

Rajinder Singh *

The Nobel Laureate CV Raman and his contacts with the European men of science in political context

(1) Introduction

In 1928 C.V. Raman¹ (1888–1970) [see Figure 1 and Box 1] and K.S. Krishnan (1898–1961) observed that if monochromatic light is passed through a transparent medium, thereafter the scattering light is accompanied by other colours. This phenomenon was later named as Raman effect.² The effect helps to find out the molecular structure of substances. In 1930 Raman was awarded the Physics Nobel prize “for his work on light scattering and the discovery of the effect named after him.” He was the first Asian to receive this honour. This made him extremely popular.

C.V. Raman interacted with the wide scientific community for about half a century and visited many countries. Some of the important physicists who corresponded with Raman were Wladyslaw Natanson,³ Niels Bohr, Max Born, Erwin Schrödinger, Arnold Sommerfeld and Ernest Rutherford.

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¹ For biographical details, see: *C.V. Raman: A Short Biographical Sketch* (1938); J. Mehra, *Chandrasekhara Venkata Raman*, (in: *Dictionary of Scientific Biography*, C.C. Gillispie, ed.), Vol. XI (1975), pp. 264–267; G.H. Keswani, *Raman and His Effect* (1980); P.R. Pisharoty, *C.V. Raman* (1982); S.N. Sen, *Prof. C.V. Raman: Scientific Work at Calcutta* (1988); G. Venkataraman, *Journey Into Light: Life and Science of C.V. Raman* (1994); A. Jayaraman, *C.V. Raman: A Memoir* (1992); G. Venkataraman, *Raman and His Effect* (1995); R. Singh, *Nobel Laureate C.V. Raman's Work on Light Scattering — Historical Contributions to a Scientific Biography* (2004); R. Singh, *Nobel Laureate C.V. Raman's Science, Philosophy and Religion* (2005).

² In German literature the Raman effect is also known as either the Raman – Smekal effect or the Smekal – Raman effect, because Austrian physicist Adolf Smekal theoretically predicated it. In Russian literature it is called the combination scattering or the Landsberg – Mandelstam – Raman effect, as the Russian scientists GS Landsberg and LI Mandelstam made the discovery nearly at the same time. However, they published their results later and quoted Raman and Krishnan publications. Later it led to dispute not only on the credit for the discovery, but also the sharing of the Physics Nobel Prize in 1930. For details, see R. Singh and F. Riess, Seventy years ago — The discovery of the Raman effect as seen from German physicists, *Current Science* 74 (1998), p. 1112–1115; R. Singh & F. Riess, C.V. Raman and the story of the Nobel Prize, *Current Science* 75 (1998), p. 965–971; The 1930 Nobel Prize for physics — a close decision?, *Notes and Records of the Royal Society of London* 55 (2001), p. 267–283.

³ CV Raman was the first scientist to explain the blue color of the sea. He applied E – S equation for liquids (named after Albert Einstein and M von Smoluchowski). Raman's letter of October 15th, 1922 to Wladyslaw Natanson (University of Cracow), indicates the contacts between them. The letter follows:

Permit me to thank you very cordially for the reprints of your papers on molecular scattering of light which you have been so good to send me. I am also very grateful for your appreciation of my work and for your suggestions you have made. My essay was written very hurriedly and I am not surprised to discover that I overlooked a good deal of the earlier literature. Most of the omissions will however be set right in the fuller volume which I have in contemplation as soon as the program of work I have in hand is completed. A series of papers will shortly appear in *the Phil. Mag.* and *Proceedings of Royal Society* describing the experimental researches carried out at this Association on this subject. I hope to collect these together and get up a book in which I shall not fail to do justice to your valuable theoretical work in this connection. *The Bull. of the Acad. of Cracow* has hitherto been entirely inaccessible in Calcutta. I should be very glad if you could use good offices with the Academy to arrange an exchange of publications for the future between this [Indian] Association [for the Cultivation of Sciences] and the Academy. I shall shortly be sending you some of the publications of this Association which may be acceptable to you.

[I am thankful to Mrs. Ewa Wyka (Cracow Science Museum) for bringing this letter to my attention and sending].

First, I scantily discuss Raman's interaction with some of the these physicists. My second point deals with the visit of one of the secretaries of the Royal Society of London, AV Hill to India in 1943. He came to organise the scientists for war efforts. I show that this visit preshaped the role Raman had to play after India's independence in 1947.



Figure 1:

C.V. Raman

(Courtesy: Raman Research Institute, Bangalore)

C.V. Raman (1888–1970)

- 1907–1916 : Bank officer and “part-time scientist”
- 1917–1932 : Professor at the University of Calcutta
- 1924– : Elected as the Fellow of the Royal Society of London
- 1928 : Discovered the Raman effect
- 1930 : Won the Physics Nobel Prize
- 1933 : Appointed as the director as well as Head of Physics Department at the Indian Institute of Sciences, Bangalore
- 1934–1970 : President of the Indian Academy of Sciences, Bangalore
- 1949 : Founded the Raman Research Institute, Bangalore

Research fields: Acoustics (Music instruments), light scattering, ultrasonic, lattice dynamics and physiology of vision

Editor/Founder of Journals: *Bulletin IACS, Proc. IACS, Indian Journal of Physics, Current Science, Proceedings Indian Academy of Sciences.*

(2) Raman's contact with the Western men of science⁴

Lord Rayleigh's reply to Raman of date July 15th, 1906 indicates that the latter started communication abroad while he was a student.⁵ Unfortunately, little is known about Raman's correspondence until 1921. We know definitely that he started writing letters after his first visit to England in the beginning of 1920s. In this decade he established contacts, in particular either with the Nobel Laureates or those closer to the Nobel Committee. After winning the Nobel Prize in 1930, he became much more influential and famous. In the beginning of 1930s he was at the peak. It was also during this period, that the Nazi came in power. It is a well-known fact that many were forced to leave Germany. However, less known part of the story is that some of the scientists tried to get positions at Indian Universities. Raman was one of the persons to support them.

Raman's activities for the displaced scientists

In 1933 Raman was elected as the first Indian Director of the Indian Institute of Sciences, Bangalore. At the same time he was the Head of the Department of Physics, which was yet to be founded. He was well aware that theoretical physics (in particular quantum mechanics) was missing in India. Not surprisingly, he wrote a letter to Max Born⁶ — one of the founders of quantum mechanics and asked to suggest a few names of theoretical physicists. In a letter of February 18th, 1934 Born replied,

~~"I should be glad if I could help you to find a younger man for your university. There are several excellent people: Peierls, Nodheim, Heitler, Bethe and others"~~ (struck off in original).

In the end he decided to come himself for a period of 6 months. He was hoping to stay longer, but due to various reasons he had to return back after finishing his term of 6 months.⁷ Like Born, the father of Wave Mechanics, Erwin Schrödinger also got invitation for working at Indian universities. Born-Schrödinger correspondence shows that the latter declined the offer, as the salary was too low.⁸ Another scientist from German speaking area was Hungarian chemist Georg de Hevesy, who was working in Freiburg. He declined Raman's invitation, as he was afraid that his knowledge might stagnate in India.⁹

Some of the fleeing scientists, who managed to come to India, had to face problems. One such example is that of R. Samuel, one of Born's students from Göttingen. He was working at the Muslim University Aligarh. On April 22, 1936 Raman wrote a letter to the Rector of the Hebrew University, Jerusalem. In the letter he explained the difficult situation Samuel had to face in Aligarh and recommended him for the chair in Jerusalem.¹⁰

Another example of Raman's activities is his proposal for the Nobel Prize in favour of Otto Stern. In his letter of October 25th, 1933 Raman stated as follows:

I understand, however, that Professor Stern has been displaced from his chair by the present Government in Germany. The award of the Nobel Prize to him will have at least

⁴ For Raman's contact with Austrian, British, Dutch, French, German, Hungarian, Russian, Scandinavian and USA scientists, see under Ref. 1, R. Singh, *Nobel Laureate C.V. Raman's work on light scattering ...* (2004), pp. 147–190.

⁵ S. Ramaseshan & CR Rao, *C.V. Raman — A pictorial biography* (1988), see section, *Raman in Madras*.

⁶ For Max Born's biography see, N.T. Greenspan, *The end of the certain world: The life and science of Max Born. The Nobel physicist who ignited the quantum revolution* (2005).

⁷ For more detail about the stay, see in Ref. 1, R. Singh, *Nobel Laureate C.V. Raman's science, philosophy and religion* (2005), pp. 162–196, & pp. 215–238.

⁸ Ref. 1, R. Singh, *Nobel Laureate C.V. Raman's work on light scattering ...* (2004), p. 150.

⁹ R. Singh, "CV Raman and his contact with Hungarian scientists", *Indian Journal of History of Science*, 37 (2002), pp. 175–191.

¹⁰ Ref. 1, R. Singh, *Nobel Laureate C.V. Raman's work on light scattering*, 2004, p. 133. R. Samuel got position at the University of Tel-Aviv, for detail see, I. Unna, "The genesis of physics at the Hebrew University of Jerusalem", *Physics in Perspective* 3 (2000), pp. 336–380.

this great merit that it would relieve him from distress and enable him to continue his most important investigations.

The forgoing discussion clearly shows that Raman was a political active scientist, and was well aware of the political situation in Europe. However, his sense of politics was different, namely, the politicians should listen scientists and not others way round (details below).

(3) The historical meeting of the Royal Society of London in Indian and Raman's role

Raman got his entire education in India. Due to historical reasons, British men of science were the first, who influenced his educational and scientific carriers.¹¹ Before he made his first journey to Europe in the beginning of 1920s, he was well known due his researches in the field of acoustics. The available documents suggest little about Raman's political views before the Second World War. It was during the war that he gave a statement, which appeared in a local newspaper on July 23rd, 1940. It follows:

When Indian cities are bombed by Nazis — we will become war-minded — force can be vanquished only by greater force. Raman pooh-poohed Mahatma Gandhi's theory of non-violence. Indian should support British victory.

Hill's letter to Born of Oct. 13th, 1941 indicates that during this year, there was a discussion among British scientists that Indian men of science should be supported for their work and ought to be involved in war efforts. However, the representatives of the Government of India did not show any interest.¹² It was only in 1943 that the Royal Society was asked by the Secretary of State for India to send a representative who should advice on the organisation of scientific research.¹³ In this connection AV Hill, a secretary of the Royal Society was informed about the 'possible fields for extra-mural work in connection with the armed forces in India' like signals and electrical equipment, wireless communication, airborne forces.¹⁴ On November 16th, 1943 Hill arrived India.¹⁵ Three days later he wrote a letter and asked for information about the 'Heads of Enquiries on Scientific Research Resources in India' in the field of Engineering, Chemistry, Biology and Health Researches.¹⁶ On November 18th, 1943 AV Hill wrote to Sahni that the former had been empowered as a Vice-President of the Royal Society by the President Henry H. Dale — and had been asked to forward latter's letters to Birbal Sahni (Biologist), Raman, Homi J Bhabha (Physicist) and Shanti S Bhatnagar (Chemist). In the same communication Hill wrote to Sahni as follows,

... The Council of the Royal Society asked me to do a thing which will be unique in the history of the Society, and to act on behalf of the President in admitting four Fellows (Bhatnagar, Bhabha, Krishnan and Sahni) of the Society who have never yet been able to present themselves at a meeting of the Society in London for their admissions.

In Dale's letter of Oct. 29th, 1943 to Sahni it was written that the ceremony of signing the parchement (by Bhabha, Bhatnagar, Krishnan and Sahni) at the occasion of the Indian Science Congress session would be preferred. Another letter of Dale written on October 29, 1943 was directed to the President of the National Academy of Sciences, Allahabad. It reads:

I am asking Professor Hill to transmit, through you, the cordial greetings and friendly sentiments of the Fellows of the Royal Society of London to the Members of the National

¹¹ For detail, see R. Singh and F. Riess, The Nobel Laureate Chandrasekhara Raman and his contacts with the British scientific community in a social and political context, *Notes and Records of Royal Society*, 58 (2004), pp. 21–46.

¹² A.V. Hill, *A report to the Government of India on scientific research in India* (1944), p.5. [I am thankful to Jahanvi Phalkey for sending this document].

¹³ Ibid., A.V. Hill, *A report to the Government of India on scientific research in India* (1944), p. 6.

¹⁴ (Name not readable) A.O.R.G. to A.V. Hill, letter dated Sept. 22, 1943.

¹⁵ Ref. 12, A.V. Hill, *A report to the Government of India on scientific research in India* (1944), p. 6.

¹⁶ Lieut.-General M.G.O. to A.V. Hill, letter dated Nov. 19, 1943.

Academy of Sciences. We have the confident hope that one of the results of Professor Hill's visit will be to strengthen the bonds of understanding and true comradeship between our Indian colleagues and the men of science of this country.

At that time India had three science academies (which still exist), namely, the National Academy of Sciences (Allahabad), the National Institute of Sciences of India (today known as the Indian National Science Academy) and the Indian Academy of Sciences (Bangalore). Each considered herself representing Indian scientific community.

Regarding attending the meeting in Delhi, Raman (the founder of the Indian Academy of Sciences) consulted the matter with Bhabha and Krishnan, and they formulated a letter, in which they appreciated Dale's offer of co-operation between British and Indian scientists. They were suspicious of losing the opportunity to sign the Charter Book in the historic room of the Society in Burlington, and also their objection was,

We ... feel that if a function of the kind proposed, which clearly affects only the Fellows of the Royal Society, is held for the purpose of obtaining our signatures in India, then it should be entirely unconnected with the meeting of any other society or organisation in India.¹⁷

Raman who was not at all affected supported 'his candidates' in the letter by writing an extra sentence: "*I entirely agree with and support the views expressed above*". In a separate letter of December 3, 1943 he asked Sahni that if he agreed to the content of the accompanying letter he should sign it on the first place being the senior. He was also informed that including him (Raman), Bhabha and Krishnan were not going to attend the Indian Science Congress (ISC). In a letter of Dec. 10th, 1943 Sahni informed Hill about the joint letter and their decision not to attend the ISC. From Hill's response of December 14th, 1943, it is evident that he was not happy with it and was of the opinion that the ceremony of signing the parchment should take place before the inauguration of the meeting. It seems that the reason for preferring this occasion was that the Indian Science Congress was a general body of Indian scientists opened to Universities and Colleges teachers as well as research institutions; thus a better platform to attract the attention of participants to show the recognition by the Royal Society, and motivate the scientists for war efforts and post-war programmes.

In the history of 281 years of the Royal Society it was the first meeting that took place outside England.¹⁸ According to *The Hindustan Times* of January 4th, 1944, Hill inaugurated the historical meeting in Delhi. Hill's lecture shows that only Bhabha and Bhatnagar were present to sign the parchment.¹⁹ On December 21st, 1943, Bhabha had written a letter to Sahni and indicated about his decision. He also suggested that he and Krishnan should attend the special meeting. If Raman will not attend, it will not be seen as unfriendly.

On April 6th, 1944 Hill left India.²⁰ He ensured the co-operation between two countries. To put it into practice, the Government of India decided to send a delegation of the Indian scientists. *The Hindustan Times*, of April 6th, 1944, shows that some the Indian scientists accepted the invitation, but Raman declined. Raman's omission was a matter of concern in India, and was interpreted as a nationalistic action, which fitted to the political situation of those days. A local periodical *The Blitz* on October 28th, 1944 reported:

An Indian Scientists Mission without C.V.? A Hamlet without the Prince of Denmark!
No, the clue perhaps lay elsewhere; C.V. Raman is not merely a scientist, dead to all life

¹⁷ B. Sahni, K. S. Krishnan, H.J. Bhabha and C.V. Raman to A.V. Hill, letter dated Dec. 2, 1943 [Courtesy Nehru Memorial Museum and Library (NMML), Delhi].

¹⁸ A.V. Hill's speech at the special meeting of the Royal Society at Delhi, Jan. 3, 1944 [Courtesy NMML, Delhi].

¹⁹ A.V. Hill's speech at the special meeting of the Royal Society at Delhi, Jan. 3, 1944. Also see the periodical, *Amrita Bazar Patrika*, Jan. 4, 1944 [Courtesy NMML, Delhi].

²⁰ A.V. Hill delivered lectures at Aligarh, Bangalore, Bombay, Calcutta, Delhi, Hyderabad, Madras and some other cities. (See Ref. 12, A.V. Hill, *A report to the Government of India on scientific research in India* (1944), p. 7, footnote).

around. He is also a patriot. Under Prof. Hill's auspices, in a mission sponsored by the Government of India, will they be touring at own will? Will they be touring at their free discretion? Is there a free Government behind them? C.V. Raman is a great scientist, but not a good salesman for British wares.

After his return to England, Hill had prepared a report entitled, *Scientific Research in India*. It deals with various fields of research and possible cooperation between the scientists from the two countries. It was meant not only for war period, but also thereafter. It was a preparation for the so called the "*Empire Scientific Conference*", which followed later (details below). In the report, on pages 49 to 52 he wrote about different science academies. according to his opinion,

Of the three, the body best suited by constitution and membership to assume the role of a national academy of science, such as, The Royal Society (London), etc., is the National Institute of Sciences of India. It is oddly named for such a body, but that was due to a compromise which was necessary at the time it was founded.

Hill — a schrewed "political-scientist" — a representative of the Royal Society gave leading role to the NIS. It had far reaching consequences. It was evident that Raman and most of the south Indian scientists will not accept it.

For preparations for the *Empire Scientific Conference*, on March 1st 1945 a preliminary meeting was held in Delhi. The committee examined the subjects which were proposed by the Royal Society for discussion at the conference. Eight subjects for the evening sessions were proposed. Saha was suppose to prepare on "*Nuclear Research*", "*Scientific aspects of radio communication and Meteorological research and climate*". Bhabha had to communicate *Cosmic Rays*. In his absence, it was decided that Raman should prepare a paper on:

Discussion of measures for improving the dissemination of scientific information within the Empire including the dissemination of scientific news to the public generally and of scientific and technical information to industry, as well as abstracting the library service.

If he did not wish to represent a paper, MN Saha was requested to do so. Sahni attended the meeting. His name did not appear in the list of those whose were to present a paper. However, in the list of "*Subject for evening session*" he was the last person.²¹

On March 4th, 1946 Bhatnagar as the Director of Council of Scientific and Industrial Research (CSIR) wrote a letter to Edward Appelson — Secretary, Department of Scientific and Industrial Research, London and sent the names of candidates for the Empire Scientific Conference. Raman, Saha and Sahni appeared as the first three candidates, but they were listed as un-official delegates²², while Bhatnagar and 7 more as official candidates, with Bhatnagar as the leader of official delegation. The list was forwarded to OF Brown — Department of Scientific and Industrial Research, London on March 5th, 1946. Next day, that is, on March 6th, 1946 Bhatnagar sent a list to Alfred Egerton — Secretary of the Royal Society. Though the list contains the same candidates, the order in the list is not so as that of date March 4th, 1946.

It seems the Royal Society was not happy with the list, which was sent by the Government of India. A letter from the Office of the High Commissioner for India, London reached to the Secretary of the India. In part it reads: "*The Royal Society have now enquired which one of the Indian Deligates would be its leader, adding, in this connection, that amongst those named in the list Sir C.V. Raman is the senior Indian Fellow. I am to request that the information now asked for may kindly be sent as early as possible and preferably by cable*". The Government of India took a diplomatic step. Its representative HVR Iengar on March 13th, 1946 sent the following reply:

In view of certain delicate personal problems of which prof. Hill will be aware, we have decided not to appoint anyone as leader of the Delegation. Bhatnagar will be leader only

²¹ SS Bhatnagar's papers, p. 191 [Courtesy National Archive of India, Delhi].

²² Unofficial candidates were either Presidents of Academies or other scientific organisations like Indian Chemical Society, Biological Society of India and Indian Science Congress, whereas the "official candidates" were selected by the Government from Departments such as Council of Scientific and Industrial Research, see Anonymous to BFHB Tyabji, letter dated 27.7.1945 (Bhatnagar's paper, p. 34).

of the official group and we propose that he should be treated as convener of the Delegation for purposes of general conference.²³

In January 1946, the Economic & Overseas Department sent a copy to Bhatnagar, in which a Programme for the British Commonwealth Scientific Conference was chalked out. The conference was to take place in July 1946.²⁴ Though the Presidents or the Nominee of the three Academies were invited, Raman refused to join. As we have seen above, the NIS was declared by Hill as the “real” Academy. Raman wrote to Akbar Hydari — Member-in-charge of the Department of Planning and Development (Delhi).²⁵ In the same letter he pointed out that his action should not be understood as disrespect to the Government and further

I am most anxious that my action should not be misunderstood by that society which had treated me with great consideration during the past years.

He requested Hydari to forward a copy of this letter and also about his withdrawal from the delegation to the Royal Society.

From the foregoing discussion, one gets the impression, as if Raman was an egoist and self-centered, considering his own interest, trying to bring “his Academy” in the center. It is only a minor part of the story. The fact is that he had different understanding of science and politics as we shall see below. To argue the case I give three examples from different periods.

Already in the 1930s, a local newspaper *The Leader*, (December 2nd, 1931) give some glimpses on this issue. While addressing convocations at the alumni of the Agra and Allahabad Universities he mentioned that the universities should be freed from the baneful effects of political intrusion.

The day when universities are run not by your teachers but by your politicians will be the day when Indian will slip down on the road and become a fifth class power like Rumania and Bulgaria. She will not then be able to rise the height of Great Britain and Germany.

The second case is directly related to the Royal Society. After Hill’s visit and the role played by the Royal Society in the following years, Raman judged the political situation correctly. In the late 1940s he felt the political elements are dominating in the Royal Society, as is evident from the following statement:

we need not to look at the Royal Society for guidance. The Royal Society today, in spite of its distinguished past, was unfortunately tending to become more a political than a purely scientific body. Some of the official of the Royal Society seemed to be more interested in maintaining British connections with India than to any purely scientific research. The mixture of politics and science ... was not likely to prove a success and it was not well that Indian had taken a step, which would enable her to take an independent line in the international scientific field.²⁶

Even in independent India Raman reflected his way of thinking again. For instance, after 1948 he

hardly ever attended the Indian Science Congress..., on the ground that they are inaugurated by politicians. ... The politician who invariably inaugurated the yearly Congress from 1949 until his death in 1964 was Jawaharlal Nehru.²⁷

Raman who did not agree with the existing development in India, distanced himself from the state policies, but continued his scientific activities in the IAS and the Raman Research Institute.

²³ SS Bhatnagar’s papers, p. 195

²⁴ SS Bhatnagar’s papers, p. 134.

²⁵ C.V. Raman to A. Hydari, letter dated March 27, 1946 [Courtesy NMML, Delhi]

²⁶ *The Hindu*, Document No. RP 9.52 [Courtesy Raman Research Institute, Bangalore].

²⁷ Ref. 1, G.H. Keswani (1980), p. 106.

(3) Conclusion

To conclude we see that Raman was a politically active scientist, but his understanding of the relation between scientists and the state was different. He was of the opinion that politicians should take the advice of scientists, and not the other way round.

Raman's invitations to Western men of science was a partial success. One of the reasons being a lack of support from the colonial government. Obviously, the success of a project depends on financial support. Interpreting the above story in European context, it can be suggested that bodies like the Royal Society (London) will play active roles to push the benefits their own countries.

So far the "migration" of individual scientist with European Community is concerned, it will be influenced by monetary and scientific factors.