

# Snowflake Bentley

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## Lesson Summary for Grade 3

*Snowflake Bentley* by Jacqueline Briggs Martin is a biography of Wilson Bentley, a Vermont farmer, who devoted his life to the study and photography of snowflakes. In his lifetime, Bentley developed a technique of microphotography that revealed to the world these truths about snowflakes: snowflakes are hexagonal crystals of ice, no two snowflakes are alike, and each snowflake is startlingly beautiful. In this lesson students are introduced to crystals through *Snowflake Bentley* and then create crystal pictures of their own. Cross-curricular activities in art, social studies, language arts, and math are also included.

## Science Activity: Crystal Pictures

*Students observe crystal formation on various types of papers while drawing pictures.*

Source: Sarquis, J.L.; Sarquis, M.; Williams, J.P. *Teaching Chemistry with TOYS*; McGraw-Hill: New York, 1995; pp 19–24. (ISBN 0-07-064722-4)

Key Science Topics:

- crystals, crystallization
- evaporation
- solids

Key Process Skills:

- observing
- comparing/contrasting

Ohio Fourth Grade Proficiency Learning Outcomes for Science:

2. Organize materials to make observations of various crystals.
3. Measure amounts needed for solutions using standard units.
4. Carry out science activity, following given guidelines.
9. Explain safety procedures, especially food safety rules.

### Introducing the Activity:

Have students compile a class list of things made of crystals. Choices may include sugar, table salt, diamonds, and ice. A collage of crystals can be made and displayed in the classroom. Explain to the students that you can find crystals almost everywhere. Crystals come in many shapes and sizes. Create a crystal web chart on chart paper. Ask students how snowflakes can be crystals.

Explain to students that *Snowflake Bentley* is the true story (biography) of a man who devoted his life to the study and photography of snowflakes. Through his work, he showed that snowflakes are hexagonal crystals of ice and that each one is unique. Point out that before Willie Bentley was able to photograph snowflakes, he spent three winters

drawing their patterns using a microscope. Read *Snowflake Bentley* to the class. Have the students describe the patterns that Willie Bentley found. Explain that they will design artificial snowflakes.

### **Activity Procedure:**

1. Before doing the activity with the students, make a saturated solution of Epsom salt according to the instructions in the Getting Ready section of the activity. Explain to the students that snowflakes are six-sided ice crystals. Tell students that since it is very difficult to collect actual snowflakes in the classroom, they will design paper versions of snowflakes and paint them with another common crystalline material—Epsom salt. Then on an 8-inch by 11-inch piece of paper draw the largest hexagon that will fit on the paper. Photocopy this pattern.
2. Have the students use the pattern to cut out several hexagons from the different types of paper. Then they can practice making different snowflake designs. They use these paper hexagons in place of the sheets of paper listed on page 20 of the activity.
3. Follow the Procedure to complete the activity. Have the class do some of the Variations and Extensions on page 22.

### **Explanation:**

Crystals are solids that are made of particles that are arranged in a regular, repeating pattern. The pattern that the larger crystal shows is a result of the pattern of these smaller particles. Wilson Bentley learned that each snowflake starts as a speck of ice too tiny to be seen. As other molecules of water attach to the original speck, branches are formed. Many variables affect the way the crystal branches of a snowflake grow, including temperature, wind, and amount of moisture. As the snowflake continues to grow, the branches come together and trap small amounts of air.

### **Assessment:**

Help students reinforce what they've learned and assess their learning by asking them to answer these four questions on a sheet of paper:

1. Describe your crystal. Use as many adjectives as you can think of that will tell all about your crystal.
2. Finish the sentence: Crystals are \_\_\_\_\_.
3. Does your crystal remind you of anything else you have ever seen? Explain.
4. Write three sentences telling what you learned in today's lesson.

## **Writing Activity**

*Students write poems about snowflakes.*

Have students make a list of ten adjectives to describe crystals. Then invite students to write haiku, cinquains, or concrete poems about snowflakes. The poetry can be displayed with the snowflake crystal pictures. Students can additionally write a paragraph summarizing the book *Snowflake Bentley*.

Ohio Fourth Grade Proficiency Learning Outcomes for Writing:

1. Write poetry on the topic of snow.
4. Use a variety of words to describe snow.
6. Make a list of adjectives.

## **Reading Activity**

*Students list and read related book titles.*

Invite students to read poems about snow and biographies of other lesser-known scientists. Have students make a list of well-known books about snow.

Ohio Fourth Grade Proficiency Learning Outcomes for Reading:

- 1, 3, & 4. Read and demonstrate understanding about snow poetry by responding verbally.
7. Compare and contrast various poems read.
8. Respond verbally to the poems.
- 11, 13, & 14. Respond verbally to the biographies.

## **Math Activity**

*Students study geometric shapes.*

Assist students in learning the meanings of the prefixes tri-, quad-, penta-, hex-, and octo-, especially as they relate to geometric shapes. Calculate how many sides or points would be on 2, 3, 4, 5, 6, 7, 8, and 9 snowflakes.

Ohio Fourth Grade Proficiency Learning Outcomes for Math:

8. Multiply whole numbers using the number of sides on a snowflake.
14. Study hexagons and other geometric shapes related to crystals.

## **Social Studies Activity**

*Students locate places on a map.*

On a map of the United States, locate Jericho, Vermont, the birthplace of Wilson “Snowflake” Bentley. Use library or Internet resources to find out the average annual snowfall of Jericho. Locate Lake Champlain and Mount Mansfield on a map of Vermont.

Ohio Fourth Grade Proficiency Learning Outcomes for Citizenship:

- 7 & 8. Locate and identify Jericho, Vermont on a map of the United States. Locate and identify Lake Champlain and Mount Mansfield.

## **Art Activity**

*Create paper snowflakes.*

Using the hexagonal pattern, have students create paper snowflakes. Fold the hexagon in half and then the halved pattern in thirds to make a pie-slice shaped piece. Cut out snippets of paper along the sides and top of the piece and then open.

## References

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Van Cleave. J. *Molecules;* John Wiley & Sons: New York, 1993.

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