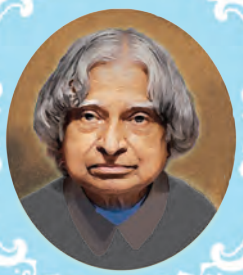
# 2.6 Great scientists have a questioning mind



Dr A. P. J. Abdul Kalam was the President of India from 2002 to 2007. He was awarded Bharat Ratna for his contribution to the scientific research and modernisation of defence technology in India. He loved children. His books and ideas have inspired many young Indians. In this passage, he talks about another great Indian scientist, C.V.Raman.

Leaders have to understand people's problems. They work hard. I want to be a political leader.

Teachers are so knowledgeable. I want to be a teacher.

**Warming up!**

List 3 of your favourite people. To which of the following categories do they belong? Add a new category if necessary.

- scientist
- cricket player
- actor/actress
- teacher
- singer
- dancer
- sportsperson
- musician
- artist
- social worker
- political leader
- progressive farmer
- soldier
- housewife
- doctor
- policeman
- lawyer
- engineer
- architect
- businessman
- journalist

Describe orally in a sentence or two, what each of the above do, and the special requirements of their profession.

Form groups of 4-5. Discuss what you want to be and what you have to do to achieve your objective.

Farmers grow food crops for all. I will use new methods. I will be a progressive farmer.

Cooking is an art. I want to be a Chef.

Chefs do so many experiments in the kitchen.

# GREAT SCIENTISTS HAVE A QUESTIONING MIND

**Think and answer :**

- Why are great scientific minds restless?
- Was Raman interested in arts?

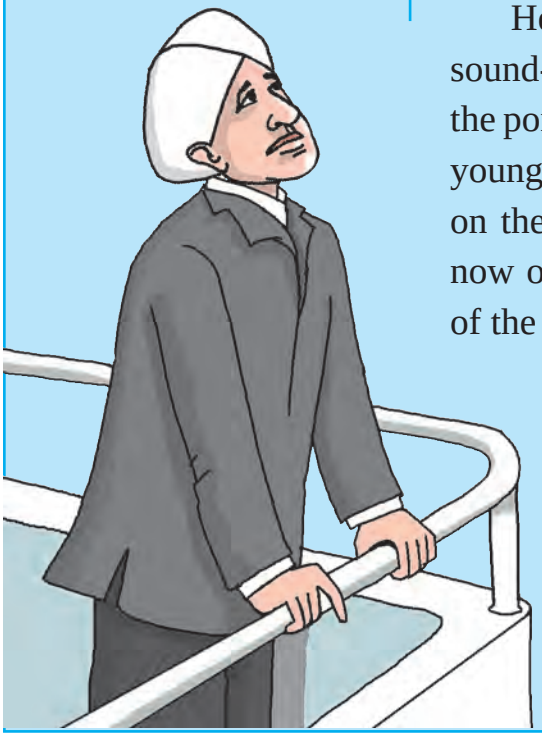
- melodious : producing pleasant musical sounds
- percussion : musical instruments played by striking, beating or tapping

Great scientific minds are restless with questions. They keep asking, 'Why does this happen?', 'Can I make it better?' or 'What more can this do?'

Let us study the life of a great scientist, who lived in the same era as Einstein but about 5000 kilometres east of Germany, in India.

Born in Tiruchirapalli in southern India, in the year 1888, Raman grew up to be one of the greatest scientists in India. He was a bright student right from the start and was deeply interested in optical science and acoustics. This is what perhaps led him to discover that the mridangam and the tabla produced more melodious sounds than any other percussion instrument. He was fascinated by colourful things, be it a flower, butterfly or gem. He kept seeking knowledge about everything around him.

He became a scholar in sound and sound-related physics. One day, a ship sailed from the port of London towards Calcutta. On board was young C. V. Raman, who had delivered a lecture on the acoustics of the violin in London. He was now on the ship's deck, gazing at the blue waters of the ocean.



As he glanced up at the sky, which was of the same shade as the ocean, a series of questions popped up in his head. 'Why are both the sea and the sky blue in colour? What is the science behind this occurrence?'

His mind seemed to suggest that the reason could be the scattering of light by water molecules. However, his theory was yet to be proved scientifically.

When the ship anchored at Calcutta, the young man immediately went on to conduct experiments to prove his theory. His research in optics, the science of light, resulted in the discovery of the Raman Effect. He announced it to the scientific world in March 1928. The discovery won him the Nobel Prize for Physics in 1930. It was the first time this prize was awarded to an Asian! The day he discovered the Raman Effect, 28 February, was later declared as National Science Day.

Even before this, his contribution to the science of optics had been acknowledged and he was elected Fellow of the Royal Society in 1924.

You would have learnt about the 'Raman Effect' in detail at school. But do you know the discovery subsequently helped in determining the internal structures of some 2000 chemical compounds?

And can you guess what the cost of the equipment that Raman used to prove his theory was? A measly two hundred rupees!

Raman strongly felt that scientists should not be confined to laboratories to solve scientific problems. They should search around themselves and find those answers in accordance with nature. For the essence of science lies in independent thinking and hard work and not in equipment. How true! Though the oceans and the sky have always been blue in colour, it needed a questioning mind with a scientific outlook to find the reason behind it!

*- Dr A. P. J. Abdul Kalam*

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**Find out :**

- What does one have to do to prove a theory scientifically?

**Listen and answer :**

- What won Raman the Nobel prize for physics in 1930?
- Why was 28 February declared as Natioanl Science Day?
- According to Raman, what are the qualities of a good scientist?
- measly : a word used to indicate a very small amount

**Things to do :**

- Find out more about the 'Raman Effect.'
- Find more information about Einstein.
- Do you have any questions like Raman? Note them down and discuss them with others.

## ENGLISH WORKSHOP

1. Prepare a life sketch of Dr C. V. Raman based on this lesson.

**Dr C.V. Raman : A Life Sketch**

- Dr C. V. Raman was born in ..... in the year ..... .
- He was a ..... a student right from the ..... .
- He was fascinated by ..... .
- He was interested in ..... .
- He delivered a lecture at ..... .
- He began to wonder about the colour of the sky.
- He was elected fellow of the Royal Society in ..... for his contribution to the science of optics.
- He announced the Raman effect in ..... .
- He won the Nobel Prize for physics in ..... .

2. Find the musical instrument mentioned in the passage.
3. List the scientific terms used in this passage.
4. Google the information about any five Indian scientists using the following points. Arrange it in a tabular form.

• Name • Place of birth • Discovery / Invention • Awards and Honours

### Language Study

A sentence is a group of words that expresses a complete idea. A sentence has two components – subject and predicate. The subject of a sentence is the part which names the person, thing, etc. that we speak about (in that sentence). The remaining part of the sentence tells us more about the subject. This remaining part is called predicate. Note the subject and predicate in each of the following sentences. Also note that the verb form in each sentence depends on the subject.

| Subject | Predicate |
|---|---|
| The sky | is blue. |
| Great scientific minds | are restless with question. |
| She | goes to school every day. |
| They | go home in the evening. |

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