dynamic earth LEARNING

PRIMARY SCHOOL DISCOVERY PACK

Teacher's Guide

heritage lottery fund

LOTTERY FUNDED

Welcome to Our 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 tour 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 on exercises
- 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.

The purpose of this teacher's guide is to assist you in making the most out of this pack, and give you a resource that provides you with both organisation *and* flexibility to ensure that as many pupils as possible get the most out of their time in the galleries.

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 on these resources so we can make them even better. Email: emma.paterson@dynamicearth.co.uk

For more ideas and resources please visit our website www.dynamicearth.co.uk and click on the section for teachers.

This gallery is a new addition to Our Dynamic Earth and replaces '*State of the Earth'* as the start of your journey. We have highlighted a number of links with other galleries later on in your tour, which are highlighted in both this guide and the Pupil Discovery Packs.

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 and Alfred Wegener – Geologists who revolutionised our understanding of some of the fundamental principles of Earth and Environmental Science
- The emergence of Plate Tectonics as a fundamental paradigm of Earth and Environmental Science.

Discovery Pack Activities

1. Listen to the conversation between James Hutton and the talking portraits, draw pictures of the characters in their frames and match up the correct description of the characters.

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.

2. Find out the name of the 'Super Continent' pictured in their Discovery Pack using one of the interactives (the 'Bookcase').
Answer – Pangaea

3. Think critically about what the giant 'Puffersphere' of planet earth is showing them:

- 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 AT THE EXIT TO THIS GALLERY.

The Time Machine, How it All Started, Restless Earth and Shaping the Surface

The next 4 galleries in your tour are designed to be multisensory and immersing experiences where you are encouraged to: look, listen, smell and feel as though you are being literally transported through space and time. You will be looked after in these galleries by a member of the Visitor Services team, who will always be nearby should you require any assistance.

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 space ship. 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 six galleries in the tour 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 your tour.

Casualties and Survivors

The next six galleries in your tour focus heavily on interactive learning experiences. Pupils will be encouraged to learn through exploration of the galleries interactive features, exhibits and AV footage through both independent and collaborative learning.

Within this gallery specifically, pupils are encouraged to learn 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

Pupils will be given the opportunity to engage with our animated characters 'Vasco and Amelia' on the large flat screen television. This is a great opportunity for them to have fun engaging with one of our staff in a way that will be unfamiliar to them and learn about early life on planet earth at the same time. Vasco/Amelia will be happy to chat to your pupils and tell them about the 'Cambrian Explosion' and early animal and plant life on planet Earth.

Important - Pupils should be aware that they are engaging with one of our staff indirectly at this interactive. Consequently, they should demonstrate the same levels of courtesy and respect they would with any other staff member whilst talking to Vasco and Amelia.

Within the **Discovery Packs**, pupils should:

1. Find out the age of the Earth and the time life began to appear on our planet
   Answers (using the 'TimeSpan' interactive) - 4,500 million years ago and 4,000 million years ago respectively

2. Talk to the interactive character (Vasco/Amelia) to discover more about early life

3. Find some specific examples of animals in the gallery and complete their names using the exhibits
   Answers – Scorpion, Westlothiana and Lystrosaurus

4. Find out three of the major causes of extinction on our planet using the gallery interactives and the three central pillars
   Answers – Climate Change, Meteorites and Plate Tectonics

5. Consider why dinosaurs would not have eaten grass
   Answer – Grass did not evolve until after the extinction of the dinosaurs 65 million years ago.
6. Fill in the blank to identify that **Charles Lyell** assisted Darwin in establishing the concept of evolution

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. The gallery asks pupils to identify **food, water, shelter and energy** as the essential needs of human survival.

Environmental Dynamics

The purpose of this gallery is to communicate using satellite imagery how human beings have altered the landscapes of our planet and highlight the diversity of environments that make up our planet's surface. Quotations complement satellite photography to pose a series of 'talking points' for pupils. The gallery also allows us to consider the often detrimental impacts of human activity on natural landscapes and the ways in which human beings can alter their lifestyles to become more 'environmentally friendly'.

Pupils are asked in their **Discovery Packs** to answer a series of True/False questions relating to this content.

Answers - To live in a hot and dry environment, a good water supply is essential.	(**T**) / F
Human beings have no impact on the environments of the world.	T / (**F**)
Cities tend to develop by the coasts and along rivers.	(**T**) / F
Human beings can claim land back from the sea.	(**T**) / F

Oceans and The Yellow Submarine

The purpose of these galleries is to provide a broad overview to oceanic environments of our planet. More specifically, the galleries aim to communicate:

- The extent to which oceans make up our planet's surface
- The anthropocentric uses of ocean environments
- The role of oceans in supporting life
- The role of oceans in influencing the Earth's climate and heat distribution

Within their **discovery packs** pupils are asked to:

1. Find out what percentage of our planet's surface are composed of oceans.
   Answer – 70%

2. Find out how many oceans there are.
   Answer – 5

3. Establish if oceans have any link to our planet's climate.
   Answer – Yes

4. Pupils are reminded that Tectonic processes are of fundamental importance in oceanic processes – this is something they have explored already in both '*Scotland's Time Lords*' and '*Restless Earth*'. They are asked to fill in the blanks to reveal that Marie Tharp discovered **high ridges and deep trenches** when mapping the sea floor.

5. Pupils are encouraged to draw pictures or describe the forms of life they would find in different marine environments through using the portholes in the '*Yellow Submarine'*.

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 aims to communicate the importance of the polar regions as laboratories of climate change.

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

- The diversity and way of life of various organisms in the polar regions
- The impacts of climate change on melting polar ice
- The impact of climate change on polar wildlife
- Some of the anthropogenic causes of global climate change
- The importance of paleaoenvironmental proxies (polar ice cores) in understanding past environmental conditions

Within their **Discovery Packs**, pupils are asked to:

1. Find out where polar bears live
Answer – North Pole

2. Find out where penguins live
Answer – South Pole

3. Compare two satellite images to determine that polar ice is melting and that this melting is associated with climate change

4. Find out some information on igloos using the information within the gallery

5. Find the Polar Ice Core and understand its significance as a palaeoenvironmental proxy

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

4D Venture – Planet Earth's Biomes

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
- Through collaborative learning of landscapes, weather and climate, build up an integrated picture of the dynamic nature of our planet Earth

Tropical Rainforest

When you leave the 4D flight, you will be met by a Visitor Services Assistant who will be your Rainforest guide. It is likely that they will talk to your party and share lots of exciting and interesting facts on the diversity of plant and animal life found in tropical forests.

The **Discovery Packs** encourage your pupils to:

1. Work independently and in groups to identify a variety of animals.
2. Work with their peers to establish the challenges facing rainforest animals.
3. Think back to '*Scotland's Time Lords'* and the process of mountain building as identified by Ben Peach and John Horne.

Curriculum Links – Curriculum for Excellence

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**