Swamiji's Vision of Scientific Rejuvenation of India

Compiled by Swami Dhyanagamyananda

February 16, 2013

Ladies and gentlemen, welcome to the last session in today's seminar. In the next half an hour we shall see what swamiji envisaged about shaping future India by adopting a scientific approach.

1 Introduction

[SLIDE] We primarily know of Swami Vivekananda as a religious leader who preached Vedanta in India and abroad. But, he was a humanist par excellence. And as a humanist he had eclectic curiosity in all matters of human importance.

Among all his interests, his admiration for western science is a subject of study by itself. And for a missionary of his stature to get interested in science, it only greets the stranger with puzzling surprise, for Science is the cross where religion is often crucified. Modern science and its sledge-hammer blows are pulverising the porcelain foundations of all dualistic religions everywhere [1]. Even during his days in America, he records his observation, that two thirds of the American population had given up the path and pursuit of their religion on the volcanic uprising of science. And yet swamiji was an avid disciple of science and scientific inquiry, because he was sure that a similar fate will not fall upon the eastern faith.

India in the eyes of Swamiji

[SLIDE] Every nation has something unique about its existence, her Individuality. A Nation survives by what it contributes. Religion and Spirituality is the backbone of India. And herein lies her individuality. Devoid of it, India is bound to die, warns Swamiji. All the same, religion should possess economic value. That is practice of religion must be assisted by adequate ventures in science. Swamiji's envisaged a hand in glove approach for regeneration of India.

Human reasoning and intellect in any period of the world's history has been engaged in the struggle to search beyond, beyond what is known, and beyond what is felt. Science and religion both are onto the same task has the scriptural sanction in the following words from Bhagavad Gita.

[SLIDE] "That knowledge by which the two objects of knowledge, Kshetra and Kshetrajna, are known is considered by Me, the Supreme God, to be the right knowledge.[2]" in which the knowledge of Kshetra falls under science and that of Kshetrajna in the domain of religion and spirituality.

Religion is blamed for two prime reasons. Firstly it is unscientific and secondly that one has to exercise one's beliefs to practice religion. The dicotomy suggested by the scripture may endorse the former taking the traditional meaning of science to be search without and religion to be search within. But the second of the blames is entirely baseless because the laws that guide both scientific

and spiritual inquiry are same. From the viewport of these laws science and religion have many things to share.

[SLIDE] Scientific endeavours are undertaken from two motives. One is to understand the forces of Nature and their working with a view to utilizing this knowledge for advancing material prosperity. This gives birth to technology and large-scale production of goods and the enhancement of the material comforts of civilization. The other is the quest for pure knowledge, knowledge of our universe and reality. In matters concerning science Swamiji's head was with the later and heart with the former.

In the first half of the sequal we shall science to mean the second of the motives, namely, quest for pure knowledge and how sharing happens with science and religion.

Science in Swamiji's Perspective

[SLIDE] Science is the emissary of Religion in the sense that while religion arrives at truth like a leapfrog, science systematically works out the intervening steps bridging the gap between the gross and subtle. How that happens? Swamiji observes, 'Take one of the most material sciences, such as chemistry or physics, astronomy or biology–study it, push the study forward and forward, and the gross forms will begin to melt and become finer and finer, until they come to a point where you are bound to make a tremendous leap from these material things into the immaterial. The gross melts into the fine, physics into metaphysics, in every department of knowledge.' [4]

[SLIDE] Science has all the instruments for its purpose while Religion apparently has none. Can there be a dialogue between these two children of philosophy? Thus he was keen to know how far the conclusions of objective science could reflect the truths known through transcendental realizations. [SLIDE] But it is to be noted that Science is still an evolving body of knowledge. Theories after theories are being proposed. The diffculties get compounded when the contending proposals entirely oppose each other. As Unity underlies all the entities and processes of nature, we can say, through various stages of development science journeys steadily towards truth. In the language of swamiji, the journey is not from error to truth, but from lower truth to higher truth.

[SLIDE] Thus with the view of putting religion into strong foundations swamiji identified branches of science, namely the so-called materialistic sciences, as 'expressions of religion whose heads, as it were, are penetrating more into the secrets of heaven though their feet are clinging to earth.'

Swamiji says , 'Science and religion will meet and shake hands.'[5] An apt poetic metaphor and yet possessing the gravity of his in depth understanding and intuitive wisdom.

We shall further see in the sequal how on the basis of his vedantic insight coupled with intuitive and metaphysical reasoning, the pronouncements he made have been surprisingly confirmed by scientists of those days and even later.

2 Swamiji's Method

[SLIDE] Contrasting to the hypothetico-deductive arguments employed by the advocates of science, knowing the essence of truth marks the character of swamiji's scientific insights, In this respect he can be called an 'Intuitive Scientist'.

The Glimpse

[SLIDE] He was one day sitting in meditation under an aged peepul tree on the bank of a flowing stream near Himalayas. In that meditative state he had a realisation that the microcosm and the macrocosm are built on the same plan. "The microcosm must bear testimony to the macrocosm, and the macrocosm to the microcosm; physical truth must have its counterpart in the internal world, and the internal world must have its verification outside [7]."

- in comparison with Atom and Planetary system

Within ten years of swamiji's passing away, in 1911, Physicist Ernst Rutherford came up with the startling discovery of the atomic model possessing a centrally concentrated heavy nucleas. Niels Bohr found the electrons to be orbiting around the nucleas in circular path and Sommerfield later corrected it to be elliptic. Finally the structure of the atom got fashioned up in the style of planetary model. Even though Swamiji applied his realization in solving problems of life, the later scientific discovery confirmed that real truth in any field of knowledge will not contradict itself; the truths internal are in harmony with the truths external.

- in comparison with Curvature of Space-time continuum

[SLIDE] In 1916, Einstein, a genius by divine dispensation, formulated the general theory of relativity which explains the fact of gravitation by supposing that the space time continuum is itself curved. Swamiji, a mystic by divine right, writes, "There is no such thing as motion in a straight line. Every motion is in a circle. If you can take up a stone, and project it into space, and then live long enough, that stone, if it meets with no obstruction, will come back exactly to your hand. A straight line, infinitely projected, must end in a circle."[6]

- in comparison with Free Will

Take for example free will, which is much debated in philosophy and off late even more in science.

Neurologist, John-Dylan Haynes is quoted in an article published in Nature-online, in august 2011, saying, "We feel that we choose but we don't" the conclusion which he arrived by performing an experiment using functional magnetic resonance imaging (fMRI) that reveals brain activity on healthy subjects. The experiment summarises this way. You may have thought you decided whether to have tea or coffee this morning, for example, but the decision may have been made long before you were aware of it." This amounts to saying that becoming aware of a decision is caused and may be a mere "biochemical afterthought". The unsettling question is how can I say the will is mine if I am not aware of its origin, much less to call it free.[8]

Now lets hear to what swamiji says, "Nobody has ever seen anything produced out of nothing; if anything arises in the mind, that also must have been produced from something. When we speak of free will, we mean the will is not caused by anything. But that cannot be true, the will is caused; and since it is caused, it cannot be free–it is bound by law. That I am willing to talk to you and you come to listen to me, that is law. Everything that I do or think or feel, every part of my conduct or behaviour, my every movement–all is caused and therefore not free." [9]

Though the scientific experiments conducted haven't been conclusive yet to discard the free will, but it has set itself in the direction of understanding that will is not all that free.

2.1 Reasoning in religion

[SLIDE] As a missionary, Swamiji concerned himself primarily with the dissemination of religious ideas and vedantic truths. And for that he adopted an analytical approach, the method of ratiocination, the technique which the physical sciences have made well use of. With the advent of the Age of Enlightenment in Europe, worship of reason divorced people from worship of reglious traditions. And this gave birth to western science. Swamiji took that very mantle of reason and forged a happy marriage with religious traditions, giving it, as it were, a double reinforcement. As we can see for instance,

In religion, intuition plays a very vital role. The methods of knowledge in the eastern thought reckons intuition as a valid form of knowledge. But herein lies one problem. Even wild imagination may pass off as intuition. [SLIDE] To check this error, Swamiji instructs that the way to intuition is through reason. Intuition may transcend reason but cannot contradict it at any point [10]. just as 'The old man doesn't contradict the child'. and by reason swamiji meant the discoveries of secular knowledge [11]

[SLIDE] During swamiji's time the scientists generally believed in an eternally static universe. Time and Space are absolute entities. This is often referred to as the Newtonian paradigm and it had dominated the then scientific thought of the world. Yet swamiji stated in unambiguous terms that space and time cannot be but relative. "Time begins with mind, space also is in the mind. Causation cannot stand without time. Without the idea of succession there cannot be any idea of causation. Time, space and causation, therefore, are in the mind."[12] Three years later to swamiji's passing away, in 1905, Einstein formulated in his special theory of relativity that space is inextricably linked up with time. One of the main tenets of that theory is that we can think of and measure space and time only relative to a particular frame of reference, to a particular observer - the concept of absolute space and time are vacuous.

2.2 Unity, The Final Tier of Religion and Science

[SLIDE] The highest point in every science was reached when it found the one unity underlying all variety. This is as true in physical science as in the spiritual. For instance, Chemistry would evolve no further when it discovers one element from which every other element can be produced. Physics would stop when it would be able to fulfil its services in discovering one energy of which all the others are but manifestations. [SLIDE] We can find such a unity being proposed in cosmology coming from the *Sānkhya* philosophy. According to this thought, the entire cosmic evolution has effected from the two primary causes *Akāsha* and *prāna*. And in turn *Akāsha* and *prāna* get resolved into *Mahat*. And Mahat has emerged, as if, from the primeval state of singularity called Brahman which cannot be conceptualized. The language is pretty esoteric. [SLIDE] Swamiji redrafted this idea in the comprehensible language of science. The entire creation can be resolved into matter and force. Matter and force must be mutually transmutable and both having its origin common in Primal creative energy which is entirely potential. But science during his time did not have the mandate for this.

[SLIDE] This was one of Swamji's favourite subject which he presented before the western audience on several occasions. They attracted some of the best scientific minds of those days and Nikola Tesla was one among them. He would stand by the hour to attend these lectures on vedanta. He found the subject so scientific, exactly harmonising with the aspirations of the age and with the conclusions to which modern science was coming to. The subject greatly stimulated Tesla's interest

in vedanta. He was charmed to hear about the Vedantic Prâna and Âkâsha and the Kalpas, which according to him are the only theories modern science can entertain.

Swami Vivekananda was hopeful that Tesla would be able to show that what we call matter is simply energy because that would reconcile the teachings of the Vedas with modern science. Tesla apparently failed to show the identity of energy and matter. If he had, certainly Swami Vivekananda would have recorded that occasion. The mathematical proof of the principle did come until about ten years later when Albert Einstein published his paper on relativity. What had been known in the East for the last 5,000 years was systematically proved true by science.

2.3 Evolution vs Involution

[SLIDE] While its true swamiji compared his notes with the latest advancement in science and found them to be in agreement at least in the conclusions, he reserved his opinion in high esteem in cases when science was speaking contrary. Darwin's theory of evolution has its four cardinal laws proposing the blue print for evolution of living species. Swamiji doesn't agree with it in toto. If species exhibit struggle for existence how is it that in our saints and ideal men we find no trace of struggle whatsoever, and contrary to survival of the fittest there is no tendency found in the perfected humans to rise higher and grow strongler by the destruction of others [13]. There we find sacrifice instead. The more one can sacrifice the greater he is. [SLIDE] Thus the theory of evolution must be compounded with theory of involution and its ramifications is beautifully phrased as Buddha is an evolved molusc and a molusc is an involved Buddha. Christian de Duve, a Nobel prize winner in cell biology, summarises in similar vein, "All living beings maintain and propagate themselves by the same mechanism, no doubt inherited from a common ancestral form. Life is one and the revelation is awe inspiring."[14]

2.4 Advaita gives the most scientific perspective to religion

[SLIDE] How true!! Life is one. Because Soul is one, declares Advaita Vedanta. Swamiji was a champion in this subject, owing mostly to his personal, first hand experiences. Advaita gets its universal appeal as it fulfils two requirements to match with scientific temperament. Firstly, it proposes the highest generalisation of the ultimate reality, beyond even personality, generalisation which is common to every being, generalisation which is both universal and eternal. For instance, impermance of a single created object generalises into impermanence of the entire universe. Secondly, the explanation Advaita offers possesses the mandate that is internal, inhering in divinity of the Soul. Every religion says doing good to others is a virtue. But why is doing good a virtue? The answer is not to be found outside the agent, but inside. But is Advaita practical?

Its a Grand Idea, but lacking in method. And yet Advaita twice saved India. Once from the hard core materialists in the pre-buddhistic era and again from the agnostics in post-buddhistic time. But thereafter it was all forgotten. And Swamiji took upon his shoulders the arduous task of broadcasting the abstract Advaita before his Indian brethren to make it living–poetic–in everyday life, out of which must come the most scientific and practical psychology.

From here on we shall take science for its first of the two motives, namely for the betterment of life.

3 Early contributions in Science

[SLIDE] In works of science, or any field of learning such as music, art etc, the ideas were enshrouded in the language of spirit, time and again ascribing the profit, beauty, and correctness of the idea to the all powerful God, Isvara. In other countries machines led to a materialistic civilization, but in India they only reinforced the idea of Isvara. For instance, the pythogoras theorem that we know now was coded in metrical verses following the science of chandas in Baudhāyana Śulbasûtra 800BCE, much like the style our philosophical works composed. Because they were required for vedic rituals. Every invention and discovery only enriched the vedic corpus.

Yeomen contribution from the ancient India

In the lecture 'India's gift to world', swamiji says, "India has given to antiquity the earliest physicians, and, according to Sir William Hunter (President of Royan Asiatic Society), she has even contributed to modern medical science by the discovery of various chemicals (and surgical techniques) and by teaching you how to reform misshapen ears and noses (what we now call plastic surgery). Even more it has done in mathematics, for algebra, geometry, astronomy, and the triumph of modern science — mixed mathematics — were all invented in India, just so much as the ten numerals, the very cornerstone of all present civilization, were discovered in India, and are in reality, Sanskrit words."

We can see that swamiji is making a tacit mention of the contributions of the then pioneers in science Brahmagupta, Charaka, Sushruta, Bhaskara, Aryabhatta and their likes. But then came upon the time when the mantle of science was held low. [SLIDE] Nay, Swamiji warns, 'The tremendous engine of competition will destroy everything. If you are to live at all, you must adjust yourself to the times. If we are to live at all, we must be a scientific nation. Intellectual power is the force [15]. The reason for this clarion call was due to the deplorable conditions of the masses, much less to speak for the cultivation of science. Its pertinent to take a three line snapshot of the then prevailing time.

4 Indian Science Chapter

[SLIDE] The colonialisation subverted much of Indian culture, turning the region into a source of raw materials for the factories of England and France and leaving only low-technology production to local entrepreneurs. What new technologies were implemented were imported rather than developed indigenously.

While the west was making progress in science in leaps and bounds, Shimla conference convened by the Imperial Government in October 1899 kept harping on setting up Institutions to teach ethics, psychology, archaeology keeping in their view the development of mind and character of the students [16]. [SLIDE] Speaking of the then university education Swamiji noted that it was almost wholly one of defects. and that it was but a perfect machine for turning out clerks. His heart was ever towards combining western science with eastern value system. And this was well drafted by the editors of Madras mail emphasising the need for scientific education.

'Scientific training should not be withheld from the higher grade students which would enable them to explore mineral resources of the country. Let us, if possible have trained mineralogists and geologists who can localise and appraise our mineral wealth; let us have trained mechanical engineers who can erect and supervise the working of machinery and who would be able to instruct Companies

of native capitalists in the matter of machinery. They should adopt for mining or manufacturing purposes. Let us have experts in manufactures of glass, paper, iron, china and stoneware.' The then Government was however not interested and opted for delaying tactics. [17]

[SLIDE] Knowing well of the prevailing trend Swamiji hoped "if I can get some unmarried graduates, I may try to send them over to Japan and make arrangements for their technical education there, so that when they come back, they may turn their knowledge to the best account for India. What a good thing that would be!.[18]

4.1 Swamiji and JCBose

[SLIDE] When Indian scholarship was void of anything like originality. With retentive memory and dogged fondness for loading it with facts the Indian students went on acquring, say, BA degree, which became a conventional phrase for hare-brained. It was Prof. JCBose who changed the scene giving India its righful place in the world of science. He was a good friend and an admirer of Swami Vivekananda. A new lease of hope sprung in the Indian minds with his scientific intiatives. And Swamiji was enthusiastic of Bose's research in science.

This young scientist had in him an in born nationalistic tendencies which might have lead him to direct political activities. Swami Vivekananda noticed this and felt disturbed. He earnestly requested Bose to work only for recognition of scientific values in Indian minds and express his nationalism through his scientific works. Bose went on to make remarkable discoveries in radio communication and plant biology, actively supported by swamiji's western disciple Sister Nivedita. But for the timely intervention of Swamiji, India would have lost a high ranking physicist in JCBose, a man who was 60 years ahead of time (according to Nobel Laurette Sir Nevill Mott).

4.2 Swamiji and Tata

[SLIDE] The birth of the country's foremost scientific research institute – the Indian Institute of Science can be traced to a chance encounter between two of the leading lights of 19th century India. The "Empress of India" was sailing from Yokohama in Japan to Vancouver in Canada in 1893. Aboard the vessel were Jamsetji Nusserwanji Tata and Swami Vivekananda: both were headed to Chicago. Tata was to attend the World's Columbian Exposition (also called Chicago World's Fair), to mark the 400th anniversary of the discovery of the New World by Christopher Columbus, and Swamiji to participate in the World's Parliament of Religions, where he made his historic speech. [SLIDE] Conversation veered around to Tata's proposed steel mill. Swamiji pointed out to him that there were two aspects to the challenge of putting up a mill – manufacturing technology and the science of steel. The former could be imported, but the latter had to be researched at home, the philosopher told the Industrialist.

[SLIDE] About five years later, Tata wrote to Vivekananda, "I trust, you remember me as a fellow-traveller on your voyage from Japan to Chicago. I very much recall at this moment your views on the growth of the ascetic spirit in India... I recall these ideas in connection with my scheme of Research Institute of Science for India." Tata noted that, "If such a crusade in favor of asceticism of this kind were undertaken by a competent leader, it would greatly help asceticism, science and the good name of our common country; and I know not who would make a more fitting General of such a campaign than Vivekananda."

With the most genereous contribution of Maharaja of Mysore Shri Krishnaraja Wodeyar IV in the form of 400 acres of land in Bangaluru and initial amount of 5 lakhs of rupees, JNTata laid

the foundation for Indian Institute of Science. But it wasn't that easy. The now premeire institute was born out of a long-drawn-out battle of will with viceroy of India Lord Curzon, who expressed doubts regarding whether this country had qualified students to enter such a university? In 1912 Steel plant in Bihar rolled out steel and the city of Bombay switched on hydro electric power in 1915.

4.3 Seed growing into Tree

From then on the Tata trusts have promoted, and continued to support, several institutions of learning, research and culture in India. These include the Tata Institute of Social Sciences, Mumbai; the Tata Memorial Centre, Mumbai; the Tata Institute of Fundamental Research, Mumbai; the Tata Medical Center, Kolkata; the National Institute of Advanced Studies, Bengaluru; and the National Centre for the Performing Arts, Mumbai. The trusts have also helped in establishing the JRD Tata Ecotechnology Centre, Chennai.

[SLIDE] It is interesting to note that Swamiji discerned the importance of institutions to undertake indigenous research in science. We hear the echoes of this visionary's dream boomeranging again in 1966 and this time it was from Homi.Bhabha. In his address at Birla Hall, Bombay, he said, "A booster in the form of foreign collaboration can give a plane an assisted take-off, but it will be incapable of independent flight unless it is powered by engines of its own. If Indian industry is to take off and be capable of independent flight it must be powered by science and technology based in this country [19]". We all know Homi Bhabha had been earlier instrumental in setting up the Department of Atomic Energy and in conceptualising the design of the first nuclear reactor at Tarapore.

5 Conclusion

[SLIDE] In a lecture 'Work before us', Swamiji says, "The Hindu mind went on in its own direction and produced the most marvellous results. Even at the present day, the logical capacity of the Hindus, and the tremendous power which the Indian brain still possesses, is beyond compare [20]." He had visualized India's pre-ordained destiny of taking on the mantle of the world's leadership. This would not only be in the realm of spirituality but also in every other sphere be it economic, political or social. He called for self reliance in science and technology. Swamiji writes (chicago sep 1894) ... with proper care and attempt and struggle of all her disinterested sons, by combining some of the active and heroic elements of the West with the calm virtues of the Hindus, there will come a type of men far superior to any that have ever been in this world.

6 References

1. CW 3.48
2. Bhagavad Gita 13:2
3. CW 3.3
4. CW 3.3
5. CW-2:140

6. CW 3:4
7. CW 2:433
8. Neuroscience vs philosophy: Taking aim at free will: August 2011, url http://www.nature.com/news/2011/110831/full/477023a.html#B1
9. CW-8
10. CW 4
11. CW 1
12. CW-2:78
13. CW 7
14. Swami Vivekananda: An Intuitive Scientist pg40, Dr. TGK Murthy, published by RKMath Bangalore, 2011
15. CW 6:113
16. Swami Vivekananda In Comtenporary Indian News-vol 2, page48, Ramakrishna Mission Institute of Culture, 2007
17. ibid-pg49
18. CW 5:372
19. url http://www.igcar.ernet.in/press_releases/press29.htm
20. CW-3:270