Teacher Notes

Themes

- Australia's geological landforms
- Australia's mineral resources
- Cultural history of Australia
- Study of geoscience

Key learning outcomes

- Australia's geological history is preserved in the minerals and formations above and below its surface.
- Australia's past and present culture has been heavily influenced by its minerals and landforms.
- The history of life in Australia is preserved in minerals known as fossils.
- Geoscience is the study of Earth and all the systems that affect it, and can require knowledge of diverse topics and fields.

Key curriculum areas

- **Science:** Science Understanding (Earth and space sciences, Chemical sciences)
- **English:** Language; Literature
- **Mathematics:** Measurement; Space
- **Cross-curriculum Priority:** Aboriginal and Torres Strait Islander Histories and Cultures

Publication details

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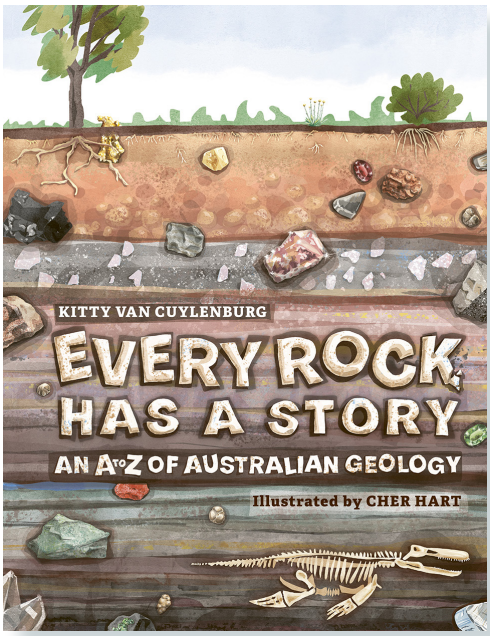
Teacher notes prepared by Mike McRae.

CSIRO Publishing
Private Bag 10
Clayton South, VIC 3169, Australia

Website: www.publish.csiro.au
Tel: 1300 788 000 (local call in Australia)
Email: publishing.sales@csiro.au



Every Rock Has a Story

An A to Z of Australian Geology

Kitty van Cuylenburg and Cher Hart

About the book

Australia is full of unique geological formations, fascinating fossils and intriguing minerals. *Every Rock Has a Story: An A to Z of Australian Geology* explores our incredible landscapes and offers captivating insights into our exceptional continent.

Discover pink diamonds and stromatolites, the Great Artesian Basin and Uluru, and granite rocks formed billions of years ago. With stunning illustrations, engaging text and packed with fun facts, this is the perfect book for anyone curious about Australian geology.

Recommended for

Readers aged 8–12 (Years 3–6)

CSIRO PUBLISHING

Teacher Notes

About the author and illustrator

Kitty van Cuylenburg is a teacher, writer and geologist. She has worked at mines across Australia, and is currently curating a geological collection for her secondary school.

Cher Hart is a nature illustrator with a background in biology and visual communication. She has created material for journals, exhibitions and government. She is also the illustrator of *Sensational Australian Animals*. *Every Rock Has a Story* is her second children's book.

Pre-reading questions or activities

Ask students to discuss their holidays around Australia, such as to the beach, the desert or the mountains. Can they describe physical features of their destination, such as the shape, colour or even the composition of the landscape? Encourage them to go into detail on the nature of the ground – whether it was sand, dust or covered in human-made material like concrete.

Open Google Maps in front of the class and revisit some of these destinations from above. Focus in as far as possible and explore the region, pointing out the high points like mountains and low points like rivers and streams. Invite the students to share their ideas on how the landscape might have changed over time, and how geological events like volcanic activity, flowing water, plants or even humans may have affected the shapes and structures of the landforms.

Discussion questions

Science

1. Read the introduction to *Every Rock Has a Story: An A to Z of Australian Geology* on pages 6 and 7, which states thinking like a geologist often involves imagining 'Oh! That's an interesting rock ...'. What features of a rock might make it interesting? List all the different ways a person can describe a rock.
2. Many craters across the planet are formed by meteors impacting the surface. Read pages 12 and 13, and discuss how other planets, moons and even asteroids are also impacted by meteors. Discuss why some bodies, like the Moon, might have more visible craters than Earth. What makes our planet different?

3. Ask students if they've ever experienced an earthquake. Read pages 16 and 17, paying close attention to the map of Australia in the middle of a tectonic plate. Discuss why some areas of the world are more prone to tremors than Australia.
4. Paleontologists are experts at interpreting fossils. Ask if any students have any fossils at home, and to describe what they look like. Read pages 18 and 19, and discuss how a paleontologist might use fossils and their surrounding to determine features of ancient environments, such as plants, locations of rivers, or even the climate.
5. Is Australia an island or a continent? Read pages 24 and 25 and discuss with the class their thoughts. Should we have a new term just for Australia? Why are clear definitions and labels so important in science?
6. Australia's highest point, Mt Kosciuszko, is just 2228 metres above sea level. Read about the formation of this mountain on pages 28 and 29. Ask the class to consider what it would take to produce higher mountains in Australia. What forces would be required? What effects would tall mountains have on the local climate, ecosystems or even on the local culture?
7. Australia's rocks contain a wide variety of useful materials we can use or sell to other countries. Read about some of these on pages 42 and 43, and ask the class what's good and bad about digging up many resources. Ask who 'owns' these materials. Who should receive the value for them? Who is responsible for restoring the land after they're removed from the ground?
8. Read pages 56 and 57, and ask who in the class would consider being a geologist. Discuss with the students why geologists are valuable in society; why might we want to know what's underground, how landforms appeared (and how they'll change), or understand the characteristics of different minerals?

English

1. Many landforms and regions in Australia have had colonial names replaced by Indigenous names. Uluru is one example. K'gari, the world's largest sand island, is another. Ask the class why place names are important for more than just describing travel destinations. Should more places in Australia have names changed to what Aboriginal and Torres Strait Islander Peoples call them?

Mathematics

1. Gold is a precious metal with a long history of being valuable in many cultures. Opals and diamonds are also precious gems. Read pages 34 to 39 and discuss what might make a mineral valuable. Why might we have coins that look gold, but are made of other metals? Why might people wear these minerals as jewellery?

Aboriginal and Torres Strait Islander Histories and Cultures

1. Uluru is the only rock in Australia that you aren't permitted to climb. It wasn't always this way, though. Read pages 48 and 49. Ask the class why they think people like to touch and climb landmarks. Do they think it is more important to respect these structures and their local custodians, or should anybody be permitted to climb them?

Activities

Science

Crater creation

Safety: Thrown as projectiles, marbles can cause harm. Ensure any objects used in this activity are only ever directed at the flour in the box. All observers must stand at least 2 metres away from the baking tray while objects are dropped.

You will need:

- Large baking tray
- 1 kilogram of plain flour
- Small and large marbles
- Ruler
- Large sheet (optional)

What to do:

1. (Optional) Lay the large sheet on the ground to make cleanup easier. Alternatively, conduct the activity outside.
2. Place the baking tray in the centre of the large sheet, or on the ground. Fill the baking tray to the brim with flour. Smooth the surface using the ruler so it is completely level and flat.

3. Hold a small marble and stand right above the baking tray. Drop the marble from a height of about half a metre. What happens to the marble? What shape does it make in the flour?
4. Smooth the flour with the ruler and repeat the process from a different height. What happens to the shape in the flour?
5. Repeat the process by taking one step back and gently throwing a marble at the flour at an angle. Does the shape in the flour change?
6. Try dropping a larger marble. How does the shape in the flour change?

What's happening?
Craters are geological formations created by the release of large amounts of energy, such as the impact of a meteor colliding with Earth's surface. Geologists can tell a lot about the nature of the impact by the shape of the crater, such as the size of the meteor, its speed and the angle at which it connected with our planet. This can even be used to estimate where the meteor may have originated in space. Earth's winds and water erode and weather the landscape quickly, reducing the visibility of old craters from above over time.

Crystal crafting
Safety: Table salt and Epsom salt are irritants. Wash hands after using and avoid touching sensitive places like the eyes.

You will need:
- Epsom salt or table salt
- Teaspoon
- Warm tap water
- Glass jar
- Paddle-pop or craft stick
- Short piece of cotton string
- Food colouring
- Fridge (optional)

What to do:
1. Fill a glass jar with warm tap water.
2. Add a teaspoon of either Epsom salt or table salt to the water. Stir until it is no longer cloudy and most of the visible salt pieces have disappeared.

3. Repeat the above step until stirring no longer helps the salt disappear (dissolve).
4. Add one or two drops of food colouring of your choice of colour to the jar of salty water.
5. Tie a short piece of string around the centre of the paddle-pop stick. Dangle the string into the salty water and lay the paddle-pop stick horizontal across the jar's rim.
6. Place the jar in a cool place, such as inside a fridge or on a shelf in a dark place.
7. Observe any changes over the next few days. What is happening to the salt in the water? What colour is the salt you can see? What shapes can you see?

What's happening?

All salts are a combination of two groups that have opposite charges. This makes the two groups stick together like magnets. Placed into water, the water's molecules pull the two halves apart, causing the salt to break apart or 'dissolve'. Warm water can hold more dissolved salt than cooler water, so as the water cools, some of the two halves can join together again. As water evaporates into the atmosphere, even more of the salt can recombine, forming large, repeating shapes called crystals. Different salts will form different shapes – Epsom salt will make long needles, for example, while table salt makes blocky shapes. Sometimes other material can be trapped inside the crystal, changing its colour.

Mudland

You will need:

- A wide wooden board (the longer and wider the better)
- Sand or soil
- Gravel
- Large rocks
- Water hose connected to water
- Twigs and leaves (optional)
- Shovel (optional)

What to do:

1. Place one end of the wooden board on several large rocks to give it a gentle slope.
2. Mix gravel with sand or soil in a pile next to the board. Add a small amount of water to make it more clay-like.
3. Place mounds of clay-like soil and gravel onto the board, creating a landscape. Use the shovel if it is easier. Feel free to decorate with leaves and twigs.

4. Turn on the hose to a light trickle. Place the end of the hose at a point at the elevated end of the sloping board.
5. Watch the path the water takes. What material is carried down the board with the flow of water? Does the path change over time?

What's happening?
Fluids like water move from high points to low points, taking whichever path provides the least resistance. As the water flows, it creates a force that pushes and even carries material. The stronger the force, the bigger the pieces of mineral it can transport. This movement of grains and pebbles is called erosion. It wears away loose material on a landscape where water flows the fastest, depositing it where the water flows the slowest.

English

Just picture it
Choose a location from one of the chapters in *Every Rock Has a Story*.

Write either a poem or short piece of prose that describes the location, without using any names. Use adjectives that connect the audience with the climate, the features of the landscape or landmark characteristics. Ask the audience to close their eyes and picture the surroundings as the poem or prose is read aloud. Invite them to raise their hand when they think they know where the location is.

Mathematics

School minerals
Use sheets of grid paper to construct a map of the school that is similar to the map of Australia on page 60.

Draw in important buildings and locations, such as sporting fields. Decide on a key that describes concreted ground and soil types such as clay, sand, pebbles and boulders. Use the guide on page 33 to determine the difference in sizes of particles of each soil type.

Australian Curriculum Links (Version 9.0)

Year level	Learning area: Science	Other learning areas
Years 3 and 4	**Science Understanding: Earth and space sciences** • Compare the observable properties of soils, rocks and minerals and investigate why they are important Earth resources (AC9S3U02) **Science Understanding: Chemical sciences** • Examine the properties of natural and made materials including fibres, metals, glass and plastics and consider how these properties influence their use (AC9S4U04)	**English: Language** • Understand past, present and future tenses and their impact on meaning in a sentence (AC9E4LA09) **English: Literature** • Recognise similar storylines, ideas and relationships in different contexts in literary texts by First Nations Australian, and wide-ranging Australian and world authors (AC9E4LE01) **Mathematics: Measurement** • Interpret unmarked and partial units when measuring and comparing attributes of length, mass, capacity, duration and temperature, using scaled and digital instruments and appropriate units (AC9M4M01)
Years 5 and 6	**Science Understanding: Earth and space sciences** • Describe how weathering, erosion, transportation and deposition cause slow or rapid change to Earth's surface (AC9S5U02) **Science Understanding: Chemical sciences** • Compare reversible changes, including dissolving and changes of state, and irreversible changes, including cooking and rusting that produce new substances (AC9S6U04)	**English: Language** • Understand how noun groups can be expanded in a variety of ways to provide a fuller description of a person, place, thing or idea (AC9E5LA06) **English: Literature** • Identify aspects of literary texts that represent details or information about historical, social and cultural contexts in literature by First Nations Australian, and wide-ranging Australian and world authors (AC9E5LE01) **Mathematics: Measurement** • Choose appropriate metric units when measuring the length, mass and capacity of objects; use smaller units or a combination of units to obtain a more accurate measure (AC9M5M01) **Mathematics: Space** • Construct a grid coordinate system that uses coordinates to locate positions within a space; use coordinates and directional language to describe position and movement (AC9M5SP02)
All	**Cross-curriculum Priority: Aboriginal and Torres Strait Islander Histories and Cultures** • First Nations Australians' ways of life reflect unique ways of being, knowing, thinking and doing (A_TSIC2)	

Related books from CSIRO Publishing

For younger readers:

- *Our World Full of Wonder* (https://www.publish.csiro.au/book/8148)

For older readers:

- *Rocks, Fossils, and Formations: Discoveries Through Time* (https://www.publish.csiro.au/book/7864)
- *The Great Australian Science Book* (https://www.publish.csiro.au/book/8083)
- *The Encyclopedia of STEM Words: An Illustrated A to Z of 100 Terms for Kids to Know* (https://www.publish.csiro.au/book/8084)

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Other CSIRO resources

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