Primary School Discovery Pack

dynamic earth

Learning for Sustainability

TEACHER'S GUIDE

Welcome to Dynamic Earth!

This guide has been designed to complement the **Primary School Discovery Pack** to help you get the most out of your experience with us.

Each gallery within the Dynamic Earth exhibition has been given a dedicated section in the Discovery Pack to give your pupils the opportunity to:

- Explore gallery content in greater depth through descriptions and short exercises
- Work individually and in teams
- Have fun through exploratory learning

This Discovery Pack has been designed to help your pupils engage with gallery content and think critically about the material presented. It is curriculum-linked to meet the needs of several *Curriculum for Excellence Experiences and Outcomes* and *Learning for Sustainability* themes.

The following sections provide you with an overview to each gallery and the activities designed for your pupils within their discovery pack.

For curriculum links, see the last section of this pack.

We hope you find these resources useful in enhancing your experience and we would welcome your feedback to make them even better. Please email enquiries@dynamicearth.co.uk if you would like to share your thoughts with us.

For more ideas and resources please visit our website **www.dynamicearth.co.uk/learning**

Timings indicative of how long to spend in each gallery for a 90 minute experience.
*denotes fixed time show.

YOUR JOURNEY THROUGH DYNAMIC EARTH STARTS HERE

SCOTLAND'S TIME LORDS

5 minutes

THE TIME MACHINE

5 minutes*

HOW IT ALL STARTED

5 minutes*

RESTLESS EARTH

5 minutes*

SHAPING THE SURFACE

5 minutes*

CASUALTIES AND SURVIVORS

10 minutes

HUMAN ANIMAL

5 minutes

DISCOVER THE DEEP

15 minutes

POLAR EXTREMES

5 minutes

ADVENTURE

15 minutes*

TROPICAL RAINFOREST

15 minutes

PLANETARIUM

additional 30 minutes

Scotland's Time Lords

The purpose of this gallery is to:

- Tell the story of the heritage of our planet in exciting and innovative ways.
- Bring to life the characters who forged modern earth science thinking.
- Put these ideas into the context of the modern world.

Specifically, gallery content aims to highlight to your pupils the ideas of:

- James Hutton, Charles Lyell, Ben Peach, John Horne, Arthur Holmes, Alfred Wegener and Marie Tharp – Geologists who revolutionised our understanding of some of the fundamental principles of earth and environmental science.
- The emergence of plate tectonics as a modern concept in earth and environmental science.

Within their Discovery Packs, pupils are asked to listen to the talking portraits and read panels around the gallery.

- Can you match up the people to their correct speech bubbles?

Answers:
Charles Lyell -> *I am very good at sharing information with other people.*
James Hutton -> *I discovered 'Deep Time'. The idea the Earth is really old!*
Ben Peach and John Horne -> *We worked out how mountains are formed.*
Arthur Holmes -> *I found out a way to uncover the age of rocks.*
Marie Tharp -> *I mapped the sea floor, discovering deep ocean mountains and trenches.*

Pupils are asked to look at the model of planet Earth.

- What is happening to Earth's continents over time?

Answer: *Moving, thanks to continental drift.*

- Where will Scotland be in 200 million years time?

Answer: *Much farther north, near the North Pole.*

Scan the QR code to access our James Hutton resource from Dynamic Earth Online.

- Can you label the diagram of the Earth's layers?

Answers from top to bottom: *Crust, Mantle, Outer Core, Inner Core*

- Find out the name of the super continent pictured in their Discovery Pack using one of the interactives (the 'Bookcase').

Answer: *Pangea*

- Pupils can think individually or discuss in pairs/groups what they see happening.
- They should notice that continents are not static and that they move around over time.
- These ideas are explored in more detail on the information placards around the room.

YOUR VISITOR SERVICES ASSISTANT WILL LET YOU KNOW WHEN YOU CAN BOARD THE TIME MACHINE TO EXIT THIS GALLERY.

The Time Machine

The Time Machine will take you back 13.7 billion years into the past using audio visual special effects. The time machine highlights the importance of 'Deep Time' – the concept Hutton explored in 'Scotland's Time Lords' – and its contribution to our understanding of earth and environmental science.

YOU WILL BE IN THE TIME MACHINE FOR 90 SECONDS. PLEASE INFORM YOUR VISITOR SERVICES ASSISTANT IF THERE IS ANY PUPIL/ACCOMPANYING ADULT WHO DOES NOT WANT TO USE THE TIME MACHINE: THEY WILL BE ESCORTED SAFELY BY A MEMBER OF OUR TEAM 13.7 BILLION YEARS BACK IN TIME VIA A STAIRWELL.

How It All Started

As the Time Machine doors open, you will be met by a Visitor Services Assistant to take you on board the observation deck of a spaceship. An AV will begin shortly providing an overview to the formation of our universe and the structure of our planet.

Restless Earth

Your Visitor Services Assistant will take you into the next gallery: a volcanic eruption and earthquake simulator with supporting AV footage. The gallery highlights the role of continental processes explored initially in 'Scotland's Time Lords' in greater depth: the birth and death of oceans, the creation of mountains, volcanic eruptions and earthquakes.

PLEASE BE ADVISED THAT A MOVING FLOOR AND STROBE LIGHTING ARE USED IN THIS GALLERY. PLEASE SEEK ASSISTANCE FROM YOUR VISITOR SERVICES ASSISTANT SHOULD SOME PUPILS/ADULTS NEED TO BYPASS THIS GALLERY.

Shaping the Surface

Your Visitor Services Assistant will lead you on into your helicopter flight across glaciated landscapes of Scotland and Norway. This gallery uses AV footage to convey the power of ice and running water to shape the landscapes of Scotland. Processes of erosion, transportation and deposition are considered. At the end of this AV, your Visitor Services Assistant will introduce the next gallery to you which explores the processes of evolution and extinction.

PLEASE BE AWARE THAT THE NEXT FOUR GALLERIES IN THE EXHIBITION ARE SELF-GUIDED. SHOULD YOU REQUIRE ANY ASSISTANCE FROM THIS POINT YOU CAN FIND A VISITOR SERVICES ASSISTANT THROUGH THE DOORS IN FRONT OF YOU AS YOU ENTER THE CASUALTIES AND SURVIVORS GALLERY, OR ALTERNATIVELY IN THE 4D GALLERY LATER ON IN THE EXHIBITION.

Casualties and Survivors

The next four galleries in exhibition focus on self-led interactive learning. Pupils will be encouraged to learn through exploration of the galleries interactive features, exhibits and AV footage through both independent and collaborative learning.

In this gallery pupils are encouraged to think about:

- Early life on our planet: where it began, when it began and what it looked like.
- The process of evolution and how organisms have changed, adapted and become more complex across time.
- How animals that cannot adapt quickly to changes in their environments may become extinct.
- The influence of natural selection in earth and environmental science.
- The multiple causes of extinction on our planet.
- The actions of humans are currently driving a new mass extinction on Earth. By taking action to reduce the effects of climate change, humans can stop this extinction.

Within their Discovery Packs, pupils are asked to find out:

- When did planet Earth form and when did life begin on our planet?

Answers: *(using the 'Time Span' interactive) 4,500 million years ago and 4,000 million years ago respectively.*

- Complete the `Hunt for Life Wordsearch' ***Answer:***

- What are the three major causes of extinction on our planet?

Answers: *(using gallery interactives and the pillars) Climate Change, Plate Tectonics and Meteorites*

Pupils are asked to think about the sabre-tooth cat.

- Do you think you would have survived an encounter? Do you think the sabre-tooth has any weaknesses?

Key points to mention: *A sabre-tooth's large front teeth were brittle. Early humans did survive encounters, and in fact hunted them to extinction.*

The Human Animal

Pupils are invited to think critically about what it means to be human. By interacting with the touch heads they are invited to think about all of the capacities of the human brain and what this has allowed us to be as a species.

Within their Discovery Packs, pupils are asked to:

- Find out what the four essential needs for human survival are.

Answers: *Food, Water, Shelter and Energy*

- Pupils can think individually or discuss in pairs/group about what it means to be human.

Key points to mention: *We have emotions, creativity, rational etc. Please note, that some of the qualities we many think of are shared by other species too!*

Discover the Deep

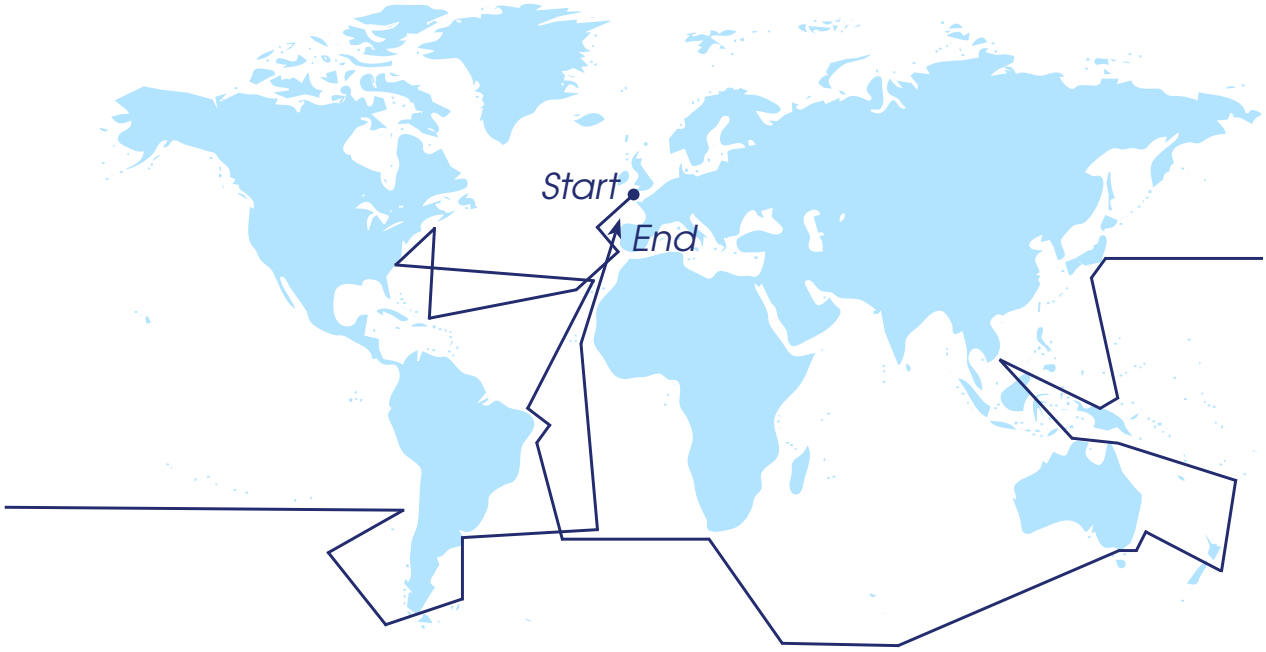
The purpose of this gallery is to provide an overview of Scotland's marine heritage and habitats, and how the deep ocean is a vast and vital system supporting live on Earth.

Explore our ocean resources from Dynamic Earth Online.

Within their Discovery Packs, pupils are asked to:

- Draw the route of HMS *Challenger* on the map.

Answer:



In the laboratory, pupils are asked to look to the left where there is information about ocean threats.

- Can you match the ocean threats to their description?

Answers:

Bottom Trawling -> Dragging heavy nets across the floor to catch fish can be damaging to everything in the trawler's path, especially cold-water coral reefs which can take decades to recover.

Deep Sea Mining -> There are lots of metals (such as copper and gold) in the ocean floor, but plans to mine it could cause irreversible damage to the deep sea ecosystem.

Ocean Acidification -> Because the ocean is absorbing lots of carbon dioxide, this means it is getting more acidic. This means that creatures with hard shells are finding it difficult to survive, putting entire habitats at risk.

Drilling for Oil -> Extracting oil from beneath the seabed provides us with fuel, but comes with the risk of oil spills, which can have a big impact on the ocean ecosystem.

Polar Extremes

The purpose of this gallery is to provide a broad overview of the similarities and differences between the Arctic and Antarctic regions of planet Earth. More specifically, the gallery highlights the importance of the North and South Pole as natural laboratories of climate change.

Through exploring the gallery, pupils should have a greater awareness of:

- The diversity and way of life of various animals in the polar regions.
- The impacts of climate change on melting polar ice.
- The impact of climate change on polar wildlife.
- By examining cores for bubbles of air, scientists can find out what greenhouse gas quantities have been in our atmosphere in the past. Ice core evidence supports that human beings are changing Earth's atmosphere; which we know is the driver for a warming world and climate change.
- The importance of paleaoenvironmental proxies (polar ice cores) in understanding past environmental conditions.

Within their Discovery Packs, pupils are asked to find out:

- Where polar bears live.

Answer: *A) North Pole*

- What is happening to their home and why.

Answer: *Polar bear habitats are shrinkng as Arctic sea ice shrinking at a rate of 13% per decade, due to climate change.*

- Where penguins live.

Answer: B) *South Pole*

Pupils are asked to find the Polar Ice Core and understand its significance as an indicator of the climate of the past.

- How do scientists get these large cores of ice?

Answer: *Drills, mechanical or thermal.*

- What are they looking for in the ice cores?

Answer: *Ice cores can show how concentrations of greenhouse gasses in Earth's atmosphere have changed over time.*

- What does this tell them?

Answer: *That this is evidence of climate change.*

- Circle the pictures that represent some of the reasons greenhouse gas concentrations are increasing.

Answers: *Car, Factory, Deforestation and Aeroplane.*

4D Adventure

This gallery is a 4D Cinema. You will meet a Visitor Services Assistant in this gallery who will explain to you what happens next and when the next `flight' is due to depart.

The area in which you wait for the flight is called the `Arctic Base'. This is the boarding gate for your flight to the `Tropical Rainforest'. The pupil Discovery Pack activity this gallery relates to the climate maps and film you can see on the screens around you in this area. In the Discovery Packs, pupils are encouraged to think about what they think the climate will be like in two contrasting biomes: the Tundra and the Sahara.

Within this gallery and the 4D film, your pupils will:

- Explore the rich diversity of living things found throughout the world's different biomes.
- Develop and broaden their understanding of how organisms are interrelated and how species depend on one another and on the environment for survival.
- Discover where these amazing biomes are found and why they vary across the globe.
- Quiz themselves on big questions such as "why is there life on Earth and not on Mars?" and discover what makes our world so special .

Within their Discovery Packs, pupils are asked to:

- Think or discuss in pairs/groups what they think the climate will be like in the biomes and draw/write descriptive words about the Tundra and Desert.

Key points to mention: *Desert - hotter in the day, often very cold at night. Dry with very little rainfall. Little vegetation. Tundra – cold, often dark, dry, little vegetation. These characteristics in both biomes require animals to adapt to survive the conditions.*

Pupils are asked to fill in the blanks of the following sentences:

Answers:
One of the reasons is the influence of the *Sun* .

The equator is the *imaginary* line around the middle of our planet.

One of the reasons that locations at the equator are *hotter* is beceause the light that reaches Earth is spread out over a small area

At the poles, the area is larger so these areas are *colder* .

Tropical Rainforest

When you leave the 4D flight, you will be met by a Visitor Services Assistant who will be your Rainforest guide. They will engage your class in the wonders of the tropical rainforest biome, exploring the rich diversity of life in these unique environments, the threats facing them and the action we can all take in our everyday lives to protect them.

Within their Discovery Packs, pupils are asked to:

- Work independently and in groups to identify a variety of animals.

Location: *These can be found throughout the gallery. Some are harder to spot than others!*

- Work with their peers to establish some of the main reasons deforestation occurs.

Key points to mention: *Providing wood for timber, spaces for agriculture (farming cattle in particular) and urbanisation such as building roads.*

Continue your learning through Dynamic Earth Online where we have a range of experiments and crafts, climate change science and stories, short videos, thought-provoking reading and more!

Curriculum Links

Social Subjects

Understand that evidence varies in the extent to which it can be trusted and can be used to learn about the past. **SOC 1-0-01a**

Describe and re-create the characteristics of my local environment by exploring features of the landscape. **SOC 1-07a**

I can describe and recreate the characteristics of my local environment by exploring the features of the landscape. **SOC 1-07a**

By exploring climate zones around the world, I can compare and describe how climate affects living things. **SOC 1-12b**

By exploring a natural environment different from my own, I can discover how the physical features influence the variety of living things. **SOC 1-13b**

I can use primary and Secondary Sources to selectively research events in the past. **SOC 2-01a**

Describe the major characteristics of Scotland's landscape and explain how these were formed. **SOC 2-07a**

I can describe the physical processes of a natural disaster and discuss its impact on people and landscape. **SOC 2-07b**

I can explain how the physical environment influences the ways in which people use land by comparing my local area with a contrasting area. **SOC 2-13a**

I can identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact. **SOC 3-08a**

I can investigate the climate, physical features and living things of a natural environment different from my own and explain their interrelationship. **SOC 3-10a**

I can investigate the relationship between climate and weather to be able to understand the causes of weather patterns within a selected climate zone. **SOC 3-12a**

Sciences

I can distinguish between living and non-living things. I can sort living things into groups and explain my decisions. **SCN 1-01a**

Through exploring properties and sources of materials, choose appropriate materials to solve practical challenges. **SCN 1-15a**

I have contributed to discussions of current scientific news items to help develop my awareness of science **SCN 1-20a**

I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction. **SCN 2-01a**

By exploring the characteristics offspring inherit when living things reproduce, I can distinguish between inherited and non-inherited characteristics. **SCN 2-14b**

By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed. **SCN 2-15a**

Having explored the substances that make up Earth's surface, I can compare some of their characteristics and uses. **SCN 2-17a**

I can report and comment on current scientific news items to develop my knowledge and understanding of topical science. **SCN 2-20b**

Literacy

As I listen or watch, I can identify and discuss the purpose, key words and main ideas of the text, and use this information for a specific purpose. **LIT 1-04a**

I can recognise how features of the spoken language can help in communication, and I can use what I learn. **ENG 2-03a**

I can select ideas and relevant information, organise these in an appropriate way for my purpose and use suitable vocabulary for my audience. **LIT 2-06a**

I can show my understanding of what I listen to or watch by responding to literal, inferential, evaluative and other types of questions, and by asking different kinds of questions of my own. **LIT 2-07a**