

6. Rocks and Landforms

Evidence in Arctic Rocks <http://www.bbc.co.uk/news/science-environment-10941026>

Discuss before reading:

1. How old is the Earth as a planet?
2. How can we find out how old the Earth is?
3. What are the parts of the planet?
4. What is the Holly Grail?
5. Match these words with synonyms: *confirm, determine, involve, signature, sample, remnant*

<i>find a decision</i>	<i>set of characteristics</i>	<i>show that st is true</i>
<i>a small representing part</i>	<i>include as a part</i>	<i>a small remaining part</i>

Over billions of years, much of the material that made up the early Earth was modified by processes such as melting and mixing. But the Arctic rocks seem to contain chemical signatures that date from just after the Earth's violent origin. If confirmed, the discovery challenges established theories about the formation of our planet. The results of the study are published today in the leading journal, Nature.

The signatures found in Arctic lavas are more than 4.45 billion years old. By comparison, the Earth is 4.54 billion years old, only slightly older. The oldest surviving remnants of our planet's turbulent beginnings were unearthed by Dr Matthew Jackson of Boston University, US, and his international team.

They collected the lava samples from Greenland and Baffin Island in the Canadian Arctic. Although they erupted only 60 million years ago, the lavas contain a chemical signature of a far more ancient source.

They show that beneath the Arctic today are small pieces of mantle - the toffee-like layer below the crust - that have survived unchanged since shortly after the formation of the Earth.

The age of this ancient mantle was determined by studying helium gas locked in the lavas. The 4.45 billion-year age means that the samples date from before the Earth's crust developed, but after the core formed.

The search for the oldest remnants of the Earth's mantle has become something of a Holy Grail for planetary scientists in recent times. Dr Carlson of the Carnegie Institution, a co-author on the study, remarked that, "this was a key phase in the evolution of the Earth. It set the stage for everything that came after".

However, Professor Tim Elliott of the University of Bristol, who was not involved in the latest study, remarked that though the conclusions were interesting, they were not beyond doubt: "A more convincing way to prove the great antiquity of this material would have been to demonstrate an anomalous extinct nuclide signature," he said.

Extinct nuclides are chemicals that were formed in stars before the formation of the Solar System. They subsequently decayed away to nothing but the traces they left behind are good markers of the early Earth.

If proven, the new discovery would challenge our understanding of the early Earth.

The ancient mantle source discovered has a different chemical make-up to that predicted by theory. It suggests that the Earth had a more complicated early history than previously thought.

Complete the table with information from the text.

1. Age of chemicals in Arctic lavas billion years
2. Town the researchers were from
3. Countries where the samples were taken and
4. When the examined lava erupted years ago
5. The lavas contained chemical element
6. The research was questioned by a professor from
7. Extinct nuclides come from

After reading the text, try to replace the following phrases with suitable synonyms:

1. Remnants were unearthed by Dr Jackson.
2. The toffee-like layer below the crust
3. It set the stage for everything that came after.
4. Conclusions were not beyond doubt.
5. They decayed away to nothing.
6. The discovery would challenge our ideas.
7. a different chemical make-up

Exam practice - sentence transformation. Rewrite the sentences using the given words.

1. It is possible that Arctic rocks contain oldest remnants of the Earth.
Arctic rocks oldest remnants of the Earth. (2 words)
2. Melting and mixing processes modified the material of the early Earth.
The material of the early Earthmelting and mixing processes. (3 words)
3. It seems that the Arctic rocks contain chemicals from the time just after the Earth's origin.
The Arctic rocks chemicals from the time just after the Earth's origin. (3 w.)
4. Dr Jackson unearthed the oldest remnants of our planet's beginnings.
The oldest remnants of our planet's beginnings Dr Jackson. (3 words)
5. Although they erupted only 60 million years ago, the lavas contain chemicals of a more ancient source.
Despite 60 million years ago, the lavas contain chemicals of a more ancient source. (2 words)
6. If proven, the new discovery would challenge our understanding of the early Earth.
If the conclusions, the new discovery would challenge our understanding of the early Earth. (2 words)

Rock types and landforms

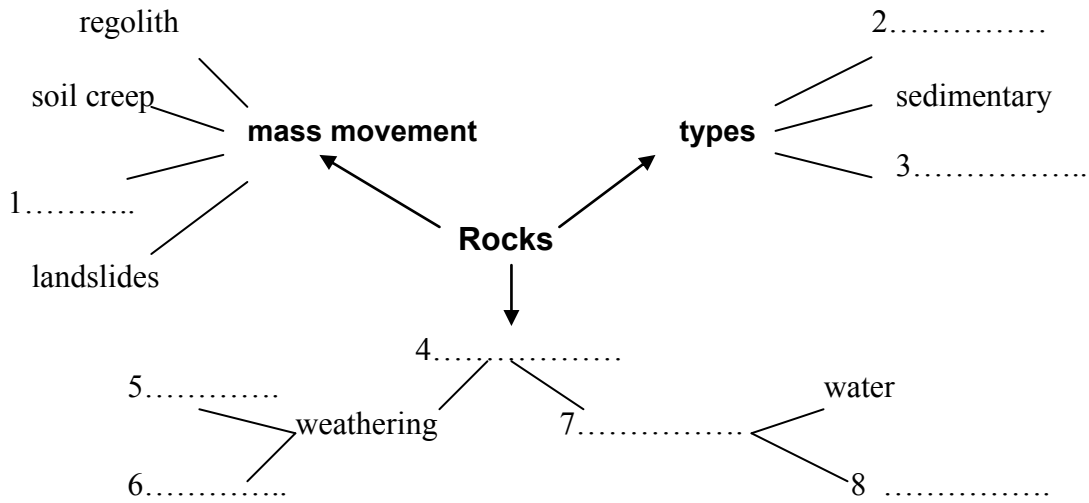
1.Can you name several factors that influence the shapes of the landscape?

2. Compare your answer with the following explanation. Highlight the key words.

Landscapes at both local and global scales have developed from a combination of processes. Plate tectonics, weathering and the action of moving water, ice and wind both create and destroy landforms. Yet these processes are insufficient to explain the many different and dramatic changes of scenery which can occur within short distances.

Each individual rock type is capable of producing its own characteristic scenery. Landforms are greatly influenced by rock type's vulnerability to weathering, its permeability and its structure.

3. **Rocks word map.** Write these words in the map: *igneous, chemical, wind, mudflows, metamorphic, mechanical, denudation, erosion*



In pairs, summarize the information from the diagram in a few sentences.

4. **Names of rocks.** Change the order of the letter to find names of rocks and complete the table.

	<i>rock</i>	<i>translation</i>	<i>example of region</i>
nestomeli			
stosanend			
angrite			
negiss			
saltba			
mecongralote			
maci-stish			

HOMEWORK

How frost can weather rocks –identifying connections

Put the letters in the correct order

- A] As it does so, it expands by about 10%.
- B] By day,
- C] By night,
- D] Eventually,
- E] freezing and thawing occur so frequently that the rock is gradually split and broken up.
- F] This widens the cracks and puts a strain on the rock.
- G] water collects in cracks in rocks.
- H] when temperatures drop to 0°C, the water freezes and turns to ice.

1 _ 2 _ 3 _ 4 _ 5 _ 6 _ 7 _ 8 _

Earth's Physical Features - listening
<https://www.youtube.com/watch?v=P9waVa5c31U>

Discuss before watching the programme.

1. What major types of landforms do you know? Give example for each type.
2. How can mountains be formed?
3. What is the longest mountain range in the world?
4. Where are the world's largest plains?

Now listen and compare your answers.

Read the following statements. Listen again and complete the missing information.

1. Mountains are classified as land risingfeet or higher above the surrounding area.
2. Mountains have wide base and
3. Volcanoes are in the Earth's crust caused by or molten material.
4. Two examples of mountains formed by volcanic activity are..... and
6. The Mid Ocean Range is miles long.
7. Hills have rounded..... They are smaller and less than mountains.
8. Over half of the world's population live in
9. Most of the world's is in plains.
10. Plateaus have sides ranging to 300 - feet.
11. Plateaus are referred to as: tablelands,, outliers, and
12. Sides of plateaus are called These are or steep rock faces that separate two comparatively level land surfaces.
13. Example of an escarpment is

Describing the countryside

Prepare a description of a region of your choice. Other students will then try to identify the region from your description.

Key to homework 1B 2G 3F 4C 5H 6A 7D 8E

Sources

E. Čoupková, JAZ01 course

Kelly, Keith: Geography, Macmillan

D. Waugh, Geography, an Integrated Approach