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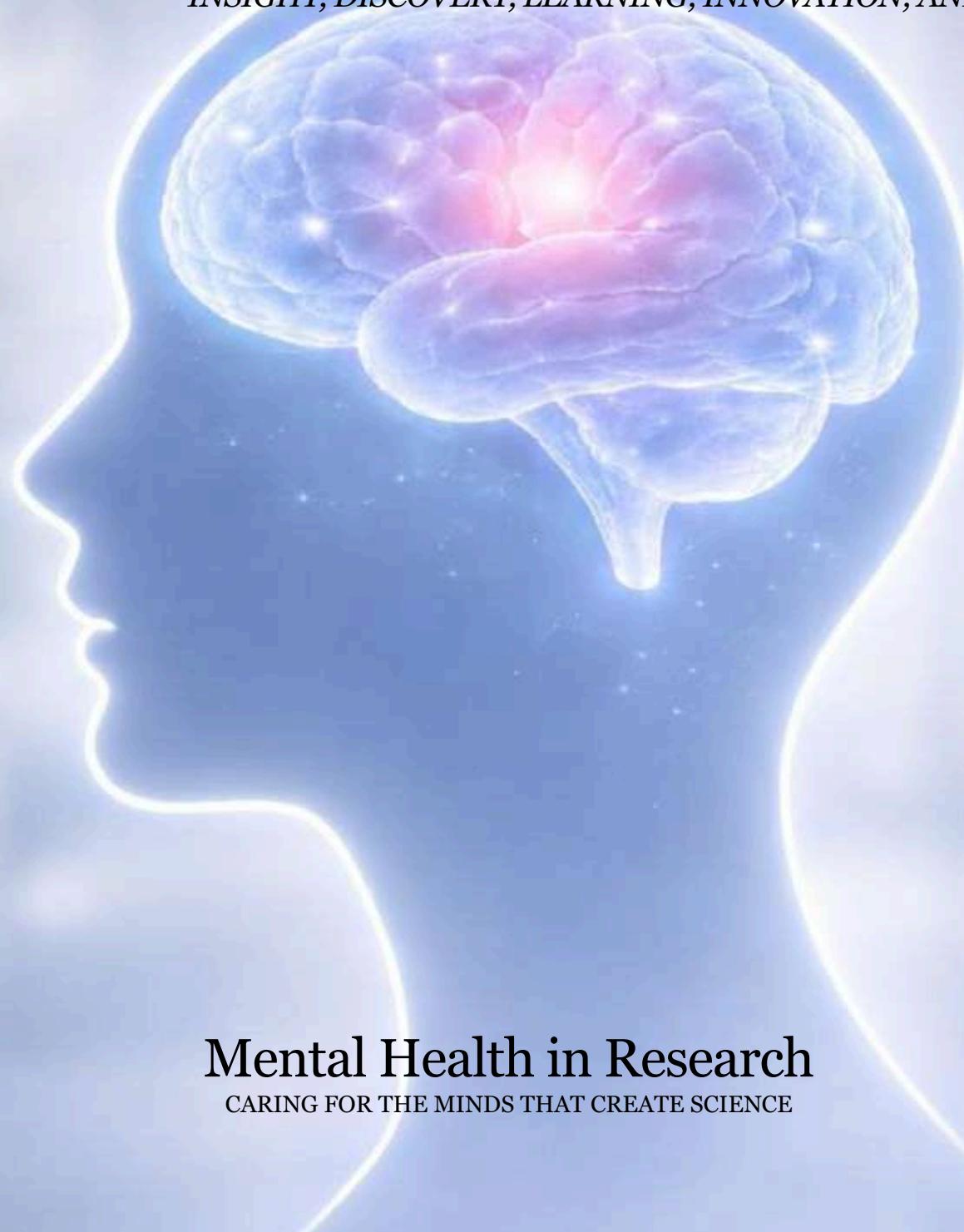
Mental Health in Research
CARING FOR THE MINDS THAT CREATE SCIENCE
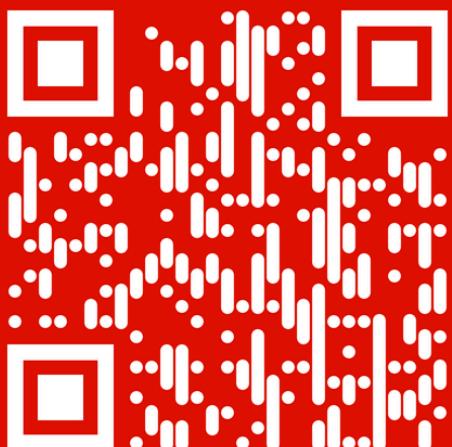
Scientific Research Empowers Social Progress !

Rosalind Franklin Council of Scientific Research (RFCSR)

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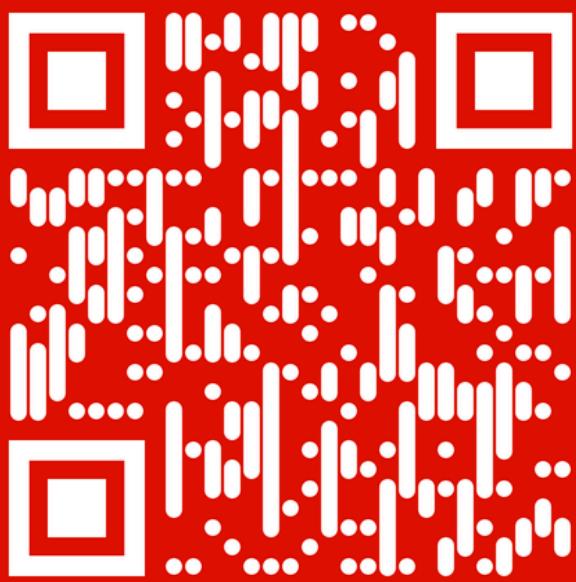
Prof. Eliora Z. Ron

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

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

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LETTER from the EDITOR

🔗 Dr. Animesha Rath
The Editor-in-Chief

Dear Readers,

This issue of Science Factors turns its focus inward toward the minds that create science. In a world driven by discovery, innovation, and competition, we often celebrate results while quietly overlooking the emotional journeys behind them. Mental Health in Research is our attempt to bring those hidden stories into the light.

Across laboratories, classrooms, hospitals, and field stations, researchers carry not only data and deadlines but also doubts, pressures, hopes, and resilience. This issue explores how mental health is shaped by inequality, childhood experiences, body image, violence, aging, and the environments we live and work in. Through carefully crafted science stories, expert opinions, and real-world research, we show that mental health is not a weakness; it is a foundation.

You will meet young minds navigating comparison and self-worth, families shaped by silent stress, adolescents struggling under expectations, and elders aging with dignity. You will also hear from experts who remind us that science progresses best when curiosity is protected, compassion is practiced, and failure is treated as part of learning.

At Science Factors, we believe that caring for mental health is not separate from scientific excellence it is essential to it. A healthy mind asks better questions, builds stronger collaborations, and sustains creativity over time. When we nurture mental well-being, we protect not only individuals, but the future of science itself.

As you turn these pages, we invite you to pause not just to read, but to reflect. On your own journey. On the journeys of others. And on how science, when guided by empathy, can heal as much as it discovers.

May this issue remind you that behind every experiment is a human story, and every human story deserves understanding.

Happy reading,

R.Animesha

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The CONTRIBUTORS

Editor-in-Chief

Dr. Animesha Rath

Managing Editor

Dr. Ipsita Mohanty

Dr. Preeti Sharma

Content Director

Dr. Avijit Das

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Fuel discovery, inspire the future.

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 ICE CREAM CHOICE THAT FOOLED AARAV'S BRAIN

Aarav loved ice cream. It was his small happiness after long school days. Chocolate was his favorite deep brown, rich, and familiar. Sometimes, just to feel adventurous, he chose vanilla or strawberry, but chocolate always felt like home.

One afternoon, after school, Aarav and his friends walked to the ice cream shop near the playground. The bell above the door rang as they entered. Cold air rushed out to meet the warm evening. The menu board was long and colorful: chocolate, vanilla, strawberry, mango, coffee, pistachio.

Aarav barely looked for long.

"Chocolate," he said, smiling.

It tasted exactly as he expected sweet, smooth, comforting. He walked home happy, licking the last drops before they melted.

The next day, Aarav passed the same shop again. He had time, and the sun was still high.

"Today I'll choose carefully," he told himself.

"I won't rush. I'll judge fresh."

He stood in front of the menu. Vanilla. Strawberry. Mango. Coffee.

But something felt strange.

Vanilla suddenly seemed plain and boring. Strawberry looked less exciting than usual. Mango felt interesting—but chocolate pulled at him strongly. It felt extra tempting, even before tasting anything.

Aarav frowned.

"Why does everything feel compared to yesterday?" he thought.

"I haven't even tasted anything yet."
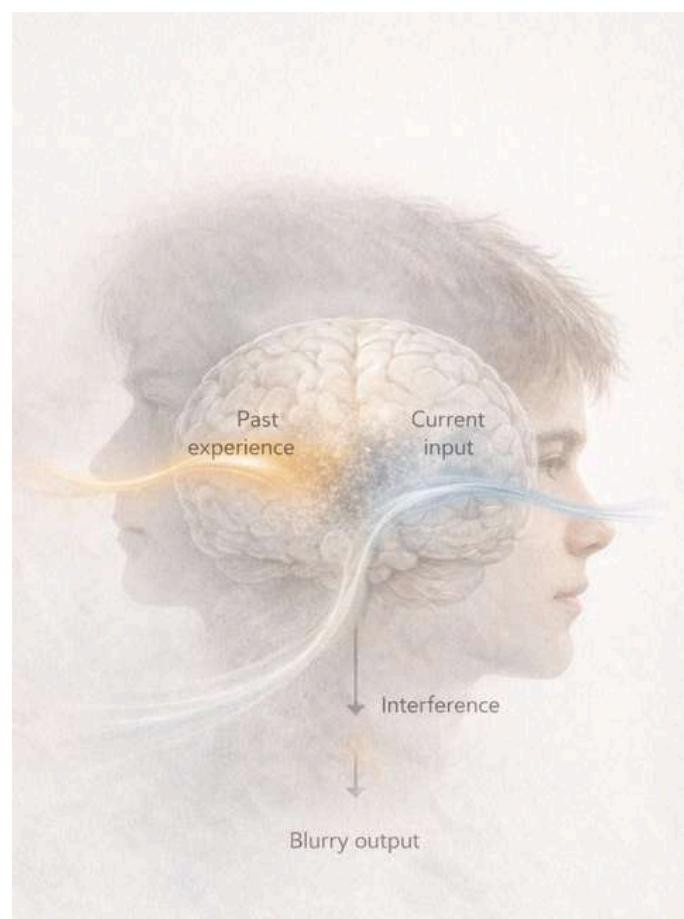
🔗 | By **Dr. Sivan Friedman**

That's when his teacher's words came back to him from science class:

 "The brain remembers more than we notice."

Aarav had not paid much attention then. But now, standing in front of melting ice cream tubs, the sentence made sense.

Scientists have found that the brain quietly uses the recent past when making decisions. This habit is called serial dependence. It means what you experienced yesterday stays in your mind and gently pulls today's decision toward it.

For a long time, scientists believed this was helpful. They thought the brain was being smart and saving energy. If things don't change much from day to day, using the past should make decisions faster and easier. Why start from zero every time?

But when scientists studied hundreds of thousands of real decisions from many people and many experiments they found something surprising. People did not make better choices. They made biased ones.

Aarav's brain was not helping him choose the best ice cream. It was dragging yesterday into today, even when today deserved a fresh start. Aarav imagined writing homework on a page that had already been used. You erase the old writing, but faint marks remain. When you write something new, the old words mix with the new ones. Reading becomes harder. The same thing was happening in his brain. Yesterday's chocolate taste had not disappeared. It stayed quietly in his mind and interfered with how he judged today's flavors. Instead of tasting each option clearly, his brain compared everything to chocolate.

Strangely, the problem was not always the same. When the new flavor was very different like mango the confusion was smaller. His brain could tell it was something new. But when flavors were similar, like vanilla and strawberry, his brain struggled. The past and present blended together, making the choice unclear.

This showed something important.

Memory does not always help thinking. Sometimes, it gets in the way.

Aarav laughed softly. "So my brain is tricking me," he said. He ordered mango.

The first bite was bright, fresh, and surprising. Nothing like chocolate. Nothing like yesterday. It tasted clear, almost clean.

As Aarav walked home, he felt thoughtful. His brain was smart but not perfect. It loved patterns and habits, even when they were not useful.

From that day on, Aarav learned to pause before making decisions. Whether it was choosing food, answering a question, or judging something new, he stopped for a moment and asked himself:

"Is this really my choice or is my brain still tasting yesterday?"

Quiz

A Moment to Think

You chose chocolate ice cream yesterday. Today, while choosing again, chocolate still feels more tempting—even before tasting anything.

What is the most accurate explanation based on recent brain research?

A. Your brain is helping you by making the choice easier

B. Your brain is using memory to improve accuracy

C. Your brain is letting yesterday's experience interfere with today's judgment

D. Your taste buds have permanently changed

REFERENCE:
Ozkirli, A., Chetverikov, A. & Pascucci, D. Large-scale mega-analysis indicates that serial dependence deteriorates perceptual decision-making. Nature Human Behaviour (2025). https://doi.org/10.1038/s41562-025-02362-8

Laboratory of Psychophysics, Brain Mind Institute, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland.

| By **Dr. Avijit Das**

HOW INEQUALITY SHAPES THE GROWING BRAIN

FEATURED

Madhu was ten years old and loved drawing. She could spend hours filling her notebook with pictures of houses, trees, and people. Some houses were big with gardens, and some were small with broken fences. She never thought much about why she drew them that way. It just felt natural.

Madhu lived in a busy city where tall buildings stood next to old, crowded streets. On her way to school, she saw children who came in shiny cars and others who walked long distances. She noticed that some friends had many books and toys, while others shared one pencil between siblings.

One day in school, Madhu's teacher, Mrs. Rao, showed the class a map of different states. She explained that some places had big differences between rich and poor people.

"This is called income inequality," Mrs. Rao said.

Madhu listened carefully. She had never heard the term before.

Later that day, Madhu went home and told her mother about it. Her mother nodded and said, "When differences are very large, it can affect how people feel, think, and even grow."

Madhu wondered quietly, "Can it affect children like me?"

A few weeks later, a group of scientists visited the school. They were studying how children grow and learn. They explained that they were part of a big project that followed thousands of children across many states to understand how their brains and feelings change over time.

One scientist explained gently, "We found that children who grow up in places with big gaps between rich and poor often face more stress. Even if their own family is doing okay, the environment around them can still affect them."

Madhu thought about her city. She remembered feeling nervous sometimes, even when nothing bad had happened. She remembered comparing her clothes, her home, and her school supplies with others.

The scientists told them that they used special brain pictures called scans. These scans showed how the brain grows. They focused on the outer part of the brain, which helps with thinking, emotions, attention, and decision-making.

"What did you find?" Madhu asked.

The scientist replied, "We saw that children living in places with high inequality often had small changes in brain growth and in how different brain parts worked together."

Madhu did not fully understand the science, but she understood the feeling. It was like when too many voices spoke at once and it became hard to think clearly.

The scientists also followed the children over time. They noticed that children from high-inequality places showed more worry, sadness, or behavior problems as they grew older. The brain changes seemed to be part of the reason. That night, Madhu lay in bed thinking. She realized that stress was not always loud. Sometimes it was quiet—hiding in comparisons and worries.

| By **Dr. Avijit Das**

Madhu's home did not change, yet her feelings, worries, and sense of safety sometimes did,

After reading the story and learning what the scientists discovered, what do you think quietly shapes how children grow and feel every day?
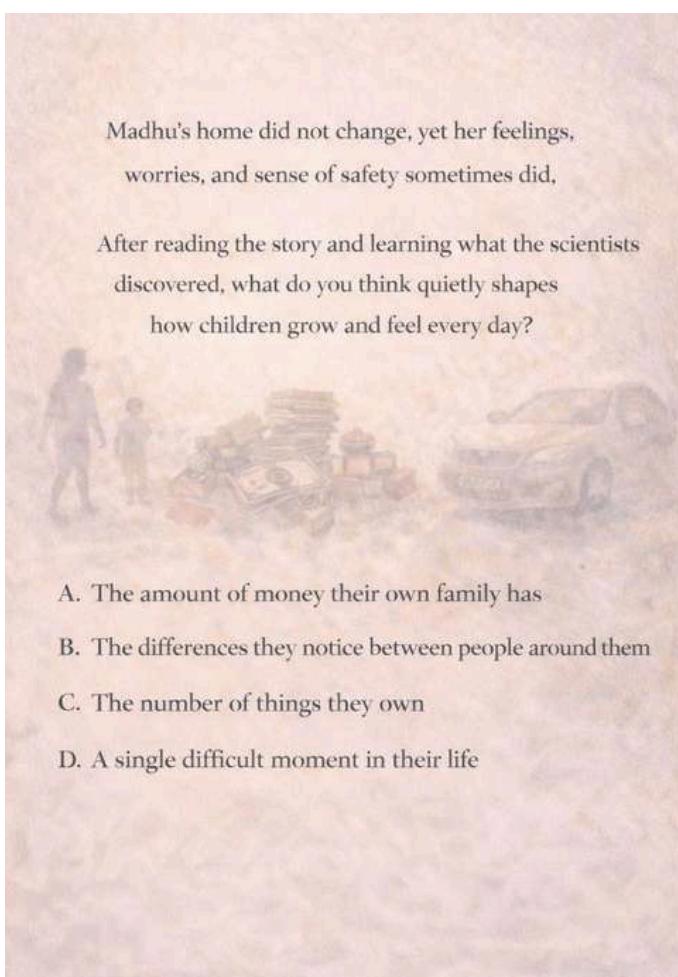
A. The amount of money their own family has

B. The differences they notice between people around them

C. The number of things they own

D. A single difficult moment in their life

The next day, Madhu drew a new picture. This time, she drew children holding hands across different houses, with trees and open spaces between them. When Mrs. Rao saw it, she asked what it meant.

Madhu said, "I think if places are fairer and kinder, children's minds can grow better."

Mrs. Rao smiled. "That is exactly what science is telling us."

Madhu learned something important. Income inequality is not just about money. It shapes how children feel, think, and grow. It can shape the brain itself.

From that day on, Madhu paid more attention not just to her drawings, but to people around her. She understood that building a fair society was not only about helping today, but also about protecting the minds of tomorrow.

And every time she drew, she remembered that a healthy brain needs more than food and school it needs safety, fairness, and hope.

REFERENCE

Rakesh, D., Tsomokos, D. I., Vargas, T. et al. Macroeconomic income inequality, brain structure and function, and mental health. Nature Mental Health 3, 1318–1330 (2025). https://doi.org/10.1038/s44220-025-00508-1

Department of Neuroimaging, Institute of Psychology, Psychiatry and Neuroscience, King's College London, London, UK

🔗 | By **Dr. Jnana Ranjan Prusty**

MORE THAN WHAT WE SEE IN THE MIRROR

FEATURED

Akhansya was sixteen years old and spent a lot of time in front of the mirror. Every morning before school, she checked her face, her waist, and her clothes. Some days she felt fine. On other days, she felt something was wrong, even if she could not explain what.

At school, Akhansya noticed how often friends talked about their bodies. Someone complained about weight. Someone else wished they were thinner. Pictures on phones showed perfect faces and perfect shapes. Slowly, Akhansya started comparing herself to others. She began to feel unhappy with her body, even though nothing about her had changed.

Her mother noticed that Akhansya had become quieter. She skipped snacks sometimes and worried more about how she looked than how she felt. When her mother asked, Akhansya said, "Everyone feels this way. It's normal." But inside, she often felt confused, tired, and unsure of herself.
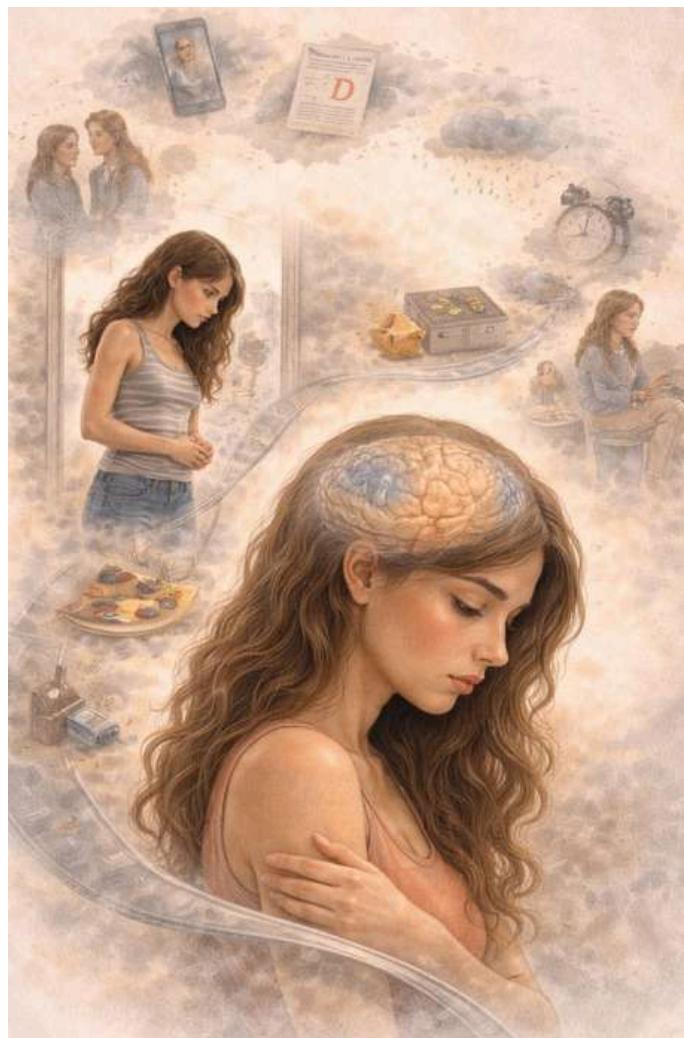
What Akhansya did not know was that many scientists were studying exactly this feeling. They wanted to understand what happens when teenagers feel unhappy with their bodies. They followed thousands of young people for many years to see how these feelings affected their lives and emotional health.

When Akhansya was sixteen, she often thought, "If I looked better, I would feel better." But the years passed, and those thoughts did not disappear. When she was twenty-one, Akhansya was in college. She felt stressed easily and worried a lot. Sometimes she felt sad for no clear reason. Food became something she controlled instead of enjoyed.

Scientists found that teenagers who felt unhappy with their bodies at sixteen were more likely to struggle later with sadness, low mood, or unhealthy eating habits. These problems did not appear suddenly. They grew slowly over time, often unnoticed at first.

| By **Dr. Jnana Ranjan Prusty**

Some people thought these problems were only due to family or genetics. To understand this better, scientists studied twins. Even when twins shared the same genes, the one who felt more unhappy about their body was more likely to face mental health problems later. This showed that body dissatisfaction was not just a passing feeling.

Genes did play a role, but they were not the full story. Life experiences, social pressure, and constant comparison also shaped how young people felt. Akhansya remembered how it started for her. It was not one comment or one photo. It was many small moments that slowly changed how she saw herself and her value.

When Akhansya was twenty-six, she began to understand something important. Her body was never the real problem. The problem was the pressure to look a certain way and the belief that her worth depended on it. This realization helped her feel lighter and more hopeful.

Scientists found that girls often feel this pressure more strongly, especially about weight and shape. But boys feel it too, in different ways. Body dissatisfaction affects many young people, even if they do not talk about it openly or ask for help.

The research showed a clear message. If we can reduce body dissatisfaction in teenagers, we can help protect their mental health later in life. Schools, families, and society all play a role. Kind words, healthy messages, and realistic images can make a real difference.

Akhansya slowly learned to be kinder to herself. She stopped judging her body every day and focused more on how she felt than how she looked. It was not easy, and some days were still hard, but she kept trying.

Her story was not just her own. It was the story of many young people learning that they are more than what they see in the mirror and that their minds deserve care, patience, and understanding.

Pause & Reflect

Akhansya's body did not change much between the ages of 16 and 21, yet her thoughts, stress, and habits slowly did.

According to the story and the science behind it, what caused the biggest change in her well-being?

A. Her body becoming less healthy over time

B. Genetic factors that she could not control

C. Years of small comparisons and pressure shaping how she saw herself

D. A sudden emotional event during college

REFERENCE

Costantini, I., et al. Longitudinal associations between adolescent body dissatisfaction, eating disorder and depressive symptoms, and BMI: a UK twin cohort study. The Lancet Psychiatry 13(1), 37–46 (2025).

Division of Psychiatry, University College London, London, UK

RESEARCH: IS THIS FOR ME?

Prof. Meera Purushottam

|Senior Consultant (Molecular Genetics) | Department of Psychiatry, National Institute of Mental Health and Neuro Sciences (NIMHANS), Bengaluru, India

🔗 | Scientific Profile | 🌐 | Organization Link |

Areas of Expertise: Neuropsychiatric Genetics | Epigenetics & Mental Health | Genetic Testing | Rare Variant Genomics

It is very important to retain the perspective of a curious child. Some of us are luckier than others, perhaps with regards to the environment in which we grew and learnt. But everyone is born with an enquiring mind. Feeding that curiosity and asking the next question is a habit one should develop or better still, never lose. Unfortunately, in India, the vast majority of students in the research field get there out of negative selection. They did not make it into medicine or engineering, hence a post-graduation degree and then even a PhD path is chosen; research was the not obvious first choice. Choosing research as an immediate source of obtaining an income is fraught with danger. Firstly, because the scholarship disbursal systems are often inefficient and secondly, salary scales are much lower. But if you have chosen this path, give it some thought. Is there a field you are comfortable with? Any particular problem you wish to solve? How will you go about it? Do you have a hypothesis? How will you test the hypothesis? What experiments will you conduct to collect the data that will prove or disprove your hypothesis? Plan your experiments carefully, with appropriate checks and balances. Often while guiding students, it has been my observation that students with brilliant academic pasts are the ones that find research most difficult. If an experiment yields a result different from what was expected, they are very quick to doubt themselves. They must have erred, hence this result. Or they are so taken aback

> *Research begins when we protect the curiosity of a child, question without fear, and learn to treat every unexpected result not as failure, but as discovery*

with the unexpected, that they take a long while to recover. Unbiased trouble shooting is the hallmark of a good researcher.

Fields and research areas differ in pace of research and progress. Hence it is very unfair to judge all research progress with the same lens. It only creates stress of the wrong kind. Be receptive to constructive criticism without descending into a valley of depression and anxiety because someone pointed out a flaw in your experiment. Speaking about your work and discussing your results with others beyond your working group is the best way to improve your understanding of your data and results.

With new methods of acquiring information and advanced storage devices, our pace of discovery should change. We should be able to solve problems in double quick time! There is a ton of data out there. Gone are the days when the only information you had, was the readings you noted down from your titration experiment, or the sequence data you got from your cloning experiment. The quantum of effort needed to justify a PhD thesis in 1990, can be completed in a few days today and with very little hands-on effort. But has biology changed? No, life's processes have not changed. What has changed is our ability to measure and record change in much smaller bite sizes of time and space, accurately. Processes are more affordable and more data can be collected reliably and reproducibly. Today you can

Prof. Meera Purushottam with her lab group members.

decide to be a doer and generate data, or you can decide to work on data generated by others which can sourced following due process. With the evolving world of AI one can be very easily fooled into thinking that data generation is a thing of the past! Remember someone still has to generate the data. That's where a country like India can have a big advantage.

Talk of a rare disease. By some definitions, it is something that concerns about 5 / 10,000 people which means it affects several lakh individuals in India. So, work on the biology, come up with a drug, there will be many who will benefit. Want to study human behavior? There is no shortage of participants of any kind. So, there is tremendous opportunity here to solve real world problems. Pick one carefully and give it your all. There is nothing that we as a country cannot achieve!

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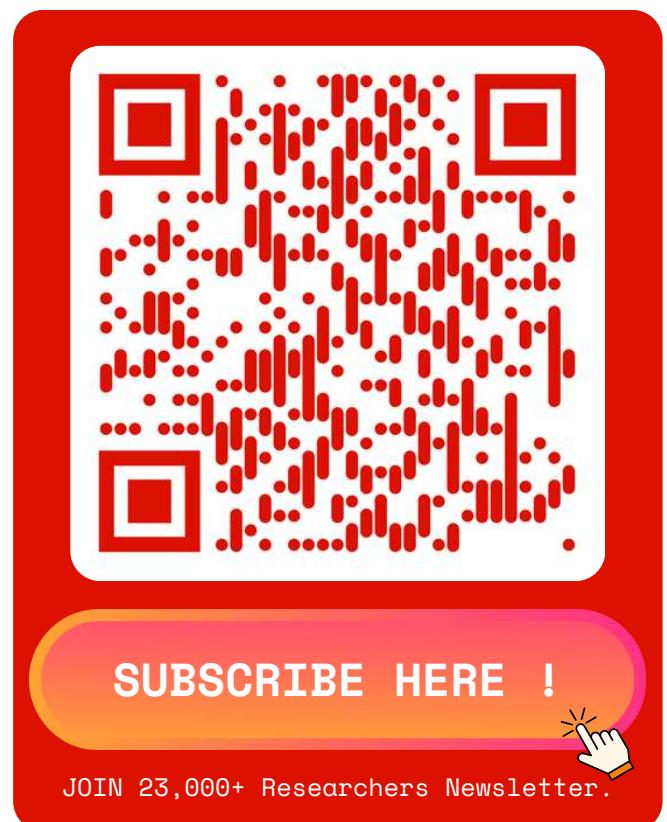
MENTAL HEALTH BEYOND MEDICATION: THE IMPORTANCE OF HOLISTIC AND COMMUNITY-BASED CARE

Dr. Dhruva Ithal

|Senior Consultant Psychiatrist | Sthira-Space for Mental Health

🔗 | Scientific Profile | 🌐 | Organization Link |

Areas of Expertise: Mental Health Advocacy | Awareness & Education | Community Outreach | Health & Well-Being Support

Mental health - an intimate topic of fascination, intrigue and stigma at the same time to many. In the era where we understand the laws of the universe better, connect to people on the other end of the globe within seconds- mind and mental health still pose a challenge in terms of understanding and following better practises for its upkeep. Fast paced life, distance from nature, evolution of the virtual world, never ending competition and ever changing technology at the pace unknown before, makes mental health- an elusive concept, almost as if human kind is being taxed for evolution of our intelligence and pre-frontal cortex.

We have come a long way in the treatment modalities in mental health, from being chained and locked in an institute to the advent of effective medicines making community living possible for people with severe mental illness to further research to find the molecules with almost minimal side effects. What has caught my attention from the beginning in this field is Electroconvulsive therapy(ECT) - Shock treatment in lay language. Though the public has always boycotted this for its poor depiction in movies and novels, it still shines as one of the most effective biological treatment modalities since its invention in 1935. It shines even brighter as an option when medications fail to bring improvement making the mental health condition as treatment refractory, by bringing improvement in as high as half of them.

> 66 *Mental health is not just about treating illness. It is about understanding the mind with compassion, strengthening it with science, and nurturing it with humanity* 99

Effective research in the past has made it more humane, less with adverse effects. Mental health care act 2018 contributed to making it completely voluntary treatment with autonomous decision. My research has been to understand the mechanisms of this through one the novel investigative modality called resting state functional magnetic resonance imaging(rs-fMRI). Though we have a long way to understand the exact mechanism, we still found important biological underpinnings with the study. More acceptable, less invasive brain stimulation modality using magnetic waves in place of electricity called - transcranial magnetic stimulation (TMS) is another promising option. Specifically in common mental illnesses like depression, this can be an effective way to avoid medication and get better sooner too.

With keen interest and investment in biological research, I also have equal motivation to explore psychological aspects as well. The extent to which the western psychology has expanded its wings, eastern psychological principles are yet to catch up the pace. Amidst many challenges of being encoded in complex language and nuances, misinformed to be related to religion, we may be missing an important contribution of ancient Indian philosophy and spiritual knowledge relating to mind. Like yoga, the other aspects need to pick up pace too. The close association between body and mind

makes using the body to help release complexities of mind, logical. Creative moment therapies exactly do that. Being a dancer myself, the inclination to use the form as a means of communication over and above speech to express ourselves is fascinating for me.

This still needs attention from Indians for the growth of this discipline at every level from more courses, candidates choosing and mastering the skill to clients preferring this modality.

Given our population and the burden of common mental illnesses, India will definitely make a mark when we choose to invest in improving mental health. When cutting edge biological interventions like rTMS are more accessible and part of the insurance system, ground level experience that comes from the utilization will feed better research questions. Young researchers taking keen interest in fields like Indian philosophy, spirituality, creative movement and art based therapies and its impact on mental health, and exploring this with openness and scientific vigor can make a huge impact. As a personal note, being introspective, flexible and inculcating the values in oneself makes us efficient, wholesome and mentally healthy contributors to the society.

> **" Mental health is not just about treating illness. It is about understanding the mind with compassion, strengthening it with science, and nurturing it with humanity "**
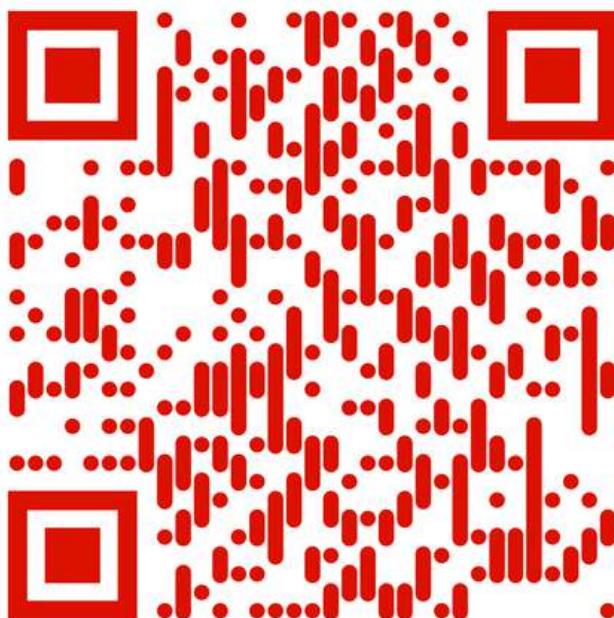
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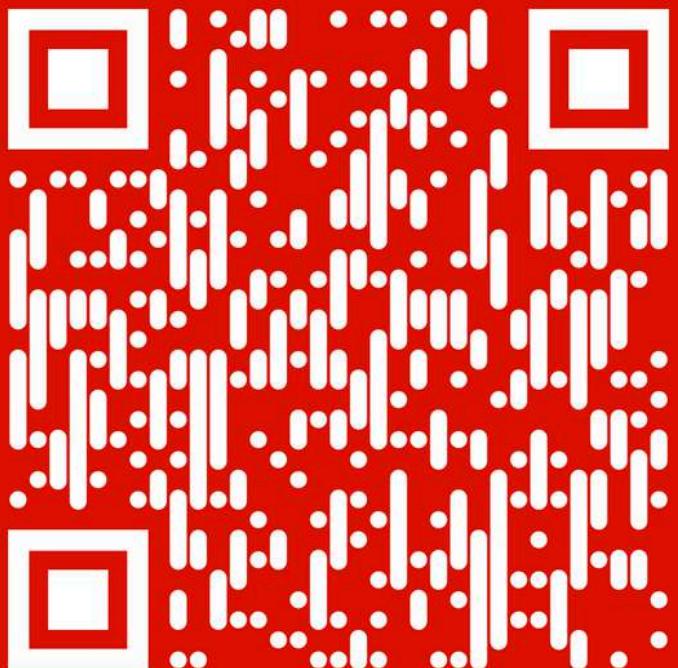
THE FIRST STEP TOWARD DOING WHAT YOU LOVE

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

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

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

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

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

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

🔗 **| SCIENCE DESK |**

TURNING FISH WASTE INTO WEALTH: A SCIENTIST'S JOURNEY IN BUILDING INDIA'S BLUE ECONOMY

Your work focuses on converting fish processing waste into valuable products. What do you consider as your most important contribution in this area so far?

For almost 11 years at ICAR-Central Institute of Fisheries Technology, my main focus has been on converting fish processing waste into useful and valuable products. Instead of seeing fish waste as a problem, I see it as a resource with huge potential. My most important contribution has been developing technologies that are not only scientifically sound but also economically practical. Many research ideas remain only in laboratories or publications. I have always tried to take research one step further by proving that it can work at industrial scale. One of the biggest achievements in this direction is the establishment of India's first shrimp shell biorefinery plant, with a capacity of processing 2 tons of shrimp shell waste per day. This plant uses a combined mechanical, chemical, and enzymatic process to recover both chitin and protein. Traditionally, shrimp shells were used mainly for low-value products, and most of the protein was lost. Our method changed that. It increased profits nearly three times, improved resource use, reduced water consumption, and produced relatively cleaner wastewater. This showed industries that waste processing can be both profitable and environmentally friendly. Today, larger biorefinery plants with capacities of 25 to 40 tons per day are being planned in different Indian states. Several entrepreneurs are interested in adopting this technology. For me, this shows that science can directly support industry, sustainability, and national economic growth. I am grateful to the Institute and my research team for the support being rendered in this exciting research journey.

How can fish processing become more sustainable in India?

India's seafood export industry is already quite advanced in processing edible fish products. However, the processing of fish waste is still not handled properly in many places. Large amounts of waste are dumped or poorly managed, causing pollution and financial loss.

Sustainability will improve only when we treat fish waste as a valuable raw material. Using modern technologies, fish waste can be converted into fertilizers, animal feed, proteins, enzymes, bioplastics, and health ingredients. Research institutions, industries, and government bodies

Dr. Elavarasan Krishnamoorthy
| Senior scientist,
Indian Council of Agricultural
Research-Central Institute of Fisheries
Technology (ICAR-CIFT)

🔗 **| Scientific Profile |**

🌐 **| Organization Link |**

Areas of Expertise:
Fish Processing Technology | Fish
Waste Utilization | Biorefinery
Development | Bioactive
Compounds | Circular Economy |
Seafood Product Innovation

processing must work together to modernize this secondary sector. When waste is fully utilized, fisheries will become more environmentally friendly, economically stronger, and socially beneficial. In simple words, sustainability is not only about protecting nature it is also about using resources wisely and completely.

3. Why are fish protein and bioactive compounds important?

Fish protein hydrolysates and bioactive compounds are gaining global attention because of their health benefits. These compounds can help in improving immunity, digestion, heart health, and overall nutrition. They are used in medicines, nutritional supplements, and functional foods. As people become more health-conscious, the demand for such products is increasing not only in cities but also in rural areas. Compared to land-based animal proteins, aquatic proteins are more sustainable and require fewer natural resources to produce. However, India needs stronger support for clinical research and faster technology development in this field. Many countries already have such products in the market.

Government programs should consider introducing these health products into public nutrition schemes such as mid-day meals and health missions. This will improve nutrition, reduce malnutrition, and create new industrial opportunities at the same time.

What limits industrial adoption of research?

There are three main challenges. First, many research projects stop after publication. Research should move beyond papers and aim to create real solutions that

TURNING FISH WASTE INTO WEALTH: A SCIENTIST'S JOURNEY IN BUILDING INDIA'S BLUE ECONOMY

industries can use. Second, many institutions do not have pilot-scale facilities. Without pilot testing, industries hesitate to invest in new technologies. Third, industries sometimes lack trust in laboratory results because they are unsure whether the technology will work at large scale. These problems can be solved by building pilot plants, encouraging industry participation in research, and motivating researchers to develop economic business models along with scientific models. When industries see clear profit and reliability, they naturally adopt new technologies.

What skills should young researchers develop?

Fish processing science is multidisciplinary. Young researchers should learn communication, problem-solving, data analysis, regulatory knowledge, industrial processes, and basic business understanding. Most importantly, they should develop a mindset that focuses on solving real problems. Science becomes meaningful when it creates value for society. Students should learn to ask:

How can my research help industry, environment, and people? That attitude will shape successful scientific careers.

What is the future priority for India's fish processing sector?

India should focus more on value-added products instead of exporting only raw frozen fish. At the same time, almost 40% of fish becomes waste during processing. If this waste is properly utilized, it can generate more than ₹50,000 crore per year. This is almost equal to India's seafood export earnings. Therefore, the top priority should be fish and shellfish waste revaluation. Government schemes, startup funding, and industrial policies should strongly support secondary fish processing. This will create jobs, protect the environment, and strengthen India's blue economy.

How has your work gained public and industry visibility?

Our work on shrimp shell biorefinery and fish waste utilization has been widely covered by research institutions, sustainability platforms, food industry journals, newspapers, and professional media. The institute has also taken the efforts and supported the dissemination of these technologies.

This visibility has helped explain to the public how waste can be converted into wealth. It has also shown policymakers and investors that scientific innovation can directly support the circular economy. Because of this exposure, many industries have shown interest in adopting the technology. New biorefinery projects are now under discussion in several Indian states.

Media coverage has also inspired students and young researchers to see fish processing science as an exciting and impactful field. For me, visibility is not about personal fame. It is about ensuring that scientific solutions reach society, industry, and decision-makers. When science is communicated well, it can influence policy, investment, sustainability, and national development.

What message would you give to young scientists?

There Science should not remain inside laboratories. It should walk into farms, factories, hospitals, and homes. Young scientists should believe that their research can change industries and improve lives. With patience, curiosity, teamwork, and commitment, they can build technologies that support food security, health, sustainability, and economic growth. India has huge potential. Science has the power to unlock it.

Pilot scale facility

Collagen Concentrate production

Chitin

Chitosan

SHAPING CLIMATE-RESILIENT CROPS THROUGH MOLECULAR INNOVATION

Your research journey spans India, Israel, and Italy. How have these experiences shaped your scientific philosophy?

My academic journey began in India at Banaras Hindu University and the ICAR-Indian Institute of Vegetable Research, where I learned the importance of crop science in real farming conditions. This training taught me to think about how research can directly help farmers and food security. In Israel, at the Agricultural Research Organization and the Hebrew University of Jerusalem, I experienced a highly innovative research culture. There, I learned to design experiments carefully, use advanced tools, and connect basic research with practical applications. In Italy, at the University of Milan and Roma Tre University, I worked in collaborative environments that strengthened my understanding of plant development and functional genomics. Together, these experiences shaped my philosophy: research should be scientifically strong, technologically advanced, and useful for improving crops and agriculture.

Dr. Avinash Chandra Rai |
Senior Scientist ICAR-Central Potato Research Institute, Shimla, H.P., India

🔗 **| Scientific Profile |**

🌐 **| Organization Link |**

Areas of Expertise: Plant Molecular Biology | Genome Editing | Functional Genomics | Crop Improvement

Your work spans fundamental and applied research across several crops. How do you choose impactful problems?

I choose research problems that address clear biological limitations in crops. For example, I focus on questions where understanding genes and pathways can help improve stress tolerance, yield, or quality. I also look for problems where modern tools like genome editing, transcriptomics, and functional genomics can make a real difference. Most importantly, I try to balance discovery with application. I want my work to advance science while also supporting farmers, food security, and sustainable agriculture.

What opportunities do you see for young scientists in genome editing and synthetic biology?

The next decade will be very exciting for young scientists. New genome-editing tools now allow very precise changes in plant DNA without adding foreign genes. This will help improve crops faster and more safely. Functional genomics will help researchers understand how genes work together as networks, not just individually. This creates opportunities for scientists who can combine biology with data analysis. Synthetic biology will allow us to design new genetic circuits and regulatory systems, opening new possibilities in agriculture and biotechnology. Young researchers who are curious, interdisciplinary, and open to learning new technologies will lead future breakthroughs.

How can young researchers succeed in multidisciplinary plant science?

First, they should build a strong understanding of basic plant biology. Technologies change, but biological principles remain important. Second, learning data analysis and bioinformatics is now essential. Third, researchers should stay focused on biological questions and use techniques only as tools to answer those questions. Collaboration is also very important. Modern science works best when people from different fields work together. Finally, patience, flexibility, and curiosity are key, because multidisciplinary research often involves challenges and long learning processes.

What habits helped you remain productive and creative throughout your career?

I try to keep a structured routine for reading, writing, and data analysis. I document experiments carefully and discuss ideas early with colleagues. Working with researchers from different backgrounds has always improved my thinking. I also see feedback as a chance to improve, not as criticism. For young scientists, I recommend developing strong skills in one area while learning basics of related fields. Good writing, data handling, and reproducible research practices are very important. Above all, staying connected to the larger purpose improving crops, helping farmers, and supporting global food and nutrition security gives long-term motivation and meaning to scientific work.

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. Ipsita Mohanty**

THE GROUND BENEATH OUR FEET

Mahesh liked walking. Every morning, he walked from his house to the bus stop to go to college. The walk was short, but it was never easy. Some parts of the footpath were broken. Some had deep cracks. After the monsoon, water filled the holes and made them hard to see. Mahesh had learned to walk carefully. He watched the ground more than the sky. He stepped slowly, avoiding loose stones and uneven slabs. Once, he slipped and hurt his ankle. Another time, he saw an old man fall because of a broken tile. Mahesh often wondered why footpaths were ignored when so many people depended on them.

One day in class, Mahesh's teacher asked a simple question.

"What makes a city safe for walking?"

Most students talked about traffic and streetlights. Mahesh raised his hand and said, "Good footpaths."

After class, the teacher smiled and told Mahesh about a group of scientists working on this very problem. They wanted to understand how bad footpath damage really was and how it could be fixed faster.
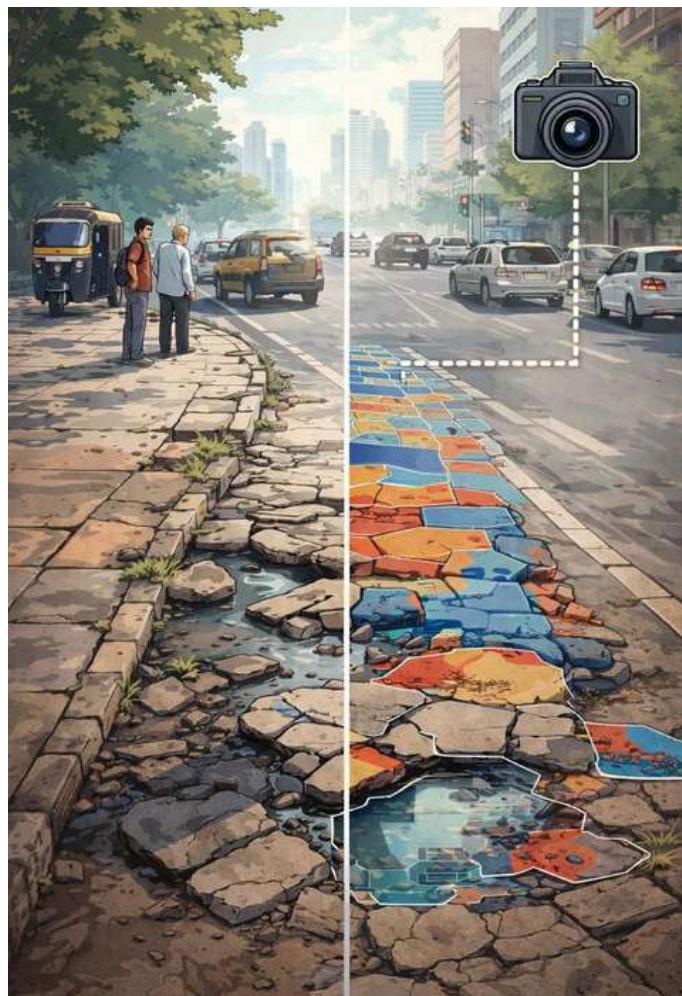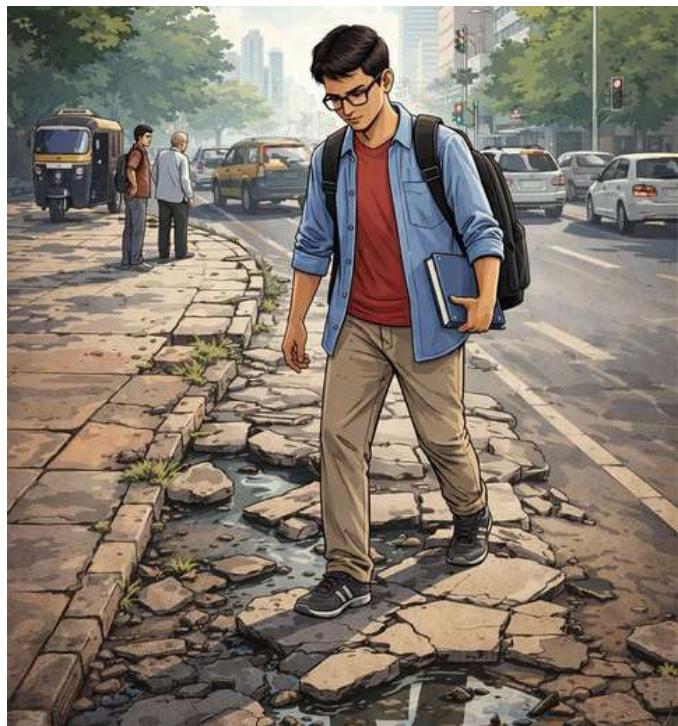
The scientists knew that checking footpaths by walking around with notebooks took too much time. Different people judged damage differently. Some cracks looked small but were dangerous. Others looked big but were not serious. Cities needed a better way.

So the scientists decided to use cameras and computers.

They walked through busy areas of a city and took thousands of photos of footpaths. They took pictures in sunlight, shade, rain, and evening light. They wanted the photos to look like real life, just like Mahesh's daily walk.

Then came the hardest part. They sat down and carefully marked the damaged parts in every photo. They showed the computer exactly where the cracks and broken surfaces were. They also marked how serious the damage was low, medium, or high. Civil engineers helped them decide what kind of damage could make people fall.

Mahesh imagined how careful this work must have been. Every crack mattered. Every broken tile told a story.

| By **Dr. Ipsita Mohanty**

Once the photos were ready, the scientists taught computers to study them. The computers learned to look at a picture and say, "This part is damaged," and "This damage is dangerous." Slowly, the computers became better at spotting problems that humans often missed.

The scientists discovered something important. Broken footpaths were one of the biggest reasons people fell—not rain, not darkness, but damaged walking surfaces. This surprised many people, but it made sense to Mahesh. He had felt it every day under his feet.

The best part was that the scientists shared their work openly. They made the photo collection available for students, researchers, and city planners. Anyone could use it to improve tools that help cities find and fix dangerous footpaths faster.

Mahesh imagined a future where a city worker could use a simple device, scan the footpaths, and know exactly where repairs were needed. No more waiting for accidents to happen. No more ignored cracks.

The scientists also knew their work was not finished. They had collected data from only one city. In the future, more cities could be added. New tools could measure depth and slope. Better systems could be built.

One evening, as Mahesh walked home, he noticed a newly repaired footpath. The cracks were gone. The surface was smooth. He smiled.

That day, Mahesh realized something important. Science was not always about big machines or distant labs. Sometimes, it was about the ground beneath your feet. About helping people walk safely. About noticing problems others overlook.

And he thought, maybe one day, he would be one of those scientists using curiosity, data, and care to make everyday life a little safer for everyone.

Think About This

Mahesh walks the same footpath every day. The cracks do not change much, but the risk to people remains.

According to the **story** and the science behind it, **what truly turns a broken footpath into a public safety problem?**

A. The age of the footpath

B. How often people complain about it

C. The fact that small, unnoticed damage affects many people every day

D. Rain and weather alone
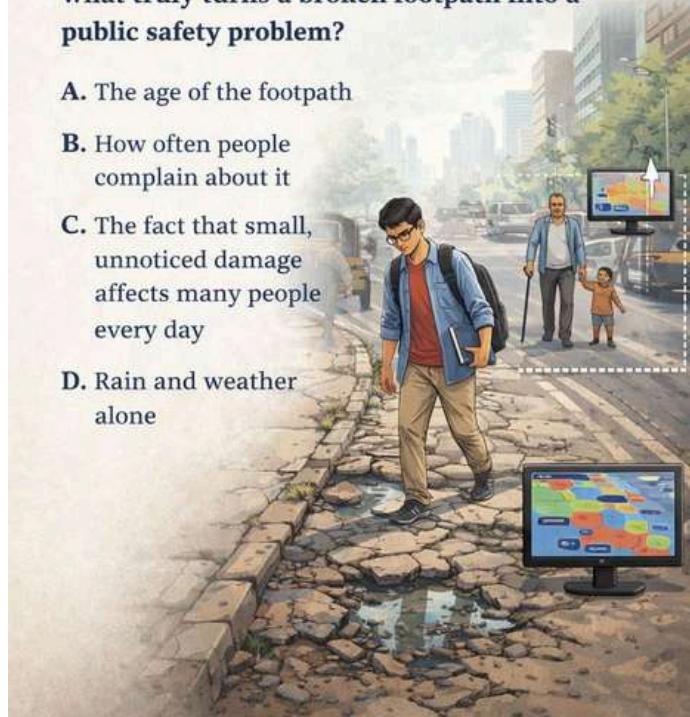
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https://doi.org/10.1038/s41597-025-06207-x

Symbiosis Institute of Technology, Pune Campus, Symbiosis International (Deemed University), Pune, 412115, India

| By **Dr. Preeti Sharma**

AGING WITH DIGNITY IN INDIA

Lakshmi was sixty-eight years old and lived in a small town in India. Every morning, she woke up early, swept her courtyard, and made tea for herself. She liked to water her plants and walk slowly to the nearby temple. Some days, her knees hurt. Some days, she forgot small things, like where she kept her keys. But she still felt active and useful.

Lakshmi had a neighbor, Radha, who was the same age. Radha had fewer health problems on paper, but she rarely went out. She felt tired often, worried a lot, and needed help with daily tasks. Lakshmi wondered why two people
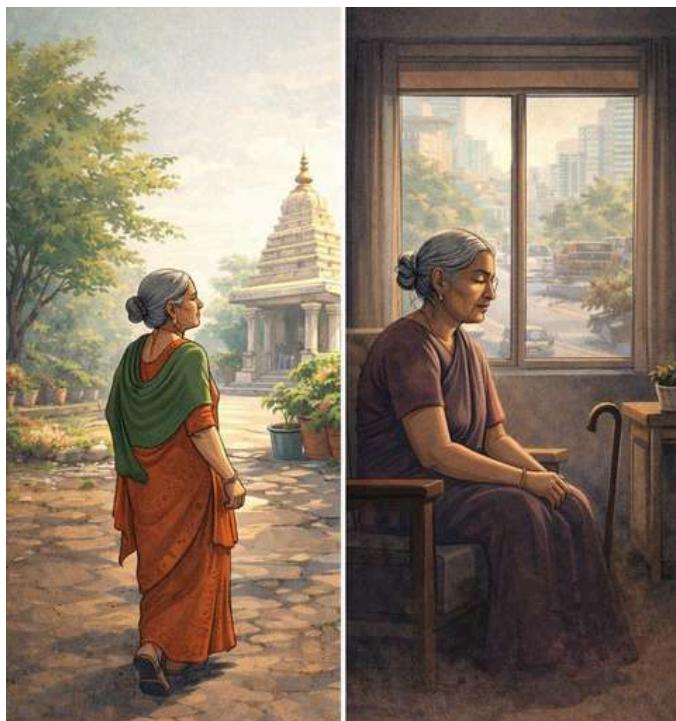
of the same age could feel so different.

One afternoon, Lakshmi's son came home with news. He told her about a study he had read about how people age in India. The study did not just look at diseases. Instead, it looked at how well people could live their daily lives.

Lakshmi listened carefully.

The researchers studied thousands of adults across India who were over forty-five years old. They wanted to understand something called "overall capacity." This meant how well a person could think, move, see, hear, breathe, sleep, and stay emotionally well. It was not about being perfect or never getting sick. It was about what

people could still do.

Lakshmi realized that this made sense. Even though her knees hurt, she could still walk. Even though she forgot small things, she could still manage her home. Her body and mind were working well enough for her to live independently.

The researchers used simple tests to understand this. They checked memory, balance, walking speed, hand strength, eyesight, hearing, sleep quality, and mood. All these together gave a picture of how strong and capable a person was. Lakshmi imagined each test as a small window into daily life how steady a step was, how clearly a face could be recognized, how calmly the mind could rest at night.

They found that people with higher overall capacity lived better, even if they had some illnesses. Lakshmi found this comforting. It meant that having diabetes, high blood pressure, or joint pain did not decide everything. What mattered was how much control and confidence a person still had in living their own life.

The study also showed that not everyone had the same chance to age well. Older age, being poor, having less education, living alone, or living in rural areas often reduced people's capacity. Lakshmi thought about women she knew who had worked all their lives but had little
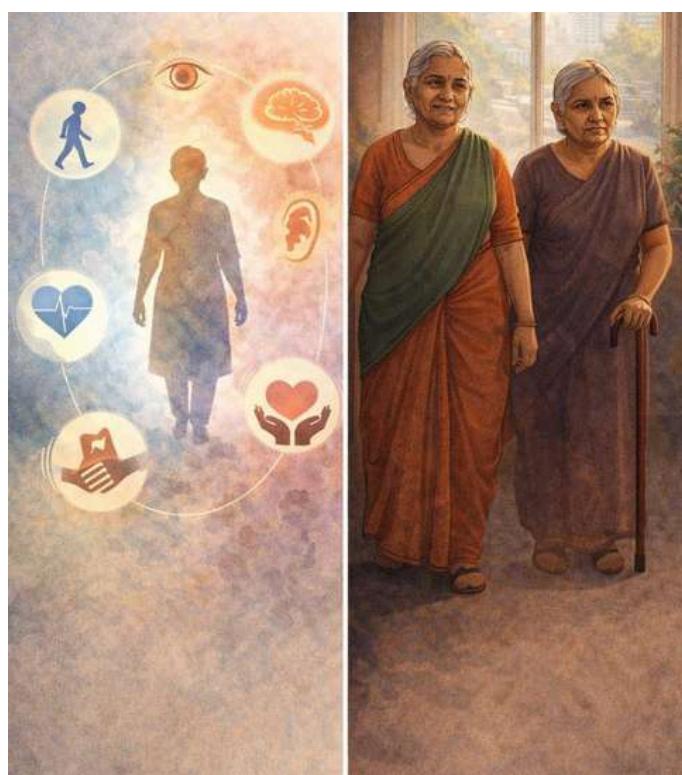
🔗 | By **Dr. Preeti Sharma**

support now. She wondered how different their old age could be if society noticed them more.

One important finding surprised Lakshmi's son. People with higher capacity were less likely to struggle with daily activities like bathing, cooking, shopping, or managing money. This was true even if they had more than one disease. It showed that aging was not just about sickness. It was about strength, balance, thinking, and emotional health together.

Lakshmi thought of Radha again. Radha's problem was not just her body. She felt lonely, anxious, and unsure. Her capacity had slowly reduced, even without a serious illness. Lakshmi decided to visit her more often, invite her for tea, and encourage her to walk in the evenings. Maybe small kindness could protect capacity too.

The researchers believed this new way of looking at aging could help India a lot. Instead of focusing only on hospitals

Lakshmi and Radha are the same age, yet their daily lives feel very different.

Based on the story and the research behind it, what most strongly shapes how well a person ages?

A The number of diseases a person has.

B How old a person is

C The combined ability to move, think, feel, and stay connected

D One major illness later in life.

and medicines, society could help older people stay active, connected, and confident. Small things like safe walking spaces, social activities, better sleep, and mental support could make a big difference.

Lakshmi liked this idea. She felt hopeful. Aging did not have to mean losing everything slowly. It could mean adapting, staying engaged, and protecting what still worked.

That evening, Lakshmi walked to the temple again. She moved slowly, but steadily. She greeted people, rang the bell, and smiled. She realized that healthy aging was not about being young forever. It was about keeping enough strength in the body and peace in the mind to live life with dignity.

Lakshmi's story was not special. It was the story of millions of older people in India. The research showed that when we focus on abilities instead of illnesses, aging becomes not just a problem to manage, but a life stage to support with care, respect, and understanding.

And Lakshmi knew one thing clearly: growing older did not mean growing weaker in every way. It meant learning how to hold on to what truly matters. She promised herself to keep moving, keep talking, keep caring, and keep believing in her own strength. Because in every step she took, she was quietly proving that age could carry wisdom, dignity, and gentle courage.

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*Policy Department, SESRI, Qatar University, Doha, Qatar.*

🔗 | By **Dr. Priyangana Deb**

WHEN HOME IS NOT SAFE

*S*ita grew up in a small village. From the outside, her house looked like any other. People passed by every day without noticing anything unusual. But inside the house, Sita often felt afraid. Her father shouted a lot. Sometimes he hit her mother. Sometimes the fear was louder than the noise.

When Sita was a child, she did not have words for what was happening. She only knew that her stomach felt tight, her heart raced, and sleep did not come easily. She learned to stay quiet. She learned to watch carefully. She learned that home was not always safe.
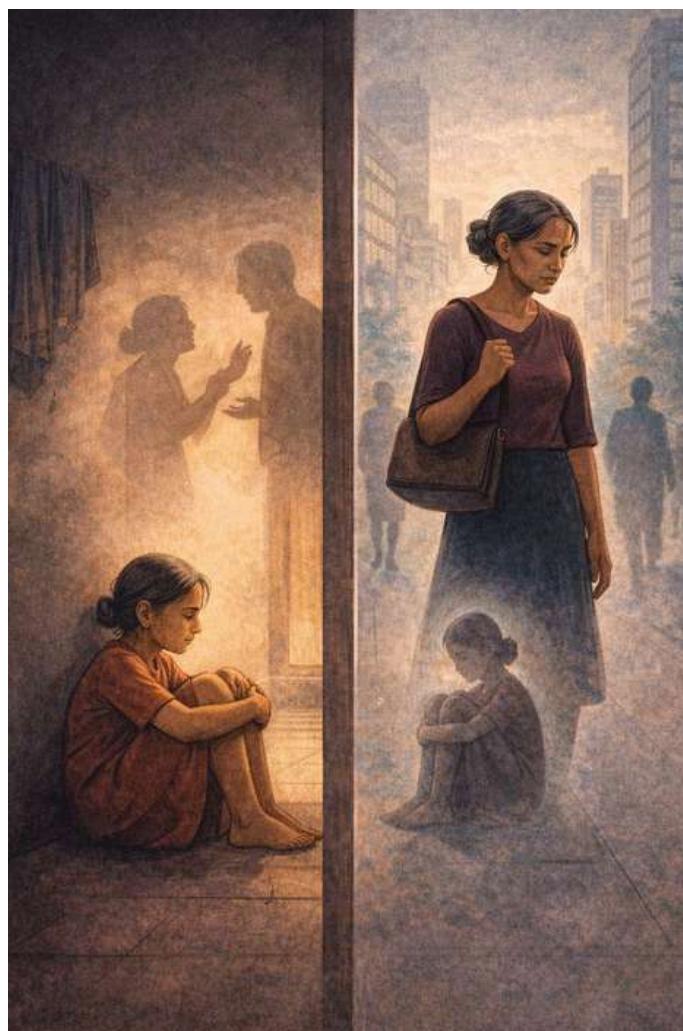
Years passed. Sita grew up, went to school, and later moved to a city for work. From the outside, her life looked fine. She had a job, friends, and a routine. But inside, something felt heavy. She worried often. She felt sad without knowing why. Loud voices made her anxious. Trusting people felt hard.
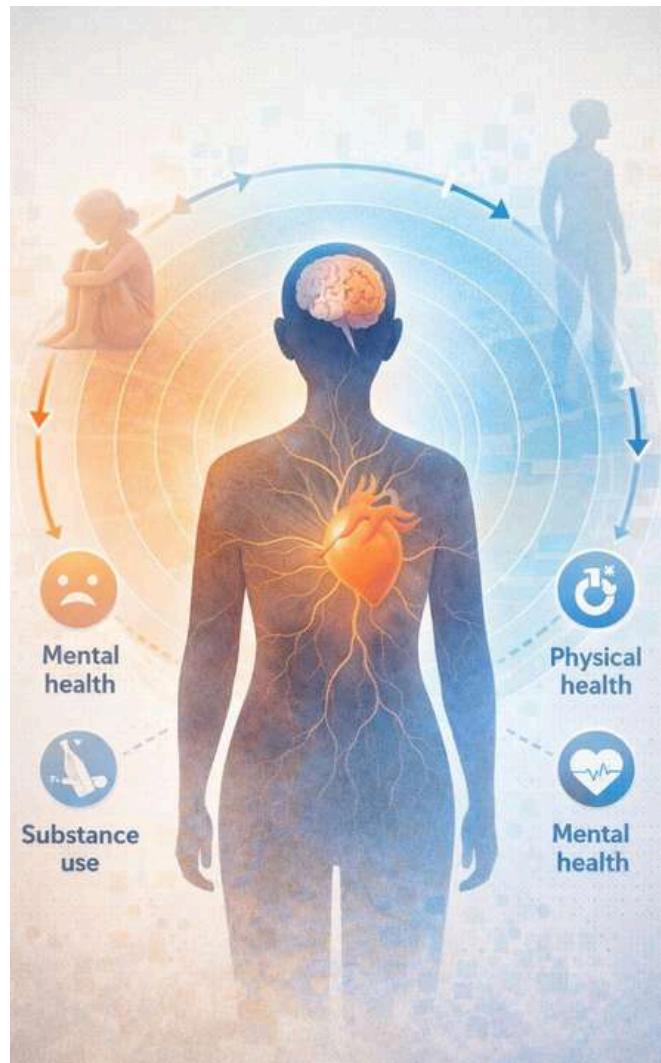
Sita believed this was just her personality. She thought she was weak or sensitive. She never connected her childhood experiences to how she felt as an adult.

One day, Sita attended a health talk at her workplace. A doctor spoke about how violence especially violence in childhood or inside homes, can affect health for many years. The doctor explained that harm does not end when the violence stops. It stays in the body and the mind.

Sita listened closely.

The doctor said that when children grow up in fear, their bodies are under stress for a long time. This stress changes how the brain develops. It affects how emotions are handled, how safe the world feels, and how people respond to challenges later in life. These changes are quiet, slow, and often invisible.

| By **Dr. Priyangana Deb**

The doctor also talked about women who face violence from partners. Even when the injuries heal, the emotional wounds can remain. Anxiety, depression, sleep problems, and health issues can follow for years. These are not personal failures. They are responses to long-term harm. Sita realized something important. The sadness she felt did not come from nowhere. It had roots.

The research behind this talk came from scientists who studied people across many countries over many years. They found that violence inside homes and violence against children were very common everywhere, not just in one place or culture. They also found that people who experienced such violence were much more likely to struggle with mental health problems later in life.

The scientists showed that violence affects health just like a disease does. It increases illness, disability, and suffering over time. In fact, the harm caused by violence adds up across a person's whole life.

The doctor said something that stayed with Sita: "Violence is not only a social problem. It is a health problem."

Sita thought of her mother. She thought of how tired her mother always looked. She thought of how strong she had been, surviving silently. She wondered how many women and children carried similar stories inside them. The talk ended with hope. The doctor explained that preventing violence could protect future generations. Safe homes, supportive communities, strong laws, and kind education could reduce fear and suffering. When children grow up safe, their minds and bodies grow healthier.

That evening, Sita walked home slowly. For the first time, she felt less alone. Her struggles were not a personal weakness. They were understandable responses to harm.

She decided to seek help. She decided to speak kindly to herself. And she decided to support others when she could. Sita's story was not unique. It was the story of millions of people whose pain was hidden behind closed doors. The research showed that if society wants healthier minds and bodies, it must take violence seriously. Because when violence is prevented, it does not just save people from harm today it protects their health for a lifetime.

And for Sita, understanding this was the first step toward healing.

Violence in childhood or within the home often leaves no visible scars.

According to the story and the science behind it, why **can such violence** still affect a person's health many years later?

A — Because people remember painful events clearly

B — Because early fear and stress slowly change how the brain and body develop

C — Because adults talk about these experiences more often

D — Because medical treatment is usually delayed

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Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA

Department of Health Metrics Sciences, School of Medicine, University of Washington, Seattle, WA, USA

| By **Dr. Dhanashree Mundhe**

THE ROADS WE BREATHE

Rohan lived in a busy Indian city. Every morning, he rode his scooter from his home to his office. The road was always crowded cars honking, buses stopping suddenly, trucks crawling forward. Sometimes the traffic moved fast, sometimes it stood still for long minutes. Rohan noticed that on some days the air felt heavier. His eyes burned a little, and breathing felt harder, especially near big crossings.

One evening, Rohan's daughter asked him a simple question.

"Papa, why is the air dirty near the main road but cleaner near our park?"

Rohan did not know the full answer. He only said, "Because many vehicles pass there."

A few days later, Rohan read about scientists studying
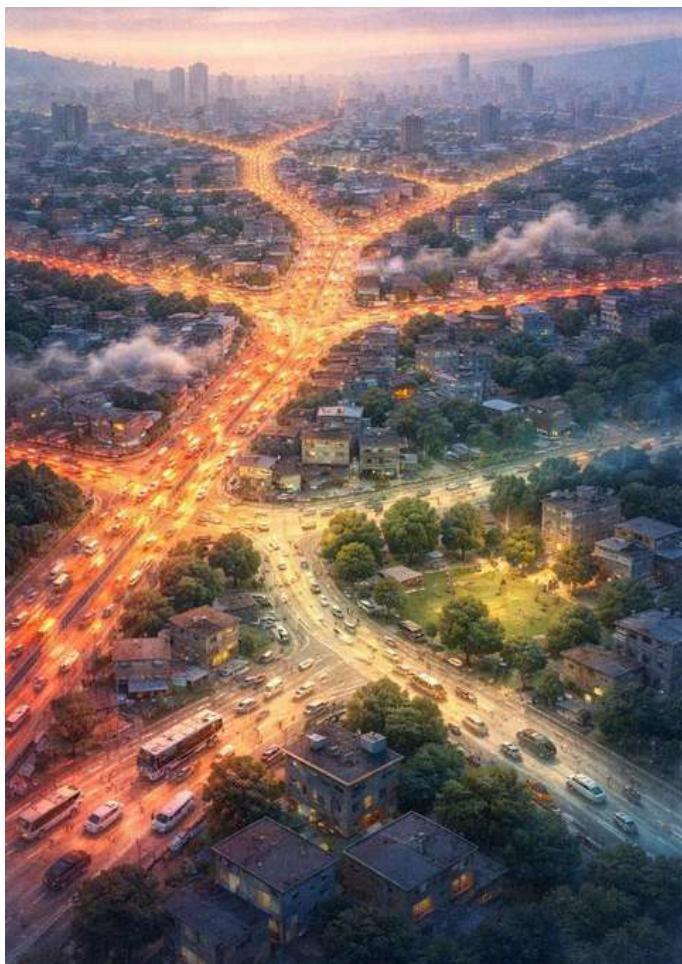
traffic pollution in Indian cities. They were trying to understand exactly how much pollution comes from vehicles and where it comes from not just city by city, but street by street.

The scientists explained that traffic pollution is a major problem in India. Cars, buses, trucks, and bikes burn fuel and release harmful gases into the air. These gases worsen climate change and damage people's health. But earlier studies gave only rough numbers for entire cities. They could not show which roads were the biggest problem.
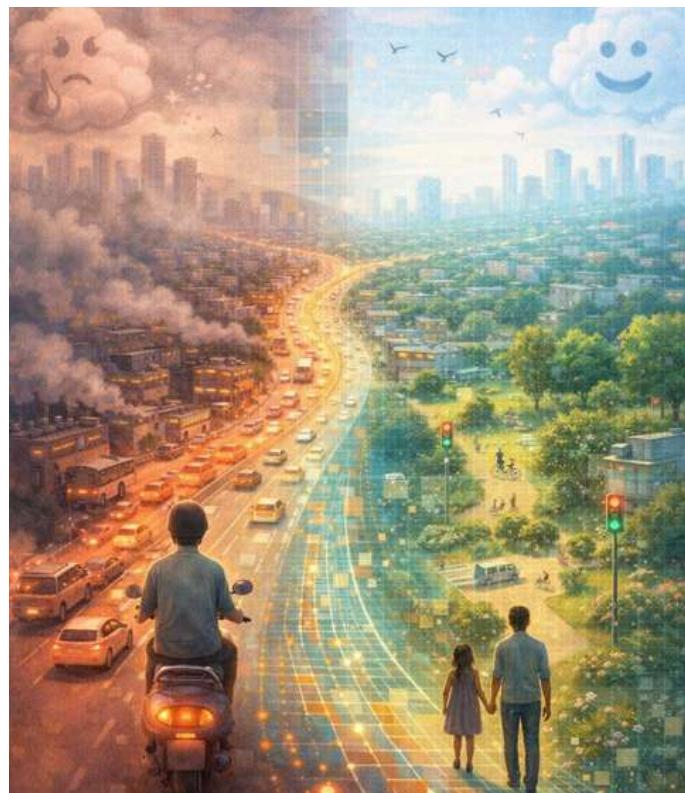
They collected location data from vehicles using navigation systems. This data showed where vehicles traveled and how fast they moved. Since not every vehicle has GPS, the scientists filled in the missing information using fuel data and smart computer methods. This helped them estimate traffic across entire cities.

They then calculated how much pollution different vehicles produced at different speeds. Vehicles stuck in traffic released pollution differently than those moving smoothly. Using this information, the scientists created detailed pollution maps for 15 Indian cities, showing emissions in small areas.

When Rohan looked at an example map online, he was surprised. Pollution was not spread evenly. Some streets

| By Dr. Dhanashree Mundhe

glowed bright, showing very high pollution. These were busy highways, traffic signals, and commercial areas. Nearby residential streets looked much cleaner.

Rohan realized something important. The pollution he felt near crossings was real and measurable.

The scientists also noticed patterns over time. Pollution was higher on weekdays and lower on weekends. During lockdowns, when traffic almost stopped, pollution dropped sharply. This showed a clear link between vehicles and air quality.

When the researchers compared their maps with older global data, they found that earlier maps smoothed out pollution and missed local differences. The new maps captured street-level changes much better.

This mattered because city leaders need precise information to act. If they know which roads produce the most pollution, they can improve traffic flow, promote public transport, redesign junctions, or limit vehicles in the worst areas. Without good data, solutions remain guesses.
The study also showed that building more roads does not always reduce pollution. More roads often bring more vehicles, leading to higher emissions. Smarter planning is needed instead.
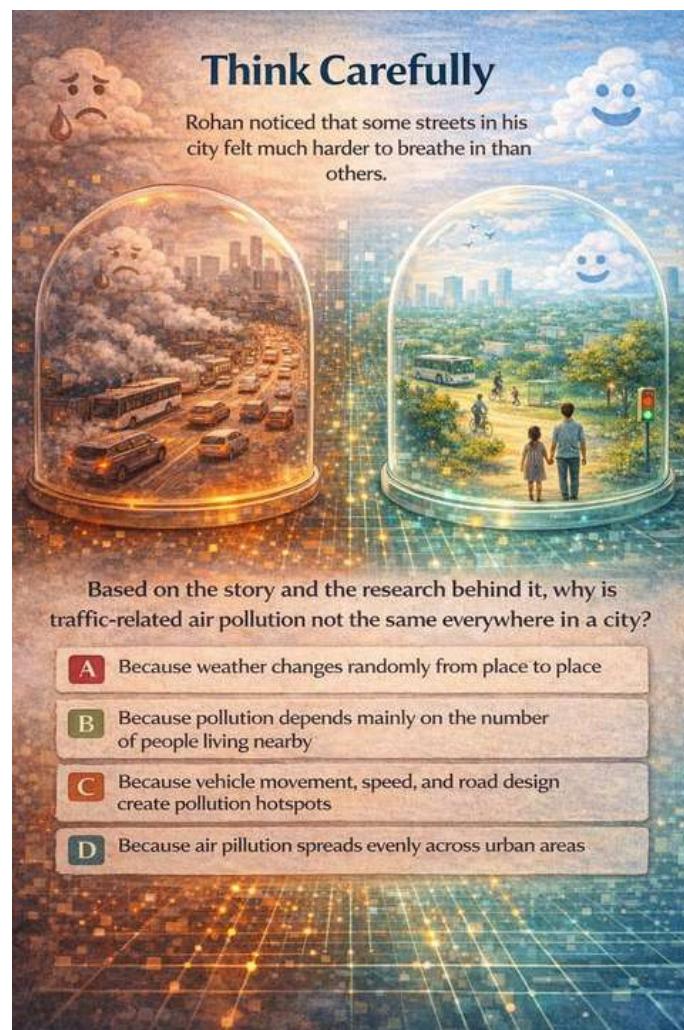
Rohan thought about his daily ride. He realized that his small choices using a bike, avoiding peak hours, and supporting public transport were part of a larger system.
The scientists made their data open so planners and governments could use it freely.

That evening, Rohan walked with his daughter to the park. The air felt lighter.

"The air is cleaner here because fewer vehicles pass nearby," he told her.

She smiled and said, "Then we should protect places like this."

Rohan nodded. He understood now. Traffic pollution is not invisible or random. It follows roads, habits, and choices. And with the right knowledge, cities can choose cleaner air, healthier lives, and a better future.

Think Carefully

Rohan noticed that some streets in his city felt much harder to breathe in than others.

Based on the story and the research behind it, why is traffic-related air pollution not the same everywhere in a city?

- **A** Because weather changes randomly from place to place
- **B** Because pollution depends mainly on the number of people living nearby
- **C** Because vehicle movement, speed, and road design create pollution hotspots
- **D** Because air pillution spreads evenly across urban areas

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Laboratoire des Sciences du Climat et de l'Environnement, IPSL CEA CNRS UVSQ, Gif-sur-Yvette, France

| By **Dr. Manas Ranjan Prusty**

A STORY OF ADOLESCENT MENTAL HEALTH IN SOUTH ASIA

Ayesha was fourteen and lived in a small town in South Asia. Every morning, she put on her school uniform, packed her bag, and walked to school with her friends. From the outside, her life looked normal. But inside, Ayesha often felt worried, tired, and sad for reasons she could not fully explain.

At school, the pressure was constant. Exams came one after another. Teachers talked about marks and rankings. At home, her parents worried about money and her future. Sometimes they argued. Ayesha tried to focus on her studies, but her sleep was poor, and her mind felt heavy. She thought something was wrong with her.

What Ayesha did not know was that many scientists were studying feelings just like hers across South Asia. They wanted to understand why so many teenagers felt anxious, sad, or stressed. Instead of studying just one school or one
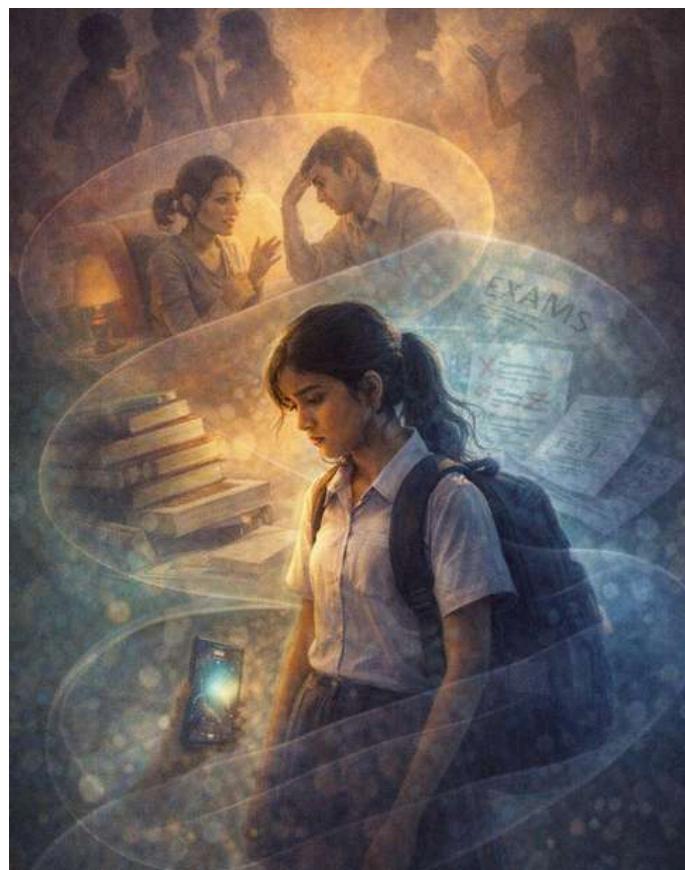
city, they looked at research from many countries in the region, including India, Bangladesh, Pakistan, Sri Lanka, and others. Together, these studies included thousands of young people like Ayesha.

The scientists found that mental health problems among adolescents were very common. Anxiety and depression appeared again and again in different places. In some areas, more than half of the teenagers showed signs of emotional distress. This did not mean these children were weak. It meant their lives were full of pressures.

The researchers learned that mental health is shaped by many things working together. At the personal level, older teenagers, especially girls, often reported more stress. Poor
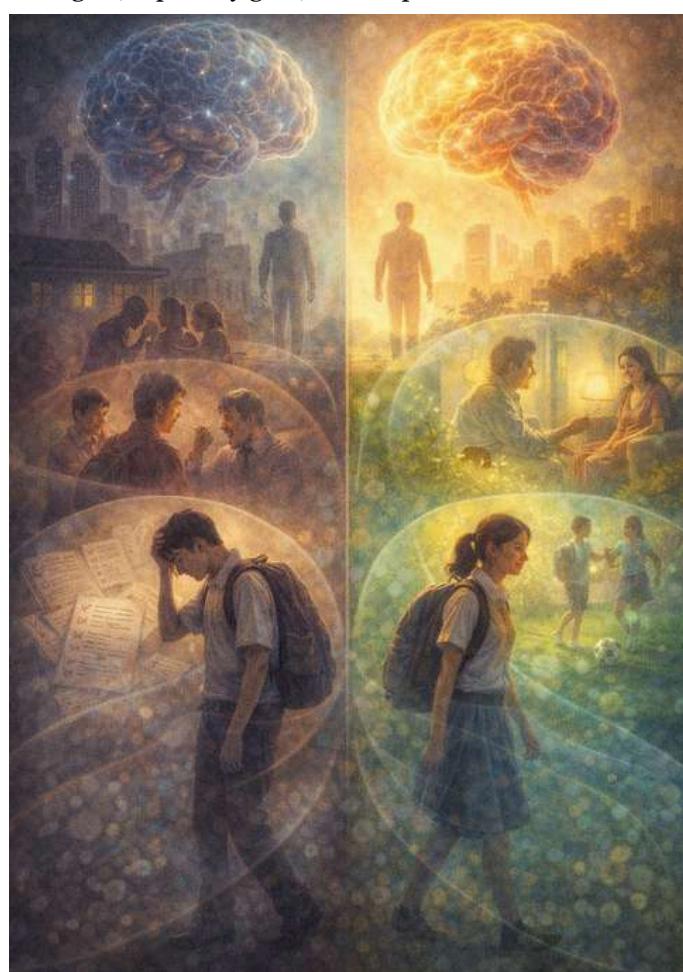
sleep, low self-confidence, too much screen time, and lack of physical activity made things worse. Ayesha recognized herself in these patterns. She stayed up late, scrolled on her phone, and rarely played outside anymore.

Family life also mattered a lot. Teenagers who lived with constant arguments, harsh discipline, neglect, or violence

| By **Dr. Manas Ranjan Prusty**

were more likely to struggle mentally. Ayesha remembered nights when her parents worried loudly about bills and responsibilities. Even when no one shouted at her, the tension stayed in the air.

School was another important part of the picture. Unsafe classrooms, bullying, punishment, and fear of failure increased stress. Some students felt supported by teachers, but many did not. Academic pressure weighed heavily on young minds. Ayesha felt this every time she opened her textbook and worried about disappointing everyone.

The scientists also looked beyond homes and schools. Poverty, food insecurity, rural living, lack of health services, and social inequality all increased mental health risks. Many adolescents had no one to talk to and nowhere to seek help. Events like natural disasters, illness, or the COVID-19 pandemic added even more stress. Ayesha remembered how lonely she felt during lockdowns when school closed and worries grew silently.

But the research did not only bring bad news. It also showed what helps. Teenagers who had caring parents, supportive friends, safe schools, and chances to play, exercise, or express themselves were more resilient. Education, especially of mothers, helped protect mental health. Simple things being listened to, feeling safe, staying active made a big difference.

The scientists were concerned about one major problem. Mental health services in South Asia were very limited. Very little money was spent on mental health, and trained professionals were few. Most help was available only in big cities, far from where many adolescents lived. This meant many young people struggled alone.

Ayesha's story was not rare. It was shared by millions of adolescents across South Asia. The research showed that mental health is not just a personal issue. It is shaped by families, schools, communities, and society.

If these surroundings become kinder, safer, and more supportive, young minds can heal and grow stronger. Helping adolescents like Ayesha is not just about treatment. It is about creating a world where their worries are understood, their voices are heard, and their futures feel possible.

Ayesha's struggles were not caused by one single event, but grew quietly over time. According to the story and the research behind it, what **most strongly shapes an** adolescent's mental health?

A Individual weakness or lack of effort

B One major stressful incident

C Everyday environments like family, school, and social support

D **Genetics alone,** which cannot be changed.

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Global and Women's Health, Monash School of Public Health and Preventative Medicine, 553 St Kilda Road, Melbourne, Victoria, Australia

🔗 | By **Dr. Poulami Chakraborty**

THE INVISIBLE RISK

A mit grew up in a small town and later moved to the city for work. In his twenties, life felt heavy. He often felt sad for no clear reason, found it hard to sleep, and worried constantly. Some days, even getting out of bed felt difficult. After many months, his family encouraged him to visit a doctor. Amit was diagnosed with depression and received treatment. Slowly, things improved. He returned to work, rebuilt his routine, and believed that chapter of his life was behind him.

Years passed.
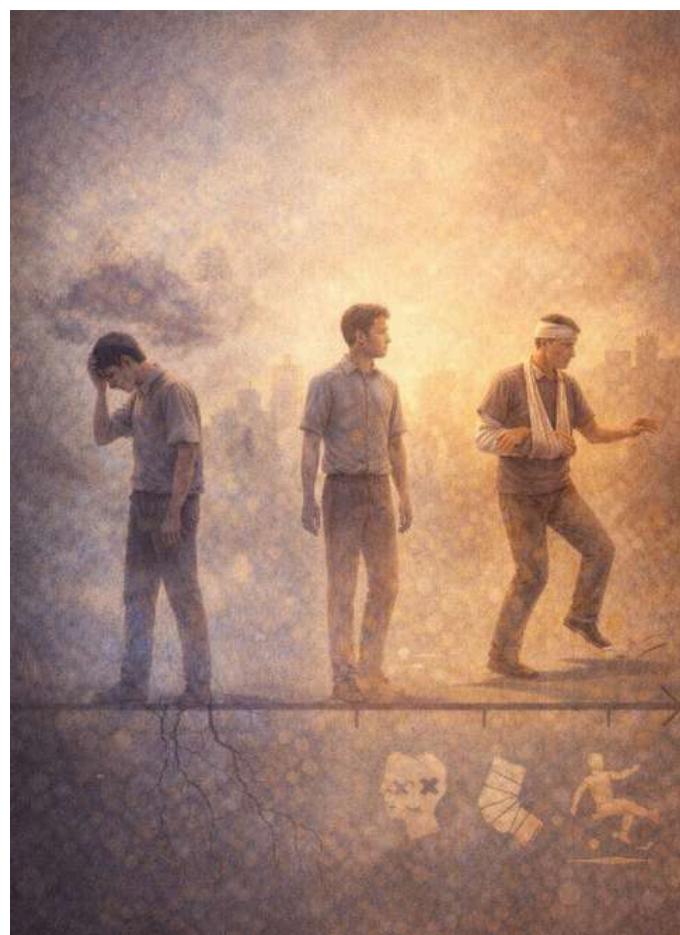
By the time Amit turned forty, he felt mostly fine emotionally. He worked regularly, took care of his family, and rarely thought about his earlier struggles. But something strange began to happen. He slipped on the stairs once and hurt his arm badly. Another time, he met with a traffic accident because he did not notice a signal change in time. These incidents felt like bad luck. He never connected them to his past.

One evening, Amit met his old college friend Neha, who worked in public health research. As they talked, Amit mentioned his accidents casually. Neha listened carefully and said, "Did you know scientists are finding links between mental health and physical injuries many years later?"

Amit was surprised. "How can that be?" he asked. "Those problems were long ago."

Neha explained that researchers studied health records of millions of people over many years. They found that people who had serious mental health conditions earlier in life were more likely to get injured later even when the injuries had nothing to do with self-harm or violence.

Amit found this hard to believe. "Why would the mind affect the body like that?" he asked.

Neha smiled gently. "Because the brain guides everything we do," she said. "Mental health problems can quietly change how we focus, react, sleep, and make decisions."
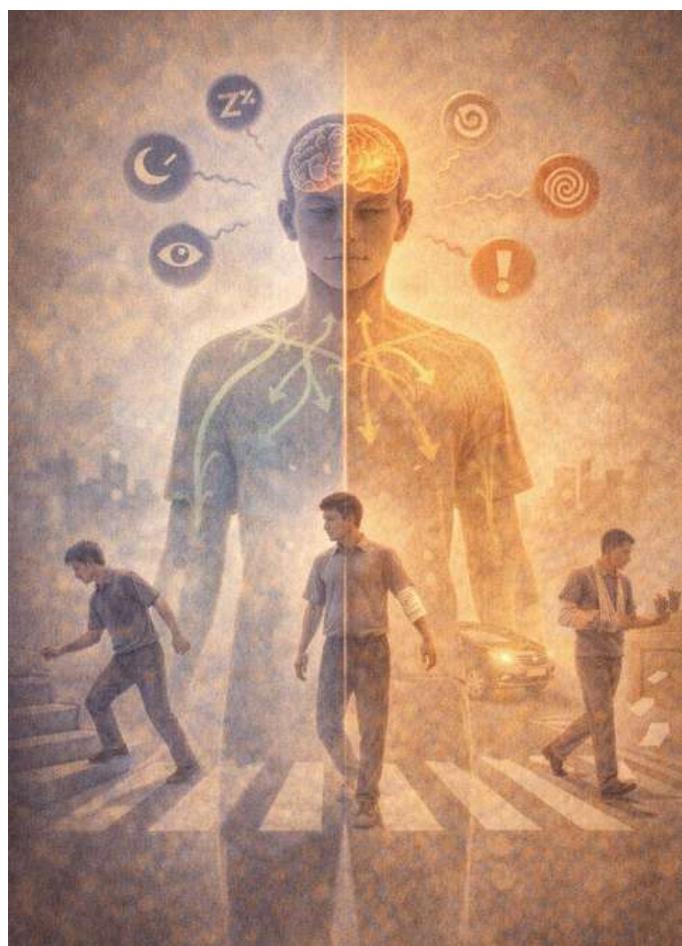
🔗 | By **Dr. Poulami Chakraborty**

She explained that when someone lives for years with stress, anxiety, or depression, the body stays in a state of tension. Attention may wander more easily. Reaction time may slow. Sleep may remain poor. Balance and coordination may weaken slightly. These changes are small and often invisible but over many years, they add up.

The scientists found that people with past mental health conditions were more likely to have head injuries, broken bones, or injuries to the spine and limbs. This was true even after removing injuries caused by self-harm. It showed that mental health problems leave long-lasting effects on the brain and body together.

Amit thought back. He remembered years of poor sleep. He remembered feeling tired even after resting. He remembered moments of distraction while driving. None of these felt serious at the time. But together, they may have increased his risk.

Neha told him something important. "This research does not blame people," she said. "It shows why mental health care matters long after symptoms improve."

The scientists also noticed that people who had repeated or severe mental health problems faced even higher risks of injury. This meant that early care, long-term support, and regular follow-up could help protect not only mental well-being but physical safety too.

Amit realized that society often separates mental and physical health. Helmets, seat belts, and safety rules are important—but so is emotional care. Supporting mental health can reduce accidents, hospital visits, and long-term suffering.

That night, Amit thought deeply. His struggles were not signs of weakness. They were health conditions with real effects, just like any other illness. He decided to take better care of himself sleep regularly, reduce stress, and seek help when needed.

The research carried a simple message. Mental health does not end in the mind. It shapes how safely we move through the world. Caring for it early can protect the body many years later.

Amit understood now. Some risks are invisible, but they are real. And protecting mental health is one of the strongest ways to protect life itself.

In the story, the man's **mental struggles** appear long before his physical injuries.

According to the research behind the story, why **can mental health problems increase** the risk of **physical injuries** later in life?

A. Because mental illness directly weakens bones and muscles.

B. Because stress, poor sleep, and reduced attention slowly affect balance, judgment, and reaction time

C. Because injuries are mostly caused by bad luck

D. Because physical health always declines after a certain
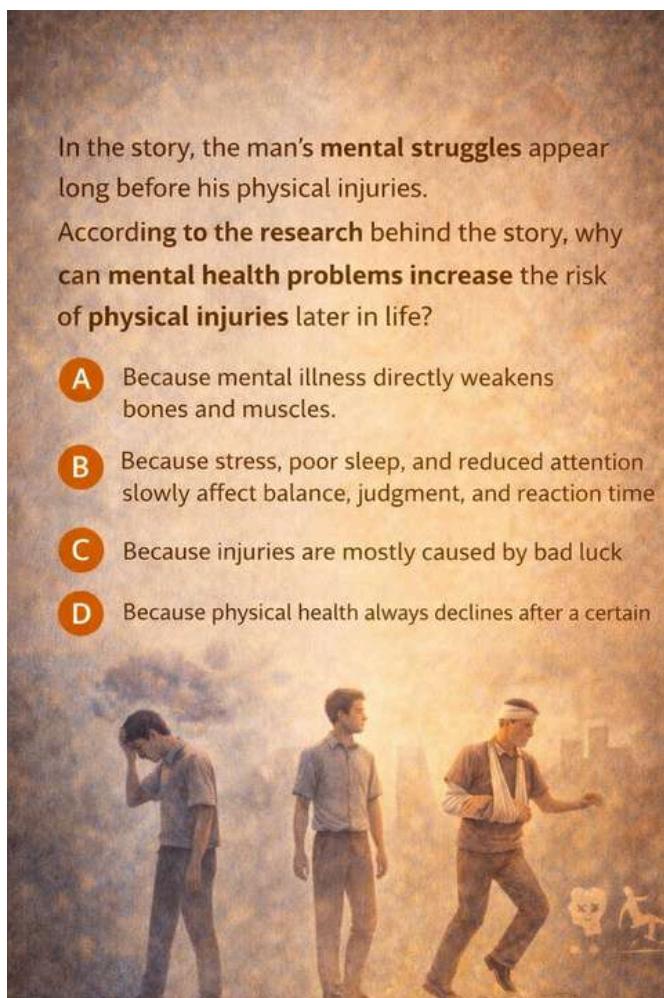
REFERENCE

Richmond-Rakerd, L.S., Milne, B.J., Houts, R.M. et al. Mental health conditions are associated with increased risk of subsequent self-harm, assault and unintentional injuries in two nations. Nat. Mental Health (2025). https://doi.org/10.1038/s44220-025-00553-w

Department of Psychology, University of Michigan, Ann Arbor, MI, USA

🔗 **| By Dr. Priyanka**

THE WORRY THAT WOULDN'T LEAVE

Aarohi was fourteen and lived in a small town with her parents and younger brother. She liked school, enjoyed drawing, and loved sitting on the terrace in the evenings. But lately, something had been bothering her.

Every time she opened her phone, she saw news about floods, heatwaves, forests burning, and animals losing their homes. Videos showed cracked land and rising seas. Aarohi did not fully understand climate science, but she understood fear. She began to worry about what her future would look like. Would there be enough water? Would summers become unbearable? Would life be safe when she grew up?

At first, her worry felt useful. She started saving water, switching off lights, and reminding her family not to waste food. She felt proud when she did these things. This was her way of caring for the planet. Her concern gave her energy and purpose.

But slowly, the feeling changed.

Some nights, Aarohi could not sleep. She kept thinking, "What if nothing changes?" During exams, her mind wandered. She felt angry when adults talked about climate change but did nothing. Sometimes she felt sad without knowing why. Other times, she felt tired of caring so much.

One day at school, her teacher talked about climate change again. Aarohi noticed that her classmates reacted differently. One boy raised his hand and said, "I think we can still fix this if people work together." Another student said nothing and stared at the desk. A girl whispered, "What's the point? It's already too late."

That afternoon, Aarohi told her mother how she felt. Her mother listened carefully and said, "You're not alone. Many young people feel this way."

Later, Aarohi learned that scientists were studying exactly these feelings. They looked at many studies from different countries to understand how children and young people experience climate change emotionally. What they found surprised her.
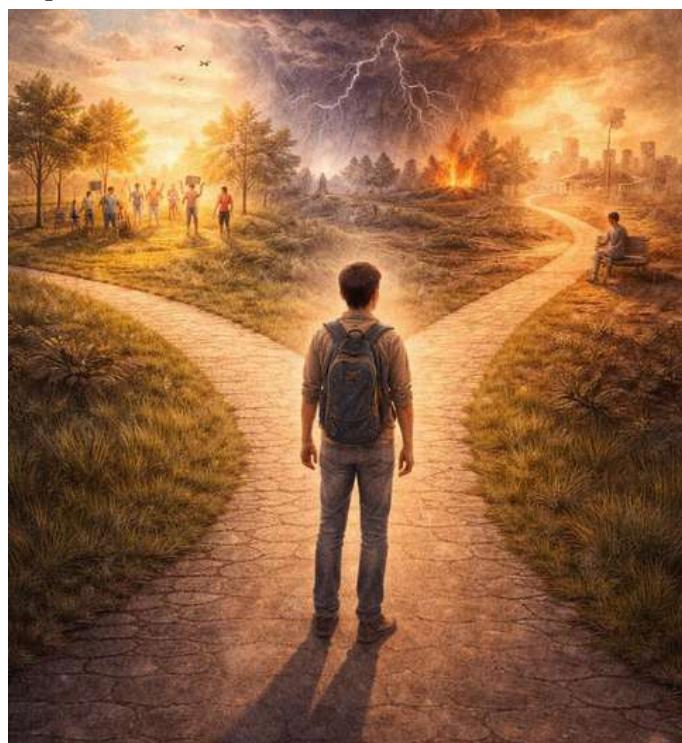
🔗 | By **Dr. Priyanka**

The scientists explained that young people usually fall into three groups. Some feel **hopeful concern**. They worry about climate change but believe action is possible. Their worry pushes them to learn, act, and stay hopeful. Aarohi realized this was how she felt at first.

Another group feels **urgent fear**. These young people feel that climate change is happening too fast and that disasters are unavoidable. This fear can lead to stress, sadness, sleep problems, and difficulty concentrating. Aarohi recognized this feeling too—it was what she felt late at night.

The third group feels **resigned frustration**. These young people believe climate change is real but feel nothing can be done. They stop hoping and focus only on surviving. This emotional shutdown protects them from constant worry, but it can also take away motivation and joy.

The scientists also found that family support makes a big difference. When parents talk openly about climate worries and take children's feelings seriously, young people cope better. Aarohi felt relieved that her mother listened instead of dismissing her fears.

The research also showed that videos and images can affect emotions more strongly than newspapers or radio. Aarohi understood this. The videos she watched stayed in her mind longer than words ever did.

Most importantly, the scientists said climate worry is **not a weakness** or a disease. It is a normal response to a real problem. The danger comes when young people feel alone, helpless, or unheard.

Aarohi slowly learned something important. Worry itself was not the enemy. Feeling overwhelmed without support was.

She joined a school group where students talked about climate issues and small actions they could take together. She still worried but now she also felt connected.

Aarohi realized that climate change affects more than weather and land. It affects young minds. And when adults listen, guide, and act, worry can turn into strength instead of fear.

She still looked at the sky every evening but now she felt less alone under it.

The young people in the story feel worried about the future even though climate change is not happening to them directly every day.

According to the story and the research behind it, what best explains this feeling?

A Young people are naturally more emotional than adults

B Constant exposure to worrying information makes distant threats feel personal

C Climate change only affects people who live in extreme environments

D Fear disappears once people understand the science

REFERENCE

Niedzwiedz, C.L., Kankawale, S.M. & Katikireddi, S.V. A systematic review of social, political and geographic factors associated with eco-anxiety in children and young people. Nat. Mental Health 3, 1579–1615 (2025). https://doi.org/10.1038/s44220-025-00550-z

School of Health and Wellbeing, University of Glasgow, Glasgow, UK

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MENTAL HEALTH IN RESEARCH

1. Stress in Research Life
Which factor is most commonly reported as a major stressor among researchers?
A. Teaching responsibilities
B. Grant and funding uncertainty
C. Laboratory safety protocols
D. Travel for conferences

2. Burnout Awareness
Which of the following is a core sign of burnout?
A. Occasional tiredness
B. Reduced curiosity and motivation
C. Working long hours occasionally
D. Being introverted

3. Early Career Researchers
Which group is shown to be at higher risk of anxiety and depression in academia?
A. Senior professors
B. Industry scientists
C. PhD students and postdocs
D. Retired researchers

4. Help-Seeking Behavior
What is one major barrier preventing researchers from seeking mental health support?
A. Lack of intelligence
B. Fear of stigma or career impact
C. Lack of interest
D. Lack of timekeeping skills

5. Healthy Research Culture
Which practice most strongly supports mental well-being in research groups?
A. Strict competition
B. Transparent expectations and feedback
C. Longer working hours
D. Minimal communication

6. Creativity and Rest
Which activity is scientifically shown to support creativity and problem-solving?
A. Continuous multitasking
B. Skipping breaks
C. Adequate rest and mental downtime
D. Working under constant deadlines

7. Failure in Science
Why is repeated failure particularly stressful in research?
A. It indicates low intelligence
B. It is rarely discussed openly
C. It happens only to early-career researchers
D. It slows publication speed

8. Comparison Culture
Constantly comparing oneself to peers on metrics like publications can lead to:
A. Faster success
B. Increased motivation only
C. Anxiety and reduced self-esteem
D. Improved collaboration

9. Mentorship Quality
Which mentor behavior best supports mental well-being?
A. Constant pressure to publish
B. Clear expectations and psychological safety
C. Minimal communication
D. Public criticism

10. Research Isolation
Which situation most increases feelings of isolation in researchers?
A. Team meetings
B. Solo work combined with limited feedback
C. Collaborative projects
D. Conference participation

DISCOVERY HIGHLIGHTS

CLIMATE SCIENCE & EARTH SYSTEMS

THE INVISIBLE IDENTITY OF THE AIR WE BREATHE

Air pollution is far more complex than it appears. A new global study has uncovered the hidden diversity of atmospheric particles by analyzing 30 years of observations (1993–2024) from 413 monitoring stations worldwide. Using advanced machine-learning techniques, researchers identified seven distinct aerosol types, separating urban pollution, biomass-burning smoke, mixed dust–pollution particles, marine aerosols, and desert dust based on their chemical and optical properties. The findings reveal that aerosols once grouped together behave very differently some scatter sunlight while others strongly absorb heat. Notably, biomass-burning aerosols fall into two chemically distinct categories. Over time, the atmosphere has shifted toward more aged and mixed aerosols, reflecting changing human activity, while natural desert dust remains relatively stable. This new classification improves climate modeling, satellite monitoring, and air-quality forecasting.

Sai Krishnaveni A. et al., Science of the Total Environment, 2025.

HOW WILDFIRES ARE QUIETLY RAISING GLOBAL CO_2 LEVELS

Wildfires do more than destroy forests they leave a lasting carbon footprint in the atmosphere. A new modeling study quantified how much carbon dioxide (CO_2) from biomass burning enters the air each year and how quickly it spreads globally. Using atmospheric transport models and fire-emission data from 2003–2019, researchers found that fires add more than 1 ppm of CO_2 annually to the atmosphere high enough to be detected by both ground stations and satellites. Tropical savannas and forests were the largest contributors, while boreal forest fires are becoming increasingly important. Once released, fire-driven CO_2 reaches monitoring stations within 6–10 days, carried mainly by large-scale winds. These findings highlight the growing climate impact of wildfires and the need to better represent fire emissions in climate and carbon-cycle models.

Musaid P.P. et al., Science of the Total Environment, 2025.

AIR POLLUTION & URBAN ENVIRONMENT

MAPPING TRAFFIC EMISSIONS STREET BY STREET IN INDIA'S CITIES

India's rapidly growing cities face a hidden climate challenge on their roads. A new study introduces CHETNA-Road, a high-resolution emissions dataset that maps carbon dioxide and air pollutants from road traffic across 15 Indian cities at an unprecedented 500-meter scale. Using GPS-based vehicle movement data combined with machine-learning and fuel-use models, researchers reconstructed daily emissions from all vehicles not just those tracked by GPS. The results show that road transport, already responsible for about 12% of India's CO_2 emissions, could sharply increase as urbanization accelerates. Compared with existing global inventories, this dataset reveals fine-scale pollution hotspots invisible in coarser maps. CHETNA-Road offers city planners a powerful tool to design targeted strategies for reducing congestion, improving air quality, and meeting India's net-zero climate goals.

Mittakola R.T. et al., Scientific Data, 2025.

INDIA'S PM2.5 CRISIS: A NATIONAL HEALTH EMERGENCY IN NUMBERS

Fine particulate pollution (PM2.5), a known human carcinogen, continues to pose a severe threat to public health across India. A nationwide analysis from 2019–2023 reveals that PM2.5 levels consistently exceeded India's air quality standards and violated World Health Organization guidelines in every single state and city studied. Winter months showed the worst pollution, with the Indo-Gangetic Plain emerging as a major hotspot. Alarmingly, PM2.5 exposure was linked to nearly 4.5 million premature deaths, driven largely by cardiovascular and respiratory diseases. To meet national standards, major states would need substantial reductions, while achieving WHO guidelines could take 10–20 years even under aggressive control measures. The findings highlight an urgent need for region-specific pollution mitigation strategies to protect public health.

DISCOVERY HIGHLIGHTS

dense crowds, synthetic clothing, and poor waste handling. These plastics don't just enter the air they act as carriers for toxins and microbes. Researchers found that iMPs were transporting lead, phthalates, pathogenic fungi like Aspergillus, and even antibiotic-resistant bacteria. Over a lifetime, an average Indian city resident may inhale nearly 3 grams of plastic. This discovery reveals a new kind of pollution one that is invisible, inhalable, and biologically dangerous. Breathing air is no longer just breathing air.

Ghosh B. et al., Environmental Monitoring and Assessment, 2025.

WATER, RIVERS & ENVIRONMENTAL REMEDIATION

CAN ALGAE HELP CLEAN THE YAMUNA?

The Yamuna River, which supplies over 70% of Delhi's water, is among the most polluted rivers in the world largely due to wastewater from the Najafgarh Drain. A new study reveals how this inflow dramatically degrades water quality, increasing salinity, organic pollution, and toxic metals such as lead and mercury beyond WHO limits. Advanced chemical analysis detected a complex mixture of pesticides, plasticizers, and persistent industrial chemicals in the river. The good news? Researchers found that a common microalga, Scenedesmus sp., can remove a large fraction of these pollutants. The algae reduced heavy metals by up to 95%, lowered nutrient pollution, and improved overall water quality. This study highlights both the scale of contamination and the promise of algae-based bioremediation as part of a broader river restoration strategy.

*Kumar D. et al., Environmental Science and Pollution Research, 2025*

THE HIDDEN CHEMISTRY OF CHLORINATED DRINKING WATER

Chlorination keeps drinking water safe from microbes, but it can also create hidden chemical byproducts. A new study from Jamia Nagar, New Delhi, examined haloacetic acids (HAAs) toxic disinfection byproducts formed when chlorine reacts with organic matter in water. Researchers detected two common HAAs at multiple locations, with total concentrations remaining below U.S. safety limits. However, India currently has no standards for these compounds. Spatial mapping revealed a worrying pattern: HAA levels increased farther from the treatment plant, where chlorine stays longer in contact with organic contaminants. Chemical analysis showed that residual chlorine, organic carbon, and pH strongly influenced HAA formation. The study highlights the need to include HAAs in Indian drinking water regulations and shows how spatial monitoring can guide safer water treatment practices.

Ahmed S. et al., Environmental Monitoring and Assessment, 2025.

MICROBIOLOGY & ECOSYSTEM HEALTH
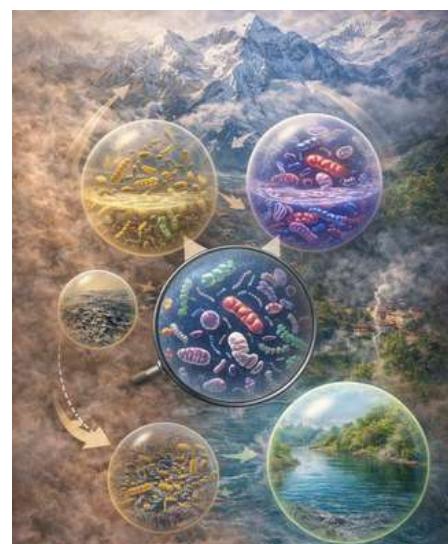
BACTERIA FROM THOUSANDS OF KILOMETERS AWAY ARE FALLING ON THE HIMALAYAS

The air above the Himalayas may look pristine, but a new study reveals it carries microbes from faraway lands. Researchers found that nearly 80% of airborne bacteria over the Eastern Himalayas arrive through long-range atmospheric transport, mainly attached to dust traveling from regions such as the Thar Desert. These incoming microbes significantly reshape local bacterial diversity and include many potential pathogens. Dust-borne bacteria were dominated by skin-infecting species, while pollution rising from foothills carried respiratory pathogens, and air descending from higher altitudes brought gastrointestinal bacteria. Even local Himalayan microbes consistently included disease-causing

DISCOVERY HIGHLIGHTS

organisms. The findings show that the Himalayan atmosphere acts as a global conveyor of life, transporting bacteria and health risks across vast distances, with important implications for public health in mountain regions.

Pramanick A. et al., Science of the Total Environment, 2025.

A NEW FUNGAL THREAT TO INDIA'S OIL PALM REVEALED AT THE GENOMIC LEVEL

Basal stem rot is one of the most destructive diseases of oil palm, and a newly identified fungus, *Ganoderma ellipsoideum*, is emerging as a serious threat in India. In a first-of-its-kind study, scientists decoded the genome of this pathogen, uncovering the genetic tools it uses to infect and kill oil palm trees. The genome reveals a rich arsenal of enzymes capable of breaking down plant cell walls, along with hundreds of genes linked to virulence and disease spread. The fungus also carries clusters for producing secondary metabolites that may enhance its pathogenicity and help it survive under diverse environmental conditions. By placing *G. ellipsoideum* within the Ganoderma family tree, the study provides crucial insights into how this pathogen evolved and how it might be controlled. These findings lay the groundwork for breeding resistant oil palm varieties, improving early disease detection, and developing more effective, sustainable disease management strategies to protect one of India's most important plantation crops.

Lakshmi M.A. et al., Scientific Reports, 2025.

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INFECTIOUS DISEASES & PATHOGEN GENOMICS
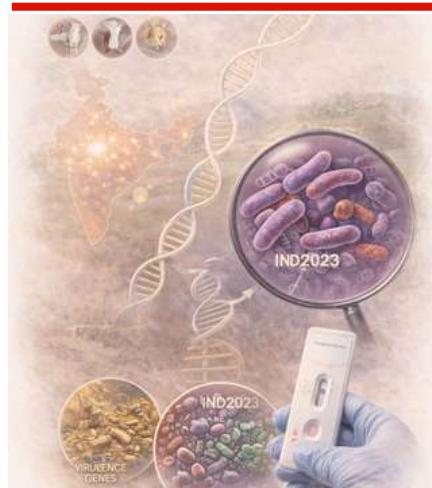
A NEW LINEAGE OF THE ANTHRAX BACTERIUM EMERGES IN INDIA

Anthrax continues to affect both livestock and humans in India, yet the genetic diversity of the pathogen has remained poorly understood. A new genomic study analyzing 17 animal-derived Bacillus anthracis isolates collected between 2018 and 2023 has uncovered a previously unknown lineage of the anthrax bacterium. By comparing whole genomes, researchers identified a new subclade, named IND2023, distinguished by unique genetic markers and a distinct evolutionary path. The strains carried numerous virulence genes and showed limited resistance to some antibiotics. Importantly, the team developed a rapid molecular test to detect this new subclade. These findings improve understanding of anthrax evolution in India and strengthen disease surveillance, outbreak tracing, and preparedness for this persistent zoonotic threat.

Pandiarajan S.K. et al., Science of the Total Environment, 2025.

MAPPING THE GENETIC LANDSCAPE OF RABIES IN INDIA

Rabies remains one of India's deadliest zoonotic diseases, accounting for nearly 30% of global rabies deaths. A new large-scale genomic study has now provided the most comprehensive picture yet of the rabies virus circulating across the country. By sequencing 630 virus samples from humans and animals across multiple states, researchers identified several distinct viral lineages. One lineage dominated and remained remarkably stable over time, while others co-circulated in specific regions, revealing largely localized transmission. Importantly, key antigenic sites in the virus showed little change, supporting the continued effectiveness of existing vaccines. This nationwide genomic map demonstrates the power of surveillance to track viral spread and evolution, offering critical insights to guide targeted vaccination, outbreak control, and India's efforts to eliminate dog-mediated human rabies by 2030.

Khandve et al., Scientific Reports, Nov 2025.

HUMAN HEALTH, SOCIETY & BEHAVIOR
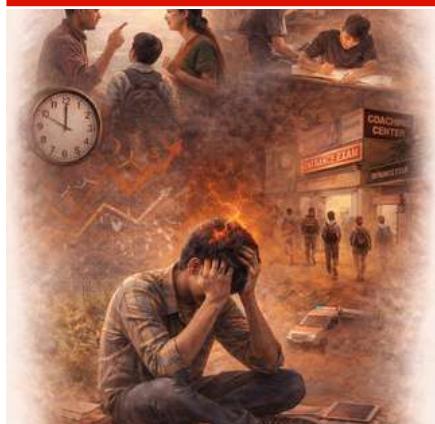
DISCOVERY HIGHLIGHTS

WHEN EDUCATION BECOMES A RISK TO MENTAL HEALTH: THE KOTA TRAGEDY

Kota is known as India's coaching capital, drawing thousands of students aspiring to elite engineering and medical careers. But it has also become a suicide cluster. A new public health analysis argues that this crisis cannot be understood only as an individual mental health issue. Instead, it frames the coaching industry as a commercial determinant of health, where profit-driven educational models, intense competition, parental expectations, and social pressure combine to create severe psychological stress. The study shows how high-stakes entrance exams and a narrow definition of success push vulnerable students toward despair, particularly young men. Viewing the Kota suicides through this broader lens highlights the need for systemic change stronger regulation of coaching institutions, supportive educational environments, and coordinated societal and health-system responses to protect student well-being.

*Yumnam V., Indian Journal of Public Health, 2025.*

WHY CHILDREN'S SCREEN TIME IS NOT JUST ABOUT PARENTS' SCREENS

With growing concern over excessive screen use among young children, a new study from India examined whether parents' own screen habits influence how much time their children spend on digital devices. Surprisingly, the researchers found no strong link between parents' screen time and that of children aged 2–6 years. Parental attitudes toward technology and confidence in managing screen use also showed little

effect. What did matter, however, was technology-related parenting. Families that set clear rules, monitored screen use, and actively managed children's digital exposure reported lower screen time among children. The findings suggest that it is not parents' screen habits alone, but consistent guidance and boundaries, that play a meaningful role in shaping healthy screen behaviors during early childhood.

Bhoi D. et al., BMC Psychology, 2025.

GENETICS, GENOMICS & EVOLUTION
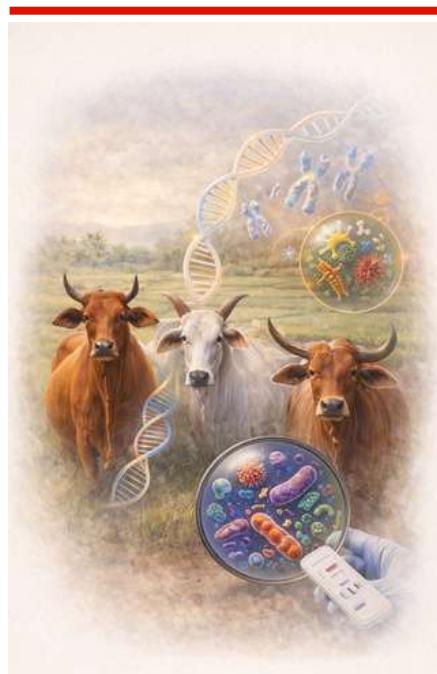
THE GENETIC SECRETS BEHIND INDIA'S RESILIENT DESI CATTLE

India's native cattle breeds are renowned for their resilience to disease, heat, and harsh environments but the genetic basis of these traits has remained largely unexplored. A new genomic study has now produced high-quality genome assemblies for five major desi cattle breeds, including Gir, Sahiwal, and Tharparkar. The analysis revealed extensive structural rearrangements in their genomes, concentrated in specific "hotspot" regions. Strikingly, these regions were enriched with immune-related genes, including those involved in pathogen recognition and immune response. This genomic architecture may help explain why indigenous cattle show strong disease resistance compared to many commercial breeds. By uncovering the genetic foundations of adaptability and immunity, the study provides valuable resources for breeding programs aimed at improving cattle health, productivity, and climate resilience.

Azam S. et al., NAR Genomics and Bioinformatics, 2025.

HOW CHROMOSOMES REARRANGE THEMSELVES INSIDE THE NUCLEUS

Inside every cell, chromosomes are not randomly packed they follow precise three-dimensional arrangements that change over time. A new study reveals how this organization is controlled by the movement of centromeres, key chromosome regions, in the pathogenic yeast Cryptococcus neoformans. Using high-resolution genome-mapping and super-resolution microscopy, researchers show that centromeres shift between clustered and dispersed states during the cell cycle, reshaping the entire genome's architecture. When centromeres disperse, chromosomes adopt a compact, globular structure; when they cluster, chromosomes stretch into elongated forms. These structural changes also separate

DISCOVERY HIGHLIGHTS

inactive regions from active genes and influence when centromeres replicate their DNA. The findings uncover fundamental principles linking chromosome architecture, nuclear organization, and genome function, offering new insight into how cells manage their genetic material in space and time.

Polisetty S.D. et al., PNAS, 2025.

AGRICULTURE, CROPS & FOOD SECURITY

EDITING A TRADITIONAL RICE TO BOOST YIELD WITHOUT LOSING ITS IDENTITY

Chittimuthyalu is a prized Indian rice landrace valued for its aroma, nutrition, and cooking quality but it yields poorly and lodges easily due to its tall, weak stems. A new study shows how genome editing can improve such traditional varieties without altering their unique traits. Researchers first optimized a tissue culture system tailored for Chittimuthyalu, enabling efficient plant regeneration and transformation. Using this platform, they precisely edited a key yield-related gene, producing plants with

thicker stems, larger grains, and nearly double the grain weight, along with a substantial increase in overall yield. The work demonstrates how modern genome editing can bring climate-resilient, nutrient-rich landraces into mainstream agriculture while preserving their heritage.

*Yousuf F. et al., Transgenic Research, 2025*

WHY SOME PEARL MILLET FLOUR TURNS RANCID FASTER THAN OTHERS

Pearl millet is a climate-resilient and nutritious cereal, but its wider use is limited because the flour turns rancid quickly. A new study reveals that this problem is not driven by nuclear genes alone; the cytoplasm inherited from the female parent also plays a major role. By comparing hybrids with identical nuclear genomes but different cytoplasmic backgrounds, researchers found that certain cytoplasms strongly increased the activity of enzymes responsible for fat breakdown and oxidation. In particular, the commonly used male-sterile cytoplasm accelerated rancidity-related processes.

However, a few hybrid combinations showed reduced enzyme activity, pointing to opportunities for breeding longer-lasting flour and improving storage stability for farmers and consumers alike. The findings highlight the importance of considering cytoplasm and nuclear interactions when developing pearl millet varieties with improved shelf life and food quality, benefiting nutrition security across diverse climate-prone regions worldwide.

Reddy P.S. et al., BMC Plant Biology, 2025.

MATERIALS, CHEMISTRY & PHYSICS
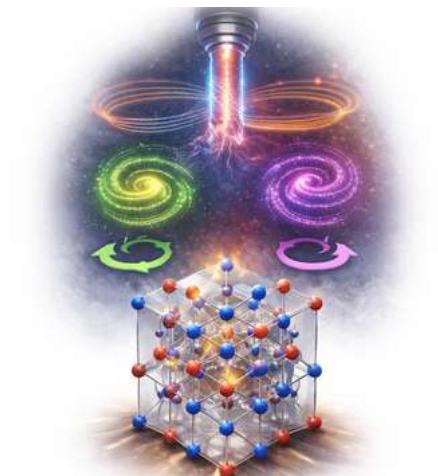
TWISTED VIBRATIONS: DISCOVERING CHIRAL PHONONS IN A FERROELECTRIC CRYSTAL

In solids, heat and sound travel as vibrations called phonons but these vibrations can be far more exotic than once thought. A new study has provided the first direct evidence of chiral phonons in the polar crystal lithium niobate ($LiNbO_3$). Unlike ordinary vibrations, chiral phonons have a distinct handedness and carry angular momentum, allowing them to interact with magnetic and electronic properties of materials. Remarkably, because $LiNbO_3$ is ferroelectric, researchers showed that the handedness of these phonons can be reversibly controlled using an electric field. This discovery opens a new route for manipulating energy flow, information transfer, and spin–lattice interactions. Chiral phonons could become key building blocks in next-generation technologies based on chiral phononics and electrically tunable quantum materials. *Ueda H. et al., Nature Communications, 2025.*

DISCOVERY HIGHLIGHTS

BENDING ATOMS TO CONTROL MAGNETISM AT OXIDE INTERFACES

At the boundary between two materials, atoms can arrange themselves in unexpected ways giving rise to entirely new physical properties. A new study reveals how tiny rotations of oxygen octahedra at engineered oxide interfaces can be precisely measured and used to control magnetism and spin–orbit behavior. By studying ultra-thin layers of $LaCoO_3$ and $La_{0.7}Sr_{0.3}MnO_3$, researchers showed that stretching or compressing the interface changes atomic bond angles, which in turn reshapes electronic orbitals and magnetic coupling. Tensile strain enhanced octahedral tilting and magnetic moments, while compressive strain suppressed them. Using advanced X-ray techniques and theoretical modeling, the work demonstrates a powerful strategy to design emergent magnetic and electronic states by engineering strain at the atomic scale, opening new avenues for next-generation spintronic devices.

Dey J.K. et al., Nature Communications, 2025.

SEEING PLANT CHEMISTRY WITHOUT TOUCHING THE LEAVES

Rosemary is prized for its health-promoting compounds, especially carnosic acid and rosmarinic acid, but measuring these molecules usually requires destructive lab tests. A new study shows that these two key compounds behave like opposites and that their balance can be tracked non-destructively using light. Using visible and near-infrared spectroscopy from the field, drones, and laboratory instruments, researchers discovered that when carnosic acid levels rise, rosmarinic acid levels fall, and vice versa. Specific wavelengths linked to each compound revealed this opposing pattern across multiple measurement scales. The study also found that plant nutrients influence the two compounds in opposite ways. This work provides a powerful spectroscopic foundation for monitoring plant chemistry in real time, opening new possibilities for precision agriculture, breeding, and quality control.

Mishra A. et al., Spectrochimica Acta Part A, 2025.

ECOLOGY & EVOLUTION

## FOLLOWING THE HIDDEN TRAILS OF THE INDIAN PANGOLIN

What happens to an animal that survives silently, underground, while humans hunt it above ground? The Indian pangolin, one of the world's most trafficked mammals, faces this exact fate in western Pakistan. A new study explores where these shy, scale-covered creatures prefer to live, which landscapes best support them, and how illegal trade routes move them out of their habitats. By combining field surveys with advanced habitat-modeling tools, researchers found that elevation and water-related factors strongly shape pangolin survival. At the same time, interviews with local communities revealed active trafficking networks and weak enforcement. The study shows that saving pangolins requires more than protection laws; it needs awareness, community involvement, and science-guided habitat restoration. Protecting pangolins may also protect entire ecosystems they quietly support.

Ahmad et al., Ecology Evolution, 2026.

ONLY ONE PERCENT: THE SILENT CRISIS FACING SHARKS AND RAYS

Sharks and rays rule the oceans, yet their most important habitats remain dangerously unprotected. A new study reveals that in the Western Indian Ocean, only about 1% of critical shark and ray areas are fully shielded from fishing. Scientists mapped 125 Important Shark and Ray Areas covering millions of square kilometers, home to over one-third of the region's species most already threatened with extinction. Surprisingly, much of the evidence came from simple methods like market surveys and citizen science, showing how powerful everyday observations can be. Still, protection lags far behind need. Without stronger marine reserves and no-take zones, many species may vanish before we fully understand them. The study urges urgent action, offering policymakers a clear roadmap to protect ocean predators and restore fragile marine ecosystems.

Cochran et al., Ecology Evolution, 2026.
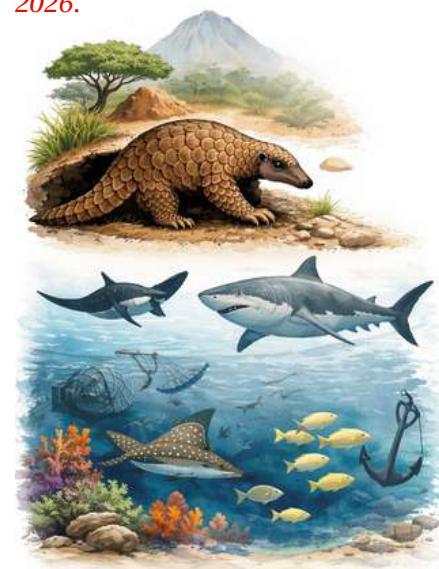
| SCIENCE IN FOCUS |

SCIENCE IN FOCUS

In December 2025, India crossed a defining milestone in its space journey by successfully launching its heaviest satellite using the LVM3-M6 rocket, a mission that was more than just a technical success; it symbolised India's arrival as a mature, reliable, and globally competitive space power. The satellite, known as BlueBird Block-2 (BlueBird 6), weighed about 6,100 kg, making it the heaviest payload ever placed into low Earth orbit by India's LVM3 launch vehicle.

The LVM3, often called India's heavy-lift launch vehicle, demonstrated its capability to carry large and complex payloads into orbit with precision. With a lift-off mass of around 640 tonnes and a sophisticated three-stage design, LVM3 has enabled India to independently launch larger commercial and scientific satellites without relying on foreign launch services a capability that was previously limited.

Beyond technical prowess, the launch had deep strategic and commercial significance. Heavy satellites like BlueBird Block-2 support advanced communications infrastructure, including direct-to-smartphone broadband, high-bandwidth internet, disaster monitoring, climate surveillance, and secure communication networks. In an era where space assets are tightly linked to national security and economic growth, this capability greatly strengthens India's strategic autonomy.

Commercially, the success reinforces India's position in the global satellite launch market. With consistent and cost-effective launch services, India has become an attractive partner for international space agencies and private companies seeking reliable access to orbit, thereby opening doors for deeper collaboration and foreign exchange revenue.

The achievement reflects decades of systematic investment in indigenous engineering, cryogenic propulsion, systems integration, and materials science. Thousands of scientists, engineers, and technicians contributed to making the launch possible a testament to the power of sustained public investment in science and technology.

Crucially, this milestone ignites the imagination of young students across India. Space missions have a unique ability to inspire curiosity and ambition. When students

India Enters a New Space Era with Its Heaviest Satellite Launch

witness India lifting the heaviest satellites, they begin to see themselves as future scientists, engineers, and innovators.

This milestone also lays the foundation for future ambitions: Indian space stations, lunar infrastructure, human spaceflight missions, and deep-space exploration. Heavy-lift capability is a prerequisite for such bold goals. India's heaviest satellite launch therefore represents more than a single mission it embodies confidence, technological maturity, and a nation ready to shape humanity's future beyond Earth.

Looking ahead, this success also strengthens India's role in international space partnerships, enabling joint missions, data sharing, and collaborative planetary exploration. As global dependence on satellite technology grows, India is no longer merely a participant but an essential contributor to the world's space ecosystem. The LVM3 mission thus marks not just a national achievement, but a global statement of India's rising space leadership.

REFERENCE
ISRO official mission documentation LVM3-M6 / BlueBird Block-2 Mission.

🔗 | SCIENCE IN FOCUS |

SCIENCE IN FOCUS

The activation of the indigenous PARAM SHAKTI supercomputer at IIT Madras marks a major leap in India's scientific computing capabilities. Supercomputers are the silent engines behind modern discoveries from climate prediction to aircraft design, from drug discovery to artificial intelligence.

PARAM SHAKTI, developed under the National Supercomputing Mission (NSM) a flagship initiative jointly led by the Ministry of Electronics and Information Technology (MeitY) and the Department of Science and Technology (DST) provides researchers with massive computational power previously accessible only in a few advanced nations. The system at IIT Madras is an indigenously built 3.1 petaflop supercomputing facility, capable of performing more than 3.1 quadrillion floating-point operations per second, enabling researchers to solve large, complex problems faster and more accurately than ever before. It was launched by the MeitY Secretary, Shri S. Krishnan, reinforcing India's commitment to technological self-reliance and global research competitiveness.

In climate science, PARAM SHAKTI facilitates accurate modelling of monsoons, heatwaves, floods, and long-term climate change. In aerospace, it enables detailed simulations of airflow, stress, and fuel efficiency before building physical prototypes. In medicine, it accelerates molecular modelling for faster drug discovery. In artificial intelligence, it trains deep learning models that power modern innovations.

The importance of PARAM SHAKTI goes beyond raw speed. It represents technological self-reliance; instead of depending on foreign computing infrastructure, India is building its own digital backbone for research protecting data sovereignty and strengthening national security. The system's infrastructure features advanced cooling, uninterrupted power supply, and energy-aware data-centre operations, allowing sustained high-volume computations for a wide range of scientific applications.

Equally significant is accessibility: PARAM SHAKTI is networked to India's supercomputing grid, enabling researchers across Indian institutions to leverage its power. This democratises high-performance computing and fuels innovation across universities, research centres,

PARAM SHAKTI: The Supercomputer Powering India's Scientific Future

and startups.

The supercomputer also supports interdisciplinary collaboration. A physicist, biologist, climate scientist, and AI researcher can all use the same platform, encouraging cross-pollination of ideas exactly how modern breakthroughs occur: at the intersection of disciplines.

For students, PARAM SHAKTI provides training in advanced computing, preparing India's future workforce for global research and technology leadership. Exposure to supercomputing builds confidence, skill, and innovation capacity.

In many ways, PARAM SHAKTI is not just a machine, it is an ecosystem connecting policy, infrastructure, education, and research into one powerful engine of discovery. As India aspires to leadership in quantum computing, AI, space exploration, and biotechnology, supercomputers like PARAM SHAKTI will remain at the heart of every major scientific leap.

REFERENCE
MeitY Press Release PARAM SHAKTI Supercomputing Facility Launch at IIT Madras.

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SCIENCE IN FOCUS

The announcement that IIIT Dharwad will deploy India's first commercial quantum computer marks a historic turning point in Indian science and technology. Quantum computing is no longer science fiction, it is rapidly becoming the next technological revolution.

Unlike classical computers that use bits (0 or 1), quantum computers use qubits that can exist in multiple states simultaneously. This allows quantum systems to solve certain problems exponentially faster than even the world's most powerful supercomputers.

Quantum computing has applications in cryptography, financial modeling, logistics optimization, material discovery, climate simulations, and drug design. Countries that master quantum technology early will shape the future of global technology leadership.

India's move from research laboratories to commercial deployment shows maturity. It signals that India is ready not just to study quantum physics, but to convert it into usable technology.

According to the Karnataka government's announcement, the state will host India's first commercial quantum computer at the Indian Institute of Information Technology–Dharwad (IIIT-Dharwad), a step that positions the region as a future quantum hub and strengthens the national innovation ecosystem. A Centre of Excellence in Quantum AI and Computing will also be established to support research, industry partnerships, and advanced training.

The quantum system at IIIT Dharwad will support startups, researchers, and industries, creating a genuine quantum innovation ecosystem. Students will gain hands-on experience, preparing a skilled workforce for future industries that do not yet fully exist.

This initiative also aligns with India's National Quantum Mission, which aims to build quantum communication networks, sensors, and computing platforms over the next decade. Together, these efforts position India among the select nations investing seriously in quantum supremacy.

Importantly, quantum technology strengthens national cybersecurity. Quantum encryption can protect sensitive

Quantum Leap: India's First Commercial Quantum Computer

communication against future cyber threats. At the same time, quantum computing challenges existing encryption systems, making it critical for India to develop indigenous solutions.

The commercial quantum computer also opens global collaboration opportunities. International research groups, companies, and universities are likely to partner with India for joint projects, strengthening scientific diplomacy.

For young scientists, this milestone sends a powerful message: India is not only following global technology trends, it is actively shaping them.

Quantum computing represents uncertainty, complexity, and immense possibility. By stepping confidently into this domain, India demonstrates courage, vision, and scientific ambition.

In the long term, quantum technology will influence how nations protect data, optimize industries, and discover new materials and medicines. By investing early in commercial quantum infrastructure, India is ensuring that it will not merely consume future technologies, but actively design them. This forward-looking step places Indian science at the frontier of the next digital revolution.

REFERENCE
The Economic Times and India Today.

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. Priyanka**

ALIGNING AIRCRAFT HARDPOINTS WITH INTELLIGENCE

Meet Nitin, an aircraft maintenance engineer, and his tiny teammate a smart tool he calls "Lumo." It's still early morning on the flight line. The jet is ready, but one problem remains: the hardpoint on the wing needs harmonisation perfect alignment so the aircraft can aim with absolute precision. In the past, this task meant hours of squinting at a distant board, making manual adjustments, and battling shadows, glare, and tired eyes.

Today, Nitin smiles.
 "Okay, Lumo. Let's do this."

He mounts Lumo onto the hardpoint using its fine-threaded shaft, locking it firmly in place. With a soft beep, Lumo wakes up and projects a thin red laser beam toward a harmonisation board positioned far ahead. On the board are neat crosshair targets, each hiding a tiny secret at its center a thermistor, like a heat-sensitive heartbeat waiting to respond. Lumo's camera opens its eye, watching the board in real time. Inside the device, a fast brain the onboard PCB control unit springs into action. It runs a trained detector called YOLO, which Nitin imagines as a super-alert spotter with binoculars.

"Crosshair detected," YOLO whispers.
 "Laser spot detected."
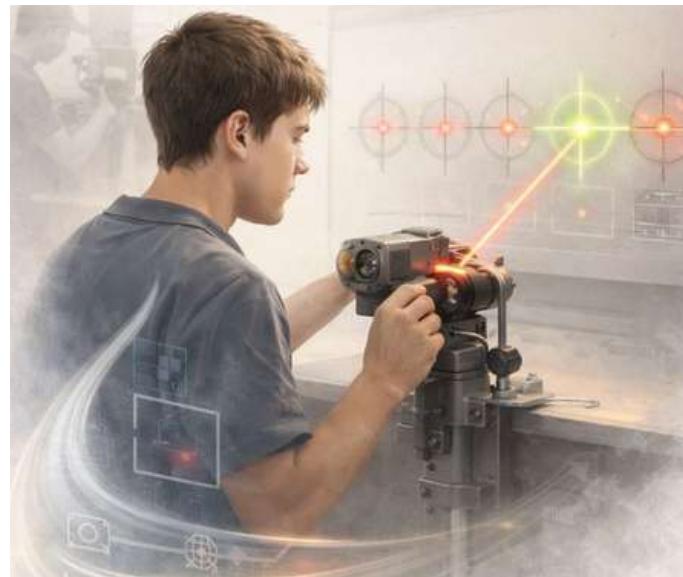
Lumo calculates the displacement vector how far the laser dot is from the crosshair center and displays simple guidance:

 "Move slightly left... now a touch up."

Nitin turns the adjustment gently. The glowing dot creeps closer. But Lumo doesn't trust sight alone.

As the laser settles near the center, the hidden thermistor begins to warm. The PCB reads its resistance through the ADC, asking a final question: Is the heat signal strong enough? Is this truly centered? The threshold adjusts automatically for ambient temperature because hangars can be cold, and runways can be blazing hot. Only when vision and heat agree does Lumo respond with certainty.

In Nitin's story, why does Lumo use both the camera (YOLO) and the thermistor to confirm alignment?

○ To make the alignment process look more advanced

○ To reduce power consumption of the laser

○ To ensure alignment is confirmed by both visual position and heat-based validation

○ To allow multiple technicians to work at the same time

INNOVATION
Reference:
Nath, K., Virani, D., Rai, A., Singh, J., Sannapareddy, M., Prasad, K. G. & Singh, G. Laser harmonisation device for automated alignment of hardpoints in aircraft.

📄 *Patent Number*: 574966

🏢 *Developed by*: Indian Institute of Technology, Mandi, India

🔗 | By **Dr. Preeti Sharma**

TEACHING CPUs TO THINK BEFORE THEY OVERHEAT

Researchers at the Indian Institute of Technology Hyderabad have developed an intelligent method to address one of the most persistent problems in modern computing CPU thermal throttling.

In embedded systems such as smartphones, edge AI devices, and automotive controllers, processors often slow down suddenly when temperatures rise. This safety response protects hardware but significantly reduces performance. Conventional thermal managers react only after a temperature limit is crossed, making them reactive rather than preventive.

To overcome this, the IIT Hyderabad team introduced a reinforcement-learning-based thermal management system that predicts and acts in advance.

Instead of relying only on current sensor readings, the sy-

stem forecasts upcoming CPU temperature using past temperature history, power consumption, CPU load, and operating frequency. This predictive ability enables early identification of thermal risk.

The true innovation lies in combining temperature prediction with reinforcement learning and performance feedback. The system evaluates CPU efficiency using Instructions Per Cycle (IPC) and learns which operating frequency best balances temperature, power, and performance. Each decision is rewarded or penalized, allowing continuous improvement.

As a result, the CPU no longer reaches thermal limits and slows abruptly. Instead, it adjusts its speed smoothly before danger occurs, maintaining stable temperature while preserving near-optimal performance.

Experimental results showed high prediction accuracy and a significant reduction in thermal throttling events. Compared to traditional OS-based governors, the approach maintained stable temperatures with minimal performance loss.

This work transforms thermal management from a reactive protection mechanism into an intelligent, learning-driven optimization process. It is especially valuable for autonomous systems, electric vehicles, edge computing, and high-performance embedded platforms.

By integrating prediction, learning, and real-time control, the IIT Hyderabad team has demonstrated how artificial intelligence can prevent hardware failure rather than merely respond to it.

INNOVATION

Reference:

Nisha, P., Vinay, R., Laad, K. & Acharyya, A (2026). Reinforcement-based learning method for maintaining CPU temperature.

📄 ***Patent Number***: 577563

🏢 ***Developed by***: Indian Institute of Technology, Hyderabad, India

🔗 | By **Dr. Sudha Shankar**

TRUTH IN THE STREAM: HOW A REAL-TIME SYSTEM FIGHTS FAKE NEWS

G anesh was a data analyst, but more importantly, he was a regular news reader like millions of others scrolling through headlines every day. One morning, a shocking financial headline flooded social media. Stocks dipped within minutes. Ganesh paused. Is this real? he wondered.

Behind the scenes, a real-time Fake News Detection System had already gone to work.

As the article appeared online, the system instantly collected it as input data from multiple sources. Ganesh never saw this step but it happened in milliseconds. The system's machine learning engine began its first task: preprocessing. The text was cleaned, irrelevant words removed, and the article prepared for analysis.
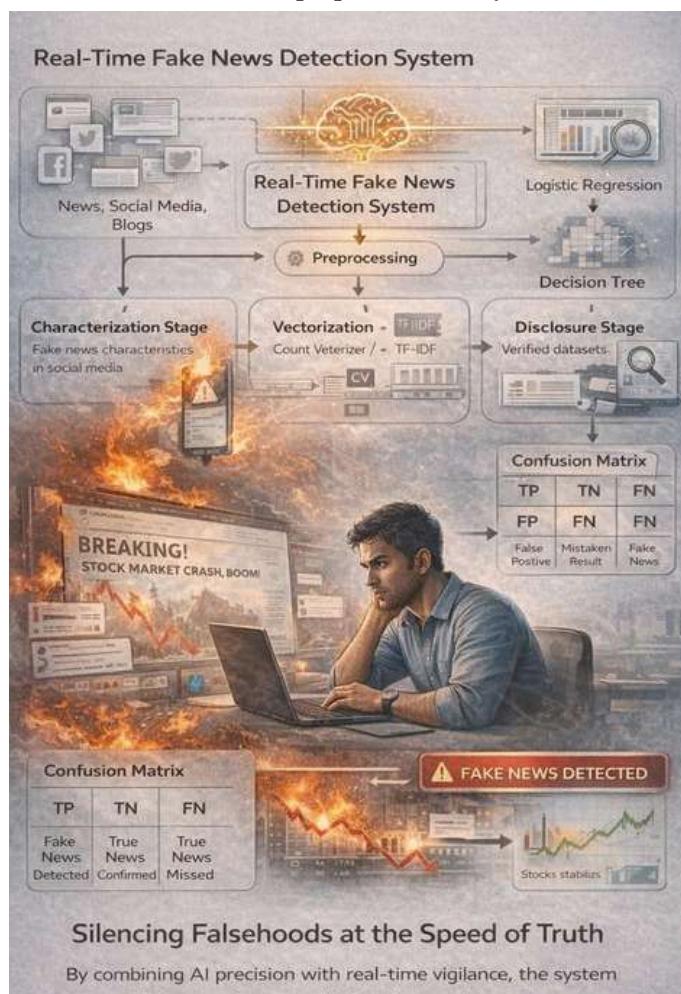
Next came vectorization. Words were transformed into numerical features using Natural Language Processing (NLP) techniques such as Count Vectorizer and TF-IDF, allowing the machine to interpret language mathematically. This transformed data was then fed into two trained classifiers: Logistic Regression and Decision Tree Classification.

Ganesh imagined them as two judges working in parallel. The Logistic Regression model, using its S-shaped probability curve, calculated the likelihood of the news being real or fake. At the same time, the Decision Tree model analyzed the article feature by feature headline structure, word patterns, emotional tone branching step by step until it reached a conclusion.

The system then evaluated the article in two critical stages. In the characterization stage, it identified common fake-news patterns seen across social media. In the disclosure stage, it compared the article with verified datasets and previously learned cases using supervised learning methods.

Finally, the system generated a confusion matrix and calculated accuracy in real time.

⚠️ Fake News Detected

Before the rumor could spread further, alerts were issued and platforms were informed. Ganesh refreshed his feed and saw a warning label appear on the article.

He smiled not because the news was fake, but because technology had protected the truth.

This system doesn't silence voices or censor opinions.

It simply ensures that facts travel faster than falsehoods in real time.

INNOVATION
Reference:
Baghel, D., Swamiwal, A., Singh, J. P., Srivastava, M. & Galav, R. K. Fake news detection.

📄 *Patent Number*: 575387

📅*Developed by*: GLA University, Mathura, India.

🔗 | By **Dr. Sourav Kumar**

THE ROOM THAT LEARNED TO BREATHE

When Anil walked into the newly renovated office, something felt wrong. The walls gleamed with fresh paint, the air-conditioning hummed softly, yet within minutes his eyes began to sting and a dull headache crept in. Others felt it too restlessness, dizziness, and unexplainable discomfort. The room looked perfect, but the air told a different story.

Hidden inside the ventilation duct was a small, intelligent device the Indoor Air Quality Monitoring System quietly working to protect everyone inside.

The device constantly sampled the air using an array of sensors, each designed to detect specific gases such as volatile organic compounds (VOCs), carbon dioxide, and methane. Instead of letting all sensors speak at once and interfere with each other, a smart switch allowed only one sensor to send its signal at a time. This ensured clarity one voice, one reading, zero confusion.
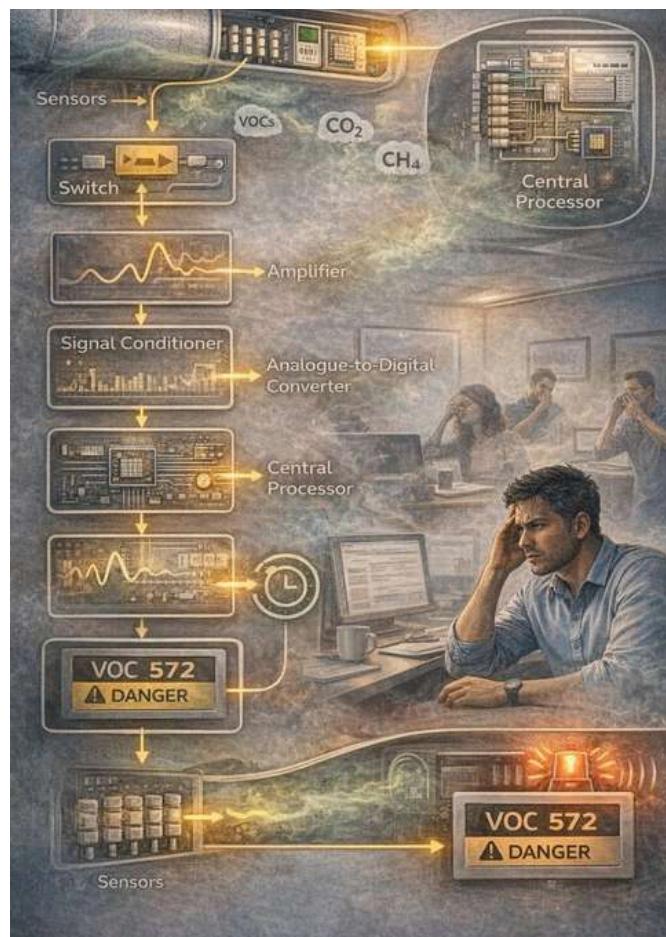
Each selected sensor's signal was weak at first, just a whisper of voltage. An internal amplifier strengthened it, and a signal conditioner cleaned it removing noise, balancing the signal, and fine-tuning it for accuracy. The refined signal then passed through an analogue-to-digital converter, transforming raw electrical data into digital information.

At the heart of the system sat the central processing unit the decision-maker. It analyzed the digital data, translated it into meaningful concentration values, and displayed them clearly on an LCD screen. Anil glanced at the display: VOC levels were climbing dangerously.

The processor compared the readings against predefined safety thresholds. When the values crossed safe limits, the system acted instantly. A sharp alarm buzzer sounded, alerting occupants to evacuate. The message was clear: the air was no longer safe to breathe.

What made the system truly intelligent was its timing. Using an internal timer, the processor automatically switched between sensors every few seconds, ensuring continuous and efficient monitoring of multiple gases without human intervention.

As fresh air was circulated and levels dropped, the alarm stopped. The room became safe again.

The device didn't just measure air it protected lives, ensuring that enclosed spaces learned when to warn, when to act, and when to breathe easy again.

INNOVATION
Reference:
Wankhede, S. U. Monitoring device for detecting air quality of an indoor enclosed area.

📄 *Patent Number*: 575195

📅 *Developed by*: Wankhede, Shweta Umesh, Nagpur, India.

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🔗 | By **Dr. Ipsita Mohanty**

A LAB IN THE PALM OF THE HAND

Rohit sat quietly in his room, holding his phone, feeling the familiar anxiety that came with fertility tests. In the past, this would have meant a clinic visit, long waits, awkward conversations, and expensive laboratory procedures. Today was different. In front of him lay a small, portable device a biological sample analysis system designed to bring lab-quality diagnostics into everyday settings.

Rohit carefully introduced the semen sample into a tiny inlet on a transparent microfluidic chip made of PDMS. With a gentle press of the pressure pump, the sample flowed smoothly into a precisely defined detection platform, creating a controlled micro-volume ideal for analysis. Everything happened neatly, without spills or contamination.
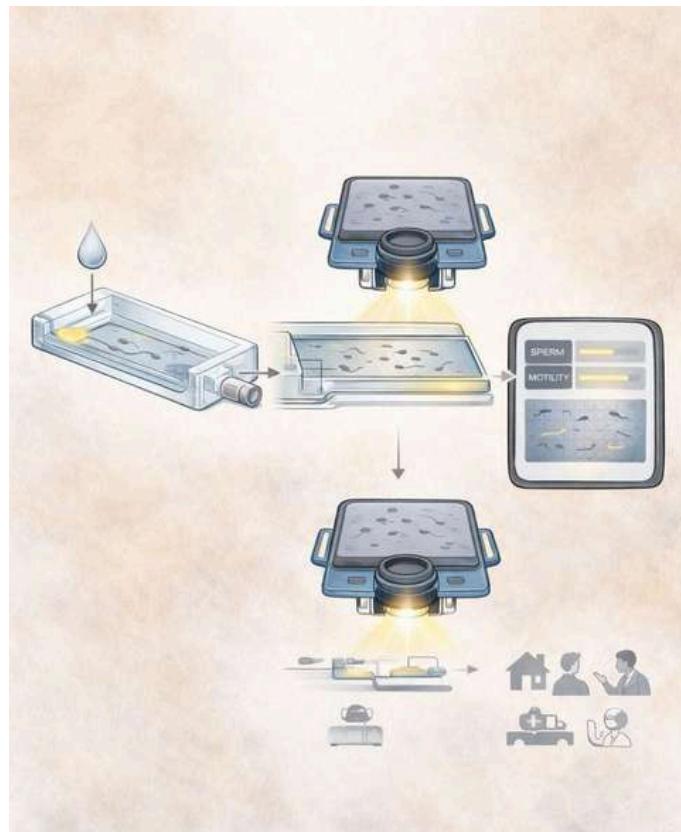
Attached to his smartphone was a simple but powerful macrolens, aligned perfectly using adjustable support wings. These wings ensured the phone camera sat exactly above the detection platform, maximizing clarity and focus. The phone's flashlight switched on automatically, illuminating the sample below.

On the screen, Rohit watched as high-resolution images and short videos appeared tiny sperm cells moving within the channel. The device's software instantly processed the visuals using advanced image analysis algorithms. Within seconds, key parameters were calculated: sperm count, motility, density, and morphology. What once required trained technicians and bulky microscopes was now happening in real time, right in his hands.

Behind this simplicity was thoughtful engineering. The polymer macrolens, carefully molded at high temperatures, enhanced resolution down to micrometer levels. The microfluidic channel ensured consistent flow and accurate observation. Automated alignment and imaging removed guesswork and reduced human error.

Most importantly, the system respected privacy. Rohit didn't need to travel, explain, or wait. The results were clear, immediate, and reliable comparable to standard laboratory analysis. If needed, the data could be saved, shared with a clinician, or used for follow-up assessments.

As Rohit set the device aside, he felt relief not just from the results, but from knowing that modern diagnostics no longer had to be distant or intimidating. This small system had transformed complex biomedical testing into something accessible, private, and empowering, redefining how healthcare could fit into everyday life.

INNOVATION
Reference:
Shubham Mishra, Ankur Verma, and Gopal Krishna Tewari. Portable Biological Sample Analysis System.

📄 *Patent Number*: 576069

📅 ***Developed by***: *Department of Chemical Engineering and Technology, IIT, BHU*

Dr. Aditi Jain, Ph.D.

SCIENTIFIC PARTNERSHIPS MANAGER, INDIA
AMERICAN SOCIETY FOR MICROBIOLOGY, UNITED STATES OF
AMERICA

A conversation with Dr. Aditi Jain

When you began your PhD, did you imagine a career beyond the lab, or did this path unfold gradually?

- I began my PhD journey with an open mind, which in hindsight feels quite bold given the societal pressures to have it all figured out. The motivation was always to learn, upskill, and put that knowledge to good use. Around the third year, I started thinking more intentionally about career options post-PhD, paying attention to opportunities and learning from conversations with professors and visitors coming to the Indian Institute of Science (IISc), and those I met at scientific events. One-on-one meetings with my advisor were invaluable in helping me understand what roles would feel like a natural fit for me. I've always believed career choices can evolve, and if something genuinely excites you even if it's unconventional, it's worth taking a leap of faith.

Many researchers feel that stepping away from the bench means stepping away from science. Did you ever feel that tension, and how do you see it now?

- I think context is important here and it really depends on the path you choose. For me, stepping away from the bench didn't feel like leaving science. The best part of roles in the publishing sector is that it's just another way of staying connected to scientific discovery. I do miss the thrill of wet lab experiments, but I take equal pride in contributing to publishing programs and bringing them to India in ways that advocate for regional priorities and needs. It's really about impact, whether that's generating knowledge at the bench or enabling research to reach the world.

Which aspects of your scientific training have been most valuable in your current role outside active research?

- I firmly believe that, apart from technical expertise, people skills can greatly influence both one's workplace experience and career trajectory. I'm grateful to my lab seniors and colleagues who set a strong example of empathetic leadership, mentorship, and excellence in work which is something I continue to draw inspiration from.

You now work closely with global scientific communities. How would you describe the role that scientific societies play in shaping research culture today?

- Scientific societies play an indispensable role in shaping research direction, culture and priorities. They carry a legacy of advancing science to improve our lives through trusted literature and knowledge dissemination. Beyond publishing, societies advocate for issues of global importance, provide evidence-backed feedback to decision makers, and champion ethical standards. They create platforms for networking, mentorship, and career development, with the aim of ensuring that scientists at all stages have access to resources and opportunities.

In your work at the American Society for Microbiology, what have you learned about why partnerships and networks are becoming so critical in modern science?

- I agree that building partnerships and nurturing networks have become critical to modern science because the complexity of today's challenges whether antimicrobial resistance, climate change, or emerging pathogens cannot be solved in isolation. Through my work at an international scientific society like ASM, I've witnessed that collaborations can open doors to diverse expertise, resources, and perspectives that accelerate discovery and innovation, and set

- new standards of scientific excellence. International networks amplify impact by creating platforms for knowledge exchange, enabling scientists to break silos to resolve global issues with collective knowledge.

What opportunities for students and early-career researchers do global societies like ASM offer that are often overlooked, especially in India?

- Global societies like ASM offer a wealth of opportunities for students and early-career researchers, especially in India. Through free ASM membership under the Global Outreach category for anyone affiliated with eligible countries (India is currently on the list), members gain access to career resources, fellowship and travel grant applications, and networking platforms. Programs like the ASM Future Leaders Mentorship Fellowship provide structured guidance to emerging scientists, while initiatives such as the ASM Career Development Grant for Postdoctoral Women offer up to $2,000 for skill-building through courses, lab visits, or conferences. Students can also start ASM Student Chapters at their universities, hosting events like career panels, industry visits, and science fair judging to foster leadership and community engagement. Beyond this, ASM's YouTube channel hosts videos on cutting-edge microbiology and professional development insights. ASM's Science Communication Toolkit is also another valuable resource for researchers to learn how to share their work effectively. The ASM meetings such as the

- ASM Global Research Symposium series are great platforms to showcase one's research work and receive valuable feedback from global experts.

What misconceptions do scientists commonly have about careers beyond academia, particularly roles that sit at the science–policy–community interface?

- One of the common misconceptions I continue to address whenever I'm asked about a career in publishing sector, is that people think such roles are mainly about science communication, and manuscript editing. While communication is an essential component, these roles are far more multidimensional. For instance, in scientific publishing, the job is not just to edit papers; it involves data analysis, peer review management, ethical oversight, community engagement, and creative ways to disseminate published research. Similarly, roles in science policy would require understanding regulatory frameworks, stakeholder negotiation, and translating evidence into actionable guidelines, not only summarizing research. Community-focused positions require program development, advocacy, public speaking and capacity-building, which demand leadership and networking skills beyond technical expertise.

What kinds of experiences during a PhD can genuinely help someone transition into partnership-, outreach-, or policy-focused roles?

- PhD scholars can sometimes become very focused on their own

- world - their thesis, their best poster award, their imaging slot, and their struggles. The ability to think beyond oneself and navigating working relationships within the lab teaches so much about building partnerships. There's no magic bullet for easing the transition to broader roles. It improves over time from learning to work with different personalities and varied working styles. I truly believe, it starts with these basic, and perhaps overlooked experiences.

Has working beyond the bench changed how you define success or purpose as a scientist?

- Once, over a lunch discussion with colleagues, someone asked, 'What success means to you?'. I was pleasantly surprised by the different answers, which made me reflect on how everyone finds their own motivation to work harder. I wouldn't say working beyond the bench has changed how I define success, but a series of experiences, personal and professional, certainly have.

- As a PhD student, there's always an underlying pressure to finish the degree, and the uncertainty about the future feels much higher. In contrast, as a working professional, while the challenges are different, there's more emotional clarity and maturity, which allows you to think beyond tangible goals. For me, real success is when people can trust you easily and that trust is what makes everything else possible.

Do you think scientists are adequately trained to think about impact beyond publications? What needs to change?

- I see that times have changed. Earlier, scientists were trained to focus on publications because they're a measurable outcome and that's fine unless it becomes an obsession leading to ethical misconduct. But now, they are investing in science communication, entrepreneurship, and even incorporating policy perspectives into finding solutions, embedding these into training programs. AI, international forums, and global collaborations have drastically expanded scientists' exposure to more impactful ways and reasons for conducting research.
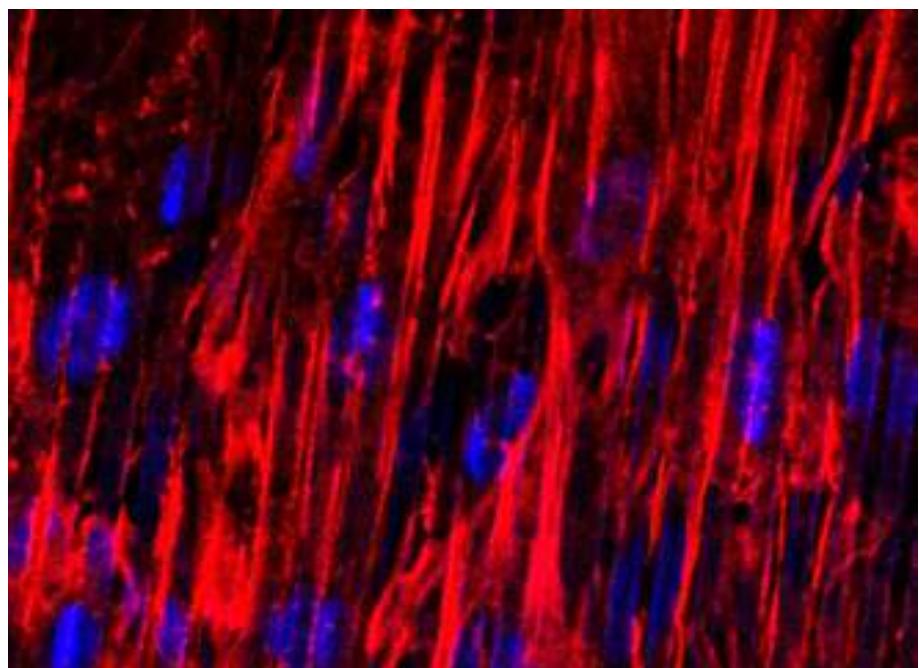
What is one habit or mindset shift that helped you navigate your transition most effectively?

- One habit I cannot advocate enough is nurturing a social circle. Speaking with friends, family, and mentors not only provides support but also helps stay focused on what one can control and not stress over what we cannot.

If a PhD student reading this is uncertain about their future in academia, what is the most important advice you would offer?

- Over a lifetime, career decisions aren't set in stone. One can change paths even after years in a role. No path comes with zero uncertainty and being okay with the unknowns helps alleviate the stress of seeking stability. It's tempting to collect advice from many people, but that often leads to more confusion. It's extremely important to filter out what truly works for you, considering one's own strengths and family commitments.
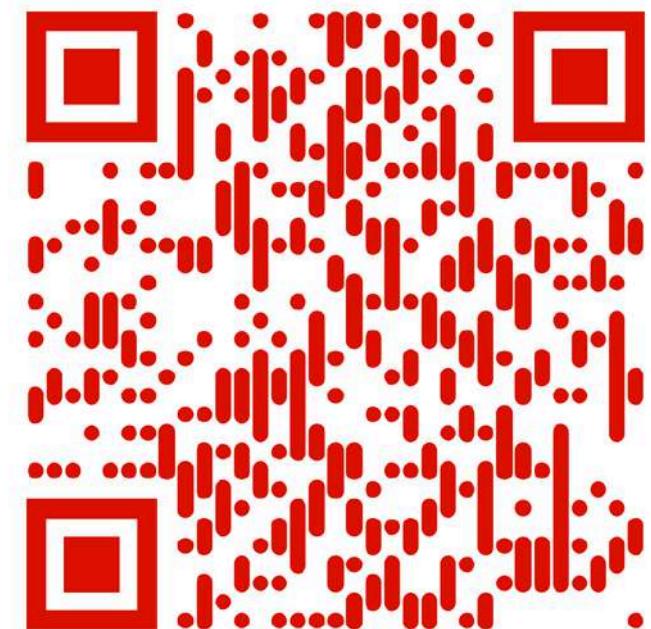
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Dr. Palpu Pushpangadan

India lost one of its most original and ethically grounded scientists on 19 December 2025, with the passing of Dr. Palpu Pushpangadan, a pioneering ethnobiologist, botanist, and visionary leader who bridged traditional knowledge and modern science with rare integrity. At the age of 81, he left behind a scientific legacy that reshaped how India understands medicinal plants, conservation, and the rights of indigenous communities.

Born on 23 January 1944 in Kerala, Pushpangadan developed an early fascination with plants, forests, and the knowledge systems embedded within them. This curiosity grew into a lifelong mission: to document, validate, and protect traditional medicinal knowledge while integrating it with rigorous scientific research. At a time when such knowledge was often dismissed as anecdotal or unscientific, he recognized its depth, complexity, and global relevance.

Dr. Pushpangadan's career was marked by extraordinary institutional leadership. He served as Director of several premier Indian research institutions, including the National Botanical Research Institute (NBRI), Lucknow, the Tropical Botanical Garden and Research Institute (TBGRI), Kerala, the Central Institute of Medicinal and Aromatic Plants (CIMAP), and the Rajiv Gandhi Centre for Biotechnology (RGCB), Thiruvananthapuram. In each role, he strengthened research infrastructure, nurtured young scientists, and expanded India's global footprint in plant science and biotechnology.

Among his most widely known contributions was the development of Jeevani, a herbal formulation derived from Trichopus zeylanicus, traditionally used by the Kani tribal community of Kerala. More than a scientific achievement, Jeevani became a landmark example of ethical bioprospecting. Under Pushpangadan's guidance, the benefits from the commercialization of Jeevani were shared with the Kani community, setting an international precedent for benefit-sharing and community rights. This model often referred to as the TBGRI–Kani model is now cited globally as a best practice in ethnobiology and conservation ethics.

Scientifically, Dr. Pushpangadan was prolific. He authored over 500 research papers, edited or wrote more than 26

A PIONEER OF INDIAN ETHNOBIOLOGY AND ETHICAL SCIENCE
(1944–2025)

books, and was associated with over 230 patents related to medicinal plants, herbal formulations, and biotechnological innovations. His work spanned ethnopharmacology, conservation biology, biodiversity management, and plant biotechnology, influencing policy, industry, and academia alike. His contributions earned him numerous national and international honors, including the Padma Shri, the Borlaug Award, the John W. Harshberger Medal for ethnobotany, and recognition from the UN Equator Initiative. Yet, despite these accolades, Pushpangadan remained deeply committed to the idea that science must serve society—especially marginalized communities who have historically safeguarded biodiversity.

What truly distinguished him was his vision of science as a moral enterprise. Long before debates on intellectual property, access and benefit sharing, or decolonizing science became mainstream, he argued that traditional knowledge holders were not subjects of study, but partners in discovery. He believed that conservation could not succeed without cultural respect, and that innovation divorced from ethics was ultimately hollow.

Even after formal retirement, Dr. Pushpangadan remained intellectually active writing, mentoring, advising policy bodies, and speaking passionately about biodiversity loss and the urgent need for sustainable practices. His conversations seamlessly blended science, philosophy, and social responsibility. With his passing, India has lost more than a botanist or administrator; it has lost a bridge-builder between worlds between tradition and technology, forest and laboratory, community wisdom and global science. Dr. Palpu Pushpangadan's legacy lives on in institutions he shaped, policies he influenced, forests he helped conserve, and in the enduring principle that science must advance with humility, justice, and respect.

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.

Har Gobind Khorana and the Genetic Code (9 January 1922 – 9 November 2011)

01

Dr. Har Gobind Khorana was an Indian-American biochemist whose discoveries reshaped modern molecular biology. Born in a small village in British India, he rose from poverty to global scientific recognition through perseverance and education. He shared the 1968 Nobel Prize in Physiology or Medicine for helping decipher the genetic code, revealing how DNA instructions are translated into proteins.

Khorana demonstrated that specific three-letter RNA sequences (codons) correspond to particular amino acids. By synthesizing artificial RNA chains, he showed how cells read genetic information. He later became the first scientist to chemically synthesize a functional gene, laying the foundation for genetic engineering and biotechnology.

He worked at leading institutions including the University of Wisconsin and MIT, and received honours such as the Padma Vibhushan and the US National Medal of Science. Khorana's life story remains a powerful example of how curiosity, discipline, and vision can transform science and humanity.
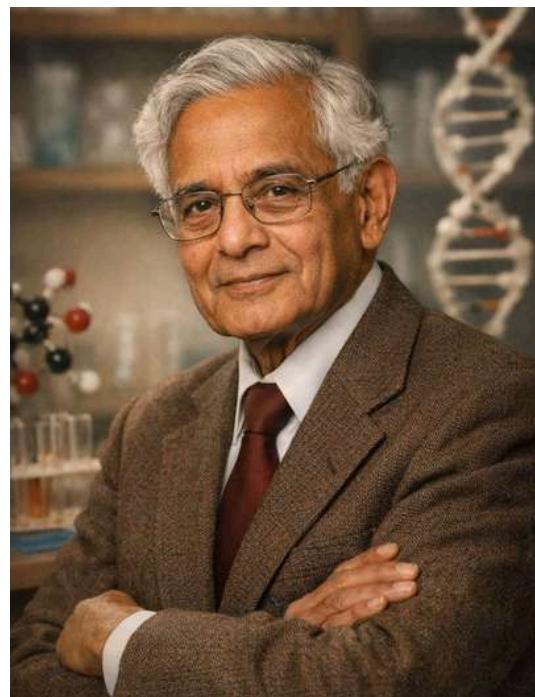
Sir Isaac Newton: Architect of the Laws of Nature (4 January 1643 – 31 March 1727)

02

Sir Isaac Newton was one of the greatest scientists in human history and a founding figure of modern physics and mathematics. Born in England, Newton transformed humanity's understanding of nature through his discoveries in motion, gravity, optics, and calculus.

He formulated the three laws of motion and the law of universal gravitation, showing that the same force that causes an apple to fall also governs the motion of planets. These principles became the foundation of classical physics for more than three centuries. Newton also made major contributions to optics, proving that white light is composed of multiple colors, and he built the first practical reflecting telescope.

In mathematics, he independently developed calculus, a tool essential for science and engineering. His book Principia Mathematica is considered one of the most important scientific works ever written.

Newton's legacy continues to shape space science, engineering, and modern technology, making him a timeless symbol of scientific brilliance.
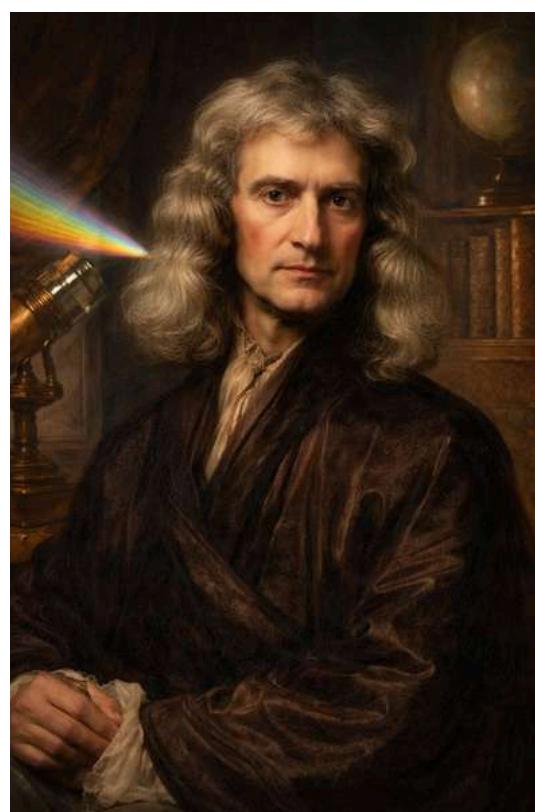
Things YET TO BE DISCOVERED

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.

🔗 | SCIENCE MYSTERIES |

RASHTRIYA VIGYAN PURASKAR 2025: CELEBRATING INDIA'S SCIENTIFIC EXCELLENCE AND NATIONAL IMPACT

The Rashtriya Vigyan Puraskar 2025 stands as one of India's highest recognitions for scientific and technological achievement, honouring researchers whose work has advanced knowledge, innovation, and societal development. Instituted under India's restructured national science awards framework, the Puraskar celebrates excellence across lifetime achievement, distinguished disciplinary contributions, young scientist leadership, and team-based innovation. The 2025 ceremony, held at Rashtrapati Bhavan and presided over by President Droupadi Murmu, reflected the breadth of India's scientific strength from fundamental research to translational technologies that directly benefit society. With awardees representing agriculture, life sciences, chemistry, engineering, space, environmental science, medicine, mathematics, and emerging technologies, the Rashtriya Vigyan Puraskar highlights how science continues to shape India's progress, resilience, and global standing. By recognising both individual brilliance and collaborative missions such as the CSIR-Aroma Mission's Purple Revolution, the awards reaffirm that Indian science is not only advancing knowledge, but also transforming lives at the grassroots level.

Let us extend our heartfelt congratulations to all the esteemed scientists and innovators honoured with the Rashtriya Vigyan Puraskar 2025, and take this opportunity to learn from, celebrate, and be inspired by their remarkable contributions to science, society, and the future of India.

🏆 Vigyan Ratna (Lifetime Achievement)

Prof. Jayant Vishnu Narlikar
(Posthumous)

19 July 1938 – 20 May 2025

Astrophysicist & Cosmologist

Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune

- Co-developed the Hoyle–Narlikar theory of gravitation, presenting an alternative to the Big Bang model.
- Advanced cosmology and astrophysics, exploring alternative models of the universe and conformal gravity.
- Founding Director of the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune.
- Renowned author and science communicator, making astrophysics accessible to the public.
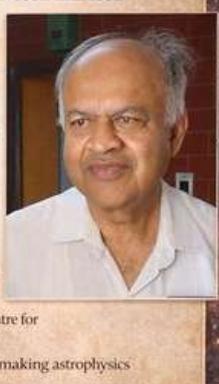
🏆 Vigyan Shri (Distinguished Scientists)

Dr. Gyanendra Pratap Singh

Indian Council of Agricultural Research (ICAR), Pune

Agricultural Science

- Pioneering research in crop improvement for sustainable and resilient agriculture
- Development of climate-resilient, high-yielding crop varieties
- Advancing stress tolerance in wheat and major crops
- Leading farmer-centric research and outreach
- Strengthening national food security through science-driven policy

Dr. Yusuf Mohammad Seikh

Department of Atomic Energy (DAE), Government of India

Atomic Energy

- Advanced nuclear reactor design and technology.
- Innovation in nuclear fuel cycle and reprocessing.
- Development of safe and sustainable radiation technologies.
- Strengthening India's self-reliance in atomic energy.

| SCIENCE MYSTERIES |

RASHTRIYA VIGYAN PURASKAR 2025: CELEBRATING INDIA'S SCIENTIFIC EXCELLENCE AND NATIONAL IMPACT

Prof. Aniruddha B. Pandit

Vice Chancellor & Kashinath Dharmambal Professor of Chemical Engineering Institute of Chemical Technology (ICT), Mumbai
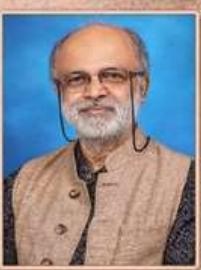
Chemical and Environmental Engineering

- Advances in cavitational and sonochemical reactors.
- Innovative processes for chemical separation and effluent treatment.
- Sustainable technologies for wastewater treatment and renewable energy.
- Contributions to proces intensification and scaling of green technologies.

Dr. S. Venkata Mohan

CSIR–Indian Institute of Chemical Technology (IICT), Hyderabad

Environmental Biotechnology

- Pioneering research in biofuels, biohydrogen, and biorefineries.
- Innovation in environmental waste treatment and resource recovery.
- Integrated bioprocesses for climate change mitigation and circular bioeconomy.
- Sustainable waste to wealth technologies for green energy production

Prof. Pradeep Thalappil

Indian Institute of Technology Madras (IIT Madras), Chennai

Chemistry

- Pioneering research in nanomaterials and environmental chemistry
- Innovation in nanoscience-based water purification technologies
- Development of sustainable and affordable nanotechnology solutions
- Contributions to molecular-level understanding of interactions at environmental interfaces

Shri Jayan N

(Vikram Sarabhai Space Centre, ISRO, Thiruvananthapuram, Kerala)

Aerospace Science & Technology

- Expertise in aerospace vehicle engineering and re-entry missions.
- Director of the Human Space Flight Centre at VSSC, focusing on astronaut training.
- Contributions to launch vehicle and human spaceflight programs.
- Developing the Next Generation Launch Vehicle (NGLV), a reusable Indian rocket for cost-effective satellite deployment.

Dr. K. Thangaraj

CSIR–Centre for Cellular and Molecular Biology (CCMB), Hyderabad

Human Genomics and Genetics

- Landmark studies of Indian population history and genetic diversity
- Pioneering research in ancient DNA and genetic ancestry
- Insights into disease susceptibility among South Asian populatons
- Use of genomics in genomic medicine for improved diagnostics
- Elevated India's profile in genomic and biomedical research

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| SCIENCE MYSTERIES |

RASHTRIYA VIGYAN PURASKAR 2025: CELEBRATING INDIA'S SCIENTIFIC EXCELLENCE AND NATIONAL IMPACT

🏆 Vigyan Yuva – Shanti Swarup Bhatnagar Award

Dr. Kapuganti Jagadis Gupta

(National Institute of Plant Genome Research, New Delhi)

Plant Biotechnology

- Research in plant mitochondrial biology and redox signaling.
- Discovery of novel enzymes in the ascorbate–glutathione cycle.
- Identified mechanisms regulating plant stress responses and improving crop resilience.
- Provided insights into plant redox metabolism and energy regulation pathways.

Dr. Deepa Agashe

(National Centre for Biological Sciences, Bangalore)

Evolutionary Biology & Ecology

- Research on evolutionary mechanisms in insect diets and bacterial symbiosis.
- Contributions to understanding rapid adaptation and genetic diversity.
- Innovative experiments on evolution in natural and laboratory settings.
- Insights into how evolutionary processes shape biodiversity and ecosystems.

Dr. Debarka Sengupta

(Indraprastha Institute of Information Technology Delhi)

Data Science & Computational Biology

- Innovative computational methods for cancer prognosis and treatment targeting.
- Contributions to precision medicine using AI and machine learning.
- Analytical frameworks for single-cell genomics in research.
- Advancing bioinformatics to enhance human health through data science.

Dr. Satendra Kumar Mangrauthia

(ICAR – Indian Institute of Rice Research, Hyderabad)

Crop Biotechnology

- Utilizes RNA interference and CRISPR technology to engineer plant disease resistance.
- Research on microRNA regulation of abiotic stress tolerance in rice and wheat.
- Developed virus-resistant rice varieties improving agricultural productivity.
- Contributions to crop improvement, enhancing yield and resilience of staple crops.

Dr. Waliur Rahaman

(National Centre for Polar and Ocean Research, Goa)

Polar Research & Biogeechemistry

- Research on nutrient cycling and biogeochemistry in polar regions.
- Documenting the impacts of climate change on polar ecosystems.
- Studies on microbial communities and greenhouse gas emissions in the Arctic.
- Contributions to understanding biogeochemical processes in Antarctic and Arctic environments.

Dr. Dibyendu Das

(Indian Institute of Science Education and Researcr Kolkata)

Molecular Chemistry

- Innovative research in self-assembled nanostructures for catalysis and materials.
- Developed artificial enzymes inspired by natural enzymes mimicking biological processes.
- Advancements in designing molecules that self-assemble into complex nanostructures.
- Contributions to supramolecular chemistry and sustainable chemical processes.

Prof. Arkaprava Basu

(Indian Institute of Science, Bangalore)

Computer Systems and Architecture

- Advances in high-performance computer systems and processors.
- Development of secure and efficient computing architectures.
- Research on improving reliability and security in multithreaded processors.
- Novel solutions for cache and memory efficiency in modern computers.

Prof. Sabyasachi Mukherjee

(Tata Institute of Fundamental Research, Mumbai)

Mathematics

- Contributions to arithmetic geometry and algebraic geometry.
- Significant advancements in the theory of p-adic modular forms.
- Research in automorphic forms and Galois representations.
- Development of new structures to understand L–functions and modular curves.

| SCIENCE MYSTERIES |

RASHTRIYA VIGYAN PURASKAR 2025: CELEBRATING INDIA'S SCIENTIFIC EXCELLENCE AND NATIONAL IMPACT

🏆 Vigyan Yuva – Shanti Swarup Bhatnagar Award

Prof. Surhud Shrikant More

(Inter-University Centre for Assronomy and Astrophysics, Pune)

Astronomy & Astrophysics

- Research on large-scale structure of the Universe and galaxy formation.
- Contributions to observational cosmology and galaxy clustering studies.
- Development of novel techniques for statistical analysis of astronomical data.
- Investigations into the nature of cosmic acceleration and dark energy.

Prof. Shweta Prem Agrawal

(Indian Institute of Technology Madras)

Computer Science

- Significant work in cryptography, particularly in lattice-based cryptography.
- Development of secure cryptographic schemes for privacy-preserving computations.
- Research on theoretical foundations of cybersecurity and data privacy.
- Innovations in secure multi-party computation and post-quantum cryptography.

Prof. Mohanasankar Sivaprakasam

(Indian Institute of Technology Madras)

Biomedical Engineering

- Innovation in medical devices for critical and affordable healthcare.
- Development of biomedical instrumentation for diagnostic and therapeutic applications.
- Significant work in the field of health monitoring and medical imaging.
- Research aimed at bridging the gap between engineering and healthcare to meet healthcare needs in India.

Prof. Amit Kumar Agarwal

(Indian Institute of Technology Kanpur)

Physics

- Contributions to the theoretical study of quantum phenomena in two-dimensional madaris.
- Significant work in the field of topological insulators and Dirac materials.
- Development of novel models to understand electron interaction and transport.
- Research on optical conductivity and response functions in quantum systems.

Dr. Suresh Kumar

(Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh)

Biochemistry & Molecular Biology

- Research on protein misfolding and aggregation diseases.
- Studies on amyloids and their role in neurodegenerative disorders, including Alzheimer's disease.
- Investigations into bacterial biofilms and antimicrobial resistance mechanisms.
- Developing innovative strategies to combat pathogenic bacteria and understanding infection processes.

Dr. Ankur Garg

(Indian Space Research Organisation)

Aerospace Engineering

- Significant contributions to propulsion systems for space missions.
- Development of advanced satellite technologies and systems.
- Innovations in aero-thermodynamics and flight mechanics.
- Research focused on enhancing India's space capabilities and scientific aphaniements.
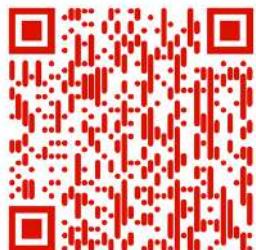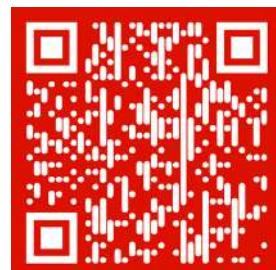
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A Researcher Showcase is a platform designed to highlight the innovative work and contributions of researchers across various fields. It provides an opportunity for scholars to present their findings, exchange ideas, and foster collaborations. RFCSR's showcases helps researchers with networking opportunities to celebrate and support academic and scientific progress.

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

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ARE YOU A RESEARCHER ?
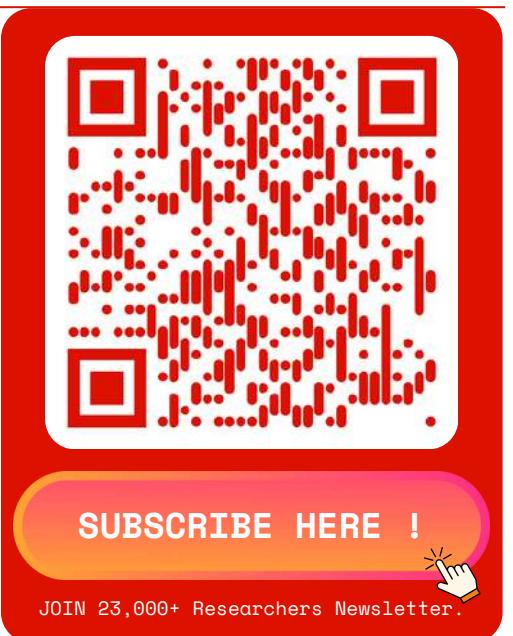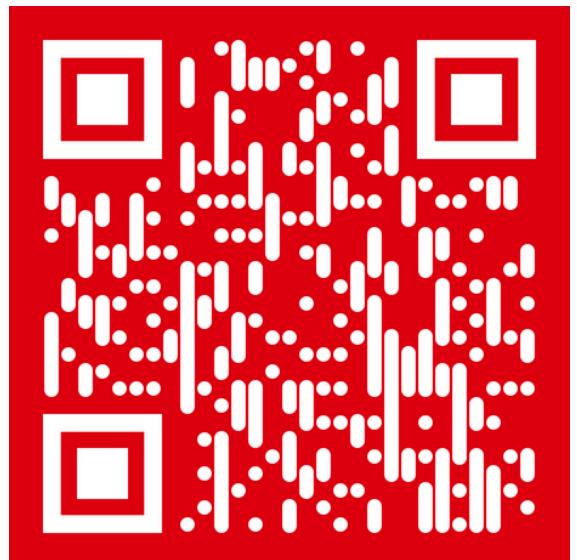
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At Rosalind Franklin Council of Scientific Research (RFCSR), we recognize that the pursuit of science is both inspiring and demanding. Alongside the excitement of discovery, researchers often face unique challenges—intense workloads, high expectations, 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.

IT'S OKAY TO ASK FOR HELP

BE KIND TO YOUR MIND

RESEARCHERS LIFELINE RESEARCH HEALTH

note to self: DO NOT QUIT
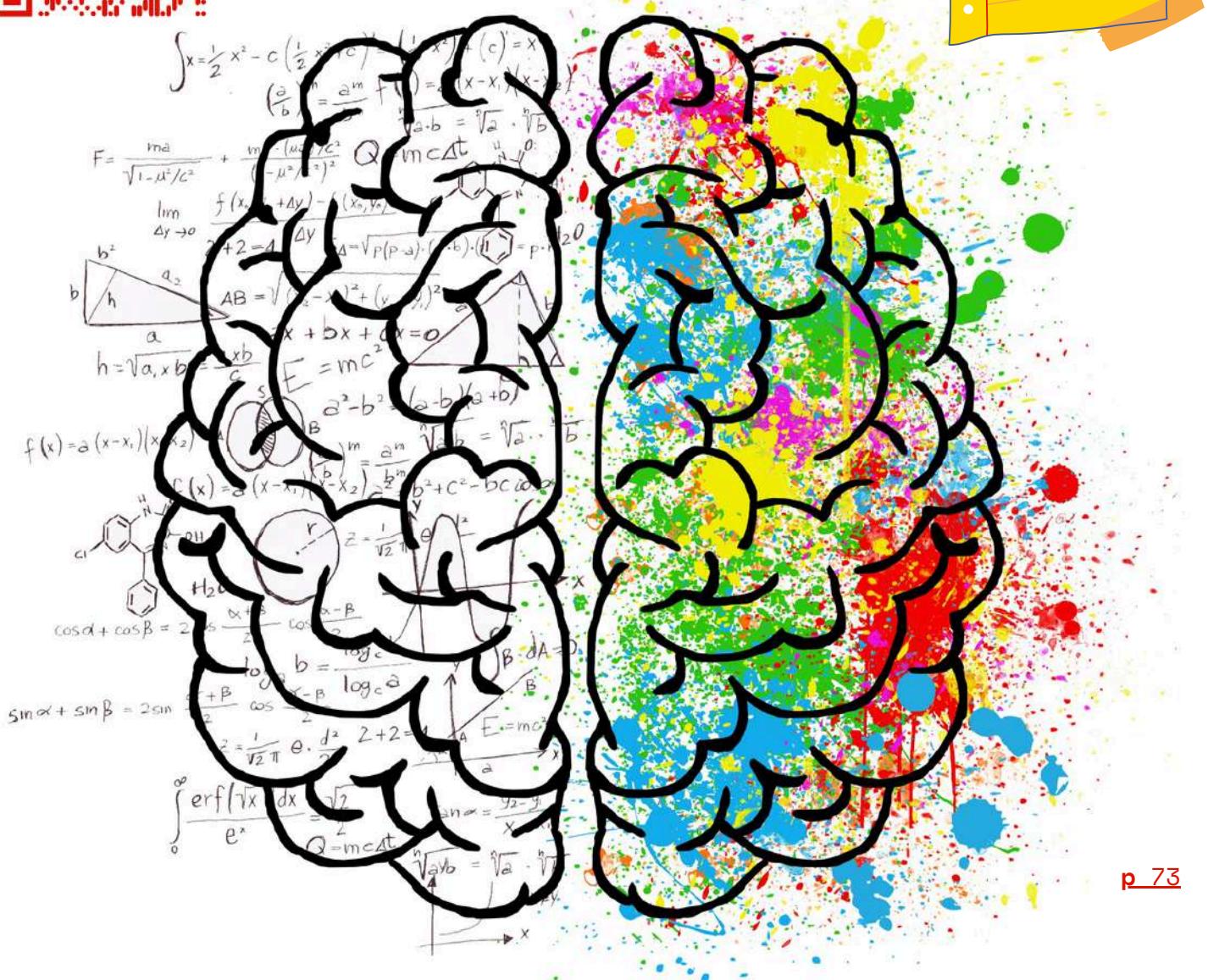
back to school

CURIOUS KID'S
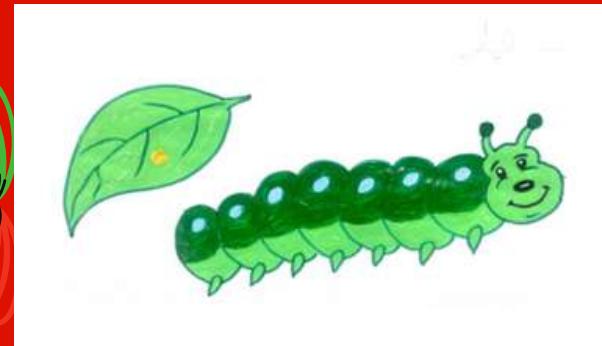
NAME: **Jhanvi Khandelwal**

Age: **11 Years**

SCHOOL: **GD Goenka Public School, Dwarka, Delhi, India**

FOCUS:

I Am a Caterpillar with a Butterfly Inside

Hello! I am a caterpillar, and this is my leaf home. I love eating green leaves because they give me energy. I taste the leaf with my feet before I bite it! When I chew, the leaf turns yellow because it feels hurt. But don't worry, that is nature's way. Inside my body, a butterfly is slowly growing. One day, I will sleep in a cocoon. Then I will wake up with wings and fly in the sky. I may crawl now, but I am really a future butterfly. Nature is full of beautiful surprises!

back to school

CURIOUS KID'S
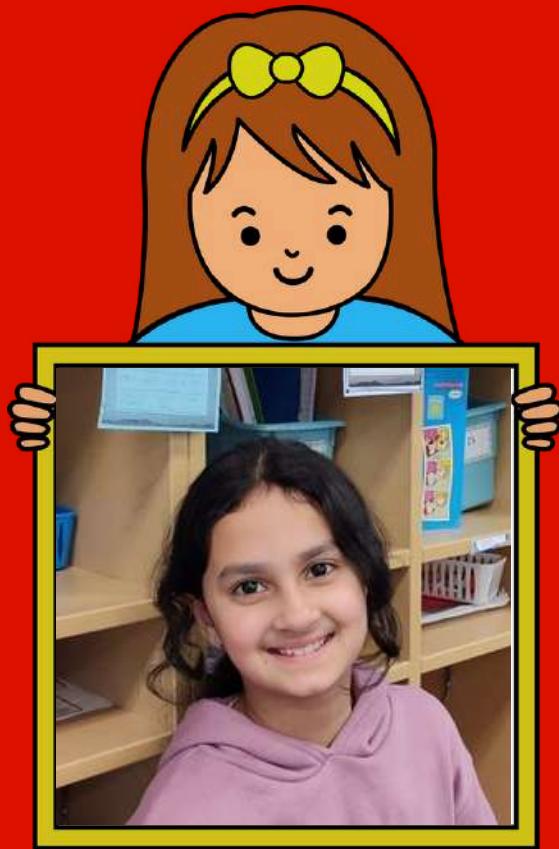
NAME: **Aradhya Tiwari**

Age: **9 Years**

SCHOOL: **Dr Howard Elementary School, Champaign, Illinois, USA**

FOCUS:

Listening Through the Web

Spiders do not have ears like humans, so they cannot hear sounds. Instead, they feel tiny movements in their web. When something touches the web, the web moves a little, and the spider feels this movement through its legs. If a small insect gets stuck, the web shakes quickly and the spider knows food is ready. If the wind blows, the web moves slowly and the spider knows everything is fine. If something big touches the web, the web shakes strongly and the spider understands there may be danger. In this way, the spider's web helps it know what is happening around it, even without touching or hearing anything.

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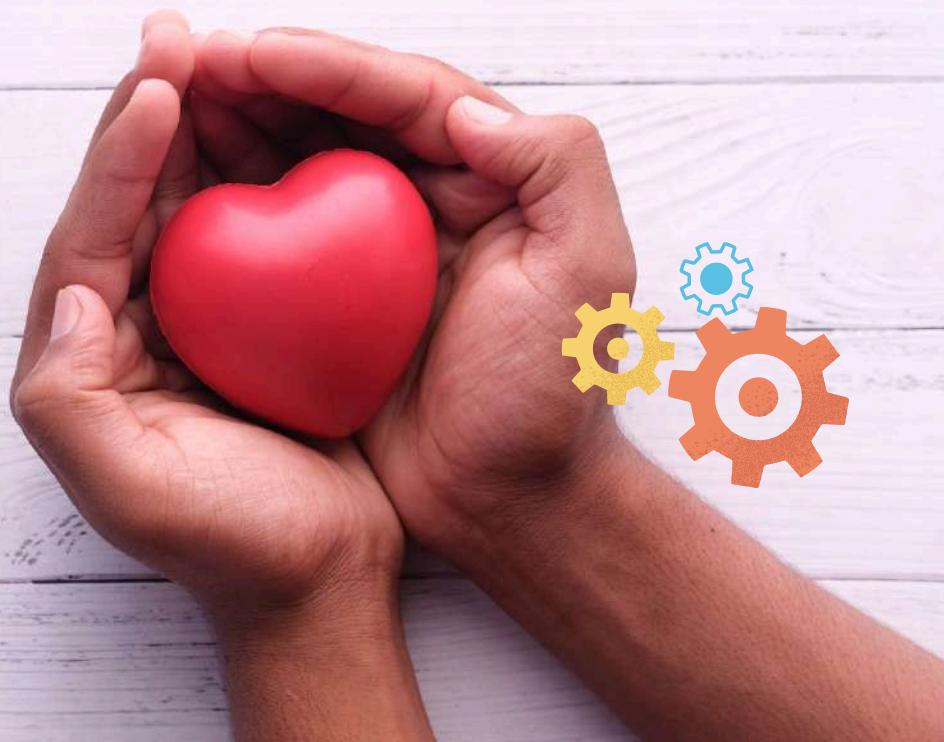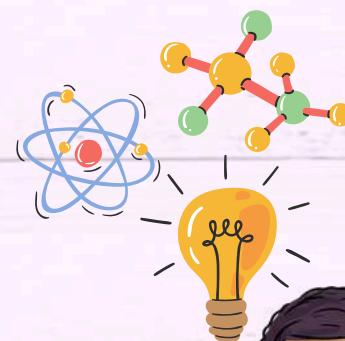
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