

# A scientist par excellence



K S Krishnan

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**P**ROFESSOR Sir K S Krishnan is one of the most distinguished Indian scientists of this century. His collaboration with Professor Sir C V Raman on the scattering of light by liquids — a collaboration which Raman described as 'a partnership in scientific research of the Bowen-Millikan type', led to the discovery of the effect that bears Raman's name and that first brought the Nobel Award in Science east of the Suez Canal.

Kariamanikkam Srinivasa Krishnan was born on December 4, 1898 in the village of Watrap in the Tirunelveli District of Tamilnadu. His early schooling was in the rural surroundings of his native village and at the Hindu High School at nearby Srivilliputtur. After matriculation, Krishnan proceeded to study in the American College, Madurai (1914 - 1916) and then in the Madras Christian College (1916 - 1918) where he was awarded the BA Degree in Physics. Between 1918 and 1920 Krishnan was a Demonstrator in Chemistry in the Madras Christian College. Attracted by the name and fame of Professor C V Raman and his growing School of Physics at the University of Calcutta, Krishnan arrived in Calcutta in 1920 and enrolled himself in the MSc. classes of the University College of Science where Raman as the Palit Professor of Physics lectured regularly.

Lectures by Raman were an inspiring experience and Krishnan decided to do research under the guidance of this great teacher and scientist. In November 1923, Krishnan became a Research Associate at the Indian Association for the Cultivation of Science. During 1924 and 1925, while Raman was away touring Europe and America, Krishnan engaged himself in work on a variety of topics including diffraction, scattering of light by metallic spheres and disks, refractive properties of liquids and gases under the influence of electric and magnetic fields etc.

Krishnan showed a remarkable capacity for independent and original thinking which impressed Raman on his return. The "feeble fluorescence" that was later identified as "A New Type of Secondary Radiation" (C V Raman and K S Krishnan 1928, Nature, 121, 501) was first noticed in 1923 by K R Ramanathan, another of Raman's early associates who later became the Director-General of Observatories. In 1925, Krishnan noticed the same phenomenon of fluorescence during an extensive series of experiments.

Raman was, of course, immensely interested in the phenomenon of the scattering of light and was looking for an optical analogue of the Compton Effect since its discovery a couple of years earlier. At his instance Krishnan started a very careful series of experiments starting in early February 1928. He kept a record of his daily activities of this time in the form of a diary extracts from which have been widely quoted in articles and books. Krishnan's diary is perhaps the most important record of the momentous events of February 1928. The Raman Effect was discovered on February 28, 1928 and almost all of the scientific papers describing the phe-

nomienon appeared under the joint authorship of Raman and Krishnan.

In a letter written to the Vice-Chancellor of Andhra University in Waltair four years later, Raman said, "If the Nobel award for Physics made in 1930 had been based on the record of the year 1928 alone, instead of on the entire work on the scattering of light done at Calcutta from 1921 onwards, Krishnan would in justice have come in for a share of the prize."

In a testimonial written to support Krishnan's application for a university teaching position dated September 28, 1928, Professor Raman — Krishnan's guru and mentor, said of him, "Mr Krishnan is in the laboratory an experimenter of rare skill and judgment, and in the library and seminar-room a mathematical physicist with a penetrating insight who can present a topic to his listeners with utmost lucidity and verve."

Later, as a Reader in Physics in the University of Dacca (now in Bangladesh) and then as the first Mahendralal Sircar Professor of Physics at the Indian Association for the Cultivation of Science in Calcutta, he made seminal studies on the Magnetic and Optical Properties of Crystals which established him as one of the leading physicists working in this area.

It brought him international recognition eventually winning him in 1940 the Fellowship of the Royal Society. Professor Krishnan moved to the University of Allahabad in 1942. In 1940, the Government of India set up the Board of Scientific and Industrial Research, the precursor to CSIR. Krishnan was made a member of the Board in 1942 and he started playing a major role in the planning and organization of scientific research on a national scale. When CSIR decided to set up national laboratories all over the country, the choice to lead the first such establishment fell on Krishnan. He moved to Delhi in 1947 when he was invited to become the first Director of the National Physical Laboratory. Krishnan accepted the position with some reluctance for he knew that this meant getting away from university teaching and research, an activity he had cherished the most during his scientific career.

The nature of his responsibilities changed for the mandate on the NRL was to generate the scientific and technological know-how for industrialisation. In spite of these heavy preoccupations, Krishnan and his colleagues succeeded in developing a new experimental technique to study the thermionic constants of metals. With S K Roy he conducted studies on alkali halide crystals.

Besides his pre-eminence in Physics, Krishnan was known as a great teacher and humanist, a great scholar of Sanskrit and Tamil literature and a great lover of sports. He was loved by all and respected for his gentle and generous nature and he always delighted his company with his wit and humour.

Pandit Jawaharlal Nehru remarked once that he did not recall meeting Krishnan on any occasion when he had not told him a new story. When the International Conference on Elementary Particles was held in Bombay in 1950, two of the well known participating scientists, Rudolf Peierls and Leon Rosenfeld, produced a doggerel verse

for the amusement of the other participants and Raman and Krishnan figured in it thus:

*For this, of course, one had to summon  
Such famous men as C V Raman  
Pick any delegate you wish, none  
Could smile more cheerfully than  
Krishnan.*

A great lover of nature, a trusted friend and a generous soul, Krishnan was as Nehru described him on his sixtieth birthday: "... a great scientist but something much more. He is a perfect citizen, a whole man with an integrated personality."

Krishnan was one of the rare and perhaps now extinct breed of scientists who were equally fluent in theory and experiment. He possessed a meticulous insight in optimising the output of the group he led at any time, whether in initiating the first cryogenic experiment in the country with A N Bose in resource-starved Calcutta or in marshalling the efforts of Indian science towards an international campaign like the International Geophysical Year.

In 1948, he was made a member of the newly founded Atomic Energy Commission, then a three-member body, of which Homi Bhabha was the Chairman and S S Bhatnagar the member-secretary. He was the Chairman of the Scientific Advisory Committee of UNESCO in 1955 and a Vice President of the International Council of Scientific Unions 1955 - 1958 and of the International Union of Pure and Applied Physics 1951 - 1957. He was a Founder-Member of the International Union of Crystallography. In 1955, the US National Academy of Sciences invited him to be the Chief Guest at their Annual Meeting in Washington D.C. The following year he was elected a Foreign Associate of the Academy. He was the recipient of the first Bhatnagar Memorial Award instituted by CSIR in 1957.

Krishnan was also involved in the Peace Movement. He knew the power of science but was also aware of the disastrous effects of a blind use of this power. In a broadcast over the AIR he had said, "It is good to have the strength of a giant but barbarous to use it like a giant."

In his long and distinguished scientific career Krishnan came in contact with many well known figures in the sciences and the arts.

He had many enduring friendships and kept in touch with his friends through regular correspondence. One of his deepest friendships was with Subrahmanyan Chandrasekhar, the great astrophysicist at the University of Chicago. When Chandrasekhar became an FRS in 1944, Krishnan was delighted and cabled him a congratulatory note. In response Chandrasekhar wrote,

*"It was a genuine pleasure receiving your cable... Under the circumstances it was natural that my thoughts should have gone back to those two summers in Calcutta when first I made your acquaintance and later your friendship. I have often wished that circumstances had been such that we could have seen more of each other during the later years, but our lives have separated ever since. However, it is one of my cherished wishes that some day in the not too distant future we shall again have the opportunity to see each other in quietness and peace."*

It was a dream that remained unfulfilled. Krishnan died in 1961 and Chandrasekhar never returned to India.

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