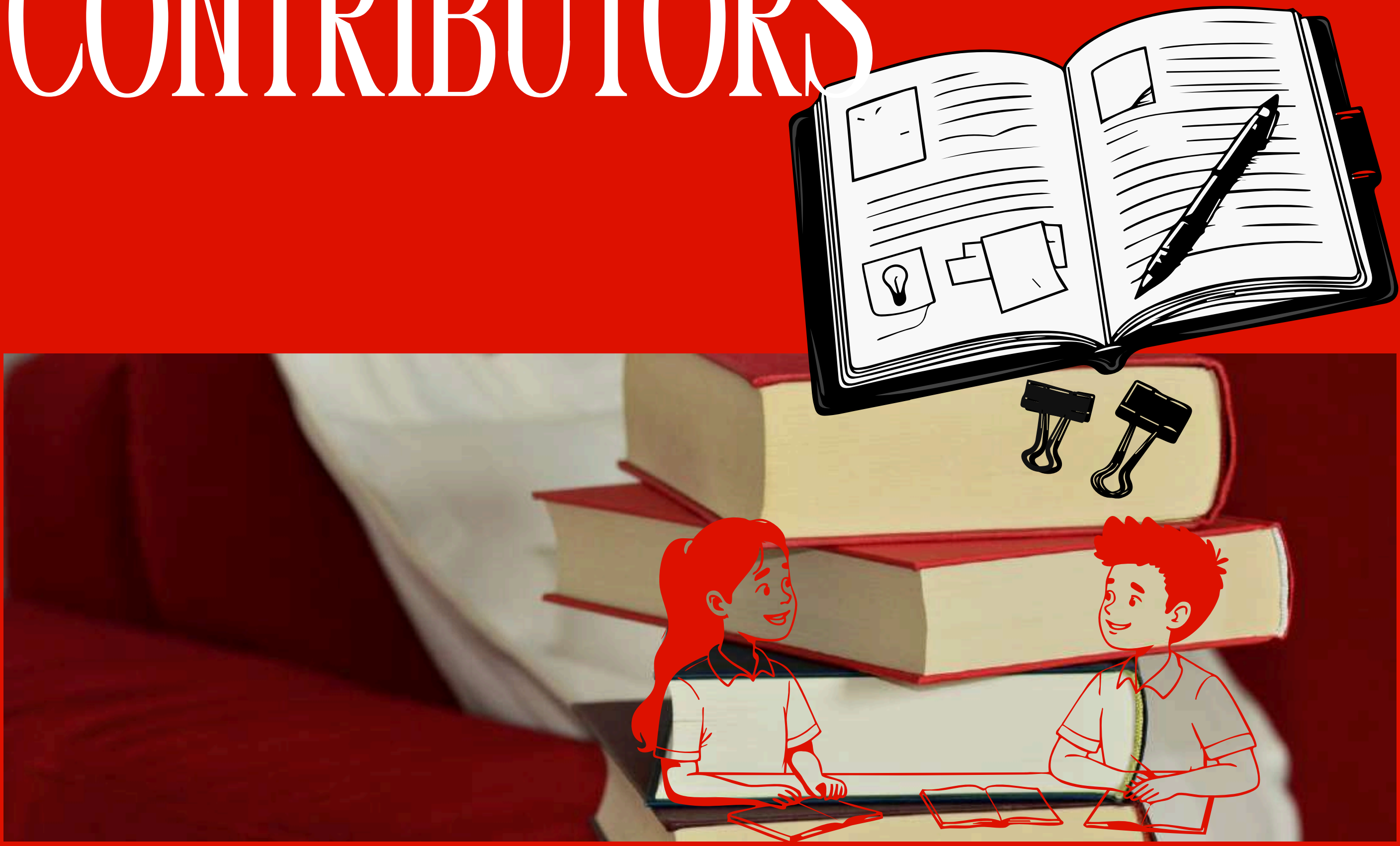
SCIENTIFIC RESEARCH EMPOWERS SOCIAL PROGRESS !

The CONTRIBUTORS



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Showcasing creativity and groundbreaking ideas.

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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. Sivan Friedman**

THE HIDDEN COST

FEATURED

It was harvest season in eastern Uttar Pradesh. The rice fields shone under the afternoon sun, the green stalks moving gently in the breeze. Birds flew low over the water channels, and the smell of cut straw hung in the air.

Ramesh, a thin farmer in his fifties, bent down, pulled a grain from a stalk, and rubbed it between his fingers. He frowned.

"This year again," he said quietly to his neighbour. "The plants look healthy, but the harvest is smaller. Every year, we work harder, but we get less."

Far away, on the horizon, tall chimneys of a coal-fired power plant rose into the sky. Pale smoke drifted slowly, spreading like a white sheet across the distance. For Ramesh, the plant was just part of life.

It gave electricity, ran water pumps, and provided jobs. But what he did not see was what else the chimneys gave out: nitrogen dioxide, an invisible gas floating over his fields, silently cutting into his harvest.

A week later, Ramesh went to a small school building in the village. The benches had been pushed aside, maps and charts covered the tables. The classroom had become a research station. Here, he met Dr. Kirat Singh, a scientist studying how coal pollution affects crops.

Dr. Singh laid a large map of Uttar Pradesh on the table. "Look here," he said, pointing to colored patches.

"This shows nitrogen dioxide in the air. Satellites measure it for us. Whenever the wind blows from the power plant toward your fields, the crops get a heavy dose of gas. When it blows the other way, the fields escape. By comparing these patterns over many years, we can measure how much yield is lost."

Ramesh frowned. "So the wind decides how much rice I grow?"

"In a way, yes," Dr. Singh replied. "The wind carries the pollution. By watching where it goes and how crops change, we can measure the damage."

He showed another chart, this one covering all of India. "We studied 144 coal power stations. Satellites tracked nitrogen dioxide above the fields, then we compared it with how green and healthy the crops looked from space. Greener fields mean more yield; duller fields mean stress. The result was clear: more coal emissions meant less harvest."

The results shocked Ramesh. In parts of Uttar Pradesh, Madhya Pradesh, and West Bengal, farmers were losing over ten percent of their harvests every year.

"Ten percent?" he gasped. "That's the difference between paying my loan or falling into debt."

Dr. Singh nodded. "Yes. Across the country, millions of tons of rice and wheat are lost this way. Enough to feed entire cities."

He continued. "We also compared crop losses with the health damage pollution causes. Coal smoke already leads to thousands of deaths from lung and heart disease.

| By **Dr. Sivan Friedman**

But when we looked at damage per unit of electricity, the crop losses were often worse than the health losses. At fifty-eight power stations, rice suffered more than people. At thirty-five, wheat suffered more. And the plants harming crops were not always the same ones harming health."

Ramesh sat in silence. He had always thought of pollution as a city problem something choking lungs in Delhi or Kanpur. Now he understood it was also a village problem, eating away at his harvest.

For him, the numbers meant fewer sacks of rice in his storeroom, less grain to sell, less food for his family, and less money to repay debts. For India, it meant millions of tons of rice and wheat gone each year food that never reached hungry mouths.

As the sun dipped lower, the shadows of the stalks stretched long. The chimneys still poured smoke into the sky, steady and endless. Ramesh looked at them differently now.

"The haze," he whispered, "is more than smoke. It steals from our breath... and now from our bread."

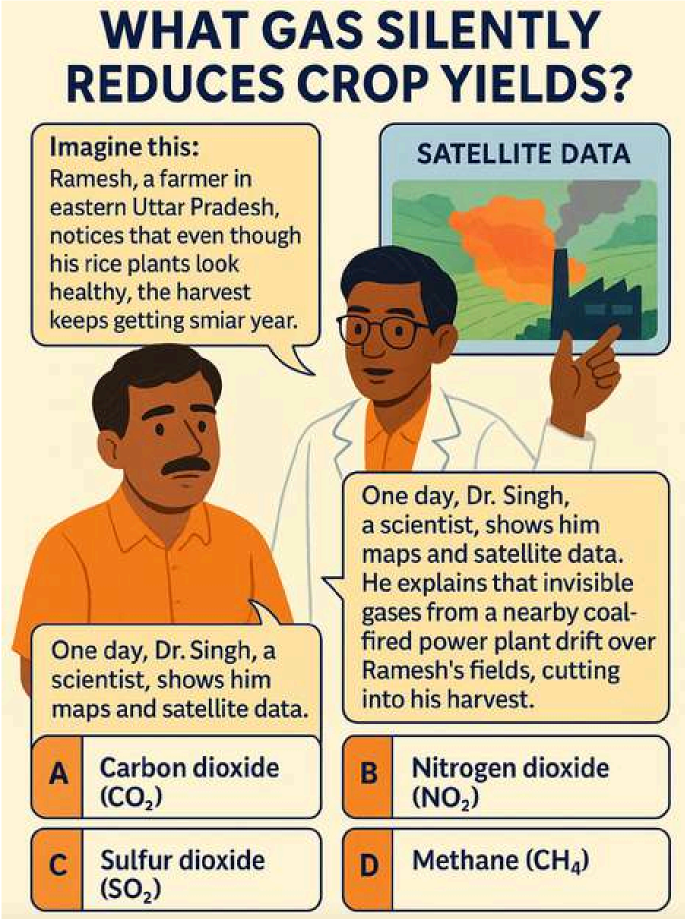
That night, he sat outside his home on a simple cot, staring at the faint glow of the chimneys in the distance. They twinkled like stars on the horizon, but their light felt heavy, not hopeful. His son asked why he looked so serious, but Ramesh only shook his head. He thought of the invisible gas drifting over his fields, cutting into his future.

Across India, thousands of farmers like him faced the same unseen enemy. They sowed their fields, prayed for rain, and worked through the seasons but above them, every breath of wind carried more than air. It carried a price.

For scientists, the message was clear. Regulating coal pollution was not only about protecting lungs in cities. It was also about protecting food in villages. Every plume of smoke was not just a health problem it was a hunger problem too.

The fields of Uttar Pradesh lay quiet under the moonlight. Crickets sang. The air was heavy with the smell of soil and husk. And in the distance, the chimneys kept smoking, steady and silent. For Ramesh, they no longer looked like progress. They looked like thieves, stealing grain by grain

rom the lives of farmers. As the sun dipped and shadows stretched across the fields, Ramesh looked again at the power station on the horizon. Its chimneys still smoked, steady and silent. "The haze," he said softly, "is more than smoke. It's stealing from our breath, and now from our bread."



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Emmett Interdisciplinary Program in Environment and Resources, Stanford University, Stanford, CA 94305

By **Dr. Avijit Das**

THE BROKEN DOMES OF INDIA

FEATURED

The airplane lifted off from Chennai and rose steadily above the coastline. Below, the Bay of Bengal shimmered under the evening sun, its waters glowing like liquid silver. Geeta, who was traveling to Delhi for work, leaned her head against he window. She always loved this part of the flight the moment when the world below turned into a giant map, with green and brown patches of farmland stitched together, rivers bending like blue ribbons, and clusters of lights glowing where cities lay.

As the plane climbed higher, Geeta's gaze wandered across the horizon. Something unusual caught her attention. Over some cities, a dome-shaped haze rose straight from the ground, as though the city itself was breathing smoke. Yet over others, the air above seemed clearer, while the haze spread thickly around the edges of the countryside. It looked as if some cities wore intact crowns of smoke, while others wore cracked ones, spilling their haze outward

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The man sitting beside her turned with a small smile. He was middle-aged, wore glasses, and carried a folder stuffed with maps and satellite images. "You've just noticed something we scientists have studied for years," he said warmly. "I work at IIT Bhubaneswar. My team has been looking at these invisible crowns we call them pollution domes."

Geeta straightened in her seat. "Pollution domes?"

"Yes. Just as cities create heat islands, they also create pollution islands. When vehicles, factories, and homes release smoke, particles often collect above the city, forming a dome. We studied 141 cities using nearly twenty years of satellite data, from 2003 to 2020."

He opened his folder to show her one of the maps. "We used something called aerosol optical depth. Simply put, it measures how much sunlight is blocked by particles in the air. If the sky looks dimmer, it means more pollution."

Geeta frowned. "Why would the countryside look worse?"
"The Thar Desert," he explained. "Before the monsoon, winds lift dust and carry it across northern India. That dust mixes with smoke from farms and factories. Cities aren't smooth like fields their tall buildings slow the winds, trapping dust around the edges. So from the sky, the center might look cleaner, but the countryside is choking."

He showed her a chart. "On dusty days, about sixty percent of the cities showed broken domes. On days with little dust, only a quarter did. More dust meant weaker domes. It proves air quality is shaped not only by what cities emit but also by winds and particles traveling hundreds of kilometers."

Geeta asked, "So, do domes stay the same all year?"
"No," he said. "They change with the seasons. After the monsoon, when winds are weak, pollution piles up three-quarters of cities showed domes then.But in dry months

| By **Dr. Avijit Das**

with dust storms, nearly two-thirds showed broken domes. It's a tug-of-war sometimes city smoke wins, sometimes desert dust does."

Geeta looked out as Delhi appeared under a reddish haze. "So if a city looks clearer, that doesn't mean it's healthier?"

The scientist shook his head. "Not at all. A broken dome doesn't mean clean air. The 'cleanest-looking' northern cities still had higher pollution levels than the dirtiest domes in the south. Whether above or around you, you still breathe it in. And the cost is high. In 2019, air pollution caused 1.67 million deaths in India almost one in five deaths. Globally, it's the second deadliest health risk. With India adding more city dwellers than any other country by 2050, the challenge will only grow."

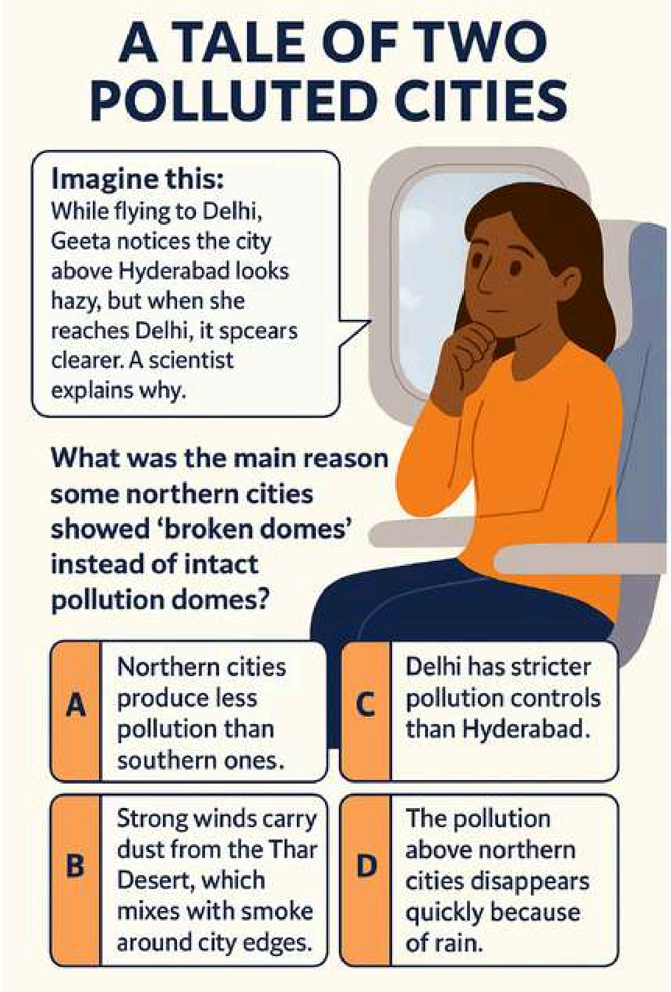
Her face fell. "That's frightening. But what can we do?"

He sighed. "Most policies focus on local fixes cleaner fuels, stricter factory rules, bans on crop burning. These help, but they're not enough. Air doesn't respect borders. Dust from Rajasthan, smoke from Punjab, emissions from smaller towns all mix with Delhi's air. The only way forward is cooperation: cleaner energy, better monitoring, cross-border agreements. Without that, the domes will keep shifting, but people will keep suffering."

The plane began its descent. Outside, the horizon glowed red as the sun slipped behind the haze. Streetlights blinked faintly through the smog.

Geeta pressed her face to the window once more. Now she saw not random haze but the crowns the scientist had described the heavy domes in the south, the broken rings in the north, shaped by smoke, dust, and winds. She understood the hidden warning in the sky: no city breathes alone, and no city can clean its air alone.

As the wheels touched down, she carried a new awareness. These crowns were not just patterns from above. They were signals of danger, reminders of shared responsibility, and perhaps, guides to a cleaner future. Beside her, the scientist from Bhubaneswar smiled quietly. His years of work had reached another heart one that would never look at the skies the same way again.



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School of Earth, Ocean, and Climate Sciences, Indian Institute of Technology Bhubaneswar, Bhubaneswar, India

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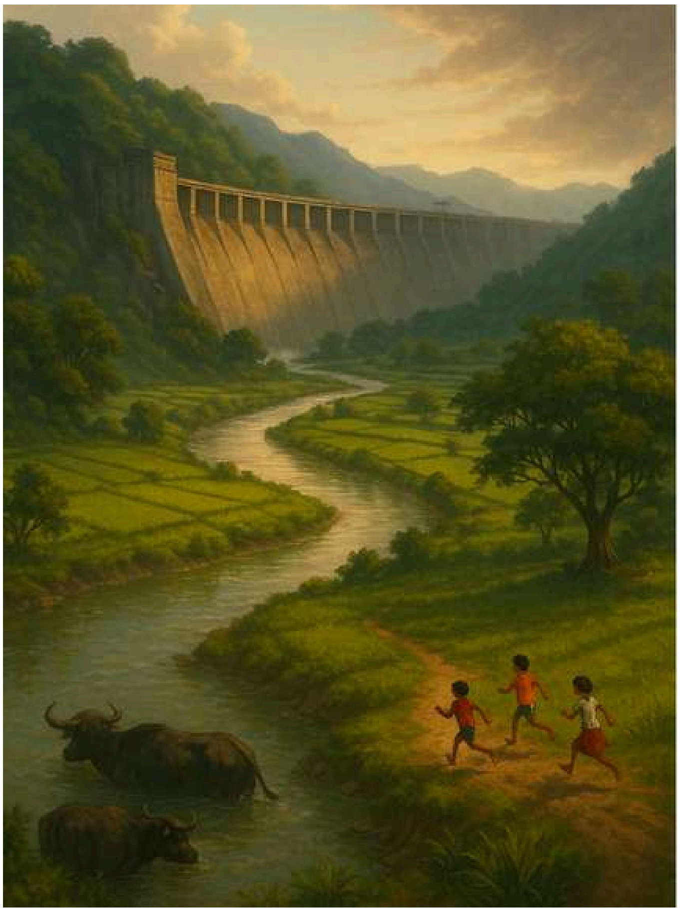
SCIENCE STORIES RESEARCH & EXPLORATIONS

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. Jnana Ranjan Prusty**

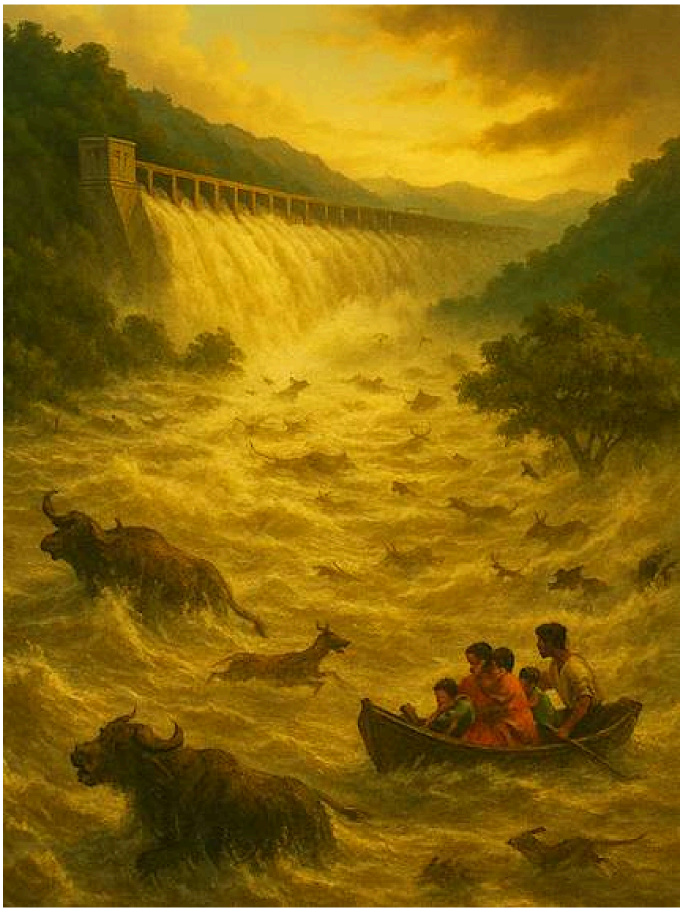
THE TWO-FACED GIANT

The village of Bharudpura lay in the fertile belly of central India, just a few kilometers downstream from the massive Raghunath Dam. To the villagers, the dam was not just concrete and steel it was a giant with two faces. One face was generous, bringing water for crops and light for homes. The other was ruthless, capable of unleashing sudden floods that swept through streets and fields. Every monsoon, villagers looked anxiously toward the giant, wondering whether it would protect them this year or betray them.



One August night, after weeks of heavy rain, the reservoir behind Raghunath Dam swelled to its limits. The officials faced a terrible choice: let the dam overtop and risk collapse, or open the spillway gates. They chose the latter. Within hours, Bharudpura was underwater. Goats and grain sacks floated away, mud houses crumbled, and children clung to rooftops as lanterns flickered in the storm. The villagers' anger was simple: "The dam was built to save us from floods. Why does it cause them instead?"

Far away, at the Indian Institute of Technology in Gandhinagar, a team of scientists had been asking the same question. India, with its more than six thousand large dams, relies on these giants for irrigation, hydropower, and flood control. But are they still protectors in a changing climate? To find out, the researchers collected data from 178 major dams across the country, drawing on river flow records, rainfall and temperature data, satellite-based reservoir storage, and global climate models. Then they used powerful simulations: the H08 land-surface model to calculate runoff, and the CaMa-Flood hydrodynamic model to mimic how rivers flow and respond to dams. With these tools, they created two worlds one without dams, where rivers ran freely, and another with dams, where giants regulated water through storage and release.
The numbers told a striking story. Dams often helped in the early monsoon, when reservoirs were not yet full. Large ones could cut peak flows nearly in half, protecting downstream villages. But once reservoirs were close to full, their protection vanished. After storage exceeded ninety percent of capacity, dams had little space left to absorb extra rain.



| By **Dr. Jnana Ranjan Prusty**

Any new storm forced operators to open gates, often suddenly, worsening floods. The scientists discovered that flood severity downstream depended less on how much rain fell and more on how full the reservoir already was. Antecedent storage, not rainfall, proved to be the deciding factor.

Looking to the future, the picture was troubling. With warming of just one degree Celsius, dams stayed dangerously full for about five days a year. At three degrees, that stretched to fifteen days three times longer. And when full reservoirs coincided with high inflows, the results were devastating. The frequency of such compound events, about half an event per year today, would double to more than one per year in a warmer world. For villages like Bharudpura, dam-induced floods could become an annual reality.

Back in Bharudpura, these findings echoed lived experience. At the panchayat meeting under the banyan tree, villagers argued bitterly. “Why can’t the dam be kept emptier before monsoon?” asked Lakshmi, the schoolteacher. “Scientists say buffer storage is the key.

If the reservoir isn’t full, it can hold the rains.” “But what about our crops?” countered Mohan, a cotton farmer. “We need full reservoirs to irrigate in winter. If they keep it empty and the rains fail, we starve.” The dilemma was clear: one reservoir had to serve two masters flood safety and water security and often failed one to serve the other.

Arjun, a college student home for holidays, had also read about the study. He stood and spoke with conviction. “The scientists showed that it’s not just the rain we must fear, but how full the dam is when the rain comes. If operators know a storm is coming, they can release water slowly, days in advance. That way, the dam has space when the peak

arrives. It’s not about building bigger dams, it’s about If the reservoir isn’t full, it can hold the rains.”

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That very year, the monsoon tested Bharudpura again. Forecasts warned of a massive storm. This time, dam operators, guided by new predictions, began releasing water gradually days before the clouds burst. When the storm came, the reservoir had space to cushion the surge.

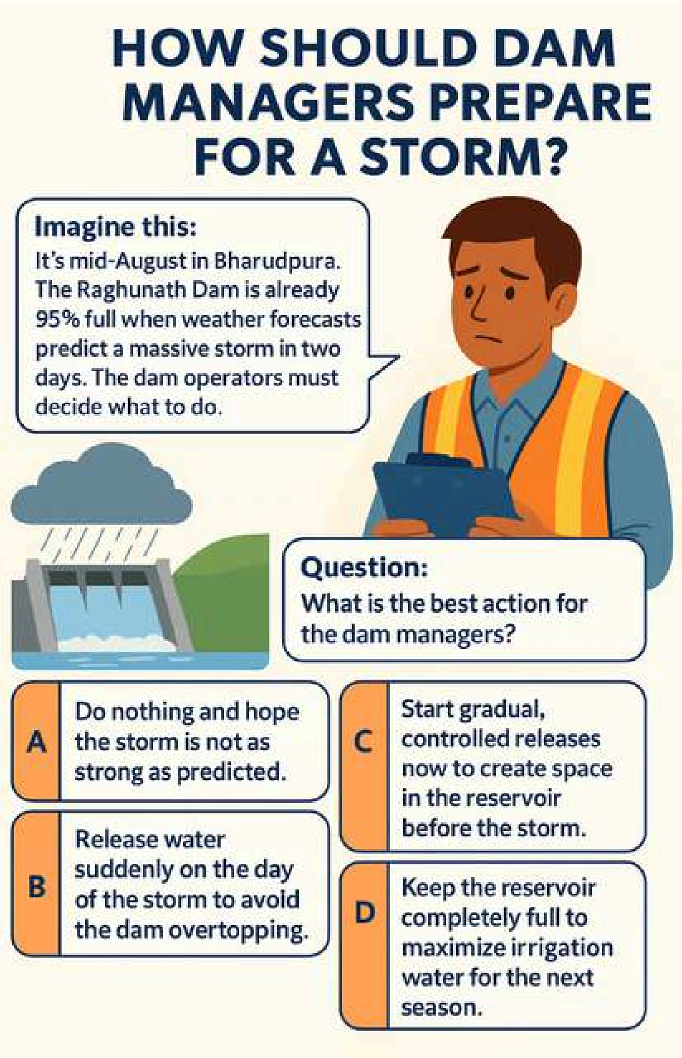
The river swelled but did not drown the village. For once, the giant’s protective face prevailed. Shanti, a widow who had lost her shop in the earlier flood, stood at the riverbank the next morning. The waters still ran high, but they stayed within their banks. “Perhaps the dam is learning,” she whispered.

The story of Bharudpura is echoed across India’s many dams. The study made one truth clear: dams are not static walls of safety. Their power to protect depends on how they are managed before the rains, and this management must adapt to a warming, more volatile climate. For policymakers, it means shifting focus from building new dams to re-operating existing ones wisely. For farmers, it means balancing irrigation security with flood safety. For scientists, it means improving real-time inflow forecasting and sharing data openly. And for villagers, it means recognizing that floods are shaped not only by clouds, but by the water already held behind the dam wall.

The scientists concluded with urgency: under climate change, dams will spend more time dangerously full, and the risk of dam-induced floods will rise. But these disasters

| By **Dr. Jnana Ranjan Prusty**

are not inevitable. With buffer storage, early releases, and climate-informed policies, dams can still act as protectors. For Bharudpura, the lesson was carved into memory: a dam is not just concrete above the river. It is a giant that must be guided with wisdom. Fed carelessly, it drowns its children. Managed wisely, it waters their fields and guards their homes. The choice lies not in the clouds, but in the hands that turn the gates.



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Civil Engineering &Earth Sciences, Indian Institute of Technology (IIT) Gandhinagar, Gandhinagar, India

By **Dr. Poulami Chakraborty**

THE QUEEN'S REQUEST

The Queen's court was restless. She had grown weary of diamonds, rubies, and emeralds. "Bring me a jewel no crown has ever seen," she commanded. The artisans of her land tried and failed, polishing stones until their hands were raw, forging metals until their fires died. But none could offer what she sought: beauty born not of the earth's accidents, but of deliberate design.

It was then that the Queen summoned her scientists. Unlike the jewelers, they did not cut rocks or hammer gold. They built with atoms, sculpting matter at a scale so small it could never be seen with the naked eye. When they heard her challenge, they whispered among themselves. Perhaps, they thought, the Queen's request was not impossible. Perhaps the jewel she demanded was waiting to be built inside a nanocluster.

The scientists began with silver. From its salts, reduced carefully with sodium borohydride, they assembled a tiny fortress: $[Ag_{17}(o1\text{-}CBT)_{12}]^{3-}$, guarded by twelve rigid carborane-thiol ligands. It was a marvel in itself, a perfect cage of atoms — $Ag@Ag_{12}@Ag_4$ — stable, strong, and precise. But it was still silver, pale and silent. The Queen would frown at such dullness.

Let us place a king at its center," one scientist suggested. They introduced gold, replacing the silver heart with a single atom of radiance.

"The new cluster, $AuAg_{16}$, did not change its shape, but its soul shifted. Where silver had allowed electrons to wander loosely, gold disciplined them. The cluster's band gap widened, its absorption shifted blue. The scientists smiled the King had taken his throne, and order reigned at the heart of silver.

But the Queen desired fire as well as order. Gold was too calm. So they called upon copper, the metal of warmth and flame. Not in the core copper refused the throne but in the corners of the outer shell. There it settled, four atoms glowing at the tetrahedral edges. This new cluster, $Ag_{13}Cu_4$, began to sing. Under light, it radiated in hues of red and orange, its excited states lingering not for nanoseconds but for microseconds. Where silver had been fleeting and gold austere, copper gave brilliance and longevity.

The Queen's jewel was closer now, but still incomplete. "What if the King and the Fire shared the same castle?" asked the youngest among them. They built again: $AuAg_{12}Cu_4$, with gold at the center and copper on the

| By **Dr. Poulami Chakraborty**

corners. The result dazzled them. The band gap widened as with gold, but the glow deepened as with copper. It was both order and fire, discipline and song.

The court scientists tested their creations rigorously, knowing the Queen's gaze was unforgiving. They struck them with heat up to 175 °C and the clusters endured. They bathed them in humidity, cycled them through hot and cold, and still the jewels shone. They watched their excited states with femtosecond spectroscopy, tracing electrons as they rose, lingered, and fell. The copper clusters held their fire far longer than silver or gold alone. The results were undeniable: atoms had obeyed their summons. Gold enthroned in the core, copper glowing on the shell, silver binding them together with strength.

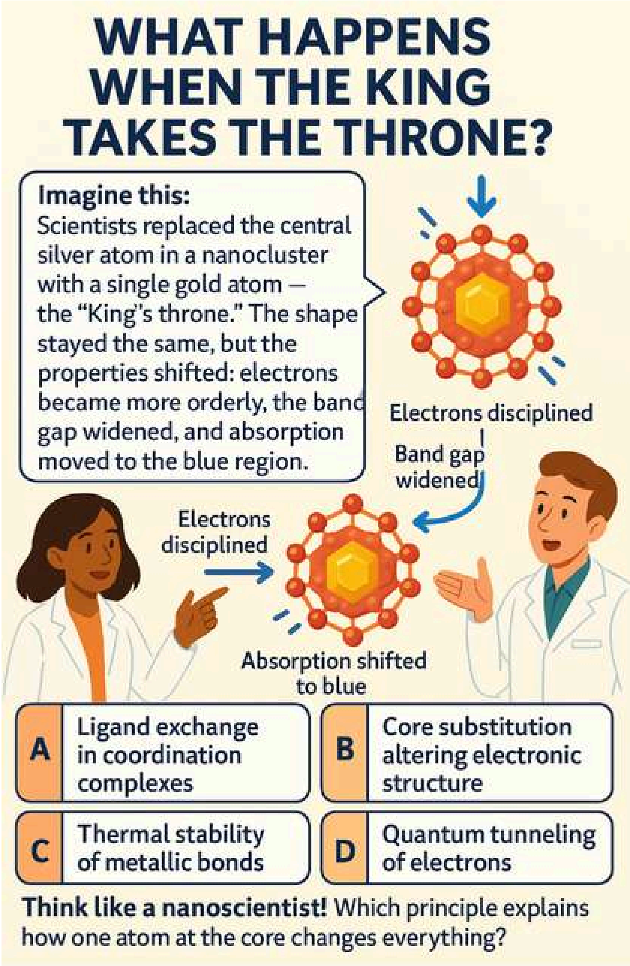
When at last the Queen entered the chamber, they placed the jewel before her. She frowned at first. "I see nothing," she said. For the cluster was invisible to the naked eye, smaller than a grain of dust. But when the scientists shone light upon it, the jewel answered. Crimson and orange flames spilled into the air, born not of any stone or star, but of atoms arranged by will.

The Queen lifted the invisible jewel and felt its glow in her hand. For the first time, matter itself had bent to her command.

Yet the scientists saw further than crowns. They spoke of future kingdoms where these jewels would light homes as LEDs, catalyze reactions in factories, guide doctors in imaging diseases, and sense poisons in the air.

They spoke of designer superatoms, each built with intent, each a new kind of material no mine or mountain could ever yield.

The Queen smiled, satisfied. Her artisans had failed, but her scientists had succeeded. They had given her what she demanded: a jewel no crown had ever seen. And in doing so, they had opened a new age not of gold, not of silver, but of atoms themselves, arranged like music, shining with a beauty born of knowledge.



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DST Unit of Nanoscience (DST UNS) and Thematic Unit of Excellence (TUE), Department of Chemistry, Indian Institute of Technology, Madras, Chennai, 600036, India

By **Dr. Animesha Rath**

THE CRIMSON MYSTERY OF THE FOREST

In the heart of an ancient forest, where shafts of golden light pierced through the canopy of sal and kusum trees, lived a creature so small it could easily be overlooked the lac insect. Barely larger than a pinhead, it clung in clusters to the bark, secreting resin that glistened like droplets of frozen blood

For centuries, villagers had climbed those trees, scraping resin with hooked poles until their hands were stained crimson. The hardened resin became bangles for brides, dyes for cloth, and lacquerware for palaces. To them, the insect was an artisan, a gift from the forest whose quiet labor sustained families for generations.

For scientists, however, the crimson pigment was a mystery. Did it rise from the trees like blood into the insect's body, or was it spun by the insect itself? Both theories faltered under scrutiny. The truth remained elusive until Dr. Govinda arrived.

A biologist with the curiosity of a detective, Govinda carried no magnifying glass but a modern kit: microscopes, DNA sequencers, and chemical detectors. To him, the forest was a courtroom, each branch a witness, the pigment a stolen jewel. Somewhere in the insect's body, he believed, hid the accomplice.

One evening, bent over a microscope, he froze. Inside the insect's translucent body floated spindle-shaped cells, budding like tiny fungi. Sequencing their DNA revealed them as close relatives of *Ophiocordyceps* fungi infamous for killing insects. But this one was no killer. It lived quietly, passed from mother to offspring, hidden like a tenant nobody had invited but everyone relied on.

This is no parasite," Govinda murmured. He named it the Kerria lacca Yeast-Like Symbiont (KLYLS). Could this hidden partner be the true source of the crimson?

The team sequenced three genomes: the insect, its bacterial lodger Wolbachia, and the mysterious fungus. The insect's genome disappointed it lacked the machinery to produce the pigments. Wolbachia was innocent as well. But KLYLS's genome lit up with answers. It carried polyketide synthase genes pigment factories and the recipe for tyrosine, an amino acid essential for making color, which the insect itself could not produce.

"It's as if we dusted the crime scene for fingerprints," Govinda smiled. "And every print belongs to the fungus."

| By **Dr. Animesha Rath**

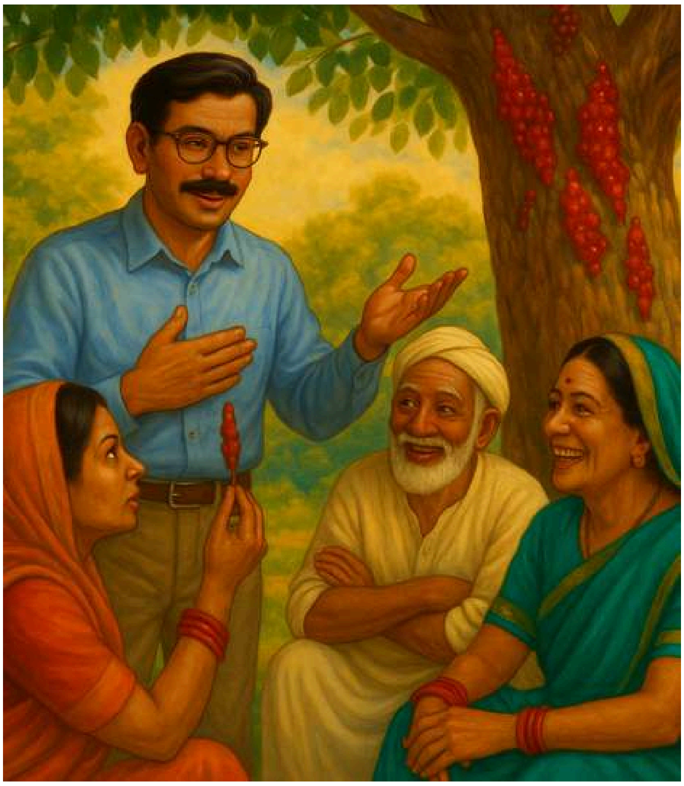
Still, the forest trees remained suspects. Govinda tapped into the phloem of Flemingia semialata, the insect's host, and scanned it with mass spectrometry. Sugars were there, but no pigments. Inside the insects, however, the crimson blazed. The trees were acquitted.

To seal the case, Govinda designed his "sting operation." He treated insects with fungicide, targeting the hidden lodger. Within days, their once-crimson bodies paled, pigment collapsed, tyrosine dwindled, their bodies weakened.

"Deprive the insect of its partner," Govinda told his team, "and you strip away both its color and its strength."
The verdict was undeniable: the lac insect was not a solitary artist. It painted side by side with its invisible symbiont.

News spread to the villages. Beneath a resin-heavy tree, Govinda explained to farmers. "So you mean," one woman asked, holding up a red-stained twig, "this color is not just from the insect?"

"It is the insect and its partner," he replied. "Together they make the crimson you see."



An elder chuckled. "All these years we thought the insect alone gave us this gift. Even it has company!" The farmers laughed, but their smiles carried understanding. In the forest, nothing truly lives alone.

For industry, the revelation promised new possibilities. If the fungus could be cultivated in vats, crimson pigments could be made without stripping forests. Farmers might learn to care for both insects and symbiont, boosting yields. Beyond dyes, cosmetics, medicines, even food coloring could benefit from this natural crimson.

The fungal genome revealed even more: KLYLS produced amino acids, vitamins, and nutrients missing from the insect's sugary diet. The insect gave the fungus a home and steady food. The fungus gave back life-sustaining nutrition and the dazzling color that marked human culture for centuries.

One morning, Govinda stood beneath a lac tree, fingers tracing resin glowing like rubies in the sun. "What looks like a single insect," he reflected, "is really a community. Life's most beautiful creations are often collaborations, hidden in plain sight."

High in the canopy, the tiny artisans continued their ancient work. For villagers, the resin was the same treasure as always. But for science, a secret had been revealed. The masterpiece was never the labor of one hand, but a duet across kingdoms of life insect and fungus, painting together, their brushstrokes stitched across millions of years.

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Department of Molecular and Human Genetics, Baylor College of Medicine, Houston, TX, USA

By **Dr. Manas Ranjan Pustry**

THE SILENT GUARDIAN OF PLATFORM NINE

The hydrogen train slid into Platform Nine with a whisper, its sleek body gleaming under the station's bright lights. Unlike the diesel engines of the past, this one released nothing but puffs of water vapor, vanishing into the night like breath on glass. Commuters marveled at its silence, proud that their city was leading the way toward a clean energy future.

But standing near the platform edge, Dr. Asha Kapoor wasn't watching the train. Her eyes were on the air above it invisible, intangible, but to her, full of questions. Hydrogen, after all, was a double-edged sword. Clean and powerful, yes. But also slippery. A tiny leak, undetected, could mix with air and ignite in an instant. And in a crowded station, that could mean catastrophe.

She reached into her pocket and touched the slim strip she carried everywhere now: her team's invention, a hydrogen sensor no larger than a fingernail. To most, it looked like nothing a sliver of plastic with delicate electrodes. But to Asha, it was the result of years of persistence, arguments, and sleepless nights.

Conventional detectors, like the ones installed on the station walls, were bulky and slow. They consumed energy, demanded high heat, and often lagged in response. In real emergencies, seconds mattered. Asha knew the world needed a sensor as fast and quiet as hydrogen itself.

She and her team had turned to organic semiconductors a gamble that many dismissed as foolish. Yet this fragile-looking film, called DPP-DTT, hid an elegant secret. Oxygen in the air would "dope" it, allowing current to flow. But if hydrogen appeared, it reacted with the oxygen on platinum, undoing the doping. The current dropped like a switch flipped off. The change was immediate, unmistakable: hydrogen was here.

When her students first tested it, the lab went silent. Numbers plunged across the screen, sharper and faster than anyone had dared hope. Detection at **192 parts per billion.** Less than a second faster than a blink. It consumed less power than a single LED. Over months, then years, they pushed it through humidity, heat, and cold. Even after **646 days**, it still worked, steady as a heartbeat. In balloon-burst experiments, it even outperformed commercial detectors.

Weeks later, these results traveled with her not just in her case, but onto the stage of a packed conference hall in Mumbai.

Rows of scientists, engineers, and policymakers leaned forward in their seats, eyes fixed on the towering presentation screen. At the podium, Asha held up the sensor strip, no larger than a fingernail, under the spotlight. The data behind her told the story: plunging curves, split-second responses, proof that her invention had outpaced the industry's giants.

The room buzzed with disbelief. One voice broke through — Dr. Vikram Mehta, defender of the old guard. "It's fragile," he challenged. "Organic films degrade. What if the sensor fails mid-journey?"

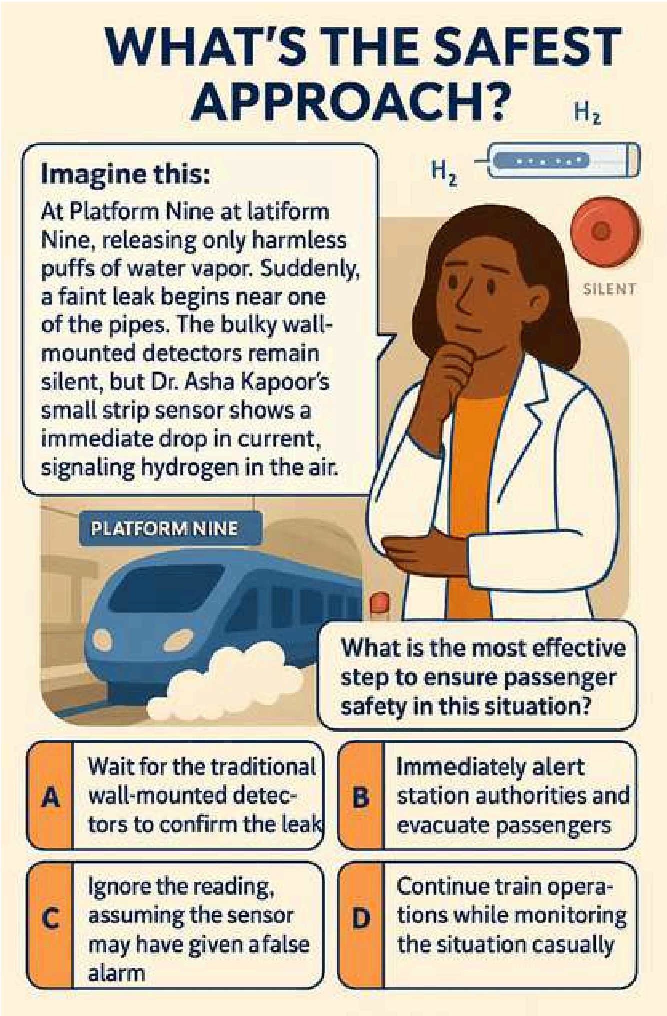
| By **Dr. Manas Ranjan Pustry**

Before Asha could reply, an engineer from the audience tapped the live feed. "It hasn't failed yet. And if these can be printed cheaply, we could scatter them everywhere — in stations, carriages, even homes. Thousands of guardians, not just a few."

Gasps and murmurs rippled across the hall. Policymakers whispered urgently. Engineers leaned closer. Rivals frowned, shaken.

For Asha, this was the real journey — not just the train she had watched at Platform Nine, but the leap from fragile trust to true safety. She closed her presentation with a quiet conviction:

"Hydrogen is not only fuel. It is a test of faith. And with this sensor, the world finally has a reason to believe."
The hall erupted in applause.



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Physical Science and Engineering Division, KAUST Solar Center (KSC), King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia

Henry Royce Institute, Photon Science Institute, Department of Electrical and Electronic Engineering, The University of Manchester, Manchester, UK

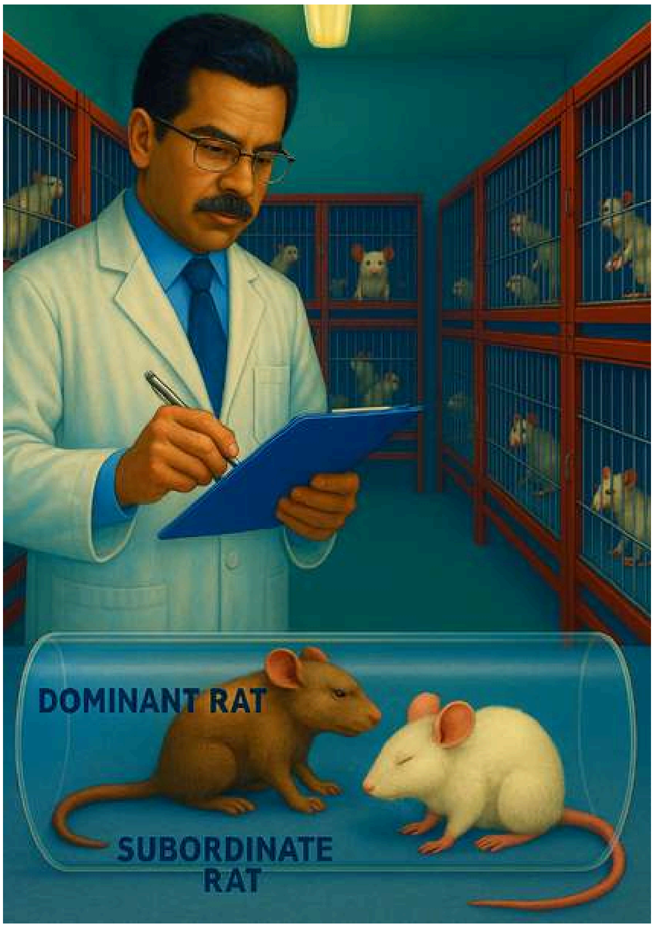
| By **Dr. Preeti Sharma**

THE SILENT BRAIN

TnThe lab was quiet, except for the hum of the lights. In rows of cages, rats lived side by side. They looked the same, but hidden among them was an invisible order: some were leaders, others followers. The leaders always pushed forward, the followers stepped aside. This was the world of dominance and submission, a world the scientists wanted to understand.

To reveal this hidden order, the researchers used a simple but powerful test the tube test. Two rats entered a narrow tube from opposite ends. When they met in the middle, only one could pass. The rat that pushed forward was the winner, the “dominant.” The one that retreated was the “subordinate.” Over time, these results repeated again and again, creating stable hierarchies inside each cage.

The question was simple but profound: how does stress affect these roles? Do dominants stay strong while subordinates crumble? Or does stress change the balance in surprising ways?



The scientists had a hypothesis that dominants would prove resilient, while subordinates would show greater vulnerability. To test this, they introduced a challenge. Half of the rats were placed in a stress situation: two hours of restraint, unable to move, an experience that triggered helplessness and fear. The others remained untouched, serving as controls. Afterward, the rats were tested again. Some faced their familiar cage mates, others were matched against strangers from different cages. The aim was to see whether stress changed behavior in stable relationships and in new, uncertain encounters.

At first glance, nothing seemed to change. When familiar cage mates met again, dominants still dominated, and subordinates still yielded. The hierarchy within the cage remained steady, as though stress had bounced off the surface.

But when strangers met, the hidden effects of stress emerged. Dominant rats that had experienced stress still pressed forward, still fought to win. They showed resilience, behaving much like before. Subordinate rats, however, were different. Those that had been stressed gave up even faster. They retreated quickly, rarely challenging their opponent. Their behavior showed a deeper, lasting vulnerability. Interestingly, some unstressed subordinates grew bolder against stressed rivals, showing that without the weight of stress, even the weaker rats could find opportunities.

The scientists then looked inside the brain, focusing on the basolateral amygdala, a region that processes emotions and stress. What they found was striking. Subordinate rats that had been stressed showed a large increase in dendritic spines tiny connections between neurons. These extra spines are often linked to heightened sensitivity, stronger emotional responses, and anxiety-like behaviors. Dominant rats, by contrast, showed no such changes. Their brains remained stable, unaffected by the same stress.

This revealed what the eye could not see: stress does not touch all individuals equally. For subordinates, stress rewired the brain, leaving them more reactive and less able to cope with new challenges. For dominants, stress left almost no trace. Their social position acted like a shield, protecting them from long-term harm.
The study’s findings carry important lessons. First, they show that social rank is not just about access to food or space it also shapes vulnerability to stress. Second, they

By **Dr. Preeti Sharma**

highlight that resilience and fragility are not evenly spread across a population. Some individuals carry heavier burdens simply because of their place in the hierarchy.

For humans, this has powerful implications. In workplaces, schools, or communities, people also live in social hierarchies. Those who feel subordinate with less control, less status, or less voice may be more vulnerable to stress and its long-term effects on the brain. Dominant individuals, with more control and security, may be buffered from the same pressures. Understanding this could help explain why stress-related disorders such as anxiety and depression often hit some groups harder than others.

The future importance of this research is clear. It reminds us that when scientists study stress, they cannot treat all individuals as equal. Social context matters. Interventions to build resilience might need to focus especially on those in subordinate positions, who carry both social and biological vulnerabilities. It also opens questions about whether boosting social support or reducing feelings of subordination could help protect against the brain changes that make stress so damaging.

In the end, the study showed that the brain has a silent way of recording social position. The dominants walked away unchanged, their brains quiet. The subordinates carried scars invisible to the eye but written into their neural connections. Stress had spoken differently to each. The silent brain told the story: resilience for the strong, fragility for the weak.

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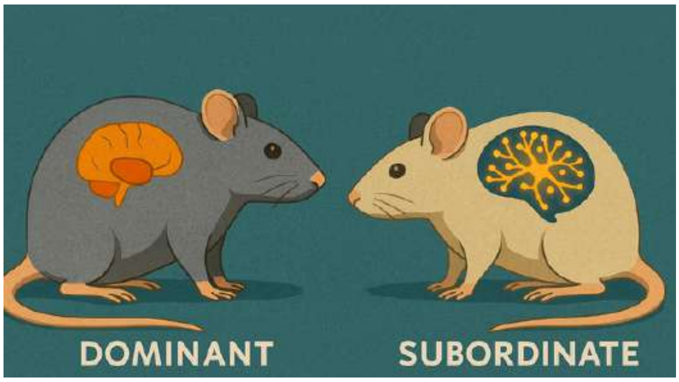
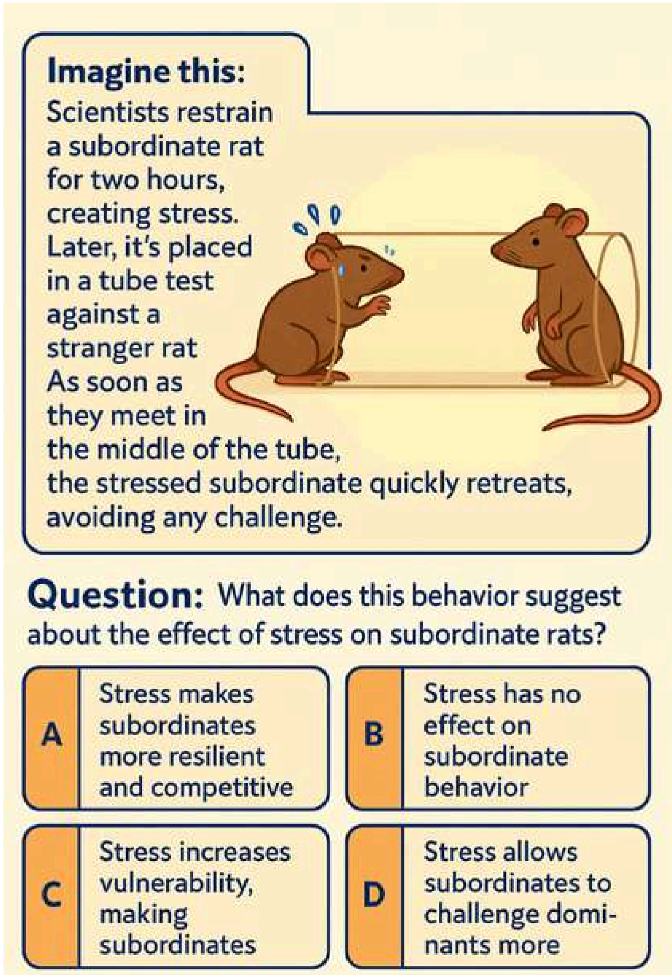




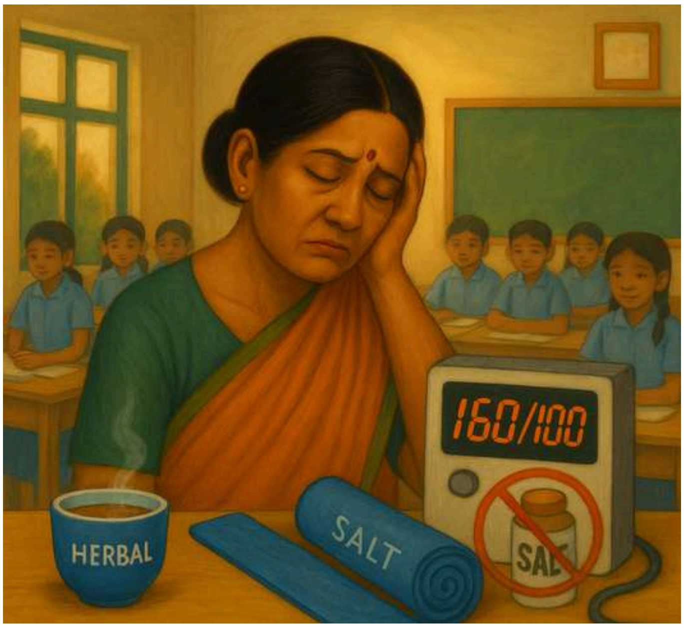
Deanery of Biomedical Science, Laboratory for Cognitive Neuroscience, Edinburgh Neuroscience, The University of Edinburgh, Edinburgh EH8 9JZ, United Kingdom

Deanery of Biomedical Science, Simons Initiative for the Developing Brain and Patrick Wild Centre, The University of Edinburgh, Edinburgh EH8 9JZ, United Kingdom

By **Dr. Sourav Kumar**

ANJALI'S BURDEN

Anjali, a 46-year-old schoolteacher in Kolkata, carried her illness quietly. To her students she was cheerful, endlessly correcting notebooks and leading morning assemblies. But inside, she worried. Her doctor had warned her about her high blood pressure the "silent killer." She tried everything she could manage at home: herbal teas, yoga in the evenings, and even cutting down on salt in her cooking. Still, every visit to the clinic ended with the same disappointing numbers on the monitor. Her pressure refused to settle.



When her doctor suggested joining a clinical study, Anjali hesitated. "They will test different medicines," he explained. "But you will only need to take a single pill each day." She had heard stories of side effects dizziness, swelling, endless complications. But eventually she agreed, seeing it as her chance to live without the constant headache and fatigue.

The study was called TOPSPIN, the largest hypertension trial ever done in India. The researchers had a clear question: would people of South Asian origin respond differently to different pairs of blood pressure medicines? In Africa, a previous study the CREOLE trial had shown that some combinations worked better than others. Could the same be true in India? The team hypothesized that perhaps one drug pair would prove more effective or safer for Indian patients.

To test this, doctors across 32 hospitals in India worked together. Almost 1,981 men and women like Anjali, aged 30 to 79, were recruited. All had untreated or uncontrolled hypertension. Each participant was randomly assigned to one of three single-pill combinations (SPCs):Amlodipine + Perindopril (a calcium channel blocker plus an ACE inhibitor),Perindopril + Indapamide (an ACE inhibitor plus a diuretic), or Amlodipine + Indapamide (a calcium channel blocker plus a diuretic).

Anjali received one of these pills. She did not know which group she belonged to the study was single-blind but she knew it contained two medicines together. She swallowed her tablet daily, expecting side effects. Instead, she slowly began to notice the difference: her headaches faded, the dizziness became rare, and climbing the stairs at school no longer left her breathless.

Meanwhile, the scientists measured outcomes carefully. Their primary goal was to track changes in 24-hour ambulatory systolic blood pressure after six months. They also measured office blood pressure, control rates, safety, side effects, and laboratory markers. The study was run with great precision: intention-to-treat analysis, imputation for missing data, and strict per-protocol reviews.

Six months later, Anjali's numbers had fallen into a safer zone. She wasn't alone. Across all three drug groups, blood pressure dropped significantly: systolic by about 13–14 mmHg and diastolic by 7–8 mmHg. Office readings fell even more by nearly 30/14 mmHg on average. About 70% of patients reached target blood pressure below 140/90 mmHg, and more than 40% even met the stricter 130/80 mmHg goal.

What surprised everyone was the comparison: there was no clear winner among the three combinations. Each pair worked equally well. Side effects were mild a little dizziness here, some ankle swelling there but serious complications were rare. Amlodipine with perindopril slightly lowered blood sugar, while indapamide groups had a little more low potassium. But overall, every treatment was safe and effective.

When the doctors explained this to Anjali, she was astonished. "So all the medicines worked, not just mine?" she asked. The team nodded. For once, medicine was not about picking the "perfect" pill.

| By **Dr. Sourav Kumar**

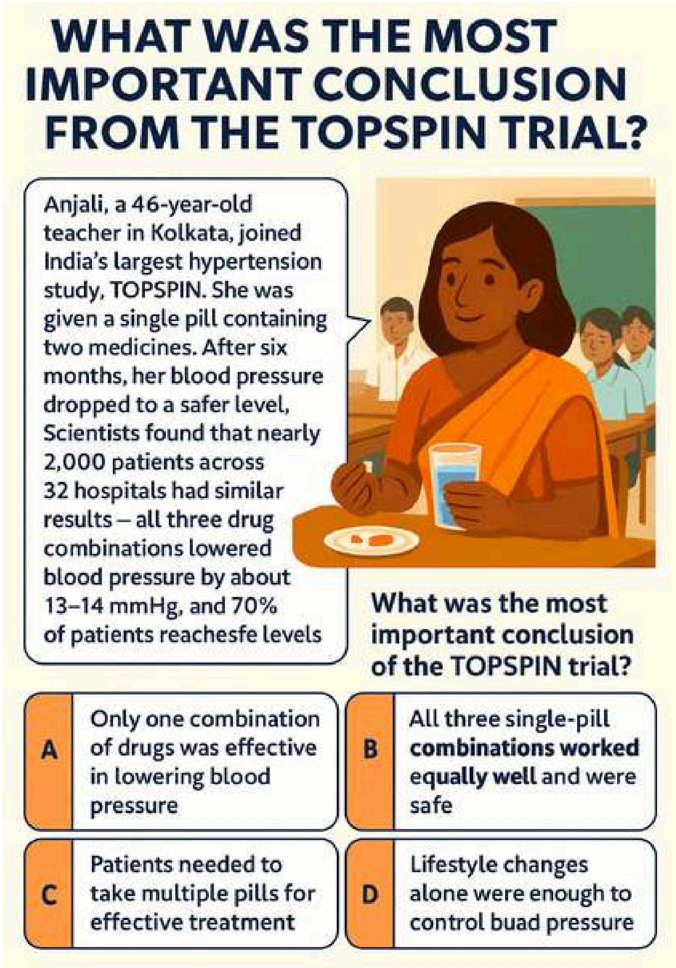
It was about simplifying treatment so patients like her could stick to it.

The implications were powerful. For India and South Asia, the trial showed that any of these combinations could be prescribed with confidence. This was vital in a country where hypertension affects millions but remains poorly controlled. For doctors, it meant flexibility they could choose based on cost or availability without worrying about effectiveness. For public health, it proved that single-pill combinations could transform care by improving adherence and reaching more people.

Globally, the study added a new piece to the puzzle of ethnicity and treatment. Unlike the African trial where differences emerged, in India all three drug pairs worked equally well. It was a reminder that treatment strategies must be tailored to populations, not assumed from elsewhere.

For Anjali, though, the lesson was simpler. She stood at the school gate one morning, watching children stream in. Her pressure was under control, her energy had returned, and the nagging worry had eased. “Sometimes,” she thought, “the best cure is not complexity, but simplicity.”

The silent burden she had carried for years had lifted, thanks to a single pill and the knowledge that she was not alone. Nearly two thousand Indians had shared her journey, and together they had proven that hypertension could be tamed. The future now looked brighter, not just for Anjali, but for millions of others like her.



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Centre for Chronic Disease Control, New Delhi, India

By **Dr. Priyangana Deb**

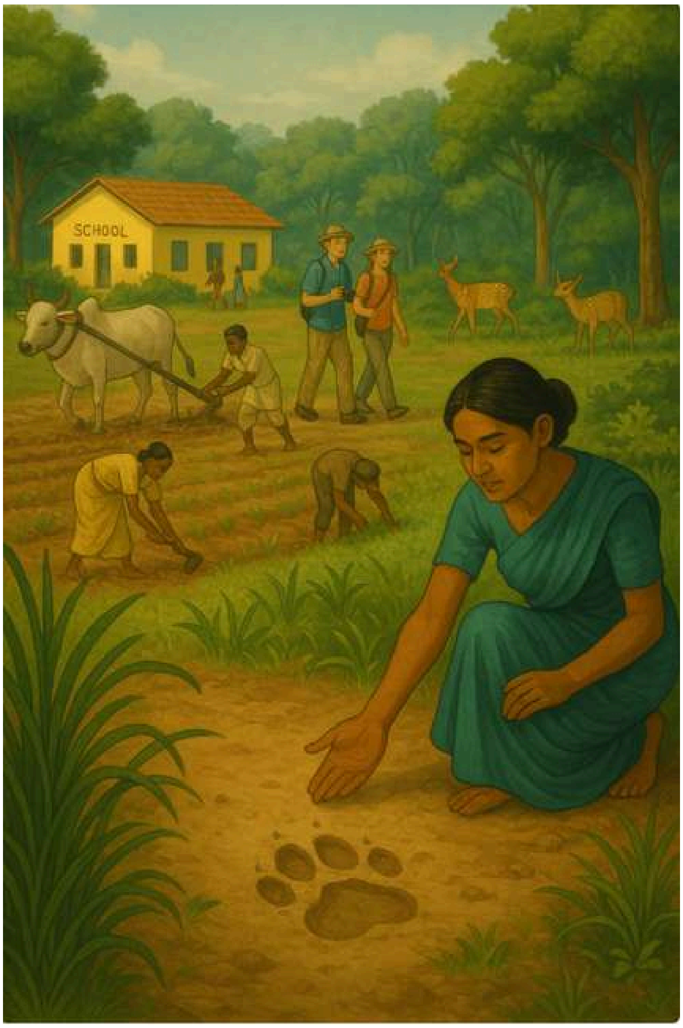
THE VILLAGE THAT BROUGHT BACK THE TIGER

In a small village on the edge of India's forests, life was once very hard. Families struggled with little food and few jobs. Many people depended on the forest to survive, hunting deer and wild pigs. Over time, the animals vanished, and with no prey to sustain them, the tigers also disappeared. The great roar of the forest was gone. Children grew up without ever seeing a tiger's paw print or hearing its call in the night. India, once home to vast tiger populations, had witnessed a steep decline. But since 2006, a nationwide effort has sought to track and protect this iconic animal. Every four years, scientists and forest staff fan out across the country in what has become the largest wildlife survey in the world. They walk thousands of kilometers, install camera traps to capture images of tigers, count prey animals, and collect data on land use, poverty, and human activity. To make sense of such a huge task, they divided the country's forests into 10 × 10 kilometer grids and studied each one to see where tigers persisted, where they vanished, and where they returned.

The scale of this work is astonishing. More than 44,000 people have contributed, covering nearly 2.5 million kilometers of forest paths. The results have revealed not only the status of tigers but also the deeper links between wildlife and human society.

One of the most important discoveries was that tigers can live alongside people. Nearly half of all tiger-occupied areas today are also home to about 60 million people. This proves that coexistence is possible if communities benefit from conservation.

In villages where schools, jobs, and tourism brought income, people were more willing to share their forests with wildlife. But in poor or unstable regions, where families still relied on hunting for food, both prey and tigers disappeared. Poverty and conflict stripped the land of animals, and the silence of the forest grew heavier.



The study also revealed how protecting tigers benefits far more than just one species. Wherever tigers thrived, other animals elephants, leopards, wild dogs, and deer also flourished. Forests rich in tigers stored more carbon, helping combat climate change. In this sense, the tiger acts like an umbrella species: protecting it safeguards entire ecosystems and the countless creatures that depend on them.

Over twelve years, the results were encouraging. Tiger range increased by about 30 percent, spreading into new forests every year. By 2018, tigers occupied roughly 138,000 square kilometers of India's land. They

By **Dr. Priyangana Deb**

recolonized more than 41,000 square kilometers, especially in areas near reserves and connected by corridors. These corridors are lifelines, allowing young tigers to disperse and claim new territories. But not all stories were hopeful. Tigers also disappeared from nearly 18,000 square kilometers, mostly in regions plagued by poverty, heavy hunting, or armed conflict. These losses were a reminder that conservation success is never guaranteed.

The lessons are clear. Protected areas remain essential: they give tigers safe homes where they can breed and thrive. Corridors between forests must stay open, ensuring that populations remain connected and resilient. Most importantly, people living near tiger forests must share in the benefits of conservation. Eco-tourism, fair compensation for livestock losses, and community development projects are as important as forest patrols and laws.

India's achievement is extraordinary. With less than one-fifth of the world's tiger habitat, it now supports more than three-quarters of the world's wild tigers. This success shows that even in crowded, developing countries, large carnivores can recover when science, government, and communities work together.

And so, the story of the tiger is also the story of people. Where poverty dominated, tigers vanished. Where prosperity grew, tigers returned. In villages where paw prints reappeared in the mud, people began to see the tiger not just as a threat but as a partner in their future. For children who once only heard stories of the great cat, the forests now echo again with its roar.Across India, the return of the tiger carries a powerful message of hope: that humans and wildlife can still share the land, and that by building a better life for people, we also give space for nature to thrive.

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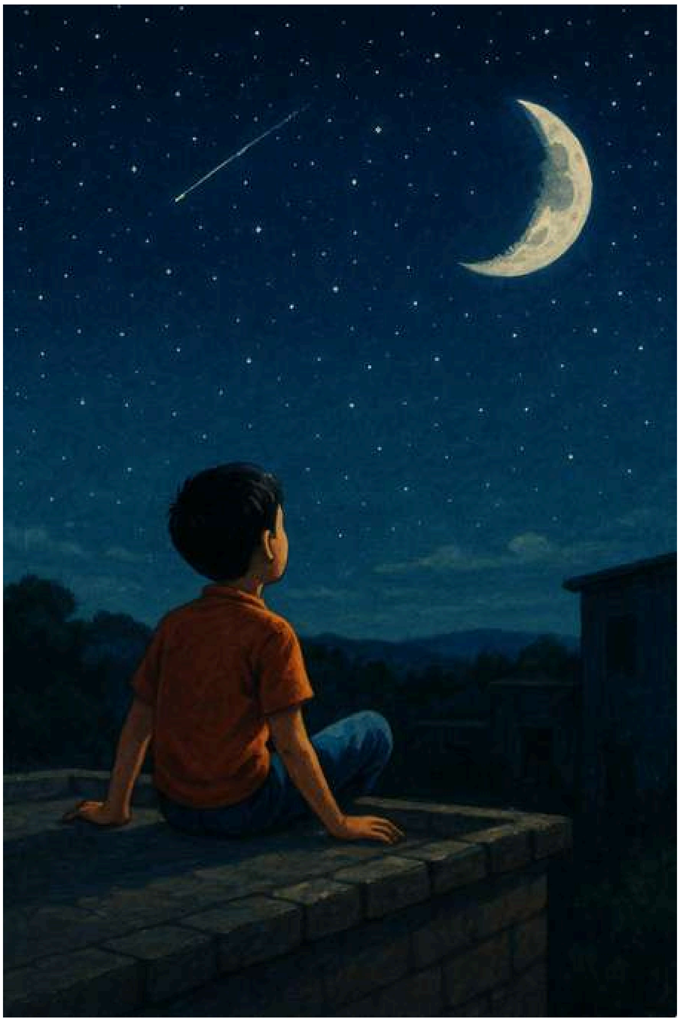
PWildlife Institute of India, Dehradun, India

| By **Dr. Priyanka**

FROM ROOFTOP DREAMS TO QUANTUM DISCOVERIES

As a boy growing up in a small town, Ravi loved climbing up to the roof at night. From there he could see the sky stretched wide like a giant blanket. Stars sparkled like little lamps, the moon changed its face each night, and

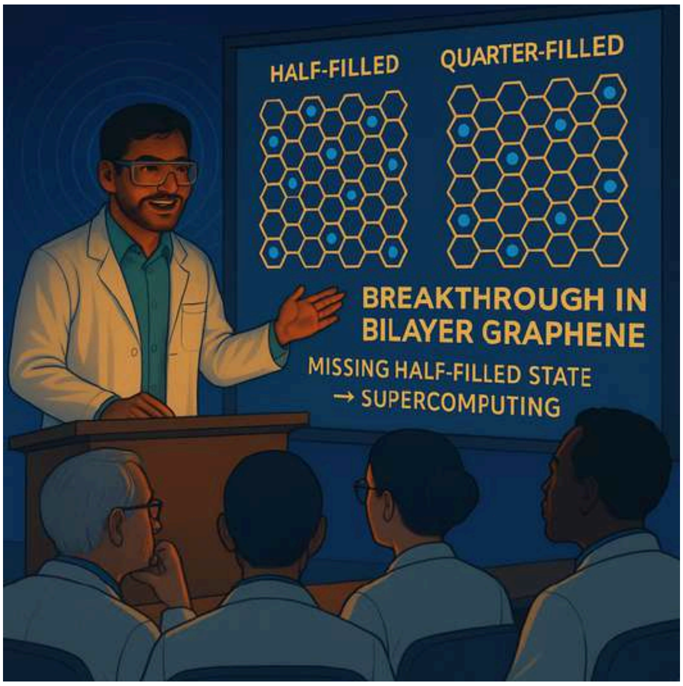


sometimes a shooting star streaked across the dark before fading away. Ravi's head was full of questions. Why do stars twinkle? Why does the moon keep changing shape? What makes a star fall from the sky? His mother smiled at his curiosity and gave him simple answers, but Ravi always wanted to know more. Those questions never left him, glowing brighter than the stars above.

"That restless curiosity led him to study physics. At college he searched for answers, hoping science would explain the mysteries that had filled his childhood. During an internship at the Tata Institute of Fundamental Research in Mumbai, he discovered something strange and beautiful: two-dimensional materials. These were sheets of matter only one atom thick. They looked almost invisible, but they had extraordinary powers. It was like finding a hidden world inside a sheet of glass. The discovery lit a spark in Ravi. Later, as a Ph.D. student at the Indian Institute of Science in Bangalore, he chose to dive even deeper. Instead of exploring the endless sky above, he was now exploring the hidden universe inside matter, ruled by the strange laws of quantum physics.

To understand the world Ravi studied, imagine two identical coins on a table. If you swap their places, nothing changes. That is how ordinary objects behave whether they are grains of sand or marbles on a floor. But quantum particles don't follow such simple rules. Swap them, and the invisible "wave" that describes them changes too.

Some particles, called bosons, behave politely. Swap them, and nothing happens; in fact, they like to gather together. This is why beams of light can combine to form lasers. Others, called fermions, are stricter. Swap them, and the wave flips like a coin turning from heads to tails. That simple rule explains how electrons build the periodic table and shape all of chemistry.



For a long time, scientists thought these were the only two families: bosons and fermions. But in flat, two-dimensional worlds, something new appeared anyons. Anyons were like mischievous dancers. When swapped, they didn't just stay the same or flip.

| By **Dr. Priyanka**

hey added a secret twist, a hidden spin to the step. Some anyons didn't care about the order of moves, but others called non-Abelian anyons remembered every step, like knots tied in a rope. That memory could one day be used to build quantum computers that hardly ever make mistakes.

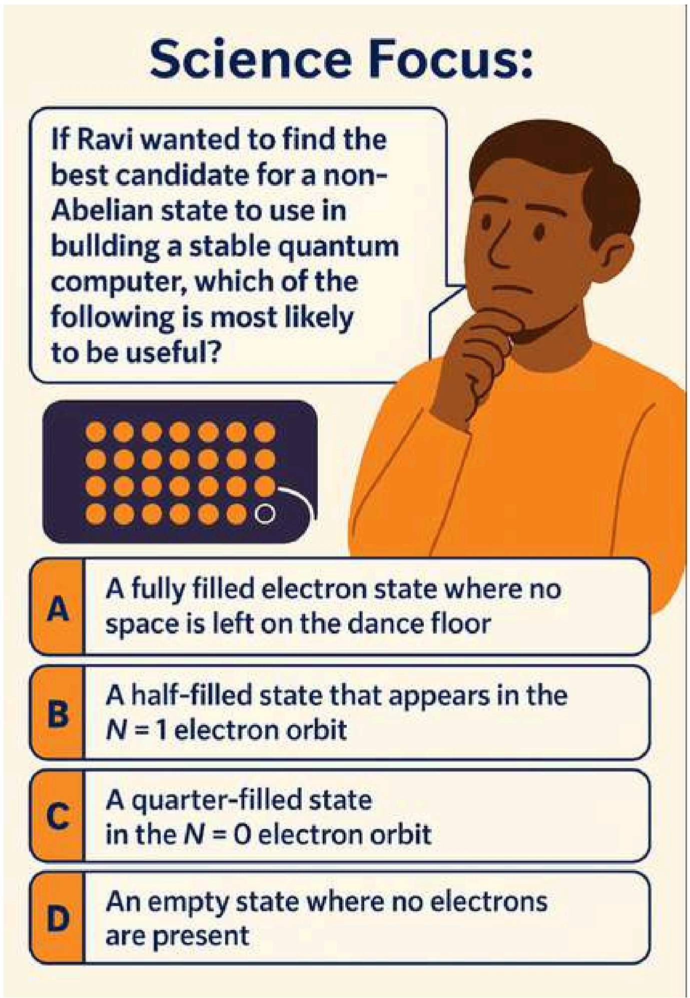
But these dancers don't appear just anywhere. They need the right stage. Electrons must be trapped in a flat sheet, cooled to a temperature colder than outer space, and placed under an extremely strong magnetic field. Under those conditions, they begin a strange performance called the Fractional Quantum Hall Effect. In this state, they join together to form anyons with unusual properties. Bilayer graphene made of two sheets of carbon atoms stacked like layers of paper became the perfect stage for this dance.

Ravi and his team prepared this stage. They cooled bilayer graphene almost to absolute zero and turned on powerful magnets. Then the magic began. At special points, such as half and three-quarters filling of the energy levels, the electrons formed exotic new states. Even more mysterious, each "parent" state gave rise to faint "daughter" states, like shadows revealing hidden patterns. These shadows hinted at secret rules, suggesting that the states might be non-Abelian the very particles scientists had long dreamed of.

Why does this matter? Because non-Abelian anyons are like knots in a string. Once tied, they remember the order forever. Imagine storing information in those knots. Ordinary computers constantly correct mistakes, wasting time and energy. But a quantum computer built from these knots could store information safely and calculate without error.

The journey isn't finished. To truly prove the non-Abelian nature, scientists still need more delicate experiments. But Ravi's team has shown that bilayer graphene is not just an ordinary material. It is a hidden world, filled with exotic states waiting to be uncovered.

For Ravi, it feels like coming full circle. The boy who once lay on the rooftop asking why stars twinkle now finds himself asking new questions about the invisible dances of matter. Just as the night sky is filled with mysteries waiting to be discovered, so too is the quantum world beneath our feet. And perhaps, one day, the computers of the future will be built not from chips of silicon, but from the strange, beautiful dances of the particles Ravi helped reveal.



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Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot, Israel

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1. Colorless, deadly, from cars I flow. I choke the blood—who am I though?
2. From burning coal, I sting the rain. I scar the Earth—what's my name?
3. Orange haze, I sting your eyes. From engines and smoke, I rise.
4. High I shield, low I bite. Born of sun, I cause the fright.
5. From cows and swamps I flee. I trap Earth's heat—what's me?
6. From fire and breath I spread. A warming blanket overhead.
7. From farms I drift, sharp and near. I haze the air—what appears?
8. Tiny dust, unseen yet strong. In lungs I settle, where I don't belong.

- Ammonia
- Methane
- Sulfur Dioxide
- Particulate Matter
- Carbon Dioxide
- Nitrogen Dioxide
- Volatile Organic Compounds
- Ozone

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.

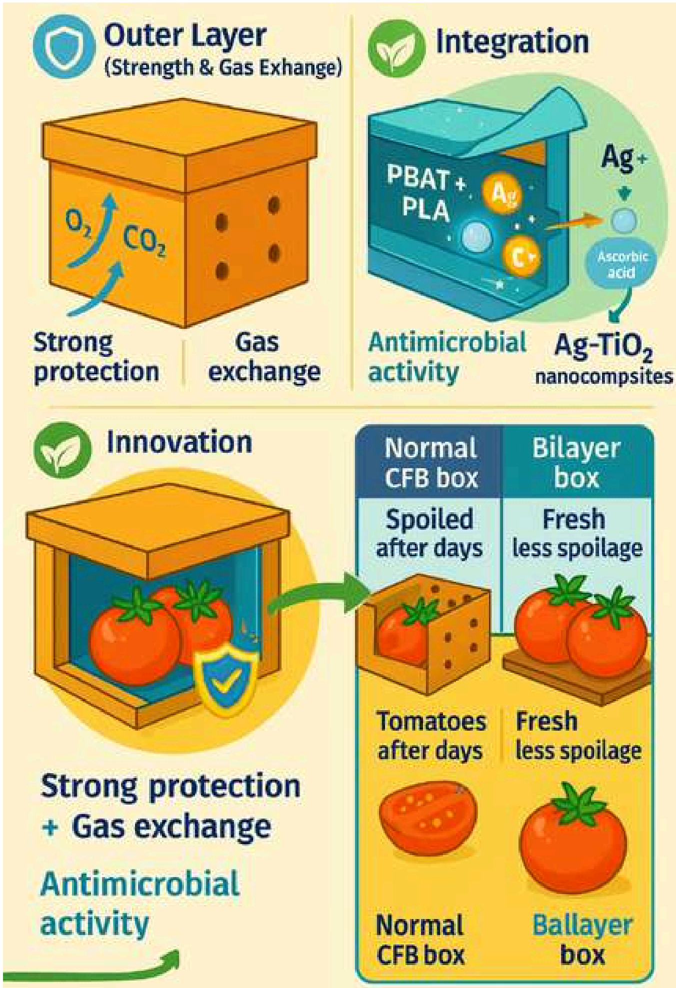
By **Dr. Ipshita Mohanty**

MAGIC BOX WITH GUARDS AND WINDOWS

One rainy afternoon, Tozo sat on the floor, watching her mother unpack shiny red apples. This time the apples didn't come in a plastic bag but in a cardboard box with tiny holes. Tozo thought it looked like the box was wearing a coat with breathing holes. Her mother explained, "This is a new kind of box that keeps fruits and vegetables fresh for longer and does not harm the environment."

Tozo imagined the apples inside as little warriors in shiny armor, fighting off invisible germs. Excited, she said, "It keeps the apples fresh, saves the planet, and even breathes. That's cool!"

This special invention is an eco-friendly packaging box made by researchers at IPT-CIPET, Bhubaneswar. The box has two protective layers.



The outside is made of corrugated fiberboard (CFB) a strong cardboard with small holes that let air move through. The inside is lined with a special biodegradable film. This film is made from a blend of two safe plastics, PBAT and PLA, mixed with tiny silver and titanium dioxide particles ($Ag\text{-}TiO_2$). These particles have strong powers to fight bacteria and fungi.

The silver nanoparticles are created in a "green" way using vitamin C. They are combined with titanium dioxide to make a fine powder. This powder is mixed with the plastics and melted to form thin, flexible, transparent films. The films are then tested to make sure they are strong, breathable, and really good at stopping microbes.

Finally, the film is glued inside the cardboard box. Together, the two layers make a bilayer box that not only protects fruits and vegetables but also keeps them fresher for longer. Tests showed that apples and vegetables stored in this new box stayed fresh with less rotting and mold.

Tozo called it a magical box one that protects food, fights germs, and saves the planet.

INNOVATION

Reference:

Sarangi, P. L., Rout, S. S., Panda, S. S., Mohanty, S. P., & Samal, A. (2025). Bilayer Biodegradable Antimicrobial Packaging Box for Enhanced Fruit and Vegetable Preservation.

Patent Number: 202531007113

Developed by: Central Institute of Petrochemicals Engineering and Technology (CIPET): Institute of Petrochemicals Technology (IPT), Bhubaneswar & Utkal University, Bhubaneswar.

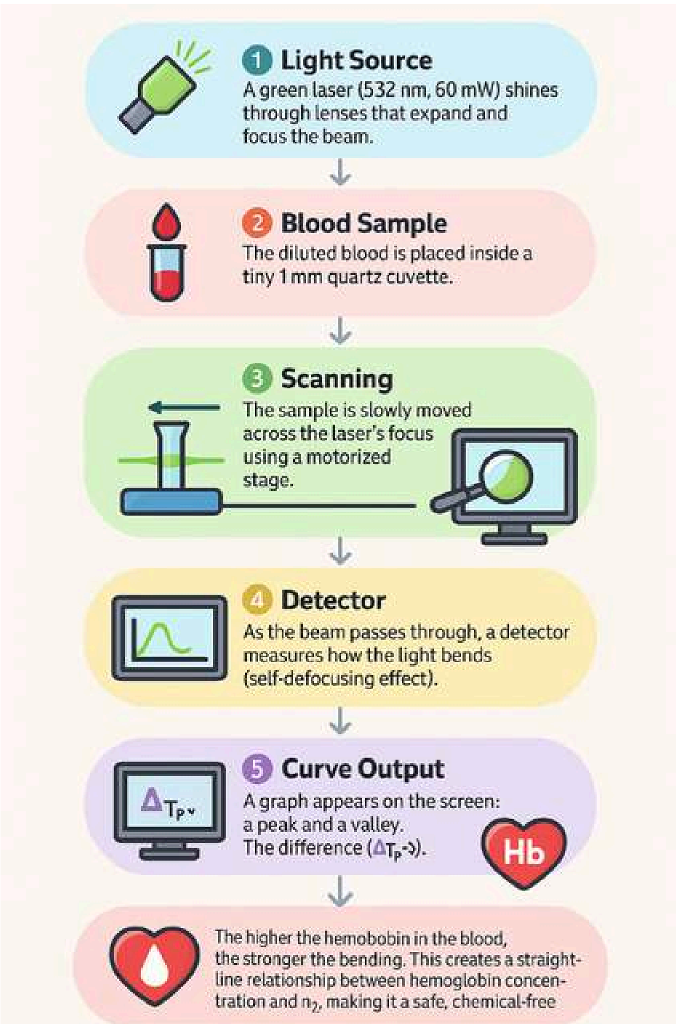
By **Dr. Sivan Friedman**

THE PATIENT'S PEACE OF MIND

Maya always dreaded hospital visits. The needles, the waiting, the smell of chemicals it all made her anxious. Hemoglobin tests were the worst. She remembered the clinking bottles, the reddish stains of reagents, and the long twenty-minute wait before the lab technician returned with her results. Today, however, things were different.

At the clinic, the nurse greeted her with a calm smile. "Just a small prick," she said, taking a tiny drop of blood and diluting it with water. No colored chemicals, no bottles labeled with danger signs. Instead, she slid the sample into a transparent quartz slot inside a compact machine.

A soft green light from a laser glowed for just a few seconds. Maya watched curiously as the device scanned her blood. The technology behind it was simple yet powerful. A 532 nm, 60 mW laser beam was expanded and focused



through special lenses before striking her sample in the quartz cuvette. The sample, resting on a motorized stage, was moved slowly across the laser's focus. A small aperture before the detector captured the transmitted light, producing a curve with a peak and valley on the computer screen. This pattern, the nurse explained, measured how her blood bent the light a property called the nonlinear refractive index.

No waiting, no harsh odors, no uncertainty. The nurse handed her a simple printout. As Maya left the clinic, she felt reassured. Light itself, she realized, had replaced chemicals, turning fear into comfort and delay into peace of mind.

Maya always dreaded hospital visits. The needles, the waiting, the smell of chemicals it all made her anxious. Hemoglobin tests were the worst. She remembered the clinking bottles, the reddish stains of reagents, and the long twenty-minute wait before the lab technician returned with her results. Today, however, things were different.

At the clinic, the nurse greeted her with a calm smile. "Just a small prick," she said, taking a tiny drop of blood and diluting it with water. No colored chemicals, no bottles labeled with danger signs. Instead, she slid the sample into a transparent quartz slot inside a compact machine.

"The more hemoglobin in your blood," the nurse continued, "the stronger the bending effect. Our software measures the peak-to-valley difference in the curve and instantly translates it into your hemoglobin concentration. It's precise, quick, and chemical-free."

Within moments, the result appeared on the screen: Maya's hemoglobin was comfortably within the normal range.

INNOVATION

Reference:

Pathak, N. K., Sahoo, P., & Tripathy, U. (2025). A nonlinear optical tool to measure hemoglobin concentration in human ABO blood types.

Patent Number: 202531005520
Developed by: Indian Institute of Technology (Indian School of Mines), Dhanbad

By **Dr. Manas Ranjan Prusty**

KNOWLEDGE ON WHEELS

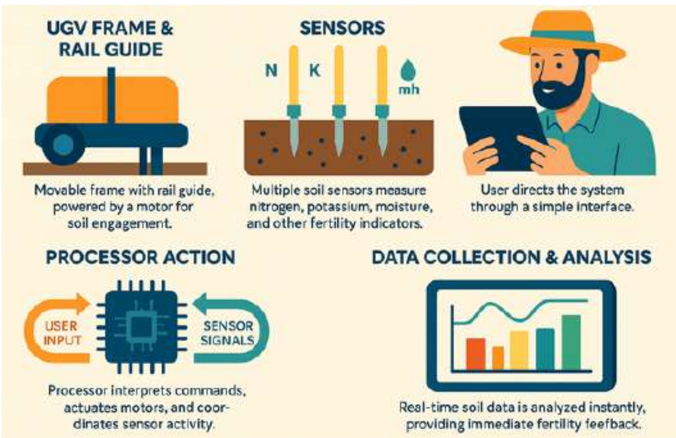
The market square buzzed with chatter that morning. Farmers had brought sacks of grain, bundles of vegetables, and stories of a difficult season. But today, something unusual rolled into the square. An unmanned ground vehicle, small but sturdy, sat gleaming in the sun.

A young farmer volunteered for the demo. He guided the machine onto a patch of bare soil near the banyan tree. With a simple press of a button on the handheld interface, the vehicle whirred to life. Its frame moved smoothly, and a rail guide lowered slim sensors into the soil.

Everyone leaned closer. In the past, they had relied on tradition, experience, and guesswork to decide fertilizer use. Sending soil samples to distant labs was slow, costly, and often impractical. Many times, they had over-applied fertilizers, wasting money and harming the soil. Other times, they had under-applied, leaving crops stunted and yields poor.

On a small display, numbers began to appear. "Potassium high," it read. "Nitrogen low. pH moderate." Gasps of surprise spread through the crowd. For the first time, the soil was speaking to them directly, through sensors and processors.

The machine's computing unit analyzed the readings instantly, showing where the soil was healthy and where nutrients were lacking. The farmers saw that no digging, bottles, or chemical reagents were needed.



A tiny vehicle with sensors and a processor was enough to turn hidden soil secrets into actionable knowledge. One elder farmer nodded thoughtfully. "All these years we guessed," he said, "but the soil knew better. Now we can listen." As the crowd dispersed, a sense of hope lingered. Knowledge no longer required guesswork or delay it had arrived on wheels, with sensors that promised a new chapter for farming.

What role do the soil sensors play in the UGV system?

A	They guide the UGV's movement across the field
B	They penetrate the soil to measure fertility-related parameters
C	They store data and act as a processor
D	They provide power to the rail guide

INNOVATION

Reference:
Banday, R. U. Z., Muzamil, M., Dixit, J., Gul, D., Rashid, S., & Tak, S. A. (2025). Unmanned ground vehicle based real-time soil fertility management system.

.

Patent Number: 202411085136

Developed by: Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K)

By **Dr. Avijit Das**

THE HIDDEN TREASURE

In the quiet wetlands of Bihar, farmers have cultivated Euryale ferox better known as makhana for generations. To them, it was a trusted source of food, strength, and livelihood. Roasted in clay pots or puffed into snacks, these seeds carried cultural importance but were seen mainly as nutrition, not as science's next breakthrough.

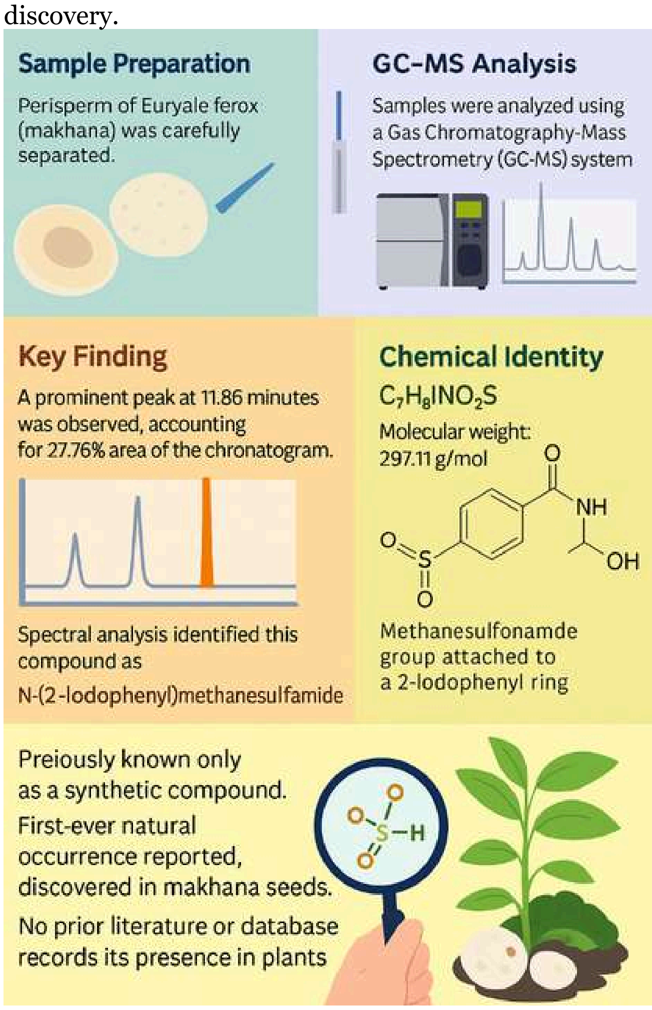
Yet hidden inside each seed was a secret waiting to be uncovered. Scientists, curious about the chemistry of makhana, decided to go beyond its known nutritional profile. They focused on the perisperm the starchy tissue surrounding the embryo and prepared samples using a clean, solvent-free Solid Phase Micro Extraction (SPME) method. Their aim was to ensure that the natural compounds could be studied without contamination.

When the samples were placed into a sophisticated Gas Chromatography-Mass Spectrometry (GC-MS) system, the instrument produced a chromatogram filled with peaks each representing a compound. At 11.86 minutes, one peak rose above the rest, claiming a striking 27.76% area. This meant the compound was not only present but abundant.

The scientists dug deeper into its identity. The spectral data revealed a molecule with a methane sulfonamide group linked to a 2-iodophenyl ring. Its molecular formula $C_7H_8INO_2S$ and molecular weight of 297.11 g/mol matched perfectly with N-(2-Iodophenyl) methane sulfonamide.

What made this discovery remarkable was not the compound itself it had been synthesized before in chemical laboratories but the fact that nature had created it too. No literature, no database, and no previous research had ever reported its presence in any plant species. For the first time, a "synthetic" compound had revealed its natural origin inside makhana.

Thus, the humble aquatic seed transformed into a biochemical treasure chest, offering new opportunities for nutrition, medicine, and functional foods. What farmers harvested as food, scientists now celebrated as discovery.



INNOVATION

Reference:

Singh, D. R., Banu, V. S., Ganguly, P., Kumar, A., & Singh, A. K. (2025). Novel Identification of N-(2-Iodophenyl) methane sulfonamide compound in Euryale ferox (Makhana).

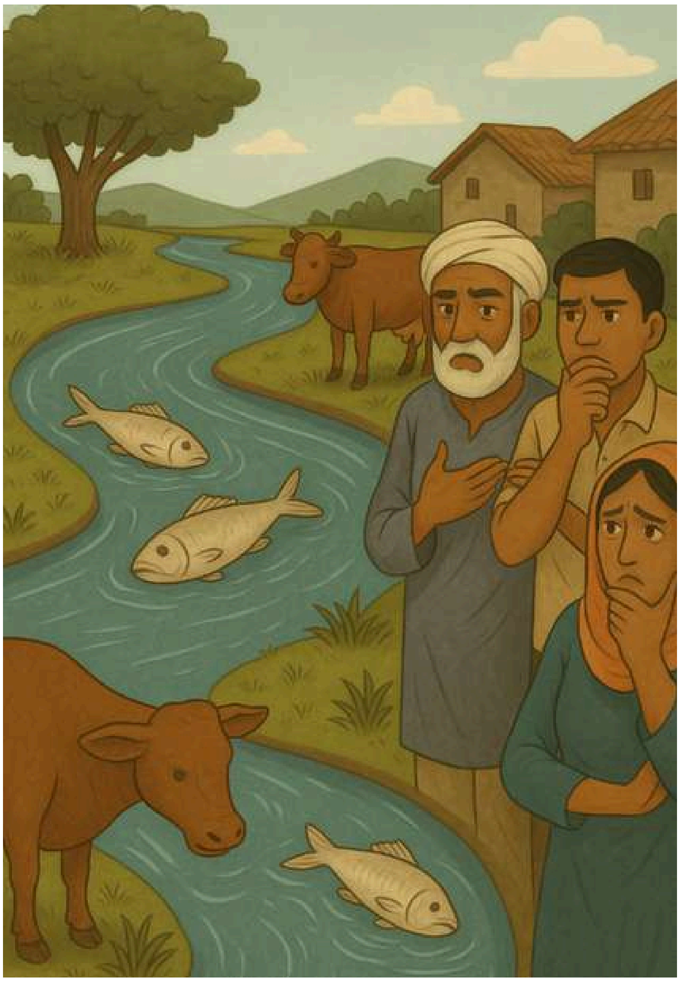
📄 ***Patent Number***: 202431094682.

🏢***Developed by***: Bihar Agricultural University

| By **Dr. Sudha Shankar**

THE RIVER THAT GLOWED BLUE

For many months, villagers worried about their river. It gave them water for crops, animals, and daily life. But strange things began to happen. Fish died suddenly, and cattle refused to drink. Some people whispered that it was a curse. Officials laughed and called it superstition. Still, unease spread through the village.



"One evening, a chemist arrived carrying a small box filled with glass vials, a lamp, and a new chemical sensor. "This tool can show us what the river hides," he said. Curious but nervous, the villagers gathered in the market hall.

The chemist filled a vial with river water. At first, it looked plain and clear. He explained in simple words:

"Cyanide is dangerous, and hard to see. But this molecule can catch it. When cyanide touches it, the rings move inside the molecule, and the anthracene lights suddenly turn on, glowing bright blue. If no cyanide is there, the vial stays dark."

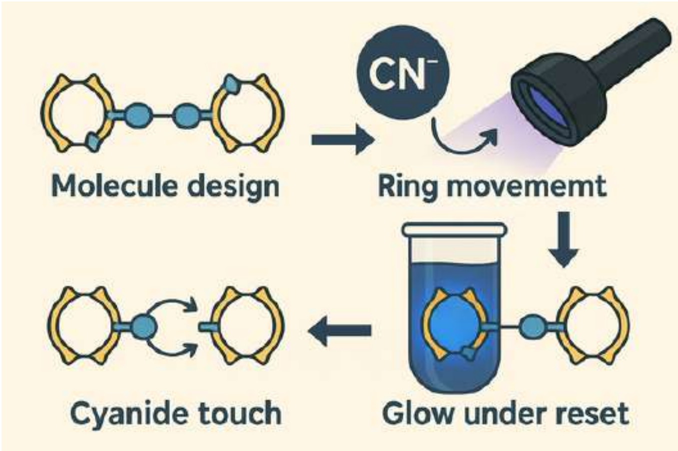
The villagers crowded closer as he placed the vial under a small UV lamp. For a moment, nothing happened. Then, slowly, the vial glowed blue. Gasps filled the hall. Children leaned forward, eyes wide.

"This is not a curse," the chemist said softly. "The river carries cyanide."

He told them about the sensor, called a rotaxane. Normally, its interlocked rings sat quietly, leaving the vial clear. But cyanide forced the rings to move, switching on the light. Even tiny, invisible amounts of cyanide made the glow appear.

The beauty of the invention was not just its sharp signal. It was fast, it worked even in mixed water, and it could be reversed adding a simple acid turned the glow off, ready to be used again.

That night, the village finally felt hope. The glowing vial had given them truth, and truth was the first step toward action.



INNOVATION

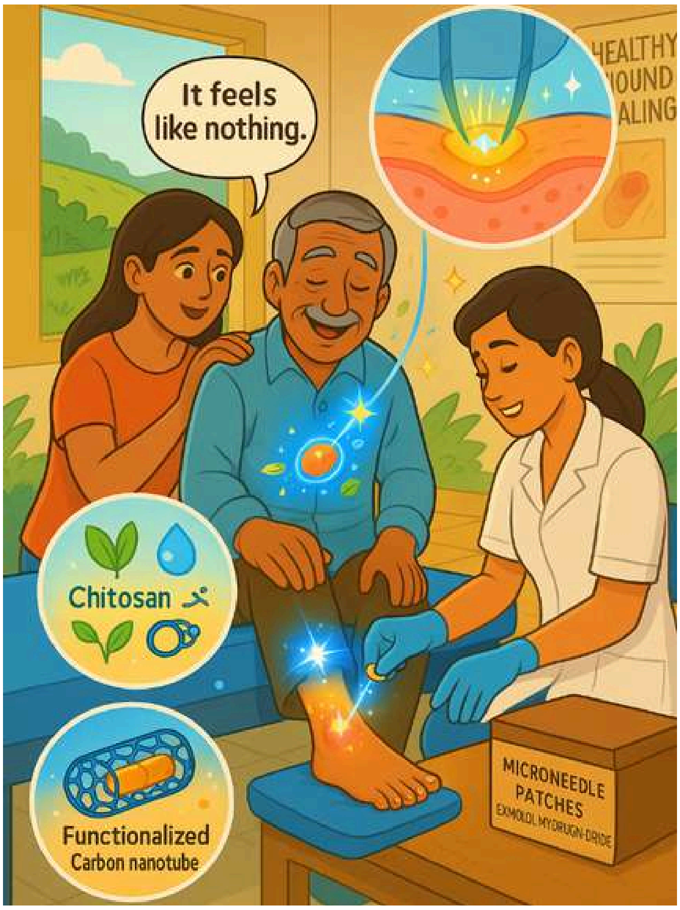
Reference:
Dasgupta, S., & Kumari, A. (2025). Anthracene Stoppered Bistable [3]Rotaxane for Cyanide Anion Detection(2025).

Patent Number: 202531007311
Developed by: National Institute of Technology, Patna

By **Dr. Animesha Rath**

THE VILLAGE CLINIC

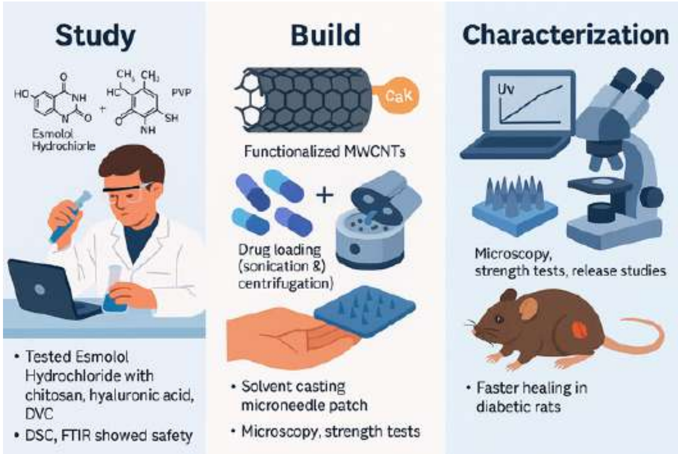
In a quiet rural clinic, Meena brought her father, who had struggled with a stubborn diabetic foot ulcer for months. Ointments and dressings had failed, and expensive biologic creams from the city needed refrigeration something their village



pharmacy could not provide. That morning, the nurse greeted them with a gentle smile and held up something small: a microneedle patch. Unlike bulky dressings, it looked like a thin, flexible square. "This patch has tiny needles that dissolve on the skin," she explained. "It delivers medicine slowly for a full day."

Meena's father looked nervous, expecting pain. But when the nurse pressed the patch onto his wound, he sighed with relief. "It feels like nothing," he whispered. The microneedles, made from biocompatible polymers like chitosan and hyaluronic acid, carried Esmolol Hydrochloride inside functionalized carbon nanotubes. Together, they reduced inflammation, fought infection, and triggered faster healing.

Behind this small patch lay careful science. Researchers first checked Esmolol's compatibility with polymers using DSC and FTIR. Carbon nanotubes were oxidized to hold the drug better, then loaded with Esmolol using sonication. These were mixed with polymers and cast into microneedle molds. Optimization ensured proper strength, drug release, and stability. Tests confirmed controlled release of Esmolol over 24 hours, and in diabetic rats, the patches healed wounds significantly faster than standard treatments.



Over the next few days, Meena noticed the difference. The ulcer shrank, edges closing neatly. Unlike creams needing constant reapplication, the patch stayed in place and worked silently. The nurse explained its advantages: painless, self-applied, stable at room temperature, cost-effective, and once daily.

For Meena, this patch was more than medicine, it was hope. It proved that advanced healing could reach rural families, bringing dignity and relief where it was most needed.

INNOVATION

Reference:

Chakraborty, T., Suma, R., Kalpana Devi, Adithya, B. S., Ghani, M., Manjula, G. S., Panda, R., Akila, E., & Bhagyanath, N. (2025). Design and Development of Esmolol Hydrochloride for Novel Transdermal Delivery in the Treatment of Diabetic Foot Ulcers.

📄 ***Patent Number***: 202541006251
🏥 ***Developed by***: Al-Ameen College of Pharmacy, Bengaluru & Micro Advance Research Centre, Micro Labs Ltd., Bengaluru

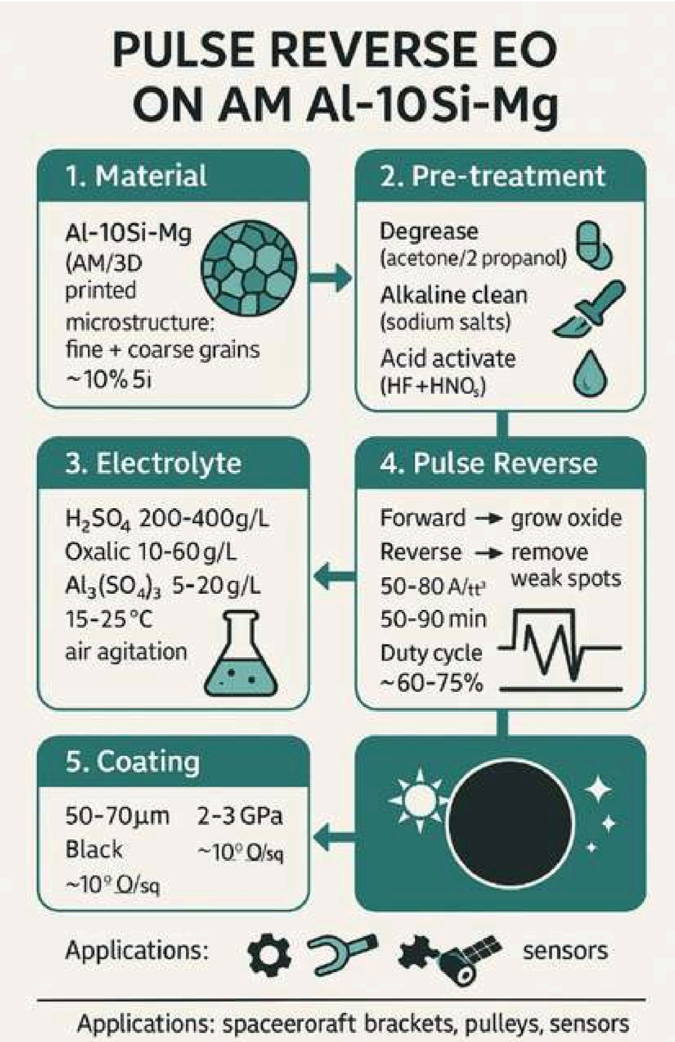
By **Dr. Ipshita Mohanty**

THE BLACK ARMOR

In space, even the smallest part can decide the success of a mission. A pulley on a spacecraft once wore out too quickly, struggling against the harsh environment of orbit. Temperatures swung between freezing cold and burning heat, and there was no air to cushion or cool it. Engineers knew they needed something stronger something that could last.

They turned to a new material: an additive-manufactured alloy called Al-10Si-Mg, built layer by layer using 3D printing. But the real breakthrough came not from the alloy itself, but from how they treated its surface. Instead of the usual anodizing, they used a new method called pulse reverse electrochemical oxidation.

The pulley was carefully cleaned, then placed in a special bath containing sulfuric and oxalic acids. A unique current flowed through it—not steady, but pulsing forward and backward. The forward pulses grew the protective oxide layer, while the short reverse pulses cleared away weak spots. Slowly, a dense and even coating formed across the surface.



When the process ended, the pulley wore a natural black armor. The coating was about 70 micrometers thick, extremely hard (around 3 GPa), and resistant to both heat and wear. It also had special thermal properties: it could absorb sunlight efficiently ($\alpha S \geq 0.90$) and release heat just as well ($\varepsilon IR \geq 0.90$).

Tests pushed it to the limit—humidity, extreme temperature cycles, and even vacuum conditions—but the coating held firm. No cracks, no fading, no loss of performance.

When the pulley returned to space, it kept working smoothly, turn after turn. Protected by its invisible black armor, it resisted abrasion and managed heat with ease. What had once been a weakness became a quiet strength. Science had given the spacecraft a shield—strong, simple, and built to endure.

INNOVATION

Reference:

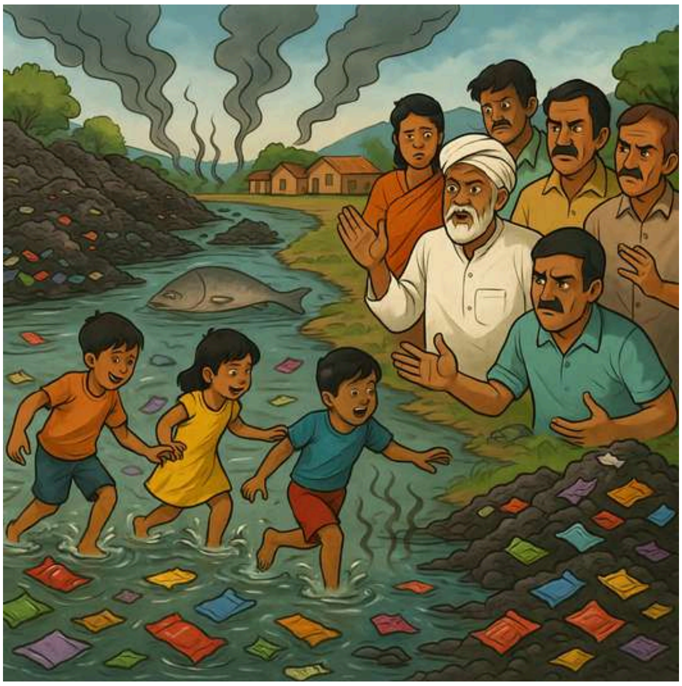
Ghosh, R., Thota, H. K., Sahu, B., Dey, A., Prakash, M., Sridhara, N., & Rajendra, A. (2025). A Novel Process for Achieving Thicker Oxide Coating on Additive Manufactured Al-10Si-Mg Alloy.

📄 ***Patent Number***: 202541008768
🏢***Developed by***: U R Rao Satellite Centre, Indian Space Research Organisation (ISRO), Bengaluru

By **Dr. Priyangana Deb**

THE VILLAGE RIVER

By the riverside, children once played among floating wrappers, chasing them like toys in the current. But over time, the water began to stink. Fish died without warning, cattle refused to drink, and heaps of plastic packets grew taller along the banks. The council debated burning the waste, but elders feared the smoke would poison the air.



Then an engineer arrived with something new: a two-compound ink remover and a small machine. He explained that the biggest barrier to recycling plastic wasn't the plastic itself, but the colorful inks and metallic coatings printed on wrappers. Logos, labels, and glossy finishes had made recycling nearly impossible—until now.

The engineer demonstrated. First, the wrappers were shredded into small pieces. Then, they were washed with a warm mixture of diethylene glycol monobutyl ether and sodium hydroxide, heated to 70–80 °C. The heat softened the plastic, opening tiny pores so the ink could be lifted away. Spinning for ten minutes forced the loosened ink out. A rinse with clean water, followed by drying, left behind spotless plastic. Finally, the pieces were compacted and melted into reusable granules.

The villagers watched in awe as dirty packets turned into clean raw material. The engineer explained that this process achieved up to 98% ink removal, far higher than older methods. Even better, the solution could be reused for several batches, saving cost and water.

No toxic smoke, no expensive chemicals just a cleaner way forward. Soon, the riverbanks cleared, and the same children once again played by waters that sparkled. For the villagers, the invention wasn't just chemistry; it was magic that gave their river back, transforming waste into hope and proving that even small communities could fight back against plastic pollution.

INNOVATION

Reference:

Podaar, P. V. (2025). An ink remover and an ink removal process from waste plastic.

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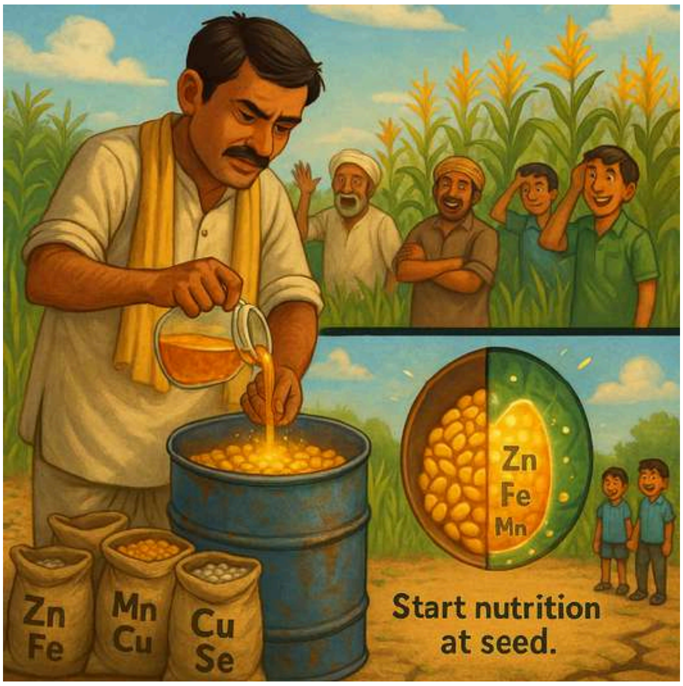
📄 ***Patent Number***: 202421102776
🏢***Developed by***: Shakti Corporation

By **Dr. Dhanashree Mundhe**

HARI'S HARVEST OF HOPE

Monsoon failed again. Cracks opened in the earth, and farmers in Hari's village shook their heads in despair. Everyone knew maize would be weak this season, with poor soil and little rain. But Hari remembered a new technique he had heard about at a nearby workshop—micronutrient seed treatment.

He took a tin drum, poured in micronutrient salts—zinc, iron, manganese, copper, a little selenium—and mixed them with water. To make the powder stick, he dissolved jaggery until it formed a thick, sweet solution. Seeds rolled in the drum, coated with the mixture, each kernel carrying a tiny layer of strength. Neighbors watched and laughed: "What difference will that powder make without rain?"

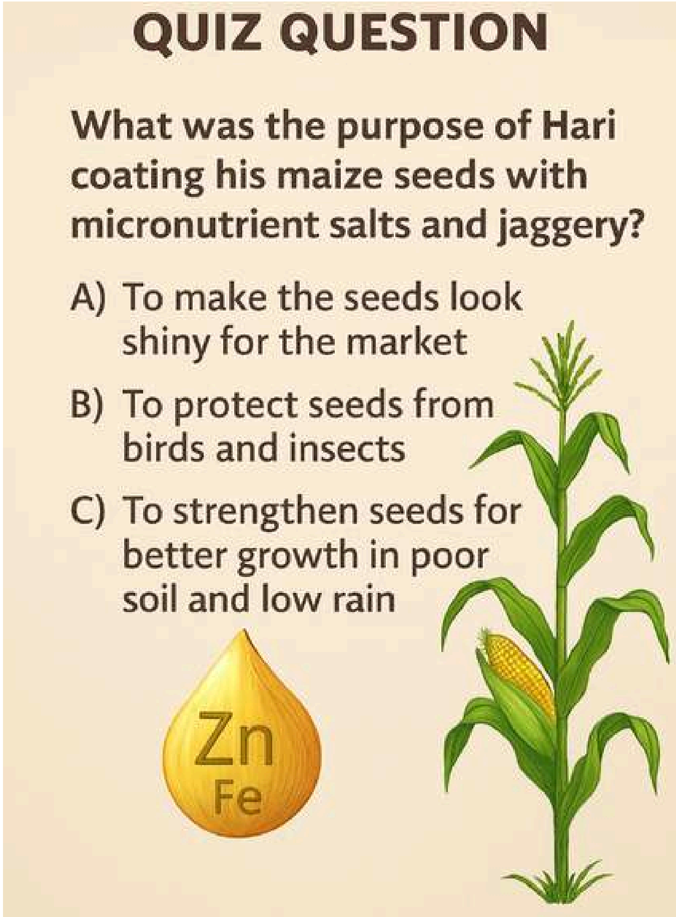


Emergence was quick. Shoots pushed through the dry soil faster than anyone expected. As weeks passed, Hari's maize stood taller and greener. Stalks looked sturdier, tassels fuller, and leaves stayed fresh when other fields wilted. The micronutrient coating had done its work—helping roots absorb more, protecting plants from hidden hunger, and fortifying every cob.

At harvest, buyers in the market were surprised. Hari's maize had plump, golden kernels, heavier than usual. Demand was high, and the price was better. With the earnings, Hari bought his children school shoes—a small but powerful symbol of change.

That night, he wrote in his notebook: *"Start nutrition at seed. Hope sticks better."* The kit was cheap, the method simple, and the results clear. Unlike expensive fertilizers or risky sprays, this approach was cleaner, kinder to the soil, and easy for any farmer to adopt.

For Hari, the harvest was more than grain—it was proof that even in failed monsoons, science could bring resilience. Seeds, once weak, now carried strength, and so did his family.



INNOVATION

Reference:

Gudadhe, N. N., Patel, D. P., Usadadiya, V. P., Virdia, H. M., Singh, N., Patel, V. P., & Parmar, P. N. (2025). *A nutrient composition for bio-fortification of maize crop* .

📄 ***Patent Number***: 202421101029
🏭***Developed by***: Navsari Agricultural University

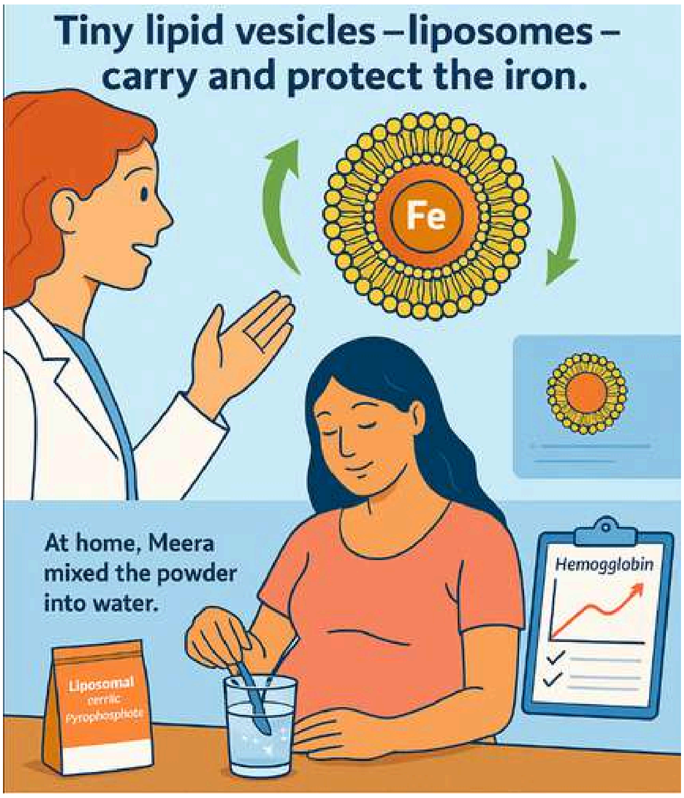
By **Dr. Preeti Sharma**

THE MOTHER'S HOPE

In her second trimester, Meera dreaded the iron tablets more than the morning nausea. Ferrous sulfate left her doubled over acidic burps, constipation, a heaviness that stole sleep. "There's another option," her doctor said, sliding a small sachet across the desk. "Liposomal ferric pyrophosphate. Gentle, but effective."

Meera blinked. "Lipo… what?"

Tiny lipid vesicles liposomes carry and protect the iron," the doctor explained. "They shield it from stomach acid and dietary blockers, then release it for absorption in the intestine. Fewer gut problems, better uptake."

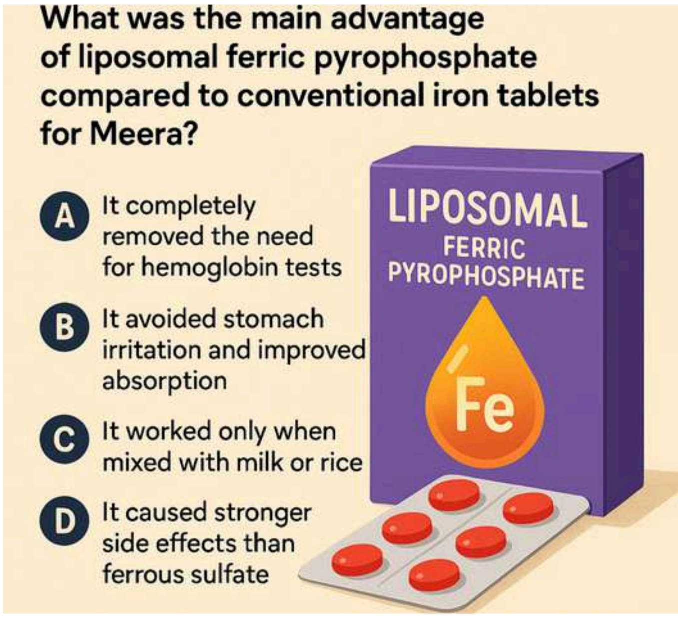


At home, Meera mixed the powder into water. No metallic taste, no burning. Over the next weeks, the fog lifted. Her steps felt lighter; the afternoon slump faded. A lab report confirmed what she felt: hemoglobin rising, steadily. She learned the science as she healed. The formulation traps iron with **over 85% encapsulation efficiency**, keeping it protected and available. Its particles—**500–2000 nm**—stay dispersed thanks to a strong surface charge (**zeta potential beyond ±30 mV**), which prevents clumping and keeps quality stable on the shelf.

Behind the scenes, a streamlined process simple precipitation, gentle pH tuning, high-speed liposome emulsification, and spray drying avoids harsh solvents and costly ultracentrifuges. Built for clinics and crowded pharmacies alike.

Researchers had tested it hard: uniform, rounded particles under the microscope; **~89% EE** maintained even after months at 40°C; stability holding firm after brief high heat. Most important to Meera, the outcomes showed faster iron availability with fewer side effects. No more bracing for cramps. No more choosing between nutrition and comfort.

By her third visit, Meera wasn't just a patient she was proof of possibility. Liposomal iron wasn't rice or milk fortified for the lucky few; it was a standalone, pharmaceutical-grade answer for mothers, children, and elders, including those who couldn't tolerate fortified foods. Scalable, stable, affordable ready for clinics from Navsari to Nairobi. On the bus home, Meera rested a hand on her belly. The invention was more than chemistry. It was a promise: strength for her, safety for her child, and a future where iron therapy worked quietly, kindly, and well.



INNOVATION

Reference:

Agarwal, S. K., Mukhopadhyay, M., Sarbajna, S., Sehanobish, A., Kundu, S., & Giri, R. (2025). Liposomal iron: A novel approach for improved iron supplementation with enhanced stability and manufacturing thereof .

📄 ***Patent Number***: 202531003321
🏭***Developed by***: West Bengal Chemical Industries Ltd.

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.

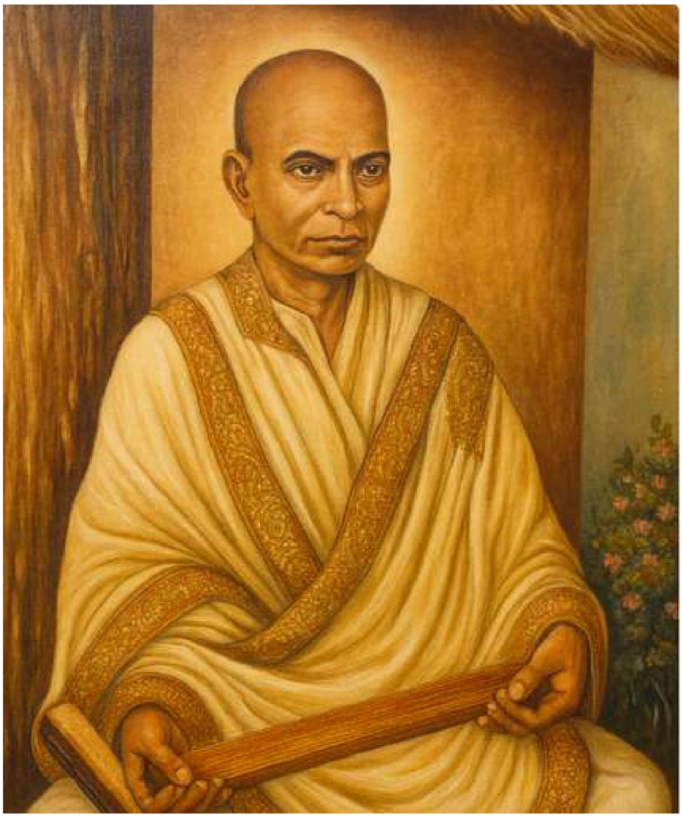
September 5: Teacher's Day

01

Every year on September 5, India celebrates Teacher's Day to honor Dr. Sarvepalli Radhakrishnan (1888–1975), a philosopher, teacher, and statesman whose life was devoted to education and knowledge. He believed that learning was not just about facts but about shaping values, curiosity, and compassion. As Vice-Chancellor of leading universities and the first Chairman of the University Grants Commission, he transformed higher education in India. Later, as the second President of India, he carried India's intellectual voice to the world. His vision united Eastern wisdom with Western thought, inspiring generations to uphold integrity, intellect, and humanity in education.

September 26: Honoring Pathani Samanta

02



On September 26, India remembers Mahamahopadhyaya Chandrasekhar Singha Harichandan Mohapatra Samanta, popularly known as Pathani Samanta (1835–1904), a legendary astronomer from Odisha. Without modern instruments, he observed the sky using devices he built from bamboo and wood, yet his calculations of planetary motions, eclipses, and celestial events were astonishingly precise. His masterpiece, Siddhanta Darpana, written in Sanskrit, documented these findings and is still admired for its scientific accuracy. Pathani Samanta's life shows how dedication and observation can unlock the universe's secrets. His legacy inspires young minds to look up at the sky with curiosity and wonder.

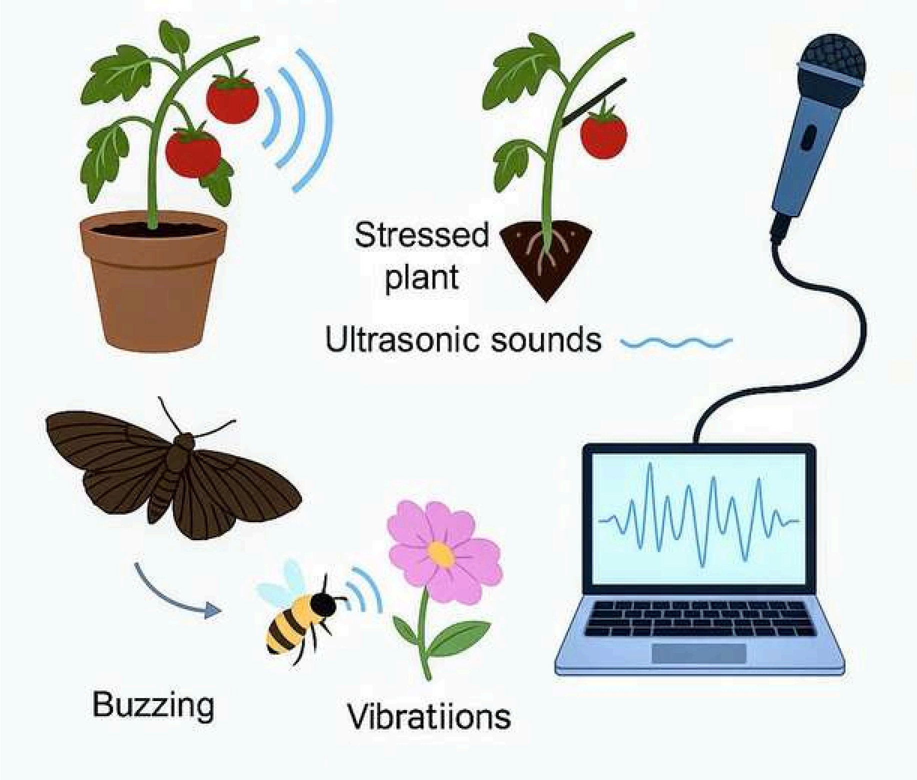
Things YET TO BE DISCOVERED

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. Manas Ranjan Prusty**

"The Secret Voices of Plants"

How leaves and stems whisper stress in sounds we cannot hear



For centuries, people believed plants were silent. We could see them grow, change color, or release scents, but we never imagined they might also speak. Now, a new science called plant bioacoustics is showing that plants do make sounds just not in a way humans can hear.

When plants are under stress such as when they are thirsty or cut they emit tiny ultrasonic clicks. These clicks are too high-pitched for our ears, but special microphones can detect them from several meters away. In experiments, tomato and tobacco plants produced dozens of clicks every hour when stressed, while healthy plants were almost quiet. Each type of stress creates a unique sound pattern, suggesting that plants "say" different things depending on their condition.

Even more fascinating is that other organisms respond to these sounds. Studies show that moths avoid laying eggs on dry tomato plants because they can detect the clicks. Flowers also react to sound: some produce sweeter nectar when exposed to buzzing vibrations, like the hum of a bee. This hints at a hidden sound-based communication system connecting plants, insects, and the wider environment.

Researchers are now asking how common this ability is. Early work suggests many plants including corn, grapevine, wheat, and cactus emit sounds when stressed. But we don't yet know whether nearby plants "listen" and react. The exact mechanism behind the sounds is also unclear, though many scientists suspect it comes from tiny air bubbles forming and bursting in the plant's water channels.

The possibilities for farming are exciting. If we learn to "listen" to crops, farmers could detect water stress early, use irrigation more efficiently, and even spot signs of disease. Imagine a greenhouse where plants signal directly when they need help.

Plant bioacoustics is still young, but one thing is certain: the green world around us is not silent. Plants may not sing like birds or whales, yet they constantly send out signals in clicks and vibrations. As we tune in, we may discover nature has been speaking all along. We just needed to learn how to listen.

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SHOWCASE: SCIENTIFIC RESEARCH

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.

JOIN RFCSR ADVISORS

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

ARE YOU A RESEARCHER ?

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

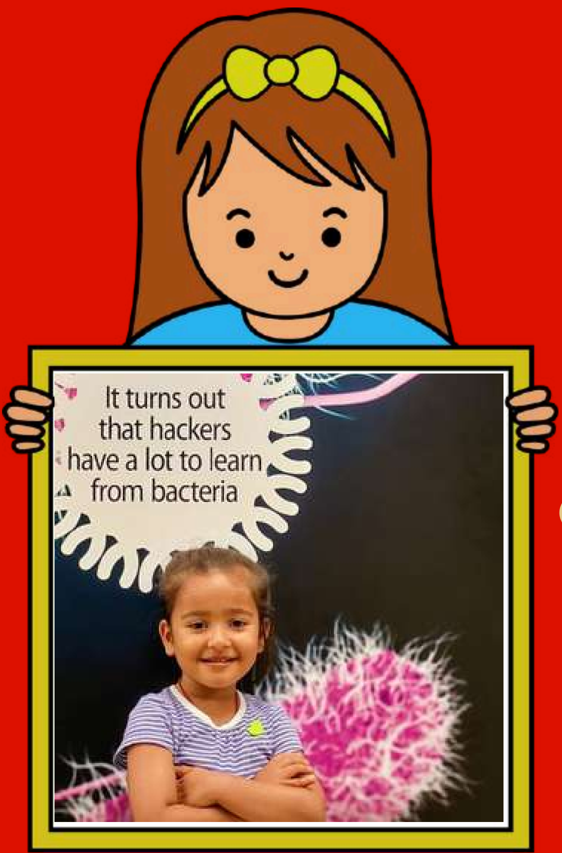
back to school

NAME: **Ayukta Das**

Age: **5 Yr.**

FOCUS:
A day at the beach is full of science!

The bright sun gives us light and energy, driving photosynthesis in plants and powering the water cycle that forms waves in the sea. The rainbow umbrella shows how sunlight contains many colors, just like a prism splitting light into a spectrum. The boat floats because of buoyancy, while fish remind us of the importance of marine biodiversity. Sand is formed from rocks and shells weathered over time, and water-rich fruits like watermelon help us stay hydrated. Even melting ice cream is science showing how heat changes solids into liquids!



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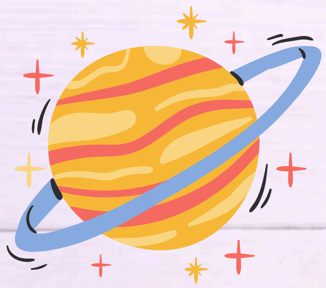
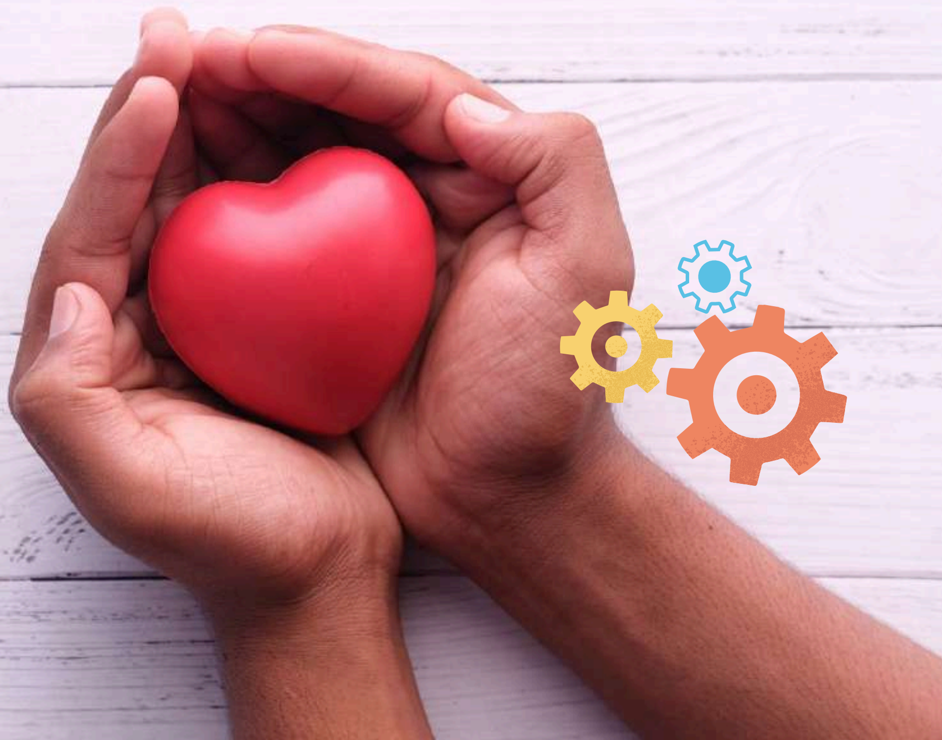
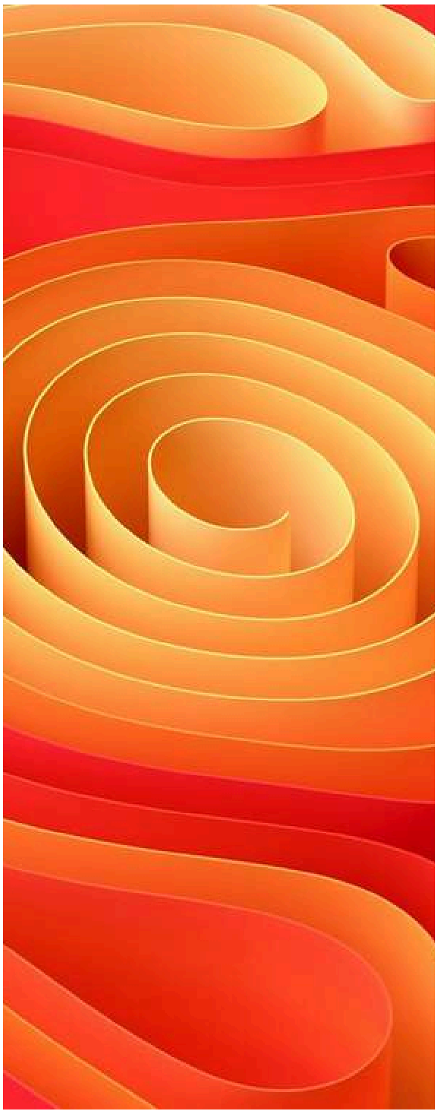
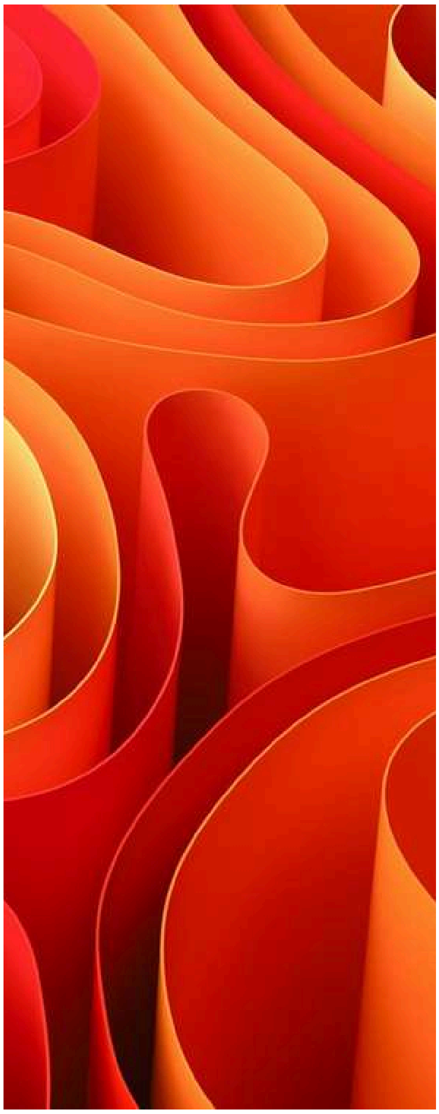
DONATION

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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