

SIR C. V. RAMAN  
A SHORT BIOGRAPHICAL SKETCH

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## I. EARLY CAREER.

Born at Trichinopoly in Southern India on the 7th of November, 1888, Sir C. V. Raman is now 43 years of age. He was educated at the Mrs. A. V. N. College, Vizagapatam and at the Presidency College, Madras. Even at an early age, he showed evidence of unusual powers of mind. When only 16 years old, he took his B.A. degree in science, being the only first class of the year, and receiving the University Gold Medal. Two years later, he took the M.A. degree in the first class, obtaining record marks. He published his first scientific paper in the Philosophical Magazine of London at the age of 18 while still a student at College. In January 1907, he sat for the competitive examination of the Indian Finance Department, and heading the list of successful candidates, was appointed as a Gazetted Officer under the Government of India. While in the Government service, he continued his research work at the Indian Association for the Cultivation of Science, Calcutta, and elsewhere, and published numerous original papers. His contributions to science drew the attention of the late Sir Asutosh Mookerjee, Vice-Chancellor of the Calcutta University, who offered the young officer, then 25 years of age, a permanent incumbency of the newly endowed Palit Professorship at the University. The offer was courageously accepted in spite of the serious financial loss which it involved.

## 2. INTERNATIONAL RECOGNITION.

Owing to legal difficulties in connection with the Palit endowment, there was some delay in entering upon the duties of the Chair. Sir C. V. Raman joined the appointment in July, 1917, and the success which he quickly

achieved in building up a school of research was recognized by the conferment on him of the Honorary degree of Doctor of Science by the Calcutta University in January, 1922, and by his election to the Fellowship of the Royal Society of London in February, 1924. These were the two first in a long series of academic honours which he has received by way of recognition of his eminent services to science. The following are some of the distinctions which have come to him in rapid succession :

Nobel Laureate in Science	...	...	...	1930
Hughes Medalist of the Royal Society of London	...			1930
Matteucci Medalist of the Italian Society of Sciences, Rome	...	...	...	1928
Hon. Ph.D. of the University of Freiburg	...			1930
Hon. LL.D. of the University of Glasgow	...			1930
Hon. LL.D. of the University of Bombay	...			1931
Hon. D.Sc. of the University of Benares	...			1932
Hon. D.Sc. of the University of Dacca	...			1932
Hon. D.Sc. of the University of Madras	...			1932
Hon. Fellow of the Indian Mathematical Society	...			1929
Hon. Fellow of the Zurich Physical Society	...			1930
Hon. Fellow of the Royal Philosophical Society of Glasgow	...	...	...	1931

As president of the Indian Chemical Society, it has been my privilege to nominate him recently for election to the Honorary Fellowship of the Society.

Sir C. V. Raman held a Visiting Professorship for a session in 1924 at the Norman Bridge Laboratory, Pasadena, in the United States. He has lectured by special invitation before numerous societies and Universities abroad amongst which may be mentioned the following :

The British Association for the Advancement of Science ; The Faraday Society ; The Physical Societies of England, France, Belgium, Denmark and Switzerland ; The Royal Canadian Institute ; The International Congress of Mathematicians ; The Mendeleff Congress of Chemistry ; The Universities of London, Cambridge, Edinburgh and



Glasgow ; The University of Paris ; The Universities of Munich, Aachen and Freiburg ; The Universities of Stockholm, Upsala, Goteborg and Oslo ; The University of Leningrad ; The Universities of Toronto, Iowa and Leland Stanford. He has also delivered special courses of Readership lectures on recent advances in science before the Universities of Madras, Bombay, Lahore, Patna, Nagpur and Dacca. He was President of the Indian Science Congress in 1929.

### 3. POSITION IN PUBLIC ESTEEM.

As an acknowledged leader of science in his own country, Sir C. V. Raman holds a unique position in the public estimation in India. Civic receptions have been held in his honour and addresses have been presented to him by the City Corporations of Calcutta, Madras, Lahore, Bangalore, Bezwada and by numerous public institutions and societies. The respect with which his opinions on academic questions are regarded is indicated by the invitations which have been extended to him to deliver the Convocation addresses at the Universities of Benares, Mysore, Andhra, Nagpur, Agra, Allahabad and Dacca. He was nominated by the Government of India as a member of the Committee of Four which in 1921-22 framed a new scheme for the management of the Indian Institute of Science at Bangalore ; under this scheme, he has since been repeatedly elected by the Universities of the Eastern Group in India as their representative on the Council of the Institute. The Government of the United Provinces invited him to visit the Harcourt Butler Technological Institute at Cawnpore, and submit proposals for improving its organization. Acting on his advice, the Government of Madras legislated for the transfer of the headquarters of the Andhra University from Bezwada to Waltair. He has assisted in organizing a University College of Science and Technology at Waltair and has been requested by the Governor of Madras to serve on the



Syndicate of the Andhra University. The University of Nagpur has requested him to serve on a Committee for framing a scheme for the administration of the bequest of Rs. 35,00,000 made by Rao Bahadur Laxminarayan for education in Applied Science and Chemistry in the Central Provinces.

It is well-known that Sir C. V. Raman is a fluent, humorous and persuasive speaker, and his appearance on a public platform in any city in India is sufficient to attract an educated audience running to hundreds or even thousands in number. This has enabled him to gain an influence on the popular mind which he has systematically used to foster public interest in science and scientific research. The public recognizes in him a watchful guardian of the interests of science in India. When recently, the Government of India were carrying out drastic retrenchments in the expenditure on scientific services and research, Sir C. V. Raman took the lead in organizing public opinion against such action, and secured strong support from the Press, the Chambers of Commerce and the Inter-University Board in his campaign. The Royal Society of London, the scientific press, and many men of science in foreign countries warmly supported the protests contained in the Memoranda submitted by him to Government, and the severity of the retrenchments originally contemplated has been appreciably mitigated in consequence.

#### 4. HIS WORK AS FINANCE OFFICER.

The ten years of service from June, 1907, to July, 1917, as an Officer of the Indian Finance Department gave Sir C. V. Raman an administrative training and a knowledge of financial and economic affairs, such as scientific men do not always possess. From the early age of 21 onwards, he was placed in charge of Government offices, successively at Rangoon, Nagpur and Calcutta, and was called upon to supervise the work of large staffs and to control officers of gazetted rank older than himself. In the various positions

held by him, he acquired knowledge of an unusual range of financial questions, having been successively in charge of Currency operations, Savings Bank, Life Insurance, Public Debt, Works and Establishment Audit, Accounts and Budget. For his successful administration and devoted services, often under difficult and trying conditions, he repeatedly received the thanks of the Hon'ble Finance Member in charge of the Department. In the year 1916, he was invited to take up an appointment in the Government Secretariat at Simla, but declined as he had already decided to remain in Calcutta and accept the offer of the Calcutta University. In the ordinary course of events, even without special promotion, he would have risen to the rank of Accountant-General in the service, had he not chosen to quit the same at the call of science.

#### 5. HIS WORK AS A SCIENTIFIC ADMINISTRATOR.

Much of Sir C. V. Raman's scientific research has been accomplished in the laboratory of the Indian Association for the Cultivation of Science at Calcutta. He has been Honorary Secretary of the Association since 1919, and his activities have made its laboratory a centre of research known throughout the world of science. The prestige and influence acquired by him have been utilized towards strengthening the resources of the Association and obtaining funds for improving its laboratory and offering stipends to qualified workers. During the five years 1927 to 1931, a sum of about Rs. 2,50,000 was secured by him as donations from the State, from public bodies and private donors towards the work of the Association. As an example of his characteristic energy and initiative in promoting the interests of science, may be mentioned the foundation of the Indian Journal of Physics. This was commenced by him originally in 1919 as the Proceedings of the Indian Association for the Cultivation of Science, and continued under the new title since 1926. The Journal is now a well-established periodical with an international circulation

under Prof. Raman's editorship. It serves as an organ for the publication of research work carried out by himself and his collaborators at Calcutta, and original contributions are also published in it by his numerous friends and colleagues in other parts of India.

As elected Dean of the Faculty of Science in the Calcutta University, Sir C. V. Raman has many administrative duties to perform. As Chairman of the Boards of Studies in physics, he took the initiative in modernizing the courses in the subject for the Intermediate, B.Sc. and M.Sc. examinations, and has made efforts towards introducing the compulsory teaching of elementary science in all high schools controlled by the University. The prestige which the research activities of the Calcutta University continue to enjoy is to no small extent due to his great achievements and continued association with it. Sir C. V. Raman also takes an active share in the teaching and administration of the department of post-graduate studies in the University.

The Indian Science Congress which is a peripatetic body analogous to the British Association owes not a little of its present position and influence to the active association with it of Sir C. V. Raman during the first decade of its existence. As General Secretary and member of its Executive Committee for many years, he gave his time and energy freely to the task of organizing the Congress and making its meetings a success.

As member of Council of the Indian Institute of Science at Bangalore, he has taken special interest in the administration of the Institute and has initiated many improvements. His active support secured the creation of lecturer-ships in each of the different departments of the Institute and the institution of numerous research fellowships for the encouragement of promising workers. His periodical visits to Bangalore provided opportunity for the delivery of a series of lectures on recent progress in science which have aroused much enthusiasm in that city. His eminent services to the cause of research have been commemorated



in a special medallion founded in his honour by the South Indian Science Association at Bangalore.

Sir C. V. Raman has served as a member of Selection Committees for filling up numerous scientific appointments in India, a type of work which is obviously of the highest importance in relation to the welfare of the institutions concerned. As examples of his willingness to shoulder all kinds of administrative burdens, if thereby the interests of learning could be advanced, may be mentioned his periods of service as Treasurer of the Asiatic Society of Bengal, as a member of the Board of Accounts of the Calcutta University, and as Secretary of the Astronomical Society of India.

#### 6. FOUNDER OF A SCHOOL OF RESEARCH.

It is, however, as the creator of an indigenous school of research that Sir C. V. Raman has the strongest claims on the gratitude of his countrymen. The enthusiasm for research which led him to forsake a lucrative official career in favour of a life of scientific toil has overflowed and fertilized the minds and careers of a host of young men. From the laboratories of the Indian Association for the Cultivation of Science and of the University College of Science at Calcutta has emerged during the last fifteen years a galaxy of able scholars whose published researches and doctorate theses contain acknowledgment of suggestions or encouragement received from him. It is significant of the catholicity of his interests that among those who have come into association with Sir C. V. Raman in this way, there have been besides physicists, also many mathematicians and chemists, and a not negligible quota of workers in the fields of geology and biology. They are to be found all over the Indian Empire, filling important positions of various kinds. The Indian Meteorological service which is one of the most active and fruitful of the scientific departments of Government includes a group of the finest products of his school. The teaching staff of the Universities of Calcutta, Dacca, Allahabad, Benares, Chidambaram and Waltair, and of

the colleges in affiliation with the Universities of Nagpur, Agra and Lahore also contain many representatives of it. Not a few of the men who first imbibed the research spirit in his laboratory have in later life continued to make active efforts towards advancing knowledge, and attained distinction in their respective spheres of work.

It is remarkable that in spite of the increasing burdens of social and administrative duties which scientific prestige and influence naturally bring with them, neither his personal enthusiasm for research nor the productivity of the school directed by Sir C. V. Raman has suffered any diminution in quantity or quality with the lapse of years. The following figures showing the number of published contributions from his laboratory during the last decade are sufficiently significant :—

Years.		Papers.	Years.		Papers.
1922	...	25	1927	...	39
1923	...	26	1928	...	49
1924	...	17	1929	...	34
1925	...	20	1930	...	51
1926	...	22	1931	...	47

In 1924, 1925 and 1929, there was a slight falling off in the numerical output, evidently due to his prolonged absence from India during those years. Apart from this, as the figures given above and a glance at the pages of the *Indian Journal of Physics* will show, the output of the school has shown a notable increase in the volume of published work, in the variety of subjects dealt with and in the influence it has exerted on current scientific progress throughout the world.

In assessing the contribution of Sir C. V. Raman to the progress of science in India, we have to remember not only his own personal work and the direct effect of his teaching and example on the researchers in his laboratory and his University lectures at Calcutta, but also the more widespread and less easily assessed influence exerted by him in other ways. For nearly two decades, by his activities in

connection with the Indian Science Congress, by his publications and his conduct of the Indian Journal of Physics and more especially by the courses of experimentally illustrated lectures on recent advances in science delivered by him at nearly all the Universities in India, he has been the most active propagandist in the cause of research in India. To this must be added, the stimulus and encouragement afforded to the entire group of scientific men in India by the striking international recognition which his work has received, and more especially by the award, for the first time to an Asiatic man of science, of the Nobel Prize. Considering the facts altogether, it would be no exaggeration to say that Sir C. V. Raman has been the leading spirit in the remarkable growth of scientific activity which the last two decades in India have witnessed.

#### 7. A PATHFINDER IN SCIENCE.

It is not possible in such a brief sketch to make even a cursory mention of the numerous fundamental contributions to science which have secured for Sir C. V. Raman a position of acknowledged eminence in the world of science. He has not followed established paths, but made his own way into many different fields of research, and opened new roads of advance. The outstanding qualities of his work have been originality and versatility. He has been a theorist as well as an experimenter. His work has illumined the fundamental problems of chemistry quite as much as it has elucidated the basic principles of physics. Mathematicians, physicists and chemists alike regard him as one of themselves. He is, in short, a pathfinder in science whose work cuts across and effaces the artificially laid boundaries which divide natural knowledge into separate territories.

The outstanding contribution to science which has made his name familiar to students of science in every country is the discovery of the phenomenon known as the Raman Effect. To quote the words of a reviewer in a British scientific periodical, "the discovery of the Raman



Effect in 1928 has opened a view of research which has almost paralleled the early history of work in X-rays and radio-activity." Mathematicians hailed the discovery with delight, as they saw in it a confirmation of the new quantum mechanics which they had framed to replace the dynamics of Newton. Physicists and chemists also received the discovery with enthusiasm as it provides unlimited opportunities for experimental research and opens new pathways of investigation in their respective sciences. In scores of physical and chemical laboratories all over the world and indeed in every civilized country, the experiments on the Raman effect were repeated and applied to the solution of a variety of scientific problems. So great was the interest in the subject that it gave a new stimulus to the optical instrument industry; the leading manufacturers vied with each other in designing and producing spectrographs specially adapted for work in this field. The Faraday Society, and more recently also the International Congress of Chemistry invited Sir C. V. Raman to open discussions on the subject. Some 600 communications dealing with the phenomenon have appeared in the scientific periodicals during the past four years, and the spate of literature on the effect continues to flow. We are indeed yet only in the beginning of an era of scientific advance into problems concerning the nature of radiation and the structure of matter which this new tool of research has made possible.

The Calcutta investigations on the scattering of light and on the Raman effect have given a new direction to physical and chemical research. But they form only a part of the array of fundamental researches which have been pursued during the past decade in the laboratory of the Indian Association for the Cultivation of Science and which have brought the sciences of physics and chemistry into closer union with each other. Magneto-chemistry has received much attention, including particularly magneto-crystalline action and its relation to crystal structure, magnetic double refraction in relation to the structure of

organic compounds, magnetic properties of colloids and the magneto-optic behaviour of the rare earths. Theoretical and experimental work of great importance on the Kerr electro-optic effect and its chemical significance has also been accomplished. The importance to physical chemistry of the pioneer researches on X-ray diffraction in liquids, liquid mixtures and solutions done at Calcutta is widely recognized. X-ray studies of crystal structure made at Calcutta were also the first to establish the molecular form in such important substances such as naphthalene, anthracene and diphenyl. New theories have been developed by Sir C. V. Raman or under his guidance on diverse subjects having a chemical aspect such as the origin of colour in organic compounds, the explanation of fluid viscosity, the birefringence induced by flow in liquids, the dielectric behaviour and refractivity of fluids, the optical properties of crystals and the photo-elasticity of solids.

#### 8. SCIENCE AND INDUSTRIAL RESEARCH.

The laboratory of the Indian Association for the Cultivation of Science at Calcutta has under the guidance of Sir C. V. Raman become, during the past few years, a centre, not only for basic or fundamental investigations, but also for technological research. Various Indian minerals have been investigated for their economic value. A systematic study of the chemistry of coal formations in India has been undertaken. New processes and new materials have been discovered or worked out and attempts made to find an industrial application for them. Amongst the results of such research may be mentioned a new synthetic resin, a new refractory material for the glass industry, new methods for the extraction of rare earths from Indian minerals, a new type of reproducing point for talking machines, and so on. This kind of activity has been encouraged by Sir C. V. Raman, as he is deeply interested in the problem of improving the economic position of India by the applica-

tion of scientific methods to her arts and industries. His own researches extending over a quarter of a century and covering many branches of physics and chemistry have brought him into close touch with the applications of these basic sciences in engineering and technology, and convinced him that a grasp of scientific principles is an essential preliminary to technical and industrial progress. His success in building up a school of research has shown that there is no lack of scientific talent in the country and therefore no insuperable obstacle in the way of making India as efficient industrially as Japan or indeed any occidental country. By promoting the spirit of independent research and impressing upon it the widest possible outlook, he has already helped to lay the foundation of scientific efficiency on which alone it is possible to erect a permanent industrial structure in India. It is to be hoped that in the coming task of making India industrially powerful and economically prosperous, Sir C. V. Raman will be called upon to play a distinguished part.

#### 9. SOME PERSONAL IMPRESSIONS.

It is obvious that a career which has been so fruitful could only have been made possible by reason of exceptional personal qualities. A restless desire for achievement and an infectious enthusiasm are the two outstanding features in his character which impress those who have known Sir C. V. Raman. Not a little of the success achieved by him has been due to his gift for discovering talent in others and his generosity in allowing younger men opportunities for achievement. He has a breadth of outlook which is remarkable in one whose life has been devoted largely to scholarship and research. There are few subjects of general interest on which Sir C. V. Raman is not well-informed and capable of expressing an independent judgment. He is acquainted with many Indian and foreign languages, has toured extensively in Europe and America and enjoys the friendship of many distinguished scientific



workers in both continents. His appreciation of knowledge and culture is thus truly cosmopolitan. Like other famous men of science, he loves colour and music, and his scientific researches frequently derive their inspiration from aesthetic sources. He has not however allowed himself any change from the disciplined habits and strict simplicity of life which is the traditional mark of learning in India.

Sir C. V. Raman bears very lightly the burden of the numerous honours which he has received. His countrymen look forward to seeing him lead a long life full of further achievements which bring distinction to himself and glory to his country.

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