



Key Stage 4 – A Geological Blink

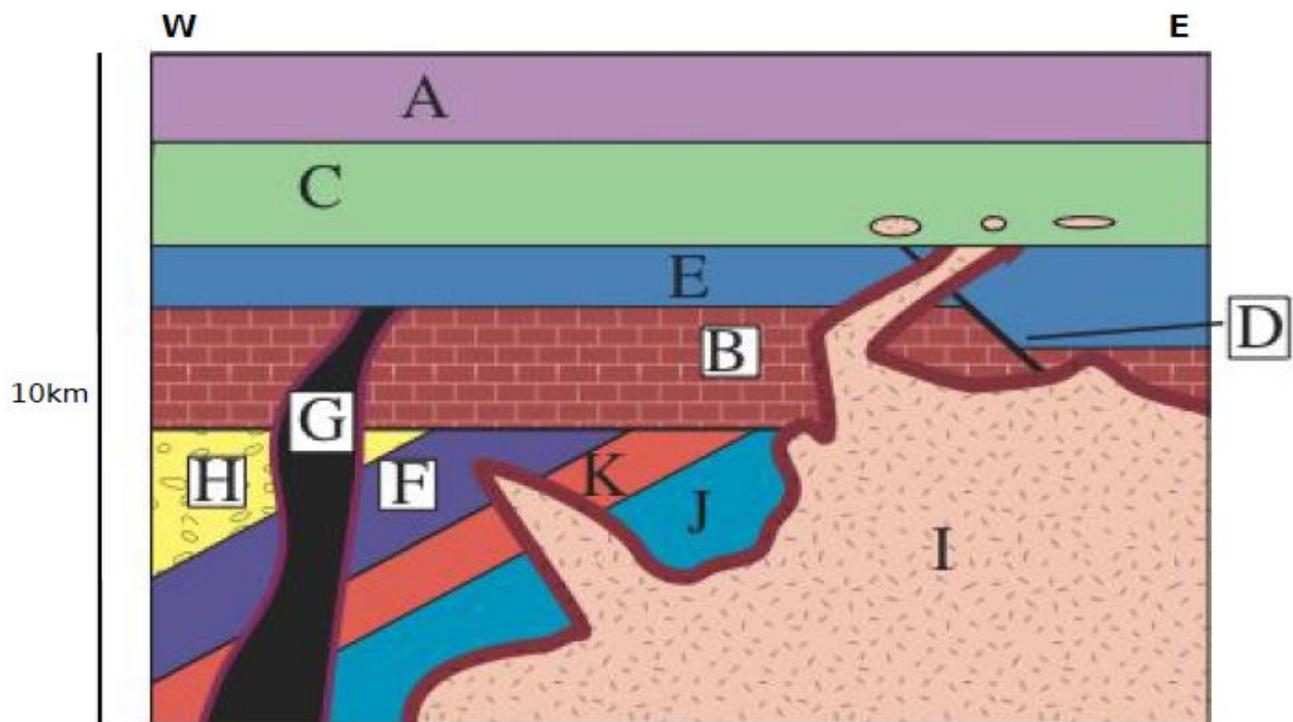
Notes for teachers

At a glance

This lesson is inspired by research at Oxford University into Australian mudstone fifteen times older than the dinosaurs. Traces of oxygen, nutrients, and early life in the mudstone have helped entirely reshape our picture of evolution, the history of life, and the geological history of the Earth.

In this lesson, students will be coming to grips with the geological timescale of the Earth, of life on Earth, and of human history. They will be exploring the colourful history that explains how scientists can detect the colours of creatures long dead, and identify hints of early microbial life interacting with the atmosphere and lithosphere.

These activities are accompanied by engaging and straightforward demonstrations and exercises that relate to the science specifications.



Learning Outcomes

- Students will develop independent research and practical skills, working both in small groups such as pairs and together as a whole class.
- Students will learn about constructive and destructive interference of waves.
- Students will learn about the processes by which sedimentary rocks can form and why these are of interest to scientists.
- Student will develop an understanding of how geography, history, biology, geology, chemistry and



physics are linked in practical scientific investigations.

- Students will understand the concepts of hard and soft water and how they relate to minerals.

Each student will need

- A copy of the student worksheet
- A piece of thick black card – small pieces work best, about A6.
- Trays
- Water
- Clear nail polish
- Access to the internet
- For the extension: soap solution, a stirrer stick, two 10cm³ measuring cylinders, two samples of water (hard, A, and soft, B) and deionised water

In addition, the teacher will need 14 reams of 500 sheets of paper. Toilet rolls could also be used, with each sheet 200,000 years, but it is important to note that drawing on these will be more difficult.

Possible Lesson Activities

1. Starter activity

Write the key words below up on the board and ask the class to guess their meanings, write down their guesses, then research them to compare. They will need to use the internet to do research.

Key words: lithosphere, biogeochemistry, biomineralisation, chemostratigraphy

2. Main activity: Paper Stratigraphy

- Ask the class to read **Paper Stratigraphy** on the provided worksheet, supply them with the paper and ask them to follow the directions to research Earth history and create a timeline. They will need to use the internet to do research.

Answers: All of Earth history = 22700 sheets of paper or 45.4 reams. 1.4 billion years = 7000 sheets of paper, or 14 reams.

You will need 14 reams of paper for this class project.

- Show the animation 'Ancient Mysteries in Marvellous Mud' (see weeblinks)
- Ask the class to read **Lithification, Times Change** and complete **Date the Strata** on the provided worksheet.

3. Main activity: Depositing Minerals

- Ask the class to read through **Structural Colour** on the provided worksheet.
- Pass out trays, pieces of card and nail polish, and invite the class to follow the instructions to make **Oil Slick Rainbows**.
- Ask the class to discuss in pairs or small groups what they can't learn from colour which may be of interest to biologists, and what the limits of structural colour are. Invite the groups to feed back ideas to the whole class.
- Ask the class to read **What is Biomineralisation?**



4. Extension activity: Hard water

- Ask the class to test the hardness of two samples of water 1 and 2, against a sample of deionised water, following the instructions on their worksheets and keeping a record of their results.
- Ask the class to read **What is “hard” water?** and form conclusions from the experiment.

5. Plenary

- Return the class’ attention to the key words on the board and the concept of interdisciplinary science.

Web links

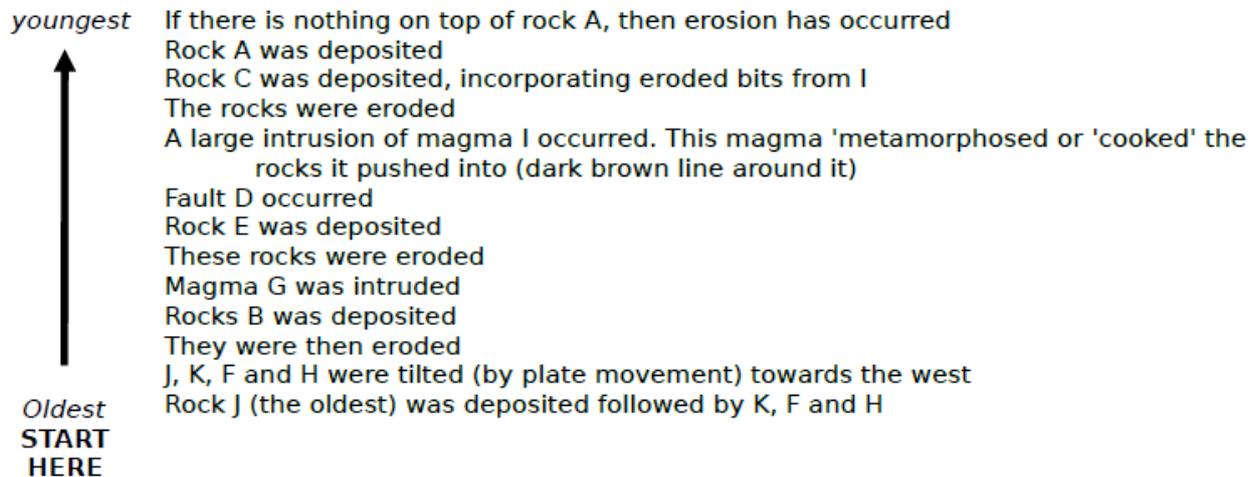
Oxford Sparks ‘Ancient Mysteries in Marvellous Mud’ animation:

<https://www.oxfordsparks.ox.ac.uk/content/ancient-mysteries-marvellous-mud>

Toilet roll of time:

http://www.earthlearningidea.com/PDF/234_Toilet_roll_of_time.pdf

Appendix 21. Answers to Date the Strata



The students’ version need not be this detailed.