

1

Beginning science

What is science?

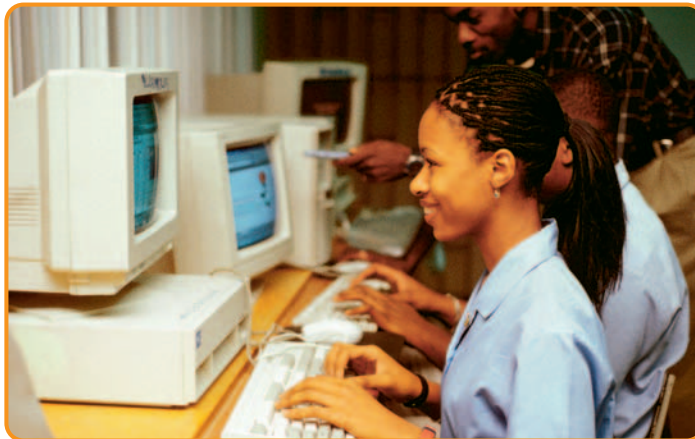
Scientists can do amazing things

The word **science** means knowledge. It is knowledge about the world around us, what it's like, how it changes and what makes it work. People who study science are called **scientists**. Scientists can do a lot of wonderful and fantastic things. For example, they can make electricity from sunlight, make an aeroplane that travels three times as fast as a bullet and build a rocket to go to the Moon. They can grow new types of crop, give a person a new heart, design a submarine to explore the deepest oceans and make a telescope to see billions of kilometres into space.



Science is ever changing

As you work your way through this course, you will discover that science is one of the most interesting subjects you study. Science is developing all the time, and new scientific facts are being discovered every day. One day, maybe, you will become a scientist and play an important role in changing the world. Perhaps you will discover a cure for cancer, help build a rocket to travel to Mars or design a new type of car engine that doesn't need gasoline.



All these pictures show science at work. As you gradually work through this course, you will learn to explain the science behind each of them.

Science is all around us

But science isn't only about wonderful and fantastic things. Science is part of our everyday lives and everything we see around us. For example, science is involved when a batsman hits a cricket ball or an athlete throws a javelin. Science is involved when you walk, ride a bicycle, open a bottle of fizzy drink, put sugar in your coffee, work on a computer or use a telephone. Science is also involved when a bird flies, when a fish swims, when a boat floats and even when a match burns. As you work through this course, you will begin to understand and explain how science is involved in all these things and many more.

Even when you strike a match you are doing science

We will use some words in this description that you will come across again and again as you study science, so try to remember them.

- 1 When you strike a match, the muscles in your hand produce a **force**.
- 2 The force pulls the head of the match over the rough surface of the matchbox.
- 3 The rubbing together of the head of the match and the rough surface of the matchbox causes **friction**.
- 4 The friction produces **heat energy**.
- 5 The heat energy starts off a **chemical reaction** in the head of the match.
- 6 The chemical reaction produces more heat and **light energy** and the head of the match is lit.
- 7 The wood of the match contains **stored energy**.
- 8 The stored energy in the wood of the match is changed into more heat and light energy and the match burns.
- 9 If you let the match burn down it will start to burn your fingers.
- 10 Tiny nerves in your fingers carry 'pain messages' to your brain telling it that your fingers are in danger of being burned.
- 11 Your brain sends a message back to your finger muscles telling them to drop the match so you don't get burned.

At this stage, it all sounds very complicated, but as you work your way through this course all these things will become clearer. For the moment, try to remember some of these important words: **force, friction, heat energy, chemical reaction, light energy** and **stored energy**. You will find them many times as you work your way through this science course.



2

What scientists do

A scientist called William Beebe once said:

“The ‘is-ness’ of things is well worth studying but it’s their ‘why-ness’ that makes life worth living.”

What do you think William Beebe meant when he said this?
 Try writing in your own words what William Beebe meant.
 Do you think he was right?



Scientists work in lots of different places

Scientists are really ‘why’ people because they are always asking the question ‘why?’ Scientists try to understand how things work and why they work. They try to understand more about the world we live in. They work in many different places, such as factories, clinics, hospitals and mines. They also work in many different areas, including agriculture, farming, fishing, forestry, space research, weather forecasting, wildlife conservation and the study of air and water pollution. There are very few activities that don’t involve scientists in one way or another.



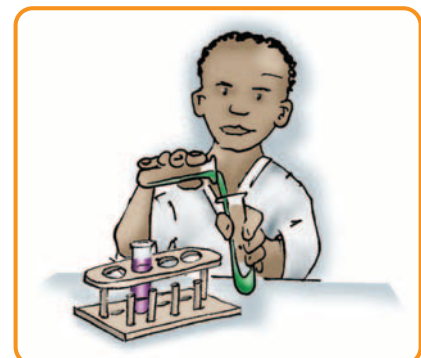
There are many different science activities

Scientists work in many areas. Some study animals and plants and the way they live together. Others work to improve farming methods, while others specialise in animal diseases. Some, such as doctors, investigate human diseases and try to find cures for them. Some scientists work with materials and structures while others study chemicals and the way they react together. There are scientists who study the Earth, its rocks, its different climates, its oceans and seas. Some scientists even look beyond the Earth and study our universe and what goes on in space.



Here are some different areas of science. Can you think of any more?

- **agriculture** (studying methods of growing crops and keeping livestock)
- **geology** (studying rocks and the Earth)
- **ecology** (studying plants and animals in their environment)
- **astronomy** (studying planets, stars and the universe)
- **space science** (studying travelling and living in space)



- **meteorology** (studying climate and weather conditions)
- **oceanography** (studying seas and oceans)
- **medicine** (studying and curing diseases in humans)
- **veterinary science** (studying and curing diseases in animals).



Activity

- Draw a poster, compose a calypso or make a scrapbook to illustrate one of the above areas of science.
- Don't forget to include the names of some scientists you have heard of who work in the area you have chosen. Write down the skills they use and what kind of things they study.

Biology, chemistry and physics – the 'big three' sciences

Most of the content in the science course you are just starting will include the three main sciences – **biology**, **chemistry** and **physics**. **Biologists** study living things and try to find out as much as possible about the bodies of animals and plants and how they work. They also study how animals and plants live in their surroundings.

Chemists try to find out more about different chemical elements, all the substances that make up our world, and the way they react together. When chemicals react, they can produce all kinds of products and effects. The reactions may cause bangs, pops, flashes and whizzes, and new chemicals are often formed.

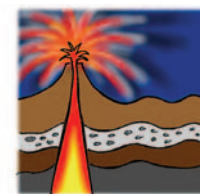
Physicists try to find out more about **energy**, **forces** and **matter**, and the relationships between them. They investigate topics such as **acceleration**, **electricity**, **forces**, **gravity**, **heat**, **inertia**, **light**, **magnetism**, **mechanics** and **sound**. You will meet all these topics as you progress through this course.

The different branches of science overlap

Your body is a living structure, so you need to know something about biology to understand how it works. Your body is also like a laboratory in which millions of chemical reactions take place all the time. To understand how your body works, you have to know something about chemistry. The way your skeleton works when you walk, run or jump has a lot to do with physics. So if you want to find out how your body moves, you have to know something about physics. You need to be a biologist, a chemist and a physicist, all at the same time, to understand the workings of your own body.



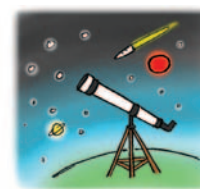
agriculture



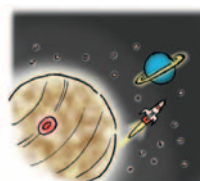
geology



ecology



astronomy



space science



meteorology



oceanography



medicine



veterinary science

3

Working like a scientist

A scientist works like a detective – the scientific method

Scientists are always asking questions and trying to find the answers. They often have to try to solve puzzles or problems. They use a way of working called the **scientific method**. They look, collect information, think of an explanation and try it out. It is important that you remember the scientific method. You must also look, collect, think and try out. Scientists use other words for these steps but they mean the same thing. In the scientific method, you must:

- **observe** what is happening – this includes looking and listening
- collect data and **analyse** it – this includes collecting information and studying it
- **hypothesise** (have a hunch) – this is thinking of an explanation
- **test** your hypothesis by experiment – this is trying it out.

Sometimes scientists make a **prediction** before they start an investigation. A prediction is like a guess. Scientists try to guess what might happen. Then they test (experiment) to see if their guess or prediction is correct.

Mr Khan's worrying problem

Mr Khan is the headmaster of a school in Arima. Not long ago, he was very worried because accidents suddenly started to occur on the road immediately outside his school gate. In a period of one month, eight accidents occurred. Most involved his students being injured by passing cars. The headmaster called a staff meeting to discuss the situation and to work out how the accidents could be prevented. The staff suggested a number of solutions.

Some suggested closing the road to all traffic. Others said the speed limit should be lowered to 20 kilometres per hour. Two teachers suggested putting up traffic lights. One member of staff proposed building a pedestrian crossing right outside the school gate.

Mr Khan became very worried because he realised that carrying out any of these suggestions would be expensive for the local council. However, Mrs Fernandez, the school science teacher, came to Mr Khan's aid.