

Longman Structural Readers
Stage 3

How Life Began

Lewis Jones

Illustrated by Brian Lee

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Chapter 1

ANIMALS IN STONE

'Look,' the young man said. The men stood round him in the village street. They looked at the things in his hands.

'These are fossils,' he said. 'Have you seen things like these before?'

'Of course,' they said. 'There are lots of them in this part of France. On the ground. In the fields.'

'These fossils are the bodies of small animals.'

The men laughed. 'Animals? They're made of stone. Animals aren't made of stone.'

'They died a long time ago,' he said. 'And their bodies changed to stone.'

'Animals are not like that.'

'Look,' he said. 'This fossil is a sea-shell. Do you see?'

'Well . . . yes . . . It's *like* a sea-shell. But this is dry land. There isn't any sea here.'

'The sea used to be here.'

'France? Under water?'

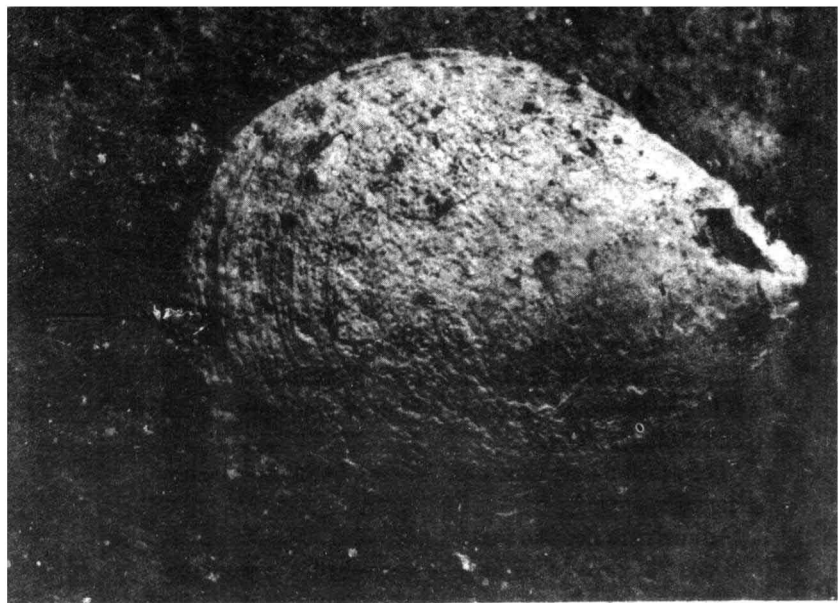
'That's right,' he said.

They laughed again, and walked slowly away.

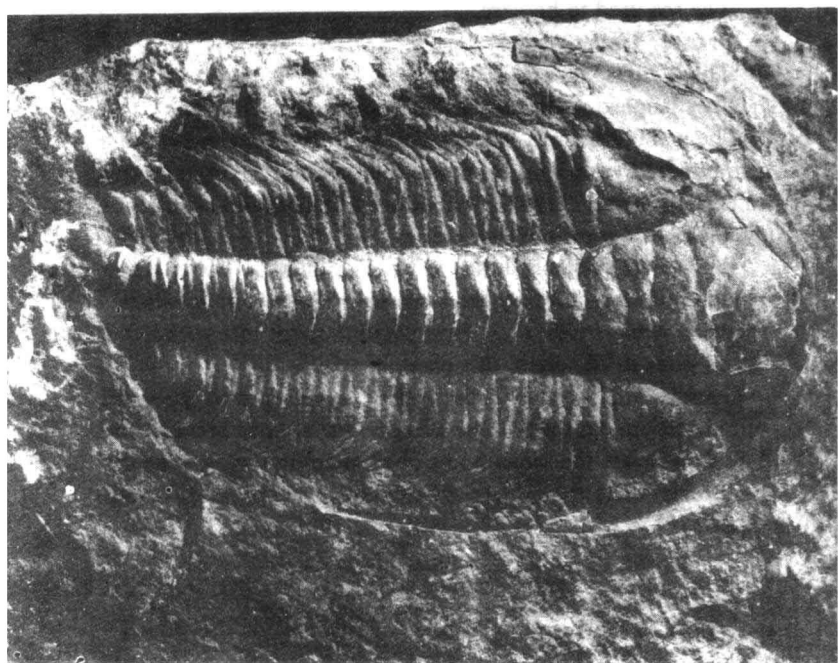
The young man was Jacques Guettard. He lived in France two hundred years ago. He found thousands of fossils, and tried to explain them. There were a lot of questions, and at that time, people didn't know the answers.

There were fossil shells at the top of high hills. Were they real shells? How did they leave the sea? There were fossils in the hard earth, inside rock. How could they get into rock? Did fossils grow in the earth, like plants?

Guettard replied, 'Go down to the sea, and look at the shells of today. Some of them are in pieces – the sea has broken them. Fossil shells are the same. Some of *them* are in pieces – the sea has broken them too. So the sea used to cover the land. It must be true.'



Animal inside rock.



But the question remained – how did living things get inside rock?

Chapter 2

ELEPHANTS IN PARIS

The people of Paris were surprised. 'Have you heard? Cuvier has found the bones of elephants, here in the city!'

When Guettard died, Georges Cuvier was seventeen years old. Now, ten years later, he was famous. Cuvier knew that every bone of an animal had its proper place. He could begin with only a few bones, and make a copy of the animal. Now, he was digging bones from the earth of Paris itself. Animals, birds, fish.

People said, 'Cuvier can bring dead animals to life.'

But some of the animals were strange – elephants, for example. The elephants were a trouble to Cuvier.

'In the past, elephants walked through France,' he said. 'Now, there are none. Why?'

Cuvier found thousands of bones. He made a list of the different kinds of animals.

Animals still alive today: 60 kinds

Animals not alive today: 90 kinds

This was very strange. People thought that animals appeared in the world at the same time. They thought that every kind of animal arrived in the world only once. Then they remained in the world.

But ninety kinds of animal on Cuvier's list were not alive. What happened? Why did they die? Cuvier could not explain.

There were more troubles. Almost every week, Cuvier visited the country round Paris. He was looking at the rocks. One kind of rock usually lay on another kind, like thick boards. And there were only two kinds of rock with fossils:

1. Rock with fossils from the *sea only* (fish, sea-shells)
2. Rock with fossils from the *land only* (lake-shells, animal bones)

Sea fossils and land fossils never lay together in the same kind of rock. So sometimes the country was under the sea, and sometimes it was dry land. Guettard was right.

Cuvier noticed another strange thing. The strangest animals lay deepest in the ground – in the lowest rocks. (*Animals not alive today* in Cuvier's list.) Higher up, there were smaller numbers of them. Higher still, there weren't any. The rocks at the top held only *Animals still alive today*.

So the rocks told a story of life. The lowest rocks were the oldest, and the story began there. The story ended in the rocks at the top. Cuvier was able to read that story, and it went like this:

Animals of the past were different from the animals of today. A very long time ago, every kind of animal was strange to us. Later, some of those kinds left the story, and did not return.

New kinds appeared. Some of these are also strange to us. They left the story too. But others were more like the animals of the present. Some of them remained, and they're still with us today.

What happened?

The men of the churches looked for the answers in their own book – the Bible. They thought that the Bible was a book of facts. It said that a god made men and animals and plants. And Cuvier accepted the Bible.

People used to ask him questions. 'Why did some kinds of animals die, and never return to the world?'

Cuvier said, 'In the past, the world sometimes went wild. Great hills jumped into the air. The seas emptied and ran over the land. Rocks flew up into the sky and broke into pieces. Valleys and hills changed places. They were times of fire and water and storm. The Bible says that God covered the land with water. Some of the world's animals died, and fossils are the bodies of those animals.'

And people said, 'There are strange animals in the rocks. They are different now. Have the world's animals changed through time perhaps?'

The answer: 'No. Change like that takes a very long time. The world is not more than 6 000 years old. The Bible tells us that. That is not enough time. Animals could not change much in 6 000 years.'

People also wanted to know, 'Where did the new animals come from?'

Cuvier replied, 'God made them. They just appeared in the world.'

'Cuvier has read the story in the rocks,' people said. 'He knows more than any other man. Those are the answers. Cuvier must be right.'

He was wrong.

Chapter 3

WATER AND TIME

In the English sea-town of Yarmouth, they were ready to put up a large statue. The year was 1817, and it was a statue of Lord Nelson. Workmen were digging a hole in the ground.

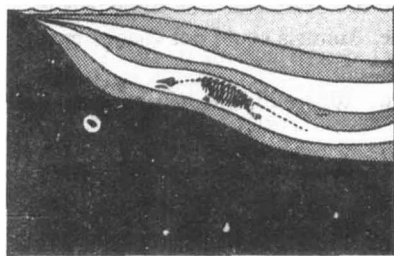
A young man watched them. Charles Lyell was seventeen years old, and he was on holiday. He looked hard at the walls of the deep hole. Sand lay two and a half metres deep. Lyell remembered the words of a friend in Yarmouth: 'Thirty-five years ago, there wasn't any sand there.'

Lyell was surprised. Two and a half metres of sand in thirty-five years! He was standing two and a half metres higher than the people of that time. Through the years, the wind brought the sand. Slowly, quietly.

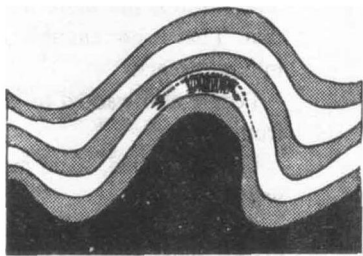
Perhaps Cuvier was wrong. The world did not need those wild years. Perhaps it changed slowly, like the sands of Yarmouth. Very slowly – and people did not notice.

Lyell went to different places. The city of Norwich used to be by the sea. But the river slowly brought new land between the sea and the city. And already in Lyell's time, Norwich was twenty kilometres from the sea.

1



2



A fossil appears above ground.

Here was an answer to the question: how did animals get inside rock? The wind was carrying sand from place to place. Winter ice was breaking the earth. Rain washed earth and stones down from the hills, and rivers carried the stones to the sea. When the dead bodies of animals fell into the water, the sand and the stones and the earth covered them.

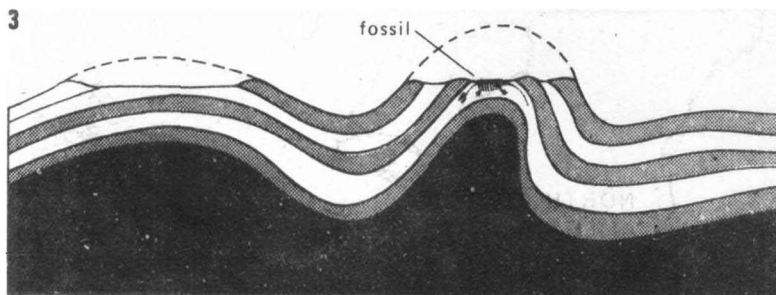
Now the story needed the answer to only one question: could the earth change into rock?

Not in 6 000 years. Again, the time was too short. But fossils *were* inside rock – people could see that. Lyell's ideas had great power. They could explain a large number of facts. Could those ideas be wrong?

Only one thing was against them – the age of the world. Perhaps that was wrong. Perhaps the Bible was wrong: In hundreds of thousands of years, heavy earth could push down on the earth below, and change it into rock. A world hundreds of thousands of years old? Millions perhaps? Was it possible?

Lyell went to different parts of the world, and looked for slow changes. He found hundreds of them.

He found an old building near Naples, in Italy. There were holes in the stone near the top. Lyell said, 'I know this kind of hole very well. Sea animals have made these holes. The land here has gone under the sea, then it came up again. But slowly – very slowly. People never notice slow changes like that.'



He found deep valleys with rivers. 'These rivers have eaten through hundreds of metres of the hardest rock,' he said. 'Water has done that – just water. But it needed hundreds of thousands of years.'

So the Bible was wrong – the world was very much older than 6 000 years.

Lyell put his ideas into a book – a large book. It appeared in two parts.

At the end of 1831, a sailing-ship left Plymouth, in England. On that ship, a man was reading the first part of Lyell's book. Three years later, the ship was sailing round South America. The second part of Lyell's book reached the ship in Valparaiso. The man now had the complete book.

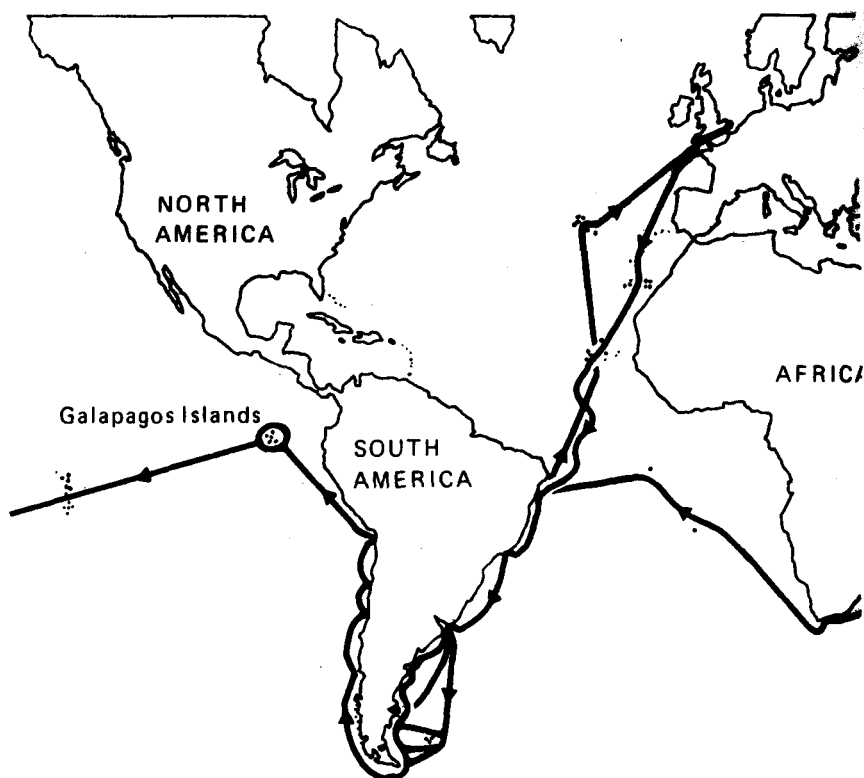
It was a special moment. A man, a ship, and a book – these three were ready to change the world.

Chapter 4

THE ISLANDS OF THE TORTOISE

The *Beagle* was a small ship, but a good one. Men wanted to know more of the world, and the *Beagle* could help them.

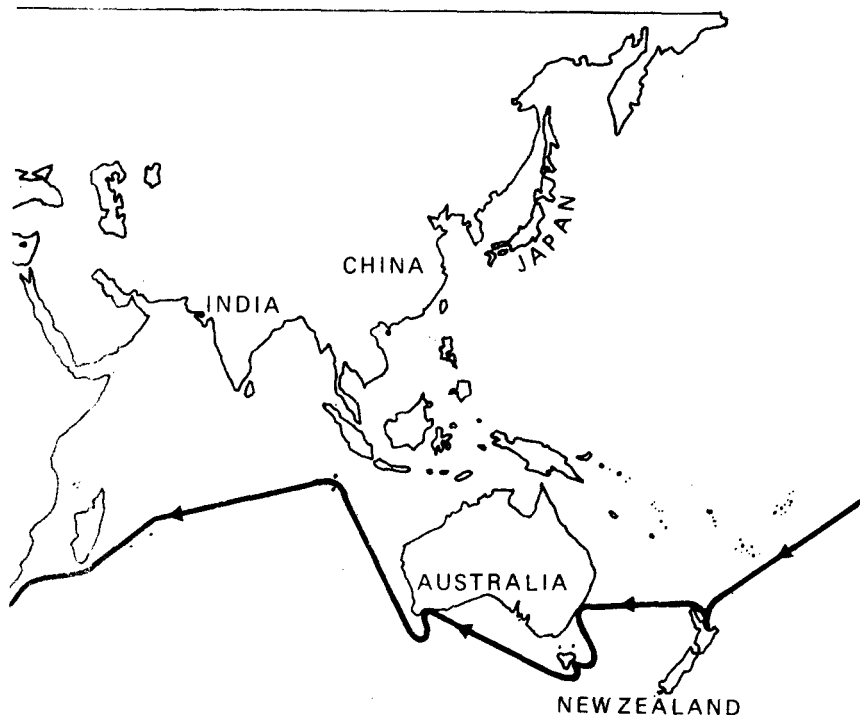
When the ship left England, it carried a young man of twenty-three: Charles Darwin. When the ship reached land,



Darwin always looked for new plants and birds and insects and animals. And he was usually glad to leave the ship – in his five years at sea, he was always sea sick.

The *Beagle* visited a number of places in South America. Just outside the little town of Bahia Blanca, Darwin walked by the side of the sea. He was looking for bones, and he found them. Among the stones, there were dozens of fossil bones – very large ones. Darwin wrote in his notebook, 'The great size of these bones is truly wonderful.'

He found more and more of them among the sea-shells. Their shapes were not very different from the living animals of South America. Was there a reason for that?

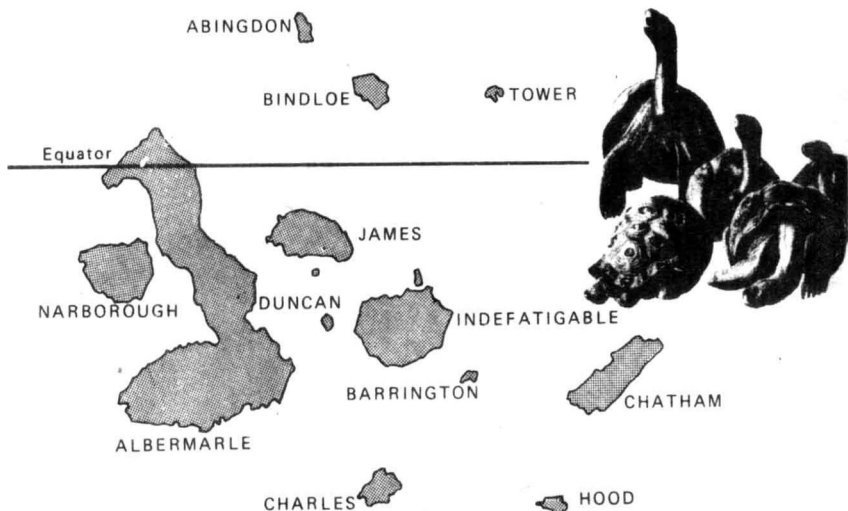


The Beagle visited a number of places.

Then Darwin found the bones of a horse – perhaps millions of years old. Three hundred years before Darwin, men crossed the seas from Spain. And they didn't find horses in South America. What happened to the horses of long ago? Why did they not stay alive? Darwin wrote the questions in his notebook. There weren't any answers yet.

He took the bones back to the ship. He took plants and shells. And insects and birds and fish and small animals. He put the bodies in boxes, and sent them back to England.

The *Beagle* sailed round South America, and then turned to the west. A thousand kilometres from land, the Galapagos Islands stand alone in the open sea. Darwin never forgot these



The Galapagos Islands.

islands.

The earth was black. Rocks lay in strange shapes under a hot sun. A few green things were growing – but only a few. When men stood on the black sand, it burnt their shoes. And on every side there were tortoises – large tortoises. Their heads could reach up to a man's arm. (Galápagos is a Spanish word for 'tortoises'.)

While the *Beagle* sailed for a month among the islands, Darwin went on land. The black rocks were like knives, and cut his shoes to pieces. And the plants had a strong, bad smell. How could any man *like* these islands? But to Darwin, they were the most wonderful islands in the world. Why?

He looked hard at the islands, and said, 'I know islands like these very well. They were not always here. They've come out of the sea. New islands in the open sea. Just rock, without life. But just like the beginning of the world – that's the important thing!'

Living things came from South America: in the air and across

the sea. Now there were trees, flowers, shells, insects. And there were always the tortoises. But for Darwin, the birds were the really important things.

Some of the birds of Galapagos were finches, and there were thirteen different kinds. That surprised Darwin. The different forms of a living thing are *species*. Thirteen different species of finch on a few little islands? Why wasn't one species of finch enough? What could be the reason for thirteen different forms of the same finch? And these finches lived only on Galapagos—not in any other part of the world. What was the reason for that? Darwin wrote down the questions in his yellow notebook.

Then a man pointed to a tortoise, and said, 'This tortoise comes from Albemarle Island.'

Darwin asked, 'How do you know?'

'Look at its back. A tortoise from Chatham Island has a different back. And a James Island tortoise is different again.'

Then Darwin noticed the same thing about the finches. Different islands usually had different species.

When Darwin looked at the birds' beaks, he had more facts for his notebook. The beaks of some finches were thin. But some were thick, some small, some large. Different birds ate different things – hard seeds, soft fruit, insects, flowers. They fed in different places – on the ground, in the trees, in the air. The thirteen species of finch acted differently.

But Darwin said, 'Yes, they are different *now*. But they are only a *little* different. And a number of things are *not* different. They're still finches, aren't they? They lay four eggs. And the eggs are white, with red marks. So here is the big question – in the past, was there only *one* kind of finch? And did it change into two species . . . three . . . ten . . . thirteen? Perhaps that has happened to every living thing in the world. At first were there only a few living things? Or perhaps only one? And in time, did it change into more and more species? I think the answer is in my notebooks. But I just can't see it.'

A year later, the *Beagle* sailed into Falmouth, in England. Its work was ended.

Darwin's notebooks were full of facts, and he put those facts into books. And his head was full of ideas, but he didn't write them down yet. He thought he was right. But he knew that people could say, 'One kind of animal can change into a different kind? Really? And how can it do that? Tell us that. How?'

Darwin didn't know the answer. But now the Galapagos Islands were thousands of kilometres away. Could he find answers to his questions in England? How? And where?

He didn't know. But he gave himself a promise: 'I will find out.'

Chapter 5

WHO WILL HAVE CHILDREN?

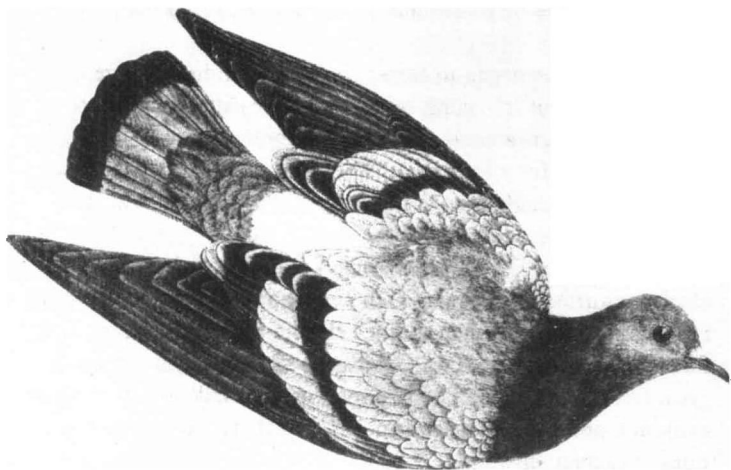
After Darwin left the *Beagle*, he was never really well again. He was ill every day of his life. But he was always busy.

He wrote about his years on the *Beagle* – the plants and animals and insects and birds. People liked his books, and bought them. But the old question still ran through his head: 'How can animals change?'

Could *plants* change? Darwin read flower-books, visited gardens. They didn't help. Some men kept pigeons. There were different kinds of pigeons, and Darwin looked hard at them. He began to keep pigeons himself. While he watched them, he used to think about his old friends – the finches of Galapagos. How did the different kinds appear?

For the pigeons, he knew the right answer. Take a male pigeon with a short face. Then find a female pigeon with a short face. Allow them to have young ones. Are there any short-faced pigeons among the young ones? If there are, take a male and a female from them. Allow these two to have young. Continue like this. Always use the pigeons with the shortest faces. In time, you will get pigeons with shorter and shorter faces.

Some men got pigeons with different shapes of body. Darwin



There were different kinds of pigeon.



talked with these men for hours, and they answered his questions.

Darwin's ideas began to form. *One animal didn't change* in its own lifetime. But its young could be a little different. And the young of this new animal could be still more different. This could continue for a long time. This kind of slow change in living things is *evolution*. At the end, the first animal and the last could be very different.

For the pigeons, this was the answer. But Darwin's thoughts always returned to Galapagos. In England, *men* supplied the right conditions. But men didn't help the evolution of the finches. What happened on Galapagos? By now, Darwin was a great friend of Lyell's. The two men used to talk about evolution and the Galapagos finches, but there were more questions than answers.

Then, by chance, Darwin read a book by Malthus, an Englishman. The book was forty years old, and Malthus was already dead. But it suddenly pushed Darwin nearer to some answers.

Malthus said, 'The number of people in the world can grow very quickly. Just think. A man and his wife could have ten children. When these ten grow up, every one of them could have ten more children. So now we have a hundred children. Again, if every one of these has ten children, we will have a thousand children. And this can continue. More and more people.'

All this *could* happen. But did it? Malthus said, 'No. It doesn't happen in the real world. The number of people remains almost the same. Why? The reason is this. We just can't grow food quickly enough. Soon there's not enough food. So some people can't eat. They die, before they bring any more children into the world.'

These ideas came at just the right time for Darwin. He asked one more question: *which people will die before they have children?* For Malthus, this was not an important question. But for Darwin, it was very important.

He asked, 'Which people will have children? Why does this