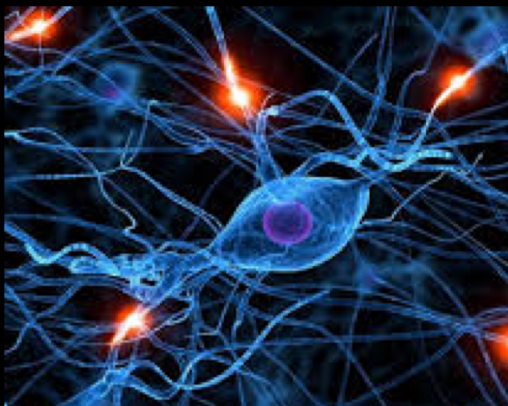
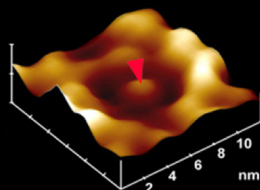
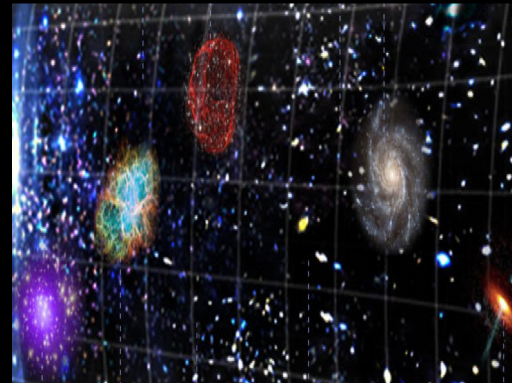


A HUMBLING JOURNEY THROUGH THE CORRIDORS OF SCIENCE

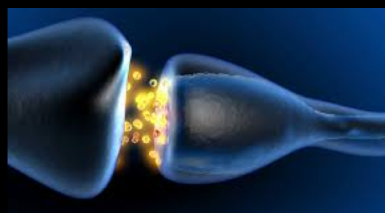
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PRESENTATION AS CHIEF GUEST
The 55th Odisha Society of the Americas (OSA) Convention
Nashville, TN, USA

July 5, 2024

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Thank you for inviting me and for your kind and generous introduction. I am honored.

When Vice President of OSA Mr. Saradakanta Panda invited me to preside as Chief Guest at this convention, I asked him what would you want me to speak about. Wisely, he responded, “please connect to OSA”, smart man!

Well, after some thought, it dawned on me that there is no point in lecturing to such an accomplished audience, and the next generation that is trying so hard to do even better, and they will.

So, I decided instead to share with you a story, **a humbling story of my random walks through the corridors of science.**

In 2007, my good friend Prof. Ahmed H. Zewail, the 1999 unshared recipient of the Nobel Prize in Chemistry, presented me with Paulo Coelho’s book “**The Alchemist**” with the following note:

Bhanu, he wrote, The Alchemist, is a journey like yours, full of excitement and treasure! -Ahmed

So, allow me share with you the **prologue** to the book, **the legend of Narcissus from Greek mythology**:

---Narcissus the youth would kneel daily besides a lake to contemplate his own beauty. He was so fascinated by himself that one morning he fell into the lake and drowned. ... When Narcissus died, the goddess of the forest found the lake weeping, turning the fresh water lake saline.

Why do you weep? The goddess asked.

I weep for Narcissus, because each time he knelt beside my bank, I could see, in the depth of his eyes, my own beauty reflected.

We discover ourselves through the eyes of Nature and humanity. Very revelatory, yet deeply humbling.

And so, I often reflect on a story of my own imagination. Many centuries in the past, on the day of coronation of this very illustrious King, the then 20-year old prince turns to his mentor sitting next to him and remarks:

“Sir I feel a bit uncertain of leaving you. Now that I will be crowned King, who will I turn to for guidance?” The teacher replied: “Your highness, you have your entire subjects to learn from and to guide you. I too have learned from you. I have learned to raise a King!”

We humans are curious beings. We all contemplate, who we are, what is life, why are we here, and what is our destiny. And so, as Albert Einstein has appropriately remarked: ...to reflect upon the

marvelous structure of the universe which we can dimly perceive, and try humbly to comprehend even an infinitesimal part... is enough for me.

And so, it is absolutely fascinating and magical to comprehend life, even an infinitesimal part of the unit of life -the cell, the immortal cell we all are made of, **38 trillion of them**. So, if you were to arrange the cells in our bodies end-to-end in a single file, they would circle half the globe. The genetic information in our DNA each of us carry, is massive. The nearly 6-feet of DNA in each cell when linearly arranged end-to-end from all the 38 trillion cells in our body, would span more than 60 times the 93 million miles of distance between the sun and earth.

So imagine, all 38 trillion cells are in perpetual communication to maintain life functions. For example, the ingestion of food triggers the release of digestive enzymes from the exocrine pancreas to digest food. Consequently, the elevation of glucose in the blood after digestion, inducing the secretion of insulin from the endocrine pancreas to maintain glucose homeostasis, or the communication between the one million miles of neurons in our brain for sensory perception, motor functions, thought and memory, are all accomplished by the release of secretory products through nanomachines or portals called **porosomes** at the cell membrane.

It is truly magical, that in the brain, the 15 nm-sized porosomes, 1,500 of which can fit the thickness of a human hair, is governing the communication between the million miles of neurons in our brain for comprehending the world around us, for all our feelings, our thoughts, memory and creativity.

This secretory nanomachine **-the porosome** that we discovered nearly 30-years ago, has revealed to us the precise molecular nature

and process of cell secretion, involved in communication between cells, providing for the first time, the treatment and pathways to the cure for a wide range of debilitating diseases resulting from secretory disorders, such as diabetes, cystic fibrosis, Alzheimer's and various cancers.

Clearly, it is evident that even a very small fundamental understanding of Nature, is profoundly powerful, providing us with the tools to greatly impact human health and wellbeing. However, it requires a lot of time, investment, and hard work. It took nearly 30-years for the porosome discovery, to be translated. It became increasingly clear to me that if inventions and discoveries are not translated, the accumulated knowledge would simply remain, in text books or note books. Therefore, I feel extremely fortunate when some leading entrepreneurs and business leaders were able to recognize the power and scope of the porosome discovery, that has now led to the pathway to a cure for many debilitating diseases.

Similarly, allow me to provide another example that all of us have recently experienced. The presence of messenger RNA (mRNA) was hypothesized and confirmed by the collective efforts of Jacques Monod, Francois Jacob and Francois Gros of the Institute of Pasteur in Paris in 1961. Since then, although our knowledge of mRNA has been the foundation of molecular biology, its utilization in therapeutics such as vaccine development is recent. It took nearly 60 years to translate the mRNA discovery to develop vaccine to combat the COVID-19 pandemic. In contrast to a decade required to develop a conventional vaccine, the mRNA vaccine development was completed in record time of just 4 months, considerably reducing hospitalization and saving millions of lives.

So, to the young explorers in the audience, I have this to say:

Knowledge is the backbone of society and its progress. We need to invest in education to bring peace and societal progress. Discoveries and inventions are made by the prepared mind. They require the depth and breadth in our understanding of multiple fields and is accelerated by collaboration and removing the barriers between the sciences.

While human curiosity drives creativity, urging us to explore our natural world, understanding how Nature works has taught us that it is the ultimate architect and engineer, capable of designing and building the most effective and efficient living unit of life -the "Cell" and the precision nanomachines within, to undertake various life-sustaining functions.

So, let Nature be your guide and mentor & Humanity your judge!

Young voyagers, get on your own random walk. Venture out there and explore, and make your own discoveries and inventions to bring new understanding and knowledge to society. Keep dreaming and make learning an addiction and a lifelong passion. Avoid the easy road and be brave to face challenges, criticism and failure, for those that do, will succeed. Make good on your victories and learn from your failures, for this will bring great satisfaction, joy, and peace in your lives.

Thank You!