ORIGIN OF LIFE RESEARCH

History

State-of-Art

New Ideas

Future Visions

Summer School - 2021

Visionary: Dr. T. D. Singh,
Founder Director, Bhaktivedanta Institute

Organized by:

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Life — the word is so easy to understand, yet so enigmatic for any thoughtful person.

— Alexander Oparin
Well-known Biochemist

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- History
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- Future Visions

16 - 20 June, 2021

4:00 - 8:00 pm | IST

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Dedicated to

Dr. T. D. Singh

(His Holiness Bhaktisvarupa Damodara Swami)

(1937-2006)

Scientist & Saint

Founder Director, Bhaktivedanta Institute

&

Founder President, Vedanta and Science Educational Research Foundation

In Memory of

Prof. Sudipto Ghosh

Department of Metallurgical and Materials Engineering,
IIT Kharagpur, India

&

His Grace Radhacharan Das

Board Member, Bhaktivedanta Institute, Kolkata and
President, Vedanta and Science Educational Research
Foundation.

Acknowledgments

I am thankful that by the mercy of the Lord and blessings of Dr. T. D. Singh (also known as H. H. Bhaktisvarupa Damodara Swami), Founder-Director of the Bhaktivedanta Institute, and the hard work of all the dedicated team members, the Summer School - 2021 is finally being organized online. We thank our distinguished speakers from India and abroad for accepting our invitation and sending their abstract within a short time frame. As in any endeavor, there is a vast team involved behind its success – some seen, some unseen. Our hearty thanks go to all the organizing team members of the school who have put immense time, heart, energy and, above all, their pure loving service for the Summer School.

We also humbly acknowledge and thank volunteers of various services, including website and poster design, publicity, fund raising, registration, online session management, among others. Further, the booklet work required much help. We are thankful to Sri Varun Agarwal, Dr. Debashis Khan, Nikhil Yenugu, Katta Sai Vineeth, Roshan Tiwari, Ruthvik Galem, Sri Aristotle, Sri Sravan, Sri Ajay Kumar Sahoo, Sri Hari Kota, K. Kishorereddy, Jagadishwar, Thukkadi Manoj, Prabhas Naidu, and Udesh Samuel Obinna, from the core of our heart for the countless hours of dedicated hard work contributed by them in making this publication possible. Our hearty thanks to them.

The assistance rendered by the various students coming from different parts of the country, including Sandhya Ravi, Shobhit Pokhriyal, Sakshi Narke, Arnav Grover, Shasank Shrivastav, and by all the members of the Bhaktivedanta Institute, is beyond

imagination. Without their dedication and full support, this Summer School would not have been possible. Our sincere thanks to all of you for your wonderful dedication. We gratefully acknowledge the good wishes and prayers from friends, well-wishers, devotees and disciples of Dr. T. D. Singh, without whose blessings we could not have thought about events like this Summer School.

We are obliged to the financial help rendered by Premalatha Mataji, Deepankar, Nagaraj, Roopa Mataji, Eshwar and many more for this Summer School. We are especially thankful to Premalatha Mataji. Thank you!

We are indebted to our beloved spiritual master Dr. T. D. Singh, who has guided us immensely in the theme of the school for the benefit of humanity. Our deep gratitude to our grand spiritual father, Srila A.C. Bhaktivedanta Swami Prabhupada, the greatest ambassador of Vedic wisdom to the modern world and the spiritual founder of the Bhaktivedanta Institute, for giving us this wonderful platform and vision.

Words are limited but feelings of heart are beyond what our minds and hands can grasp. We sincerely thank to each and every individual, whether your name is mentioned or not, from the unlimited depths of our hearts. May good thoughts come from all directions. May everyone be happy.

Sarve jana sukhinobhavantu!

In the service of the Supreme Lord and your good selves,

K. Vasudeva Rao,
President, Bhaktivedanta Institute

CONTENTS

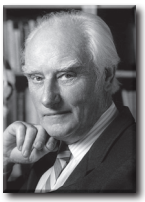
Werner Arber

(1929 –)

Noble Laureate in Physiology or Medicine

Although as a biologist, I must confess that I do not understand how life came about… To me, auto-replication of a macromolecule does not yet represent life. Even a viral particle is not a live organism, it can only participate in life processes…

— Werner Arber



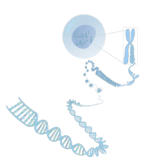
Francis Crick

(1916 – 2004)

Nobel Laureate in Physiology or Medicine

Everytime I write a paper on the origins of life I swear I will never write another one, because there is too much speculation running after too few facts, though I must confess that in spite of this, the subject is so fascinating that I never seem to stick to my resolve.

— Francis Crick



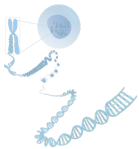
Stanley Miller

(1930 – 2007)

Father of Prebiotic Chemistry

We really don't know what the Earth was like three or four billion years ago. So there are all sorts of theories and speculations. The major uncertainty concerns what the atmosphere was like. This is a major area of dispute.

— Stanley Miller



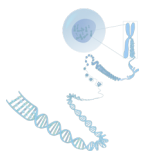
Louis Pasteur

(1822 – 1895)

Father of bacteriology and
Father of Microbiology

You pass from matter to life because of your intelligence today... cannot conceive things otherwise. How do you know that in ten thousand years one will not consider it more likely that matter has emerged from life?

— Louis Pasteur



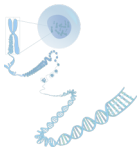
SZENT-GYÖRGYI

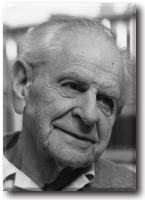
(1893 – 1986)

Noble 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...

— Szent-Györgyi





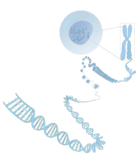
Karl Popper

(1902 – 1994)

Influential Philosopher of Science

The undreamt of breakthroughs in molecular biology has made the problem of the origin of life a greater riddle than it was before: we have acquired new deeper problems.

— Karl Popper



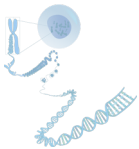
Dr. T. D. Singh

(1937 – 2006)

Founder Director of The Bhaktivedanta Institute

An enormous gulf lies between the few simple chemical facts known about DNA and the actual functioning of a cell.

— Dr. T. D. Singh



Welcome

oṁ ajñāna-timirāndhasya jñānāñjana-śalākayā
cakṣur unmīlitaṁ yena tasmai śrī-gurave namaḥ

My respectful namaskar to all my teachers, mentors, guides and advisors; and my gratitude to all serving and supporting the important works of the Bhaktivedanta Institute. My special gratitude to all the frontline workers around the world rendering unparalleled service to humanity in the present difficult times of COVID pandemic.

Good evening. On behalf of the Bhaktivedanta Institute and the convenor and the organizing team of this event, I am delighted to welcome you all, the delegates and the speakers of the Summers School on Life and its origin research. I am very happy to witness great enthusiasm on part of both the participants as well as the organizing team which makes this event a great success. This summer school is a dedication to two distinguished board members of the Bhaktivedanta Institute, Prof. Sudipto Ghosh and His Grace Sri Radha Charan Prabhuji.

Bhaktivedanta Institute is unique in the sense that it was borne out of open dialogues and intense debates between the wisdom of an old saint and the scientific temper of a young creative scientist migrated to USA, about the true nature of life. We celebrate both of them, His Divine Grace Srila Prabhupada and Dr. T. D.

Singh as the founders of the Institute who continue to inspire us with their spiritual wisdom and scientific temper. The mysteries of life are so profound that it seems to permeate all branches of human knowledge and endeavor.

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.

Life is the most intriguing concept, but it is also the closest of all experiences we have. It is very simple as well as very complicated. We sometimes try to simplify it with proposals like the astonishing hypotheses of Francis Crick, *"Your joys, your sorrows, your memories and your ambition, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells."*

However, when we try to materialize it in the lab, it gets more complicated and astonishing than the original hypothesis.

Understanding of life can be divided into two parts, ontology of life and dynamics of life. If we get the ontology wrong, then we will also be wrong in grasping the dynamics. We cannot get away with wrong ontology of life because it has implications to the dynamics of life and to meaning and happiness of our own existence. It might even be harmful to our mental health if we take astonishing hypothesis seriously into our life. Charles Darwin expressed, "I have said that in one respect my mind has changed during the last twenty or thirty years. Up to the age of thirty, or beyond it, poetry of many kinds, such as the works of Milton, Gray, Byron, Wordsworth, Coleridge, and Shelley, gave me great pleasure, and even as a schoolboy I took intense delight in Shakespeare, especially in the historical plays. I have also said that formerly pictures gave me considerable, and music very great delight. But now for many years I cannot endure to read a line of poetry: I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me. I have also almost lost my taste for pictures or music. Music generally sets me thinking too energetically on what I have been at work on, instead of giving me pleasure. I retain some taste for fine scenery, but it does not cause me the exquisite delight which it formerly did." "My mind seems to have become a kind of machine for grinding general laws out of large collections of facts, but why this should have caused the atrophy of that part of the brain alone, on which the higher tastes depend, I cannot conceive. ... The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature."

Hence, the origin of life research should be done not only with our brains but also with our hearts because our theories need to account not only for what is going on in brain, but also what is brewing in our hearts. Therefore, I appeal to our distinguished speakers as well as delegates to be not afraid to propose astonishing and bold alternative theories and pursue them until we are fully satisfied not only with its scientific evidence but also with its meaning and purpose to our existence.

With this few words, I would like to welcome all our distinguished speakers and delegates especially, Prof. Chandra Wickramasinghe , University of Buckingham, UK; Prof. James M Tour, Rice University, USA; Prof. Nick Lane, University College London, UK ; Dr. Sasi Kotagiri, MD Anderson Cancer Center, University of Texas, USA; Prof. Manoranjan Sinha, IIT Kharagpur; Dr. A.K. Mukhopadhyay; Dr. B. D. Mundhraji, Bharatiya Vidya Mandir; Dr. Sai Phani Northwestern University, USA; Pavan Kumar Polkampally IIT Kharagpur; Roshan Tiwari, IISER, Kolkata; Dr. Viknish Krishnan Kutty, Founder and CEO of Cellivate Technologies, Singapore; Srikant Chandragiri, Max Planck Institute for Biology of Ageing in cologne, Germany; Dr. Hare Krishna Mohanta, BITS Pilani; Dr. Jaynarayan T Tudu, IIT Tirupati & Dheeraj Dube, Tata Institute of Fundamental Research (TIFR), Hyderabad; Denis Robert Delva, President of the Association "Ayurvedic Medicine", Europe; Sri Sobhaschandra Singh, Direcor, BI Radhakunda, Sri Varun Agarwal, Director, Bhaktivedanta Institue; Mr. Aristotle Nandy, Sri Prabhakar Ballapalle, President BI Bangalore, and last but not least, Dr. Debashis Khan IIT (BHU) Varanasi, India, the convenor of this School.

I am sure all of them will engage us in deep discussions on the nature of life and its origin. I welcome also all the distinguished delegates, Advisors, organizing members and volunteers. I am thankful and grateful to all of you for being with us tonight and next few days.

Bhaktivedanta Institute is looking forward to all your active participation and support. Interested participants are welcome to join us in our Institute's courses, publications, internships, seminars, conferences and research collaborations. Feel free to write to us at info@binstitute.org

Thank You. Namaskar.

With gratitude,

K. Vasudeva Rao,
President, Bhaktivedanta Institute

Introduction

The splendid exposition of various life forms on earth has always thrilled the minds of the scientist, theologian, philosopher, artist, poet as well as every thoughtful person. The age old quest to understand life and its origin seems to be of extreme importance to understand the meaning as well as purpose of life. Thus, the inquisitive human minds are ever increasingly seeking definite answers and explanations about life and its origin. In the post renaissance era thinkers of diverse schools have contemplated into the subject matter. In 1944, Erwin Schrödinger wrote his famous book *"What is Life?"* Since then, we have explored deeply at the cellular and sub-cellular level with the modern sophisticated tools and techniques. Despite amazing advancements in the fields of science and technology life remains a notion not understood to a noteworthy extent. While empirical insights into the functions of life have been majorly successful, the scientific community has not been able to understand life per se. Albeit, day by day, research data about life molecules is increasing exponentially, but at the same time, more mysteries of life are coming to the surface than ever. The July 2005 issue of renowned journal 'Science' has listed 125 questions for which modern science doesn't have answer and one of the listed questions is, "How and where did life on earth arise?"

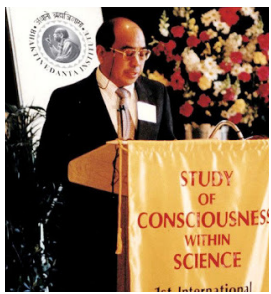
Conversely, ancient sages and traditional spiritual texts have delved deep into this subject matter of life. They have thrown significant light on it. Exhaustive analysis and portrayal on life, consciousness and their origin can be found in ancient spiritual texts, especially the Vedantic literatures.

The main objectives of the Summer School - 2021 on *"Origin of Life Research - History, State-of-art, New Ideas, Future Visions"* are many-fold. It will bring together a multidisciplinary group of researchers and scholars around the world to discuss the state-of-the art theories of origin of life and to talk about issues & challenges in current theories. The Summer School also aims to provide alternative proposals and novel ideas to handle the issues and to interact virtually with each other over an extended period of time. The Summer School is as well intended to present future visions with an opportunity to learn from and interact with the leaders in the field in a stimulating setting. Thus, the lectures to be delivered will cover a broad range of perspectives and will enthuse the participants with thought provoking questions, ideas and an undoubting hankering for the answers to the questions on life's origin as well as purpose. A special guest session is also included in order to summarize the presentations and to highlight the potential areas of research.

We hope the Summer School would enable the participants to appreciate multidisciplinary approaches highlighting the multidimensional aspects of life and will lay the foundation for the holistic approach in the quest for understanding life and its origin. Best wishes for your life's journey.

— Convener
Summer School - 2021

Visionary



Dr. T. D. Singh (His Holiness Bhaktisvarupa Damodara Swami) received his Ph.D. in Physical Organic Chemistry from the University of California at Irvine in 1974. Then, he was a Post Doctoral Research Fellow in the Chemistry Department of Emory University, Atlanta, Georgia, U.S.A., 1974-76. He has contributed many papers in the prestigious journals, such as, Journal of American Chemical Society and the Journal of Organic Chemistry in the field of fast proton transfer kinetics in model biological systems using stopped-flow technique and NMR spectroscopy. He also worked on gas phase reaction mechanisms using Ion Cyclotron Resonance (ICR) spectroscopy. He was a scientist and spiritualist known for his pioneering efforts in the synthesis of science and religion for a deeper understanding of life and the universe. He was trained in Vaishnava Vedanta studies from 1970 to 1977 under His Divine Grace A. C. Bhaktivedanta Swami Prabhupada and was appointed Director of the Bhaktivedanta Institute in 1974. He organized four major International Conferences on Science and Religion - First and Second World Congress for the Synthesis of Science and Religion (Mumbai, 1986 & Kolkata, 1997), First International Conference on the Study of Consciousness within Science (San Francisco, 1990), and Second International Congress on Life and Its Origin (Rome, 2004). Collectively, thousands of prominent scientists and religious leaders

including several Nobel Laureates participated. He has authored and edited more than dozen books including *What is Matter and What is Life?* (1977), *Theobiology* (1979), *Synthesis of Science and Religion: Critical Essays and Dialogues* (1987) and *Thoughts on Synthesis of Science and Religion* (2001). He was also the founder Editor-in-Chief for two journals of the Bhaktivedanta Institute. Dr. Singh was very concerned for the student community with regard to their holistic development. He felt our younger generations were exposed to the latest scientific and technological developments in various disciplines at numerous colleges and universities around the world, but lacked a spiritual foundation to make proper use of them. Hence, he felt the need to organize student conferences on the interface of Science and Spirituality for their holistic growth and development. With this vision, Dr. Singh conceptualized the All-India Students' Conference on Science and Spiritual Quest (AISSQ) series of conferences. He personally organized the first conference of the series in December 2005 in Vrindavan, UP. However, by the will of Providence, Dr. Singh left for the spiritual abode on 2 October 2006. He had made all the arrangements for the 2nd AISSQ conference that was held in December 2006 in Puri, Orissa. Dr. Singh also expressed his noble desire for the third and fourth AISSQ conferences in the series to be organized in Tirupati and Sri Rangam (Trichy) respectively. The fifth AISSQ conference was held at MNNIT Allahabad. Both NIT Trichy and MNNIT Allahabad received funding from the prestigious Department of Science and Technology (DST), one of the apex research bodies of the country. Today, inspired by his vision, his students, friends and well-wishers throughout the world are making a humble attempt to carry out his grand vision of harmonizing modern civilization through the synthesis of science and spirituality.

In Memory of

This Summer School is organized in memory of our beloved Prof. Sudipto Ghosh. He is a gentleman of brilliant personality, who possessed many interesting qualities, be it as a scientist, as a teacher, as a mentor, as a spiritual seeker or as a loving friend. Being the son of the renowned Professor Ahindra Ghosh, ex-faculty from the Department of Materials and Metallurgical Engineering, IIT Kanpur, he was brought up at the IIT Kanpur campus itself. He had a very outstanding academic career. Starting from his preschool education up to his Phd., his entire education was completed within the IIT Kanpur campus. He started his early childhood education in Kendriya Vidyalaya housed within the campus, and then went on to receive his B.Tech. (Metallurgical Engineering) in 1990, M.Tech. (Metallurgical Engineering) in 1992 and Ph.D. (Metallurgical Engineering) in 2000 from IIT Kanpur. It is very interesting to note that even though he studied Metallurgical Engineering, he loved Physics very much. He served as a scientist in the 'Process Modeling Group' at Tata Research Development and Design Centre (TRDDC) located in Pune for around six years (February, 1998 - June, 2004), and his contributions at TRDDC were highly appreciated. However, because of his passion towards teaching and research, he joined the Department of Metallurgical and Materials Engineering at

IIT Kharagpur as an Assistant Professor in July 2004: and, subsequently, through his hard work and diligence, he became Associate Professor in January 2009 and then Professor in May 2015. Prof. Ghosh was a genuine researcher involved in many diversified areas. He exclusively worked in mathematical modeling of materials' processes (particularly solidification and high temperature deformation processing at different length scales), continuous casting and casting of bulk nano-composites, nanofluids, mechanical behavior of materials and new materials for batteries. As a part of his collaborative research works, he visited highly reputed institutions and universities such as Georgia Tech, USA; Karlsruhe Institute of Technology, Germany etc. He was affiliated to many National and International Professional Societies. He organized several national and international conferences. Prof. Ghosh published 131 articles in peer reviewed journals and had 4 patents to his credit. He actively guided 12 Ph.D. students and was guiding 16 Ph. D. students at the time of his sudden demise. He was involved with a number of sponsored Research & Development projects since the beginning of his career at IIT Kharagpur. He left the mortal world on 7th January 2020.

SCHEDULE

16
June 2021
Wednesday

Day
1

Theme: Overview of Theories on the Origin of Life

4:00 pm – 4:45 pm	Welcome and Introduction
4:45 pm – 5:00 pm	Break
5:00 pm – 5:45pm	**Establishing Our Links to the Cosmos** Prof. Chandra Wickramasinghe *University of Buckingham, UK*
5:45 pm – 6:00 pm	Q & A
6:00 pm – 6:45 pm	**Critique of Current Origin of Life Research** Prof. James M Tour, *Rice University, USA*
6:45 pm – 7:15 pm	Q & A
7:15 pm – 8:00 pm	**How did Life Begin?** Dr. Sasi Kotagiri *MD Anderson Cancer Center, University of Texas, USA*
8:00 pm – 8:15 pm	Q & A

17
June 2021
Thursday

Day
2

Theme: Issues & Challenges in Current Theories

4:00 pm – 4:45 pm	**Energy and Matter at the Origin of Life** Prof. Nick Lane *University College London, UK*
4:45 pm – 5:00 pm	Q & A
5:00 pm – 5:45pm	**The Fast-Growing Evidence for Panspermia as the Mode of Origin of Life** Prof. Chandra Wickramasinghe *University of Buckingham, UK*
5:45 pm – 6:00 pm	Q & A
6:00 pm – 6:45 pm	**Cosmic Reality: Accepting Subordination to God** Prof. Manoranjan Sinha *IIT Kharagpur, India*
6:45 pm – 7:00 pm	Q & A
7:00 pm – 7:30 pm	**Special Guests Session**
7.30 pm – 8:00pm	**Cultural Program**

18
June 2021
Friday

Day
3

Theme: Mathematical Challenges

4:00 pm – 4:45 pm	**Mathematical Basis of Darwin's Natural Selection Theory** Dr. Debashis Khan *IIT (BHU) Varanasi, India*
4:45 pm – 5:00 pm	Q & A
5:00 pm – 5:45pm	**Computational Modeling of Chemical Origin of Life** Dr. Sai Phani *Northwestern University, USA* & Pavan Kumar Polkampally *IIT Kharagpur, India*
5:45 pm – 6:00 pm	Q & A
6:00 pm – 6:45 pm	**Self-Replication, an Out-of-Equilibrium Phenomenon, the Basis of Life** Roshan Tiwari *IISER, Kolkata*
6:45 pm – 7:00 pm	Q & A
7:00 pm – 7:45 pm	**Science and Religion: My Vision for the Future** Dr. Viknish Krishnan Kutty *Founder and CEO of Cellivate Technologies, Singapore*
7.45 pm – 08:00pm	Q & A

19
June 2021
Saturday

Day
4

Theme: Alternative Proposals and Novel Ideas to handle the Issues

4:00 pm – 4:45 pm	**Does Evolutionary Theory Need a Rethink?** Srikant Chandragiri *Max Planck Institute for Biology of Ageing in Cologne, Germany*
4:45 pm – 5:00 pm	Q & A
5:00 pm – 5:45pm	**On Origin of Life: A Vedantic Perspective** Dr. Hare Krishna Mohanta *BITS Pilani, India*
5:45 pm – 6:00 pm	Q & A
6:00 pm – 6:45 pm	**Revisiting the Living System Dynamics: Borrowing Concepts of Vedic Origin** Dr. Jaynarayan T Tudu *IIT Tirupati, India* & Dheeraj Dube *Tata Institute of Fundamental Research (TIFR), Hyderabad*
6:45 pm – 7:00 pm	Q & A
7.00 pm – 7:30 pm	**Cultural Program**

20
June 2021
Sunday

Day **5**

Theme: Future Visions

4:00 pm – 4:45 pm	**Distinguishing Life, Matter and Mind** Sri K. Vasudeva Rao *President, Bhaktivedanta Institute, Kolkata* *(Alumnus, IIT Kanpur)*
4:45 pm – 5:00 pm	Q & A
5:00 pm – 5:45pm	**Yoga and Ayurveda for Immunity and Healthy Life** Denis Robert Delva *President of the Association "Ayurvedic Medicine", Europe*
5:45 pm – 6:00 pm	Q & A
6:00 pm – 6:45 pm	**What is Life? – Temptations and Beyond** Sri Varun Agarwal *Director, Bhaktivedanta Institute, Kolkata* *(Alumnus, IIT Kanpur)*
6:45 pm – 7:00 pm	Q & A
7:00 pm – 7:10 pm	**Briefing the Courses of Bhaktivedanta Institute, Kolkata** Prof. Ramgopal Uppaluri *IIT Guwahati, India*
7:10 pm – 7:12 pm	**Announcement of "Special Course for Students and Faculty"** by ISR, Navi Mumbai
7.12 pm – 7:45 pm	**Valedictory Session**

ABSTRACTS & BIO-DATAS

No matter when, where, or how life arose, it has extraordinary significance in adding dimensions which were not there before human emergence.

— V. V. Raman
Rochester Institute of Technology, USA

ESTABLISHING OUR LINKS TO THE COSMOS

Prof. Chandra Wickramasinghe

University of Buckingham, UK

The long history of ideas connecting life on Earth to the wider cosmos is reviewed. The most persistent theory spanning nearly 2 millennia is that of the spontaneous generation of life on the Earth, an idea that can be traced back to Aristotle in the 3 rd century BCE. This ancient idea forms the basis of the currently fashionable theory of spontaneous generation and abiogenesis, which I argue is fundamentally flawed.

Prof. Chandra Wickramasinghe is a Professor and Director of the Buckingham Centre for Astrobiology at the University of Buckingham, UK. He is a Sri Lankan-born British mathematician, astronomer and

astrobiologist. He obtained his Ph.D. in mathematics from Cambridge University in 1963. His research interests include the interstellar medium, infrared astronomy, light scattering theory, applications of solid-state physics to astronomy, the early Solar system, comets, astrochemistry, the origin of life and astrobiology. He was a student and collaborator of world-renowned scientist Fred Hoyle, the pair jointly worked for over 40 years as influential proponents of panspermia (life exists throughout the universe). In 1974 they proposed that some dust in interstellar space was largely organic. He is an award-winning poet and the author or co-author of over 30 books and over 350 scientific papers in internationally renowned journals. In 1992 he was honored by the President of Sri Lanka with the titular honor of Vidya Jyothi. He was awarded the International Sahabdeen Prize for Science in 1996.

CRITIQUE OF CURRENT ORIGIN OF LIFE RESEARCH

Prof. James Tour

Rice University, USA

Prof. James Tour is a T. T. and W. F. Chao Professor of Chemistry at Rice University, USA. He obtained his Ph.D. in Chemistry from Purdue University and then pursued postdoctoral research at the University of Wisconsin and Stanford University. His research interests include carbon materials chemistry, Molecular electronics, synthetic organic chemistry and nanotechnology. He is a highly cited researcher with over 715 research publications in internationally renowned journals and over 140 patent families, with an h-index of 150. He is also well known for his chemical perspectives on the molecules needed for life. He also

received several international recognitions, to mention a few, Royal Society of Chemistry's Centenary Prize for innovation in materials chemistry, Trotter Prize, Feynman Prize in Nanotechnology, the NASA Space Act Award and many other. Prof. Tour was ranked one of the Top 10 chemists in the world over the past decade.

HOW DID LIFE BEGIN?

Dr. Shashi Kumar Kotagiri

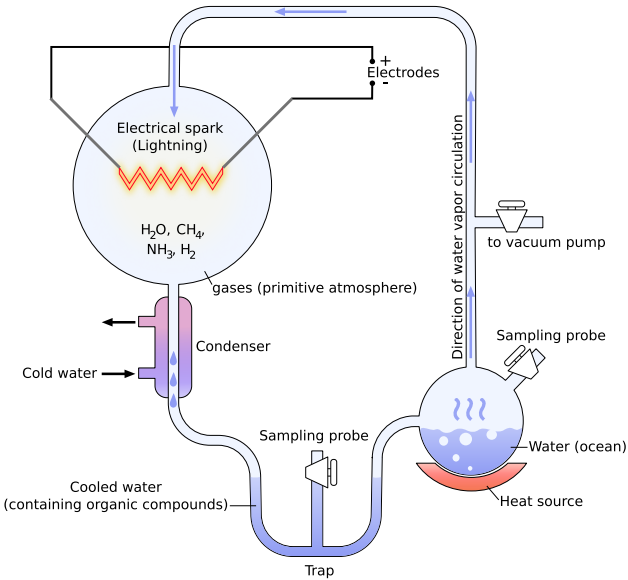
Post Doctoral Research Fellow, University of Texas, Houston, USA

"How and where did life begin?" is one of the most fascinating fundamental questions among several unsolved scientific mysteries from centuries. It's an age-old enigmatic puzzle for both philosophers and scientists and many theories have been proposed. During the middle of the 20th century, scientists used to believe that a common ancestor for the life was formed due to spontaneous interactions among simple molecules in the primordial soup. Experiments by Urey & Miller in 1953 to the recent finding by Sutherland have showed how precursor molecules for life originate from simple molecules in laboratory. However, currently one of the widely accepted idea to explain the origin of life is

the RNA world theory. This theory proposes that life started from the self-replicating RNA molecules that contain both the genetic information and catalytic function. Extensive research on the chemical evolution and the origin of life during last several years has provided few answers but raised many more questions. These findings are far from the goal; origin of life from chemicals. This article provides a glimpse of the past, recent advancements, and future research on the origin of life.

Dr. Shashi Kumar Kotagiri obtained his master's in genetics from Osmania University. With a fellowship from the Indian Council of Medical Research (ICMR), he pursued his doctoral study (PhD) at the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, one of the most premier research organizations in frontier areas of modern biology in India. At CCMB, he worked on chronic myeloid leukemia and skeletal muscle differentiation. After obtaining his Ph.D. degree, he received the Department of Science and Technology (DST)-National Postdoctoral fellowship to work as a postdoctoral fellow in the Indian Institute of Chemical Technology (IICT) on developing therapeutics for diabetes. Currently, he is working as a postdoctoral fellow at the prestigious MD Anderson Cancer Center, Houston. He is exploring non-small cell lung cancer pathogenesis to discover therapeutics.

Miller–Urey Experiment Diagram



Prof. Nick Lane

University College London, UK

ENERGY AND MATTER AT THE ORIGIN OF LIFE

Prof. Nick Lane is a professor in evolutionary biochemistry at University College London. He graduated from Imperial College London and thereafter earned his Ph.D. in 1995 from Royal Free Hospital Medical School. His research interest includes evolutionary biochemistry and bioenergetics, focusing on the origin of life and the evolution of complex cells. He has published more than 80 peer-reviewed papers in top international journals, including many in Nature and Science. He played a crucial role in the establishment of the UCL Consortium for Mitochondrial research and the UCL Centre for

Life's Origin and Evolution. He has authored four popular books on evolutionary biochemistry. He has gained several international recognitions including the Royal Society Michael Faraday Prize in 2016, the Biochemical Society Award in 2015, BMC research Award in 2011. He is a Fellow of the Linnean Society, the Royal Society of Biology and the Biochemical Society.

Prof. Chandra Wickramasinghe

University of Buckingham, UK

THE FAST-GROWING EVIDENCE FOR PANSPERMIA AS THE MODE OF ORIGIN OF LIFE

Evidence over the past 4 decades appear to converge on panspermia – in particular cometary panspermia - as the mode of origin of life throughout the universe. I discuss this evidence – derived from many different disciplines, and also the cultural constraints that appear to impedethe admission of panspermia to the realms of orthodox science. Attempts to stop or delay a long-overdue paradigm shift would have serious implications both for the progress of science as well as the well-being of human society as whole.

Prof. Chandra Wickramasinghe is a Professor and Director of the

Buckingham Centre for Astrobiology at the University of Buckingham, UK. He is a Sri Lankan-born British mathematician, astronomer and astrobiologist. He obtained his Ph.D. in mathematics from Cambridge University in 1963. His research interests include the interstellar medium, infrared astronomy, light scattering theory, applications of solid-state physics to astronomy, the early Solar system, comets, astrochemistry, the origin of life and astrobiology. He was a student and collaborator of world-renowned scientist Fred Hoyle, the pair jointly worked for over 40 years as influential proponents of panspermia (life exists throughout the universe). In 1974 they proposed that some dust in interstellar space was largely organic. He is an award-winning poet and the author or co-author of over 30 books and over 350 scientific papers in internationally renowned journals. In 1992 he was honored by the President of Sri Lanka with the titular honor of Vidya Jyothi. He was awarded the International Sahabdeen Prize for Science in 1996.

Prof. Manoranjan Sinha

IIT Kharagpur, India

COSMIC REALITY: ACCEPTING SUBORDINATION TO GOD

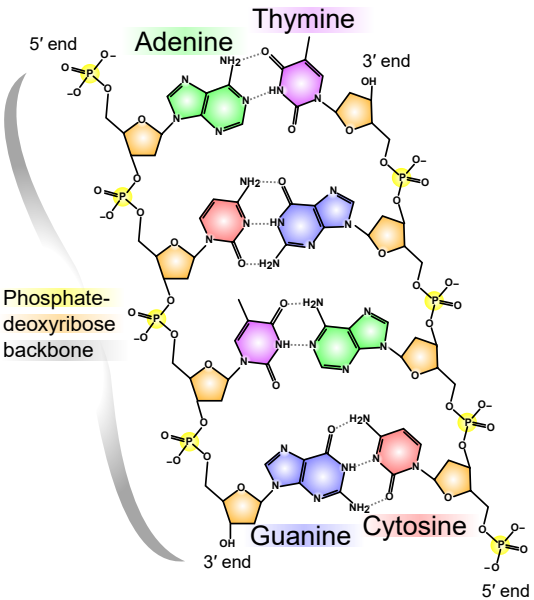
What we miss to understand, or what lacks in our curriculum at early stage is that our life and our size are insignificant on the cosmic scale. This results in building ego and creates many problems in social life and may lead to religious zealot also. This gives rise to one's own superiority and others inferiority and leads to many horrific acts in extreme conditions, e.g. acts of Nazism and many terrorist activities around the world. Therefore, it is important that we understand our insignificance and greatness of the creation to get rid of the ego. The greatness of creation and its real description is detailed in Srimadbhagvatam which is revealed

knowledge. The modern description of universe is based on inferential knowledge and may not be a correct description. This has posed rather more problems than solving. Moreover, gives rise to atheism which results in abnormal psychology of the society. This will prove to be a disaster in long run. The description of universe is not only revealed but generates love for Godhead, which is the ultimate purpose of life. To save the destiny it is necessary that we align ourselves along the theistic philosophy endowed with love of Godhead and compassion for even a insignificant creature, which is not observed in most of the religious practices around the world. The present article is meant to show not only the limitations of the modern cosmology but also shows our insignificance and our subordination to God.

Dr. Manoranjan Sinha is a Professor at IIT Kharagpur in the Department of Aerospace Engineering. He received his B.Tech in Aerospace Engineering from IIT Delhi in 1993 and subsequently obtained M. Tech and Ph.D. in aerospace engineering from the Indian Institute of Technology, Kanpur, India. He pursued his Post Doctoral research in neural networks at the University of Saskatchewan, Canada under the supervision of Prof. Madan M. Gupta. Later he served as an Assistant Professor at Birla Institute of Technology (BITS), Pilani and IIT Mumbai. He joined the Department of Aerospace Engineering, IIT Kharagpur in 2004. (Since then he is continuing there with escalating positions) His research interests include neural networks, flight dynamics

and attitude dynamics. He is involved with the lunar satellite orbit determination, lunar gravity and topography modeling for Chandrayan Mission - I of ISRO. He is also working on reconfigurable flight control. He was awarded the President of India Gold Medal, Institution of Engineers India in 2013 and Vikram Award for Systems (2010). He is also interested in integrative cosmology from Scientific and Vedantic perspectives and their connections to the origin of life in the cosmos.

Chemical Structure of DNA



Double Helical Structure of DNA

MATHEMATICAL BASIS OF DARWIN'S NATURAL SELECTION THEORY

Dr. Debashis Khan

IIT (BHU) - Varanasi, India

The Darwinian theory of natural selection has become very well-liked and it has intensely penetrated through the educational system worldwide. According to this theory, there must be variation in a population of organisms and the fittest members of the population competing for resources can survive while others are eliminated. Darwin's evolution theory has inspired a great number of researchers over the years from different academic disciplines like biology, chemistry, physics, mathematics etc. in order to validate the trustworthiness of the natural selection and the random mutation based Neo-Darwinism concept. In this work, an attempt has been made to check the mathematical and logical basis of the Darwin's natural selection and the random mutation based Neo-Darwinism concept using simple

feedback differential equation and proper boundary conditions. For illustration purpose, basic reproductive model has been considered. From the analytical solutions, it has been observed that Darwin's natural selection theory may be correct in a very limited sense only and beyond a certain point it becomes invalid.

Dr. Debashis Khan received his Ph.D. degree in Mechanical Engineering from the Indian Institute of Technology Kharagpur in 2007. Then he joined as an Assistant Professor in the Department of Mechanical Engineering at the Indian Institute of Technology (BHU) Varanasi and presently he is serving there as an Associate Professor. His research interests include analytical and computational methods in engineering and science, Solid Mechanics, Fracture Mechanics, Continuum Mechanics and Finite Deformation Plasticity. He was a visiting research scientist at University of North Texas, USA in the year 2013. Also, in the year 2016, he was a visiting researcher at the Zernike Institute of Advanced Materials, University of Groningen, The Netherlands. He has published 22 peer-reviewed papers in international journals of repute and many conference papers. He has guided 3 Ph. D. students and presently guiding 04 Ph. D. students He has recently co-authored a popular book entitled "Mathematical Theory of Subdivision: Finite Elements and Wavelet Methods". He is a member of 'American Society of Mechanical Engineers' and 'Indian Society for Theoretical and Applied Mechanics'. He is a fellow of 'The Institution of engineers (India)'. His interests also expand over mathematical formulation of evolutionary systems and their exploration in the origin of life which led him to work at the interface of science and spirituality in collaboration with Bhaktivedanta institute.

COMPUTATIONAL MODELING OF CHEMICAL ORIGIN OF LIFE

Dr. Sai Phani Kumar

Post Doctoral Research Fellow, Northwestern University, USA

Pavan Kumar

Research Scholar, IIT Kharagpur, India

A thermodynamic definition of the living system would insinuate an open self-organizing set-up interacting with its environment through flows of information, energy and matter. The self-organizing capability manifested in a number of dissipative structures and complex systems resonates with the idea that living systems can be completed and solely derived from matter or a complex organization of matter. But over the past few decades, the persistent abortive attempts at validating this idea has resulted in an outset of a skeptical attitude amongst leading research fronts. The scientific world, as of now, is looking towards revisiting the definition of life which in turn

has resulted in a new emerging flavor of theory of living systems. Adopting an alternative paradigm of life, a recent trend is to prefer to regard intelligent cause to be superior to the hypothesis of natural selection. Under this umbrella of intelligent design, it becomes possible to challenge naturalism and advocate the concept of life being a separate entity, physical or non-physical, interacting with matter instead of being a symptom peculiar to complex material assembly. A holistic approach involving synthesis with Vedantic wisdom while studying matter-life division is proposed as one of the strategies while addressing the problems related to consciousness, mind, biology and life.

Dr. Sai Phani Kumar is currently working as a postdoctoral research fellow at McCormick School of Engineering at Northwestern University. He pursued his Ph.D. in Chemical Engineering from Indian Institute of Technology (IIT) Kharagpur. He has research experience in the computational design of metal oxide-based materials for heterogeneous catalysis, high-performance battery applications and drug delivery applications with emphasis on the surface chemistry of different surface-exposed facets and site-specific activity. His interests also span over in computational modelling of biomolecular systems.

Pavan Kumar, currently working as a PhD research scholar at the prestigious Indian Institute of Technology (IIT)

Kharagpur, India. His research involves multiscale and multiphysics modeling of electrochemical energy storage systems. As part of his research he uses Density Functional Theory (DFT) and Molecular Dynamics (MD) to obtain various physical parameters of atomic scale and transfer them to the continuum scale models to explore better battery designs with improved performance. Before joining PhD he obtained MS (by Research) degree in materials engineering from IIT KGP.

Roshan Tiwari

Research Scholar,
IISER Kolkata, India

SELF-REPLICATION, AN OUT-OF-EQUILIBRIUM PHENOMENON, THE BASIS OF LIFE

Living beings takes energy from the surrounding environment and to remain ordered decreases the entropy by dissipating the heat. Self replication is one of the features of living beings to make identical copies, thus passing the information to their offspring. This is irreversible process which involves the increase in the entropy of the surroundings. Thus, the properties of self-replicators must be constrained by thermodynamic laws. This work concerns with quantitative investigation to derive the minimum value of heat dissipation taking place during a process of self-replication in a system coupled to a thermal bath. This minimum value is dependent on parameters like growth rate, internal entropy, and

durability of the replicator. This finding has important scope for studying the bacterial cell division, as well as for the pre-biotic emergence of self-replicating nucleic acids.

Roshan Tiwari is a research scholar in the Department of Physical Sciences at the Indian Institute of Science, Education and Research (IISER) Kolkata. He completed his BSc from BHU, Varanasi in 2014 and from then he is pursuing his Integrated PhD at IISER Kolkata. His current research interests include spectroscopy, bioinspired- waveguides, microscopy, sensing, optical trapping and statistical analysis. He is enthusiastic about learning and disseminating science to the masses through popular outreach talks and experimental demonstrations. Moreover, he is interested in delving deeper into the unexplored aspects of reality with possible connections with age-old wisdom.

Dr. Viknish Krishnan-Kutty

Founder and CEO of Cellivate Technologies, Singapore

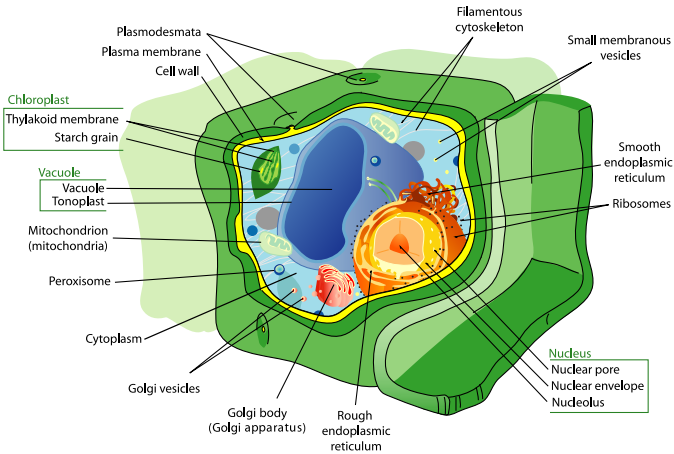
SCIENCE AND RELIGION: MY VISION FOR THE FUTURE

Science and Religion are two dominant forces in our society today. While they are both trying to uncover the truth, their approaches are very different. Both sides are diverging; from a mundane point of view, science does not need religion. It uses the power of logic and observation and is spurring the present world away from religion; if religion has a role, it is primarily for mental and emotional wellbeing or as an anchor to overcome challenges in life. In this presentation, I present a possible vision for a future where science and religion can complement each other in a synergistic manner. For this to happen, certain foundations need to be established and there needs

to be mutual respect from both sides. The religious opinions presented here are based on the Vedic teachings, though I try to bring links to religion in general.

Dr. Viknish Krishnan-Kutty is a scientific entrepreneur and the founder and CEO of Cellivate Technologies and also a Biomedical researcher in Nanoscience and Nanotechnology Institute at National university of Singapore (NUS). He obtained his B.Eng (Biomedical Engineering) from the State University of New York, Stony Brook in 2006 and then completed his PhD in Bioengineering at the National University of Singapore in 2011. He is a bio-engineer with expertise in oncology, neuroscience & stem cells. His research interests include modelling methods and creating technologies to control mammalian cells and promote clean-meat revolution. He is a recipient of NUS Graduate Research Innovation Programme (GRIP) Fellowship in 2016. He is also currently the president of the Society for Bhagavata Culture, Singapore and has a keen interest in understanding the synthesis of science and spirituality.

Plant Cell Structure



DOES EVOLUTIONARY THEORY NEED A RETHINK?

Srikanth Chandragiri

Doctoral Research Scholar, Max Planck Institute for Biology of Aging, Cologne, Germany

One of the biggest questions in science is "How did life begin?" Although origin of life is not clear but the scientific speculation is that all living beings originated and evolved from a single and common descendent. In 1859, Charles Darwin theory stated that evolution occur due to natural selection. Darwin has no idea about genes. With the knowledge about genetic inheritance, Neo Darwinism theory came into existence. Later mainstream evolutionary theory was proposed that evolution occur due to genetic inheritance and processes that change gene frequencies. Yet new data coming from different disciplines helped to a new theory called extended

evolutionary synthesis (EES). According to this theory evolution cannot be reduced to genes. Rather organisms are constructed in development, not simply 'programmed' to develop by genes. Living things do not evolve to fit into pre-existing environments, but co-construct and coevolve with their environments, in the process changing the structure of ecosystems. This article highlights the history, advancement and limitations of evolution theory.

Chandragiri Srikanth is currently working as a doctoral researcher at Max Planck Institute for Biology of Ageing in Cologne, Germany. At present, his research involves investigating the mechanism of Ageing. He obtained Master's in Genetics from Osmania University. After completing his master's degree, he carried out brief research in the Notch signaling of T cell development and survival at National Centre for Biological Sciences (NCBS) Bangalore. He also worked at University of Fribourg (UNIFR) Switzerland on the molecular mechanism of membrane contact sites (MCS) formation and its role in facilitating the transport of biomolecules between the organelles. He has been a recipient of CSIR, ICMR and DBT fellowships in India and Swiss National Science Foundation (SNSF) fellowship in Switzerland.

ON ORIGIN OF LIFE - A VEDANTIC PERSPECTIVE

Dr. Hare Krishna Mohanta

BITS Pilani, India

Origin of life is still a mystery in science. It is one among the 150 questions in 150 years of development of science which are not answered yet. "How did life begin?" is also one of the twenty big questions that the modern science is trying to get a proper answer. According to "Primordial Soup" theory, life began some four billion years ago by stirring the primordial soup. A few simple chemicals got together and made the first molecules capable of replicating themselves appeared. Scientists such as Darwin and Stanley Miller imagined that elementary living forms might have arisen from the random combination of organic

chemicals in the primordial "soup." But there is still no answer to how these simple or basic molecules spontaneously arrange themselves to begin life. How DNA formed? Scientists still can't agree on what exactly happened. Some say that life began in hot pools near volcanoes and others believe that it was kick-started by meteorites hitting the sea. But still these theories of Chemical Evolution of life is most prevalent in the scientific community. In this article the Vedantic perspective of origin of life will be discussed.

Dr. Hare Krishna Mohanta is an Associate Professor in the Department of Chemical Engineering in BITS Pilani, Rajasthan. He obtained his B.E. (Chemical Engineering) in 1995 from NIT Rourkela, M.Tech (Chemical Engineering) in 1998 from IIT Kanpur, and Ph.D. in Chemical Engineering in 2006 from BITS Pilani. He has been teaching in BITS pilani since 1998. He worked in Indian Rare Earths Ltd (A Govt of India Undertaking) during 1995-1996. He is a Member of Indian Institute of Chemical Engineers(IIChE). He has several publications in internationally renowned journals. His areas of research include Advanced Process Control, Process Monitoring and Control, Sensors and Microreactors, Catalysis and Pyrolysis, Applied Wavelet Analysis, Reactive Distillation, Modeling, Simulation and Consciousness Studies. His interests also expand over vedantic studies of Consciousness.

REVISITING THE LIVING SYSTEM DYNAMICS: BORROWING CONCEPTS OF VEDIC ORIGIN

Dr. Jaynarayan Tudu

IIT Tirupati, India

Dheeraj Dube

Senior Research fellow, TIFR - Hyderabad, India

Biophysics, as a field, has emerged quite extensively in the recent times. Be it various experimental techniques like Nuclear magnetic resonance, Fluorescence, electrophysiology, single-molecule methods etc. or in silico methods like molecular modelling including various enhanced sampling techinques or equilibrium computer simulation; have all catered well towards the need of exploring the structure, properties, dynamics or function of biophysical systems at an atomic or molecular level. The minute details of the molecular level investigation have no doubt helped us in understanding a lot about the biophysical phenomena

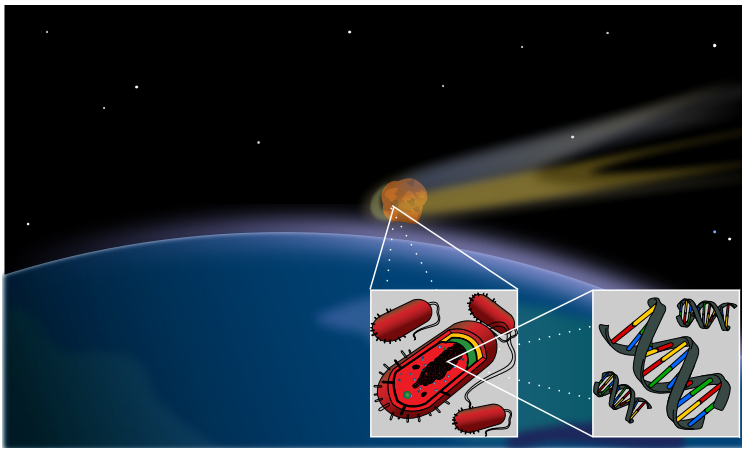
from deciphering the physiological behaviour of our body to suggesting the specificity of the various drug molecules towards their target host in our body. But still there are certain perplexing queries, in connection with the relation between the macroscopically manifested properties of the biophysical systems and their molecular construct, still haunting the brilliant minds, both experimental as well as theoretical, of this field. A holistic approach of synthesizing the Vedantic wisdom while studying the organic matter in connection with the living systems is hoped to better address this connection of the microscopic realm to the macroscopic realm. While doing so one is supposed to bridge the epistemological differences in the two disciplines, the modern biophysics and the vedic disciplines like Ayurveda and Sankhya philosophy.

Dr. Jaynaryan Tudu is an assistant professor in the Department of Computer Science and Engineering at the Indian Institute of Technology (IIT) Tirupati. He obtained his MSc(Engg) and Ph.D. from the Indian Institute of Science(IISc) - Bangalore. His research interests include in the domains of dependable and Energy-aware Computing, dependable processor architecture and design, and autonomous CAD tools for the next gen computing hardware. He is also interested in computational studies in the field of consciousness.

Dube Dheeraj is a doctoral researcher at Centre for Interdisciplinary Sciences of TATA Institute of Fundamental

Research (TIFR) Hyderabad. He obtained B.Tech in Mechanical Engineering from IIT-BHU, Varanasi (2010-2014). His research interest includes in Bio-macromolecules and their complex transitions in biological systems, Principles of Drug designing and Computational biophysics, He works in deciphering the major modes of fluctuations, guided by the chemical propensities of the interacting species, behind the nucleating precursors large-scale macromolecular transition events. In addition, his interests also expands at the interface of theoretical biology and the Principles of Ayurvedic sciences.

Cosmic Origins of Life



DISTINGUISHING LIFE, MATTER AND MIND

Sri K. Vasudeva Rao

IIT Kanpur (Alumnus), President of Bhaktivedanta Institute, Kolkata

'What is life?' and the 'origin of life' are closely related. Our understanding about life is very crucial because it has implications for origin of life research. This understanding leads our direction in what we look for and where we look at in our search for origin of life. Without definite and satisfying answer to the question of what life really is ontologically, our search for origin of life could be incomplete and inconclusive.

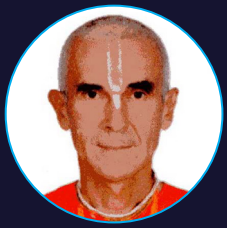
Though we do not yet know how the first living cell appeared, the origin of life research at large is being conducted with the assumption that life is purely a physical and chemical phenomenon.

Professor Werner Arber, a Nobel Laureate in physiology and medicine, opined that life could be beyond the assembly of biomolecules. Similarly, advances in consciousness research point to a possibility of consciousness, and therefore life, being fundamentally a different reality than that we deal in physics, chemistry, and biology. It is time for us to be more open and allow reasonable and respectable space and support for research in this direction as well. We should also look at alternative interpretations of existing scientific data within the acceptable approximations and extrapolations.

Further, many traditional wisdoms, especially Indian Vedic tradition, have excellent models of life and consciousness. We should seriously look into these models and design experiments to verify them, at least some core portions of them if not all. Therefore, a partnership between science and traditional wisdom would be of tremendous value in unraveling the mystery of life and its origin.

If life is beyond matter, it is possible to manifest through any form of a biology in which the basic functions of life are facilitated. This means that life may exist and exhibit through matter outside the types of molecules we are looking for. Therefore, it is necessary to look into the alternative as well as traditional models of life where foundational properties of life may offer substantial understanding about how life operates over matter and mind. This can lead to some fundamental breakthroughs in origin of life research.

Vasudeva Rao (also known as His Holiness Bhaktisvarupa Vrajapati Swami), an alumnus of prestigious institute, IIT Kanpur (Computer Science, 1998), is currently the President of the Bhaktivedanta Institute, Kolkata. He is one of the major contributors of Bhaktivedanta Institute Publications, and also the Editor of Bhaktivedanta Institute's reputed annual journal, Savijnanam – Scientific Exploration for a Spiritual Paradigm He travels widely across India and abroad creating awareness regarding the interface of Science and Spirituality among the academic and professional circles. His deep interest in the Foundations of mathematics, fundamentals of computer science and Logic and its relation to the nature of consciousness, nature of reality as well as ancient Indian texts led him to interact and meet and interact with renowned scholars at Harvard, Princeton, Stanford, and MIT. He has delivered numerous talks on computer science and spirituality. Under his able guidance and supervision, more than 10 national conferences, 2 International conferences, over 200 papers and over 100 seminars and workshops on science and spirituality have been organized by the Institute in the past decade which includes contributions from more than 20 Nobel Laureates and world-renowned scholars. He is also a Global Council Trustee of the United Religions Initiative.



Denis Robert Delva

President of the Association "Ayurvedic Medicine", Europe

YOGA AND AYURVEDA FOR IMMUNITY AND HEALTHY LIFE

"Ātmā" also means "endeavor." ('Śrī Caitanya caritāmṛta' Madhya 24.169) In the same way, health appears not a cheap thing. We have to learn and practice. Hopefully Kṛṣṇa gives us generously plenty of information in *śāstra*. One of the main points to remember: Our *kṣetra* (body), our field stands essential for good health at all levels. Viruses will never affect a good *kṣetra*, as a good organic garden stay free from the disturbance of parasites, etc. These few chapters (and more in following seminars) will show you tips for your immunity. Easy, but very fundamental!

Denis Robert Delva (H. H. Bhaktisvarūpa Bṛhaspati Svāmī)

has been the President of the Association of Ayurvedic Medicine in Europe, since 1980; presided over the Parapsy Institute in France for over 10 years. He is a Vedanta teacher at Vedanta Science Educational Research Foundation, Kolkata and taught in gurukula for 12 years. He delivered hundreds of lectures regarding health sciences and spirituality on congresses, radio, TV and authored 64 books in French about Yoga, Āyurveda, Vāstu, Vedic Numerology and Sanskrit. He received training in spiritual wisdom under Dr. T. D. Singh since 1986 and he actively participated in the humanitarian welfare field in India since 1992.

Sri Varun Agarwal

IIT Kanpur (Alumnus), Director of Bhaktivedanta Institute, Kolkata

WHAT IS LIFE? – TEMPTATIONS AND BEYOND

While we have made amazing progress and developments in numerous disciplines of knowledge today, from physics to astronomy, fast emerging fields of biosciences and artificial intelligence, whether theoretical or experimental, one of the most challenging questions for humanity still remains unanswered - What is Life? How far our search for understanding life through the research on origins and formation of the first living cell can help us answer this question? Given the appreciable developments but confronted with still the same impasse for resolving this age-old riddle, has time come to start rethinking about the validity of the equation of life, Life = Matter,

which we started assuming from the day Wöhler discovered urea? Is this equation complete and if not, what could make it complete; and are there any possibilities to really upgrade it? Could "consciousness" so much being talked about today, from quantum physics to neuroscience and philosophy help us here? Do we need to now make a "Paradigm shift" in our search for the origins - shift from search for Primordial soul to search for a Primordial Being or Consciousness? The lecture will attempt to highlight and explore some of these aspects about life and its origin along with sharing some possible hopes for the future.

Varun Agarwal (also known as His Holiness Bhaktisvarupa Vrajendra Kumar Swami), an alumnus of Indian Institute of Technology Kanpur (IIT Kanpur, 1999, Aerospace Engg.),is currently the Director of the Bhaktivedanta Institute, Kolkata, India. He was a recipient of IIT Kanpur Director's Gold Medal in 1999 for his undergraduate studies. His research interests include the foundations of science and its possible connections with spirituality. His search for a deeper meaning of life culminated in meeting and taking personal guidance from Dr. T. D. Singh which completely changed his life, after which he dedicated himself to the cause of selflessly helping humanity. He is the Editor of many publications on science and spirituality as well as of the Bhaktivedanta Institute's reputed annual science-spirituality journal, Savijnanam – Scientific Exploration for a Spiritual Paradigm. His deep interest in the foundations of mathematics and nature of consciousness and

its relation to nature of reality as well as ancient Indian texts has led him to interact and meet with renowned scholars at Harvard, Princeton, ETH, Stanford, and MIT. He has given numerous talks worldwide on the foundations of science, as well as the foundations of life, mathematics and spirituality.

CONVERGENCE OF SPIRITUALITY AND SCIENCE ON ORIGIN OF LIFE IN THE UNIVERSE

Prof. Ahindra Ghosh

Formerly Professor, Department of Materials & Metallurgical Engineering, IIT Kanpur

Vedanta and the Bhagavad Gita are the spiritual basis of this paper . According to these two , there is a superconscious entity pervading the Universe . It is eternal and unchanging and is known as Nirguna Brahma . The Universe is reverberating with the sound Om, which the Yogis experience in their Nirvikalpa Samadhi. Cosmologists have generally accepted the 'big bang ' hypothesis , according to which the Universe originated about 13.7 billion years ago from a primordial entity through a big explosion , and is continuously expanding . Physical sciences have no clue as to where from this primordial entity came. Vedanta conclude that it came from

Nirguna Brahma..

The basic tenets of modern physics are as :

The phenomena may be classified as Known , Unknown and Unknowable (same as in religion) . (2) Observations depend on mind of the observer (same as in religion). Several top –ranking physicists believe that there is a Universal Consciousness. S. Arrhenius proposed a hypothesis that life on the Earth was introduced billions of years ago by extraterrestrial sources in space . This hypothesis is known as Panspermia. The temperature of space has been estimated as 30 K . Therefore, the unicellular organisms can survive there in dormant state . These become active when they settle in a planet such as Earth .

Charles Darwin in his theory of evolution advocated survival of the fittest . This way , in millions of years a species undergoes so much change that it appears as a new one. Estimates of habitable planets like our Earth , based on new data of NASA , have yielded numbers of the order of billions in our galaxy (Milky Way) . So Avataras and Liberated Souls existed there even before the advent of Avataras on Earth .

AHINDRA GHOSH, (Sc.D., MIT, USA), formerly Professor, Department of Materials and Metallurgical Engineering, Indian Institute of Technology Kanpur, is well known for his expertise in Metallurgical and Materials Thermodynamics.He received his B.E.degree of Calcutta University in 1958 with

1st rank amongst the Metallurgical Engineering graduates. He received his Sc.D. (Doctor of Science) degree from MIT, USA, in 1963. He was at the Ohio State University as a post-doctoral fellow for a year. He joined as faculty at IIT Kanpur in 1964. Besides 35 years of teaching and research experience at IIT Kanpur, Professor Ghosh has rich industrial experience, having worked with major companies like Tata Steel and Tata Consultancy Services. A Life Fellow of Indian Institute of Metals and Institution of Engineers (India), Life Member ISTE, and Fellow, Indian National Academy of Engineering, he has contributed extensively to national and international journals including Metallurgical and Materials Transactions (USA), ISIJ International (Japan), Steel Research (Germany), Ironmaking and Steelmaking (UK), and Trans. Indian Institute of Metals. He has also authored six books on Metallurgical sciences.

About 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 *Bhagavadgītā* and the *Śrīmadbhāgavatam*, 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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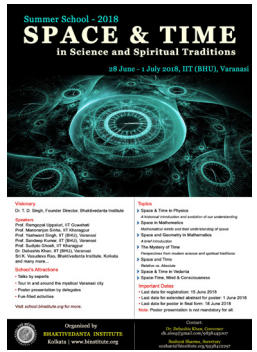

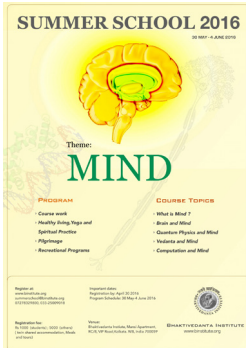

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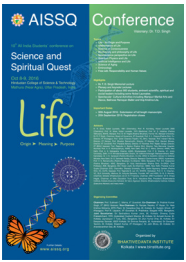

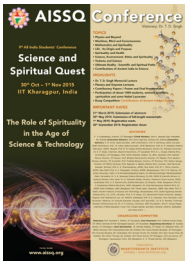

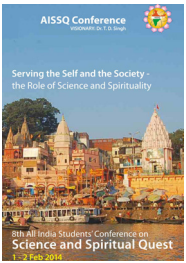

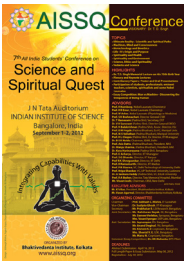

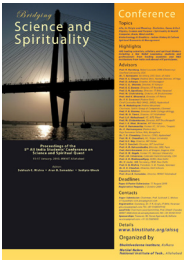

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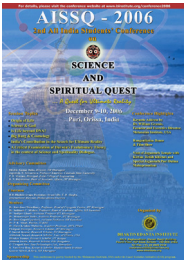

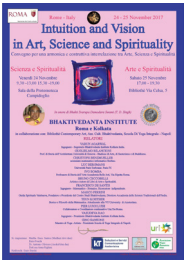

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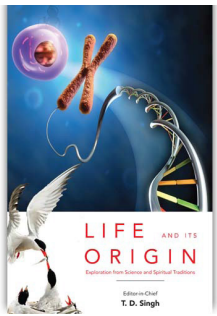

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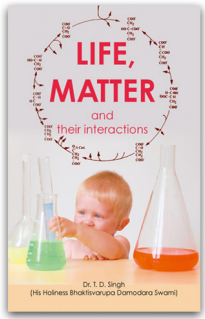

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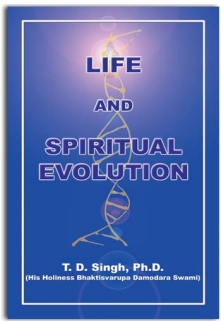

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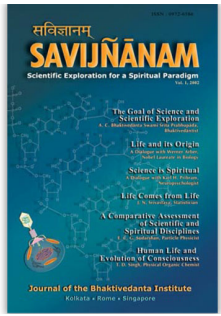

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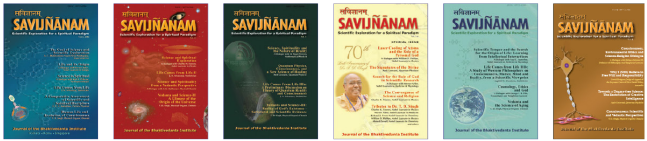

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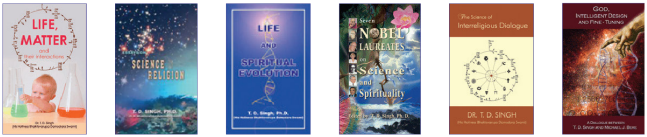

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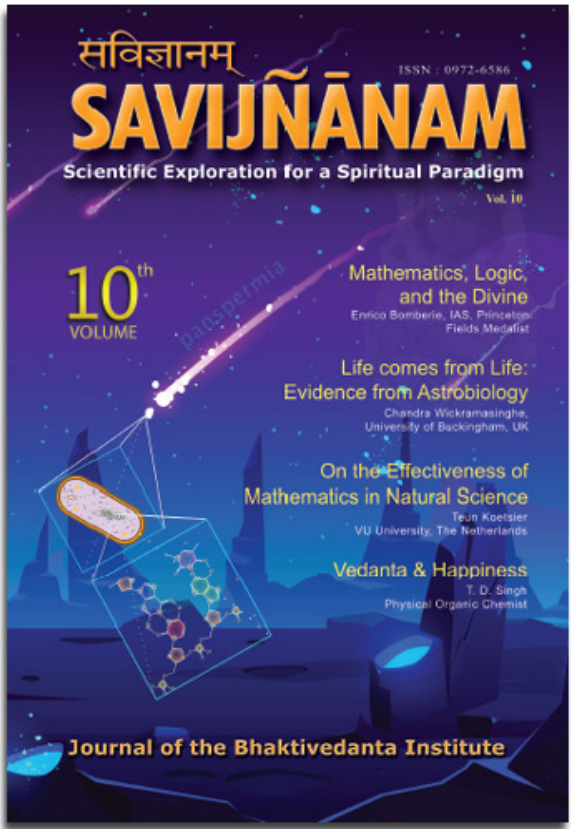

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