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Rabindranath's Thoughts on Science

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A close study of the intellectual renaissance which occurred in India during the second half of the nineteenth century, flowing into the twentieth is vital in order to understand Rabindranath Tagore (1861-1941), one of the makers of Modern India. It was within this renaissance that a creative synthesis of the best of the East and the West took place in science, art, literature and culture. Rabindranath was the symbol of that great synthesis. Rabindranath is the personification of supreme intellect, his name being synonymous with genius. The first Nobel Laureate in Asia and Africa in 1913 (in Literature for his book: "Gitanjali" - 'Offering of Songs') was not only a poet, a philosopher, an artist, but also an ardent propagator of popular science in order to eradicate age-old irrational superstition among his people.

Rabindranath is India's greatest modern poet and the most brilliant creative genius produced by the Indian Renaissance. As well as poetry, he wrote songs, stories and novels, plays, essays, memoirs and travelogues. He was both a restless innovator and a superb craftsman. His poetry has an impressive wholeness: a magnificent loving warmth, a compassionate universal humanism, a delicate sensuousness, an intense kinship with nature and a burning awareness of man's place in the universe. He moves with effortless ease from the literal to the symbolic, from the part to the whole, from a tiny detail to the vast cosmos. His sense of science and its spirit is thematically reflected in his writings.

At the very dawn of the Indian Renaissance, Rabindranath came in close contact with the rising scientists of India [Acharya Jagadish Chandra Bose (1858-1937), Acharya Prafulla Chandra Roy (1861-1944), Chandrasekhara Venkata Raman (1888-1970)-the first Asian to win the Nobel Prize in Physics in 1930 for his Raman Effect and also Professor of Physics in the University of Calcutta, Meghnad Saha (1893-1956) Acharya Satyendranath Bose (1894-1974), Dr Mohammed Kudrot-e-Khuda, Professor of Chemistry, Presidency College, Calcutta, and so on].

Rabindranath's interest in science can be traced to his early teens. He loved astronomy, and when in England many years later, visited the Greenwich Observatory. Eminent astrophysicist, Meghnad Saha, persuaded him to write a book-rather a booklet-in Bengali ("VISHVAPARICHAYA"- 'Introducing the Universe', 1937) which he dedicated to Satyaendranath Bose, Father of Bose and of Bose-Einstein Statistics-Bose-Einstein Condensate (BEC) fame. He collaborated with one of his very close family friends-Prashanta Chandra Mahalanobis, Professor of Physics and Statistics, Presidency College, Calcutta, who became General Secretary of Vishva Bharati University in 1921. He had encounters with European scientists and scientifically minded philosophers, such as Bertrand Russell (1872-1970), Nobel Laureate in Literature, 1950. The German physicist, Arnold Johannes Wilhelm Sommerfeld (1868-1951), met him in Calcutta in 1928. The famous German physicist and philosopher, Werner Karl Heisenberg (1901-1976), Nobel Laureate in Physics 1932 (for his Uncertainty Principle) met him in Calcutta at his Jorasanko house in 1928. He is reported to have said in 1972 that Rabindranath's philosophical ideas had been of help to him as a physicist. Heisenberg (the young scientist of 27 then) had several conversations with the mature poet (then 67) about relativity, incommensurability, inter-connectedness and impermanence as fundamental aspects of physical reality. After the conversations he said: "Some of the ideas that had seemed so crazy, suddenly made much sense. That was of great help for me." His enduring fascination with the relationship between Man and Nature, notably in his Hibbert Lectures "The Religion of Man" at Manchester College, Oxford University on May 19, 21, & 26, 1930, -brought him close to Albert Einstein (1879-1955), Nobel Laureate in Physics, 1921. The Russian-Belgian scientist-Ilya Prigogine (1917-), Nobel Laureate in Chemistry, 1977, remarked in 1984 that "Curiously enough, the present evolution of science is running in the direction stated by the great Indian poet." A magnificent

tribute indeed! In India Santiniketan School (Established 1901—first as Brannma-Charya School) is the first institution where learning of science by direct practical experimentation was introduced at primary school level. In one of his essays—"SHIKSHA" (1906) he wrote: "In order to teach science to youngsters, their eyes need to be opened up first and power of observation enriched." (Translation by this author.) Thanks to Rabindranath for his foresight!

Allusions and references of things scientific and medical fascinated both William Shakespeare (1564-1616) and Rabindra-nath. There are plenty of them in their writings. Shakespeare was interested in health and sickness in his time (allusions in King Lear, Macbeth, Julius Caesar, Twelfth Night, and so on). Rabindranath's interest was in contemporary sciences—astronomy, astro-physics, biology, etc. allusions are spread in his novels, short stories, poems, essays, etc., written from his teens to almost the end of his life.

Eminent Bengali writer and linguist, Syed Mustaba Ali, one of the closest students (1921-1926) of Rabindranath at his Santiniketan School recorded in one of his articles that he used to read books on science, physics, anthropology, chemistry, astronomy, regularly, and sent them to the school library regularly.

All of Rabindranath's writings containing references to things scientific are in his mother tongue—Bengali. This is a serious limitation to non-Bengali readers. Bengali, in terms of numbers of Speakers, is the seventh most-spoken language in the world (about 200 million in India, Bangladesh and in several countries outside India—United Kingdom, United States of America, Germany, France and Gulf countries). In order to get the real flavour and beauty of Rabindranath's writings, one needs to read them in original; translations in other languages are no substitute. Bertrand Russell appreciated Rabindranath's poems, but wished he could have read them in Bengali.

FIRST WRITING ON SCIENCE

It was written at the age of 13. It was about planets and their inhabitants (its Bengali title: "Grahagan Jiber Abashbhumi—Planets are the home of things living). It was published in their family periodical—"TATTABODHINI PATRIKA" in 1874. The periodical was established and edited by his father—Debendranath Tagore (1817-1905). This article shows his keen interest in astronomy, which stayed with him till the end of his life.

In 1885, a children's journal—"BALAKA"—was started in the Tagore family at Jorasanko by Jnandanandini Devi, wife of Rabindranath's elder brother, Satyaendra-nath Tagore. It was short-lasting—only eleven issues were published. Rabindranath also took an active part in its editing and publication. The aim was to encourage literary activities among the children of the family. Rabindranath himself wrote in the 6th issue (on 'Barafpara' [Icefall] p. 34-44; 'Vignan Sanbad' (science news), p. 351-354). In fact, he wrote on science news from the very first issue.

Rabindranath edited five periodicals (SADHANA, BHARATI, BANGADOR-SHAN, BHANDAR, TATTABODHINI) at different times of his life. News and articles on science got prominence in all those periodicals.

Rabindranath edited "BANGA-DARSHAN" [established by Bankim Chandra Chatterjee (1838-1894)] for five years (1901-1905), when it came out again after Bankim's death. Bankim also wrote a book on popular science ("Vignan Rahasya", "Mystery of Science"); science also got prominence in his journal—Bangadarshan. O Rabindranath, during his editorship, encouraged people to regularly write on science in Bangadarshan. He himself wrote on Acharya Jagadish Bose's research in Bangadarshan ('Acharya Jagadisher' Joybarta Victory Message of Acharya Jagadish, 1901).

Rabindranath was primarily in charge of the science section of SADHANA (1901). He himself wrote many articles on science [Gatinirnayaner Indriya (Indicators of Motion), Iccha Mrityoo (Suicide), Utpakhir Lathi (Leg of Camel bird), Vugarvastha Jal (Underground Water), Bayuprabaha (Force of Wind) 1894].

Inquisitiveness for scientific knowledge and information made him a prolific reader and thinker-their reflection is scattered limitlessly in his literary works. He meant what he thought and put them into words wherever relevant.

POET AND COPERNICUS

European Renaissance (1500-1700 A.D.) threw off many myths concerning Nature. With the publication of "De Revolutionibus Orbium Coelestium" (On the Revolution of Celestial Spheres) by the Polish astronomer, Nicolus Copernicus (1473-1543) in 1543, the myth of geocentric universe (earth is the centre of the universe) was shattered and was replaced by the concept of heliocentric universe (the sun is the centre of the universe, around which our planet earth moves). It was against the Biblical preaching (same as in other religions-Hinduism, Islam, etc). The Vatican rejected it. Galileo Galilei (1564-1642), the Italian astronomer, was a staunch supporter of the Copernican concept and was condemned by the Vatican in 1616 and 1633, and was put in house arrest in Florence for the rest of his life. The poet, John Milton (1608-1674), though blind since 1652, went to see Galileo at Florence. Geordano Bruno (1548-1600) extended the concepts of Copernicus by suggesting that the universe was infinite and thus paved the way for Galileo, Johann Kepler (1571-1630), Tycho Brahe (1546-1601) and Isaac Newton (1642-1727). Bruno was a churchman, but still he was burnt at the stake as a heretic for supporting the ideas of Copernicus.

Heliocentric universe of Copernicus did not escape the attention of the poet. He expressed the whole concept of Copernicus in a beautiful way in his poem-"BASUNDHARA" (1893) in his book of poems-"SONARTARI" (1894):

... You, my earth are many years old
Taking me on your lap, aligning with
the infinite sky
Going round and round with
your untiring legs
Around the solar system-innumerable
days and nights
through the ages. ..."
(Prose translation by this author)

Rabindranath was totally free from superstitions-religious or otherwise. In his poem "BASUNDHARA" he totally rejected the geocentric concept of the universe postulated by the Egyptian astronomer and geographer of the Antiquity-Claudius Ptolemaeus (c.A.D.100-c.170) in his "Almagest". According to his theory, the Earth is the centre of the universe with the Sun, Moon and Stars revolving around it. The poet poetically accepted in the above poem the concept of heliocentric concept of the universe proposed by Copernicus, Galileo and Bruno. He eloquently wrote about the fight of Bruno against religious superstition, for which he gave his life.

THE POET AND THE SUN

In his poem-"SABITRI" (1924), written on the ship to Buenos Aires (Argentina)-Haruna-Maru-on Sept. 26, 1924, the poet described how the Sun has kept his darling daughter-the mother Earth-alive and kicking with the gift of his enormous rays. In the preamble to the poem, he gave an account of how different elements-Hydrogen, Helium, etc.-are constantly burning generating profuse heat and high temperature. In that gaseous melee, the poet imagined the presence of "Saraswati"-the goddess of learning with violin in her hand. He felt the influence of solar power within himself and introduced himself to the reader:

"...This life is a torn tune of your flute,
 A trail of tunes in the confluence of our
 existence,
 Smilingly floating in the stream
 in a game,
 The mother earth amusingly
 embraced it,
 Who knows what you gave me
 from the storage of glow
 and glare..."

(Prose translation by this author.)

This was the poet's very personal way of expressing his profound gratitude, acute appreciation and indebtedness to the mighty Sun—donor of all energy and power to the mother earth. What an astonishing sense of science!

In another poem—'AWBHAN' (1924) written on the ship—Haruna—Maru —on October 1, 1924, the poet admitted the influence of solar power in the very core of his mindset.

"...In this darkness of mother earth
 who is that
 enlightened composing sons,
 Inviting others in every shade of
 light with burning
 and glowing eyes,
 That is why romance arises
 in the deep darkness of
 the soil, in the excited grasses,
 The earth rises with cries,
 ray of life spreads in
 all directions..."

(Prose translation by this author.)

He was familiar with the famous physics textbooks of Adoiphe Ganot (1804-1887) that ruled European schools and undergraduate classes for many decades, and on which all Bengali physics textbooks were modelled till 1898. Tagore's acquaintance with Ganot is apparent from a passing reference to Ganot and the German physicist—Herman Ludwig Ferdinand von Helmholtz (1821-1894) —the inventor of ophthalmoscope, in the famous satirical poem "UNNATILAKSHAN" ('Signs of Progress') included in his book of poems—"KALPANA" (1900). Shortly after his return from the momentous tour of Europe and the USA in 1914, the poet wrote a delightful essay "AMARJAGAT" ('My World'), the theme of which is a mock debate between a poet and his scientist friend.

SCIENCE IN SATIRES

Intellectual satires in his works are very well-informed and based on facts and not fiction. In one of his classic novels—"SESHER-KABITA" (1928) the hero Amit Ray, while addressing Labanya as Banya in her maternal aunt—Jogamay's house, insisted that the same person may be addressed in different names in different places and in different contexts, and this is relativity of names. He tells Labanya that he wants to be famous by preaching "Relativity of Names"; he also mentions time-space relation and time dilation as thought by Einstein. (SHESHER KABITA, VISVABHARATI, 1929, p. 53-54.) It was a time when the Special Theory of Relativity by Albert Einstein (1879-1955) was a talk of the day in science, arts, philosophy, sociology, theology and so on. It stole people's hearts; it spoke the language of their lips, it sang the song of their souls and it played the music of their minds. Such an epoch-making event—the Special Theory of Relativity—cannot and did not escape the attention of Rabindranath.

In another context in *Shesherkabita* Labanya (Banya) is sitting alone under a tree and is tearing grass; suddenly Amit (Mita) appeared on the scene and commented "Labanya's study of the Botany of grass did not proceed any further."

In another conversation, the very basic concept of the relationship of man, universe and velocity ($E = MC^2$: E = energy, M = mass, C = velocity of light) found literary expression in the shortening and lengthening of names. He made the complex theory of Relativity easy for all of us. Einstein's Theory of Relativity got a new popular dimension in the poet's classic-"Shesherkabita" (p. 54, q.v.).

"...Time should not mean the same to everybody. Conventional clock gives one time relative to space, but personal clock which controls the Universe, gives another. This is what Einstein thinks."
There are many such scientific satires in his works.

TAGORE, THERMODYNAMICS AND ENTROPY

Rabindranath had a wide and diverse interest in science. In his "PANCHA DIARY" (1895), he mentions if heat is the source of motion, then matter exists only when there is heat, matter moves and wind blows; if heat is exhausted, then everything comes to a standstill. The idea has a touch of the second law of thermodynamics which can be interpreted to mean that the entropy of a closed system tends towards a maximum and its available energy tends towards a minimum. It has been held that the Universe constitutes a thermodynamically closed system, and if this were true, it would mean that a time must finally come when the Universe unwinds itself, no energy being available for use. Heat and energy are convertible both ways. This state is referred to as the "Heat death of the Universe". In his statement Rabindranath considers this aspect and expressed apprehension. It is by no means certain, however, that the Universe can be considered as a closed system in that sense. The Universe is still expanding. There might be many a Universe -multiverse might be the right expression.

RABINDRANATH AND THE UNIVERSE

The evidence of Rabindranath's inquisitiveness about the planets, stars, etc. of the Universe is scattered in his writings over 40 years, starting from "NAIBEDYA" (1901) to "JANMADIN" (1941). The cosmos and the Universe always roamed in the corridor of his mind:

.. What we mean by words like body, soul, mind: I don't fathom, but I shall always observe the universe quietly,
without words
the current of the cosmos's awareness flows towards you."

("Naibedyā" Poem No. 88: Translation by Ketaki Kushari Dyson-"Rabindranath Tagore: I Won't Let You Go". Bloodaxe Books Ltd., Newcastle upon Tyne, 1991, p.125).

The discovery of the power source of the vast universe and the changing structure of atoms in 1900 revolutionized our perception about things around us. There are reflections of this phenomenon in other poems of "Naibedyā":

"...Body, mind and soul in unison
What a beautiful display in my body
What a glow-what a burning light
In the eternal theatre of day and night."

.....
"...In the veins and arteries of my body
Flow the waves of life day and night,
That life is rushing to win the universe
That soul is dancing on the planet
in beautiful tunes."

(Translation by this author.)

In his youth Rabindranath read about gravitation, life sciences, astronomy and mechanics of atoms. Protons and electrons are the foundation of all characteristics of the biological world. A wonderful display in our own body. The poet imagined the main scientific entity between the cycles of creation and destruction, which are flowing eternally. He wrote in his poem "Nataraj" in "BANABANI (1931)-how electron rebels against the proton -circling the proton and enriching itself rushes again to the center of another proton:

"...the rebel atom becomes beautiful in its dancing spree Around the feet of the moonlight"
(Translation by this author.)

The poet contemplated on the uniqueness of the Grand/Intelligent Designer. In his classic novel "GORA" (1909) dedicated to his son, Rathindranath Thakur, Gora-the hero-enumerated different aspects of uniqueness of the Grand Designer in His/Her Uni/Multi-verse pointing out science is breaking its head to explore the mystery [GORA, Rabindra Rachanabali (Collected Works of Rabindranath), Visvabharati Kolkata, Vol. 3, p.459, 1986].

Rabindranath, in fact, thought of an assimilation of reality with scientific truth. This is an echo of his understanding about the nature of the elements creating the Uni/Multi/verse-a problem yet to be solved by science.

There are pertinent questions about the origin of the Universe and our place in it. When and how did it begin? Why are we here? Why is there something rather than nothing? What is the nature of reality? Why are the laws of nature so finely tuned as to allow for the existence of beings like ourselves? And, finally, is the apparent 'grand design' of our Universe evidence for a benevolent creator who set things in motion? Or does science offer another explanation? The most fundamental questions about the origin of the Universe and of life itself, once the province of philosophy, now occupy the territory where scientists, philosophers and theologians meet-if only to disagree. It seems there is no one Universe. There is now multiverse concept of reality, in which there are many Universes.

Rabindranath-the science conscious poet-philosopher-symbolically alluded to the Universe and our position in it in a myriad ways in his poems, songs, dramas, novels and. in popular science writings.

Who is the Intelligent/Grand Designer of the Uni/Multiverse? A million dollar question! In the odyssey of "HIS/HER" discovery, the caravan of scientists, poet-philosophers, theologians, and so on, starting from Newton, Rabindranath, Einstein to Stephen Hawking (1942-) stopped abruptly at the periphery and did not proceed any further to the centre of the question.

TAGORE AND EINSTEIN

Albert Einstein and Rabindranath are legendary figures, whose reputation endures into the twenty-first century. Einstein and Tagore met four times-the first time in 1926 in Germany. Their first conversation about the nature of reality took place on July 14, 1930, during his second visit at Einstein's home at Kaputh, Potsdam, near Berlin. It was reported in the *New York Times* by the journalist Dmitri Marianoff (Einstein's step-son-in-law): "It was interesting to see them together; Tagore-the poet-with the head of a thinker, and Einstein-the thinker-with the head of a poet'. It seemed to an observer as though two planets were engaged in a chat". On Science, the Poet told the Scientist during the conversation: "Science is concerned with that which is not confined to individuals; it is the impersonal human world of truth." [See Tagore "Farewell To the West" (1930-1931), p. 294-295; Tagore "The Religion of Man", New York, Macmillan, 1931]

They met again for the third time at Einstein's home at Kaputh on August 19, 1930, and had a lengthy conversation on science and music. This was Tagore's second conversation. On the Nature of Reality, *New York Times Magazine*, August 10, 1930, published an article entitled "Einstein and Tagore plumb the truth".

Tagore again met Einstein in mid-December, 1930, in New York for the fourth and last time. They shared a deep mutual respect. Einstein alluded to Tagore affectionately as "Rabbi" (Teacher) and Tagore turned down the offer of an Honorary Doctorate from Berlin University as a protest against the Nazi treatment of Einstein. The conversation on science made a great impact on several Indian scientists of the day. There was a progressive encounter between Western science and educated Indians during the last two centuries, and the development of science in Indian society.

The year 1905 is not only the 'ANNUS MIRABILIS' (Miraculous Year) of Albert Einstein (1879-1955), "the Copernicus and Newton" of the Twentieth Century "Person of The Century" (TIME Magazine, Dec. 31, 1999) but also of the world of Modern Science, when five epoch-making papers were published in *ANNALEN DER PHYSIK*, Vol.17, 1905. Einstein was then a second division Clerk at the Patent Office at Berne, Switzerland. His Special Theory of Relativity proposed in two of the 1905 papers (See Sisir K Majumdar: *A TRIBUTE TO EINSTEIN*, Germinal Publications, Kolkata, 2006, p. 23-32) sent ripples in the world of science. It stunned every thinking person-scientist, theologian, philosopher, sociologist, artist and so on. It postulated that space and time were not independent and the world is a four-dimensional metrical continuum with three-dimensional space.

The Poet accepted the time-space continuum, and in appreciative hymnic adoration, he "sang the song of praise for light emanating from the source of darkness". The only witness is the limitless unknown. What a height of poetic imagination!

The new philosophy of time-space continuum-fourth dimensional world is reflected in several poems of his book-"*SESH SAPTAK*" (1935):

 "...In the new theory, the boundary of
 time was drawn in the
limitless sky at the beginning of creation. The largest space is measured in the
 scale over crores of
years. On the planet boundary of human
 era is drawn but in a small
measure in the form of light and
 darkness behind
the eye of the stars secretly....
In the twinkle of their eyes,
 the cycle of creation and
destruction continues here on earth."

(Translation by this author.)

This is how the Poet shows his respect and salutes the science of astrophysics.

He did appreciate the philosophical problems of science, as well as its relationship with the other creative areas of humans. He wrote in 1932:

 "...Modern science analyses reality with a detached mind; modern poetry should also do the same, for that is what is eternally modern."

(Rabindra Rachana-vali, Vol. 14, p. 348, West Bengal Govt. Edition, Calcutta, 1961).

Rabindranath seemed to be ambivalent with a bit of concern about the apparent incompatibility, conflict and contradiction between objectivity in science, literary and artistic imagination or innovation. Literature, he said, was characterised essentially by the prejudices and caprices of the individual, which was in direct opposition to the impersonal and rational objectivity of science. He cites a beautiful example from his own lyrical dance-drama "*CHITRANGADA*" (1891). The hero-Arjun-is indulging in voyeurism (one who obtains sexual gratification looking at others' sexual actions or organs), when he

stealthily looks at young narcissistic (youth who pined away from love of his own reflected image -morbid self-love or self admiration) Chitrangada undressing before bathing in a pond, rapt at the exquisiteness of her own form. Arjun is excited and overwhelmed. This, Rabindranath appears to be saying, can be treated in two ways; one is the interpretation of Sigmund Freud (1856-1939), Father of Psychoanalysis which dominates modern psychiatry, which is perfectly in order in science. However, the moment that interpretation interferes with and dominates over artistic presentation, it kills art. Rabindranath felt that Western literature of the modern period had fallen victim to just such an aggression from reductionist modern science.

In later life, he seemed to have reconciled. He says that poetry should also look at the world with an objective clinical detachment. He brings in mathematics to solve the riddle when he says in 1932:

"The mathematician no doubt engrosses himself in the profound symmetry permeating high-level mathematics, in the unity of forms. The fact of its orderliness is not only epistemic, it belongs also to the sphere of deep feelings: there you get pure bliss. It finds expression at the apex of knowledge, where it is free of any utilitarian concern. There knowledge attains liberty. One naturally wonders why this has not been the subject of poetry. The reason, of course, is that its experience is esoteric (not generally intelligible), its access denied to the common person."

(Rabindra Rancharabali,
op.cit. p. 348.)

RABINDRANATH AND THEORY OF EVOLUTION

The Poet was immensely influenced by the Theory of Evolution by Charles Robert Darwin (1809-1882) : While reading life sciences he was very much moved by Darwinism. There are references and allusions to the theory of evolution scattered in his various writings. In one letter in "CINNYAPATRA" (TORN LETTERS) he said: "I can clearly remember that many thousand years ago I was born as a tree on this planet earth and on that day in the morning rays from the new sun were flashing on my body." There, are many such descriptions in many of his letters. His ideas and thoughts on human evolution were mostly expressed in his letters.

At the age of 22 in 1883, the poet commented in his essays -"BIBIDHA PRASANGA" and "JAGATPIRA" on what Evolution Theory teaches us. He wrote in "Jagat Pira":

"Every inert atom is trying to attain life; tiniest life is trying to attain full life; every full being (for instance, man) is trying hard to avoid the clutches of unfulfillment. In the vast Universe, every atom is constantly trying to evolve."

RABINDRANATH AND JAGADISH CHANDRA

Jagadish Chandra Bose (1858-1937) experimented with wireless communication in Presidency College, Calcutta; he was the real inventor of Guglielmo Marconi's (1874-1937), (Nobel Laureate in Physics, 1909), wireless detector (coherer) used for the trans-Atlantic wireless signal reception. Rabindranath and Jagadish were very close friends; both were in constant touch with each other at home and abroad-a union of two minds-poetic and scientific. Jagadish always looked to Rabindranath for inspiration and guidance in moments of despair in his odyssey of scientific research at home and abroad.

Rabindranath, while Editor (1901-1905) of 'Bangadarshan' congratulated Jagadish-chandra in one article in 1901 (q.v.). He wrote a congratulatory poem-thematic of his research work under the title-"JAGADISH" (1928) in his book of poems-"BANABANI".

"JAGADISH
(Addressed to
Sri Jagadish Chandra Bose)

Dear friend,
The day when the world was
painless wordless desert,
Plants appeared with pleasure,
apprehension and
sadness in dangerous loneliness.....

.....
Today with thousands, I proclaim:
'Blessed you are, blessed are your friends,
blessed is the holy land of your birth.'

Later, Jagadish moved his research interest from Physics to Botany, particularly electro-physiology in plants; he believed plants have life. Rabindranath also found echo in support of his philosophy of universal humanism in the research of Jagadish involving both living and non-living world. He wrote:

"European science is following the way of our philosophy. This is the way of unity. One of the major obstacles which science had faced in forging this unity of experience is the differences between the living and non-living.

Even after detailed research and experimentation, scholars like Huxley could not transcend this barrier. Venturing this excuse biology has been maintaining a wide distance from physics. Acharya Jagadish has discovered the unifying bridge between the living and the non-living with the help of electrical waves."

(Rabindranath Tagore, "Acharya Jagadisher" Jaivarta [Message of Victory of Archya Jagadish], Vasudhara, Vol.2, p. 107, 1957.)

It may be mentioned that when Guglielmo Marconi (1874-1937) of Italy and Karl Ferdinand Braun (1850-1918) were jointly awarded the Nobel Prize for Physics in 1909 for development of wireless telegraphy and Jagadishchandra was excluded, Indians all over the world were sentimentally and emotionally wounded, and this pathos still today pains Indian minds.

Rabindranath was an active patron of scientific research; he always encouraged Jagadishchandra in his research at home and abroad. He helped Jagadishchandra in raising funds to establish the Bose Institute in 1917. A seed sown by Jagadishchandra in 1917 has now grown into a big tree. The Bose Institute (BASU VIGNAN MANDIR) in Kolkata is now a leading centre of scientific research in India.

EPILOGUE

In all humility, Rabindranath said about himself : "I am not a worshiper of science not a writer on science". But the truth was exactly opposite. Einstein once said : "Experimentation with instruments only does not make one a scientist, to me scientific mind makes one a real scientist". Rabindranath fits his definition of scientist. It seems he had his "Rabbi" (Einstein affectionately addressed him so) when he made the above comments. In the study of things scientific, he knew his limitations and that is well expressed in the Introduction of his only book on popular science "VISVAPARICHAY". He was a wise man with multi-faceted talents. "Wisest is he who knows what he does not know" so said Plato (427-347 BC). □□□