Evolution and Inheritance

Learning Objective:

To recognise that living things have changed over time and that a number of factors can affect a species' evolution.

Why do species change over time?

1 The changes from one generation to the next are completely random.

2 When a species reproduces, its offspring have lots of variations.

3 Sometimes, some animals will get eaten by predators. The ones that survive pass on their characteristics, and the ones that die don't.

4 Things like disease or food shortages can cause changes in a species.

Which of these statements do you agree with? Which do you disagree with? Why?

The variations that occur from one generation to the next are not always random. Many characteristics are inherited from one parent or the other, and are the same from one generation to the next.

In this family, the daughter has inherited her brown eyes from her father. This is not random: if two parents have blue eyes and brown eyes, it is much more likely that their offspring will inherit brown eyes. Some *dominant* characteristics such as this are more likely to be inherited.

Do you notice any other inherited characteristics in this picture?

Although some variations are caused by *genetic information* from a parent being inherited by the offspring, many, many variations that occur from one generation to the next **are** random.

These random variations are caused by something called ***mutations***. Mutations occur naturally from one generation to the next in all living things.

Most of the time, these mutations are unnoticeable or unimportant, but sometimes they create a variation that is either advantageous or disadvantageous.

Can you roll your tongue? Tongue-rolling is caused by a harmless mutation - it is neither advantageous or disadvantageous.

1

you fold your arms the other way round to your parents

2

having a slightly different eye colour to your parent

3

tomatoes give you a stomach ache

4

you are less likely to become ill from some common cold viruses

Which of these variations caused by mutations do you think are harmless? Which are advantageous? Which are disadvantageous?

Did you know that
there are lots of factors other
than inherited characteristics and
mutation that can affect how a
species evolves over time?

Let's find out
more about some of those
external factors...

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Sudden changes to a species' environment can affect how it evolves over time.

Example One:

This is an Arctic environment in Norway. This year, the winter season in this environment was much colder than usual.

Some plants in a species of grass have a variation which means they are better protected from extreme cold. Most of the grass plants in this population do not have the same variation.

What do you think will happen to this grass population?

Did you think of these consequences?

The grass plants that have *mutated* to resist damage caused by extreme cold are more likely to survive the winter. More of them will be able to reproduce. This variation may be inherited by new grass plants, spreading through the population until most or all new grass plants in that species have the new variation. More grass plants may grow in the environment due to their resistance to cold weather.

Sudden changes to a species' environment can affect how it evolves over time.

Example Two:

A few different species of ladybird live in this environment. They feed on aphids which, in turn, feed on the crops grown here.

The farmer changes the crop he is growing. The aphid population dies out because it cannot eat the new crop; a different species of aphid start to populate the environment. Not all of the species of ladybird can eat this new aphid.

What do you think will happen to the ladybird populations?

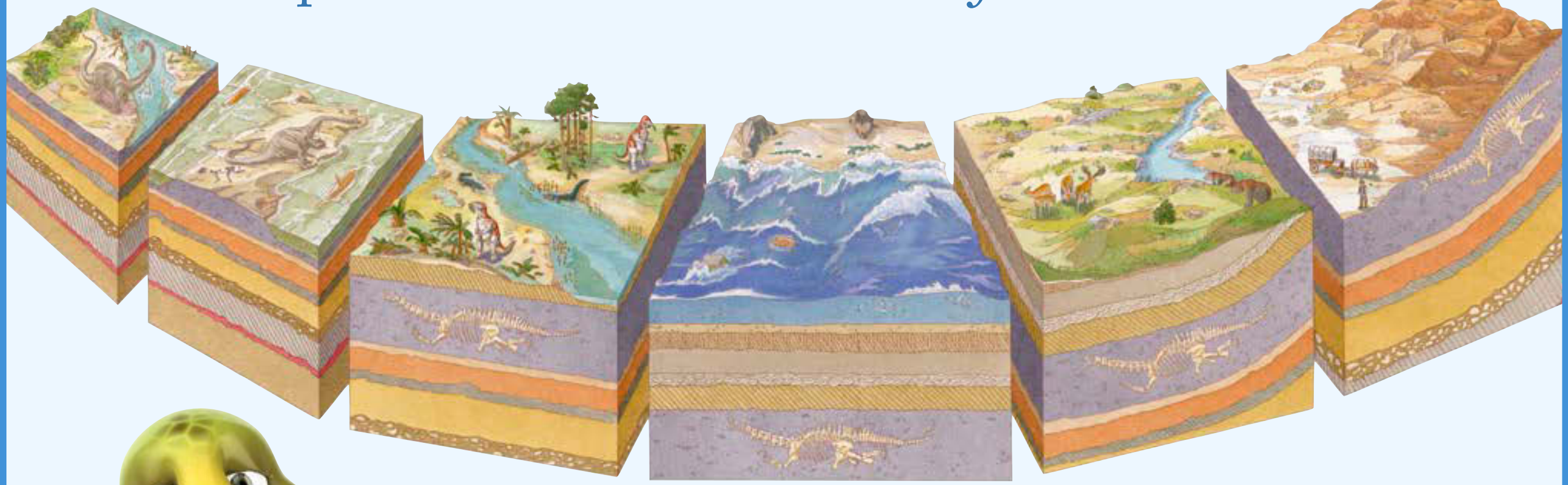
Did you think of these consequences?

The species of ladybird which can eat the new aphid will thrive; more of them will survive long enough to reproduce, and their population will grow in size. The species of ladybird which cannot eat the new aphid will shrink in size; it may even die out completely in that area.

What evidence is there to show that living things have changed and evolved over time?

Discuss your ideas.

One of the main pieces evidence that helps explain the process of evolution is the *fossil record*.



Fossils are formed over millions of years. The remains of animals have been fossilised, and layer after layer of rock built up above them as the landscape changed.

Palaeontologists are scientists who study fossils in rocks to learn more about how animals and plants have evolved over millions of years.

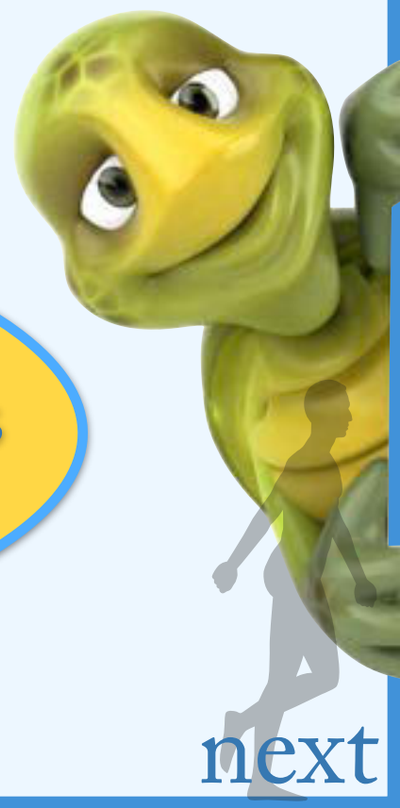
Palaeontologists use the fossil record (as well as contributing more information to it) to work out the age of fossils:

The type of rock where fossils are found is built up in layers. Scientists have worked out how old each layer of rock is.

They are then able to tell how old the fossils in these layers are too.

Palaeontologists are able to compare fossils from different rocks in different parts of the world. This is another way that fossils can be dated.

Scientists have noticed similarities between fossilised remains of animals and plants that became extinct millions of years ago and those that are alive today! Let's find out more...



Charles Darwin had an interest in fossils. While he was in South America he found *subfossilised* remains of what he though was a species similar to armadillos. He later found out that they were of *Glyptodon*, a species that went extinct over ten thousand years ago.

Can you see some similarities between the glyptodon and the armadillo? Evidence from fossils such as this help explain how species have evolved over millions of years.

Today we will be
learning more about the evidence around us
that helps explain how living things have
changed over time.

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Plenary

Sometimes there are catastrophic events that can cause many, many species to become extinct. This happened around sixty six million years ago when a huge asteroid hit the Earth.

Plenary

Thick dust and ash, thrown up into the atmosphere by the impact of the asteroid, filled the sky, blocking out sunlight. Plants and some micro organisms (that needed sunlight to produce food) died out.

Following this, animals that fed on those organisms died of starvation. Food quickly became scarce for the predators that hunted them. It was this event that led to the extinction of the dinosaurs - it is estimated that 75% of all life was wiped out by the asteroid impact.