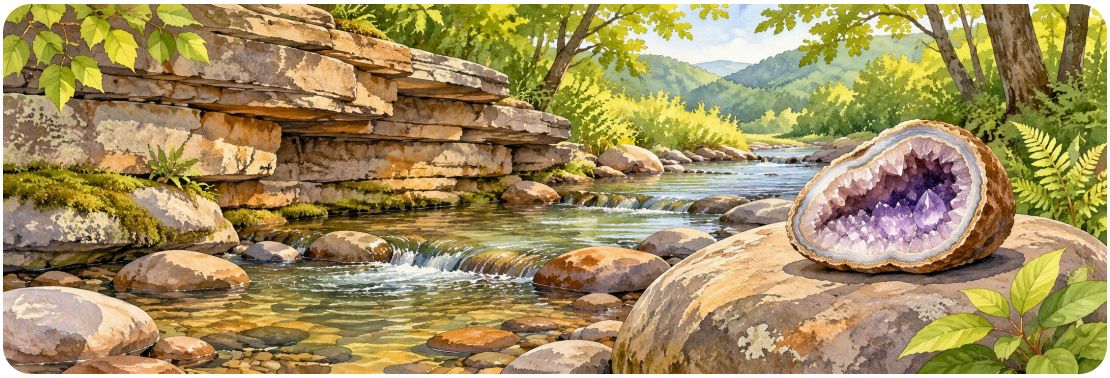
CARDINAL COMPASS - NO. 6 - HANDS-ON LEARNING - WITH CARL THE CARDINAL

Rocks & Crystals

VOL. 6

Stones that hide crystals, rocks born from fire, and rocks squeezed from layers. And three experiments you can do safely at home.

A plain gray stone can hide a whole cave of purple crystals. You cannot tell from the outside. That is the fun of rocks.



Cover illustration: layers of rock stand over a stream, and a geode split open on a boulder shows the purple crystals that were hiding inside.

Read together	Build together	Grown-up with you for every experiment



Meet Carl - Rock Carl

Carl the Cardinal is your guide. For this project, he carries a magnifier and found a geode split open with purple crystals inside. His green neckerchief and gold compass medallion stay on. Color your own Carl on the last page.

How to use this book: Pages 2-4 tell the story. Page 5 is safety. Read it first. Then do the three experiments. The salt crystals take days of waiting, so start them first. Finish with the questions. Color Carl at the end.

Keep a notebook near you. Write what you guess. Write what you see.

You will need, for all three experiments: table salt, room-temperature water, a cup for mixing, a clean shallow tray or dish, a second tray or dish, a spoon, white vinegar, a dropper, known limestone, quartz, rocks to collect, a brush, paper cards, an egg carton, safety goggles, a notebook.

Science - Volume 6 - Version 6

What is a rock? What is a crystal?

Pick up a stone. It feels simple. It is not. That stone is made of smaller stuff, it was born in one of three ways, and some stones are hiding crystals inside. This unit teaches you how to read a stone.

> **Rock:** a rock is a natural solid made of one or more minerals. A pebble, a boulder, and a mountain are all rock.
>
> **Mineral:** a mineral is the natural building-block stuff that rocks are made of, like the ingredients in a recipe. One rock can hold a few minerals mixed together.
>
> **Crystal:** a crystal is a solid whose tiny parts stack in the same pattern again and again. That repeating internal pattern is why crystals grow with flat sides and sharp corners.

Every rock belongs to a family

Scientists sort rocks into three families. The family tells you how the rock was born.

> **Igneous, the fire-born family:** melted rock cooled down and hardened. Some cooled slowly under the ground. Some burst out of a volcano and cooled fast.
>
> **Sedimentary, the layer-squeezed family:** layers of sand, mud, and shells piled up and were squeezed together until they turned to stone.
>
> **Metamorphic, the changed family:** an old rock was changed by heat and squeezing deep underground, until it became a new kind of rock.



Left to right: a fire-born rock with speckles and glass, a layer-squeezed rock with a shell in its layers, and a changed rock with wavy bands.

Reading a rock's history

A rock cannot tell its story in words, but it carries **evidence**: evidence is the clues you can observe and check for yourself. A careful observer reads that evidence clue by clue. Four kinds of clues do most of the work. The first two are on this page, and the next two are on the next page.

> **Layers:** flat layers stacked one on top of another show material that settled in piles, one pile at a time. The bottom layer was laid down first, so layers let you put events in order. Layers that stand tilted or wavy show that squeezing moved them after they formed.
>
> **Grains:** a grain is one tiny piece of mineral or rock that you can pick out in a stone, like a single grain of sand. Big, speckled grains that fit together like puzzle pieces point to melted rock that cooled slowly underground. Small, even grains pressed tight together point to piles of sand or mud that were squeezed into stone.