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OBITUARY

Remembering Jayant Vishnu Narlikar: The Maverick Cosmologist Who Dared to Think Different

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London, 11 June, 1964. The grand halls of the Royal Society buzzed with an electric anticipation. The air was thick with the murmurs. The hall was packed with distinguished scientists, journalists, and scholars, all gathered for what promised to be a historic evening. Two speakers stood poised to present a theory that the grapevines informed would challenge Einstein. Fred Hoyle, the renowned cosmologist who had already made history by predicting the critical carbon-12 resonance state, a finding that clarified the abundance of carbon in stars, was the first. Next to him was a young, modest Indian scholar, Jayant Vishnu Narlikar.

A Talk That Shook the World

Jayant Narlikar was born on 19 July 1938 in Kolhapur, Maharashtra. His early education took place on the campus of Banaras Hindu University (BHU), where his father, Vishnu Vasudev Narlikar, was a distinguished mathematician. The intellectual environment at home nurtured young Jayant's curiosity, and by the time he left for Cambridge for higher studies, he was already marked as a mathematics prodigy. At Cambridge, he distinguished himself as a Wrangler and Tyson Medallist in the Mathematical Tripos, earning his B.A. in mathematics in 1960. By 1963, he had also completed his PhD under the supervision of Fred Hoyle, setting the stage for what would become one of the most dramatic moments in modern cosmology.

The title of their talk that evening was nothing short of audacious: “A New Theory of Gravity”.

Hoyle and Narlikar had already completed three joint papers slated for publication in the Proceedings of the Royal Society. Recognising the significance of their work, the Royal Society had specially arranged this presentation to unveil their groundbreaking findings to the scientific community. The published articles would later appear in the journal’s 3 November 1964 issue.

The audience was a veritable who’s-who of 20th-century British science. Abdus Salam, Hermann Bondi, Paul Dirac, and other luminaries sat in rapt attention. Even the press had descended in droves, sensing a major breakthrough. Hoyle set the stage, explaining the motivation behind their daring research. Then, the young Narlikar took over, diving into the intricate mathematics that wove together Einstein’s General Theory of Relativity and Mach’s Principle, the idea that the mass of every object in the Universe is shaped by its interaction with all others.

What followed was sensational. Einstein himself had once admitted defeat in reconciling Mach’s Principle with his relativity. Yet here, before a stunned audience, Hoyle and Narlikar presented a bold new framework that appeared to get relativity to blend with Mach’s Principle. The room fell into a hushed silence as the implications sank in. With a touch of humility, the duo remarked, “We are clearly aware that in putting forward still another idea, we may be like small boys trying to steal apples.” But as *Time* magazine later noted, this was no childish mischief—it was “ambitious larceny.”

The reaction was instantaneous. Visibly awed, Professor Brian Flowers of Manchester University confessed to reporters, “If you give me three months to sit down and think about it, I might come up with something.” Another Royal Society member marvelled at the “parade of splendid mathematics” that had just unfolded.

The next morning, newspapers across Britain splashed the news. A week later, the *New York Times* declared in bold letters:

"SCIENTIST REVISES EINSTEIN'S THEORY." *Time* magazine followed with a feature titled "Cosmology: Math Plus Mach Equals Far-Out Gravity." The ripples reached India, where newspapers erupted in pride, proclaiming that a "young Indian don at Cambridge and his senior collaborator had seen beyond Einstein."

This was a moment of triumph for a newly independent India, starving for global recognition. A young Indian daring to rewrite the laws of the cosmos. Naresh Dadhich, a renowned Indian theoretical physicist who later worked closely with Narlikar, reflected: "This was precisely what the young nation was looking for, as it was hungry for such recognitions—and it was the first big one. An independent India was aspiring to catch up with the Western world in all spheres of life quickly, and more so in science, which is believed to be the key transformation vehicle for material progress. This is how Jayant Narlikar arose with a bang on the Indian science horizon."

The Cosmic Clash: Big Bang vs. Steady State in the 1960s

But the fuss was nothing new to Jayant Narlikar. His very first steps into cosmology, like a young gladiator thrown into the arena, had lunged him straight into the heart of scientific debate. As a consequence of his inaugural research project, before he had even completed his PhD, Narlikar found himself at the centre of one of the most heated scientific disputes of the era. This baptism by fire would come to define Narlikar's approach to science and life, never shying away from an unpopular idea.

By the 1930s, astronomers had established that the Universe was expanding, thanks to Edwin Hubble's groundbreaking observations showing galaxies receding apart. This led many cosmologists to propose that the cosmos began in an unimaginably hot, dense state, what became known as the Big Bang Theory, suggesting a violent birth billions of years ago. Yet, as the evidence was sketchy, alternative theories still held sway.

Leading the opposition was Fred Hoyle, who championed the Steady State Theory (SST) along with Hermann Bondi and Thomas Gold. In a 1950 BBC radio talk, Hoyle famously mocked the “Big Bang”, dismissing it as an “unsatisfactory” idea. He said, “One [idea] was that the Universe started its life a finite time ago in a single huge explosion and that the present expansion is a relic of the violence of this explosion. This “big bang” idea seemed to me to be unsatisfactory even before detailed examination showed that it leads to serious difficulties.” Hoyle, Bondi, and Gold envisioned an eternal, unchanging universe where matter continuously appeared to fill the gaps left by expansion. To them, the cosmos had no beginning or end; it simply was, always had been, and always would be.

But the Big Bang made a critical prediction: if the Universe had evolved from an ultra-dense state, the distant past should have been far more crowded than the present. Martin Ryle, Britain’s foremost radio astronomer, set out to test this by counting distant radio galaxies. If the Steady State Theory were correct, he reasoned that these galaxies should be evenly distributed across time and space.

Ryle’s team spent years refining their surveys, detecting ever-fainter radio sources. Since dimmer signals typically came from farther away, they reasoned that these observations were like cosmic time machines, revealing the Universe’s past. Just as we see the Sun not as it is now but as it was eight minutes ago due to light’s travel time, Ryle’s data offered a glimpse into deep cosmic history.

The results were sensational. Instead of a uniform distribution, Ryle found far more radio sources in the distant past than the Steady State Theory allowed. This implied the Universe was denser long ago, precisely what the Big Bang predicted. Convinced he had disproven Hoyle’s model, Ryle prepared to announce his findings at the Royal Astronomical Society’s meeting on 10 February 1961.

Seeing this as a direct challenge to his theory, Hoyle resolved to counter Ryle’s claims. With barely a month to prepare, he enlisted the help of Jayant Narlikar. Together, they scrutinised Ryle’s data and identified two critical weaknesses. First, Ryle had assumed the large-scale Universe was perfectly uniform, but what if, instead, it contained vast superclusters and voids at the scale of, say, 150 light-years? Such irregularities could distort the results. Second, if older galaxies were more likely to become radio sources, their higher density in the past would not necessarily contradict the Steady State model.

As the debate loomed, Hoyle dropped a bombshell: a prior commitment forced him to miss the RAS meeting. The task of defending the Steady State Theory fell on the young shoulders of Jayant Narlikar. Walking into what felt like a lion's den, the undeterred Jayant Narlikar delivered a sharp, eight-minute rebuttal, challenging Ryle's assumptions head-on.

That first tumultuous encounter at the Royal Astronomical Society meeting was merely the opening act for Jayant Narlikar in what would become a career-long willingness to challenge conventional wisdom and venture where others feared to tread.

The Hoyle-Narlikar Theory of Gravity: A Radical Alternative

Imagine a bucket of water spinning on a twisted rope. At first, the water stays flat while the bucket turns beneath it. But as the water starts spinning, too, its surface curves upward into a bowl shape. Here is the mystery: once both bucket and water spin together, why does the water still curve?

At that stage, the water and vessel are rotating together, and there is no relative motion between them, yet the water somehow "knows" it is rotating. Newton concluded that this proved the existence of absolute space, an invisible framework that filled the Universe.

This explanation stood unchallenged for nearly two hundred years until physicist Ernst Mach called the bluff. In his 1883 book, Mach argued that water was not responding to some imaginary absolute space but to the real matter in the Universe, the Earth, stars, and distant celestial objects. This became known as Mach's Principle: inertia and rotation only make sense when measured against the cosmic backdrop of all matter in the Universe.

Mach turned Newton's idea on its head. That feeling of being pushed sideways when a car turns? It is about the car's motion and your movement relative to the entire Universe. The bowl-shaped water surface? A conversation between the spinning water and distant galaxies. Most radically, Mach suggested that there would be no inertia at all in an empty universe: no resistance to motion. In fact, no motion. The difference between Newton and Mach was this: is motion and inertia something we measure against the void, or are they an ongoing dialogue with the entire cosmos?

Einstein's General Theory of Relativity reimagined gravity not as a traditional force but as the bending of spacetime itself. Picture spacetime as a vast, cosmic trampoline, usually flat and featureless until you place objects upon it. When a massive object like a star sits on this fabric, it creates a deep depression, much like how an iron ball would sag a trampoline's surface. Smaller objects nearby, instead of being mysteriously "pulled" by an invisible force, simply follow the natural curves of this warped surface. A marble rolling near our iron ball would spiral inward not because of some magical attraction but because it is tracing the contours of the distorted fabric. This elegant concept explains everything from why apples fall to how black holes trap light, revealing gravity as the natural geometry of a universe where matter tells spacetime how to curve, and spacetime tells matter how to move. The entire cosmos becomes a dynamic dance of mass shaping space and space guiding motion.

The Hoyle-Narlikar theory of gravity, developed in the 1960s, was a bold attempt to reconcile Einstein's general relativity with Mach's Principle. Unlike Einstein's theory, where mass warps spacetime on its own, Hoyle and Narlikar proposed that mass is a consequence of the entire Universe's influence, a cosmic "give-and-take" where every particle's inertia depends on the distribution of all other matter.

Imagine a famous "influencer" whose celebrity status depends on the audience's recognition; their fame would not exist without fans. Similarly, in the Hoyle-Narlikar theory, a particle's mass is not an intrinsic property but emerges from interacting with the rest of the Universe. The more distant matter there is, the more it contributes to the particle's inertia. According to their theory, a universe with nothing in it is impossible. There must be at least two particles, each to give mass to the other.

In this framework, the masses, and therefore the gravity, of the Sun and the Earth are partly due to each other, partly due to the influence of distant stars and celestial objects.

After the talk, responding to a press query, Hoyle said, “If the Universe were to be cut in half, local solar-system gravitation would double, drawing the Earth closer to the Sun. The pressure in the Sun’s centre would increase, thus raising its temperature, its generation of energy, and its brightness. Before being seared into a lump of charcoal, a man on Earth would find his weight increasing from 150 to 300 lbs.”

Instead of Einstein’s curvature-based gravity, Hoyle and Narlikar used action-at-a-distance physics, where particles directly influence each other across space and time. Think of a crowded marketplace: instead of walking on a warped floor (Einstein’s curved space), people are constantly nudged by others around them (direct interactions). Their theory avoided sudden “origins” (like the Big Bang) and allowed for continuous matter creation, aligning with Hoyle’s ever-present Steady State model.

The theory also introduced a “creation field” (C-field) that generates new matter to maintain a constant density as the Universe expands. It predicted variable particle masses over cosmic time, meaning an electron in the early Universe might have weighed differently than today. It also explained why gravity is an attractive force rather than repulsive. When there are multitudes of particles in the Universe, their model matches the General Theory of Relativity.

Homecoming

Inspired by the media coverage, then-Prime Minister Lal Bahadur Shastri and Education Minister M.C. Chagla invited Jayant Narlikar to India under the aegis of the Indian Council for Cultural Relations to visit educational campuses and enthuse students toward science. They also extended an invitation for him to return to India and work at a place of his choice with full government support.

Meanwhile, realising the interesting times ahead for cosmology, Fred Hoyle took the initiative to establish a unique institution known as the Institute of Theoretical Astronomy (IOTA) as an autonomous centre in Cambridge. Narlikar decided to stay back for at least a few years as one of the founding staff members.

During this period, in 1966, Narlikar married Mangala Rajwade, a Ph.D. in mathematics. They had three daughters, Geeta, Girija, and Leelavati, all of whom pursued careers in science. Dr Mangala Narlikar passed away a few years ago in 2023.

In 1969, recalling the Prime Minister's earlier invitation, Jayant Narlikar wrote to then-PM Indira Gandhi, expressing his intention to return to India in 1972, preferably to work at the Tata Institute of Fundamental Research (TIFR). Prime Minister Gandhi and TIFR Director M.G.K. Menon responded with welcoming letters and facilitated his transition. In due course, Narlikar was appointed as a Full Professor with the implicit mandate of developing the Theoretical Astrophysics (TAP) Group at TIFR, marking the beginning of his significant contributions to India's astrophysics research landscape.

New Vistas

During his tenure at TIFR, while building the theoretical astrophysics program, Jayant Narlikar and his collaborators proposed a radical idea: extragalactic objects could exhibit additional redshift due to variable mass. Their model suggested that particles begin with zero mass at creation, moving at light speed, but gradually gain inertia as their causal horizon expands. This progressive mass acquisition would cause the objects to decelerate while their redshift diminished. This paradigm explains the pairs (or larger groups) of objects with differing redshifts lying in close proximity, an alternative explanation of puzzling observations, Narlikar argued, that was systematically overlooked because it undermined the foundational Hubble redshift-distance relationship central to Big Bang cosmology.

The Big Bang paradigm itself, Narlikar noted, rests entirely on extrapolating Einstein's classical general relativity equations to extreme conditions. Yet these equations inevitably fail when the Universe's curvature radius approaches quantum scales (below 10^{-33} cm), meaning the true origin of the cosmos belongs to the still-elusive domain of quantum gravity, a frontier Narlikar pioneered and explored.

By the 1980s, cosmology had become deeply entwined with high-energy physics and conjectural concepts like inflation and dark energy. While these ideas defied the mainstream cosmological models, Narlikar remained sceptical. In 1989, he joined Fred Hoyle, Geoffrey Burbidge, Chip Arp, and Chandra Wickramasinghe in a landmark critique of standard "Big Bang" cosmology, published in *Nature*, challenging methodological biases in their cosmological practices. Though their arguments forced concessions about the Big Bang model's weaknesses, defenders maintained it remained the "only game in town."

Undeterred, Narlikar, Hoyle, and Burbidge formulated the Quasi-Steady State Cosmology (QSSC) 1993, a bold alternative featuring cyclical cosmic epochs with continuous matter creation. Their subsequent Cambridge University Press monograph (2000) systematically developed this framework, arguing a competitor to standard "Big Bang" cosmology.

Although Narlikar was among the minuscule minority who disbelieved the Big Bang theory, his critique of the standard established view of cosmology was taken seriously with respect and consideration. This was evident when he was elected as the President of the Cosmology Commission of the International Astronomical Union for the term 1994–1997.

The Birth of IUCAA: Revitalizing Indian Astrophysics

Before India's independence, universities like Banaras Hindu University, Allahabad, and Calcutta were globally renowned centres of learning. However, establishing specialised institutes like the Tata Institute of Fundamental Research (TIFR) outside the university system gradually eroded the universities' research capacities. Recognising this decline, the University Grants Commission (UGC), under the visionary leadership of Professor Yash Pal in the mid-1980s, sought to create centres of excellence within the university framework to rejuvenate academic standards.

This initiative led to the concept of Inter-University Centres (IUCs), designed to enhance teaching and research by providing advanced facilities and fostering collaboration among universities. Among the first proposed was the Inter-University Centre for Astronomy and Astrophysics (IUCAA). Tasked with preparing the project report, Jayant Narlikar was offered the role of founding director with the assurance that his leadership would expedite approval and funding. Drawing from his experience at Cambridge, where he witnessed the creation of the Institute of Theoretical Astronomy (IOTA), a model of autonomy within a university setting, Narlikar embraced the challenge.

Under his guidance, IUCAA was established at a remarkable speed. It was formally inaugurated on 28 December 1992 by UGC Chairman Ram Reddy. The event was graced by a lecture from Nobel Laureate Subrahmanyan Chandrasekhar. Narlikar's vision for IUCAA, encapsulated in his "Eightfold Way", excellence in basic research, helping academics from universities upgrade their work, pedagogical activities like schools and workshops, guiding PhD students, guiding university teachers in using national and international facilities in observational astronomy and science popularisation programme for schoolchildren and the general public.

As noted by Naresh Dadhich, Narlikar's greatest legacy is IUCAA itself: "The greatest gifts JVN has given to the nation and to science in general and astronomy, in particular, is IUCAA, a world-class astrophysics centre for the promotion and growth of astrophysics teaching and research in universities."

Prof. Narlikar retired from Directorship in 2003. Under his direction, IUCAA emerged as a world-class institution, upgrading astrophysics research and education in India, bridging the gap between universities and cutting-edge science, and inspiring future generations of astronomers.

Championing Scientific Temper

From his early days as a young faculty member at TIFR, Jayant Narlikar cultivated a deep commitment to public science communication, choosing to write and speak in Marathi and Hindi despite the greater challenge it posed compared to English. He often remarked that while crafting scientific content in Indian languages demanded extraordinary effort, its profound impact on the common person made it immensely rewarding. This interest soon blossomed into creative expression through science fiction, with his collection “Stories of the Future’ earning widespread acclaim among enthusiasts. For his efforts at science communication through his books, articles, and radio/TV programs, he was honoured by UNESCO in 1996 with the Kalinga Award.

Narlikar emerged as one of India’s most influential voices advocating scientific temper, tirelessly engaging the public on the importance of rational inquiry and evidence-based thinking. Armed with expertise in astronomy and Sanskrit, he critically examined India’s astronomical heritage while vehemently opposing pseudoscience, superstition, and astrology. “Even though there are some in this country who decry the science done today as Western, there is nothing in the truths discovered by science that has Western cultural values,” he wrote.

In a landmark 2009 collaboration with rationalist Narendra Dabholkar, Narlikar spearheaded a rigorous, double-blind study to test astrological claims. Published in *Skeptical Inquirer* and *Current Science*, their research, which asked astrologers to match birth charts with personality profiles, found no correlation beyond random chance, delivering a data-driven rebuttal to astrological claims. Writing in 2018, Jayant Narlikar said, “as India continues to be hidebound with tradition and rituals, the need for ‘scientific temper’ is essential as never before” and contended that “scientific temper is an essential component of man’s mental framework in his struggles to face the challenges of the present and the future.”

Homage

Jayant Narlikar passed away on 20 May 2025, at the age of 86, after a fulfilling life and career in cosmology. He was decorated with the Padma Bhushan in 1965 at the young age of 26. In 2004, he was awarded the Padma Vibhushan. He was a Bhatnagar Awardee, the M.P. Birla Award recipient, the Prix Janssen of the French Astronomical Society, and an Associate of the Royal Astronomical Society of London. He was a Fellow of the three national science academies and Third World Academy of Sciences.

Jayant Narlikar's life is a testament to intellectual courage. In an era where scientific consensus usually discourages dissent, Narlikar's legacy reminds us that progress thrives on bold ideas, even or especially when they defy convention and dare to ask, "What if we are wrong?"

And perhaps, in the grand tradition of science, that is the greatest tribute one can pay to a mind like Jayant Narlikar's, not blind acceptance but the willingness to question, probe, and wonder.

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