

CHILDREN'S SCIENCE SERIES

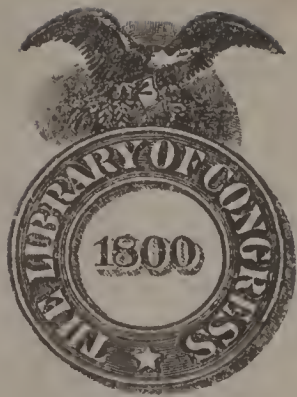
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THE
BOOK OF
STONES



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CHILDREN'S SCIENCE SERIES

Federal writers' project Pennsylvania

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THE
BOOK OF
STONES

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NOTE

The Book of Stones is the second in a series of children's science books prepared by the Federal Writers' Project of Pennsylvania.

This book was written by John F. Hausmann, Jr. under the supervision of Paul Comly French, State Director and George B. Reeves, Assistant State Director, all of whom resigned before publication.

The illustrations and cover design are by Edward Giordano, former staff artist.

CONRAD C. LESLEY
Acting State Director



“A VERY LARGE PART OF THE WHOLE WORLD IS MADE OF ROCK.”

Book of Stones

One day John passed a field covered with stones. Some were green, some grey, some red and some were almost black. Some stones were small like pebbles. Others were large like cobblestones. John came home with his cap filled with stones. His mother told him to place them in a wooden box out in the shed.

John's brother Ned was home for his vacation. Ned was very much interested in John's stones.

“Rocks and stones,” Ned said when he looked at John’s stones. “That is just what I have been studying about in school. I have found many different kinds of stones myself.”

The next morning they both went out into the field to look for more stones.

“Where do all these stones come from?” John wondered.

“All stones come from some mountain,” Ned replied. “The soil and mud are also parts of mountains. They are stones that have been broken into very small pieces.

“Frost breaks large stones into smaller pieces. The change from hot weather to cold weather helps to break the stones. The rains and the winds also cut and wear the stones until they break.

“At the bottom of all mountains there are many large and small stones and there also is much soil and gravel and mud. These stones, soil, gravel, and mud have all been a part of the large rocks that make up the mountain itself.”

The two boys sat down on a stump and Ned continued with his tale.

“Do you remember what happened to the pitcher with water in it that froze at Grandmother’s last winter?” Ned asked John.

“The pitcher cracked,” John replied.

“The pitcher cracked,” Ned said, “because the water spread when it froze. The frozen water pushed out. When water freezes between rocks it acts in the same way. The rain and snow that settle in the cracks of the rocks turn into ice.

The ice pushes the rocks apart. When the ice melts and the water moves the rocks about, they are broken into smaller pieces.

“Near sandy places, by the sea or near a desert, the wind carries sand along with it. The wind wears away the hardest rocks. It is helped by the sand that it carries along with it. The wind then acts like a sandblast. The harder rocks take a longer time to cut away while the softer rocks are carved away first. Chunks of hard rocks are left. Strange shapes are then formed. In this way the mountains lose part of their rocks.”

“Our teacher showed us a picture of a mountain that looks like a castle,” John said. “She said the rain and the winds made the mountains look like that.”



HARD ROCKS TAKE A LONG TIME TO CUT AWAY.

“That is true,” Ned answered. “And pieces of rocks are broken off to make these shapes. What happens to these pieces of rocks? Some we know become changed to soil and gravel. Some of the pieces of rocks are carried away from the mountains by the streams and rivers. As the streams and rivers rush down the mountain sides they carry the stones with them.

“During the winter the stones that lie on the river beds become covered with ice. Ice is lighter than water. You have seen how ice cubes float on top of your lemonade. That is just what happens when ice forms in the river. When enough ice forms the ice rises to the top like a float.

“The ice carries with it the stones that

lie on the bottom of the river. The floating ice and the rocks beneath move down with the current to far places. Some rocks are left on the banks of the river. Some rocks remain on the river bed. When the river dries, hundreds of years later, the rocks again can be seen.”

John was puzzled by this story.

“But there are rocks that weigh as much as small buildings,” he said. “No river could have carried those large rocks.”

“Those rocks are called Lost Stones,” Ned told John. “I have heard of a Lost Stone ten feet high and some have been found that weighed six thousand tons.

“Men who have studied our mountains and rocks say that the earth once was a hot, boiling mass of iron and rock. After

a long time parts of this hot, boiling mass cooled. No one knows how long it took for the earth to cool.

“The crust of the earth cooled first. After millions of years, the center of the earth became cooled. As it cooled, the center of the earth became smaller. The crust of the earth had cooled long before the center of the earth had cooled. Now the crust of the earth became too large. You have seen an apple that is dried. The skin of the apple is all wrinkled. Thus the earth slowly began to wrinkle.

“The wrinkles came where the earth was weakest. The weak places gave way more easily. The wrinkles in the earth came where there had once been an ocean. Where oceans had dried the earth was made of mud soil. Now the

tops of old mountains pushed their way through these weak places of mud soil. This was the beginning of our rocks.”

“But how were these rocks moved from place to place?” John asked.

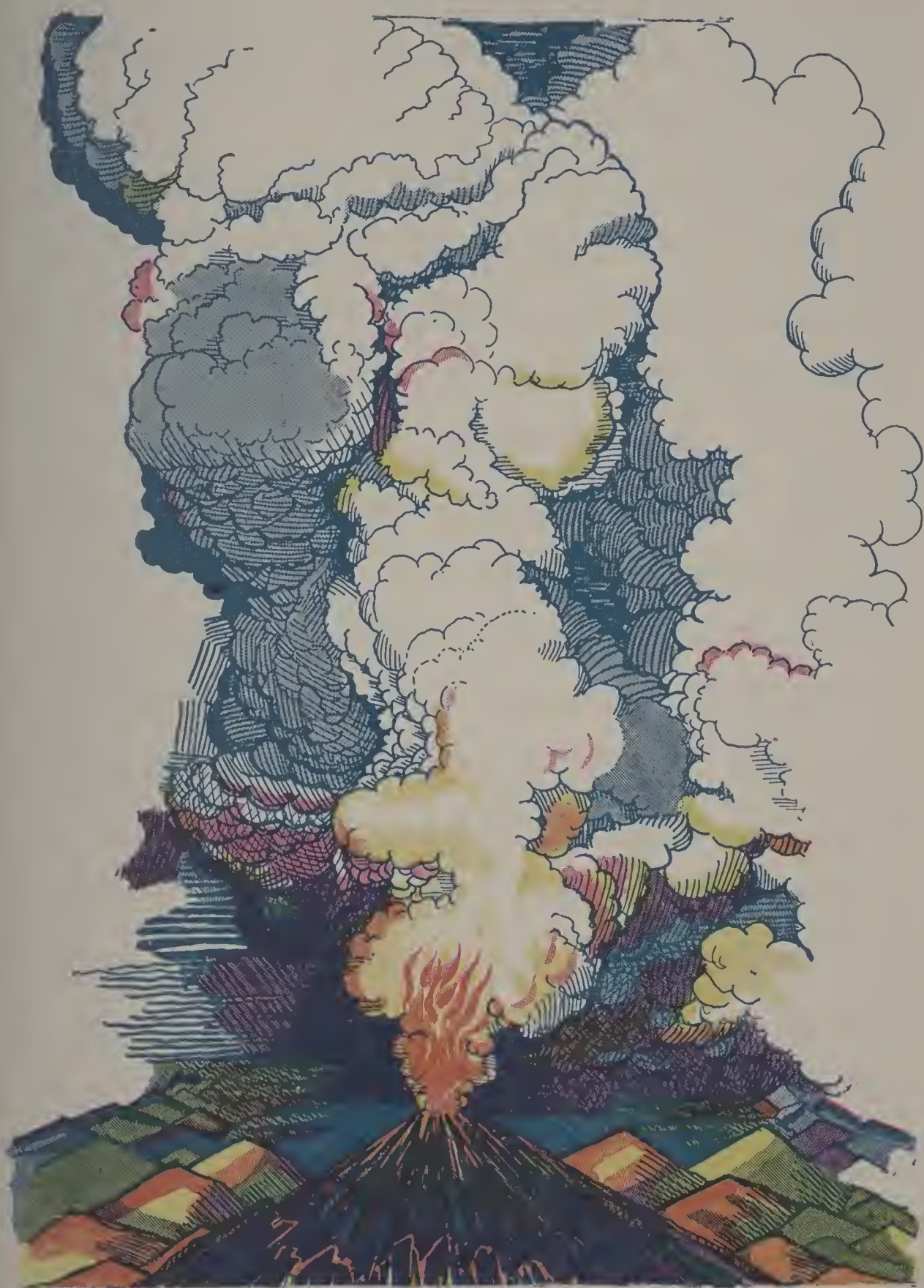
“Rivers of ice that we call Glaciers moved the rocks and stones,” Ned explained. “Glaciers are made by snow. Many millions of snowflakes made a Glacier. The snowflakes are frozen into a river of ice. This river of ice slowly pushes down the mountain sides. As it pushes down the Glacier carries along with it loose rocks, dirt, and stones.

“Ice bends, so a Glacier bends over rocks. It fits into hollows. The ice cracks on turning corners. When the Glacier reaches straight ground it again becomes a solid ice.

“The river of ice moves slowly. It carries along with it on either side a line of rocks and stones. Most Glaciers travel no more than a few feet a year. As they travel over the rocks they polish the rocks and make them round. Sometimes the Glacier scratches the rocks.

“There are Glaciers in the world today. Some are in Greenland, near the North Pole, and there are some small Glaciers in the Alps in Switzerland.

“Millions of years ago, Glaciers covered most of the earth. Some say that perhaps the sun gave less warmth. Others say because there were many high mountains the air on the earth was colder. The air on mountaintops is always colder than the air on the lowlands. The clouds coming over the mountains turn to snow



and ice. They cover the mountaintops all the year around.

“On this rising land of long ago, the air became colder and colder. Snow fell. It froze, then fell and froze again. Glaciers overran the world. The moving Glaciers ground and pushed and broke down rocks and mountains. They carried these broken pieces of rocks and mountains a long, long way with them.

“That is why we now find these large boulders and fields of cobblestones far from the place where they broke off. These very stones in this field may have been brought here many, many years ago by a Glacier. That is how the stones and rocks were moved about.”

“Are there many different kinds of rocks?” John asked.

“Yes,” Ned said. “There are many kinds of rocks and stones because they were not all made the same way.

“A very large part of the whole world is made of rock. This rock was once very hot. Some of this rock had risen out of the inside of the earth. Some of this kind of rock has cooled on top of the earth. Quartz, Granite, and Basalt are the important rocks of this kind. Most of the crust of the earth is made of Granite.

“Granite comes from the inside of the earth. The hot boiling Granite burst from the inside of the earth. But the outside crust of the earth which had cooled a long time before stopped the hot Granite. Then the hot Granite gradually cooled and remained buried just



“WATER DRIPPING THROUGH THE LIMESTONE ROOFS FORMS LONG GLITTERING SHAPES.”

inside the earth's crust. Years and years later the earth's crust was worn away by winds and rains and then we found the Granite.

"Granite has different shades of color in it. There are grey and pink grains, and many other colors."

Ned handed a large piece of Granite to John who said, "I can see lots of colors in this Granite."

Ned picked a white flat stone from the pile of stones. He tried to make a dent in it with his knife. The knife blade left only a small mark on the rock.

"This is a piece of Quartz," Ned explained. "See the tiny blade mark that the steel point left in the Quartz. Quartz is a very hard rock. It is one of the hardest of our rocks. This piece of

Quartz is white, but it comes in many colors, yellow, brown, purple, and pink.”

John saw a shiny, smooth rock. It was black and green and the colors made him wonder what it was.

“Tell me about this rock,” he asked Ned.

“This is a piece of Basalt,” Ned explained. “Basalt is a rock that rose from the inside of the earth. The Basalt we find on the earth escaped from cracks in cliffs. When the Basalt cooled it sometimes formed in long, six-sided columns. In Ireland, at a place called the Giant’s Causeway, there are huge cliffs made of these strange Basalt columns. The Palisades or cliffs along the Hudson River in New York State are also made of Basalt.

“Many of the things which are now on the outside of the earth were affected by another kind of rock we call Lava,” said Ned. “Has your teacher told you about volcanoes?” he asked.

“Oh, yes!” John replied. “She told us that part of the deep inside of the earth has never cooled and is still boiling. She said that a volcano is an opening in the earth’s surface where the steam from the boiling center of the earth has broken through the outer crust.”

Ned looked pleased. “That is right,” he said. “But sometimes more than steam comes out of a volcano. Sometimes a stream of boiling rock comes out of the volcano. We call this liquid rock, Lava.

“Lava comes out of the mouth or top



PRECIOUS GEMS ARE REALLY JUST RARE, BEAUTIFUL STONES.

of a volcano. Sometimes much Lava comes out of volcanoes. Sometimes so much Lava comes out that it may cover an entire city. Pompeii, a city in Italy, was buried that way. Sun, wind, and rain could not reach the covered city.

After two thousand years the buried city of Pompeii was uncovered. The city was very much as it was when buried. The Lava kept the city from rotting in the sun and wind.

“In Yellowstone Park there is a forest of huge tree stumps. This forest was buried under the ashes of a great volcano. The covered tree stumps have turned to stone. The rains and the Yellowstone river have torn the ashes away. The large stumps of trees now stand in the sun. They have turned to stone.

“There is another group of rocks. These rocks are formed in layers. These rocks have not come from the hot inside of the earth. They have been made by the broken pieces of Granite, Quartz, and Basalt. Sun, wind, rain, and the

ocean washed and ground the hard rocks down. They are wearing and grinding the hard rocks all the time.

“Granite, Quartz, and Basalt broke into smaller pieces. The soft part of the rocks turned to mud. The hard Quartz was ground to sand. The mixed mud and sand settled on the bottom of ponds and lakes. Streams and rivers carried this soil from the mountains and fields to the sea. There the sand and the mud were pressed into layers. These layers were turned into stones.

“Shale is a mud rock. It can be cut with a knife. Shale also splits into thin sheets. It breaks easily and crumbles and becomes just mud again.

“Sandstones are made up from grains of sand. The grains of sand come mostly



MANY TIMES SHINING PILLARS ARE FORMED IN UNDERGROUND
CAVES.

from Quartz. A grindstone is a fine Sandstone. Sandstones wear away by rubbing against something hard.”

Ned looked through a pile of stones and picked up a small round yellow stone. He now rubbed the stone with a piece of Quartz. Some of the sandy grains rubbed off. The stone felt very sandy.

“Limestones are another rock that does not come from the inside of the earth,” Ned continued. “Limestones are made mostly from the shells of one-celled animals that lived in the ocean. One-celled animals are the smallest animals in the world. Some of their tiny shells are no longer than a grain of sand.

“Many years ago the shells of these small creatures began to gather in small piles as the animals died. Through the centuries, millions and millions of the shells were added to these piles on the floor of the ocean.

“After millions of years these piles of shells became pressed into the form of rocks which we have named Limestone rocks. Later, when the oceans were destroyed the Limestone rocks became dry land. The Pyramids in Egypt are made of Limestone.

“You can tell when a stone has lime in it by pouring acid on it. When you pour acid on a Limestone the acid sizzles and bubbles.

“Many times Limestone forms underground caves. The water dripping through the Limestone roofs forms long glittering shapes. They look like colored icicles. They are made slowly, drop by drop. Some of the drops fall on the floor. In time they are high rods. The rods reach the ceiling. Many times the

shapes that hang from the roofs meet the rods rising from the floor. When these shapes meet they form shining pillars.

“Coral is another rock made by the shells of tiny animals. The Coral looks like the petals of a plant. But Coral really belongs to the animal world. The centers of these petal forms, Polyps, are really mouths. These animals build one upon the other. Those that live on the inside die. But life blooms on the outside. Whole islands are built by these tiny gem-like creatures of the seas.

“Another group of stones are the soft-layer rocks. These rocks have been washed by rivers and oceans and have been heated by the sun. Some of the rocks have laid in ocean beds. Others have laid under new layers of rocks. In



“SOME ROCKS REMAIN ON THE RIVER BED.”

time all these things changed the soft-layer rocks into different kinds of rocks. The rocks have been changed into new shapes.

“Marble, Gneiss and Slate are the important stones of this group. Sandstones have been changed to hard Gneiss. Gneiss is as hard as Granite. Shale has been changed to Slate. Slate breaks more easily than Shale, but is much firmer. Slate can be split into thin sheets. These sheets of Slate are used for roofing.

“Now, we come to the loveliest stone of all stones, Marble,” Ned said. “Marble is hardened Limestone. It is a light-colored smooth rock. The Marble beds lie deep underground. Marble is used by many artists who carve beautiful statues from it.

“The artists who make these statues are called sculptors. They are the finest of all stonecutters. Marble is also used in building many public buildings because of its great and lasting beauty.”

John agreed with his brother that Marble was the loveliest of all the stones.

He thought that some day he, too, would like to learn to carve beautiful things from Marble.

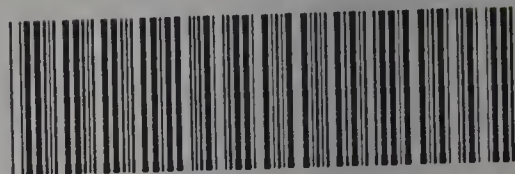
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