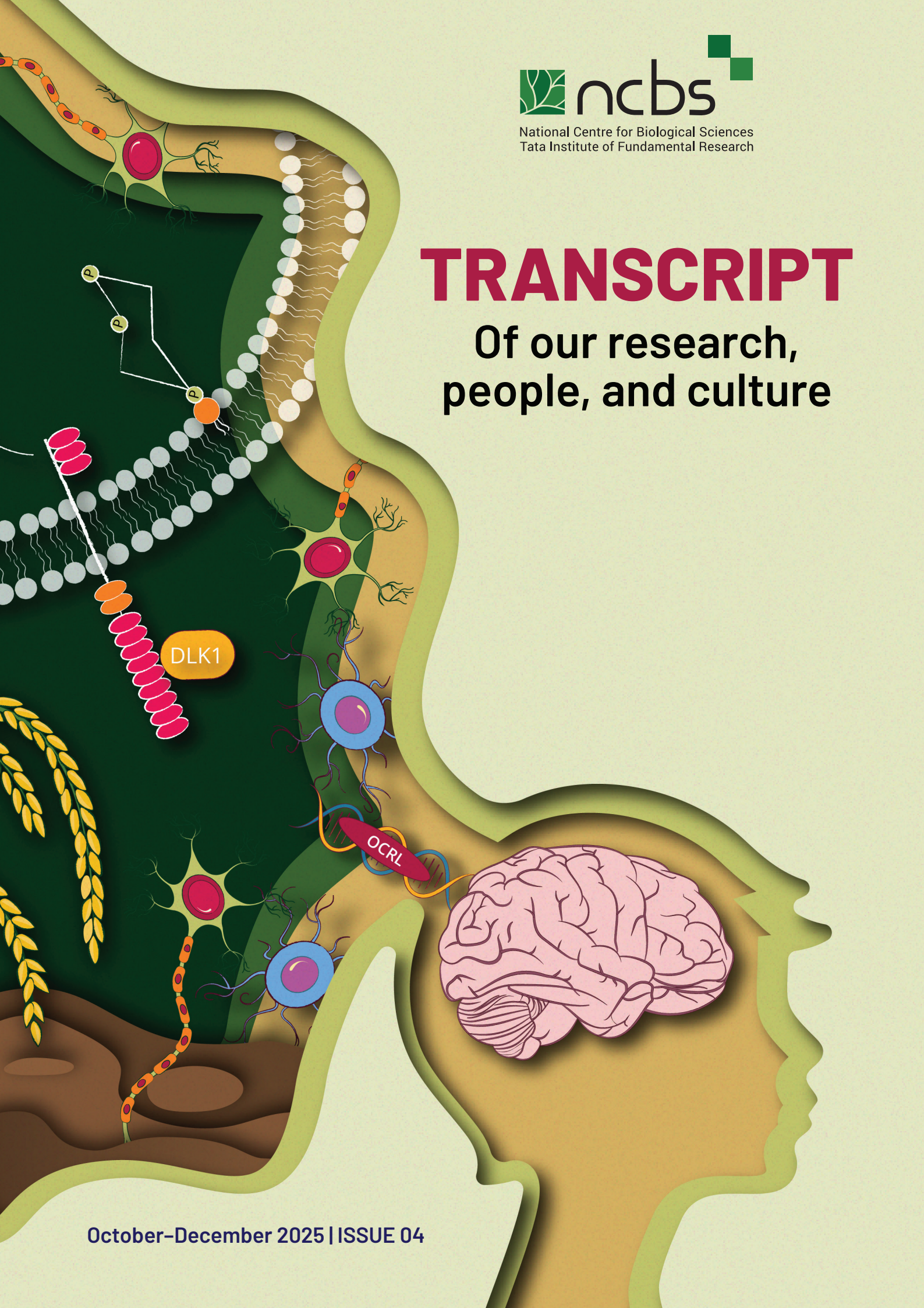


# TRANSCRIPT

Of our research,  
people, and culture



## Faculty Feature

### Tracking Forest Futures Through Traits and Time



Dr. Meghna Krishnadas

Principal Investigator

Plants are all around us, and predictably, sometimes escape the curiosity that several charismatic animals garner. However, there is infinite magic in how forests grow, regenerate, and adapt to changing environments, and that is what drew in Dr. Meghna Krishnadas, who at one time was pursuing a career in medicine. *“When we say ‘switch,’ it sounds like it happened instantaneously,”* she says. *“But it really took a while. It was a process of meandering through.”*

Today, at the Community and Functional Ecology (CaFE) Lab at NCBS, Dr. Krishnadas studies how forests regenerate, the functional traits that determine how they do it, and how that regeneration may change in a warming, human-modified world. Much of her work focuses on seedlings, an often-overlooked life stage which happens to hold a wealth of information. *“People are interested in big trees, but changes at the seedling-level tell you what a future forest might look like,”* she explains. By tracking thousands of individually tagged seedlings over years, her lab’s long-term monitoring is uncovering patterns that short-term studies would never catch.

One of the central ideas guiding her research is functional traits: heritable features of plants like leaf characteristics, wood density, and resource use, which influence how they survive, grow, and interact with their environment. Instead of only focusing on which species are present, trait-based ecology asks why they behave differently, even while growing side by side under the same external conditions.

*“You go beyond just the identity of species and ask whether traits like leaf characteristics, temperature preference, and size can help us make predictions across systems,”* Dr. Krishnadas says. This approach allows ecologists to compare forests in the Western Ghats with those in the Amazon or the Himalayas, and to anticipate how communities might respond to environmental change.

Some of her long-term observations in tropical forests of the central Western Ghats found that seedlings seem to survive less well in nutrient-rich soils. *“This threw us off completely,”* Dr. Krishnadas admits. In a world accustomed to fertilizing plants, the idea that excess nutrients could be harmful feels counterintuitive. While the results are yet to be formally published, the findings may have serious implications: atmospheric nitrogen and phosphorus deposition—an invisible by-product of agriculture and industrial emissions—is increasing globally and might impact forests.

Climate change is another major lens through which her lab examines regeneration. Forest edges, created by fragmentation, are typically warmer and drier than interiors, exposing plants to microclimates that mimic possible future climate scenarios. In a recent study, her team found that acquisitive species—those with traits like higher leaf area and lower leaf mass per area—sometimes survived drought better at forest edges, a counterintuitive result challenging the assumption that conservative, stress-tolerant species would always fare better under dry conditions.



Doing this kind of science in India is not easy. Long-term permits, short funding cycles, and retaining skilled local field staff are constant challenges. *“Most grants last two to five years, but trees live for decades,”* Dr. Krishnadas explains.

At its core, her work is about patience: watching forests grow, change, and respond while peeling back, as she puts it, *“the layers of what plants are doing while they seem to be standing still.”*

Read more about Dr. Krishnadas’ CaFE Lab here: <https://cafelab.in/>

Looking ahead, long-term monitoring remains a priority for her lab. *“Forecasting needs trends, and for that, you need long-term data,”* she says. Her lab is also deepening its focus on plant interactions with soil microbes, fungi, and insects, particularly the chemical traits that mediate these relationships.



# Publication Features

## Mind the Gaps! Proteins Do Better When Packed Tight

Proteins are essential for life—from immune signalling to digestion, almost every biological process relies on them. But proteins can be fragile. Heat, stress, and chemical environments often cause them to unfold and stop functioning. For industrial biotechnology and medicine, this instability is a major bottleneck. Creating proteins that remain stable under harsh conditions can increase efficiency, reduce production costs, and improve therapeutic durability.

A recent study from NCBS sought a way to strengthen proteins without disrupting their function. The research team focused on the hydrophobic core of proteins. This core is made of amino acids that huddle together tightly and repel water. This packing helps a protein keep its shape. But sometimes, the packing is not perfect as tiny empty gaps can form inside during folding. These small gaps make proteins weak, like building a wall with small holes—it can crumble easily. The research team wondered: What if we could fill these gaps with slightly bigger pieces? Would the protein become more stable?

*“We built a computer program called CoreStab. It looks at the 3D shape of a protein and suggests small changes where a slightly bigger amino acid can fit better in the core,”* says Dr. Aravind Ravichandran, the lead author of the study. The program is careful not to perturb the protein’s function.

To test this, the team used a protein called NEDD8. It looks similar to another protein named ubiquitin, but NEDD8 is much less stable. CoreStab found two places inside NEDD8’s core where the amino acid valine was a bit too small, leaving extra space around it. CoreStab suggested replacing valine with a slightly larger amino acid called isoleucine. When the scientists performed the replacement, protein stability improved.

*“The protein’s melting temperature increased by 17°C. It became much tougher without losing its normal function,”* says Dr. Ravichandran.



How does filling a tiny gap hold the whole protein together? Isoleucine’s skeleton is one carbon atom longer than valine’s. The research team showed that this extra carbon atom filled the gap and improved the core’s packing, lowered flexibility, reduced internal tensions, and strengthened long-range interactions across the protein. In other words, the tiny interior upgrades ripple outward, making the entire structure more robust.

*“This shows that improving a protein doesn’t always mean big changes. Small, well-planned edits inside the protein can make it survive heat and stress much better,”* says Prof. Ranabir Das, the principal investigator of the study. *“With CoreStab, scientists can now rapidly test stability-enhancing mutations on many proteins, potentially designing stronger enzymes for industry and more durable protein therapeutics for healthcare. Future studies will explore combining such subtle internal edits with other engineering strategies to tailor proteins for tougher environments,”* he added.

Read the full study here: <https://doi.org/10.1002/pro.70360>



# How Tuberculosis Turns Our Defences Against Us

Tuberculosis (TB) is one of the world's oldest and deadliest diseases, which takes a toll on over a million people every year. Traces of it even appear in Egyptian mummies. What makes this bacteria particularly dangerous is not merely its persistence, but its uncanny ability to manipulate our immune defences.

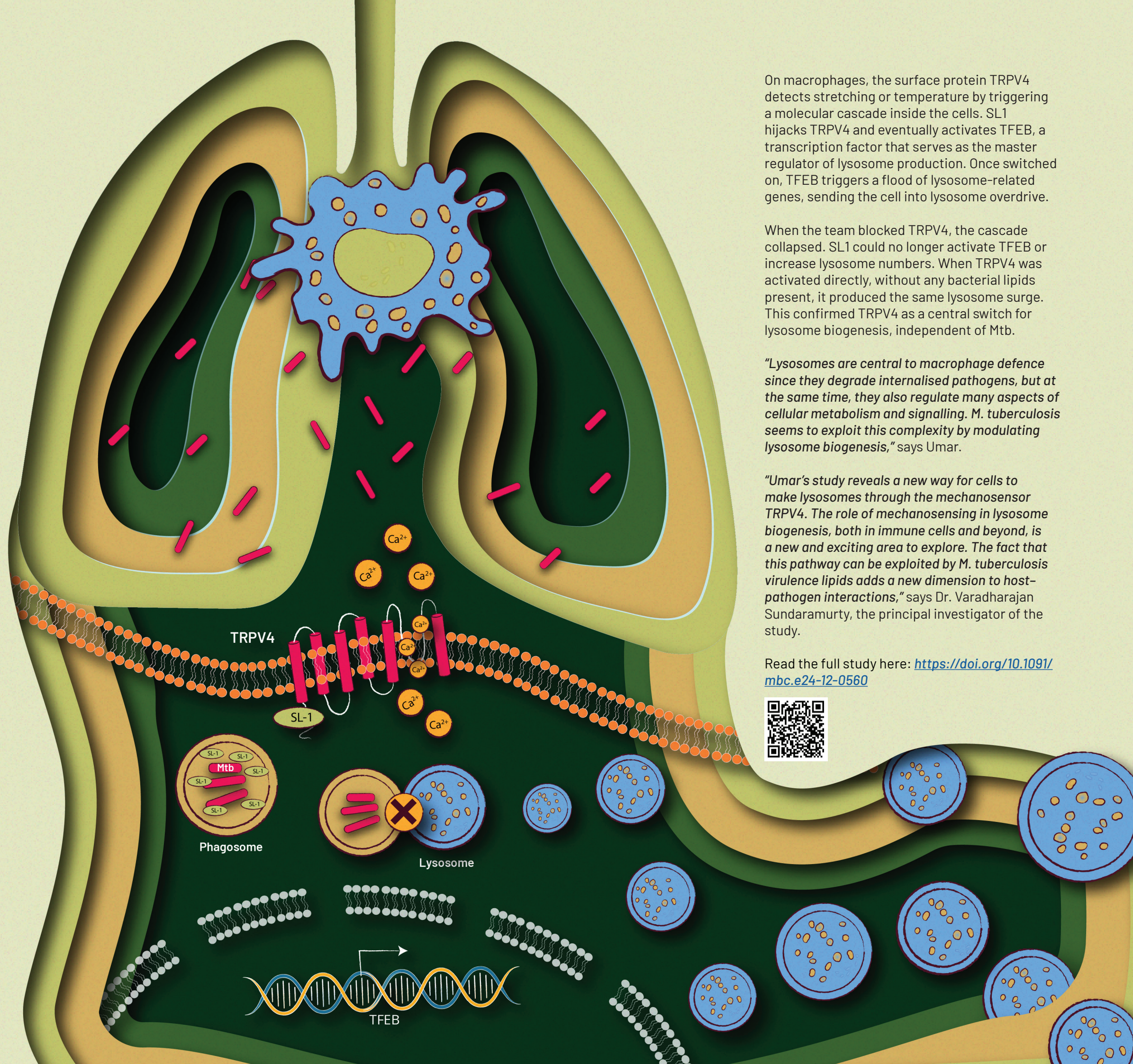
A recent study from Dr. Varadharajan Sundaramurthy's lab at NCBS reveals a new mechanism that helps *Mycobacterium tuberculosis* (Mtb) take over our immune system. When a microbe enters our body, specialised immune cells called macrophages engulf it by wrapping it inside a tiny bubble known as a phagosome. To destroy the invader, the phagosome must fuse with another structure called a lysosome—an organelle packed with powerful digestive enzymes. When the phagosome and lysosome merge, they form a phagolysosome—a hostile chamber that breaks down and eliminates most bacteria.

However, Mtb has evolved clever survival strategies. One of its most effective tricks is to block the fusion of the phagosome with the lysosome. By doing so, Mtb avoids exposure to the lysosome's destructive enzymes and safely hides within the phagosome, where it can survive.

*"Blocking fusion should be enough. But recent studies noticed something puzzling. Cells infected with Mtb actually have more lysosomes than uninfected cells,"* says Mr. Ibrahim Umar, the lead author of the study.

In a previous study, their team used high-resolution imaging, infection models, and genetic tools to trace the effect back to one bacterial surface molecule: sulfolipid-1 (SL1)—a well-studied virulence lipid.

SL1 rewires the functioning of the host cells. This lipid flips a switch in immune cells, which dramatically increases the number of lysosomes—the very organelles designed to destroy microbes. Why an Mtb virulence associated molecule should do this is a paradox emerging from this work.



On macrophages, the surface protein TRPV4 detects stretching or temperature by triggering a molecular cascade inside the cells. SL1 hijacks TRPV4 and eventually activates TFEB, a transcription factor that serves as the master regulator of lysosome production. Once switched on, TFEB triggers a flood of lysosome-related genes, sending the cell into lysosome overdrive.

When the team blocked TRPV4, the cascade collapsed. SL1 could no longer activate TFEB or increase lysosome numbers. When TRPV4 was activated directly, without any bacterial lipids present, it produced the same lysosome surge. This confirmed TRPV4 as a central switch for lysosome biogenesis, independent of Mtb.

*"Lysosomes are central to macrophage defence since they degrade internalised pathogens, but at the same time, they also regulate many aspects of cellular metabolism and signalling. M. tuberculosis seems to exploit this complexity by modulating lysosome biogenesis,"* says Umar.

*"Umar's study reveals a new way for cells to make lysosomes through the mechanosensor TRPV4. The role of mechanosensing in lysosome biogenesis, both in immune cells and beyond, is a new and exciting area to explore. The fact that this pathway can be exploited by M. tuberculosis virulence lipids adds a new dimension to host-pathogen interactions,"* says Dr. Varadharajan Sundaramurthy, the principal investigator of the study.

Read the full study here: <https://doi.org/10.1091/mbc.e24-12-0560>



## Publication Highlights

### Reawakening Silent Neurons to Treat Brain Disorders

Some brain disorders leave neurons alive but functionally silent. Researchers at the Rohini Nilekani Centre for Brain and Mind at NCBS investigated how such silencing occurs and whether it can be reversed. Using patient-derived induced pluripotent stem cells from individuals with Lowe syndrome, the team generated 3D brain organoids to model early human brain development. They found that neurons were unusually inactive due to the loss of the enzyme OCRL, leading to an excess of phospholipid PI(4,5)P<sub>2</sub> and disrupted electrical signalling, along with increased astrocyte production. They also repurposed a drug, which restored neuronal activity, showing that this silencing is reversible and potentially treatable.

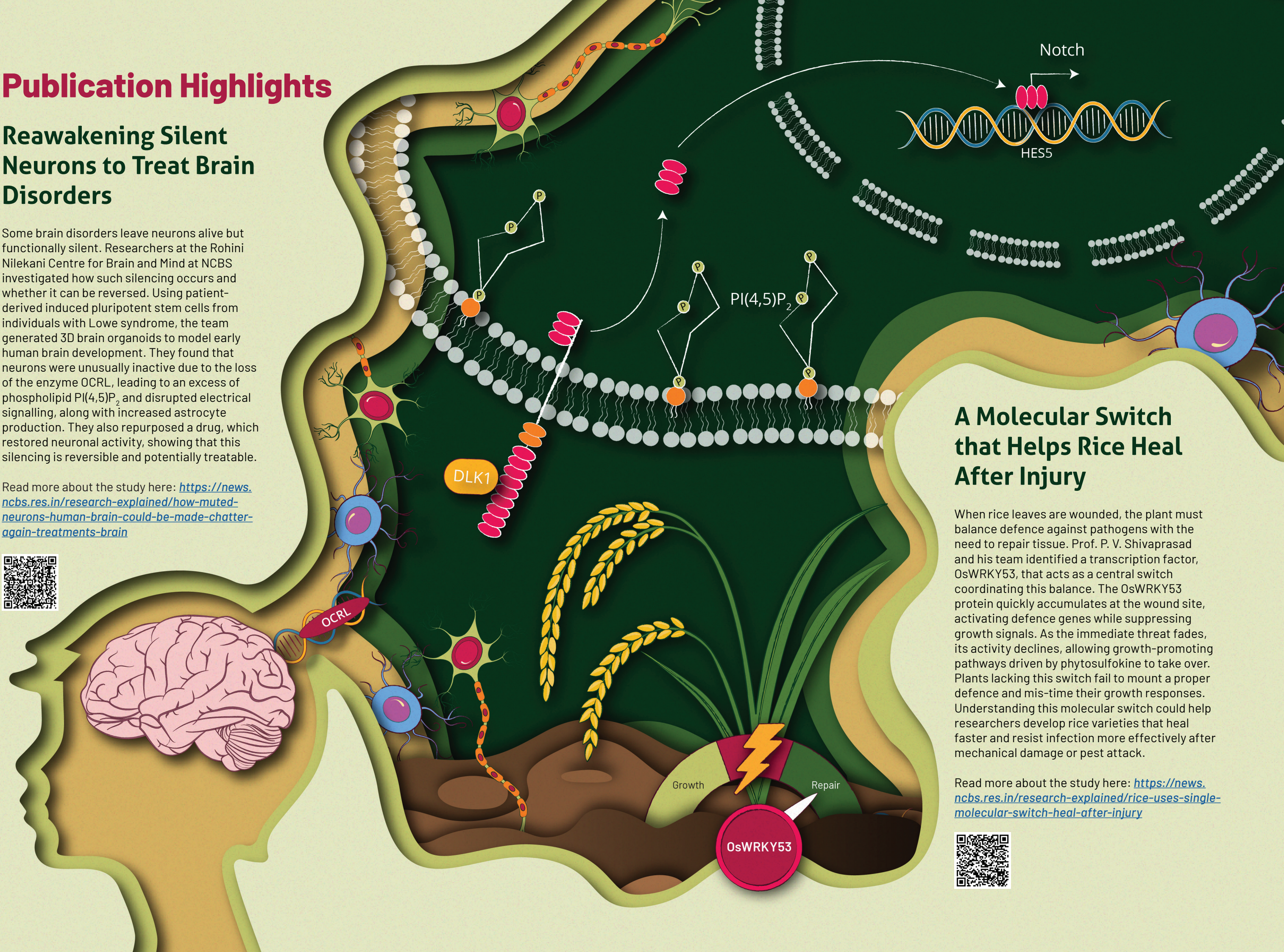
Read more about the study here: <https://news.ncbs.res.in/research-explained/how-muted-neurons-human-brain-could-be-made-chatter-again-treatments-brain>



### A Molecular Switch that Helps Rice Heal After Injury

When rice leaves are wounded, the plant must balance defence against pathogens with the need to repair tissue. Prof. P. V. Shivaprasad and his team identified a transcription factor, OsWRKY53, that acts as a central switch coordinating this balance. The OsWRKY53 protein quickly accumulates at the wound site, activating defence genes while suppressing growth signals. As the immediate threat fades, its activity declines, allowing growth-promoting pathways driven by phytosulfokine to take over. Plants lacking this switch fail to mount a proper defence and mis-time their growth responses. Understanding this molecular switch could help researchers develop rice varieties that heal faster and resist infection more effectively after mechanical damage or pest attack.

Read more about the study here: <https://news.ncbs.res.in/research-explained/rice-uses-single-molecular-switch-heal-after-injury>



# Facility Feature

## Scaling Science and Research at NCBS with Technical Services

At NCBS, while research happens across the many labs on campus, much of it is quietly enabled behind the scenes by the Technical Services facility. The facility stands as a strong pillar: one that designs, builds, maintains, and increasingly innovates the infrastructure that research depends on.

The facility did not begin as a single, unified entity. *“Technical Services at NCBS is quite old—it existed much before I joined,”* says Mr. Prem Chandra Gautam, who has been associated with the campus since 2002 and started the Instrumentation Division in 2014. The service was originally started by then-Dean Prof. Jayant B. Udgaonkar and later managed by Professor Satyajit Mayor, before being overseen by two committees led by Professor Upinder Singh Bhalla.

A major restructuring in 2014 brought these functions together, splitting responsibilities into project execution and operations-and-maintenance teams. Mr. Gautam led the Operations and Maintenance team while Mr. Rangaswamy handled projects. That shift allowed the group to move from simply keeping things running to actively shaping how research infrastructure is designed and delivered across the campus.

Today, the facility supports virtually every day-to-day activity at NCBS and advises units across the Bangalore BioCluster. Routine operations—equipment installation, calibration, preventive maintenance, power and data uptime, and helpdesk redressal—are handled by specialized teams. For larger efforts involving new buildings, lab renovations, or facility upgrades, civil, electrical, and HVAC engineers, architects, instrumentation specialists, and IT teams coordinate under a single umbrella.

A recent example is the new Technical Services and central storage building, designed and executed entirely by in-house engineers and

completed within one year—six months ahead of schedule. *“This is a completely green building,”* Mr. Gautam shares. *“Everything runs on solar energy; we don’t take power from the electrical grid of the campus.”* During the day, excess solar energy is fed back into the campus grid;

at night, the building draws power back to continue running systems like sample storage freezers, lifts, etc.

Where Technical Services most directly accelerates research is inside laboratories. The team routinely designs and fabricates custom prototype equipment tailored to specific experimental needs. *“Sometimes, labs don’t really need the extra features available in the market models, so we build what they actually need,”* Mr. Gautam explains. These in-house prototypes include stage warmer temperature control systems for the Drosophila Lab, microcentrifuges, stage top CO<sub>2</sub> incubators,

and online temperature monitoring systems for the -80°C freezer, which automatically send WhatsApp and email alerts when conditions fluctuate.

The team’s proudest achievement is a campus-level change two decades in the making. *“In 2002, 100% of our equipment maintenance was outsourced,”* he recalls. *“Today, we handle 90% of that in-house.”* This shift saves costs and time by reducing research downtime and avoiding long waits for external service engineers.

As the instrumentation team grew from a single person to 15, so did NCBS: from 12 principal investigators and roughly 100 students to over 45 faculties and 450 students campus-wide, and from roughly 2,000 units of equipment to over 15,000.

Looking ahead, the facility’s priorities include expanding prototyping workshops, increasing in-house PCB repair capacity, introducing mandatory user training, developing 24x7 infrastructure monitoring, and scaling up renewable energy. The team also aims to extend these innovations to other universities. *“In the next five years, our plan is to meet 30 to 40% of our power requirement through solar energy,”* Mr. Gautam shares.

Through all of this, the facility’s guiding principle remains simple. *“We are here to support the research community,”* says Mr. Gautam.

Read more about the Technical Services facility here: <https://www.ncbs.res.in/facilities/technical>



## Faculty Awards

### Dr. Tapomoy Bhattacharjee Elected as EMBO Young Investigator 2025

Dr. Tapomoy Bhattacharjee has been elected as an EMBO Young Investigator to the 2025 cohort for the next four years, recognizing him amongst 28 outstanding early-career group leaders in the life sciences. He was also conferred the Merck Young Scientist Award 2025 for Scientific Excellence in Biological Sciences. His research spans cellular mechanics and the physical control of biological behavior and cellular states.



### Dr. Anjana Badrinarayanan Awarded the Infosys Prize 2025 in Life Sciences

Dr. Anjana Badrinarayanan has been awarded the Infosys Prize 2025 in Life Sciences for her pioneering research in microbial cell biology and genome maintenance and repair. Her work has revealed novel pathways of how microbial cells repair DNA, and respond to and regulate mitochondrial DNA damage.



### Dr. Soumyashree Das Elected to the EMBO Global Investigator Network

Dr. Soumyashree Das has been elected to the EMBO Global Investigator Network, making her one of 12 outstanding researchers recognized for their contributions to life sciences research. Her research combines structural and cell biology to study collateral arteries.



### Prof. Ranabir Das Awarded the CRS Silver Medal

Prof. Ranabir Das has been awarded the CRS Silver Medal by Chirantan Rasayan Sanstha (CRS), a non-profit scientific society dedicated to advancing interdisciplinary research, innovation, and public engagement in science and technology. The award recognizes his significant contributions to scientific research and development and its broader relevance to society.

### Prof. P. V. Shivaprasad Awarded the Tata Transformation Prize 2025 for Food Security

Dr. P. V. Shivaprasad has been named the Food Security Winner of the Tata Transformation Prize 2025, awarded by The New York Academy of Sciences and Tata Sons. The Prize recognizes his work in plant molecular biology that addresses key challenges in agricultural resilience and sustainable food systems in India, with strong potential for societal impact amidst climate change.



### Dr. Deepa Agashe Awarded the Rashtriya Vigyan Yuva Puraskar 2025

Dr. Deepa Agashe has been conferred the Rashtriya Vigyan Yuva Puraskar 2025 by the Government of India, recognizing her work in evolutionary biology and the ecological drivers determining adaptation. Her research has advanced understanding of behavioral and phenotypical changes in organisms.



# Event Highlights

## Workshops

### Hands-on Training Workshop on Basic Bio-Methodologies of Laboratory Mice and Rats

Held on 6–10 October 2025, the Workshop involved hands-on skill development and lectures about working with mice, rats, and zebrafish. It covered ethical regulations, husbandry, and advanced surgical and necropsy techniques.



### Building Brains: Workshop on Neurodevelopment Research and Techniques

Hosted by BRIC-inStem and NCBS, this Workshop, held on 5–7 November 2025, featured talks by eminent researchers, discussions on current experimental approaches, and insights into techniques used to study neurodevelopment, offering participants exposure to contemporary scientific advances, challenges and emerging tools in the field.



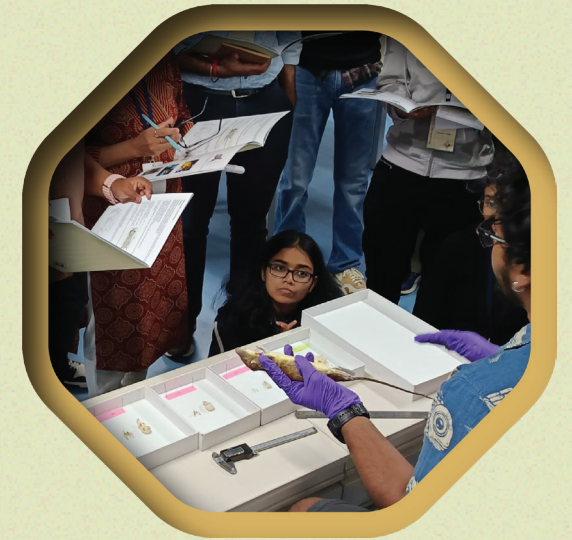
### Statistical Genomics Workshop

The Workshop, held on 8–12 December 2025, covered basic statistics, supervised and unsupervised modeling, transcriptomics (bulk, single-cell, and spatial), gene regulation, and whole-exome and whole-genome analysis. Designed for early-career life science researchers, it covered quantitative methods for interpreting high-dimensional genomics datasets and applying them to research.



### Small Mammals, Big Insights: Ecology, Evolution and Conservation

The Workshop, held on 19–21 November 2025, combined expert lectures with hands-on exposure to field, museum, and analytical approaches used in small mammal research, such as trapping, identification, and analysis of cataloged specimens.



### Manuscript Writing Workshop

The Workshop, co-hosted by Cactus Communications and NCBS, held on 18–19 December 2025, offered structured training in research planning, manuscript writing, journal workflows, research promotion, and organizing information. Aimed at early-career researchers, the workshop strengthened skills essential for effective scientific writing, dissemination, and sustaining academic practice.

## Academic Collaborations

### Centre for Artificial Learning and Intelligence for Biological Research and Education

NCBS, in partnership with International Centre for Theoretical Sciences, announced the establishment of CALIBRE—the Centre for Artificial Learning and Intelligence for Biological Research and Education. The Centre aims to integrate artificial intelligence, machine learning, and computational approaches into biological research and education.



## Conferences

### First Annual Indian Mechanobiology Meeting 2025

Held on 15–16 October 2025, the Meeting included scientific talks and discussions by leading mechanobiology experts. The keynote talks were delivered by Dr. Linda Kenney, President of Mechanobiologics Inc, USA and Prof. Madan Rao, Professor Emeritus at NCBS.



### Neuroscience Research Symposium

The Symposium, part of Manotsava 2025, the national mental health festival, held on 10–11 November 2025, was organized by the Centre for Brain and Mind in collaboration with NIMHANS. This annual symposium focused on advances in human neuroscience research, including the emerging biology of neuropsychiatric disorders. Academics, clinicians, and industry professionals shared insights with the goal of advancing diagnosis and management of mental illnesses.



### Cancer Genomics Symposium

The Cancer Genomics Symposium, held on 13 December 2025, at NCBS brought together researchers interested in understanding cancer evolution through genomics. The event included scientific presentations and talks, aimed at advancing knowledge of genomic alterations, data analysis methods, and translational insights in cancer research.



## Science Education

### Workshop on Polymerase Chain Reaction

This hands-on one-day workshop was organized for postgraduate biotechnology students in collaboration with NMKRV College, Jayanagar, Bengaluru. The program covered the principles, variants, and applications of PCR. The participants were guided through setting up PCR reactions and analyzing amplification products using agarose gel electrophoresis.



## Public Events

### Pint of View: Much Ado About 'Moth'ing

Dr. Pritha Dey, moth biologist and head of Natural History Collections at NCBS, delivered a Pint of View public lecture exploring the diversity, ecology, and often overlooked beauty of moths. The session blended scientific insights with stories from fieldwork in India's biodiversity hotspots and offered tips for observing nocturnal moths in everyday environments, highlighting their ecological roles beyond common perceptions as mere "night butterflies."



### Moth Day 2025

Moth Day 2025 was celebrated as an awareness initiative focused on insect conservation, particularly the diverse moth species of Karnataka. The event provided students with opportunities to learn about moth identification, ecological roles of insects, and ongoing conservation efforts.



## Community Events



### Sattriya Performance by Dr. Anwesa Mahanta

NCBS hosted a Sattriya dance performance by renowned Sattriya practitioner and scholar Dr. Anwesa Mahanta, showcasing the ancient classical dance form from Assam. The dance is known for blending expressive storytelling with intricate footwork and traditional music.

### National Mental Health Day

As part of National Mental Health Day, the Centre for Brain and Mind at NCBS organized activities to raise awareness about mental well-being, reduce stigma, and promote supportive practices. The program included talks, resources, and community engagement inviting reflection on mental health challenges and strategies for resilience.



### BLiSC Cricket Tournament 2025-2026

The BLiSC Department-wise Cricket Tournament 2025-2026 saw eight teams competing over several weeks at the NCBS grounds. Students Eleven clinched the title, defeating the Security team in the finals after weeks of competitive play.



## Fellowships

### Sreepadmanabh M. Awarded the Sun Pharma Science Scholar Fellowship

Sreepadmanabh M., a graduate student in Dr. Tapomoy Bhattacharjee's lab, has received the Sun Pharma Science Scholar Fellowship in Biomedical Sciences from the Sun Pharma Science Foundation. The fellowship recognizes his work on understanding how the physical microenvironment actively regulates living matter across biological scales.



### Sakshi Shigvan Awarded the HUL Fellowship for Women in STEM

Sakshi Shigvan from Dr. Dimple Notani's lab has been selected for the Hindustan Unilever Limited (HUL) Fellowship for Women in STEM. The fellowship will support her doctoral research in epigenetics, focusing on enhancer networks that regulate estrogen response in breast cancer.



### Arpitha Jayanth Awarded the HUL Fellowship for Women in STEM

Arpitha Jayanth from Prof. Mahesh Sankaran's lab has been selected for the Hindustan Unilever Limited (HUL) Fellowship for Women in STEM for her doctoral research. Her research examines recruitment, growth, and functional strategies of evergreen and deciduous trees to better understand Indian tropical forests.



## Talks

### Public Lecture by Prof. Spyros Artavanis-Tsakonas

In his talk titled "From Aristotle to AlphaFold: A Journey Through Two Millennia in Biology", Prof. Spyros Artavanis-Tsakonas, Professor Emeritus of Cell Biology at Harvard Medical School, explored the historical evolution of biological thought from early philosophies to modern computational breakthroughs like AlphaFold.



### How I Got Here: A Talk by Dr. Jayashree Aiyar

Dr. Jayashree Aiyar shared her career journey from laboratory research to leading R&D as Chief Scientific Officer at Syngene International. Drawing on over 30 years of global experience in molecular pharmacology and drug discovery, she shared insights on what shaped her scientific vision and professional growth.



## Other Highlights

### Brain 101 at Manotsava 2025

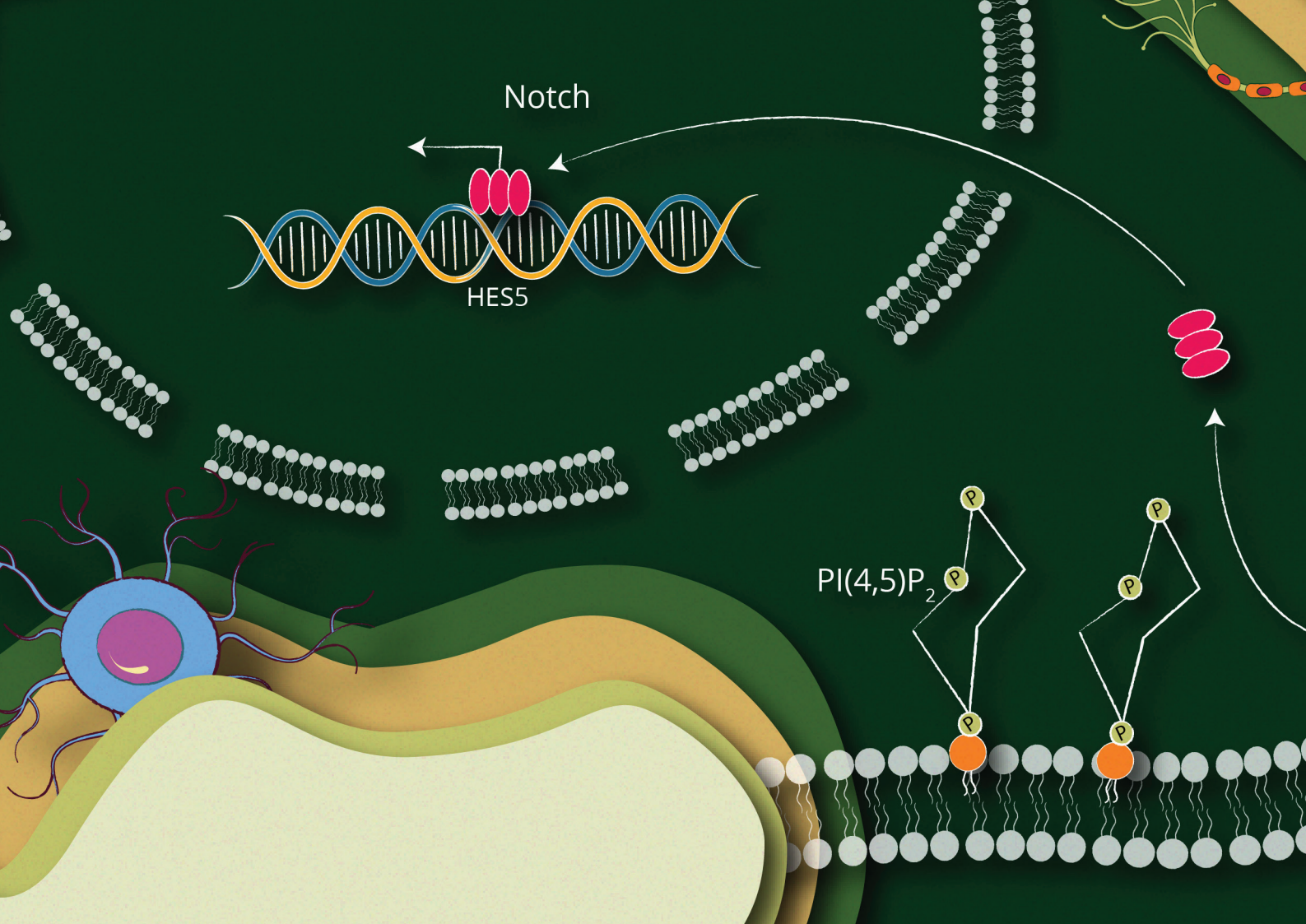
At Manotsava 2025, the Science Education Office, together with NCBS students, presented the Brain 101 interactive stall. Featuring five exhibits and an installation, the stall introduced visitors to brain structure and function through hands-on activities. Highlights included a brain-lobe jigsaw puzzle, visualizations of brain activity, and an artistic mesh figure illustrating information flow in neuronal networks.



### Nature Science Museum at Echoes of Earth

At Echoes of Earth 2025, NCBS hosted a Nature Science Museum experience aimed at engaging the public with biodiversity and environmental science. The stall, set up by the NCBS Communications office, attracted diverse audiences and encouraged conversations around plants, fungi, animals, their interconnectedness, and the role of science in understanding and protecting ecosystems.





National Centre for Biological Sciences  
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