

Unit II

Biography: Sir C V Raman

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Summary:

Sir Chandrasekhara Venkata Raman (1888-1970), internationally reputed Indian physicist, is best known for his research on the molecular scattering of light. For his discovery of this phenomenon, known as the Raman Effect, he was awarded the 1930 Nobel Prize for Physics.

Raman was born in Trichinopoly (now Tiruchirapalli) to Chandra Shekar Iyer and Parvati Ammal. Raman was an avid reader since his childhood. Three books among the great many books that he read as a child had a lasting impression on Raman's young mind. These three books were "Light of Asia", "The Elements of Euclid", and "The Sensations of Tone". The last of these books was about sound waves. Later on, when he grew up and got an opportunity to conduct research in IACS (Indian Association for the Cultivation of Science), he chose to study musical instruments. He also published a book on the mechanical theory of the musical instruments. Thus, as Raman himself humbly admitted later, what he read in his school days paved the way for his future interests.

Raman was a precocious child – he completed his schooling when he was just eleven and joined Presidency College at thirteen for his graduation. There he failed to impress his teachers because he was not athletic like his father and looked too young to be a college student. So, when he went to attend his first English class the professor asked him if he really belonged to the junior B.A. class. But, very soon Raman proved all his teachers wrong by asserting his presence and standing first in his class. His teachers were so impressed with his brilliance that they forced Raman to sit for the ICS examinations.

The Civil Surgeon of Madras declared Raman physically unfit to travel abroad for appearing for the Indian Civil Services examination. Raman did not get disappointed because he was not at all interested in any career other than scientific research. Raman forever remained grateful to this "great man" - the Civil Surgeon of Madras! He considered this a blessing in disguise and continued his higher education choosing his favorite subject Physics for his M.A. He made most of the liberal attitude of his teachers in Presidency College and ventured into research on light waves. He achieved great heights of glory in his chosen field and became the first student from the college to publish a paper in the prestigious Philosophical Magazine. He also emerged as the top ranker in the university.

He got married to Lokasundari in 1907. Soon after, he was forced to sit for the IFS (Indian Financial Service) examination because he was not in a position to pursue research in his favorite

subject due to financial difficulties. He was appointed as the Assistant Accountant General in Calcutta. There, he came across the IACS – Indian Association for the Cultivation of Science which offered laboratory facilities for the research enthusiasts. The day when Raman walked into the Indian Association for the Cultivation of Science was a historic moment because it was going to be the lab of this Association where he and his team performed the legendary experiments on light, which the world knows today as “The Raman Effect”. When Raman got the first chance to study and experiment at IACS, he decided to study musical instruments. He explained the working of the Ektara, a simple musical instrument. Raman also studied the physical nature of musical sounds and the mechanics of various musical instruments. He made a scientific study of the functions of violin and even designed an innovative mechanical violin. He later studied the functioning of various musical instruments and published many papers on the research findings. He was appointed as the Professor of Physics at the University of Calcutta in 1917 by Ashutosh Mookerjee, the Vice Chancellor and a philanthropist. During his voyage across the Mediterranean Sea while coming back from his European trip after participating in a conference, Raman discovered that water molecules could scatter light just like air molecules. It led him to the discovery of his famous “Raman effect”. Raman continued as a Professor till 1933 and after that he was appointed head of the department of Physics of the Indian Institute of Science in Bangalore. In 1947, he became Director of the Raman Research Institute, also in Bangalore. He was knighted in 1929 and was made President of the Indian Academy of Sciences in 1934.

Raman Effect

Raman Effect, is a change in frequency observed when light is scattered in a transparent material. This phenomenon was discovered by the Indian physicist Sir Chandrasekhara Venkata Raman in 1928. When monochromatic light, such as that obtained from a laser, is passed through a transparent gas, liquid, or solid and is observed with the spectroscope, the spectral line ordinarily produced by the light has associated with it lines of longer and of shorter wavelength, called the Raman spectrum. These lines are caused by photons losing or gaining energy by elastic collisions with the molecules of the transparent substance. The Raman spectrum of a particular spectral line varies with the nature of the material that scatters the light. The Raman Effect has practical importance in spectrographic chemical analysis and in the determination of the structure of molecules.

Raman Research Institute

Raman Research Institute, an institution of higher education in the city of Bangalore. The institute was founded in 1948 by Chandrasekhara Ventaka Raman, and until 1970 was run from his personal resources. On his death, the institute was reorganized, and is now mainly funded by the Indian government’s Department of Science and Technology.

The Institute has active collaboration programmes with several research institutes and universities both nationally and internationally. The institute’s library has holdings of some 18,850 volumes and 22,000 periodicals. Raman’s principal scientific interests in optics, spectroscopy, and vision are reflected in the institute’s main current research specializations, which embrace astronomy and astrophysics, condensed matter, optics, and theoretical physics.

Reading Comprehension:

- a. As a child, Raman was: **an avid reader.**
- b. Raman displayed his ability for original thinking and interest in research while: **an MA student.**
- c. The discovery of the Raman Effect was made on: **28 Feb 1927.**
- d. C.V. Raman went to Oxford in 1921: **to represent Calcutta University in a conference.**
- e. Raman set up: **the Raman Research Institute.**

Answers the following comprehension questions:

1. How were the great men who Raman read about as a child reflected in the work he did later in life?

Raman was an avid reader right from his childhood. Three books among the great many books that he read as a child had a lasting impression on Raman's young mind. These three books were "Light of Asia", "The Elements of Euclid", and "The Sensations of Tone". The third book among these was about sound waves. Later on when he grew up and got an opportunity to conduct research in IACS (Indian Association for the Cultivation of Science), he chose to study musical instruments. He also published a book on the mechanical theory of the musical instruments. He also explained the working of the Ektara, a musical instrument. Thus, what Raman read in his school days got reflected in the inventions he made.

2. Why did Raman fail to impress his teachers when he first joined Presidency College?
Raman failed to impress his teachers when he joined Presidency College because at that time he was just thirteen years old. And he was not physically very strong and looked very young like a school boy. So, when he went to attend his first English class the professor asked him if he really belonged to the junior B.A. Class.

3. What made Raman say of the Civil Surgeon of Madras, 'I shall ever be grateful to this man'?

The Civil Surgeon of Madras was the one who declared Raman physically unfit to travel abroad for appearing for the Indian Civil Services examination. Raman did not get disappointed because he was not at all interested in any career other than research. He chose his favorite subject Physics for his higher education. So Raman forever remained grateful to the Civil Surgeon of Madras.

4. Why was the day when Raman walked into the Indian Association for the Cultivation of Science a historic moment?

The day when Raman walked into the Indian Association for the Cultivation of Science was a historic moment because it was in the lab of this association where he and his team

performed the legendary experiments on light, which the world knows today as “Raman Effect”.

5. Outline the subject of the first research Raman conducted in the IACS?

When Raman got the first opportunity to study and experiment at IACS, he decided to study musical instruments. He explained the working of the Ektara - a simple musical instrument. He also made a scientific study of the functions of violin.

6. What discovery did Raman make during his voyage across the Mediterranean and how did it prove to be important?

During his voyage across the Mediterranean Sea, Raman discovered that water molecules could scatter light just like air molecules. It led him to the discovery of his famous “Raman Effect”.

Dr. Sam Pitroda

“The Father of India's Communication Revolution,” Satyanarayan Gangaram Pitroda, or Dr. Sam Pitroda, as he is better known, was born in Titlagarh, Orissa in 1942. **Dr. Pitroda is presently the Chairman of India's National Knowledge Commission, besides being the Chairman and CEO of World-Tel Limited and the founder and CEO of C-SAM, Inc.** He also worked as an advisor to the United Nations in 1992.

His parents had migrated to Orissa from Gujarat. They were deeply influenced by Mahatma Gandhi and his philosophy. **Sam completed his Masters in Physics and Electronics from Maharaja Sayajirao University in Vadodara**, following which he went to the United States to do a Masters in Electrical Engineering. Thereafter, he worked at GTE and formed Wescom Switching, Inc. **He has many technology patents to his name and was involved in research work on telecommunications and handheld computing. He introduced microprocessors in telephone switches leading to digital switching and invented the Electronic Diary in 1975.**

He designed **his own Computer-themed Card Game called Compucards in 1983**. He returned to India in 1984 on the advice of the then Prime Minister Mrs. Indira Gandhi and founded the Center for Development of Telematics (C-DOT). **In 1987, he became advisor to the then Prime Minister Rajiv Gandhi and was responsible for revolutionizing India's foreign and domestic telecommunications policies.** He is widely known as the brain behind the introduction of the Public Call Offices (PCO) across the length and breadth of the country.

He left the country once again after a spat with K.P. Unnikrishnan, the Minister for Telecommunication in the V.P. Singh government. The present UPA government at the Centre constituted the National Knowledge Commission, of which Mr.Pitroda is the Chairman.

Comprehension

1. Sam Pitroda was born in Titlagarh, Orissa on 4th May 1942 in a large family of seven brothers and sisters. His father believed in educating his children and letting them do what they wanted to do.
2. Pitroda did his Masters in Physics and Electronics from Baroda.
3. Pitroda started his career in digital Technology at GTE Inc., Chicago, USA.
4. He opened a telephone exchange company called Wescom Switching in 1974.
5. Pitroda thought of setting up cheap rural exchanges when he made his first telephone call after moving to USA to study Electrical Engineering.
6. He visited Saudi American Bank in Jeddah as a venture capitalist.
7. Indian Prime Minister Mr. Rajiv Gandhi made him his chief scientific Advisor and provided the opportunity to start a new public-sector venture called Centre for the Development of Telematics (C-Dot)
8. Rural automatic exchanges were provided with SS7 Intelligent Networking Signaling Systems. Which are used to find out if a number busy or available and to check up the database of telephone numbers.
9. According to Sam Pitroda, we need to make use of IT to fulfill basic human needs related to food, water, sanitation, literacy and health. It must speed up the process of nation-building using the tools available and it should help us to handle problems in core areas like governance, commerce, finance, education, health, agriculture, environment, legal issues and employment.
10. Pitroda's idea of electronic wallet does not contain any currency. It would contain only plastic currency - credit card, debit card and other cards like health card, insurance card, driving license etc.
11. A **digital wallet** (also known as an **e-wallet**) allows users to make electronic commerce transactions quickly and securely. A digital wallet functions much like a physical wallet. The digital wallet was first conceived as a method of storing various forms of electronic money (e-cash), but with little popularity of such e-cash services, the digital wallet has evolved into a service that provides internet users with a convenient way to store and use online shopping information.