INFOSYS SCIENCE FOUNDATION

INFOSYS PRIZE 2025

ECONOMICS

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Imagine a cat…

"Technically, a cat locked in a box may be alive or it may be dead. You never know until you look. In fact, the mere act of opening the box will determine the state of the cat, although in this case there were three determinate states the cat could be in: these being Alive, Dead, and Bloody Furious"

—**Terry Pratchett**, *Lords and Ladies, Discworld*.

We don't know what state the cat on our cover is in. Perhaps unlike Pratchett's Greebo locked in the box, our cat on the cover is grinning like Lewis Caroll's Cheshire cat.

UNESCO designated 2025 as the Year of Quantum Science and Technology to mark 100 years of quantum science. Technological advances based on quantum mechanics bring home the importance of basic research. It is a discovery that upended our understanding of what we thought we knew about our universe.

Quantum theory is what Benjamin Labatut calls "the crown jewel of our species, the most accurate, far-ranging and beautiful of all our physical theories. It lies behind the supremacy of our smartphones, behind the internet, behind the coming promise of godlike computing power. It has completely reshaped our world."

But as Labatut goes on to say, "We know how to use it, it works as if by some strange miracle, and yet there is not a human soul, alive or dead, who actually gets it. The mind cannot come to grips with its paradoxes and contradictions."

As we contemplate the often baffling implications of quantum theory, we realize that we need the humanities and social sciences to make sense of what it means for our place in the greater scheme of things. As we begin to apply quantum science in ways affecting large sections of humanity, ethical frameworks will need to be shaped. Philosophy, legal studies, history, literature and other disciplines become ever more important as we wrestle with these questions and frame language to describe it all.

Our laureates this year share a curiosity about the world and a desire to leave things better than they found them. Whether they are studying invisible organisms that quietly shape our world or making sense of chaotic systems or looking at ancient languages or producing fertilizer from sunlight and water, they're all seeking things beyond what we already know.

Schrödinger's cat in the box was a metaphor for a radioactive atom left to decay. But it is also a metaphor for embracing uncertainty and a multitude of possibilities. For certainty is the end of creativity and uncertainty helps us push the boundaries of everything we think we know.

Let us embrace uncertainty and may it propel us on the path of inquiry and discovery...

ECONOMICS

Nikhil Agarwal

Paul A. Samuelson Professor, Department of Economics, Massachusetts Institute of Technology, USA

Nikhil Agarwal is Paul A. Samuelson Professor of Economics at the Massachusetts Institute of Technology. He received his B.A. in Economics and Mathematics from Brandeis University, and in 2013 he got his Ph.D. in Economics from Harvard University, joining MIT soon afterward.

Prof. Agarwal's research focuses on empirical design, efficiency, and equity of allocation and matching markets, including school choice, medical residency and kidney exchanges. His work has been published in leading journals such as the *American Economic Review, Econometrica, Review of Economic Studies, and the Quarterly Journal of Economics.*

A recipient of the Sloan Research Fellowship, Agarwal's research is supported by the National Institute of Health and National Science Foundation in the US. At MIT, he also co-directs Blueprint Labs, which applies economic analysis and data science to improve public policy and social outcomes.

The Infosys Prize 2025 in Economics is awarded to Prof. Nikhil Agarwal for his contributions to research on market design. Prof. Agarwal has made pioneering contributions, including the development and implementation of pathbreaking methodology for empirical studies of allocation mechanisms, including school choice, medical residency, and kidney exchanges.

Scope and Impact of Work

Prof. Nikhil Agarwal is a leading scholar who has spearheaded a new wave of research that applies highly sophisticated econometric techniques to analyze markets which do not rely on prices to match supply and demand. Much of economics assumes that the invisible hand of the market brings about prices where demand equals supply. While this is likely true for apples and oranges, this is not the way those needing kidneys find those willing to supply kidneys, or students seeking college admission find the college that will admit them. These matching problems are hugely important but inadequately understood. Prof. Agarwal's work has transformed this rudimentary literature into one anchored in data, providing new insights into policy design.

Agarwal's publications appear in leading journals, including the *American Economic Review, Econometrica, Review of Economic Studies, and the Quarterly Journal of Economics.* He currently serves as an Associate Editor of *Econometrica.*

At MIT, Nikhil Agarwal co-directs Blueprint Labs, a research initiative that applies economic analysis and data science to improve outcomes in education, health, and labor markets. He has also demonstrated exceptional success in mentoring Ph.D. students, many of whom have gone on to placements at leading universities such as Yale, Northwestern, UCLA, Princeton, and Wharton. His research has received widespread recognition. For a scholar still under forty, Agarwal's record is remarkable—combining intellectual leadership, methodological innovation, and tangible social impact—and there is every indication that his most significant contributions are still ahead of him.

Expanded Citation

Prof. Nikhil Agarwal is a leading authority on market design, bringing this literature into real-world applications of great importance. Doing so is exceptionally challenging and requires command of nearly the entire economics toolkit: equilibrium analysis with strategic interactions, advanced structural estimation techniques, and the ability to apply state-of-the-art econometrics to the hardest identification problems.

A highly skilled microeconomic-theorist and applied econometrician, Prof. Agarwal develops and applies innovative tools to analyze real-world allocation mechanisms including school choice, medical residency, and kidney exchanges. His research connects market design, industrial organization, and econometrics, turning a once-theoretical field into one grounded in data and policy relevance.

Widely recognized for innovation and impact, Nikhil Agarwal's work exemplifies how rigorous economic analysis can facilitate institutional design and enhance human welfare.

Jury Chair
Kaushik Basu

My congratulations to Nikhil Agarwal for his pioneering research on market design. My fellow jury members were highly impressed by the brilliance of his work. Nikhil is an economist of amazingly diverse skills, ranging from microeconomic theory to empirical analysis. Moreover, he has brought his talent to bear on topics of great importance for human welfare, which will, hopefully, be a step towards a better world.

My kingdom for a kidney

Who gets the kidney

In India around 200,000 people are waiting for a kidney transplant in any given year. And it is estimated that the median wait time for each patient is around 3.16 years. Of these only about a third get the life-saving transplants they need. How do we prioritize patients needing kidney transplants? In the U.S. at any given time, about 100,000 people are waiting for kidney transplants. In such a scenario of limited supply and high demand, how do we think about optimizing the limited supply to meet the high demand?

Not just another commodity

Typical market economics works on the principle of the invisible hand of the market which determines prices of commodities like fruit or vegetables. But this is not how it works in complex problems like how eligible patients find donors with matching kidneys, students to schools, or medical residents. This is a complicated market design problem that Nikhil Agarwal works on.

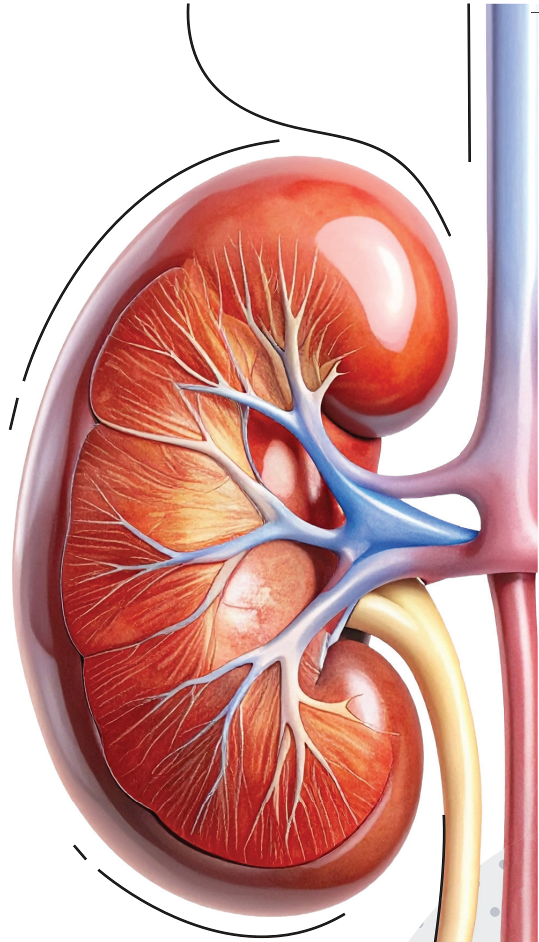
The nuances of allocation

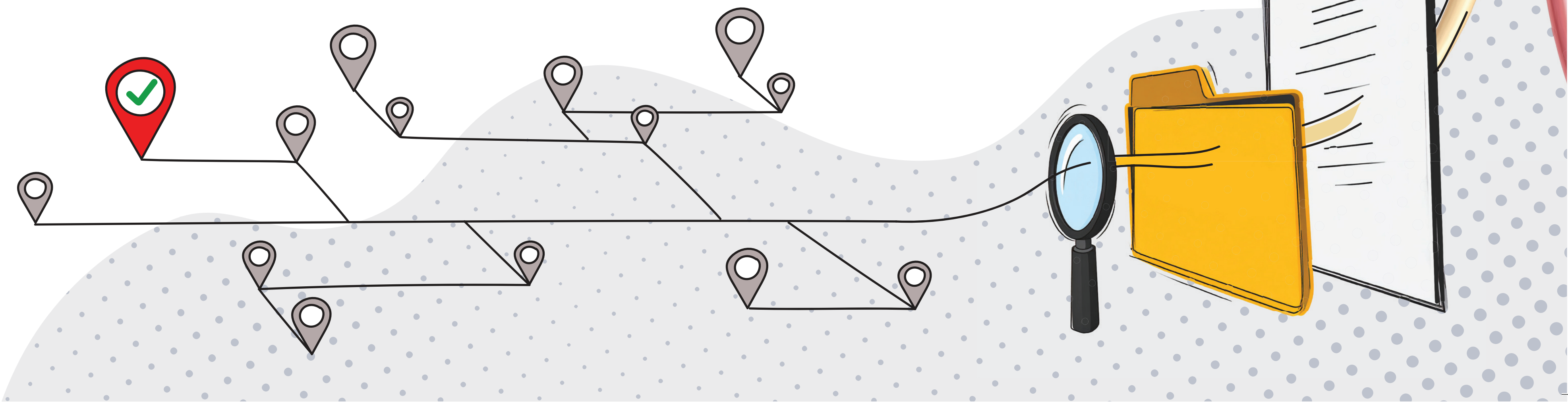
In 2013 Alvin Roth won the Nobel Prize in Economics for his theoretical approaches to allocation mechanism design. Agarwal (whose mentor Roth is) studies how these systems work in practice. Agarwal's work combines the theory with real-world data, tries to determine how to best allocate the limited supply of kidneys among those in need of that transplant, how to assign students to schools, and the workings of medical residency matching.

Agarwal's research takes into account nuances such as strategic behavior and the value of assignments. This approach yields kidney waitlist designs that account for the lifespan-lengthening effects of transplants, who does it benefit most, pre-existing health conditions and other factors; and school admissions systems that consider equity and efficiency of matches.

From theory to policy

Research like Agarwal's helps in determining how to design policies around the system that make matches. This engineering approach based on data, theory and real-world practice can be applied more broadly on similar problems.





Engineering & Computer Science

Sushant Sachdeva

Associate Professor,
Mathematical and Computational Sciences,
University of Toronto, Canada

Sushant Sachdeva is an associate professor of computer science at the University of Toronto. He holds a B.Tech. degree in Computer Science and Engineering from IIT-Bombay and a Ph.D. in Computer Science from Princeton University. His research interests include algorithms, optimization, machine learning, and statistics, with a particular focus on fast algorithms for graph problems.

Prof. Sachdeva has received numerous awards and fellowships, including the Google Faculty Research Award and the IIT-Bombay President of India Gold Medal. He has also been a faculty member at the University of Toronto and a Vector Institute affiliate. Sachdeva's contributions to the field have been recognized with the Sloan Research Fellowship and the FOCS Best Paper Award.

The Infosys Prize 2025 in Engineering and Computer Science is awarded to Prof. Sushant Sachdeva for his deep insights into mathematical optimization and the resolution of longstanding open questions in algorithmic theory. His work has established new standards on achievable performance in computational problems affecting information flows across societal lifelines, including the internet, transportation and communication networks.

Scope and Impact of Work

Prof. Sushant Sachdeva's research sits at the core of computing and communications systems that power vital societal services—from education and healthcare to transportation. These systems rely on algorithms that process vast amounts of data and networks to enable intelligent, timely decisions. As artificial intelligence (AI) continues to reshape society, the underlying algorithms must scale efficiently while maintaining accuracy across increasingly complex datasets and interconnections. For decades, computer scientists have worked to improve these foundational methods, but true breakthroughs are rare.

Prof. Sachdeva's work marks such a breakthrough. Described by peers as producing "absurdly fast" algorithms, he bridges mathematical analysis, optimization, and computational problem-solving to create a unified framework for flow problems like bipartite matching, minimum-cost flow, optimal transport, and matrix scaling. He smoothly integrates linear systems, programming, and network flow techniques. To achieve this, Sushant Sachdeva leverages innovations in graph approximation and sparsification techniques. Among his key contributions are breakthroughs in maximum flow algorithms, graph sparsification, efficient preconditioners, oblivious routing on expanders, and optimization methods for variational inequalities and regression tasks, which enable faster computations for real-world networks such as electrical grids, telecommunications, and transportation systems by leveraging planar or near-planar graph structures. His deterministic, almost-linear time algorithms for minimum-cost flow and incremental approximate maximum flow support dynamic optimization and bottleneck resolution. In machine learning, his work improves convergence in autoencoders and introduces width-reduced methods for quasi-self-concordant optimization, pushing the boundaries of scalable, intelligent computation.

Expanded Citation

Prof. Sushant Sachdeva is a pioneer in theoretical computer science whose fundamental contributions have profoundly impacted many algorithmic challenges underlying modern society. His work has influenced core computational problems involving systems of linear equations, graph search, and network flows — areas that have engaged generations of theoretical computer scientists since the earliest days of the field. Through deep insights into random matrix theory, spectral graph theory and advanced data structures, Prof. Sachdeva has developed near linear-time network flows solvers, long considered unattainable. His creative use of graph-approximation and sparsification techniques to solve linear systems and network flows, have substantially advanced mathematical optimization and algorithmic theory. Sushant Sachdeva's contributions have reshaped how researchers approach important computational challenges, and how practical problems in optimization are solved.

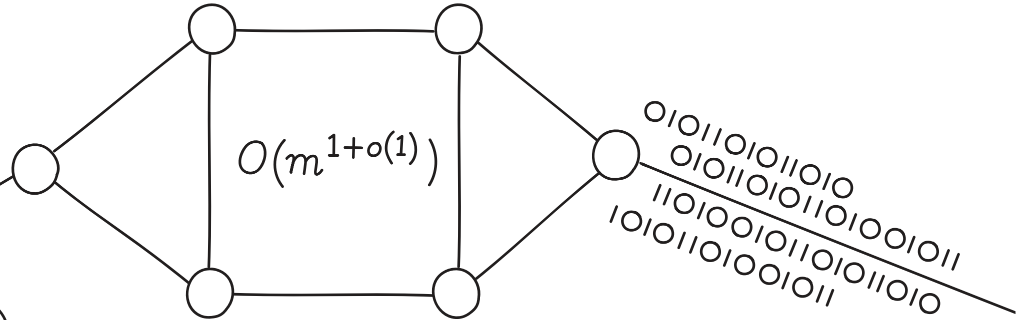
Jury Chair
Jayathi Murthy

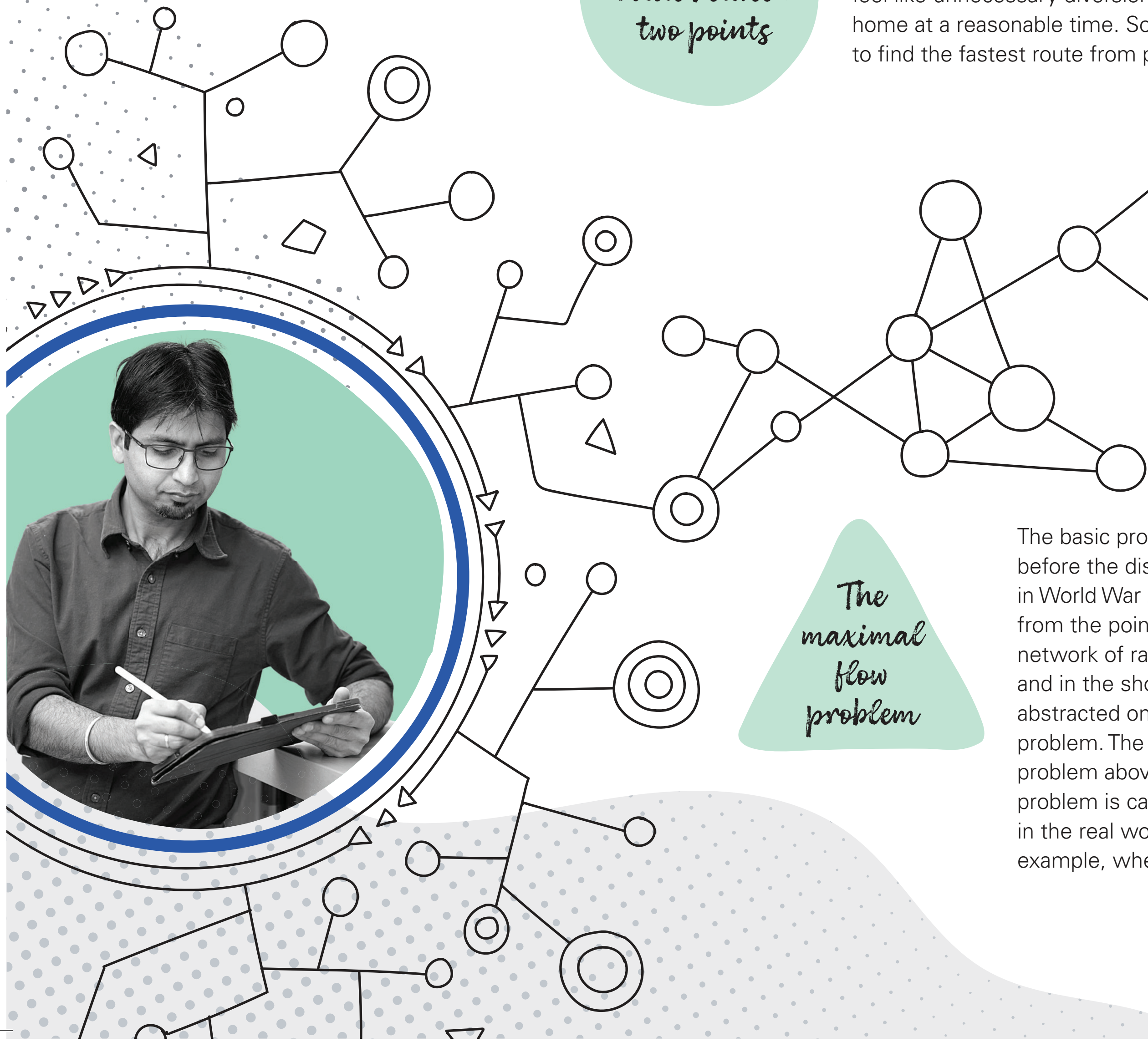
"On behalf of our jury, I extend my congratulations to Prof. Sushant Sachdeva for winning the Infosys Prize 2025 in Engineering and Computer Science. Your work powers modern computing and communication systems by developing foundational methods spanning mathematical analysis, optimization, and computational problem-solving. These techniques will influence fields as diverse as healthcare, transportation and education for years to come.

The sparsest graph of them all

The fastest route between two points

It's peak traffic time in Bangalore. You have booked your ride and as your commute starts, your taxi driver starts following the map on his phone and changes routes based on the bottlenecks indicated on his map. While you feel irritated by what may feel like unnecessary diversions, you are happy nevertheless when you finally reach home at a reasonable time. So how exactly have we got to this place that allows us to find the fastest route from point A to B at the press of a button.



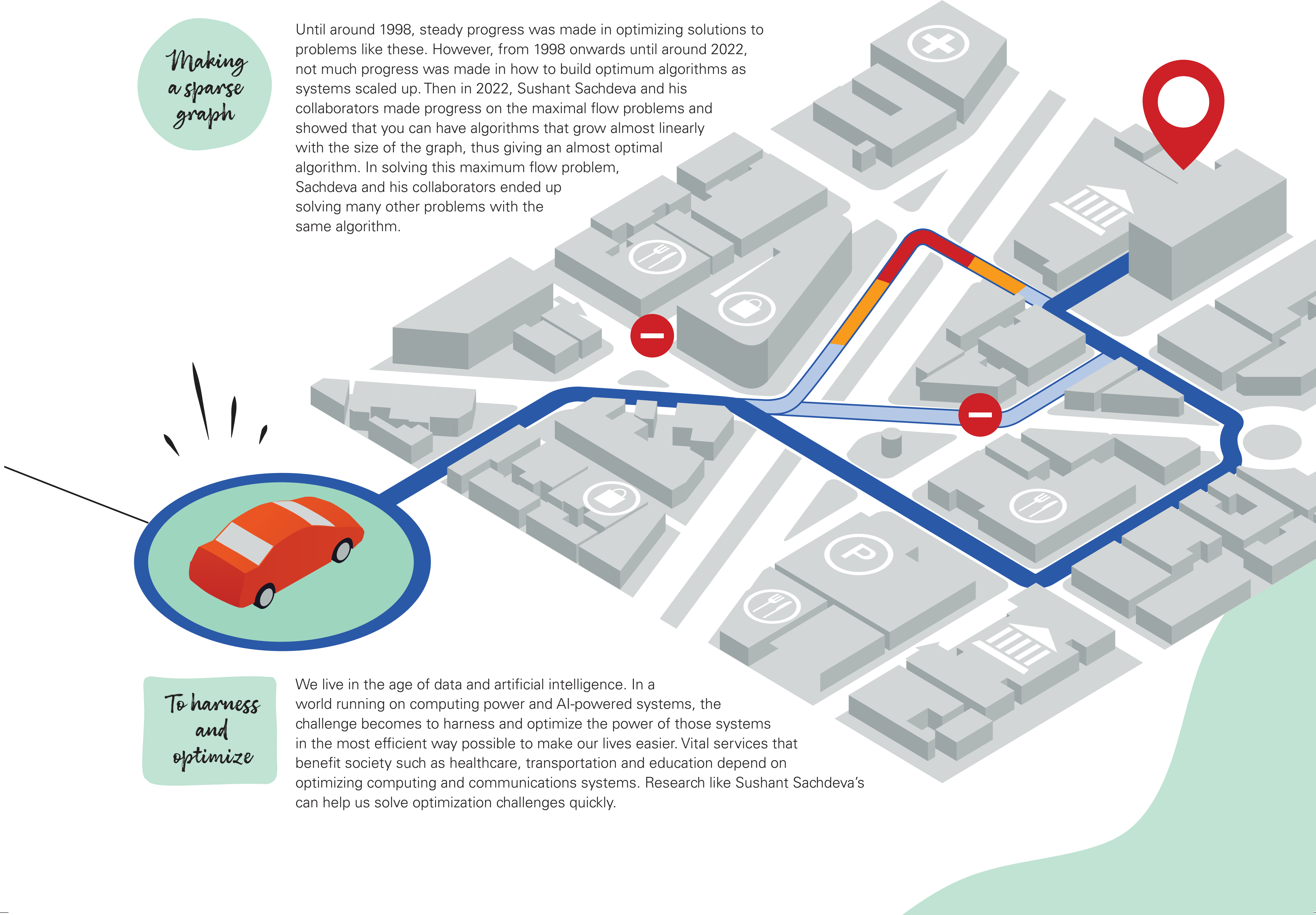


The maximal flow problem

The basic problem, called the maximal flow problem, existed long before the discipline of computer science was even formalized. Back in World War 2 in the Soviet Union, they needed to move resources from the point of manufacture to the frontline, along their huge network of railway lines. They needed to do this as fast as possible and in the shortest time possible. This real-world problem can be abstracted on to a graph and this abstraction is called maximal flow problem. The maximum flow problem can capture the fastest path problem above and much more. An alternative formulation of this problem is called the minimum cut problem, which can be translated in the real world to what is the bottleneck along these routes. For example, where could the enemy capture these goods?

Making a sparse graph

Until around 1998, steady progress was made in optimizing solutions to problems like these. However, from 1998 onwards until around 2022, not much progress was made in how to build optimum algorithms as systems scaled up. Then in 2022, Sushant Sachdeva and his collaborators made progress on the maximal flow problems and showed that you can have algorithms that grow almost linearly with the size of the graph, thus giving an almost optimal algorithm. In solving this maximum flow problem, Sachdeva and his collaborators ended up solving many other problems with the same algorithm.



To harness and optimize

We live in the age of data and artificial intelligence. In a world running on computing power and AI-powered systems, the challenge becomes to harness and optimize the power of those systems in the most efficient way possible to make our lives easier. Vital services that benefit society such as healthcare, transportation and education depend on optimizing computing and communications systems. Research like Sushant Sachdeva's can help us solve optimization challenges quickly.

Humanities & Social Sciences

Andrew Ollett

Associate Professor, Department of South Asian Languages and Civilizations, The University of Chicago, USA

Andrew Ollett, Associate Professor at the University of Chicago in South Asian Languages and Civilizations, was trained in classical Greek and Latin before turning to Sanskrit and other South Asian languages. He completed his Ph.D. dissertation at Columbia University in 2016. He was a member of the Harvard Society of Fellows and joined the University of Chicago in 2019.

Prof. Ollett's major works include *The Mirror of Ornaments* (Alaṅkāradappaṇō): *A Prakrit Work of Poetics*; *Language of the Snakes: Prakrit, Sanskrit, and the Language Order of Premodern India*; and the edition, translation, and annotation of the Prakrit novella *Lilavai* by Kouhala. He is the co-founder of *NESAR—New Explorations in South Asia Research.*

Prof. Andrew Ollett's work in progress includes a comprehensive study of classical Sanskrit theories of meaning and an edition and translation of the Kannada grammar of poetry, *Kavirājamārgam* (with Sarah Pierce Taylor).

The Infosys Prize 2025 in Humanities and Social Sciences is awarded to Prof. Andrew Ollett for his outstanding work as a philologist, linguist, and intellectual historian of India and the leading scholar of the Prakrit languages in this generation. His book, *Language of the Snakes*, is a magisterial analysis of the cultural roles of Prakrit in tandem with Sanskrit and the Indian vernaculars over the last two thousand years. Ollett is a profound and creative scholar of classical Indian philosophy of language, especially semantics and pragmatics.

Scope and Impact of Work

Prof. Andrew Ollett's work is a model of philological depth and insight and a superb contribution to the intellectual history of South Asia over the last two millennia. His book, *Language of the Snakes* (University of California Press, 2017) presents a powerful, context-sensitive analysis of the many roles of the Prakrit languages, including Apabhraṃśa, in relation to Sanskrit and the vernaculars from the earliest beginnings of Prakrit through the eighteenth-century Prakrit plays and extended poetic novels produced in Kerala and elsewhere. The book is a highly original essay on understanding the language order, to use Ollett's term, throughout South Asia over this immense stretch of time.

Prof. Ollett's work has also made central contributions to linguistics, particularly the study of semantics, pragmatics, and syntax, by lucidly presenting the rich theories of Indian philosophers of language writing in Sanskrit, including Kumārila Bhaṭṭa and the little-known Śālikanātha Miśra, shrewdly assessing many of the key figures in this field of Indian thought, for theoretical plausibility both in its formal aspects as well as their application to the analysis of literary texts. Apart from completing this project on Indian theories of meaning, he is now working with Sarah Pierce Taylor on the grammar and poetics of the earliest stratum of medieval Kannada.

Andrew Ollett's contribution to the cultural and intellectual history of India is clearly of relevance to scholars of ideas in any human civilization. In particular, the overlapping or parallel concepts and also the striking divergences among Indian philosophers of language and modern linguists and cognitive scientists constitute a fertile field for study and experiment.

For scholars working in any of the South Asian languages and literatures, in any historical period including modernity, Ollett's definitions of shifting language orders have become fundamental to further research. The range of his linguistic abilities and the scope of his textual analyses and explications are exceptional, and his interdisciplinary interests have influenced colleagues from other humanistic disciplines, as was clearly the case during his years at the Harvard Society of Fellows. He is also the co-founder of *NESAR—New Explorations in South Asia Research*.

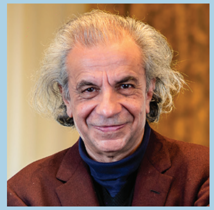
Expanded Citation

Prof. Andrew Ollett, is one of the finest philologists and cultural historians of South Asia in this generation. He is the leading scholar of Prakrit language and literature in the world and probably the finest connoisseur of Prakrit poetry since medieval times. Prof. Ollett's magisterial book, *Language of the Snakes: Prakrit, Sanskrit, and the Language Order of Premodern India* (2017), offers an historical grammar and analysis of the cultural roles of Prakrit in relation to, indeed interdependence with, Sanskrit and the vernaculars over the last two thousand years.

Ollett has, in addition, produced a pathbreaking edition and translation of the great early-ninth-century Prakrit novella of Kouhala, *Lilavai* (Murty Classical Library of India, 2021) as well as several penetrating essays on Indo-European linguistics, classical Kannada poetics, manuscript technologies, and the philosophy of language in the Sanskrit sources, with pioneering studies of Śālikanātha Miśra and Kumārila Bhaṭṭa, among other pivotal figures.

Andrew Ollett's linguistic mastery and knowledge is breathtaking, ranging from detailed contributions to the study of Sanskrit, Prakrit, Kannada, Tamil, Old Javanese, and Chinese, to say nothing of his knowledge of the modern European languages and his training in Greek and Latin.

Jury Chair
Akeel Bilgrami



I extend my warmest congratulations to Andrew Ollett on being awarded the Infosys Prize 2025 in the Humanities and Social Sciences. As chair of the jury, I read with great admiration (and instruction) a very wide swathe of your writing, including *Language of the Snakes* and your Paris Lectures on pre-modern Indian theories of meaning—a corpus to be truly proud of, and to build on for what I expect will be equally significant contributions in your field in the future.

Contextualizing an ancient language

Language as culture and tradition

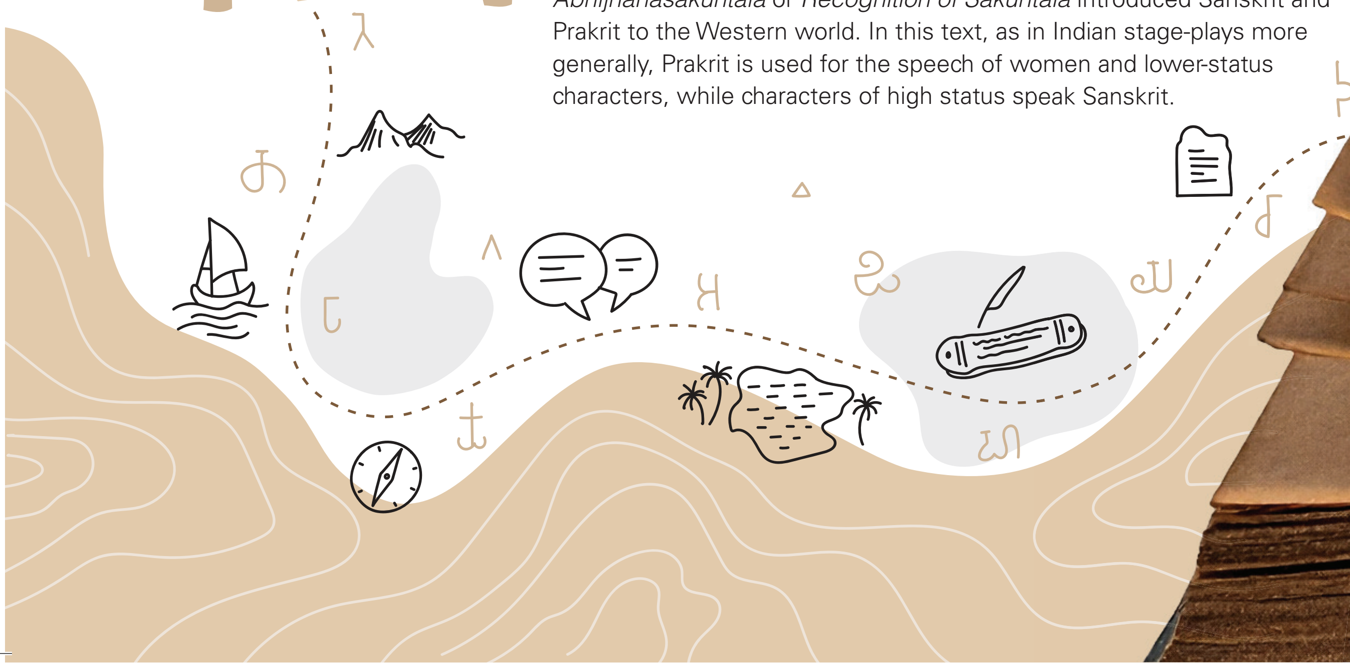
The Kenyan scholar Ngugi wa Thiongo once wrote, "Language carries culture, and culture carries, particularly through orature and literature, the entire body of values by which we come to perceive ourselves and our place in the world."

The discipline of linguistics helps us understand how language works on a theoretical level. The discipline of philology studies language as it is used in texts, especially historical texts, whether oral or written.

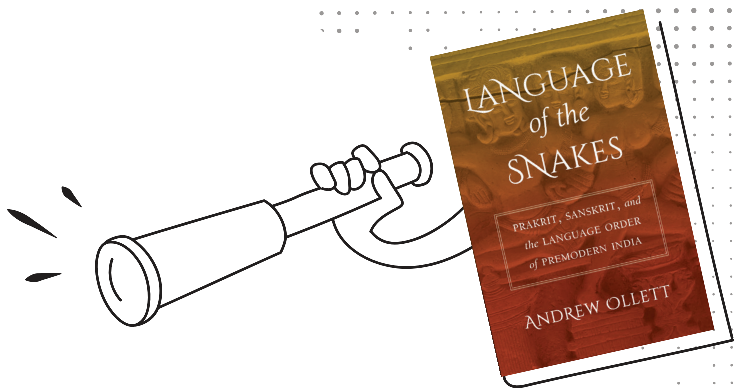
A discovery of languages

Andrew Ollett is an expert in Prakrit, a group of languages from ancient India. Like Sanskrit, it was a language of literary culture and used across South Asia, from Kashmir to Tamil Nadu, and from Sindh to Bengal, and was also known in Cambodia and Java. Traces of Prakrit can be found in many modern Indian languages such as Kannada, Gujarati, Marathi and others. Ollett's work explores the cultural role of Prakrit, its rise and decline through the centuries.

The Welsh scholar and judge William Jones's 1786 translation of Kālidāsa's *Abhijñānaśākuntala* or *Recognition of Śakuntalā* introduced Sanskrit and Prakrit to the Western world. In this text, as in Indian stage-plays more generally, Prakrit is used for the speech of women and lower-status characters, while characters of high status speak Sanskrit.



A language of fictional romance

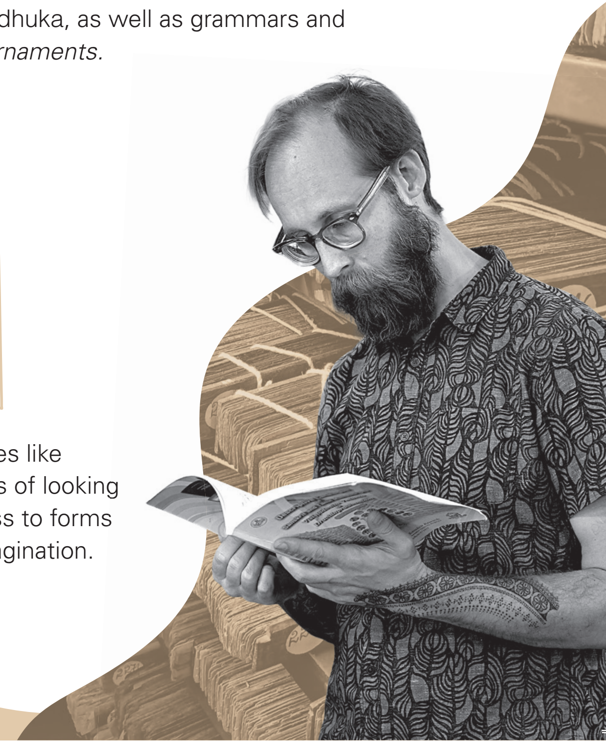


In his book *Language of the Snakes*, Ollett traces how Prakrit was used in plays, poetry and other literature. For example, Ollett explains how the poem *Seven Centuries* by Hāla (allegedly a king of the Sātavāhana dynasty that ruled the Deccan region in the first or second century CE) helped establish Prakrit as a literary language and also helped establish the category of 'literary language' itself. Ollett explains how it became the preferred language in which fictional romances were composed.

Some of these include Pālitta's *Taraṅgavatī* (the first or second century). Others are Haribhadra's Story of *Samarāditya*, Uddyotana's *Kuvalayamālā*, and Kautūhala's *Līlāvatī*, all from around the eighth century. Aside from literature, Prakrit came to be used in other kinds of texts as well. While most of the main scientific texts were written in Sanskrit, there were also texts on alchemy and medicine written in Prakrit such as *Hara's Belt* by the tenth-century author Mādhuka, as well as grammars and works of poetics in Prakrit, such as the *Mirror of Ornaments*.

Unlocking the secrets of the past

The study of ancient languages like Prakrit can open up new ways of looking at the past by giving us access to forms of human expression and imagination.



Life Sciences

Anjana Badrinarayanan

Associate Professor,
Cellular Organization and Signaling,
National Centre for Biological Sciences, Bangalore

Anjana Badrinarayanan is currently Associate Professor at the National Centre for Biological Sciences, Bangalore. She received her Ph.D. in 2011 from Oxford, where she received an Overseas Research Award and a Clarendon Fellowship for Ph.D. research. Dr. Badrinarayanan subsequently did postdoctoral research at MIT, for which she received a Human Frontiers Program long-term fellowship. She joined NCBS as Assistant Professor in 2016 and was promoted to Associate Professor in 2023.

Anjana Badrinarayanan has received an HFSP Career Development Award (2018) and a DBT-Wellcome India Alliance Intermediate Fellowship (2022-2026) and has been awarded the Khorana Innovative Young Biotechnologist Award of DBT (2019) and the Indian National Science Academy Medal for Young Scientists (2021).

Dr. Badrinarayanan serves on multiple editorial boards and is Vice Chair and designated Chair of a Gordon Conference on Microbial Stress Response. She has recently been named Eric and Wendy Schmidt Global Faculty Fellow at Imperial College London.

The Infosys Prize 2025 in Life Sciences is awarded to Dr. Anjana Badrinarayanan for pioneering contributions to understanding mechanisms of genome maintenance and repair. Through innovative live-cell imaging combined with genetic and cell biological approaches, her work has revealed fundamental principles of how DNA damage is repaired, demonstrated mutagenesis in non-dividing cells, and identified novel pathways of mitochondrial DNA damage responses, illuminating principles central to life and evolution.

Scope and Impact of Work

Dr. Anjana Badrinarayanan's research addresses one of the most fundamental problems in biology: how genomes faithfully preserve their integrity despite widespread potential for damage. Her work has illuminated key principles governing DNA replication, recombination, and repair, combining quantitative live-cell imaging, bacterial genetics, and cell biology to reveal dynamic molecular processes within single cells. A hallmark of her research is methodological innovation—her laboratory developed live-cell microscopy to visualize chromosome dynamics in real time. Using this approach, she uncovered how a specific molecule, the structural maintenance of chromosome—like protein RecN, drives long-distance homology search during double-strand break repair, solving a longstanding mystery in the DNA repair field.

Dr. Badrinarayanan's discoveries demonstrating mutagenesis in non-dividing cells have overturned classical paradigms that link mutation solely to replication, providing mechanistic insight into how dormant bacterial populations evolve and acquire antibiotic resistance. Her studies have also revealed novel regulatory mechanisms of bacterial DNA damage responses and illuminated how mitochondrial DNA is repaired and cleared following damage. Together, these advances have reshaped understanding of genome maintenance across both prokaryotic and eukaryotic systems.

Anjana Badrinarayanan's work exemplifies scientific creativity, precision, and depth, bridging molecular mechanisms with cellular physiology. By uncovering universal strategies that cells use to safeguard their genomes, she has profoundly advanced the fields of genome and microbial biology, establishing new directions for research into genome stability and cellular resilience.

Expanded Citation

Dr. Anjana Badrinarayanan is recognized for her pioneering and transformative contributions to understanding how genomes maintain their integrity. Her innovative studies have revealed fundamental mechanisms underlying DNA replication, recombination, and repair. Building a high-level research group and developing live-cell imaging technologies to visualize bacterial chromosome dynamics and DNA repair, Dr. Badrinarayanan uncovered how cells search for homology over long stretches of DNA during double-strand break repair—a longstanding mystery in the field.

Her discoveries demonstrating mutagenesis in non-dividing cells and uncovering novel methylation-dependent and nucleotide excision repair pathways have redefined classical concepts of DNA damage responses. Extending these approaches to mitochondria, Badrinarayanan has elucidated mechanisms of mitochondrial DNA clearance and maintenance.

Through her creativity, technical innovation, and conceptual rigor, Dr. Anjana Badrinarayanan has provided deep insights into genome stability across domains of life, establishing herself as a leader in the molecular biology of genome maintenance and repair.

Jury Chair

Mriganka Sur

On behalf of the jury, I warmly congratulate you Dr. Anjana Badrinarayanan on receiving the Infosys Prize 2025 in Life Sciences. This prize recognizes your creative and pioneering research which has revealed fundamental principles of how cells repair their DNA with remarkable precision, provided new insights into activation of DNA damage responses, and revealed how damage to mitochondria, the energy-producing machinery of cells, is repaired.

Invisible shapers of our world

The stuff of life

DNA is the stuff of life, the most fundamental component that makes a living organism. In order to survive, the DNA of an organism must constantly change and repair itself in response to the constant assault of stresses of the environment around it. It is estimated that the average living cell is assaulted by 10,000 damages per cell per day. How do cells remain stable when faced with so much instability?

Replication

Recombination

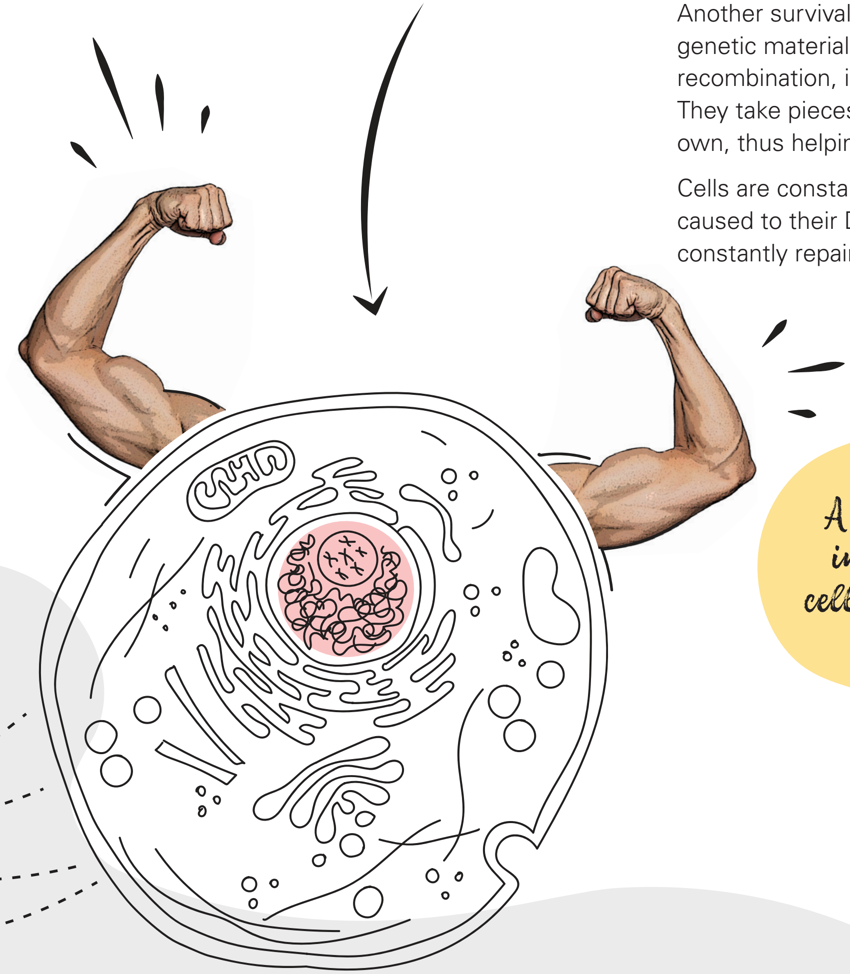
Repair

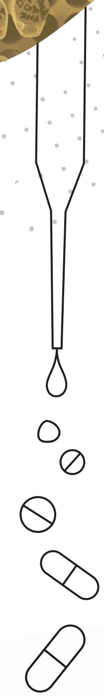
Living cells remain stable by changing constantly. This quality of plasticity in its genome allows a living cell to adapt to a diversity of environments as well as different kinds of stresses from those environments.

Cells are not just surviving but replicating as well. Francois Jacob the molecular biologist once said that the dream of every cell is to become two cells, meaning that duplication is a central drive of every living cell. They pass on genetic material through replication.

Another survival mechanism that cells have is to sometimes exchange genetic material between themselves, a process called recombination, in order to survive better in stressful environments. They take pieces of DNA from other cells and combine it with their own, thus helping them cope with challenges to their survival.

Cells are constantly using various processes to correct damage that is caused to their DNA by internal or external stresses, i.e. they are constantly repairing themselves as a stress response.



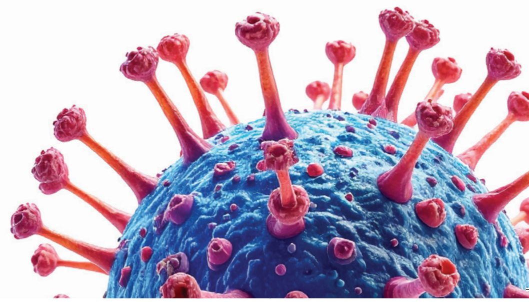


A window into how cells survive

Anjana Badrinarayanan's lab studies the molecular mechanisms of these processes that maintain and modify genomes in bacterial cells. She has pioneered the imaging of living cells of these microbes.

By studying how microbial cells live and adapt to environmental stresses, Badrinarayanan's research is shining a light on fundamental processes of cell survival and adaptation.

Studying these processes helps us understand how microbes evolve over time and develop properties like antibiotics resistance.



Mathematical Sciences

Sabyasachi Mukherjee

Associate Professor, School of Mathematics, Tata Institute of Fundamental Research, Mumbai

Sabyasachi Mukherjee was born in India in 1986 and is currently an Associate Professor in the School of Mathematics at the Tata Institute of Fundamental Research (TIFR), Mumbai. Before joining TIFR, he was a Milnor Lecturer at the Institute for Mathematical Sciences, Stony Brook University. He earned his Ph.D. in Mathematics from Jacobs University Bremen in 2015, after earlier studies at Université Paris 13 and the University of Calcutta.

Prof. Mukherjee's research lies at the intersection of conformal dynamics, complex analysis, and Teichmüller theory. His work focuses on parameter spaces of rational maps, anti-holomorphic dynamics, combination theorems, holomorphic and anti-holomorphic correspondences, and Sullivan's Dictionary relating rational maps and Kleinian groups. Sabyasachi Mukherjee was awarded the 2025 Vigyan Yuva-Shanti Swarup Bhatnagar (VY-SSB) award in Mathematics and Computer Science. He has been invited to deliver a Joint Section Lecture, with Luna Lomonaco, in the Dynamics Section of the 2026 International Congress of Mathematicians in Pennsylvania, USA.

The Infosys Prize 2025 in Mathematical Sciences is awarded to Prof. Sabyasachi Mukherjee for his powerful and original work linking two distinct areas: the dynamics of Kleinian group actions and the iteration of holomorphic and anti-holomorphic maps in complex dynamics. His results have reshaped our understanding of conformal dynamics.

Scope and Impact of Work

Prof. Sabyasachi Mukherjee's work, carried out with his collaborators, has established new and striking instances of Sullivan's Dictionary, which articulates deep analogies between the dynamics of Kleinian groups and those of rational maps. Originally conceived as a suggestive correspondence rather than a literal translation, this dictionary has acquired new mathematical substance through Prof. Mukherjee's framework that combines these two kinds of conformal dynamical systems within a single dynamical plane.

Mukherjee's research has led to a deeper understanding of the dynamics of algebraic correspondences on Riemann surfaces. It has also revealed an unexpected link between anti-holomorphic dynamics and phenomena arising in physics and potential theory. His methods have already been applied to resolve complex-analytic problems using dynamical ideas, and further such applications are anticipated.

A central theme in dynamics is how intricate behavior emerges from iterating simple rules: the Mandelbrot set, defined by quadratic rational maps, is a classic example of this principle. Prof. Mukherjee's work brings new insight to Tricorns—the counterparts of Mandelbrot sets in the setting of anti-rational quadratic maps—by showing that they correspond to the bifurcation loci of Schwarz reflections.

Expanded Citation

In a prescient note from 1928, Fatou observed a striking analogy between the actions of Kleinian groups and the dynamics of rational maps. This analogy, developed in the 1980s through Sullivan's pioneering work, gave rise to Sullivan's Dictionary linking Kleinian groups and rational maps.

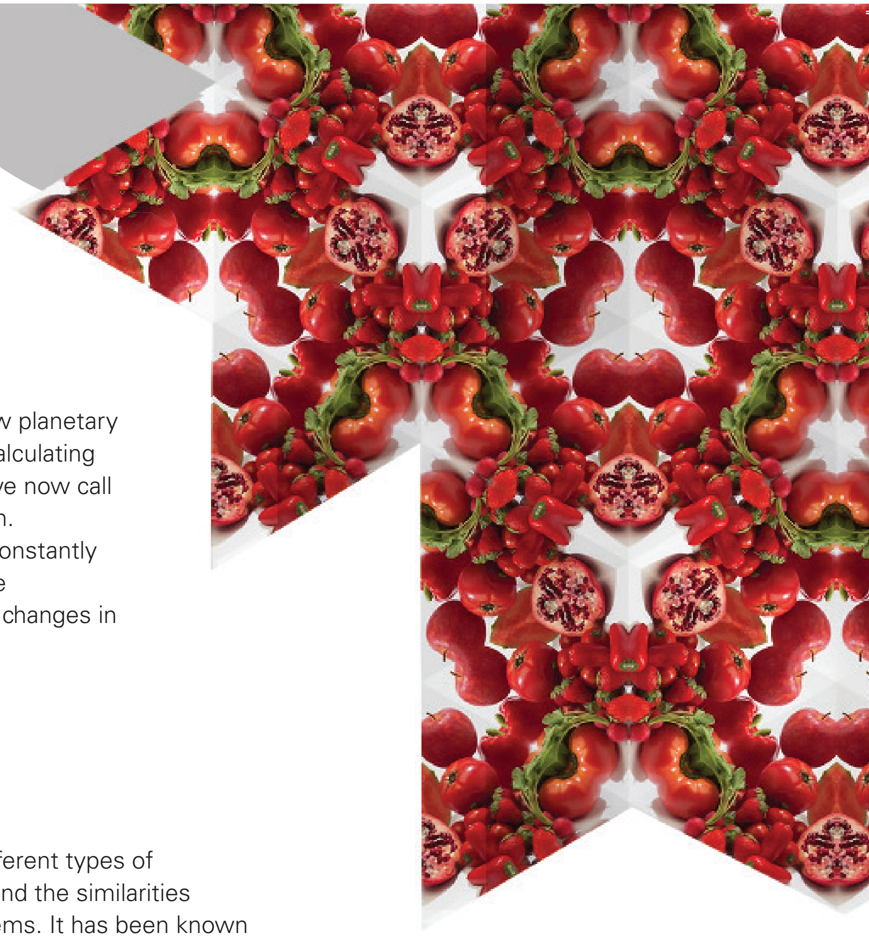
Prof. Sabyasachi Mukherjee, together with his collaborators, has greatly extended this program by developing a dynamical theory of Schwarz reflections. His work gives new depth and scope to Sullivan's Dictionary, establishing it across a remarkably broad class of new examples, thereby demonstrating its fundamental robustness.

Prof. Mukherjee's research unifies the study of Kleinian group actions, iterations of holomorphic and anti-holomorphic maps, and the dynamics of Schwarz reflections and algebraic correspondences, producing a comprehensive framework that reshapes our understanding of conformal dynamics.

Jury Chair
Chandrashekhar Khare

"

I would like to congratulate Sabya for his deep and astonishing work leading to the writing of many new entries in the celebrated dictionary conjectured by Sullivan in the 1980s that links two very different kinds of dynamics. In mathematics, the most celebrated results build bridges between different fields, and Sabya's beautiful work builds such a bridge.



Mapping constant change

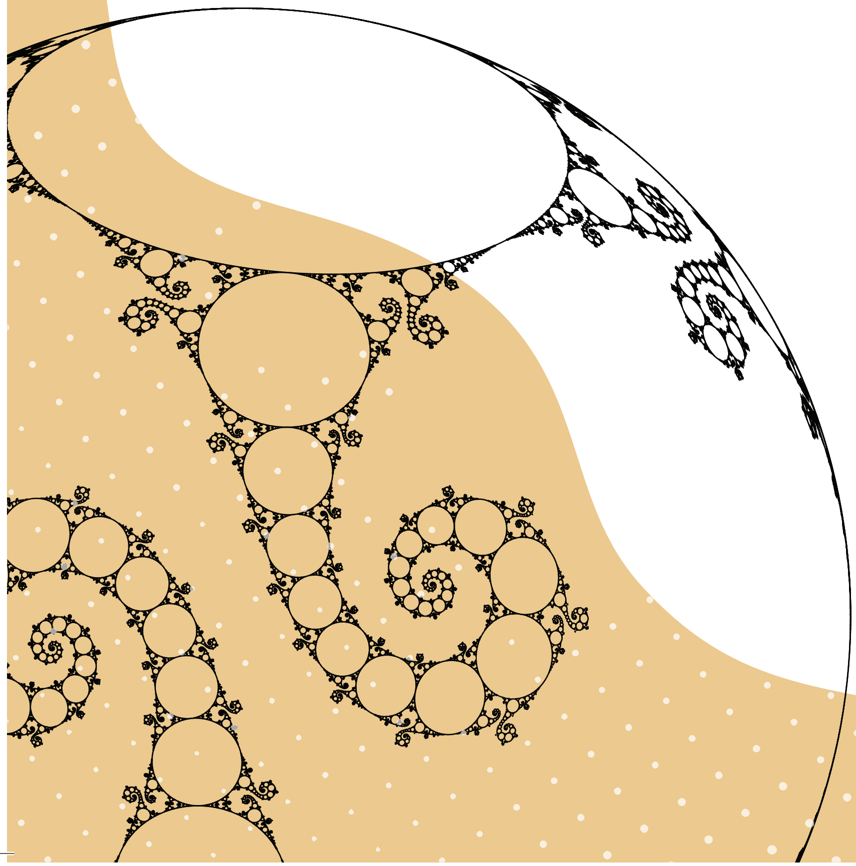
The beginning

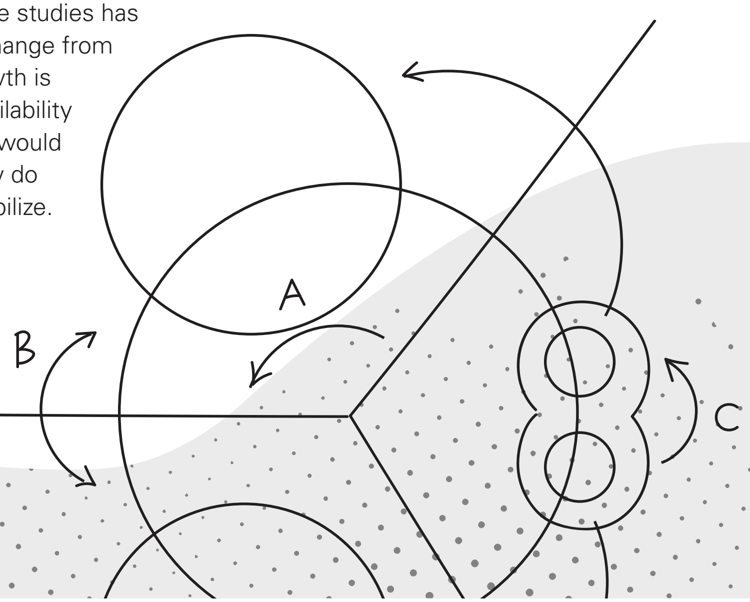
In the late 19th century, physicists and mathematicians began studying how planetary systems with their many moving parts work. They came up with ways of calculating the stability of these systems. The resulting mathematical model is what we now call differential equations. This is how the study of dynamical systems was born.
The principles of dynamical systems can be applied to any system that is constantly changing from one moment to another. This could be weather systems, the movement of fluids in a particular space, the movement of gas particles or changes in a population over time.

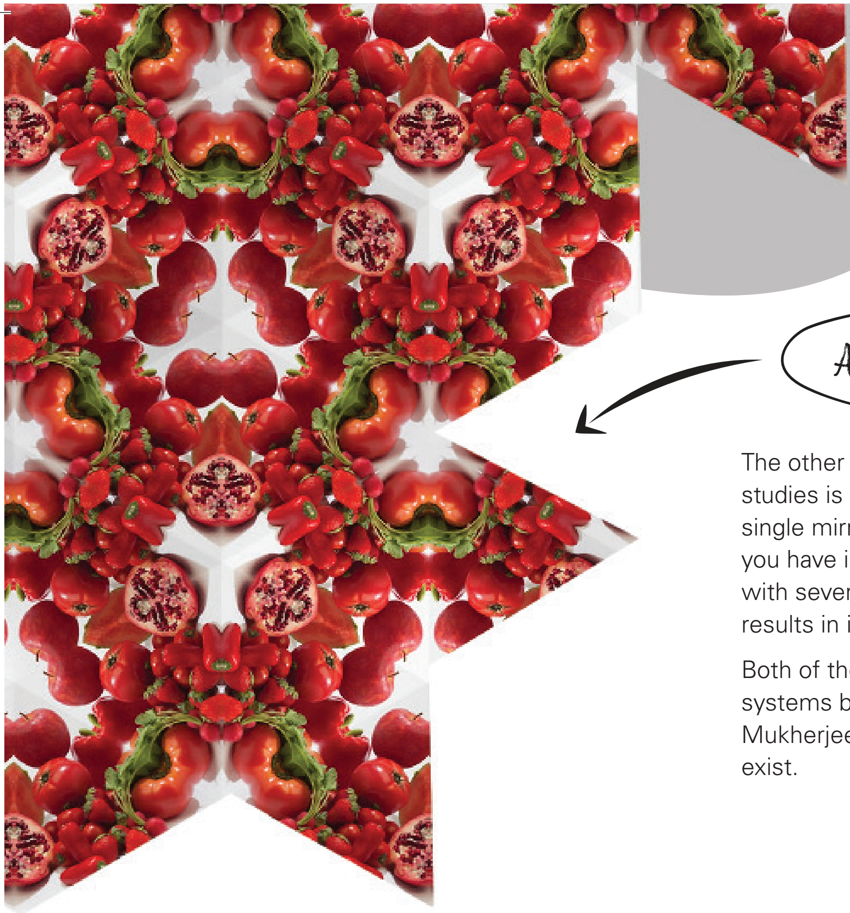
Different but same

Sabyasachi Mukherjee studies how different types of dynamical systems change over time and the similarities between two types of dynamical systems. It has been known for over 100 years that even when different kinds of dynamical systems arise in different ways, there are commonalities between these systems. But it is unclear why this is so.

One kind of dynamical system that Mukherjee studies has its roots in understanding how populations change from one point in time to the next. Population growth is affected by many factors, for example, by availability of resources. Limited resources for example would lead to slowing of a population's growth. How do we then predict when the population will stabilize.



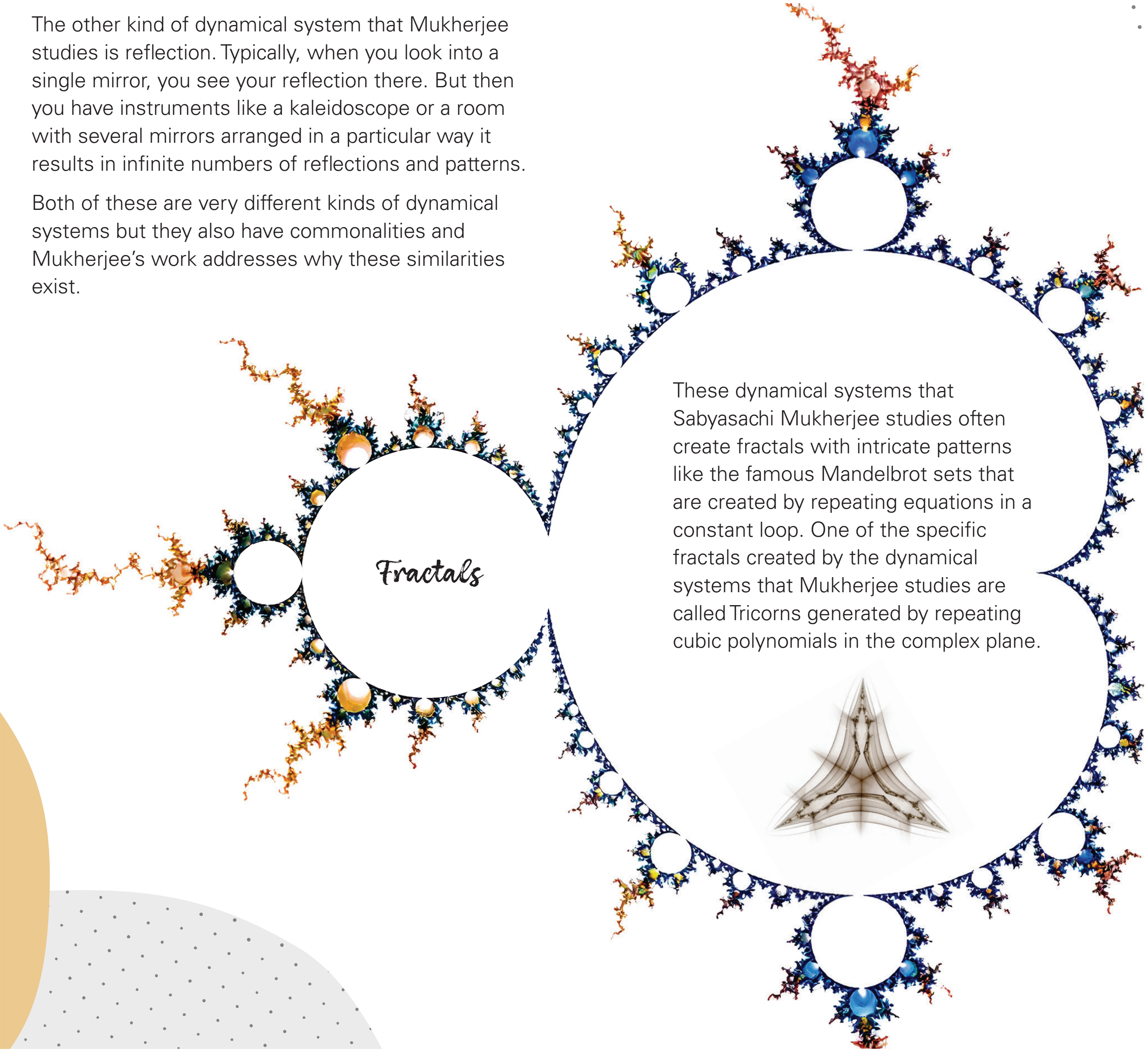




A house of mirrors

The other kind of dynamical system that Mukherjee studies is reflection. Typically, when you look into a single mirror, you see your reflection there. But then you have instruments like a kaleidoscope or a room with several mirrors arranged in a particular way it results in infinite numbers of reflections and patterns.

Both of these are very different kinds of dynamical systems but they also have commonalities and Mukherjee's work addresses why these similarities exist.



Fractals

These dynamical systems that Sabyasachi Mukherjee studies often create fractals with intricate patterns like the famous Mandelbrot sets that are created by repeating equations in a constant loop. One of the specific fractals created by the dynamical systems that Mukherjee studies are called Tricorns generated by repeating cubic polynomials in the complex plane.

Physical Sciences

Karthish Manthiram

Professor, Chemical Engineering and Chemistry, California Institute of Technology, USA

Karthish Manthiram is Professor of Chemical Engineering and Chemistry at Caltech, where he is also the William H. Hurt Scholar. A graduate of Stanford (B.S. 2010) and UC Berkeley (Ph.D. 2015, with Paul Alivisatos), he trained as a postdoctoral fellow with Nobel laureate Robert Grubbs before joining MIT as faculty in 2017. He moved to a full professorship at Caltech in 2021.

Prof. Manthiram's honors include the Sloan Research Fellowship, DOE Early Career Award, NSF CAREER Award, Camille Dreyfus Teacher-Scholar Award, the ISE Elsevier Prize for Applied Electrochemistry, and recognition in *Forbes* "30 Under 30." He has delivered over 150 invited talks, mentored a new generation of leaders, and published over 50 high-impact papers and patents.

The arc of Karthish Manthiram's work embodies the convergence of fundamental chemistry, engineering insight, and societal urgency, forging electrified pathways to a sustainable chemical future.

The Infosys Prize 2025 in Physical Sciences is awarded to Prof. Karthish Manthiram, for pioneering sustainable electrochemical routes to essential chemicals. His breakthroughs in lithium-mediated ammonia synthesis and oxygen-atom transfer catalysis have transformed our understanding of electrified chemical manufacturing, demonstrating how renewable electricity can drive selective, efficient synthesis of chemicals that are fundamental to agriculture and industry.

Scope and Impact of Work

Prof. Karthish Manthiram's research spans the frontiers of electrochemistry, catalysis, and sustainability. His central theme is the electrification of chemical synthesis: developing methods to convert N_2, CO_2, and H_2O into essential products using renewable electricity, rather than fossil fuels.

Prof. Manthiram's most notable contribution is the creative coupling of the hydrogen oxidation reaction to lithium-mediated nitrogen reduction. By introducing novel gas-diffusion and metal-mesh electrodes, his group achieved ammonia synthesis rates under ambient conditions that were two orders of magnitude higher than prior art. This set a world record and provides the seed of an alternative to the Haber–Bosch process, which is among the most carbon-intensive industrial operations. His recent sodium–titanium tandem strategy further lowers cost and expands the scope of electrochemical nitrogen fixation.

Equally transformative is his vision for electrified oxygen-atom transfer. In *Science* (2024), Manthiram reported Pd–Pt oxide catalysts that directly epoxidize propylene using water as the oxygen source, achieving Faradaic efficiencies near 66%. This eliminates hazardous oxidants like chlorine and peroxides, showing how water-oxidation intermediates can serve as clean, versatile oxidants for organic synthesis. This work leads the field on selective oxidation, with significant implications for decarbonizing hydrocarbon upgrading.

Karthish Manthiram's other key innovations include electrochemical hydroformylation catalysts that operate faster than thermal analogues, CO_2 carboxylations of unactivated bonds, and lactonizations relevant to polymer synthesis. Each represents not just a new reaction, but a strategic leap toward electrified chemistry.

Manthiram's fearless pursuit of unconventional ideas, backed by deep mechanistic insight, is already shaping multiple areas of catalysis. His work exemplifies the Infosys Prize ideal: bold, original science with transformative potential for society.

Expanded Citation

Prof. Karthish Manthiram has redefined how electricity can be used to synthesize critical chemicals from abundant small molecules such as N_2, CO_2, and H_2O. In a landmark paper in *Nature Catalysis*, he demonstrated record-setting rates of ambient ammonia synthesis, overcoming diffusion bottlenecks by inventing metal-mesh electrodes for nitrogen reduction.

Prof. Manthiram then introduced palladium–platinum oxide alloy catalysts, in a paper in *Science*, to selectively epoxidize propylene from water, enabling efficient, chlorine-free production of propylene oxide.

Beyond these signature advances, his lab has electrified hydroformylation and devised sodium–titanium tandem systems that lower costs for nitrogen fixation. His creative use of the hydrogen oxidation reaction to power organic synthesis bridges electrochemistry, catalysis, and organic synthesis and is a bold new paradigm to replace fossil-based feedstocks with renewable electricity. The Infosys Prize recognizes his fearless creativity and transformative contributions to sustainable chemical manufacturing.

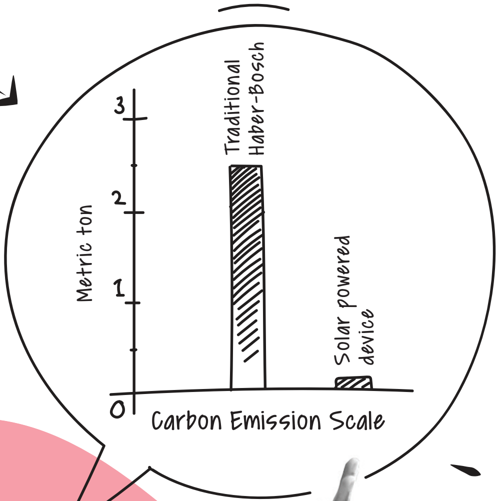
Jury Chair
Shrinivas Kulkarni

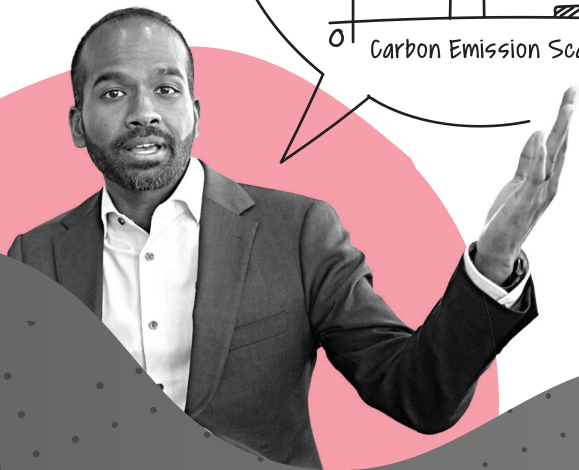
On behalf of the jury, I warmly congratulate Prof. Karthish Manthiram on receiving the Infosys Prize 2025 in Physical Sciences. His fearless creativity in electrifying the synthesis of vital chemicals—spanning ammonia, propylene oxide, and beyond—exemplifies transformative science at the interface of chemistry, energy, and sustainability. He is a brilliant role model for the next generation of physical scientists.

All you need is a little sun

Ammonia and its carbon footprint

Ammonia is a vital ingredient for fertilizer production since nitrogen is the key nutrient for plant growth. However, the production of ammonia is a primary contributor of carbon dioxide emissions leading to climate change. As the production process involves fossil fuels, the emissions are sizeable. 70 percent of global ammonia is used in the production of fertilizer. Between 1.9 and 2.6 metric tons of carbon dioxide are generated for every ton of ammonia produced. Furthermore, in places like Africa that need to step up agricultural production to meet demand, current centralized methods of production are not feasible.



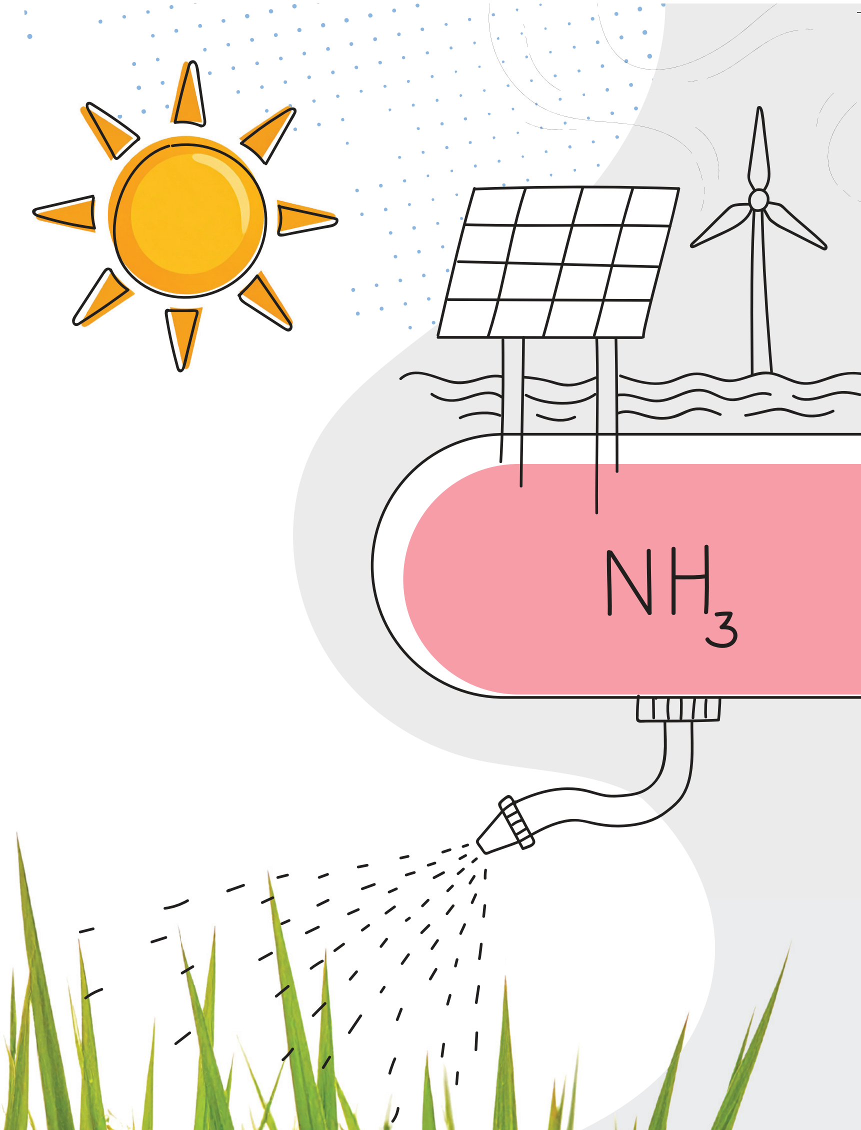


Feeding a burgeoning population

At the turn of the 20th century, as the global population grew, food production needed to be stepped up. The demand for fertilizer in agriculture increased exponentially. Industrial production of ammonia needed to produce fertilizer had to be scaled up. The German physicists Fritz Haber and Carl Bosch came up with the Haber-Bosch process of synthesizing the ammonia using water, natural gas and atmospheric nitrogen. There has been little change or innovation in this space since that time.

Solar powered devices for cleaner ammonia

Now, more than one hundred years later after the discovery of the Haber-Bosch process, Karthish Manthiram's lab has come up with a process for producing ammonia using renewable energy sources. Manthiram has developed a device that can produce ammonia from just air, water and sunlight. The process developed by Manthiram would significantly reduce carbon emissions.



Modular ammonia

The Manthiram Lab's research could revolutionize fertilizer production by making ammonia close to where it is needed. The devices are modular, meaning that they can be assembled in the areas that they are needed, so that the ammonia is made where it is demanded, thereby reducing emissions and carbon footprints further. This would help countries in Africa which have traditionally struggled with ammonia cost and distribution, affecting agricultural production.

Jury Chairs

Economics
Kaushik Basu

Kaushik Basu is Professor of Economics and the C. Marks Professor of International Studies at Cornell University. He is a former Chief Economist and Senior Vice President of the World Bank. Prior to joining the World Bank, he served as Chief Economic Adviser to the Government of India. A Fellow of the Econometric Society, he has published widely in the areas of Development Economics, Industrial Organization, Game Theory and Welfare Economics. His books include *Analytical Development Economics* (1997), *Prelude to Political Economy: A Study of the Social and Political Foundations of Economics* (2000), *Of People, Of Places: Sketches from an Economist's Notebook* (1994), *Beyond the Invisible Hand: Groundwork for a New Economics* (2011), *An Economist's Miscellany* (2011), and *The Republic of Beliefs* (2018). In May 2008, he was awarded the Padma Bhushan by the Government of India.

Jurors

Levon Barseghyan
Robert Julius Thorne Professor of Economics, Department of Economics, Cornell University

Sudipta Sarangi
Professor & Department Head, Department of Economics, Virginia Tech

Ajit Mishra
Professor & Head, Department of Economics, University of Bath

Lata Gangadharan
Professor of Economics & Joe Isaac Chair of Business and Economics, Monash University

Tavneet Suri
Louis E. Seley Professor of Applied Economics, MIT Sloan School of Management

Engineering & Computer Science
Jayathi Y. Murthy

Jayathi Murthy is the President of Oregon State University. Prior to joining Oregon State, Murthy served as the first woman dean of the UCLA Henry Samueli School of Engineering and Applied Science. During her tenure, she made expanding access to a UCLA engineering education a top priority by deepening relationships with local community colleges, increasing outreach to underrepresented minority groups and easing the transition for transfer students. She led the effort to establish Women in Engineering at UCLA While at UCLA, she was active in helping raise more than $330 million in philanthropy. She is a member of the National Academy of Engineering (NAE), foreign fellow of the Indian National Academy of Engineering (INAE), fellow of the American Society of Mechanical Engineers (ASME) and the recipient of many honors, including the ASME Heat Transfer Memorial Award in 2016, the ASME Electronics and Photonics Packaging Division Clock Award, and ASME Kate Gleason Award in 2023.

Jurors

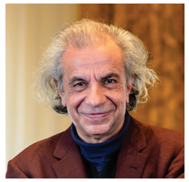
Vikram Deshpande
Professor of Materials Engineering, University of Cambridge

Dhananjaya Dendukuri
CEO & Co-Founder, Achira Labs Pvt. Ltd., Bengaluru

Rajesh K. Gupta
Dean, School of Computing, Information and Data Science, UC San Diego

Sunita Sarawagi
Institute Chair Professor, Computer Science and Engineering, Indian Institute of Technology, Bombay

Umesh Mishra
Dean, The Robert Mehrabian College of Engineering, Richard A. Auhll Professor, Electrical and Computer Engineering, University of Santa Barbara



Humanities & Social Sciences
Akeel Bilgrami

Akeel Bilgrami is the Sidney Morgenbesser Professor of Philosophy and Professor, Committee on Global Thought, Columbia University. He is the author of the books *Belief and Meaning, Self-Knowledge and Resentment,* and *Secularism, Identity, and Enchantment* and is currently writing a book on Gandhi's philosophy as well as a longer work on the nature of practical reason. At Columbia he has been the Chairman of the Philosophy Department from 1994-98, the Director of the Heyman Centre for the Humanities from Dec 2003-2010, and the Director of the South Asian Institute from 2013-2016. He was elected Cullman Fellow at the New York Public Library, held the Radhakrishnan Chair in India, visiting professorships at Oxford University and Yale University, and has been the recipient of fellowships and grants from the Mellon Foundation, Ford Foundation, National Endowment of the Humanities, as well as the Luce Foundation. He is also the President of the Trustees and the Executive Editor of The Journal of Philosophy.

Jurors

Kalpana Kannabiran
Distinguished Professor, Council for Social Development, New Delhi

David Shulman
Professor Emeritus, Hebrew University, Jerusalem and Member of the Israel Academy of Sciences and Humanities

Veena Das
Professor Emeritus, Department of Anthropology, Johns Hopkins University

Niraja Gopal Jayal
Professor, Avantha Chair, King's India Institute, King's College London

Prachi Deshpande
Associate Professor of History, Centre for Studies in Social Sciences, Kolkata

Life Sciences

Mriganka Sur

Mriganka Sur is the Newton Professor of Neuroscience; Director, Simons Center for the Social Brain; and Investigator, Picower Institute for Learning and Memory, at the Massachusetts Institute of Technology. He was head of the MIT Department of Brain and Cognitive Sciences for 15 years. The McGovern Institute for Brain Research was founded under his leadership. At MIT, Sur received the Hans-Lukas Teuber Scholar Award in the Brain Sciences (1997), the Sherman Fairchild Chair (1998), and the Newton Chair (2008). He is an elected Fellow of the Royal Society (UK), the US National Academy of Medicine, the American Academy of Arts and Sciences, and the Indian National Science Academy.

Jurors

Tejal Desai
Sorensen Family Dean of Engineering, Professor of Engineering, Brown University, USA

Imran Siddiqi
Emeritus Scientist, Centre for Cellular and Molecular Biology, CSIR, Hyderabad

Sankar Ghosh
Chairman and Silverstein and Hutt Family Professor of Microbiology & Immunology, Columbia University, USA

Satyajit Mayor
Leverhulme International Professor, Centre for Mechanochemical Cell Biology, Warwick University, UK

Paola Arlotta
Chair, Harvard Department of Stem Cell and Regenerative Biology Golub Family Professor of Stem Cell and Regenerative Biology, Harvard University, USA

Mathematical Sciences

Chandrashekhar Khare

Chandrashekhar Khare is Professor & David Saxon Presidential Term Chair in Mathematics, University of California, Los Angeles, USA. He is a number theorist and works on the connection between modular forms and Galois representations. Prof. Khare's work with Jean-Pierre Wintenberger gave a proof of a celebrated conjecture of J.-P. Serre in the subject. He has received a number of honors and awards in recognition of his work. Khare received the Humboldt Research Award in 2011, Cole Prize in 2011, Infosys Prize in 2010, Guggenheim fellowship in 2008, Fermat prize in 2007, and the INSA Young Scientist Award in 1999. In 2012, Prof. Khare was elected as a Fellow of the Royal Society. He is the author of a memoir, *Chasing a Conjecture: Inside the Mind of a Mathematician* (2025), detailing his journey as a mathematician leading to his proof of the Serre conjecture.

Jurors

Ritabrata Munshi
Professor, Theoretical Statistics and Mathematics Unit, ISI, Kolkata

Andrew Wiles
Regius Professor of Mathematics, University of Oxford

Hélène Esnault
Einstein Professor (Emeritus), Institute of Mathematics, Free University, Berlin

Kavita Ramanan
Roland George Dwight Richardson University Professor of Applied Mathematics, Brown University

Physical Sciences

Shrinivas Kulkarni

Shrinivas Kulkarni is the George Ellery Hale Professor of Astronomy and Planetary Science at the California Institute of Technology, USA. His primary interests are the study of compact objects (neutron stars and gamma-ray bursts) and the search for extra-solar planets through interferometric and adaptive techniques. He serves as the Interdisciplinary Scientist for the Space Interferometry Mission (SIM) and is co-Principal Investigator of the Planet Search Key Project (also on SIM). He has been awarded the Alan T. Waterman Prize of the NSF, a fellowship from the David and Lucile Packard Foundation, a Presidential Young Investigator award from the NSF and the Helen B. Warner award of the American Astronomical Society and the Jansky Prize of Associated Universities, Inc. He was also elected a Fellow of the American Academy of Arts and Sciences (1994), Fellow of the Royal Society of London (2001) and Fellow of the National Academy of Sciences (2003) and foreign member of the Royal Netherlands Academy of Arts and Sciences (2016). In 2017, he won the Dan David Prize for his contribution to the emerging field of Time Domain Astronomy.

Jurors

Peter Zoller
Professor, Theoretical Physics, University of Innsbruck; Emeritus Professor & Scientific Director, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria

Yamuna Krishnan
Louis Block Professor, Department of Chemistry, The University of Chicago

Steven Allan Kivelson
Prabhu Goel Family Professor, Stanford University

Spenta Wadia
Infosys Homi Bhabha Chair Professor and Founding Director, International Centre for Theoretical Sciences of TIFR, Bengaluru

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Trustee, Infosys Science Foundation

Bhavna Mehra
General Manager,
Infosys Science Foundation

Infosys Science Foundation

The Infosys Science Foundation, a not-for-profit trust, was set up in 2009 by Infosys and members of its Board, with the objective of encouraging, recognizing, and fostering world-class scientific research connected to India. We do this primarily through the Infosys Prize, which is awarded to researchers and scholars in six categories: Economics, Engineering and Computer Science, Humanities and Social Sciences, Life Sciences, Mathematical Sciences, and Physical Sciences. A jury comprising eminent leaders in each of these fields evaluates the achievements of nominees against the standards of international research, placing the winners on par with the finest researchers in the world. The prize consists of a gold medal, a citation, and a purse of US $100,000. In keeping with our mission of spreading the culture of science, we also partner with educational institutions to host lectures featuring Infosys Prize laureates and jurors aiming to spark curiosity and inspire the next generation of scholars. The Foundation creates conversations around science and society, engaging with various sections of the community, through talks, initiatives, workshops and training. Log on to www.infosysprize.org to know more.

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