

# SIR CHANDRASEKHARA VENKATA RAMAN AND HIS SCIENTIFIC JOURNEY, AN OVERVIEW

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## HOW NATIONAL SCIENCE DAY BEGAN TO BE OBSERVED?

In the year 1986, the National Council for Science and Technology Communication (NCSTC) proposed the Indian government to designate the discovery date of the famous Raman Effect, i. e. the 28<sup>th</sup> day of February, every year as the National Science Day and to observe it every year. Consequently, the **observance** of the National Science Day on February 28 began from the year 1987.

## National Science Day 2024 Theme :

**“Indigenous Technology for Viksit Bharat”** ( Viksit means developed).

## LIFE & WORKS OF C .V. RAMAN:

**BIRTH:** Born on 7 Nov. 1888 at **Thiruvanaikaval**, near Tiruchirappalli in Tamil Nadu, India ( the then Madras Presidency).

**Full Name:** CHANDRASEKHARA VENKATA RAMAN.

**Father’s Name:** *Chandrasekhara Aiyer*, Lecturer in Mathematics and Physics.

**Mother’s name:** *Parvathi Ammal*.

**Spouse:** Lokasundri

**Children:** Chandrasekhar *Raman* and Venkatraman Radhakrishnan.

**Death:** 21 November 1970 at Bengaluru.

## Graduation and Post-graduation:

Passed B. A. (with Gold medal in Physics & English) in 1904 from Presidency College, Madras University.

Passed M. A. with distinction in 1907 from Madras University.

## Service Career:

Qualified in the same year (1907) Indian Finance Service ( Now Indian Audit & Accounts Service) in the first position and posted in Calcutta as Assistant Accountant General).

He took permission for doing research work at the Indian Association for the Cultivation of Science (IACS) after his office hours and on holidays. After transferring to Rangoon (Now Yangon) and then to Nagpur, he was promoted to Accountant General and posted to Calcutta again. After a decade of service, he resigned from his post of Accountant General to become the first Palit Professor of Physics [Rajabazar Science College](#) under Calcutta University at about half-reduced pay. He was awarded honorary D. Sc. In 1921. Under his editorship, the publication of the [Indian Journal of Physics](#) began in the year 1926. In February 1928, he discovered Raman effect for which he was awarded Nobel Prize in Physics in 1930.

In 1933, he became the director of the [Indian Institute of Science](#) in Bangalore (now Bengaluru). **He founded the [Indian Academy of Sciences](#) the same year. He established the [Raman Research Institute](#)** in 1948 where he worked to his last days.

**Research Fields:** Raman's research fields were in Optics & Acoustics.

## Starting of a Quest:

In 1921, while Raman was returning home in a ship on the Mediterranean sea from a trip to Europe, he began to think about the blue colour of sea-water. He even started some experiments inside the ship with his self-made pocket spectroscope and prism. He hesitated to agree Lord Rayleigh's explanation of blue colour of sea-water due to reflection of the blue colour of the sky.

## Discovery of Raman Effect in Optics (1928):

Prof. Raman and his students (i) Kariamanikkam Srinivasa Krishnan and (ii) Kalpathi Ramakrishna Ramanathan and (iii) S. Venkateswaran performed research works in IACS during early 1920s.

In April 1923, K. R. Ramanathan first observed a phenomenon of light scattering in water.

Next, in December 1927, S. Venkateswaran again observed the phenomenon in pure glycerine. These were then reported to Prof Raman.

Due to limited availability of S Venkateswaran, Raman persuaded his favourite student K.S. Krishnan to reconfirm the experimental observations and accordingly, Krishnan confirmed the observations with many transparent liquids.

A paper titled ‘ A new radiation’ was published in the 2nd edition of the [Indian Journal of Physics](#).

Raman himself performed many confirmatory experiments and on 28 February, 1928, Raman and Krishnan confirmed the discovery of a modified scattering of light by transparent liquids. The next day (29 Feb 1928), the discovery was released to ‘**Associated Press of India**’.

Although Raman verbally acknowledged Krishnan for the discovery, papers were published with his sole name. Raman had sent the paper titled '*A change of wavelength in light scattering*' to *Nature* Journal under his sole authorship. For this discovery of Raman effect, Prof. Raman was awarded Nobel Prize in 1930. In his Nobel Prize in 1930, Krishnan had no share.

### **Statement of Raman Effect or Raman Scattering in Simple Language:**

**The Raman Effect is a process of scattering of light by molecules of a transparent medium in such a way that the scattered light consists of three components- one component having the same energy or frequency as the incident light, a second component having energy or frequency lower than that of the incident light and a third component having energy or frequency higher than that of the incident light.**

In Raman Scattering, light of lower frequency is referred to as **Stokes lines** in honour of a 19th-century British physicist, **Sir George Gabriel Stokes**. Light of lower frequency is referred to as **Anti-Stokes lines**.

### **Russian physicists and Raman Effect:**

In April 1928, two Russian physicists, **Grigory Samuilovich Landsberg** and **Leonid Isaakovich Mandelstam** reported a phenomenon called ‘combination scattering’ similar to Raman effect, but in transparent solids instead of liquids. But, a similar phenomenon known as Raman effect was already reported in February of the same

year. Thus, the physicists in the world called the phenomenon “Raman effect” but the Russians used to call it “Landsberg-Mandelstam effect” or “combination scattering”.

### **Discovery of Raman-Nath theory in Acousto-optics (1937):**

In 1937, C. V. Raman and N. S. N. Nath (Nagesh Subbarao Nagendra Nath) discovered Raman-Nath theory of light diffraction by ultrasonic waves.

### **Raman’s Works on Indian Musical Instruments:**

Raman did research in the sounds produced by Indian drums like **Tabla** and **Mridangam** and also by Indian stringed musical instruments like **Veena** and **Tanpura**.

### **Raman’s Work on Colours of Flowers:**

Raman did research in different colours of flowers and proposed the presence of pigments in flowers thereby causing the colours. **But his proposal was latter proved incorrect.**

### **AWARDS/PRIZES:**

1924: Fellow of the Royal Society

1928: Matteucci Medal

1930: Knight Bachelor, Hughes Medal, Nobel Prize in Physics.

1941: Franklin Medal.

1954: Bharat Ratna.

1957: Lenin Peace Prize.

**The awards/prizes posthumously awarded are not included in the list.**

**Thank You All.**

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