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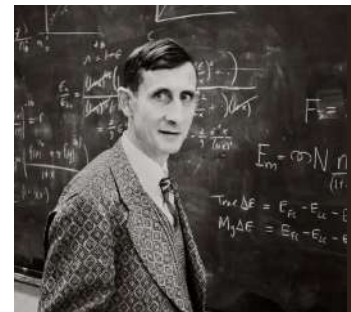
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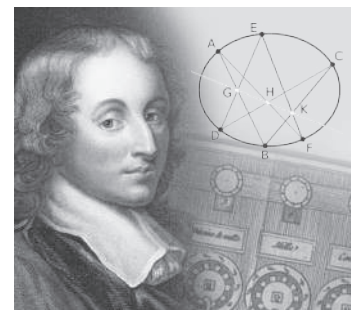
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TATVAJIJÑĀSĀ

Scientific and Spiritual Quest for Ultimate Reality

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EDITORIAL

Dear Readers,

With great pleasure we bring out the fourth volume of *Tattvajijñāsā – Scientific and Spiritual Quest for Ultimate Reality*, the magazine of the Bhaktivedanta Institute.

We are blessed to live in a universe so perfectly designed for all of us to dwell in, and not only dwell but also marvel at the knowns and yet-unknowns that this universe holds. It's a perfect avenue for inquiry (*jijñāsā*). The interesting feature of this inquiry is that it eventually involves us too, inadvertently. We and this universe seem to complement each other, and that could be the reason for this inquiry loop. Is there no way out of this loop? But then that might demand our transcending the realms of this universe with expanded horizons. That might also require us to transcend our own selves. Is there a wisdom out there that has done these transcending jobs already? If so, then our inquiry has found an immediate direction and it would require aligning ourselves to that wisdom.

The articles in this volume do stir such inquiring fervor of ours, in the way that they produce a cascade of further inquiries while resolving the original ones. For instance, the very first article, which is a dialogue between renowned theoretical physicist Freeman Dyson, and Vasudeva Rao, President of the Bhaktivedanta Institute, along with Varun Agarwal, Director of the Bhaktivedanta Institute, takes us through a number of avenues, ranging from a spaceship and dark matter to the quantum world, and much more. Dyson is known for his work on quantum field theory, astrophysics, nuclear physics, among other areas of research. Dyson himself is a confessed traveler across the many dimensions of science.

The second article is dedicated to the life and works of saintly-scientist Blaise Pascal. The author Roshan Tiwari, IISER Kolkata alumnus, has wonderfully brought forth the exemplary portrait of Pascal, which reveals Pascal's benign, divine and scientific fervor — a personality who delved deep into the metaphysical world. Pascal is certainly one of the torchbearers on the path of science and spirituality we ought to revere.

The third article is a contribution by Gerald L. Schroeder, Ph.D from MIT, and an author of many wonderful books. Here we get a hint of a metaphysical stalker, which Schroeder calls an 'Intelligent Mind'. We are not alone. It could have been a comfort-assuring conclusion sounding fact only if it had not been revealed that this stalker is the one that might be keeping us moving.

INTERVIEW

An Open Dialogue with **Freeman J. Dyson**

Emeritus Professor, Institute for Advanced Study,
Princeton, USA and Templeton Prize Laureate



Vasudeva Rao

President, Bhaktivedanta Institute



Varun Agarwal

Director, Bhaktivedanta Institute

An Expedition into the SECRETS OF THE UNIVERSE

The universe is filled with mysticism in each and every nook and corner. It is worth taking an expedition too. Many choose to focus on only one corner. However there are some who would like to explore more than just one avenue. Freeman Dyson, Professor Emeritus, Institute for Advanced Study, Princeton, USA is one such amazing ranger. He is noted as a keen-eyed futuristic visionary with a zeal in multitude of topics. This dialogue that took place between the world-renowned mathematical physicist Freeman Dyson and the Bhaktivedanta Institute, serves as a testimony. Intriguing aspects ranging from origin of life to astronomy and astrophysics, discovery of numerous planets in the universe and studying the nature of stars, asteroseismology have been discussed. Also, the indispensable role of mathematics in understanding the nature as utilized by Freeman Dyson to his best abilities is been shared by Dyson himself.

Mystery of the First Cell

The seventeenth-century scientist Robert Hooke peered through an early microscope at a slice of cork; he saw a network of vacant little boxes. They reminded him of the cells in a monastery. So, he called the empty little spaces 'cells.' Little did he know that they were related to living things. In later years, cells were recognized as the fundamental unit of life. They were no longer seen as vacant spaces but rather as magic puzzle boxes with their secrets of impenetrable complexity. The chemical engineering of even the simplest cell is equated to a micro-miniaturized factory containing thousands of intricately designed molecular machinery, made up altogether of one hundred trillion atoms, which are far more complicated than any machine built by man. Advances in biology over the past decades have served only to deepen the mystery of the cell.

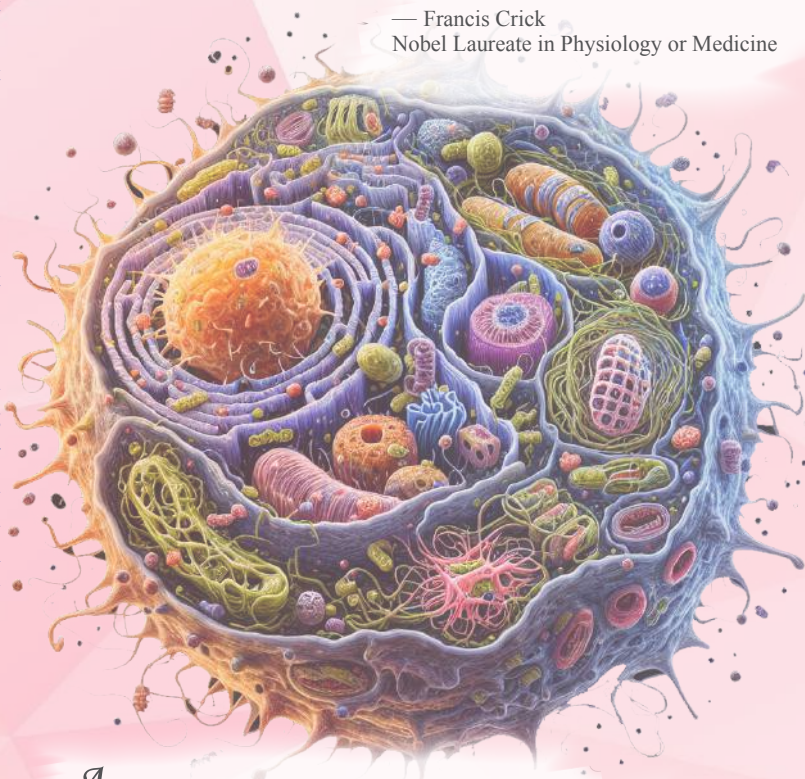
We are yet to decipher how the first cell came into being. There is an enormous gap between the transition from prebiotic soup to the simplest living cell. Rather than revealing the elusive path from a chemical soup to the last common ancestor of all extant life, the spectacular progress in cell biology and organic chemistry has revealed just how immense the chasm is between a soup of organic compounds and the cell, with its membrane, the necessary complement of enzyme catalysts, the proteins' synthetic apparatus, genetic information encoded in the double helix, and so forth. Nobel Laureates like Stanley Miller, Francis Crick, Harold Urey, Werner Arber, and Szent Gyorgyi have opined that the appearance of the first cell is nature's greatest miracle and a mystery.⁶⁻¹⁰

The origin of life remains one of the humankind's last great unanswered questions, as well as one of the most experimentally challenging research areas. . . . Despite recent progress in the field, a single definitive description of the events leading up to the origin of life on Earth some 3.5 billion years ago remains elusive.

— Stanley Miller
Nobel Laureate in Chemistry

The origin of life appears to be almost a miracle, so many are the conditions which would have had to be satisfied to get it going.

— Francis Crick
Nobel Laureate in Physiology or Medicine



All of us who study the origin of life find that the more we look into it, the more we feel it is too complex to have evolved anywhere. We all believe as an article of faith that life evolved from dead matter on this planet. It is just that its complexity is so great, it is hard for us to imagine that it did.

— Harold C. Urey
Nobel Laureate in Chemistry

Although a biologist, I must confess that I do not understand how life came about. . . . The most primitive cell may require at least several hundred different specific biological micro molecules. How such already quiet complex structure may have come together, remains a mystery to me.

— Werner Arber
Nobel Laureate in Physiology or Medicine

In my search for the secret of life, I ended up with atoms and electrons which have no life at all. Somewhere along the line, life has run out through my fingers. So, in my old age, I am now retracing my steps...

— Albert Szent-Györgyi
Nobel Laureate in Chemistry



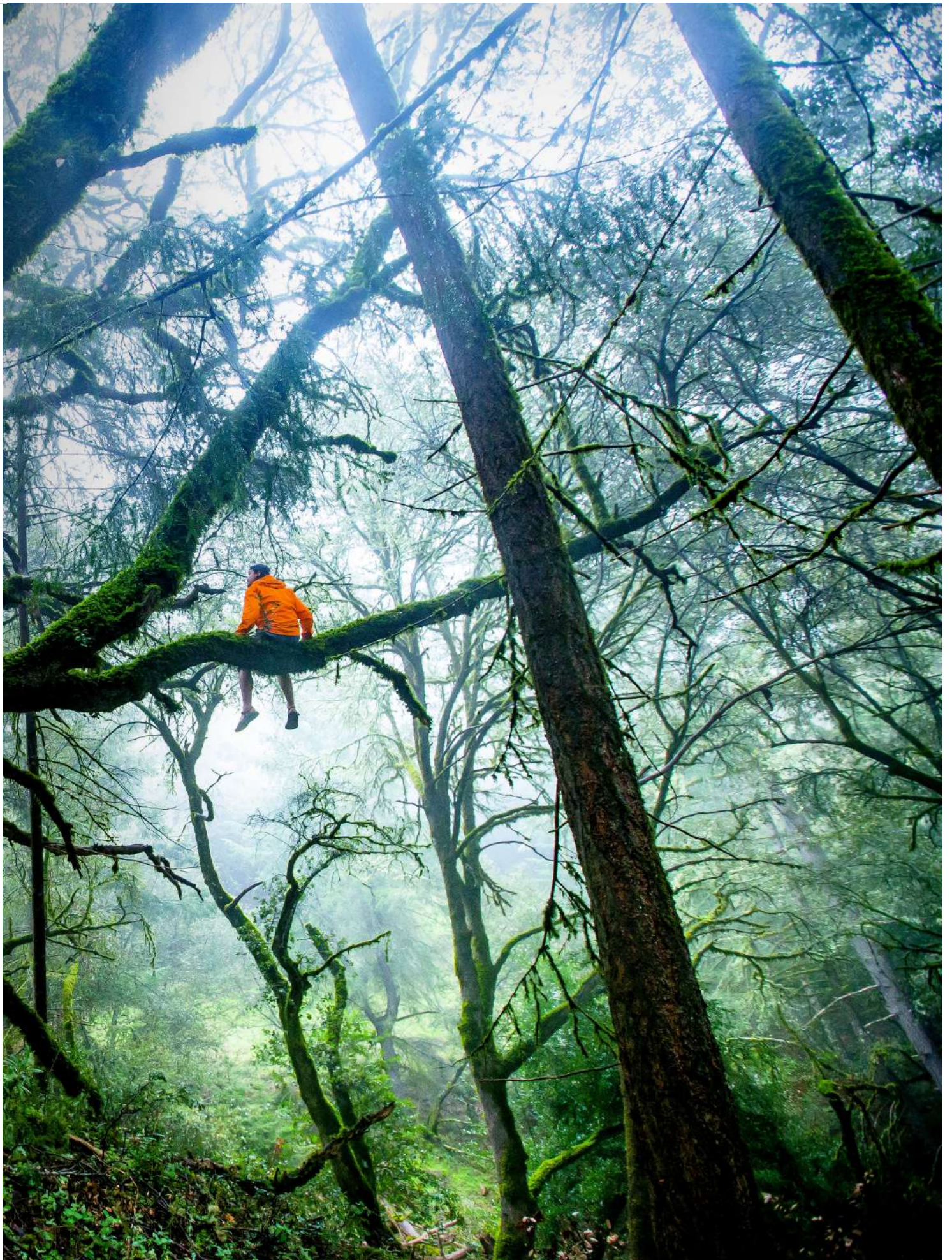
METAPHYSICS

THE I.Q. OF OUR UNIVERSE

Gerald L. Schroeder

Ph.D, Earth Sciences and Physics, M.I.T, USA

Have you ever wondered how a huge tree is contained within a minute seed, or for that matter how this big universe came out of 'Nothing'? Nature never stops amazing us - be it the invisible electrons or the mathematical laws of the vast space or our very sense of awareness. In fact, several great scientists and scholars have often opined that hidden behind such intricate and precise laws is an Intelligent Mind or a Spirit. In this article, the famous author and physicist, Dr. Gerald L. Schroeder, discusses the stage-by-stage increase in the apparent I.Q., that is, the increasing unfolding of intelligence and wisdom, within our magnificent universe. This is expressed in the laws of nature and then in the progressive development of life, brain, mind and, eventually, abstract thought. We believe that henceforth, a Nature walk will no longer be a mere stroll in the woods, but a sublime experience of the handiworks of the Creator that fill the mind with ever increasing admiration and awe.



The I.Q. of Our Universe

We must appreciate that far beyond the superficially obvious parameters that shape our existence, such as there being one time dimension and three spatial dimensions, a myriad of laws, describable by mathematical relationships, govern every physical path of our existence.

which the cup rests to have the semblance of a solid surface even though the actual protons and electrons that have combined to form the atoms and molecules of the table top occupy less than one millionth of a billionth of the actual surface of the table top. And all this is just to get a cup of tea. When we get to the



For a simple example, consider a cup of tea: laws governing the flow of heat from the hot cup of tea to the cooler surrounding molecules of air; laws governing the change in local air pressure as the motions of the molecules of air increase as the air gets hotter; laws governing the rate and turbulence of flow of the tea when the cup is tilted; laws that determine the strength of bonding among the varied types of atoms that comprise the molecules from which the cup is made; laws that describe the virtual forces that cause the table top on

mathematics of rocket science, brain science or quantum physics, volumes of pages are required to list the equations. And all this wisdom, this evidence of a superior mind, entered the universe fully formed at its creation and ultimately, after eons of time, is described by totally abstract symbols and relationships of humanly invented (or better to say—humanly discovered) rules of mathematics, which can be explained by joining the abstract symbols, which we refer to as letters, into clusters we call words and sentences.

The I.Q. of Our Universe

we were a century ago.”¹³

Robert Sapolsky, former professor of biological science and neurology at Stanford University, in an article published in *Scientific American*, seconded that description of our conundrum of mind- consciousness-imagination: “...despite zillions of us [neurologists] slaving away at the subject, we still know squat about how the brain works.”¹⁴ The chemistry is well studied. The locations within the brain where sight and sound and taste and smell and touch are recorded are well known. It is the replay that is unknown. How and where are the images and sounds that we see and hear displayed, the scent experienced? Nowhere in the brain is the picture that we see.

Two thoughts by two Nobel laureates, one a physicist, one a biologist, may lead us to the answer, which in turn reveals a very deep truth.

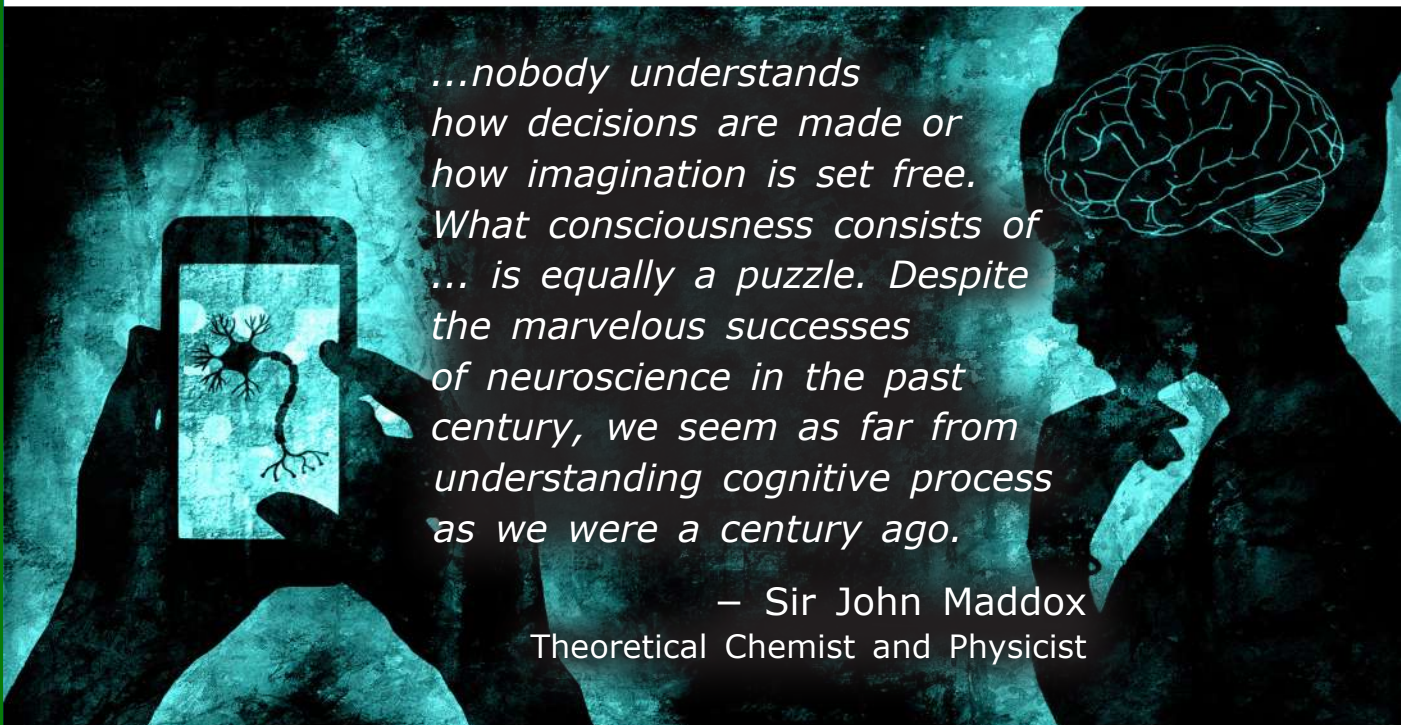
Erwin Schrödinger: His work has become the heart of quantum mechanics, upon which almost all of the hi-tech industry is based. While Einstein’s insights taught us about the

vast cosmos, Schrödinger’s insights taught us about the subatomic world. In his book *Nature and The Greeks and Science and Humanism* (1951), he writes:

“So, in brief, we do not belong to this material world that science constructs for us. We, [the awareness that each of us has of being one’s self], are not in it, we are outside. We are only spectators. The reason why we believe that we are in it, that we belong to the picture, is that our bodies are in the picture. Our bodies belong to it. Not only my own body, but those of my friends, also of my dog and cat and horse, and of all the other people and animals. And this is my only way of communicating with them.”¹⁵

George Wald: His reflections based on his study of how the information brought to the brain by vision is transformed into a conscious awareness are recorded in ‘Life and Mind in the Universe’ in the *International Journal of Quantum Chemistry: Quantum Biology Symposium* 11 (1984); 1–15:

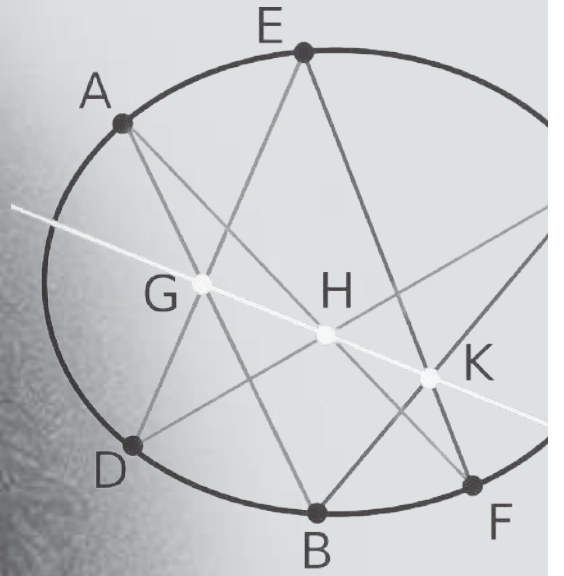
“It has occurred to me lately—I must confess

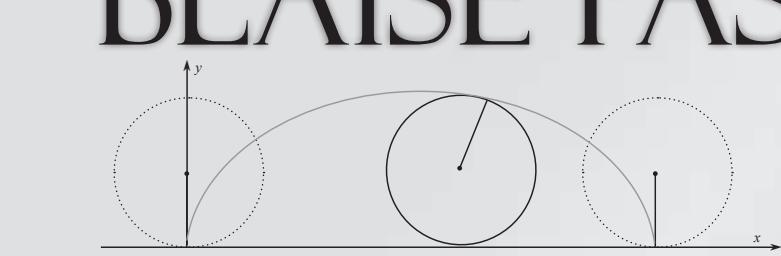


*...nobody understands
how decisions are made or
how imagination is set free.
What consciousness consists of
... is equally a puzzle. Despite
the marvelous successes
of neuroscience in the past
century, we seem as far from
understanding cognitive process
as we were a century ago.*

— Sir John Maddox
Theoretical Chemist and Physicist

SCIENTIST AND SAINT

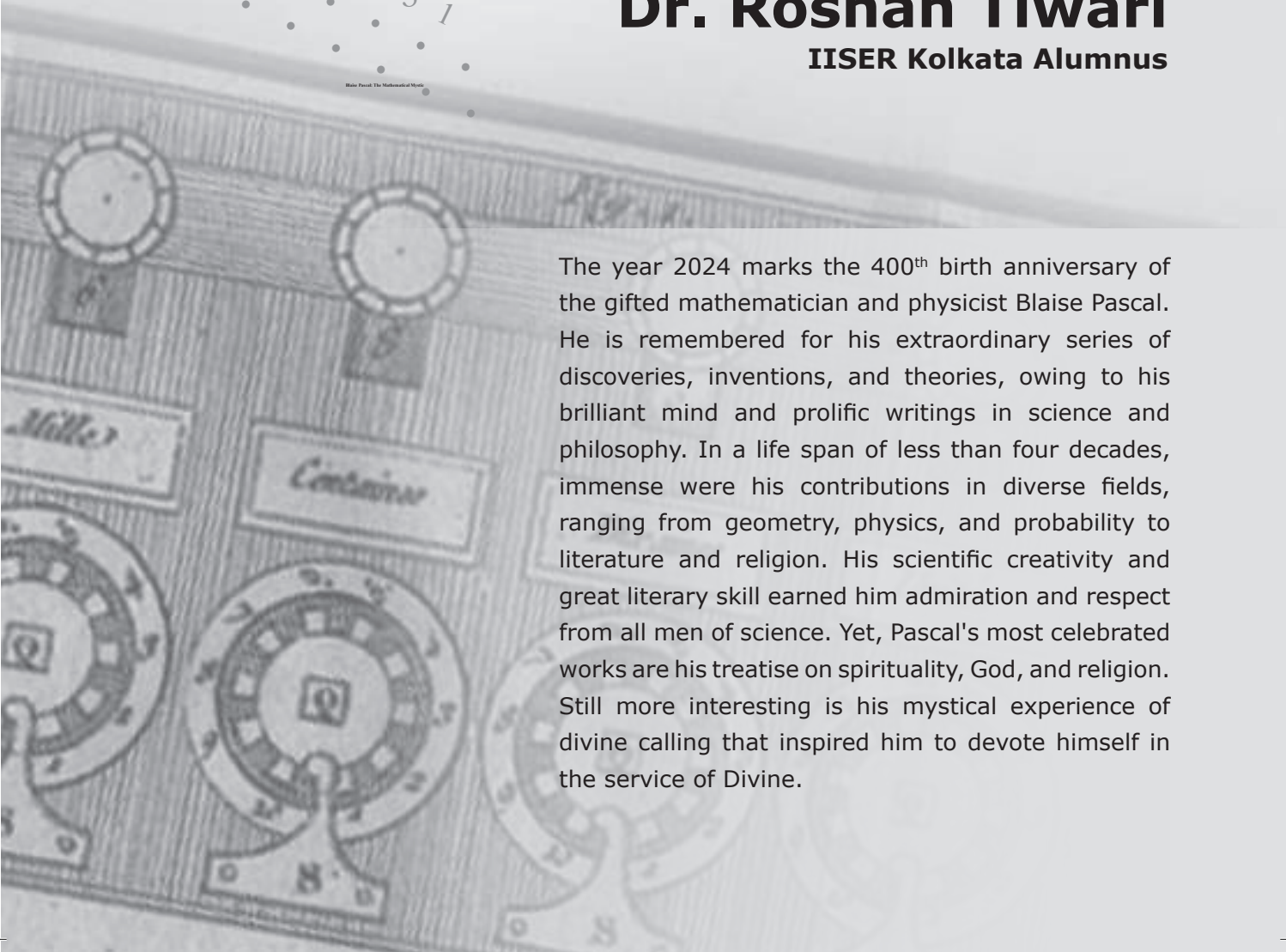




BLAISE PASCAL: THE MATHEMATICAL MYSTIC



Dr. Roshan Tiwari
IISER Kolkata Alumnus



The year 2024 marks the 400th birth anniversary of the gifted mathematician and physicist Blaise Pascal. He is remembered for his extraordinary series of discoveries, inventions, and theories, owing to his brilliant mind and prolific writings in science and philosophy. In a life span of less than four decades, immense were his contributions in diverse fields, ranging from geometry, physics, and probability to literature and religion. His scientific creativity and great literary skill earned him admiration and respect from all men of science. Yet, Pascal's most celebrated works are his treatise on spirituality, God, and religion. Still more interesting is his mystical experience of divine calling that inspired him to devote himself in the service of Divine.

Blaise Pascal: The Mathematical Mystic

1. Introduction

During the first decades of the seventeenth century, the bottom-up scientific method of observation and experimentation became the central approach to study the observable phenomena of nature. Thenceforward, science and theology saw an explicit disentangling and distancing of one from the other. During these times, Blaise Pascal (1623–1662) was a seminal figure who made noticeable contributions in both the spheres of religion and science.

Most of us are aware of Pascal's diverse scientific contribution in physics and mathematics. We are content in familiarizing ourselves with concepts such as Pascal's Triangle, Pascal's Law, or the programming language 'Pascal'. But there lies an unexplored aspect of this creative genius, who was born with an insatiable curiosity for truth, who emerged as a scientist and who departed from this mortal world a saint. According to T. S. Eliot, the Nobel laureate in Literature, "Pascal is one of those writers who will be and who must be studied afresh by men in every generation. It is not he who changes, but we who change. It is not our knowledge of him that increases, but our world that alters and our attitudes towards it."¹ Therefore, while we appreciate his contributions to science, it will be worthwhile for us to have a glimpse of Pascal's philosophical works, which venture into the seldom-explored territory of metaphysical reality, such as free will, divine grace, soul and God, among others.

2. The Pascal Family

Blaise Pascal was born on 19 June 1623 in the city of Clermont Ferrand in central France. He was named after his paternal uncle and

Saint Blaise, the 3rd century Armenian saint. He grew up with his sisters, Gilberte and Jacqueline. Pascal's father, Étienne Pascal, was a presiding judge at the taxation court in Montferrand. Although he had a law degree, Étienne had vast knowledge in subjects of science and mathematics. He was also well-versed in ancient languages, Greek literature and the art of poetry. Due to his scientific fervor, Étienne often spent his leisure hours being in the company with men of science. Pascal's mother, Antoinette Begon, known for her piety and charitable work, died in 1626 when Pascal was only three years old and Jacqueline was but an infant.

Born with a feeble constitution, Pascal was the most delicate among the children and suffered various pains and diseases throughout his life. Being the only son between two beloved



Pascal's birthplace in Clermont-Ferrand

Blaise Pascal: The Mathematical Mystic

for there is no reason why I am here rather than there, why now rather than then. Who put me here? By whose order and direction have this place and time been allotted to me?"²²

Pascal thus found that the employment of reason alone failed to address the ultimate questions and thus renounced further research. In this way, Pascal the geometer traversed from the domain of mathematics to metaphysics in his search of higher truths about reality.

6.2 Knowledge Beyond Reason

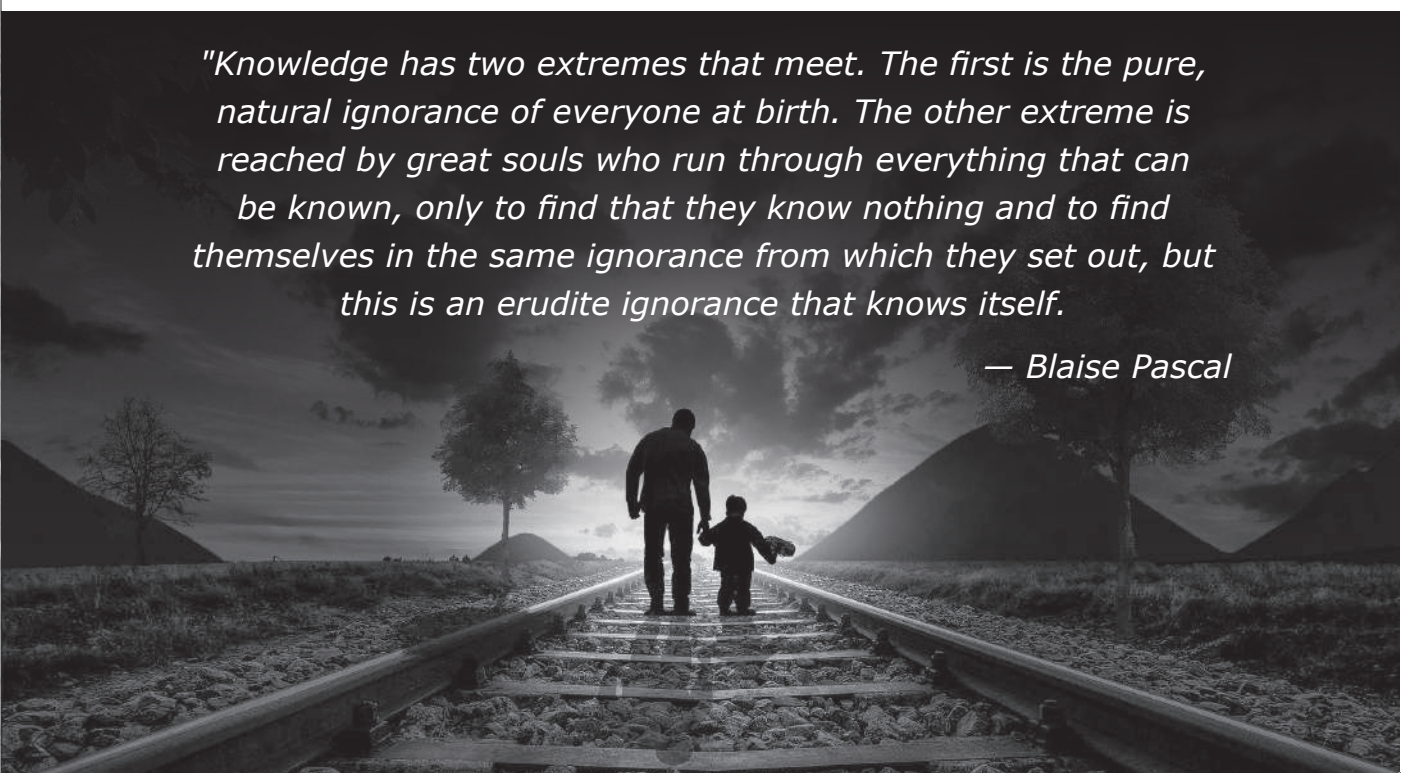
Pascal's inquisitive spirit then took a turn towards the basic questions about man: his nature, purpose and relationship with God. In exploring these truths, he recognized that such knowledge lay beyond the grasp of the senses and the reasoning mind. Thus, Pascal came up with a theory of knowledge distinguishing the three ways of knowing (acquiring knowledge), based on three different modes of perception: the senses, the mind and the heart. He called the process of proving and evidence weighing "reason" (*raison*), while he called the intuition of self-evident knowledge the "heart" (*cœur*).

He stressed that "we know the truth not only through reason but more so through the heart; and it is in this latter way that we know the first principles such as space, time, motion and number, from which reason starts but which it cannot produce. ... The heart feels that there are three dimensions in space and numbers are infinite, and reason then shows that there are no two square numbers of which one is double the other. Principles are felt, propositions are proved; all with certainty, though in different ways. And it is as useless and absurd for reason to demand from the heart proofs of its first principles before accepting them, as it would be for the heart to demand from reason an intuition of all demonstrated propositions before receiving them. This inability must serve, then, only to humble reason"²³ Thus, the senses and reason are not our only capacities for obtaining knowledge.

As the senses give us some truth in their own sphere, so does reason give us the truth in its own sphere; but reason is a deep source of human dignity. He says, "Reason's last step is the recognition that there are an infinite number

"Knowledge has two extremes that meet. The first is the pure, natural ignorance of everyone at birth. The other extreme is reached by great souls who run through everything that can be known, only to find that they know nothing and to find themselves in the same ignorance from which they set out, but this is an erudite ignorance that knows itself.

— Blaise Pascal





Sculpture of Blaise Pascal

The plaster model was exhibited at the Salon of 1781.

Blaise Pascal studying the cycloid, engraved on the tablet he is holding in his left hand; the scattered papers at his feet are his *Pensées*, the open book his *Lettres provinciales*.

Faith: A Gift of God

With the gradual evolution of scientific thought emerged the mechanistic conception of the world, the view that all natural phenomena can be explained solely in terms of matter and motion. However, when science confronted the metaphysical realities, great men of science such as Descartes, Pascal, Copernicus, and Max Planck saw the need to reconcile science and faith. Thus, several arguments came up, such as the “design” argument for proving God’s existence and thus supported the holistic perspective of the universe.

However, for Pascal getting closer to the reality of God was more than just a quest for the Absolute Truth. He saw it in a new light (after the mystical experience) as a gateway for mankind to enter a life of bliss and eternity. Thus, like holy men in the past, Pascal believed that the best service one could offer to humanity is to draw people closer to God, and that faith helps to re-integrate the broken unity of man and God and set man free for service on a higher dimension.

Pascal saw that the real serious obstacle to faith was in the “will,” which is the unwillingness to give up the passionate enjoyments, thus is entangling the heart from the mundane dualities of life. To help reflect on the need to disentangle the heart, Pascal analyzed the profound insignificant nature of man and the vastness of the infinite reality. He stirred one to self-examination and to confront the necessity for making a decisive choice—to believe or not in the metaphysical aspect of reality.

Pascal introduced the first step toward belief in God with his famous “wager”: “Either God exists, or He does not. But which of the alternatives shall we choose? Reason cannot decide anything. Infinite chaos separates us. At the far end of this infinite

distance, a coin is being spun, which will come down as heads or tails. How will you bet? Reason cannot determine how you will choose, nor can reason defend your position of choice. Let us weigh the consequences involved in calling heads that God exists. If you win; you win everything; but if you lose you lose nothing. Don’t hesitate, then, but take a bet that He exists...”²⁹

TIME LINE ▶▶

1623 ▶



Blaise Pascal
born in Clermont,
France.

1631 ▶

Pascal’s
Family moves
to Paris

1635 ▶

Gets access to
the weekly
gatherings
of Academie
Mersenne

1640▶

Published his
short work:
*Essay on
Conic Sections*

1642 ▶

Begins to
work on his
calculating
machine, the
Pascaline

1645 ▶

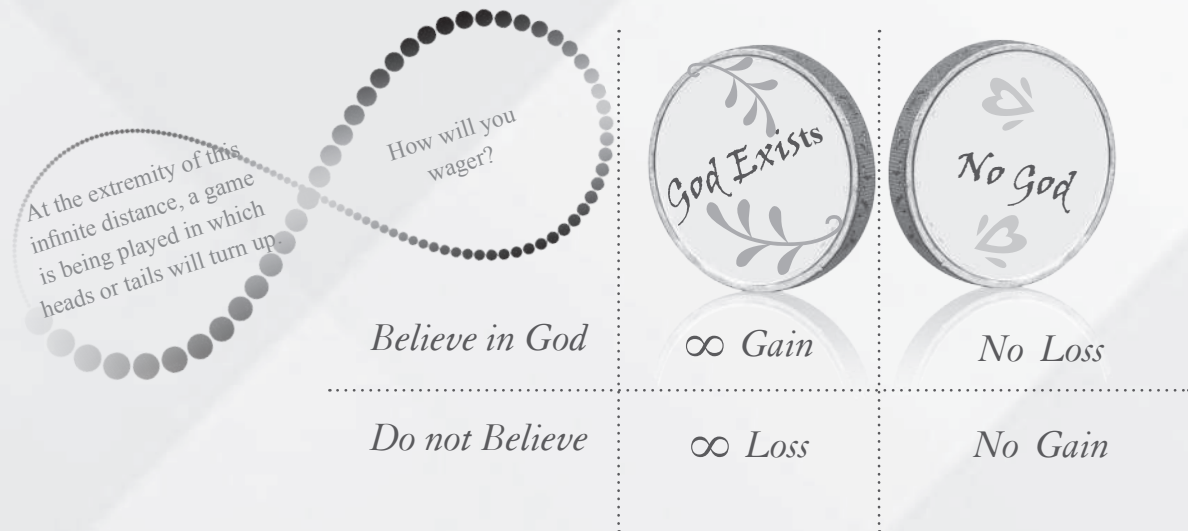
Letter to the
Chancellor,
dedicating the
calculating
machine

1646 ▶

First
conversion.
The family gets
acquainted with
Jansenism

1647 ▶

Publishes a
Pamphlet: *New
Experiments
Concerning
Vacuums*



The wager argument offered a new way of thinking about God. So, now one holds the choice to shape one's destiny. Pascal believes God's existence may not be rationally proved but can be responsibly presupposed.

Pascal's wager, with its famous heading *Infini-Rien* draws a striking parallel between mathematical infinity and the divine infinity. He writes, "We know that there is an infinite, and we know not its nature. As we know it to be false that numbers are finite, it is, therefore, true that there is a numerical infinity. But we know not of what kind; it is untrue that it is even, untrue that it is odd; for the addition of a unit does not change its nature; yet it is a number, and every number is odd or even (this certainly holds of every finite number). Thus we may quite well know that there is a God without knowing what He is.

We know then the existence and nature of the finite because we also are finite and have extension. We know the existence of the infinite, and are ignorant of its nature, because it has extension like us, but not limits like us. But we know neither the existence nor the nature of God, because He has neither extension nor limits. But by faith we know His existence; in glory we shall know His nature."³⁰

Pascal holds that even if our reason cannot definitively resolve the question of God's existence, it may still be helpful in leading us towards faith in Him. Reasoning helps man to return to "natural ignorance, which is the true seat of man." With the awareness of learned ignorance (which knows itself) dawns the humble sense of dependence and utter need of faith like a little child. In such a state, one is prepared to take sides by the act of will. The French philosopher Jacques Chevallier says about the profound significance of the wager: "to comprehend, submission is necessary; and to perceive the Truth, we must discipline and place ourselves in the attitude demanded by the Truth. And this attitude, this discipline, can be summed up in one word --- humility."³¹

While we have the choice about where to put the faith, it is true that only by divine grace is one drawn towards the divine truths. Therefore, Pascal says, "faith is a gift of God ... that God himself puts into the heart, and proof is often its instrument. Faith comes by hearing. But this faith is in the heart and makes us say not I know, but I believe. ... Thus it is the heart which experiences God, not the reason. And proof of God's existence cannot set Him in our hearts; the only way to know the Truth is to be in Truth, so the only doctrine which gives us real knowledge of God is the doctrine that unites us to Him."³² So Pascal shows us that faith or belief in spiritual realities is a journey one chooses to make by divine grace and mercy. And the process eventually will illuminate the heart enabling him to witness the self-revealing Truth of God.

1653 ▶	1654 ▶	1654 ▶	1655 ▶	1656-57 ▶	1658 ▶	1662 ▶	1670
Writes the <i>Treatise on the Equilibrium of Liquids</i>	Writes the <i>Treatise on the Weight of the Air Mass</i> and <i>Trait 'e du triangle arithm'etique</i> .	November 23: Pascal's night of religious ecstasy. Pascal's second conversion	Composed <i>De L'Esprit g'eom'etrique</i>	Writes the <i>Lettres provinciales</i>	Works on the cycloid. Presents plan of his apologetic project	First omnibus service instituted by Pascal in Paris. Falls ill in the spring and dies on 19 August	Posthumous publication of Port-Royal of Pascal's <i>Pensees</i>

ETERNAL AXIOMS

THE SCIENCE OF PRAYER

ॐ नमो भगवते वासुदेवाय ॥

*om namo bhagavate
vāsudevāya*

om — O my Lord; *namaḥ* — my respectful obeisances unto You; *bhagavate* — unto the Personality of Godhead; *vāsudevāya* — unto Lord Kṛṣṇa, the son of Vasudeva.

(Śrīmad-Bhāgavatam 2. 1. Invocation)

TRANSLATION

O my Lord, the all-pervading Personality of Godhead, I offer my respectful obeisances unto You.

Lecture given at Berkeley, USA on October 29, 1986 by
Dr. T. D. Singh (His Holiness Bhaktisvarupa Damodara Swami)

In any transcendental matter, the speaker actually gets his inspiration by submitting completely to the lotus feet of the Supreme. Here, the invocation, ‘*Om Namo Bhagavate Vāsudevāya*’, is the proper format.¹ It is a form of prayer.

Prayer is a very important function in life, especially for the human form of life. Other forms of life, in general, may not know what is meant by prayer or to be praying. So, prayer is an external as well as an internal symptom of a hankering soul or of a sincere living entity or a sincere soul who is trying to spread the glories of the Supreme. Srila Prabhupāda (Founder Acharya of Bhaktivedanta Institute) explains that the prayer in a way is like the crying of a little baby. Unless one's mind is tuned in that mood, one cannot actually speak anything divine.

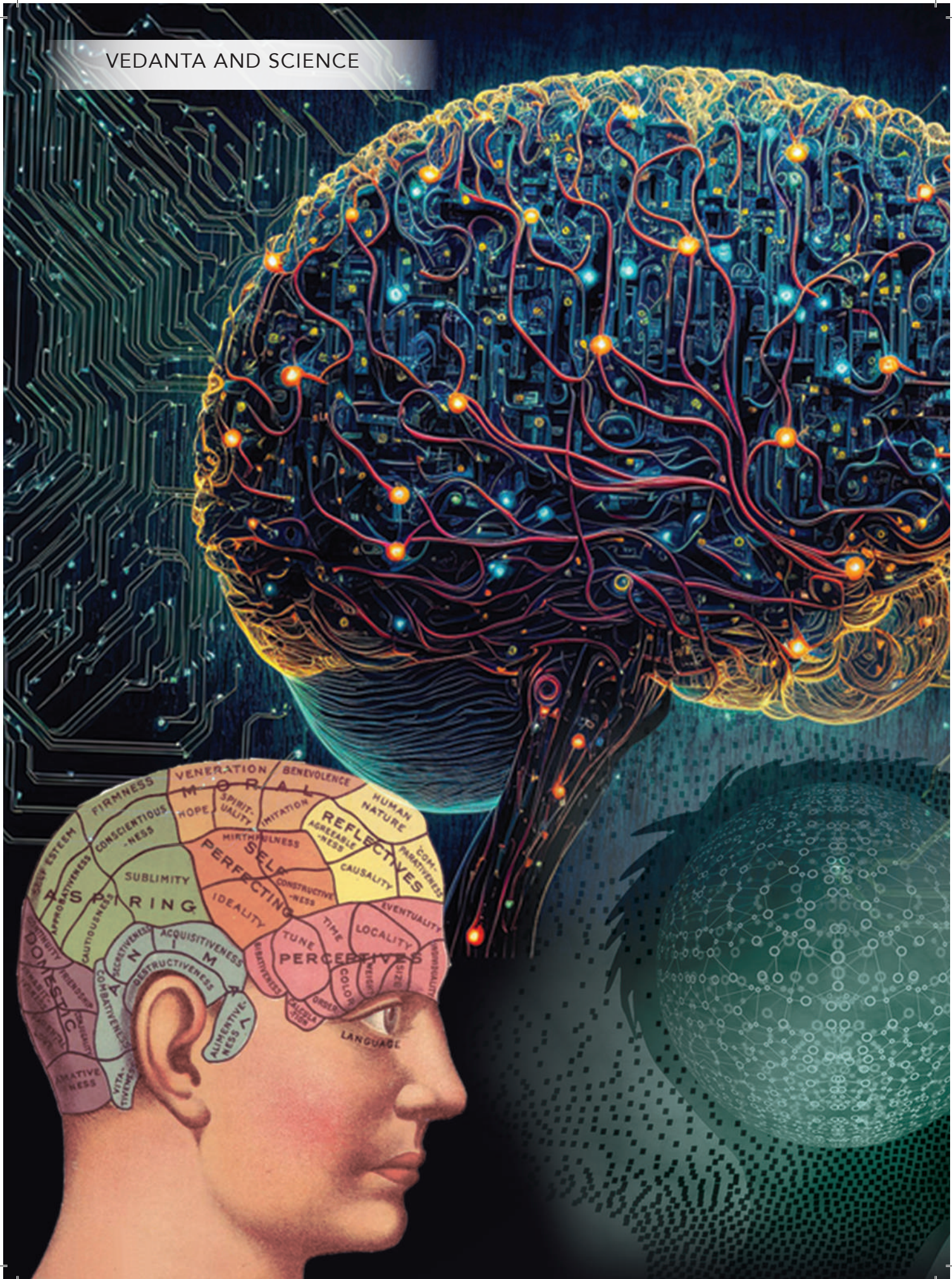
In this prayer, ‘*Om Namo Bhagavate Vāsudevāya*’ Śrila Śukadeva Gosvāmī is asking for transcendental inspiration or transcendental guidance. Especially in the transmission of spiritual knowledge from

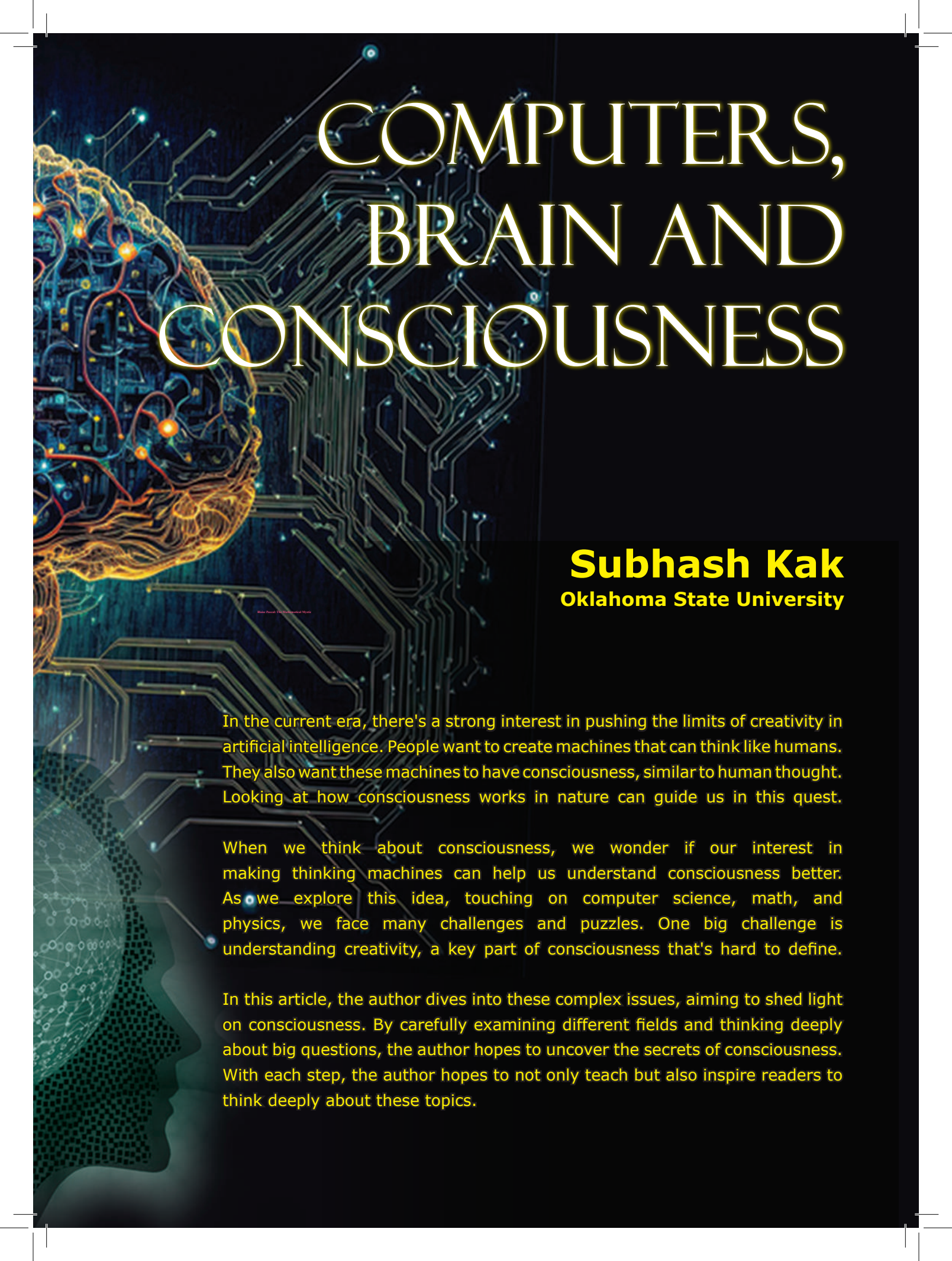
master to disciple, the utmost necessity is to understand that, whatever is spoken by the master should be coming by the blessings of Lord Sri Kṛṣṇa (Vasudeva). So, in that mood, this invocation is a preliminary step in any spiritual dialogue.

One cannot pray unless one's mind is tuned properly. Prayer cannot be done in an artificial way. It has to come as a natural process for expressing the complete helpless nature of the living entity — "I am completely helpless, I am completely ignorant, I am completely fallen. So, my dear Lord, kindly give me the guidance, kindly give me the understanding, so that at least I can utter in a mature way some of the great qualities of Your Supreme Personality." In this mood, the devotee prays for the blessings of Lord Kṛṣṇa. Unless the blessings are there, one is not qualified to make any statement about the Lord. So, this invocation is meant for one to be blessed by the Lord. Thus, by the blessings and guidance of the Supreme, whatever one utters will be a

Prayer is a very important function in life, especially for the human form of life. Other forms of life, in general, may not know what is meant by prayer or to be praying.

VEDANTA AND SCIENCE





COMPUTERS, BRAIN AND CONSCIOUSNESS

Subhash Kak
Oklahoma State University

In the current era, there's a strong interest in pushing the limits of creativity in artificial intelligence. People want to create machines that can think like humans. They also want these machines to have consciousness, similar to human thought. Looking at how consciousness works in nature can guide us in this quest.

When we think about consciousness, we wonder if our interest in making thinking machines can help us understand consciousness better. As we explore this idea, touching on computer science, math, and physics, we face many challenges and puzzles. One big challenge is understanding creativity, a key part of consciousness that's hard to define.

In this article, the author dives into these complex issues, aiming to shed light on consciousness. By carefully examining different fields and thinking deeply about big questions, the author hopes to uncover the secrets of consciousness. With each step, the author hopes to not only teach but also inspire readers to think deeply about these topics.