The Raman Effect

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Context:

February 28th is celebrated as national science day

Background:

In 1986, the Government of India, under then Prime Minister Rajiv Gandhi, designated February 28 as National Science Day to commemorate the announcement of the discovery of the "Raman Effect".

About Raman Effect

1. While passing through the Mediterranean Sea, Raman was most fascinated by the sea's deep blue colour. Dissatisfied with the then-accepted answer ("the colour of the sea was just a reflection of the colour of the sky"), his curious mind delved deeper.
2. He soon found out that the colour of the sea was the result of the scattering of sunlight by the water molecules.
3. Fascinated by the phenomenon of light-scattering, Raman and his collaborators in Calcutta began to conduct extensive scientific experiments on the matter – experiments that would eventually lead to his eponymous discovery.
4. Simply put, the Raman Effect refers to the phenomenon in which when a stream of light passes through a liquid, a fraction of the light scattered by the liquid is of a different colour. This happens due to the change in the wavelength of light that occurs when a light beam is deflected by molecules.
5. In general, when light interacts with an object, it can either be reflected, refracted or transmitted.One of the things that scientists look at when light is scattered is if the particle it interacts with is able to change its energy. The Raman Effect is when the change in the energy of the light is affected by the vibrations of the molecule or material under observation, leading to a change in its wavelength.
6. In their first report to Nature, titled "A New Type of Secondary Radiation," CV Raman and co-author KS Krishnan wrote that 60 different liquids had been studied, and all showed the same result – a tiny fraction of scattered light had a different colour than the incident light. "It is thus," Raman said, "a phenomenon whose universal nature has to be recognised."
7. CV Raman's discovery took the world by storm as it had deep implications far beyond Raman's original intentions. As Raman himself remarked in his 1930 Nobel Prize speech, "The character of the scattered radiations enables us to obtain an insight into the ultimate structure of the scattering substance."
8. The discovery would also find its use in chemistry, giving birth to a new field known as Raman spectroscopy as a basic analytical tool to conduct nondestructive chemical analysis for both organic and inorganic compounds.
9. With the invention of lasers and the capabilities to concentrate much stronger beams of light, the uses of Raman spectroscopy have only ballooned over time.

10. Today, this method has a wide variety of applications, from studying art and other objects of cultural importance in a non-invasive fashion to finding drugs hidden inside luggage at customs.