What colour was the world in the past?

Using rock evidence and '*the present is the key to the past*' to colour the geological world

What were the colours of past geological worlds? We can begin to answer this question by first looking at the evidence preserved in the rock sequence and second, by applying the *'principle of Uniformitarianism*' to use what we know about the Earth today to picture the geological past.

What colours were sediments and volcanic rocks in the geological past?
Breaking a rock shows us the unweathered surface beneath, and it is likely that the colours you see there have not been changed much by rock-forming processes, with examples like:

- black basalt lavas which were probably black when they first formed;
- red sandstones which were laid down containing the red oxidised iron of the desert environments where they were deposited;
- brown and yellow sandstones have contained brown hydrous iron oxides since they first formed;
- muddy limestones and shales still have the grey and black colours of the original sediments;
- pale limestones are rich in pale calcium-carbonate minerals, but may be coloured by other original trace materials too.

What colour was past Earth's vegetation?
Most vegetation on land grows through photosynthesis. Photosynthesis requires plant leaves to contain chlorophyll and this vital chemical compound for plant growth, is green. This shows that most land-based vegetation must have been different shades of green.

What colour was past Earth's sky?
Clear skies today are coloured blue because particles in the atmosphere scatter the Sun's light to leave a blue colour. Since exactly the same process happened in the geological past, past Earth skies must have been blue too.

Red desert sand, green vegetation, blue sky, Ayers Rock/Uluru, central Australia.

Similarly, Earth's past atmosphere contained water vapour. This condensed to form clouds, of shades from white to dark grey, as today. So the past Earth had blue skies with white to grey clouds as well.

What colour were seas in the past?
Water then and now was transparent, but larger water bodies like the sea reflect the colour of the sky, which is why the sea can be blue or grey.

Pale sand, blue sky and sea, white clouds, green vegetation, Oahu Beach, Hawaii, USA.

What colour was past sea-life?
Since today's sea life has evolved from past sea life, it is likely that the sea life of the past had very similar colours to those of today.

What colours were past land animals?
Past land life too probably had very similar colours to those we see today. Birds evolved from dinosaurs and some dinosaurs had feathers which have been preserved. Many coloured birds today use their feathers as part of attracting a mate, and it is likely that some dinosaurs did too – and so were likely to have been just as brightly coloured as some birds are today, like the example here.

A drawing of a small dinosaur that had feathers, with evidence that some were brightly coloured.

What colours were past flowers?
Plants with flowers first evolved in the Triassic Period some 200 million years ago. The main function of flowers is now, and has always been, to attract pollinating insects, and this is often more effective if the flowers are brightly coloured. So, it is likely that the Earth has been coloured by bright flowers ever since Triassic times.

The back up

Title: What colour was the world in the past?

Subtitle: Using rock evidence and '*the present is the key to the past'* to colour the geological world

Topic: A discussion, using the colours of unweathered surface rocks and '*the present is the key to the past'* to give a coloured picture of past geological worlds.

Age range of pupils: 5 years upwards

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- explain that surface rocks are likely to be of similar colour to the colours when they originally formed;
- explain how processes at the Earth's surface operating to produce colour today must have worked in similar ways in the geological past, producing similar colours.

Context:
Earth's surface colours today are produced by the same processes that operated in the geological past. Since the features that made up past geological landscapes were coloured in the same ways as today, many of these landscapes must have had the same combination of colours as Earth's surface today.

We must beware though, since rock surface colours are changed by weathering, and some colour changes can happen during the rock forming processes. The coloured rings in these sandstone paving slabs formed while the rock was being lithified.

Liesegang rings in sandstone slabs, Geological Walk at the British Geological Survey (BGS) HQ, Keyworth, Nottingham, UK (*Peter Kennett*).

We see the sky as blue today because the white light the Earth receives from the Sun, is made up of the rainbow light colours from red to violet and each of these colours has a different wavelength. The shorter wavelength blue is scattered more by the air molecules it hits in the atmosphere than the longer wavelengths, so we see the sky as blue. Past skies were also blue for the same reason.

Following up the activity:
Ask your class how different the Earth might have looked from space at different times in the geological past (including during 'Snowball Earth' and the 'Palaeocene-Eocene thermal maximum', when plants colonised the polar regions).

This is the 'Blue Marble', the famous photograph of the Earth taken on December 7, 1972, by the crew of the Apollo 17 spacecraft *en route* to the Moon at a distance of about 29,000 kilometres (18,000 mi). It shows Africa, Antarctica, and the Arabian Peninsula.

This file is in the public domain because it was solely created by NASA.

Underlying principles:

- The colours that we see at the Earth's surface are caused by the same processes that operated in the geological past.
- Past geological landscapes must therefore have had similar colours.

Thinking skill development:
Understanding how Earth's surface colours form is a construction activity, whilst applying these ideas to the geological past requires bridging skills. Discussion about the results is likely to result in cognitive conflict and metacognition.

Resource list:

- none

Useful links:
An animation explaining why Raleigh scattering makes the sky blue can be seen at: https://www.youtube.com/watch?v=twSg2zbjjnA.
Meanwhile by asking a search engine on the internet 'Why is the sky blue?' you can find animations of simple demonstrations which show this too.
The 'What was it like to be there?' ELIs on rocks and fossils use colour as part of the discussions.

Source: Chris King of the Earthlearningidea Team.