Swami Vivekananda's interaction with scientists and his appreciation of them: celebrating his 150th birth anniversary

B. N. Dwivedi

This note gives a brief account of Swami Vivekananda's voyage to Chicago, his interaction with scientists and also his appreciation of them, and also his service to humanity with love as a 'law of nature'.

Swami Vivekananda at Chicago

As an 'orator by divine right' and as a 'messenger of Indian wisdom to the Western world', Swami Vivekananda (Figure 1) gave his first lecture on 11 September 1893 at the Art Institute of Chicago[1], on the first day of 'The Parliament of the World's Religions'. He began his speech with salutation: 'Sisters and brothers of America!'. An enthralled audience of about 7000 gave him a standing ovation. Vivekananda greeted the audience on behalf of 'the most ancient order of monks in the world, the Vedic order of sannyasins, a religion which has taught the world both tolerance and universal acceptance'. He finished his speech with appeal, 'help and not fight', 'assimilation and not destruction', 'harmony and peace and not dissension'. In his last speech on 27 September 1893 at Chicago, he proclaimed that the Parliament 'proved to the world that holiness, purity and charity are not the exclusive possessions of any church in the world, and that every system has produced men and women of the most exalted character'.

Figure 1. Swami Vivekananda (12 January 1863–4 July 1904), at Chicago in September 1893. (He has written in his own handwriting, both in Bengali and English as seen in the figure: 'One infinite pure and holy – beyond thought beyond qualities I bow down to thee'.)

Vivekananda's interaction with scientists and his appreciation of them

Vivekananda was a great scientific visionary of all times. He strongly believed that the scientific attitude is a key to the pursuit of truth. He said 'Do not believe a thing because you read it in a book! Do not believe a thing because another has said it so! Find out the truth for yourself! That is realization!' He sowed the seeds of Vedanta in the West and scientific growth in India. He considered the synthesis of east and west as the best model for mankind and for excellence. The eminent scientist Nikola Tesla (Figure 2) was charmed by the resemblance of the Samkhya theory of matter and energy and that of modern science.

Actually, in 1895, Vivekananda shared with Tesla the idea of matter and energy to be one, and requested him to prove it through mathematics. However, Tesla failed to accomplish it. Vivekananda also interacted with the other two giants of Western science, namely William Thomson (Lord Kelvin) and von Helmholtz in New York. Eventually after 10 years, in 1905, Albert Einstein (Figure 3) proved the oneness of matter and energy ($E = mc^2$). Vivekananda's exploration of

Figure 2. Nikola Tesla (left) and Swami Vivekananda (right).

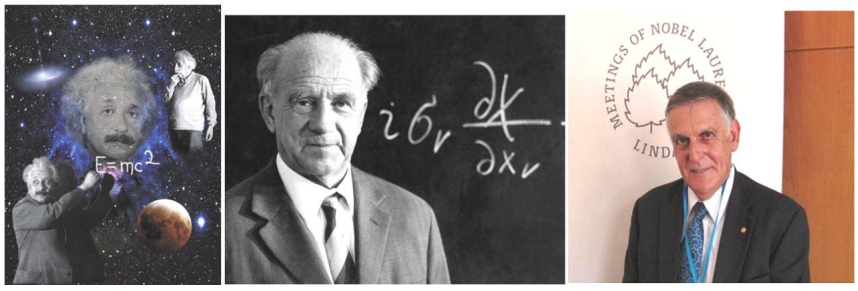

Figure 3. Albert Einstein (left), Werner Heisenberg (middle) and Dan Shechtman (right).

the cosmic universe was infinitely deeper than what science revealed after he was dead.

In 1929, Nobel laureate Werner Heisenberg (Figure 3) visited India as the guest of Gurudev Rabindranath Tagore. They interacted extensively on science and Indian philosophy. Greatly impressed by Indian thought, Heisenberg realized that the fundamental aspects of physical reality lay in the recognition of relativity, interconnectedness and impermanence. And this was the same as the foundation of the Indian spiritual traditions. These conversations with Tagore led Heisenberg to admit, 'Some of the ideas that had seemed so crazy suddenly made much more sense. That was a great help for me'.

Unlike religion, science is not dogmatic and it is open to revision. 'But in the frontiers of science there is not much of a difference between science and religion', said Nobel laureate Dan Shechtman (Figure 3) in an interview at Lindau on 4 July 2012 with a correspondent of *The Hindu*. It is remarkable to note that Albert Einstein has also summarized the relationship between religion and science in the same spirit as that of Vivekananda, 'Science without religion is lame, religion without science is blind'.

We now describe the case of J. C. Bose, who was immensely inspired by Vivekananda. Bose did pioneering research in physics and physiology. In 1889, Heinrich Hertz produced electromagnetic waves in the 60 cm wavelength range, which verified James Clerk Maxwell's electromagnetic theory. Bose investigated electromagnetic waves in the range of centimetre-wave to millimetre-wave. He was the first to detect 5 mm waves (60 GHz). In 1897, Bose presented his experiments on 2.5 cm to 5 mm waves at the Royal Institution in London (Figure 4). He could not detect short wavelength radio waves from the Sun, but speculated in prophetic wisdom: 'It may be that electric rays are absorbed by the solar or terrestrial atmosphere'. Bose also perfected the method of transmission and reception of electromagnetic waves. Proper credit is now being given to Bose for his pioneering work in the area of wireless telegraphy[2,3]. The Institute of Electrical and Electronics Engineers (IEEE) in one of its publications mentions: 'Our investigative research into the origin and first major use of solid state diode detector devices led to the discovery that the first transatlantic wireless signal in Marconi's world-famous experiment was received by Marconi using the ironmercury-iron-coherer with a telephone detector invented by Sir J. C. Bose in 1898'. (The true origin of the 'mercury coherer with a telephone' receiver that was used by Marconi to receive the first transatlantic wireless signal on 12 December 1901, has been investigated and determined. Incontrovertible evidence is presented to show that Bose invented the novel wireless detection device. His epoch-making work was communicated by Lord Rayleigh to the Royal Society London on 6 March 1899, and read at the Royal Society Meeting on 27 April 1899. It was then published in the *Proceedings of the Royal Society*. This corrected the century-old misinformation on an epoch-making invention of semiconductor devices by Bose which has been recognized in recent years.)

Bose was a pioneer in microwave optics technology. He was the first to show that semiconductor rectifiers could detect radio waves. His galena receiver was amongst the earliest examples of a lead sulphide photoconducting device.

In 1900, Bose presented on epoch-making paper at the International Congress of Physics held in Paris on 'On the similarity responses of inorganic and living matter', and compared the responses to the excitation of living tissues with that of inorganic matter. He gave a fresh scientific impetus to the age-old wisdom of the East, i.e. the basic unity of all life. Swami Vivekanada who was then in Paris, went to hear Bose at the Congress. While describing his impression about the Congress, Swami Vivekananda wrote, 'Here in Paris have assembled the great of every land, each to proclaim the glory of his country. Savants will be acclaimed here; and its reverberation will glorify their countries. Among these peerless men gathered from all parts of the world, where is thy representative, O thou the country of my birth? Out of this vast assembly a young man stood for thee, one of thy heroic sons; whose words here electrified the audience, and will thrill all his countrymen.'

Bose used his own invented crescograph[4] to demonstrate the similarity between plant life and animal life. His work on the quasi-optical properties of very short radio waves led him to improve a radio detector. Swami Vivekananda was greatly delighted and impressed to listen to this, e.g. the response of living and non-living objects to electrical current. He asked Bose to file for its patent, and took the help of his followers Sister Nivedita and Sara Bull in this context. It is noteworthy that the first semiconductor device and the photovoltaic cell has the US Patent No. 755840, awarded in 1904. This is one of the finest examples of Vivekananda's enthusiasm for science and respect for scientists.

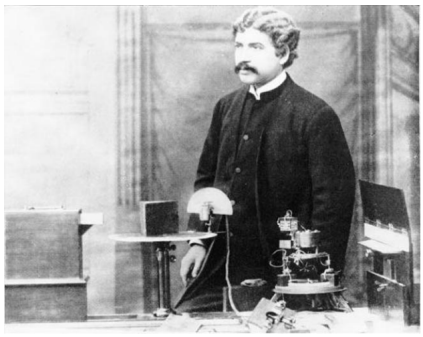

Figure 4. J. C. Bose at the Royal Institution, London in 1897.

Vivekananda and Tata

Swami Vivekananda met Jamshetji Tata (Figure 5) on a ship in 1893, and discussed the latter's plan of bringing the steel industry to India. Tata wrote to Vivekananda five years later: '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, of which you have doubtless heard or read'. Impressed by Vivekananda's views on science and leadership abilities, Tata wanted him to guide his campaign. Vivekananda endorsed

Figure 5. (Left) Jamshetji Tata (founder of IISc). (Right) IISc logo.

the project with enthusiasm. Today, the Indian Institute of Science (IISc), Bangalore (Figure 5) has become a centre of excellence in the world, thanks to Vivekananda's holistic vision. Actually, Tata offered the first Directorship of this Institute to Vivekananda. Inspiration by Vivekananda resulted in two world-class premier institutions in India, namely IISc and Tata Institute of Fundamental Research in Mumbai.

Vivekananda's message to the countrymen

Swami Vivekananda returned to India in January 1897. He received an enthusiastic welcome everywhere. He awakened his countrymen/women by delivering a series of lectures in different parts of the country. This created a great stir all over, and inspired his countrymen to do the following:

- to rouse the religious consciousness of the people and create in them pride in their cultural heritage;
- to bring about unification of Hinduism by pointing out the common bases of its sects;
- to focus the attention of educated people on the plight of the downtrodden masses, and to expound his plan for their upliftment by the application of the principles of practical Vedanta.

What a messenger of light and life and to humanity! His service to humanity with love as a 'law of nature' is clearly reflected in his poem: 'All love is expansion, all selfishness is contraction. Love is therefore the only law of life…'.

Following his message to humanity and practising it in words and deeds would be a real tribute to this great visionary, while celebrating his 150th birth anniversary (1863–2013). I conclude by quoting Ramakrishnan[5]: 'So, inspired by him, let us go forth and learn not only how to read well the book of Nature, but how to write something new, different, and significant'.

1. Dwivedi, B. N., *Hindustan Times*, 31 October 2013.
2. Emerson, T. D., *IEEE Trans. Microwave Theory Techn.*, 1997, **45**, 2267–2273.
3. Bandyopadhyay, P. K., *Proc. IEEE*, 1998, **86**, 259–285.
4. Response to wireless stimulation in *Life Movements in Plants*, Bose Research Institute, Calcutta, 1919, pp. 418–424.
5. Ramakrishnan, T. V., preprint.

ACKNOWLEDGEMENT. I thank Prof. T. V. Ramakrishnan whose lecture note on 'Vivekananda and modern science' inspired me.

B. N. Dwivedi is in the Department of Physics, Indian Institute of Technology (BHU), Varanasi 221 005, India.
e-mail: bnd.app@iitbhu.ac.in