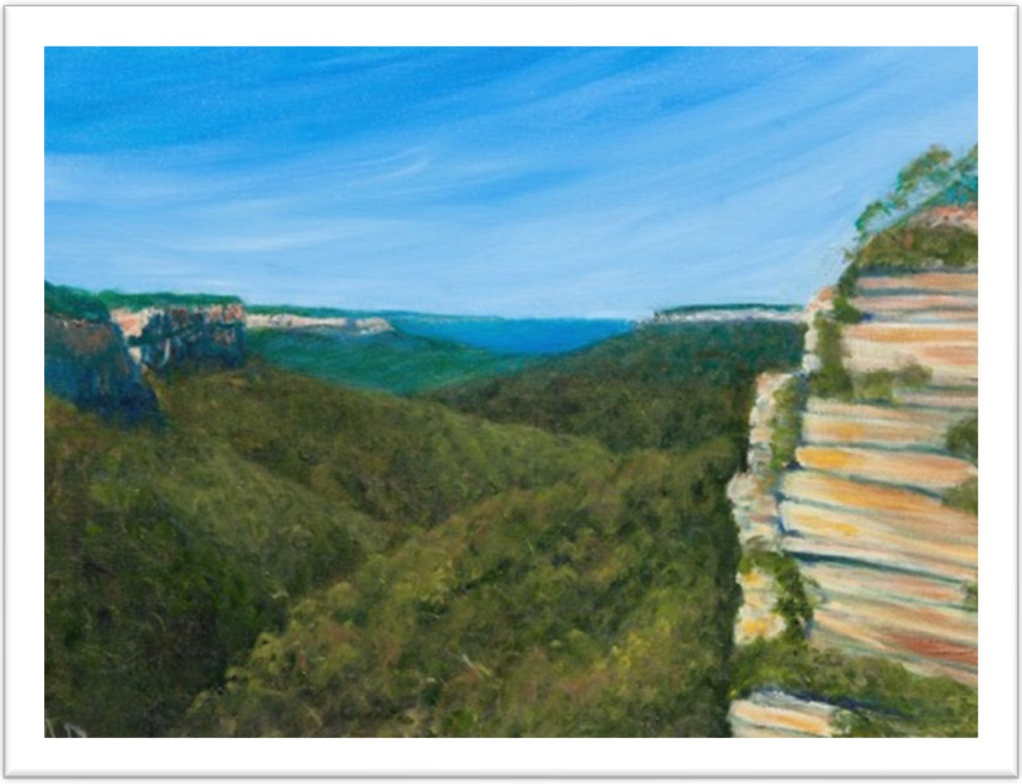
Landscapes and Landforms

By Jo Lloyd



Land – Cliffs in the Blue Mountains by Angharad Dean

Table of Content

WELCOME FOR PARENTS 4
WELCOME TO STUDENTS 8
LESSON 1 – INTRODUCTION: CYCLES ON EARTH 9
LESSON 2 – IGNEOUS ROCKS AND INSELBERGS 12
LESSON 3 – SEDIMENTARY ROCKS 15
LESSON 4 – METAMORPHIC ROCKS AND THE ROCK CYCLE 19
LESSON 5 – ROCK CLIMBING, MINERALS, FOSSILS AND PRECIOUS STONES 21
LESSON 6 – CREATING LANDFORMS AND LANDSCAPES 24
LESSON 7 – FIELDWORK PROJECT – BEACH LANDSCAPES 27
LESSON 8 – TWO PICTURE STUDIES AND A POEM 32
LESSON 9 – EXPLORING DIVERSE LANDSCAPES 33
LESSON 10 – CREATING GORGES AND CANYONS 36
LESSON 11 – LIMESTONE CAVES AND KARST LANDSCAPES 39
LESSON 12 – IGNEOUS LANDFORMS AND VOLCANOES 43
LESSON 13 – SALT MINES AND OTHER UNDERGROUND LANDSCAPES 48
LESSON 14 – FOLDS AND FAULTS 51
LESSON 15 – VALUING LANDSCAPES 56
LESSON 16 – TWO PICTURE STUDIES AND A POEM 60
LESSON 17 – ABOUT TIME 61
LESSON 18 – KATOOMBA'S GEOLOGICALLY BASED TOURISM BOOM 65
LESSON 19 – FAMOUS GEOLOGISTS 68
LESSON 20 – TWO PICTURE STUDIES AND A POEM 71
LESSON 21 – FIELDWORK PROJECTS – TOOLS AND EQUIPMENT 71
LESSON 22 – FIELDWORK PROJECT – OWN CHOICE LANDSCAPE OR LANDFORM 76
LESSON 23 – WEATHERING 79
LESSON 24 – EROSION AND WAVE ACTION 81
LESSON 25 – DEPOSITION 84
LESSON 26 – FIELDWORK PROJECT – INVESTIGATING A WATERFALL 87
LESSON 27 – USING DIAGRAMS AND PREPARING CROSS-SECTION DIAGRAMS 91
LESSON 28 – GEOMORPHOLOGICAL HAZARDS – EARTHQUAKES 94
LESSON 29 – GEOMORPHOLOGICAL HAZARDS – LANDSLIDES AND AVALANCHES 97
LESSON 30 – TWO PICTURE STUDIES AND A POEM 100
LESSON 31 – CONSERVING LANDSCAPES AND LANDFORMS 101
Lesson 32 – URANIUM MINING AND KAKADU NATIONAL PARK 103

Welcome to Students

This semester the focus for science and geography will be on landscapes and landforms. You will explore the different kinds of rocks that are in the world around us and the landforms they create, considering the different processes that create and shape the physical world around us. From the comfort of your own homeschool you will travel to the huge salt mines of Europe, amazing canyons in South America, caves along the Nullabor Plain here in Australia, as well as examine the sites of volcanoes, earthquakes and landslides. You will also study some stunning artworks that depict different landscapes within our world and read poems that tell of their beauty. Yet, it isn't all armchair travel. There are three fieldwork projects included for you to complete, to study a beach landscape, a waterfall and another landscape or landform of your own choosing out in the field. This is a great opportunity to learn more about a place that may have intrigued and interested you as to how did it form and why it is the shape and form that it is. Getting outside and doing fieldwork is a great part of geography and scientific studies!

My husband and I both studied geography alongside a number of other subjects. Learning more about the processes that shape our Earth is a fascinating area of study. However, it is somewhat infectious, in a good way. You will find that after a few lessons you are looking at and considering the places and rocks around you in a new way, examining landforms for clues as to how they may have formed.

For each lesson you will read the text. Once you have read that you can look at the links provided in the Landscapes and Landforms Complementary Links Moodle Book. Then, having read the content and examined the links, make an entry in your geography or science notebook about what you have learned. You might like to include diagrams to explain processes, like the ones my sons, Joseph and Dominic, prepared for this resource.

Have you ever read the *Curious George* series of books by H.A. Rey? Perhaps they were read to you when you were small. They have bright yellow covers and feature a monkey, George, and a man with a yellow hat. George was curious. He was always getting into scrapes while examining something further. Now, I'm not suggesting you need a monkey, or a yellow hat, or that you should be getting into troubles, but being just a little curious to find out more about something can be a good thing!

Jo Lloyd

Lesson 1 – Introduction: Cycles on Earth

Next time you're at the beach, pick up a handful of sand and look at it – really examine it. You'll notice that each grain differs from its neighbours. Some may be black, others shiny; still others may be green or white or various shades of brown. If you look at the grains under a microscope, more differences appear. Some look smooth and rounded, some sharp and angular. All of these differences arise because the grains of sand you are holding, despite their differences, share one important property: all are part of one of the great cycles that operate on our planet.

The grains of sand are different colours because each comes from a different rock inland from the beach. The grains have different shapes because they may have been washed to the beach, buried, incorporated into new rocks, uplifted, and washed to new beaches many times. The great cycles of weathering and erosion of rocks, sedimentation, and creation of new rocks has gone on since Earth's beginning, and will continue until the sun burns out and the planet dies. Because of this cycle, it is possible that you hold in your hand the very first grain of sand that formed on the very first beach when Earth was young.

As scientists examine nature in operation, they recognise many ongoing processes – natural actions that constantly change the surface of the globe. Rain falls, gradually washing away rocks and soils and creating sand and silt. Rivers flow, carrying away those sediments from hills and mountains to the valleys below. Ocean and lake waters evaporate, creating new rain clouds. Rocks, water, and atmosphere – the matter that forms the outer layers of our planet – are forever being shifted from place to place.

Water evaporates from the oceans and flows back, sometimes on the surface, sometimes underground, and sometimes stopping for a while in an inland lake. When the climate turns cold, water is taken up in huge ice sheets that spread out from the poles, and sea levels fall around the world. With warmer weather the ice sheets retreat and the water flows back into the sea. Like rocks, water moves in cycles.

Even the air moves in stately cycles, from the prevailing winds that bring us our daily weather to the long-term effects that constantly change the climate.

In fact, Earth operates in cycles.

Today, scientists recognise that all of Earth's cycles are connected, each influencing the others. We are beginning to see our planet as a kind of marvellous machine, full of turning gears and moving parts. And most wonderful of all, we are beginning to understand how that machine works and how all the parts fit together.

No feature on Earth is permanent. Mountains weather away, continents break apart, oceans disappear, glaciers form and melt. Change is the hallmark of our planet. Yet amidst all this change, there is constancy. For all practical purposes Earth has a fixed budget of atoms. For an atom to be used in one structure, it must be taken away from another. Like a child in a

room filled with wonderful building blocks, Earth has a large but finite number of pieces to play with.

Earth's surface displays a remarkable variety of rocks. But despite this variety, geologists classify rocks into only three basic types: igneous, sedimentary, or metamorphic. Cataloguing rocks is not just an academic exercise. Each type of rock records a different complex past – a past revealed by mineral textures and form. Each type of rock can be changed from one form to another and then back again. Geologists call these transformations the rock cycle.

Excerpt from Science Matters: Achieving Scientific Literacy *by Robert M. Hazen and James Trefil (2009)*

Cast even a quick glance around you and you will find a number of items that are made of rock. Perhaps a building nearby, a sculpture in the garden, the kitchen benchtop, the pumice stone in the bathroom or the pebbles in the creek nearby. All of these are part of our geology, the rocks and minerals that make up landforms and shape the landscapes we see each and every day. The focus of this unit is to better understand and appreciate the landscapes and landforms in our world. This will include rocks and minerals and crystals, as well as famous places throughout Australia and the world, some you may have seen, some you are yet to visit. Don't be fooled into thinking that this is just a topic for geologists to get excited about. Be curious and explore aspects of the world around you in a new way.

This unit will harness aspects of Science and Physical Geography. To study geology is to seek to understand minerals, rocks and plate tectonics; geological processes and time frames involved; to study rocks and minerals, the structure of Earth and know how aspects such as water and winds shape the planet. To study physical geography, or geomorphology, is to be interested in the physical features of the Earth's surface and how they relate to geology and geological processes. It is a study of lithology, which is the study of the general characteristics of rocks. In Greek, the word *lithos* means rock and *sphaira* means globe, so the lithosphere refers to the solid upper zone of the Earth. This upper zone includes the rocks and soil within 7 kilometres to 200 kilometres deep. Physical geographers and geomorphologists also examine the biosphere, atmosphere and hydrosphere too, examining how these interact and affect the lithosphere. They are interested in the study of landscapes and landforms and the processes, large and small, that have made them the way that they are. Geomorphologists and geologists seek to understand the history of the Earth and how it formed, specifically in relation to rocks and sediment, and physical geographers desire to know more about the formation of landscapes and landforms and how they are still forming and changing today. It is these issues that we will cover in this unit, which will cover one semester. It will involve some armchair travel, as we seek to uncover some unusual landforms and landscapes of our Earth, formed and shaped by these processes and cycles that geologists, physical geographers and geomorphologists find so fascinating.

Lesson 1 – Introduction: Cycles on Earth – Complementary Links

Further information on this lesson is included in the Landscapes and Landforms Complementary Links Moodle book.