SNOWFLAKES

NO TWO ARE EXACTLY ALIKE!

When it is winter in Pennsylvania, it often snows!

Snow is precipitation in the form of ice crystals. When a water molecule in the atmosphere attaches to a particle of dust or pollen, it creates an ice crystal. The ice crystal is heavier than the surrounding air, and as additional water molecules latch on, the snowflake grows and falls toward the earth. There are many conditions, including temperature, wind, humidity, and time, that affect where and how water molecules attach to the crystal. These factors also affect the shape and size of the snowflake.

Because of the changing conditions that affect snowflakes as they form and fall to the ground, no two snowflakes are exactly alike, but because they are ice crystals, they have the same structure. The water molecules that form ice crystals are made from two hydrogen atoms bonded to one oxygen atom. The ice crystals that make up snowflakes reflect the internal order of the crystal's water molecules as they arrange themselves to form a symmetrical hexagonal or six-sided crystal. Ice crystals will occasionally be seen that have 3 sides or 12 sides, as they are half or double the expected 6.

Snowflakes have fascinated many people, including a young man who lived on a farm in Vermont, named Wilson A. Bentley. By combining a microscope and a camera, Bentley became the first person to photograph an individual snowflake on January 15, 1885. Bentley was a pioneer in "photomicrography," the photographing of very small objects, especially of snowflakes.

Smithsonian Institution Archives, SIA2008-1395, Created by Bentley, W. A, "A "Dendrite Star" Snowflakes Photomicrographed by Wilson A. Bentley", SIA2008-1395, Retrieved on 2020-12-16

In 1904, Bentley donated 500 prints of snowflakes to the Smithsonian Institution in Washington, D.C., which are now part of the Smithsonian Institution Archives. In 1931 Bentley published a book, *Snow Crystals*, along with William J. Humphreys, a physicist with the US Weather Bureau, documenting his belief that each snowflake was unique. The book included more than 2,400 snowflake images. His documentation of these images advanced the study of meteorology in his time. In his lifetime Bentley would capture more than 5,000 images. You can also read about his life in the children's book, *Snowflake Bentley*.

Be a Bentley

Materials

- 8” x 10” piece of cardboard
- 8” x 10” sheet of black felt or velvet
- glue
- magnifying glass
- snowy day

Wilson Bentley spent many hours outside in the cold waiting to catch a falling snowflake. On a snowy day, you can examine snowflakes as they fall, like Bentley did. If it is not snowing yet, then you can get ready. Glue an 8” x 10” sheet of black felt or velvet onto an 8” x 10 “piece of cardboard. The board needs to be cold or the snowflakes will melt on impact. Place the board in the freezer or if it is below 32 degrees, in a box outside. When the snow falls, catch snowflakes on the cold board. Use the magnifying glass to examine them, comparing how the snowflakes are similar and different, and try to classify them using the basic shapes below.

Look for some of these basic shapes of snow crystals


Star Crystal


Dendrite Star


Columns


Hexagonal Plates


Capped Columns


Needles

If you want to try and “preserve” a snowflake to examine under a microscope later, you will need a microscope slide and some hairspray. Spray one side of the microscope slide with hairspray so that it is sticky. Place the microscope slide sticky side up in the freezer or if it is below 32 degrees, in a box outside, to prevent the snowflake from melting on impact. When the snow falls, place the slide with the sticky side facing up so that the snowflakes will land on the slide. Once the slide has a snowflake, place it in a cold, dry space and allow the water to evaporate. This may take several hours. Once the water has evaporated, an imprint of the snowflake will remain on the slide for you to observe closely under the microscope.