Golden Jubilee Lectures on

VOYAGE *through the* COSMOS

History, Models, Theories, Images and Foundational Issues in Exploring the Universe

March 16-22, 2026 | Online Mode

BI Golden Jubilee

Handbook

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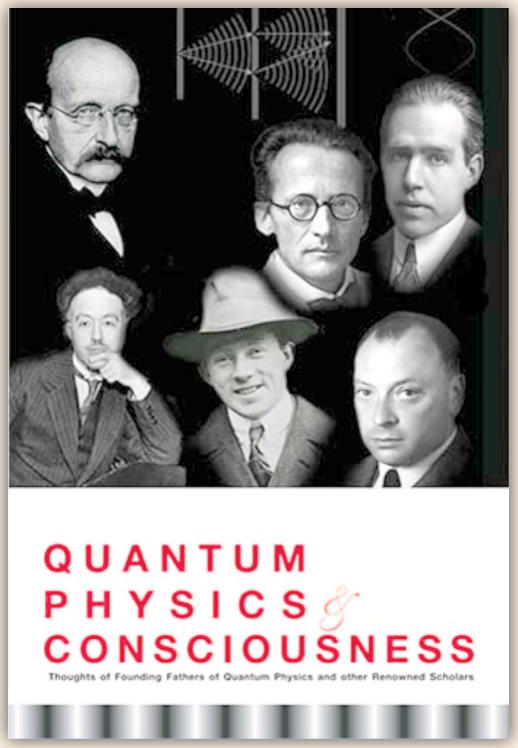

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The eternal mystery of the world is its comprehensibility…
The fact that it is comprehensible is a miracle.

— Albert Einstein
Nobel Laureate in Physics

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History, Models, Theories, Images and Foundational Issues in Exploring the Universe

March 16-22, 2026 | Mode: Online

Organized by

Bhaktivedanta Institute
Kolkata

Dedicated to

Dr. T. D. Singh

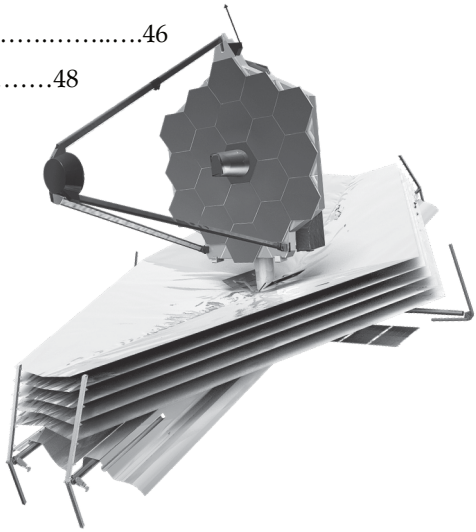
(His Holiness Bhaktisvarupa Damodara Swami)

(1937-2006)

Scientist and Saint

Founder Director, Bhaktivedanta Institute
&
Founder President, Vedanta and Science Educational Research Foundation

Contents



Welcome Address

Among the great mysteries that make humans curious about, the cosmos stands the greatest and universal. From early ages of the mankind to the modern scientific age, cosmos has nurtured, guided and intrigued all human life. Even a toddler who is unable to ask any questions wonders about the twinkling stars and the shining moon. Such is the mystery of our observable universe that it had deep impact on our curiosity from which the science was borne. The beauty in the visible universe and the beauty of the equations that describe it, both intrigue the deep thinkers – what is the origin of universe and its laws? Is beauty a fundamental aspect of the universe? Are there a greater meaning and purpose of the universe and our existence?

From studying the visible patterns of the cosmos and using them to mark the seasons and times of the day, we have come a long way in probing and predicting the universe beyond the visibility of the naked eye – thanks to the incredible advancements of science. Our observation range was expanded by carefully crafted optical telescopes. The range of observation was further expanded by radio telescopes. We have even changed the point of observation from the earth into the cosmos itself by launching the telescopes into space. We could confirm the space time curvature of the universe by predicting and observing cosmic events. The detection of cosmic microwave background was useful to predict the beginnings of the universe. The James Webb Space Telescope (JWST), launched in 2021, has revolutionized infrared astronomy by capturing detailed images of early galaxies, star

formation, and exoplanet atmospheres—some of the most distant objects ever observed. An exoplanet is a planet that orbits a star outside our Solar System. Since the first confirmed discovery in 1992, over 6000 exoplanets have been confirmed, spread across more than 4,500 planetary systems. These worlds exhibit extraordinary diversity, including hot Jupiters, super-Earths, mini-Neptunes, and Hycean worlds—planets with ocean-covered surfaces and hydrogen-rich atmospheres that may support life beyond traditional habitable zones. The search continues for Earth-sized planets in the habitable zone of Sun-like stars, with estimates suggesting 11 billion potentially habitable Earth-sized planets may exist in the Milky Way alone. With uncertain conditions on the earth, our survival seems to depend on our cosmic success.

Cosmology is one of the important research areas of the Bhaktivedanta Institute. On the occasion of the Golden Jubilee celebrations of the Bhaktivedanta Institute, we are happy to welcome you to this Golden Jubilee lecture series on the "Voyage through the cosmos" with inspiration from Albert Einstein who exclaimed, "The most beautiful emotion we can experience is the mystical. It is the power of all true art and science. He to whom this emotion is a stranger, who can no longer wonder and stand rapt in awe, is as good as dead. To know that what is impenetrable to us really exists, manifesting itself as the highest wisdom and the most radiant beauty, which our dull faculties can comprehend only in their most primitive forms—this knowledge, this feeling, is at the center of true religiousness. In this sense, and in this sense only, I belong to the rank of devoutly religious men."[Rowe, David and Robert Schulmann (2007). Einstein on Politics: His Private

Thoughts and Public Stands on Nationalism. Princeton: Princeton University Press, pp. 229-230.] [1]

Let me express few words about the Bhaktivedanta Institute, the organizer of this event. Bhaktivedanta Institute was founded in 1974 by scientist-saint Dr. T. D. Singh, who obtained his Ph.D. in physical organic chemistry from the University of California, Irvine, and Srila A. C. Bhaktivedanta Swami Prabhupada, a visionary saint for the modern age. The emblem of the Institute mentions a verse from Vedanta – athato brahma Jijnasa – Inquiry into the Absolute. The Institute thus promotes inquiry or curiosity into the meaning and purpose of life and the universe we live in. It thus focuses on the foundational questions of life and universe such as What is life? What is Consciousness? Why are we here? Why this cosmos? It believes that in search for the answers to these questions, a multi-disciplinary approach is necessary, where ancient wisdom and traditions will be partners. For example, Indian traditional knowledge systems have incredible information about the universe – the age of the universe that is comparable to the scientific age of universe, the structure of reality indicating multiverse, the relativity of time, extraterrestrial life, etc. Bhaktivedanta Institute is celebrating its 50 years of Golden Jubilee these three years, 2024 to 2026. As a part of these celebrations various events are being organized, starting from a lecture by Nobel Laureate in Physics William Phillips in January 2024 and then Summer Schools on Origin of Information, and Quantum Foundations, and then a special Conference on Consciousness and various other events. By the blessings and vision of its Founder Director,

[1] Rowe, David and Robert Schulmann (2007). Einstein on Politics: His Private Thoughts and Public Stands on Nationalism. Princeton: Princeton University Press, pp. 229-230.

Dr. T. D. Singh, also known as Scientist-Saint Bhaktisvarupa Damodara Swami, despite various challenges and difficulties, the Institute is continuing its humble activities from past 50 years to help humanity through interface of modern scientific temper with ancient spiritual wisdom.

I welcome all the distinguished speakers, guests, teachers, professors, and students to this online voyage through the cosmos.

Thank you for joining us.

Vasudeva Rao
President, Bhaktivedanta Institute
(Alumnus, IIT Kanpur)

About Lecture Series
Voyage through the Cosmos

Universe is marvellous. Just look at the sky – planets, stars, galaxies, clusters, asteroids, comets, solar system, and it fills you with tremendous amazement. The amazing pictures and new data which we regularly gather about our cosmos, thanks to latest space telescopes and observatories, we are thrilled and astonished about our wonderful universe every day. Modern observational and theoretical advances—from precision measurements of the cosmic microwave background to the mapping of large-scale structures—have provided unprecedented insights into the universe's formation and dynamics. In the last century, we have made remarkable progress — the detection of cosmic microwave background fluctuations, precise measurements of the accelerating expansion of the universe, evidence for dark matter and dark energy, the observation of gravitational waves, and the unveiling of distant galaxies through next-generation telescopes.

How far have we come to understand our universe? What theories do we have to understand our visible universe? What are the challenges we still face to fully grasp the beginning of our universe? Could new developments in quantum information and quantum technologies help us to fill the gaps in our understanding? Is there a relation between the marvellous structure of universe we have discovered with a purpose behind this universe? Do the understanding we have about our universe points towards an intelligence behind it, as many brilliant cosmologists and astrophysicists often expressed being amazed by its structure and functioning? Can we ever fully know our universe, at least theoretically? Or are there any limits to our knowledge, our observation

and even to very our comprehension of the entire universe? What are the foundational questions which still trouble us in coming up with a comprehensive model of the universe, given the vast developments in cosmology, astrophysics, and astronomy in last century? What is the source of beauty in our visible universe, as seen in the movement of planets and galaxies, in precise laws and equations, which has always thrilled and inspired great scientist from all times, from Newton, Kepler, Galileo, Einstein to Fred Hoyle?

The present lecture series is an exciting and amazing voyage through our marvellous cosmos, exploring some of these profound questions through the minds of great scientists and universe-study-leaders, who have spent their entire life and contributed significantly to advancing our knowledge about our common home, our universe. It seeks to examine both empirical discoveries and enduring questions, bringing together scholars, leading researchers, and bright students for rigorous, interdisciplinary dialogue, featuring Keynote talks, discussions and exchanges. Join us to this awe-inspiring exploration and stay amazed! Welcome back to your own astonishing home!

— Organizers
Voyage through the Cosmos - 2026

Program Overview

Distinguished speakers, respected colleagues, dear students, and honored guests. Welcome to all of you. It is a great pleasure and privilege to welcome all of you to this lecture series titled "Voyage Through the Cosmos: History, Models, Theories, and Foundational Issues in Exploring the Universe."

Cosmology is most probably the only academic stream where scientists use mathematical equations and sophisticated telescopes and some other instruments to understand the origin of the universe and its fate. The most startling thing is that the moment one question is answered, the universe poses many more mysteries to grapple with.

Human beings try to understand their own existence, and meaning of life and existence of the universe in which they live. The present series of the lectures by eminent and renowned cosmologists of the world is a humble attempt to explore our existence in terms of the language of science we understand today. We sometimes miss to remember that our life and our size are extremely insignificant on the cosmic scale. Therefore, we miss to develop humility in our life giving rise to many social conflicts. At an advanced stage of understanding we become free from lamentation and get filled with compassion for other living entities as corroborated in Bhagavad Gita, an ancient Indian text:

ब्रह्मभूतः प्रसन्नात्मा न शोचति न काङ्क्षति ।
समः सर्वेषु भूतेषु मद्भक्तिं लभते पराम् ॥ १८.५४ ॥

"One who is transcendentally situated becomes joyful in the self. Such a person neither laments nor desires anything. Being equal toward all living beings, he then attains supreme devotion unto Me."

Therefore, it is necessary for us to inquire and learn about the universe. The existence of knowledge about the universe can be broadly categorized into 3 parts. (a) The Surya Siddhanta Model of the planetary system (based on Direct Perception) and its equivalents. (b) The Modern Cosmology (based on Inference). (c) The Vedic Model of Universe (based on Revealed knowledge).

Revealed knowledge is the top down approach (deductive) for acquiring knowledge, whereas the inference is the bottom up approach (inductive knowledge). We can never be sure about the inductive knowledge that it will never fail. Thus, there remains an iota of doubt whether we are proceeding on the right path.

A combination of the deductive and inductive knowledge could serve us much better, which the current series of lectures will attempt to explore. In the early twentieth century, a revolutionary transformation took place with the theory of General Relativity, proposed by Albert Einstein, provided a new framework for understanding gravity—not as a force, but as the curvature of space-time itself. Soon after, observations by Edwin Hubble revealed that distant galaxies are moving away from us, indicating that the universe is expanding. This discovery led to the development of the Big Bang Theory, which describes the universe as evolving from a hot and dense initial state approximately 13.8 billion years ago.

Interestingly, the Vedic model states the universe age to be about 155 trillion years. It is much larger than the modern value we have and this difference may be due to the fact that our modern estimate depends on observable universe at the moment of consideration.

We understand many aspects of the universe but simultaneously lack more than what we know such as anomalous rotation of galaxies which is being inferred due to the presence of Dark matter. We can see here that these ideas are being inferred. We are are not sure and we need to research more using our inductive approach.

These discoveries raise deep foundational questions. What is the true nature of space-time? Why do the fundamental constants of nature have the values they do? What is the origin of cosmic structure? And perhaps most intriguingly—what happened at the very beginning of the universe?

The fact that the proper time along a photon path is zero and the phenomenon of quantum entanglement may even imply that the space time are not fundamental rather are emergent properties of quantum activity.

In recent years, many physicists have even explored radical ideas such as the Multiverse hypothesis or the possibility that reality itself might be understood through principles of information and computation. These proposals challenge our traditional understanding of physical reality and blur the boundaries between physics, philosophy, and metaphysics.

As many as ten radical ideas about the nature of universe can be listed as follows: (a) Brane (b) Ekpyrotic (c) Plasma filled/Big-Bang (d) Holographic (e) Steady State (f) Multiverse (g) We got gravity wrong (h) Super fluid space-time (i) Simulation theory (j) Cosmic ego-trip/ Anthropic Principle of Cosmology.

Thus, the statement by Steven Weinberg, "Physics is not a finished logical system. Rather, at any moment it spans great confusion of ideas,

some that survive like folk epics from the heroic periods of the past, and the others that arise like Utopian novels from our dim premonitions of a future grand synthesis", seems to be correct which implicitly implies that our understanding of the universe is in nascent stage and we need to go very long before we appreciate it better.

Thus, "the voyage through the cosmos" is not only a journey through space and time— it is also a journey through ideas. It forces us to confront foundational issues: What is a scientific model? How do observations constrain theory? What distinguishes a physical explanation from a philosophical view point?

Lecture Series like this will provide an invaluable platform for exposing the young minds to the intricacies of the universe and the existing views.

The title "Voyage Through the Cosmos" is therefore particularly appropriate. Our journey is far from complete. Each generation of scientists pushes the boundary of knowledge a little further, often discovering that the universe is even more surprising than we imagined.

I hope that these lectures will not only deepen our understanding of the cosmos but also stimulate new ideas, new collaborations, and perhaps even new paradigms for exploring the universe and also inculcate humility and produce a spark for understanding the meaning of life.

We have many stalwarts who will be taking us through the intriguing secrets of the universe. On the first day Prof. Wendy Freedman will tell us about "something missing in our understanding of the universe". Prof. Avi Loeb will be letting us know about the current status of discovery in the extra terrestrial object search.

On day two, Prof. Paul J. Steinhardt will be telling us about the fallacy of the Big Bang model which is keeping us away from the true understanding of the universe. Prof. Andrie Linde will illuminate us about the universe and multiverse.

On day three, Prof. Ofer Lahav, Prof. Tim Eastman, and Prof. George Ellis will be delivering lectures on the nature of the universe. On day four Prof. Louis Marmet, Dr. Mario Livi, and Prof. Tejinder Singh, will be illuminating us with different aspects of the universe and its modeling.

On day five, Prof. Luke Barnes, Prof. Frank J. Tipler and Sri Vasudeva Rao will be discussing about various aspects of universe. On day six, Prof. John Schwarz from Caltech will be discussing about his personal reminiscences of string theory development. David Dilworth and Sri Varun Agarwal will be illuminating us on the different aspects of universe.

On the day seven, Prof. Manoranjan Sinha, Prof. R. N. Iyengar, and Prof. M S Sriram will be discussing about the Vedic view point of cosmology. With these thoughts, I warmly welcome all the speakers and participants. I look forward to the stimulating lectures and discussions that will follow over the course of this program.

Thank you, and I wish that this lecture series proves to be a very successful and intellectually rewarding voyage through the cosmos.

Prof. Manoranjan Sinha
Dept. of Aerospace Engg., IIT Kharagpur,
Program Chair,
Voyage through the Cosmos - 2026

Topics

- Looking at the Universe: Planets, Galaxies, Clusters and more
- New Frontiers & Introduction to Space Equipments: Telescopes, Space Missions and Observatories
- Space, Time and the Human Mind: Quantum Theories of Universe
- Structure and Purpose of Universe: Are they related?
- Newton, Einstein and amazing Comprehensibility of Universe
- Big-Bang, String Theory and more: Decoding the Dimensions of Universe
- Deciphering Beauty and Fine-tuning in Universe: Equations, Constants and Laws
- Are we Alone? Search for Life in our universe
- Young Universe: Revisiting the Early Universe theories
- Invisible Universe: Dark Matter, Dark Energy and more
- Introducing the Cosmos: Quest to Understand the Universe since antiquity
- Vast Universe and Humility: Limits of understanding the Universe
- Guide to the Universe: Perspectives from Scientific and Traditional Knowledge
- Universe in the light of Indian Knowledge Systems
- Cosmology and Purpose: Science and Spirituality in Search of Meaning & Purpose of universe
- Universe, Multiverse and more: Science and Spirituality in Search of God
- History of Cosmology: Our Evolving Conceptions of Universe
- Latest Visual Tours of Cosmos: New Images and New Data Gathered of the Universe
- Universe, Mind and God: Exploring the Deepest Secrets of Universe

Schedule

Day 1 **March 16, 2026 (Monday)**	
Time (IST)	**Topic and Speaker**
5pm – 6pm	**Inauguration and Guests Talks** **Guest of Honor:** Prof. Dipankar Banerjee, *Vice Chancellor, Indian Institute of Space Science and Technology, Thiruvananthapuram* **Guest of Honor:** Prof. Annapurni Subramaniam *Director, Indian Institute of Astrophysics, Bengaluru* **Chief Guest:** Dr. A. K. Anil Kumar, *Director, ISRO Telemetry Tracking and Command Network (ISTRAC), India*
6pm – 7pm	**Topic: Is There Something Missing From Our Current Understanding of the Cosmos?** Wendy Freedman, *Dept. of Astronomy and Astrophysics, Univ. of Chicago, IL, USA* (Speaker Local Time: 6.30am)
7pm – 8pm	**Topic: Searching for Extraterrestrial Technological Artifacts Near Earth** Avi Loeb, *Director, Institute for Theory & Computation, Harvard University, USA* (Speaker Local Time: 9.30am)
Day 2 **March 17, 2026 (Tuesday)**	
5pm – 6pm	**Topic: Time to take the Big Bang out of the Big Bang Theory** Paul J. Steinhardt, *Dept of Physics, Princeton University, USA* (Speaker Local Time: 7.30am)

6pm – 7pm	**Topic: The Story of Black Hole: Life and Death of Massive Stars in the Universe** Pankaj S. Joshi, *International Center for Space & Cosmology, Ahmedabad University, India (Former Senior Professor, TIFR, Mumbai)*
7pm – 8pm	**Topic: Universe or Multiverse?** Andrie Linde, *Stanford University, USA* (Speaker Local Time: 6:30am)
Day 3 **March 18, 2026 (Wednesday)**	
5pm – 6pm	**Topic: Is Dark Energy evolving with cosmic time?** Ofer Lahav, *Department of Physics & Astronomy, University College London (UCL), UK* (Speaker Local Time: 11:30am)
6pm – 7pm	**Topic: Plasma Cosmology** Tim Eastman, *(formerly) University of Alaska, USA* (Speaker Local Time: 8.30am)
7pm – 8pm	**Topic: The nature of the Universe: The Big Picture** George Ellis, *Mathematics Department, University of Cape Town* (Speaker Local Time: 3.30pm)
Day 4 **March 19, 2026 (Thursday)**	
5pm – 6pm	**Topic: An Optical Illusion at the Crossroads of Cosmological Models** Louis Marmet, *York University, Toronto, Canada* (Speaker Local Time: 7.30am)
6pm – 7pm	**Topic: Is Earth Exceptional?** Mario Livio, *(Formerly) Space Telescope Science Institute, Baltimore, Maryland, USA* (Speaker Local Time: 8.30am)

7pm – 8pm	**Topic: Quantum Theory, Gravity, and the Cosmos** Tejinder Singh, *Ex-Professor, Tata Institute of Fundamental Research (TIFR), Mumbai & Visiting Professor, IUCAA*
Day 5 **March 20, 2026 (Friday)**	
5pm – 6pm	**Topic: A Fortunate Universe - Life in a Finely Tuned Cosmos** Luke Barnes, *Western Sydney University, NSW, Australia* (Speaker Local Time: 10.30pm)
6pm – 7pm	**Topic: Does Universe have a Purpose?** Vasudeva Rao, *President, Bhaktivedanta Institute (Alumnus, IIT Kanpur)*
7pm – 8pm	**Topic: The Universe: Its Beginning, Its End, and The Role of Humanity in Universal History** Frank J. Tipler, *Professor of Mathematics, Tulane University* (Speaker Local Time: 8.30am)
Day 6 **March 21, 2026 (Saturday)**	
10am – 11am	**Topic: String theory in the 20th Century: A Personal Perspective** John Schwarz, *California Institute of Technology (Caltech), USA* (Speaker Local Time: 9.30pm – Friday night for him)
11am – 12:00	**Topic: Bubbles and Voids versus Fancies - Oh My !** David Dilworth, *USA* (Speaker Local Time: 10:30pm – Friday night for him)
12:00 – 13:00	**Topic: Cosmology and Consciousness: Search for a Complete Story of our Universe** Varun Agarwal, *Director, Bhaktivedanta Institute (Alumnus, IIT Kanpur)*

Day 7 **March 22, 2026 (Sunday)**	
10am – 11am	**Topic: Cosmology in Vedic Tradition** Manoranjan Sinha, *Dept. of Aerospace Engg.* *Indian Institute of Technology (IIT) Kharagpur, India*
11am – 12:00	**Topic: Concept of Physical Time in the Vedas** R. N. Iyengar, *Centre for Ancient History & Culture, Jain University, Bangalore (Former Chair Professor, IISc Bangalore & Raja Ramanna Fellow, DAE)*
12:00 – 13:00	**Topic: Essential Features of Indian Astronomy** M S Sriram, *President, Prof. K.V. Sarma Research Foundation, Chennai (Former Professor, Department of Theoretical Physics, University of Madras)*
13:00 – 13:35	**Topic: A Voyage Through Our Heliosphere to study our nearest Star, the Sun** Prof. Dipankar Banerjee, *Vice Chancellor, Indian Institute of Space Science and Technology, Thiruvananthapuram*

Abstracts & Bio-data of Speakers

Day 1
March 16, 2026 (Monday)

1. Is There Something Missing From Our Current Understanding of the Cosmos?

Wendy Freedman, *Dept. of Astronomy and Astrophysics, Univ. of Chicago, IL, USA*

For nearly a century following the discovery of the expansion of the universe by Edwin Hubble in 1929, astronomers and cosmologists have made great strides in understanding the origin, evolution and composition of the universe. Yet, recently cracks have begun to appear in our standard model of cosmology, one of those stemming from the measurement of Hubble's constant, the current expansion rate of the universe. Professor Freedman will follow this history and describe recent measurements from the Hubble and James Webb Space Telescopes that may be indicating that something is missing from our current understanding of the cosmos.

Wendy Freedman is the John & Marion Sullivan University Professor of Astronomy and Astrophysics at the University of Chicago and a towering figure in observational cosmology. She served as the principal investigator for the Hubble Space Telescope Key Project, leading a massive international team to resolve the decades-long controversy over the expansion rate of the universe. Her precise determination of the Hubble Constant (H_0) ended the "factor-of-two" uncertainty that plagued cosmology, providing the first accurate

calculation of the universe's age and serving as the observational anchor for the modern concordance model of Dark Energy.

A Fellow of the Royal Society and a recipient of the National Medal of Science, Freedman continues to define the frontier of precision astronomy. She is currently pioneering the use of the Tip of the Red Giant Branch (TRGB) method to resolve the "Hubble Tension," a critical discrepancy that may hint at new physics beyond the standard model. As the founding leader of the Giant Magellan Telescope (GMT) project, Freedman is also instrumental in building the next generation of super-telescopes, ensuring her legacy will guide the future of cosmic discovery for decades to come.

2. Searching for Extraterrestrial Technological Artifacts Near Earth

Avi Loeb, Director, *Institute for Theory & Computation, Harvard University, USA*

Over the past decade, the first four interstellar objects were discovered. They include the interstellar meteor, IM1, detected on January 8, 2014, `Oumuamua detected on October 19, 2017, Borisov detected on August 29, 2019 and 3I/ATLAS detected on July 1, 2025. Among these, the second and fourth appeared anomalous relative to known solar-system rocks whereas the third appeared to be a familiar comet. IM1 exhibited the highest material strength among all meteorites in the CNEOS catalog of NASA. In June 2023 we recovered 850 spherules from the Pacific Ocean site IM1. A tenth of these submillimeter meteoritic spherules displayed a unique chemical composition, different from familiar solar system materials.

`Oumuamua featured a flat shape and non-gravitational acceleration with no detectable cometary evaporation. 3I/ATLAS has 13 anomalies, including a trajectory aligned to within 5 degrees of the ecliptic plane. Currently, new Galileo Project Observatories are

monitoring millions of objects near Earth in the infrared, optical, radio and audio and analyzing their nature with machine-learning software. Forthcoming data from the Rubin Observatory in Chile will offer additional clues on the nature of interstellar objects. Is space trash from extraterrestrial technological civilizations lurking among the natural interstellar rocks?

Abraham (Avi) Loeb is the Frank B. Baird, Jr., Professor of Science at Harvard University and a bestselling author (in lists of the New York Times,Wall Street Journal, Publishers Weekly, Die Zeit, Der Spiegel, L'Express and more). He received a PhD in Physics from the Hebrew University of Jerusalem in Israel at age 24 (1980-1986), led the first international project supported by the Strategic Defense Initiative (1983-1988), and was subsequently a long-term member of the Institute for Advanced Study at Princeton (1988-1993). Loeb has written 9 books, including most recently, Extraterrestrial and Interstellar, as well as over a thousand scientific papers (with h-index of 133 and i10-index of 631) on a wide range of topics, including black holes, the first stars, the search for extraterrestrial life and the future of the Universe. Loeb is the Director of the Institute for Theory and Computation (2007-present) within the Harvard-Smithsonian Center for Astrophysics, and also serves as the Head of the Galileo Project (2021-present).

He had been the longest serving Chair of Harvard's Department of Astronomy (2011-2020) and the Founding Director of Harvard's Black Hole Initiative (2016-2021). He is an elected fellow of the American Academy of Arts & Sciences, the American Physical Society, and the International Academy of Astronautics. Loeb is a former member of the President's Council of Advisors on Science and Technology (PCAST) at the White House, a former chair of the Board on Physics and Astronomy of the National Academies (2018-2021) and a current member of the Advisory Board for "Einstein: Visualize the Impossible" of the Hebrew University. He chaired the Advisory Committee for the Breakthrough Starshot Initiative (2015-2024) and served as the Science

Theory Director for all Initiatives of the Breakthrough Prize Foundation. In 2012, TIME magazine selected Loeb as one of the 25 most influential people in space and in 2020 Loeb was selected among the 14 most inspiring Israelis of the last decade. In 2025, Loeb was ranked number 3 in publication record and impact of research among all astronomers worldwide over the past 5 years by ScholarGPS. Loeb's latest TED talk was among the top five most popular TED talks in 2024. Click here for Loeb's essays on innovation (https://avi-loeb.medium.com/)

Personal website: https://www.cfa.harvard.edu/~loeb/
Commentaries: https://avi-loeb.medium.com/

Day 2
March 17, 2026 (Tuesday)

1. Time to take the Big Bang out of the Big Bang Theory

Paul J. Steinhardt, *Dept of Physics, Princeton University, USA*

The talk will attempt to explain how a cosmological model that begins with a big bang followed by expansion (with or without inflation) cannot explain the observed properties of our universe. What becomes clear, then, is that the problems can be avoided by replacing the big bang with a bounce and replacing inflation with a period of slow contraction. In explaining this, I will point out common misconceptions about cosmology and general relativity that have been holding us back from making progress.

Paul J. Steinhardt is the Albert Einstein Professor in Science at Princeton University and a visionary theoretical physicist who has fundamentally reshaped two distinct fields of science: cosmology and condensed matter physics. As one of the original architects of "New

Inflation," he helped establish the standard model of the early universe, and later proposed the revolutionary "Bouncing Model of Cosmology." This bold paradigm posits that the universe undergoes eternal cycles of expansion and contraction driven by brane collisions in higher dimensions, offering a mathematically consistent alternative to the Big Bang that resolves the predictive paradoxes of the multiverse.

Steinhardt is equally renowned for redefining the concept of matter through his discovery of "Quasicrystals"—ordered materials with forbidden symmetries previously thought impossible by the laws of crystallography. His scientific tenacity led him to organize a daring expedition to the Russian tundra, where he proved the natural existence of these exotic structures in ancient meteorites. A recipient of the Dirac Medal and the Oliver E. Buckley Prize, Steinhardt's work stands as a testament to scientific rigor, bridging the gap between the abstract geometry of the cosmos and the tangible atomic structure of solids.

2. The Story of Black Hole: Life and Death of Massive Stars in the Universe

Pankaj S. Joshi, *International Center for Space & Cosmology, Ahmedabad University, India (Former Senior Professor, TIFR, Mumbai)*

Einstein's theory of gravity predicts the existence of Black Holes and Space-time Singularities. The singularities may be hidden within a black hole or visible to faraway observers in the universe; also called naked singularities. These typically arise from the gravitational collapse of massive stars. We discuss the current theoretical and observational efforts to detect these entities. Quantum gravity effects dominate near naked singularities, which we call 'Quantum Stars'. These potentially offer an exciting opportunity to test quantum theories of gravity or the Unification of Physics. The connection to new observational missions such as the Event Horizon Telescope

(EHT), Gravitational Waves, TMT, and others is pointed out, and recent emerging developments are discussed.

Pankaj S. Joshi is an eminent Indian physicist and cosmologist, and a leading authority in general relativity, gravitation, and cosmology. He is currently Distinguished Professor of Physics and Founding Director of the International Centre for Space & Cosmology at Ahmedabad University in Gujarat, where he leads research, training, and public engagement in fundamental questions about the universe. Before joining Ahmedabad University, Prof. Joshi was a Senior Professor in the Department of Astronomy & Astrophysics at the Tata Institute of Fundamental Research (TIFR), Mumbai, where he carved an international reputation for his work on the gravitational collapse of massive stars and the nature of spacetime singularities — including insights into black holes and the possibility of naked singularities. His research has been published in more than 200 peer-reviewed papers and major monographs from Oxford and Cambridge University Press.

Invited by Stephen Hawking to work at Cambridge University under a Nuffield Foundation Fellowship early in his career, Prof. Joshi has also held visiting positions at top institutions across the UK, USA, Japan, Spain, South Africa, and Italy. He is a Fellow of leading scientific academies and a recipient of prestigious awards including the INSA-Vainu Bappu Memorial Award. Prof. Joshi's contributions span deep theoretical advances and wider science outreach, making him one of India's most respected figures in theoretical physics and cosmology.

3. Universe or Multiverse?

Andrie Linde, *Stanford University, USA*

Cosmological observations show that the universe is remarkably uniform on the largest scales accessible to our telescopes. The inflationary theory offers the most compelling theoretical explanation

for this uniformity. Over the last 45 years, many predictions of this theory have been confirmed by cosmological observations. Rather paradoxically, this theory, explaining the uniformity of our part of the universe, predicts that on extremely large scales, much greater than what we can see now, the world may look totally different. Instead of being a single spherically symmetric balloon, our universe may look like a "multiverse," a collection of many different exponentially large balloons ("universes") with different laws of low-energy physics operating in each. The new cosmological paradigm, supported by developments in string theory, alters standard views of the universe's origin and global structure, as well as of our place in the world.

Andrei Linde is the Emeritus Professor of Physics at Stanford University and one of the seminal architects of modern cosmology. He is the originator of the "Chaotic Inflation" theory, a paradigm-shifting framework that revolutionized our understanding of the Big Bang. Linde demonstrated that the exponential expansion of the early universe does not require fine-tuned initial conditions but arises naturally from the dynamics of scalar fields. His work corrected the fatal flaws of earlier models, firmly establishing inflation as the standard explanation for the uniformity and geometry of the observable cosmos.

Linde's theoretical vision extends beyond a single universe to the concept of "Eternal Inflation," which posits that the cosmos is a self-reproducing fractal Multiverse. He showed that quantum fluctuations in the inflationary field continuously spawn new, exponentially large parts of the universe, potentially with different physical laws. A recipient of the Fundamental Physics Prize, the Gruber Prize, the Kavli Prize, and the Dirac Medal, Linde's contributions have fundamentally altered humanity's conception of our world, providing a mechanism that explains the origin and the large-scale structure of the universe.

Day 3

March 18, 2026 (Wednesday)

1. Is Dark Energy Evolving with Cosmic Time?

Ofer Lahav, *Department of Physics & Astronomy, University College London (UCL), UK*

After more than a quarter of a century as the standard model of Cosmology, the Λ Cold Dark Matter (ΛCDM) paradigm is increasingly challenged by combinations of observations from galaxy clustering, weak lensing, Type Ia supernovae, and the cosmic microwave background. This talk will critically review recent results from DESI++ and DES++, and contrast the evidence supporting ΛCDM with emerging indications for an evolving dark energy component.

Ofer Lahav is the Perren Chair of Astronomy at University College London (UCL) and a leading researcher in the study of the dark sector of the Universe. As a co-founder of the Dark Energy Survey (DES) and long-serving Chair of its Science Committee, Lahav coordinated the efforts of hundreds of scientists mapping hundreds of millions of galaxies, producing one of the most comprehensive probes of cosmic acceleration and the distribution of dark matter. His work focuses on characterising the properties of dark energy and testing whether it arises from a cosmological constant or from modifications to Einstein's theory of general relativity.

A pioneer at the interface of astrophysics and data science, Lahav introduces advanced machine-learning and artificial-intelligence techniques into cosmological data analysis, including early applications of neural networks in the early 1990s for galaxy classification and photometric redshift estimation. By combining massive observational surveys with sophisticated statistical methods, his research aims to shed light on the 95% of the Universe that remains invisible.

2. Plasma Cosmology

Tim Eastman, *(formerly) University of Alaska, USA*

Scientists using a plasma cosmology model successfully predicted early in 2022 (in advance of first observations) the existence of fully-formed massive galaxies, similar to local galaxies, at very high redshift as observed by the James Webb Space Telescope. Further, instead of interpreting redshift in terms of cosmic expansion, recent quantum spectroscopy research indicates that observed levels of redshift will necessarily arise from coherent photon scattering through dilute intergalactic electron plasma. Together these recent developments indicate that the universe may be of indefinite age with timescales sufficient to enable galactic evolution, and observed cosmic structures at multiple scale lengths, through both gravity, and electromagnetism and plasma processes. Such a plasma cosmology approach is capable of explaining essentially all known cosmological observations from first principles without the use of ad hoc assumptions such as cosmic expansion, inflation, dark matter, or dark energy.

Timothy E. Eastman (PhD physics/geophysics), University of Alaska 1979) is an independent researcher in plasma and space physics, and philosophy. His scholarly works have encompassed research and consulting in space physics, plasma applications, and space weather data systems since the 1970's. In 1975 he discovered the low-latitude boundary layer of Earth's magnetosphere and has since published over 100 research papers in space physics and related fields. While serving as a program officer at NASA ('85-'88) and the National Science Foundation, NSF ('91-'94), Dr. Eastman was co-coordinator for major interagency and international programs. Concurrently, he carried out research in philosophy, publishing over 30 papers, and served as lead editor of Physics and Whitehead (SUNY, 2004) and Physics and Speculative Philosophy (de Gruyter, 2016). His current research is focused on a synthesis of recent developments in philosophy, physics, logic, semiotics, and process thought as

articulated in his Untying the Gordian Knot: Process, Reality, and Context (Lexington, 2020), which contributes to a new natural philosophy for the 21st century. Dr. Eastman's latest essays include "Triads as Primal" (Process Studies Supplements, 2023), and "Orders of Possibility and Actuality" (Pari Perspectives, Jan. 2025).

3. The Nature of the Universe: The Big Picture

George Ellis, *Mathematics Department, University of Cape Town, RSA*

I will summarise the current scientific understandings of the nature of the universe, together with their limits. I will conclude with some reflections on the issue of whether there is meaning in the universe, and its relation to moral realism.

George Ellis is the Emeritus Distinguished Professor of Complex Systems at the University of Cape Town and one of the world's leading theorists in cosmology and general relativity. He is the co-author, alongside Stephen Hawking, of the seminal monograph The Large Scale Structure of Space-Time, which established the rigorous mathematical foundations for understanding black holes, singularities, and the causal geometry of the universe. A Fellow of the Royal Society and past President of the International Society on General Relativity and Gravitation, Ellis has been instrumental in defining the physical laws that govern the cosmos.

Beyond his contributions to physics, Ellis is a profound thinker and deeply questions the validity of reductionistic framework with his theory of "Top-Down Causation." He demonstrates how complex systems, including the human brain, can causally influence underlying physical matter, providing a scientific framework for understanding agency and ethics. A recipient of the Templeton Prize and the Order of Mapungubwe from the South African government, Ellis is a leading moral voice in science, advocating for the synthesis of

rigorous empiricism with a deep appreciation for the philosophical and ethical dimensions of human existence.

Day 4
March 19, 2026 (Thursday)

1. An Optical Illusion at the Crossroads of Cosmological Models

Louis Marmet, *York University, Toronto, Canada*

In recent decades, high-accuracy astrophysical data extending to high redshifts has revealed significant inconsistencies and gaps within Concordance Cosmology. Notably, the Hubble tension and the observation of mature galaxies at redshifts beyond z = 10 call for a re-evaluation of the foundations of the Standard Cosmological Model and its observational aspects. I will explore limitations of the scientific method and compare two contrasting cosmologies to illustrate how an optical illusion can profoundly alter our understanding of the universe. I aim to show how my personal worldview offers a compelling avenue for research by briefly describing the current status of my work and my future aspirations in understanding the universe.

Topics: Observation and interpretation, redshift, and cosmology

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Louis Marmet is Adjunct Professor of Physics at York University in Toronto. He studies light– matter interactions and their importance in our interpretation of astrophysical phenomena. Marmet obtained his Ph.D. in physics from the University of Toronto with specialization in experimental quantum optics. As an Alexander von Humboldt fellow at the Ludwig Maximilian University of Munich, he conducted research on quantum chaos in atomic systems. His career at the National Research Council, Canada, focused on high-precision atomic clocks and laser-cooling of atoms to microkelvin temperatures.

Marmet is currently collaborating with a group at York University on an experiment that uses an atom interferometer sensitive enough to detect laser-heating from a single-photon interaction.

Prof. Marmet's passion for physics appeared at an early age, inspired by his father, who was also a physicist and introduced him to the principles of measurement, inquiry, and a profound desire to understand the world. His interests led him to a broad range of activities that include amateur astronomy, photography, mathematical modeling, philosophy of science, and astrophysics. These diverse skills are key for perceiving nature with a distinct clarity, as he recognizes that illusions pose a constant challenge to knowledge. This unique lens is especially important in cosmology, a discipline at the intersection of science and philosophy. Marmet believes his perspectives can offer a fresh understanding of the universe we inhabit. Since 2018, he has been facilitating a discussion group focused on cosmology, fostering dialogue and exploration of these themes.

2. Is Earth Exceptional?

Mario Livio, *(Formerly) Space Telescope Science Institute, Baltimore, Maryland, USA*

The questions "How did life on Earth begin?" and "Are we alone in the universe?" are arguably two of the most intriguing in science. While until recently these questions tended to be relegated to the "too difficult" box, the attempts to answer them have now become extraordinarily vibrant and dynamic frontiers of science. I will examine how using knowledge acquired through ingenious chemical experimentation, geological studies, advanced astronomical observations, and imaginative theorizing researchers have managed to delineate a plausible pathway leading from the formation of the Earth to the appearance of the early biological cells. I will also draw on astounding findings of astronomers and astrobiologists in the last three decades —discoveries that have brought us to the verge of being able to detect extraterrestrial life.

Mario Livio is a distinguished astrophysicist and best-selling author, formerly a senior astrophysicist at the Space Telescope Science Institute (STScI), the scientific operations center for the Hubble Space Telescope. His scientific research has produced seminal contributions to the theory of accretion disks, binary star evolution, Type Ia supernovae (which are the "standard candles" critical for measuring the expansion of the universe), and the search for life in the universe. Livio's theoretical models have deepened humanity's understanding of how compact objects like white dwarfs and black holes interact with their environments to produce the most energetic events in the cosmos, and the search for extraterrestrial life.

Beyond his technical achievements, Livio is a globally recognized intellectual who bridges the gap between hard science, mathematics, and philosophy. Through influential works such as The Golden Ratio and Brilliant Blunders, he explores the epistemic nature of discovery and the "unreasonable effectiveness" of mathematics in describing reality. A Fellow of the American Association for the Advancement of Science, Livio combines rigorous theoretical astrophysics with a profound capacity to articulate the beauty and complexity of the universe in a simple language.

3. Quantum Theory, Gravity, and the Cosmos

Tejinder Pal Singh, *Ex-Professor, Tata Institute of Fundamental Research (TIFR), Mumbai & Visiting Professor, IUCAA*

Our understanding of the universe is limited by how well we understand the laws of quantum mechanics and of gravitation. A key foundational difficulty with the current formulation of quantum theory is that it depends on an external classical time. Recent developments in addressing this problem guide us towards a novel theory of quantum gravity and its unification with particle physics. We also gain some new insights as to how the universe might have begun and how it might end. It appears as if universes are being born and

dying all the time! And the underlying substrate from which they emerge and into which they vanish are what we call atoms of spacetime-matter, a substrate which is indistinguishable from pure mathematics!

Tejinder Pal Singh is a distinguished theoretical physicist formerly with the Tata Institute of Fundamental Research, renowned for his work on quantum foundations, gravitation, and cosmology. He earned his Ph.D. from TIFR in 1989 and subsequently held postdoctoral and visiting positions, including at the Inter-University Centre for Astronomy and Astrophysics. Over a career spanning more than three decades, he progressed through various academic roles at TIFR, contributing significantly to research and mentoring in high-energy physics and quantum theory.

His research focuses on developing deeper connections between quantum mechanics and gravity, with notable work on spontaneous wave-function collapse models, quantum-to-classical transitions, quantum interference in time, and generalized theories of gravity. Prof. Singh has also contributed to studies of cosmological constant problems, dark energy, gravitational collapse, and torsion-based gravity theories. Widely respected for his conceptual clarity and theoretical insight, he continues to be active in advancing foundational questions in modern physics.

Day 5

March 20, 2026 (Friday)

1. A Fortunate Universe – Life in a Finely Tuned Cosmos

Luke Barnes, *Western Sydney University, NSW, Australia*

Over the last 40 years, scientists have uncovered evidence that if the

universe had been forged with even slightly different properties, life as we know it – and life as we can imagine it – would be impossible. With small tweaks to the way the universe works, we can erase the periodic table, disintegrate particles and remove all traces of structure in the cosmos. The fine-tuning of the universe for life is a major unsolved problem in the world of physics. I'll introduce the science, and show how it leads to deep questions about our cosmos.

Luke Barnes is a physicist at Western Sydney University. He researches in the fields of galaxy formation and cosmological fine-tuning. Holding a Ph.D. from the University of Cambridge, Barnes utilizes numerical simulations to explore the evolution of matter in the cosmos. He is widely recognized for his work on the "Fine-Tuning of the Universe for Life," investigating how minute variations in the fundamental constants of physics would render the universe uninhabitable. Dr. Luke Barnes and Prof. Geraint Lewis are the authors of "The Cosmic Revolutionary's Handbook (Or: How to Beat the Big Bang)" and "A Fortunate Universe: Life in a Finely Tuned Cosmos", with Cambridge University Press.

2. Does Universe have a Purpose?

Vasudeva Rao, *President, Bhaktivedanta Institute (Alumnus, IIT Kanpur)*

Abstract: The inquiry into whether the universe possess a purpose stands as one of the most profound and epistemologically fraught intersections of theoretical physics, cosmology and philosophy of science. Originating in the classical philosophical frameworks of Plato and Aristotle, the notion that the universe exhibits an intrinsic, goal-directed order was considered virtually self-evident and occupied a contentious and fluctuating position in the natural sciences. However, with the advent of scientific revolution that endorses empirical observation focused strictly on material and efficient causation, teleological explanations were dismissed as "specious and shadowy," and the search for final causes or purpose was subsequently expunged

from the physical sciences. Interestingly, the teleological concepts have made a surprising come back, not rooted in mysticism but rather driven by empirical discoveries in observational cosmology, the baffling implications of quantum mechanics, the fine-tuning of fundamental physical constants, the formalized study of complex, non-linear dynamics and Bayesian probability analysis. We investigate necessary conditions for scientifically concluding purpose for the universe and for the scientific community to legitimately entertain the hypothesis that the universe has a purpose. Also, the central challenge for contemporary philosophy of science is no longer the outright dismissal of purpose, but the rigorous epistemological demarcation of it – a philosophical need for reexamination in distinguishing science from non-science and expanding the boundaries of science if necessary. Such demarcation may not only have implications for a purposeful universe but also for some disciplines or fields practiced under science today.

Vasudeva Rao (also known as His Holiness Bhaktisvarupa Vrajapati Swami) obtained his M.Tech. (Computer Science, 1998) from IIT Kanpur, India. After a brief tenure of working as a software professional, he decided to significantly contribute himself to the science spirituality interface under the able leadership and vision of Dr. T. D. Singh, the Founder Director of the Bhaktivedanta Institute.

Presently, His Holiness is the President of Bhaktivedanta Institute and actively promotes discussion on science and spirituality. He is also the Editor of Bhaktivedanta Institute's reputed annual journal, Savijnanam – Scientific Exploration for a Spiritual Paradigm and travels widely across India and abroad. His deep interest in the foundations of mathematics, fundamentals of computer science and logic and its relation to nature of reality as well as ancient Indian texts led him to interact and meet renowned scholars at Harvard, Princeton, ETH, Stanford, and MIT. He has delivered several talks on topics at the interface of science and spirituality.

3. The Universe: Its Beginning, Its End, and The Role of Humanity in Universal History

Frank J. Tipler, *Professor of Mathematics, Tulane University*

The Final Anthropic Principle says that in any universe, intelligent life must come into existence and persist until the end of time. Equivalently, in any universe, a universal computer will be constructed. I shall demonstrate that the laws of physics imply the Final Anthropic Principle. I shall show that future life will turn off the Dark Energy, with the universe then collapsing to a final singularity which has no event horizons: an Omega Point singularity. Such an end to the universe has implications for the beginning of the universe. I shall show that the laws of physics require the universe to have begun in a very regular Friedmann isotropic and homogeneous singularity, with the only field present in the early universe being the SU(2)L field of the Standard Model.

This field naturally generates only matter, no antimatter, in the early universe. If this field survived to the present day, it would comprise most of the Cosmic Background Radiation, and such a CBR would resolve several observational inconsistencies in cosmology, two examples being (1) the existence of ultrahigh energy cosmic rays which pass through the CBR as if it were not there, and (2) the fact that the Sunyaev-Zel'dovich Effect has been observed by both WMAP and PLANCK to be lower than predicted if the CBR were all-photons. A mainly SU(2)L CBR would also allow the Dark Matter to be an oscillation of the Standard Model Higgs field, and I shall show that were such an oscillation to be the Dark Matter, the Hubble Tension would be resolved. If the CBR is indeed mainly the Standard Model SU(2)L field, this fact can be established by direct observation. The IT billionaire Peter Thiel gave me money to build the necessary apparatus to determine what the CBR is composed of, and I shall present the results of the observations in my lecture. Bottom line: the CBR is indeed mainly the Standard Model SU(2)L field. I shall finish my talk

by emphasizing what this means for humanity in general: we humans will create our robotic descendants, and in the far future these AGI's will resurrect us all, never to die again. If the laws of physics be for us, who can be against us?

Frank J. Tipler is a Professor of Mathematics and Physics at Tulane University and a pioneering figure in the study of Global General Relativity. He is the co-author, along with John Barrow, of the definitive scientific treatise The Anthropic Cosmological Principle, which rigorously investigates the necessary physical constraints for the emergence of intelligent life. His expertise in the causal structure of spacetime led to the discovery of the "Tipler Cylinder," a celebrated exact solution to Einstein's field equations that theoretically permits the existence of closed timelike curves, demonstrating that the laws of physics do not strictly forbid time travel.

Renowned for pushing the logical limits of physical law, Tipler formulated the "Omega Point Theory," a provocative cosmological model that synthesizes thermodynamics, information theory, and eschatology. He argues that the known laws of physics require the universe to evolve toward a state of infinite computational capacity, enabling the indefinite continuation of intelligence and the potential simulation of all past physical states. This work, often described as the "Physics of Immortality," represents one of the most daring and mathematically rigorous attempts to deduce the ultimate destiny of consciousness from the fundamental axioms of the universe.

Day 6

March 21, 2026 (Saturday)

1. String theory in the 20th Century: A Personal Perspective

John Schwarz, *One of the Leading Founders of String Theory, California Institute of Technology (Caltech), USA*

String theories, first developed in the late 1960s, are theories based on one-dimensional objects called strings. This was a radical departure from all previous particle physics theories, which are based on point particles. At the time, the goal was to formulate a theory of the strong nuclear force. However, the correct theory of the strong nuclear force, which is based on point particles, was discovered in 1973. Therefore, almost everyone stopped working on string theory at that time. My collaborators and I continued studying string theory, because we realized that it necessarily incorporates gravity, and that it might provide the correct framework for a unified quantum theory of all fundamental forces. It took a decade of development before this proposal achieved widespread acceptance. Much more has been learned since then, and string theory is mainstream science today.

John Henry Schwarz is a titan of modern theoretical physics and the Harold Brown Professor of Theoretical Physics Emeritus at the California Institute of Technology (Caltech). Recognized universally as one of the founding fathers of String Theory, he demonstrated unparalleled intellectual courage by sustaining the field during the 1970s when it was largely abandoned by the scientific community. His visionary collaboration with Joṇl Scherk fundamentally redefined the discipline by proposing that string theory was not merely a model of

nuclear forces, but a unified quantum theory of gravity, predicting the existence of the graviton within a consistent mathematical framework.

Schwarz's most transformative contribution, the "First Superstring Revolution" of 1984, changed the course of physics history. Working with Michael Green, he proved the anomaly cancellation mechanism, demonstrating that superstring theory is free from the mathematical inconsistencies that plagued previous attempts at unification. This breakthrough established string theory as the premier candidate for a "Theory of Everything," bridging Quantum Mechanics and General Relativity. A recipient of the MacArthur Fellowship, the Dirac Medal, and the Breakthrough Prize in Fundamental Physics, Schwarz's legacy is etched into the fundamental understanding of the dimensionality and structure of the universe.

2. Bubbles and Voids versus Fancies – Oh My!

David Dilworth, *US Naval Postgraduate School, USA*

Embracing Unlimited Inspiration -- Tempered by Carefully Limited Hypotheses & Calm Logic
We are blessed & overwhelmed with a daily avalanche of new astrophysics data. We need inspiration to solve cosmology puzzles, but in the face of abundance our imagination must be tempered with Calm Logic - or we step outside the boundaries of science.

Logical Fallibilism - My Claims could be Wrong
Fallibilism asserts that all physical Scientific theories or interpretations are Indefinite, Provisional, or Tentative, yet that seems forgotten by so many mathematicians who have commandeered Cosmology.

David will illuminate pros and cons of leading Cosmology Models and Theories. You might be in for a few surprises.

"David J. Dilworth studied cosmology at US Naval Postgraduate

School in Monterey California by invitation of Emeritus Prof Karlheinz 'Kai' Wohler who assisted his Professor Werner Heisenberg. David humorously points out how this makes him Heisenberg's Grand-student. David's Superpower is an ability to translate complex and obscure cosmology into plain English. Which is possibly why his award-winning website, CosmologyScience.com was ranked #1 in web searches for "Best Cosmology Blog" for 10 years.

"David's goal in publishing his Cosmology and Philosophy work, is to remind us of the minimum criteria for providing a claim which has scientific value. Specifically the bright lines between hypothesis and conjecture, and separately distinguishing a scientific theory from non-science claims. He is just finishing a paper solving Philosophy of Science's enigmatic Demarcation Problem, offering it for publication this year.

"Dilworth is a prominent figure in the "Alternative Cosmology" community and founder of Science Based Cosmology. His "Glossary of Cosmology Principles" and "Cosmology Hypothesis Application Form" are useful and popular tools for cosmology students. Due to his extensive and detailed analysis of logical and observational anomalies, he questions many fundamental facets of Big Bang models, noting how primary support such as universe expansion, Cosmic Microwave "background" radiation, and Dark Matter, lack any direct empirical verification, require logical fallacies or contradict bedrock physics. Dilworth advocates for avoidance of logical fallacies and a return to strictly empirically validated physical principles in cosmology, which leads to Static, "Simmering Universe" explanations.

3. Cosmology and Consciousness: Search for a Complete Story of our Universe

Varun Agarwal, *Director, Bhaktivedanta Institute, Kolkata*
(Alumnus, IIT Kanpur)

The journey through the universe is awe-inspiring – massive galaxies, numerous planets, stars, amazing clusters. We have come a long way from the time of Kepler and Galileo, trying to decipher our cosmos with simple instruments to modern day advanced space telescopes, as well as highly abstract mathematics and computation. It is a great triumph for humanity and we know our universe much better than before.

However, foundational questions about the universe still remain unanswered as centuries before: why are we here? Why this universe? What was there before the beginning of universe? Why there is something than nothing? Why this earth and why do I exist at all? Questions such as these have pushed renowned thinkers and cosmologists of all times to revisit our cosmological conception and ask: Is the picture of universe we have "complete"? Can a story of universe be complete without 'thoughts', without 'mind' and without 'consciousness', the basic tools with which we have been exploring our universe at the first place? This leads to a further bigger question: Can our understanding of universe ever be complete without bringing in mind and consciousness? Leading thinkers of all times have deeply pondered about some of these foundational questions. The present lecture will attempt, bringing in the insights and works of renowned scholars, such as James Jeans, Arthur Eddington, Carl Sagan, Jayant Narlikar, Owen Gingerich, among others, towards a new vision of our universe where consciousness is also a part.

This synthesis will not only help to bridge the missing gaps and foundational questions in modern cosmological picture, but also help towards a better humanity, with better minds to handle numerous challenges we face today. The time has come to expand the boundaries of modern cosmology if we want to save our planet and future generations - a shift of mindset from viewing our universe as an objective material element to subjective and friendly perspective to the universe and our planet. Or else the history will repeat - what we have done to our planet, we will do the same to other planets in future as we

explore our galaxy and beyond. Universe is vast, and we are very small – it is thus only a humble attempt in the face of magnificent universe we are gifted with.

Varun Agarwal (also known as His Holiness Bhaktisvarupa Vrajendrakumar Swami) graduated from the prestigious Indian Institute of Technology Kanpur (IIT Kanpur), India obtaining his B.Tech in Aerospace Engineering (1999). He worked on a project of solar-powered aircraft and was ranked first in his entire department. However, his longing for something deeper about life which always bothered him finally culminated in meeting the illustrious scientist-saint Dr. T. D. Singh (His Holiness Bhaktisvarupa Damodara Swami), the Founder Director of the Bhaktivedanta Institute.

Under his guidance, he began studying ancient Vedantic wisdom, dedicating himself completely for the cause of helping humanity through the interface of scientific temper and spiritual wisdom. He is currently serving as the Director of the Bhaktivedanta Institute, Kolkata, India. Besides his various involvements, he frequently travels across India & abroad and interacts with scientists and scholars all over the world including world-renowned universities of Harvard, Princeton, ETH and Stanford to MIT. He is also the Editor of Bhaktivedanta Institute's reputed science and spirituality journal, Savijnanam.

Day 7
March 22, 2026 (Sunday)

1. Cosmology in Vedic Tradition

Manoranjan Sinha, *Dept. of Aerospace Engg., IIT Kharagpur, India*

Knowledge about the universe is mainly acquired in three ways, i.e. direct perception, inference, and through revelation. The direct perception encompasses the knowledge in the Surya Siddhanta its contemporary astronomy and is just a modeling of what we directly perceive through our eyes. The inference which encompasses the modern cosmology is primarily based on observations through radio telescopes and then images are reconstructed and colored. This has its own limitations as the inference is always not foolproof as it is an inductive way of acquiring knowledge. On the other hand, the knowledge gained through revelation comes from a perfect knowledgeable source and hence considered to be the real picture of the material nature.

Already there are many contending hypotheses about the origin of the universe although the balance is more tilted toward Big-Bang. However, existence of the so many contending hypotheses shows that the knowledge gained through inference is changing with time and bound to change in the future also because it is inductive in nature. The current concept of space time itself may not be fundamental as we get hint from the quantum entanglement. It is proposed that a combination of deductive and inductive approach may resolve many of the existing issues in the cosmology. In this lecture, I propose to show that Vedic texts although not a treatise on astronomy mention about the existence of domain where the time ticks at a different rate, not because of relativity, but because of the nature of the domain. In the Vedic texts, time is not only at different scales in different frames, but also is stated to be as a result of working of mind which we feel as a passage of time. Also those in the higher domain can access the

lower domain much easily which is not possible vice-versa. This also states that light cannot escape a boundary defined which extends to the higher dimensions. The distance of the sun and its movement given in the Vedic texts are not irrational. This is shown through texts given in Srimad Bhagavatam and compared against the modern view. Various data given about the movement of the sun has not be deciphered yet but some of them are roughly comparable to the modern values.

Manoranjan Sinha is a senior faculty member in the Department of Aerospace Engineering at the Indian Institute of Technology (IIT) Kharagpur. His academic work spans areas such as flight dynamics, control systems, aerodynamics, and aerospace vehicle design. With extensive teaching and research experience, he has contributed to training generations of aerospace engineers and guiding research in both theoretical and applied aspects of aeronautical engineering.

At IIT Kharagpur, Prof. Sinha has been involved in various academic, research, and departmental initiatives, including supervision of postgraduate research, development of aerospace laboratories, and collaboration on aerospace technology projects. His work emphasizes rigorous engineering fundamentals and innovative approaches to solving problems related to aircraft performance, stability, and control.

2. Concept of Physical Time in the Vedas

R. N. Iyengar, *Centre for Ancient History & Culture, Jain University, Bangalore (Former Chair Professor, IISc Bangalore & Raja Ramanna Fellow, DAE)*

Vedic texts characterize *kāla* (Time) to be of two types. First is the abstract; the second is the physical *time* as related to sun, moon and the stars. This is the *mūrta-kāla* (phenomenal time) such as nimeṣa, *muhūrta*, day, night, fortnight, year etc. *Maitrāyaṇīya Āraṇyaka Upaniṣat* (MAU) declares Sun to be the origin or generator of time, since *ahorātra*

(day-night) based on counting sunrises is the most natural time unit. Additionally, MAU with its abstract perception says that before manifestation of Sun, it was *akāla* (non-time). The word *kāla* for physical time is a derivative of the word *kalā* (part). Hence, *kāla* denotes that which is related to and made up of digits or parts. *Kāla* and *Akāla* are said to be the two forms of the unitary *Brahman*. In this talk I briefly discuss the how physical time was characterised leading to *chandas* (meter) and *akṣara* (syllable) measure.

R. N. Iyengar (b. 1943) is renowned for his contributions to Earthquake Engineering, Random Vibrations, Mathematical Modelling, and Natural Sciences in Sanskrit. As faculty at the Indian Institute of Science from 1969 till his retirement in 2005 as KSIDC Chair Professor, Iyengar published over 200 technical papers, reports, general articles and books. He was Distinguished Schmidt Chair Professor, FAU, USA (1995) and Director CSIR-CBRI (1994-2000). He is currently Distinguished Emeritus Professor at the Jain University, Bangalore.

Iyengar received initial training in Sanskrit studies in the traditional way. This made him an avid reader of ancient texts in the original. He has developed, combining Indic intellectual traditions with modern methods, a new line of study of Indian knowledge systems. His findings on comets, eclipses, earthquakes, ancient geography, Pole Star Dhruva in Vedic literature, concept of Probability in classical music, have attracted worldwide attention. He brought out the Parāśaratantra, an ancient Sanskrit treatise on astronomy and natural sciences, with text, translation and notes in 2013. He edited in 2018 Nāradaśilpam, a medieval prose text on Architectural Civil Engineering from three manuscripts with translation and notes. He is presently critically editing the Vṛddhagārgīya Samhitā, a large corpus of manuscripts on astral sciences. A part of this corpus namely, Mahāsalilam published in 2024 is the most ancient Vedāṅga text on astronomy and astrology.

Fellowships and honours of RN Iyengar include, FNAE, FASc, FNASI, FAvH Foundation, Raja Ramanna Fellow. Visvesvaraya Award (1996); Technology Day Award (2001); Vasvik Award (2013); Saraswati Samman of Central Sanskrit University (2024); Śāstra Mahāmana Award (2026).

3. Essential Features of Indian Astronomy

M S Sriram, *President, Prof. K.V. Sarma Research Foundation, Chennai (Former Professor, Department of Theoretical Physics, University of Madras)*

There are references to astronomical observations from the Vedic period in India. They were necessarily qualitative, but significant nevertheless. A basic calendar with solar and lunar months, ecliptic etc. in there. In some Jyotiṣa texts of the Vedāṅga period, there are discussions on cosmology and cosmogony: a primordial state of the dark-matter, out of which all creation including the celestial bodies emerged.

Quantitative astronomy as a scientific discipline in India with well defined methods of calculation can be traced to the Vedāṇga Jyotiṣa of Lagadha (around 1250 BC). This is in the sutra format, or algorithmic in nature. Here, we have a well defined calendar with the Sun and the Moon moving uniformly in the stellar background around the Earth. The algorithmic nature continues in the later siddhāntic texts, beginning with the Āryabhaṭīya (499 CE). Now, the Sun, Moon and the planets do not move uniformly around the Earth. To deal with the non-uniform motion, trigonometry was necessary. Modern trigonometry is the Indian version of it, and enabled Indians to describe the motion of the celestial objects, using formulae.

There was a continuous evolution of ideas in the tradition. It also needs to be emphasised that though the siddhāntic astronomy was algorithmic, the rationales for the algorithms, proofs and demonstrations are to be found in various commentaries of the texts.

Prof. M. S. Sriram did his B.Sc.(Hons) in Physics from Bangalore University in 1969, and M.Sc. in Physics from IIT Kanpur in 1971. He completed his Ph.D. in Theoretical Physics in 1978 from IIT Kanpur. He worked in the University of Allahabad for 5 years before joining the University of Madras, from where he retired as the Professor and Head in 2011. Currently, he is with the Prof. K. V. Sarma Research Foundation, Chennai. He was the President of the Indian Society for History of Mathematics till recently. Apart from his research in physics, he has been working in the field of Indian astronomy and mathematics for nearly 35 years. He has published several papers on Indian astronomy and mathematics, and also three important texts of the Kerala school of astronomy and mathematics, namely Yuktibhāṣā, Tantrasaṅgraha and Karaṇapaddhati (with co-authors), and also a book on the "Siddhāntaśiromaṇi" , the major work of Bhāskarācārya (with co-authors) very recently. Currently he is working on two Kerala texts on astronomy (with co-authors).

He was elected as a Fellow of the Indian National Science Academy (INSA) recently for his contributions in the area of Indian astronomy and mathematics.

4. A Voyage Through Our Heliosphere to study our nearest Star, the Sun

Prof. Dipankar Banerjee, *Vice Chancellor, Indian Institute of Space Science and Technology, Thiruvananthapuram*

On September 2, 2023, the Indian Space Research Organisation (ISRO) launched Aditya L1, a dedicated space-based solar observatory, utilizing the Polar Satellite Launch Vehicle (PSLV) C57. Aditya L1 successfully entered halo orbit around the Earth-Sun Lagrange point L1 on January 6, 2024. As India's inaugural dedicated space-based solar observatory, Aditya L1 offers uninterrupted observations of the Sun, enabling the study of its solar atmosphere, solar wind, and space

weather phenomena. The observatory is equipped with a combination of four remote sensing instruments and three in-situ instruments. Since its operational commencement, Aditya L1 has provided invaluable data, including the first high-energy X-ray observations of solar flares and comprehensive full-disk images in the near-ultraviolet spectrum. Aditya L1 is a component of a global initiative involving several other major missions currently monitoring the Sun and heliosphere. Notably, the Polarimeter to Unify the Corona and Heliosphere (PUNCH) mission was launched on March 11, 2025. In this presentation, I will delve into the complementary role of Aditya L1 in enhancing the capabilities of recent missions.

Professor Dipankar Banerjee currently serves as the Vice Chancellor of the Indian Institute of Space Science and Technology (IIST) in Thiruvananthapuram and previously held the position of Director at the Aryabhatta Research Institute of Observational Sciences (ARIES) in Nainital. As an astrophysicist, he holds a bachelor's degree in physics from St. Xavier's College and a master's degree in Theoretical Physics from the University of Kolkata. His doctoral research was conducted at the Indian Institute of Astrophysics, he completed two postdoctoral tenures at esteemed institutions in Europe. Prior to his current role, he was a senior professor at the Indian Institute of Astrophysics.

Professor Banerjee is the co-chair of the Science Working Group for the "Aditya-L1" mission. Aditya-L1 is India's inaugural dedicated mission to study the Sun, launched by the Indian Space Research Organisation (ISRO) on September 2, 2023. He is also actively involved in NASA's PUNCH mission. Additionally, he is a fellow of the Indian Academy of Sciences, the National Science Academy, the Royal Astronomical Society, and served as the immediate past President of the Astronomical Society of India.

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Bhaktivedanta Institute

The Bhaktivedanta Institute was founded by His Divine Grace A. C. Bhaktivedānta Swami Prabhupāda in Vrindavan in August 1974. Śrīla Prabhupāda was one of the greatest exponents of Vedic culture in the 20th Century. He strongly felt that modern civilization is completely misdirected by scientific materialism and there is an urgent need to introduce the spiritual knowledge and wisdom of the *Bhagavad-gītā* and the *Śrīmad-bhāgavatam*, the essence of all the Vedic literatures, to the scientists, philosophers, scholars and students of the world. He noticed that all the prestigious academic institutions and universities of the world were teaching many different subjects but they had left out the most important branch of knowledge—the science of the soul. He envisioned that this spiritual knowledge of life would help restore an ethical culture for modern society. Thus, there would be hope for bringing lasting happiness and world peace. He felt that introducing this spiritual culture should be the contribution of India for the welfare of humanity. Śrīla Prabhupāda appointed his disciple Dr. T. D. Singh (Bhaktisvarūpa Dāmodara Swami) as the director of the Institute from its very inception and left several instructions to him to carry forward his vision.

The Bhaktivedanta Institute is a center for Advanced Studies in Science and Vedānta and focuses on a consciousness-based paradigm. This spiritual paradigm has a unique potential to resolve

the mind-body problem, the question of evolution and life's origin and many other philosophical and ethical concerns. Thus, this paradigm will have profound significance for science, religion, and their synthesis. One of the primary objectives of the Bhaktivedanta Institute is to present this paradigm for the critical attention of serious scholars and thinkers throughout the world. As such, the Institute supports a closer examination of existing scientific paradigms in cosmology, evolution, physics, biology, and other sciences. The Institute also promotes scientific, philosophical and religious dialogues among scientists, scholars and theologians of the world covering various common conceptual grounds of science and religion for the purpose of creating a better and harmonious understanding among all people. In order to achieve these goals, the Institute organizes international conferences regularly and publishes books and journals. Interested persons may contact the secretary of the Institute at:

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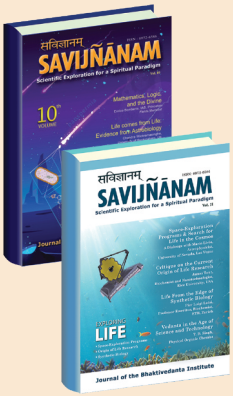

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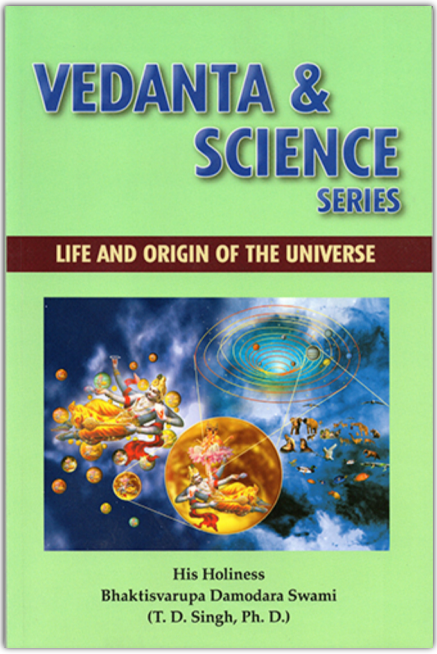

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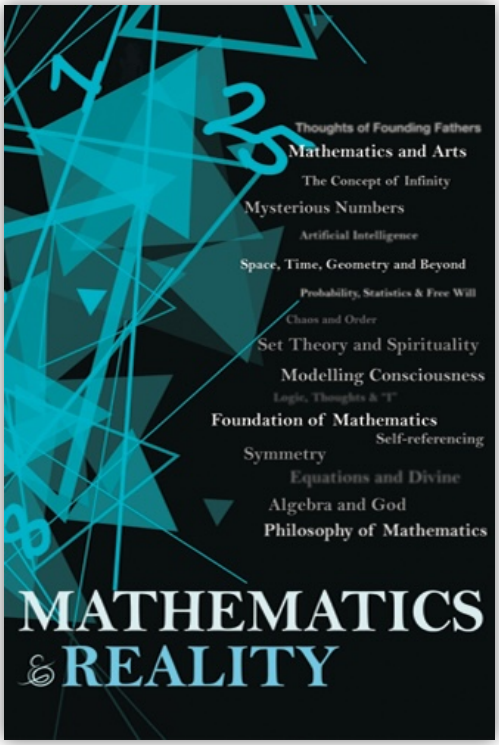

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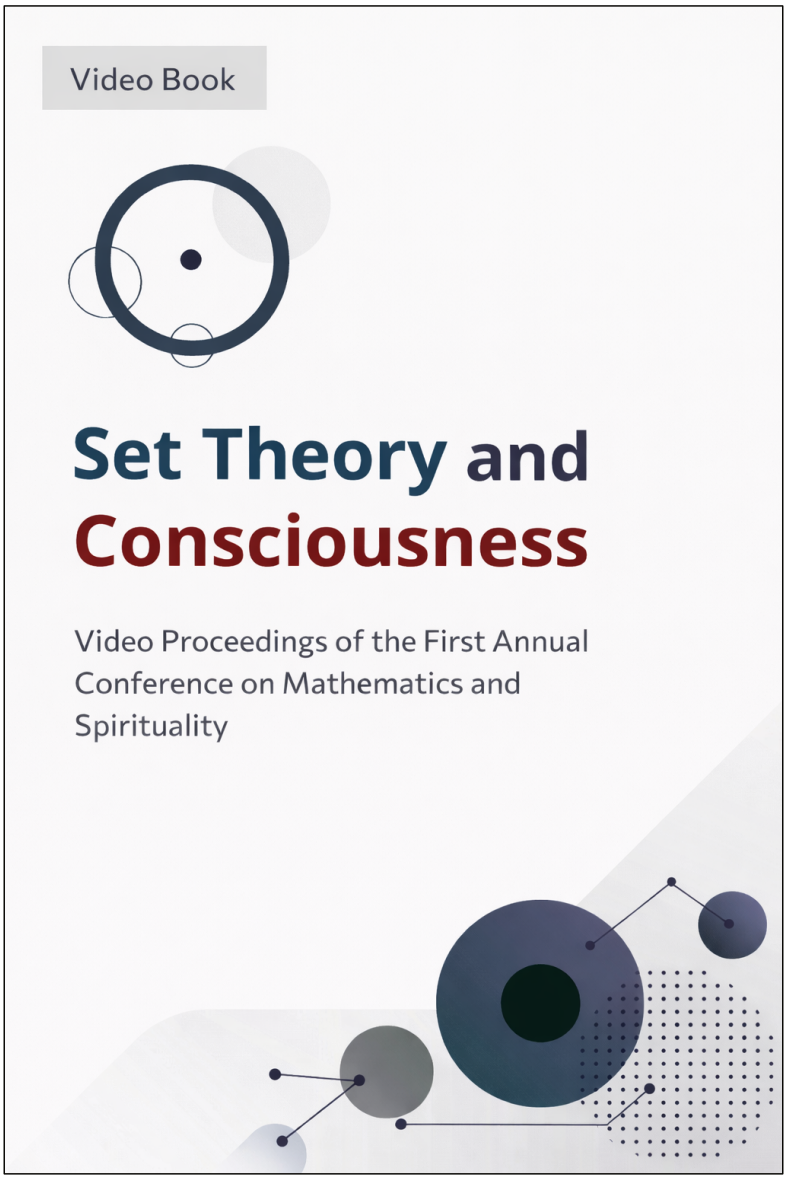

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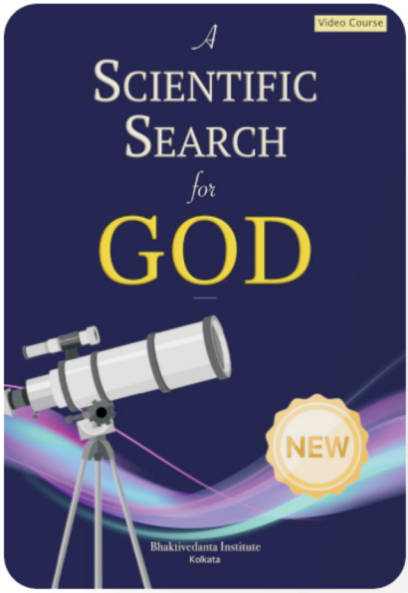

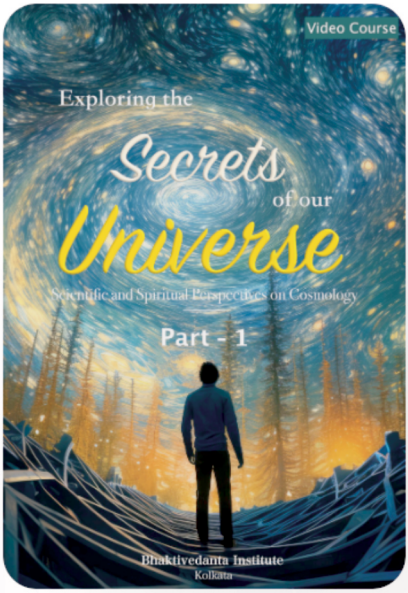

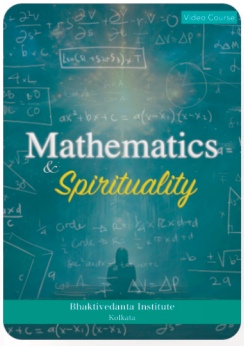

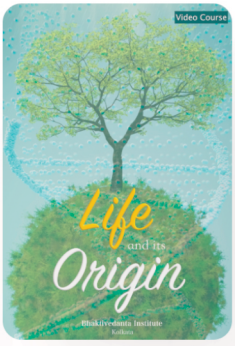

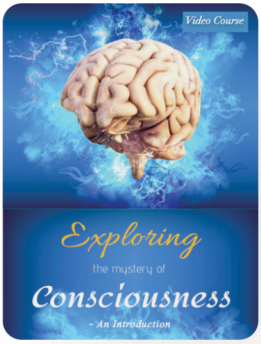

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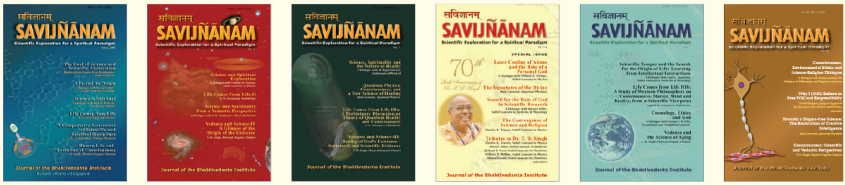

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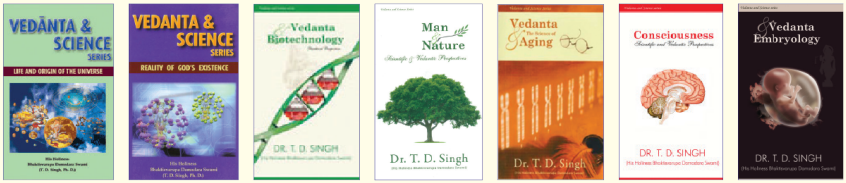

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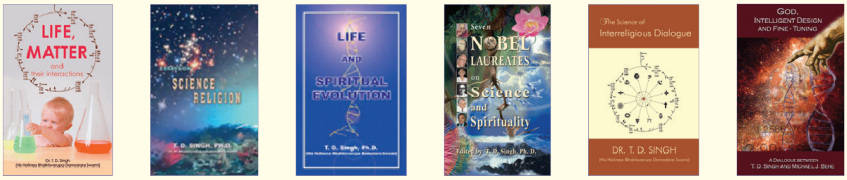

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I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.

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