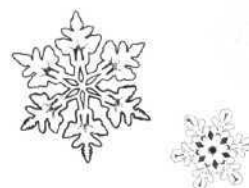




THE SNOWFLAKE MAN

By Monroe S. Miller

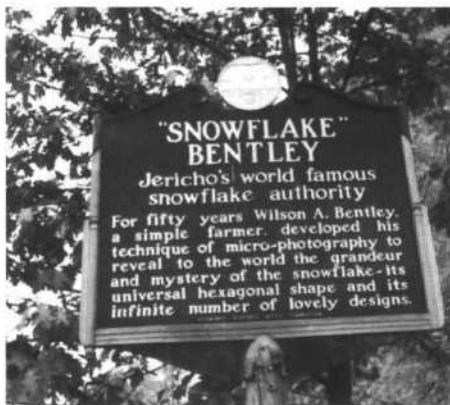


I'm not sure it merits the term "pilgrimage", but this fall I got serious and devoted the better part of a day to learning more about and getting to know the man who might be the most famous person ever in the study of snow — Wilson Alwyn Bentley. W. A. Bentley was a farm kid from Jericho Center, Vermont who lived in the later years of the 1800s and passed away in December of 1931. He was known as the Snowflake Man of Jericho for his pioneering photomicrographs of individual snowflakes.

Bentley's work has interested me for a long time, years before I made my first foray into Vermont. My interest in him resulted from an interest in snow. It is pretty difficult to live in a northern state like Wisconsin for your whole life and not be curious about snow. Double that curiosity if you grew up on a farm and experienced a career as a golf course superintendent. After all, it is an old farm adage that says "a year of snow, a year of plenty." It has been an observation I've confirmed many times as a course manager as well.

Snow's value to those of us growing plants results primarily from its efficiency as an insulator. The experiments confirming that are basic and long standing. One simple test recorded an open air temperature of -27 degrees F. and a temperature seven inches beneath the snow surface of +24 degrees F. In another simple experiment the air temperature above a snow bank was -32 degrees F.; one inch below the surface the temperature was -1 degree F., and at one foot below the surface the thermometer read a toasty +31 degrees F. Clearly, whether you are managing golf greens or alfalfa fields or simply growing roses at home, snow is something you need for a successful winter.

Snow (more specifically snowflakes) has interested men for centuries. The classic, undamaged snowflake is a little, six-sided star. Chinese



A historical marker on the village green in Jericho Center, Vermont honors its most famous son, W.A. Bentley.



This photo was taken in the Bentley Museum — the old billows camera and the microscope he used are in the foreground.

scholars noticed this symmetry first in 135 B.C. Naturalist Albertus Magnus wrote about snowflakes in 1260, and the Archbishop of Upsala published a crude drawing (a woodcut, actually) of a snow crystal in 1550.

Perhaps the most detailed thinking about snowflakes I have read was written in the winter of 1609 by the Polish astronomer and mathematician Johannes Kepler. The question he posed, in general terms, was "why snowflakes in their first falling, before they are entangled in larger plumes, always fall with six corners and six rods (radii), tufted like feathers..."

Kepler then wrote a long winded



The house on the Bentley farmstead. Note the snowflake design on the peak of the house.



Bentleys' final resting place is on a rural Vermont hillside, looking at Mt. Mansfield.

dissertation that compared snowflake shapes to the honeycombs of bees and the most efficient way to stack cannonballs. In the end, he said snowflakes were hexagonal because "it is their nature to be so."

More recent explanations of this phenomenon by mathematicians and physicists use atomic theory, something now taught kids in grade school science. The hex shape relates to the atomic structure of water—the angle formed by the two hydrogen atoms and the single oxygen atom is 60 degrees—one-sixth of a circle. Snowflakes are shaped by their molecular constituent!

The best art of depicting snowflakes carefully and accurately was the work of the Arctic explorer, Scoresby, in 1820. Although he was deliberate and detailed, it took W.A. Bentley to move snowflake depiction from art to photography.

The Bentley farm was almost literally in the shadow of the western slope of Vermont's highest mountain, Mt. Mansfield. Most Americans are more familiar with the eastern slope of Mt. Mansfield. There is found the von Trapp Lodge near Stowe, Vermont. This is the real Austrian-born family that the 1965 movie *The Sound of Music* loosely depicts. The Bentley farm was a good place to study snowflakes; it is very cold in the winter in that part of Vermont and it snows a lot. Wilson had lots of subjects to study.

It was probably twenty years ago when I first read about Snowflake Bentley, as he was affectionately called. After that I discovered a great collection of his glass plates of snowflakes in the Fairbanks Museum in St. Johnsbury, Vermont. A decade ago I found a copy of his magnum opus, *Snow Crystals*, a book he wrote with Dr. W. J. Humphreys of the U.S. Weather Bureau, in the Dartmouth College bookstore. It is a Dover reproduction of the 1931 McGraw-Hill book, and it is a beauty. Jen Sammerdyke used photos in it for this issue's cover.

I buzzed through Jericho two times previous to last fall—once on my way to Burlington and Lake Champlain, and again the time I was on my way to President Chester A. Arthur's childhood home near Fairfield, Vermont. But I never really connected with the Bentley story on either pass through the village. I vowed that this past fall I would spend whatever time was required to learn all I could about W.A. and his very interesting life. It took nearly a day, but I feel very satisfied with what I was able to learn.

Bentley is always referred to as the Snowflake Man of Jericho, Vermont. The fact is that he was actually from Jericho Center, a small village southeast of Jericho. The Bentley farm was located a mile or a mile and a half east of Jericho Center. And always, you are aware of Mt. Mansfield with its forehead, nose and Adam's apple, Mr. Bentley's career with snowflakes really started on February 9, 1880



W.A. Bentley photographing snow crystals.

when his mother gave him an inexpensive microscope for his birthday. February in Vermont (like Wisconsin) means snow and the first thing he observed through his microscope was a snowflake. His study didn't end until he died in 1931. He lived until three weeks after his book was published.

During a snowstorm Mr. Bentley used a smooth board about a foot square that he had painted black to capture snowflakes. A mitten would cover his hand so no heat was transferred to the board. Damaged flakes were brushed off with a feather from a bird's wing.

He hurried into a small wooden shed where he had his equipment set up. The snowflake he selected to photograph was carefully picked up from the board with a fine splinter of wood and placed on a glass microscope slide. Great care was given to place the snowflake perfectly flat so all parts would be reflected equally on the photograph. The camera was pointed toward the window and the snowflake was photographed through the microscope. The exposure times were long, ranging from ten seconds

to 100 seconds. During a snow storm, W.A. would take photomicrograph after photomicrograph this way.

The process required a steady hand, which he had because he had never used either tobacco or liquor. He moved quickly, holding his breath so as not to melt the snowflake.

The camera he used was a big bellows implement; it is shown here with Bentley next to it. A combination of pulleys and wheels and ropes which he designed permitted him to focus this sort of clumsy apparatus while watching the ground glass at the rear. The camera is now on display in the Red Mill Museum in Jericho. I took a picture of it while I was there; reflections reduced the quality somewhat, but I have included it here, as well.

Once the glass plates were removed from the fixing bath, Bentley would wash them in the ice cold stream that flowed from a spring in back of their farm house. Talk about low technology!

W.A. Bentley took photomicrographs of almost 6,000 snow crystals
(Continued on page 31)

(Continued from page 29)

in his life. He sold two hundred to Tiffany's, the famous New York City jewelers. They used them as patterns for pins and brooches and pendants. Others of his snowflake glass plates were used as patterns for wallpaper design. They've found their way, also, into the design of metal and other crafts, cloth and silk, Christmas ornaments, and more.

His glass plates are in museums all across the country. While visiting with the curator of the Bentley Museum in Jericho, she said to me, "you didn't have to come so far to see some of Mr. Bentley's glass plates. There are some of them at the University of Wisconsin in Madison. Do you live near Madison?" Obviously, when I got home I started to track them down and learned that the UW-Madison's snowflake expert, Dr. Pao Wang, was on sabbatical. When he returns I fully intend to get to the bottom of this wonderful possibility.

Bentley photographed snowflakes in many locations, but the best crystals were right there in his backyard.

Places with winters warmer than Jericho, Vermont frequently produced snowflakes that had flawed patterns before they fell. The humidity of Great Lake states like Wisconsin also distorted snowflake forms. Hudson Bay snow fell in the same category as Wisconsin. What luck for Bentley, and the rest of the world really, that he lived near Mt. Mansfield.

Bentley, despite his humble background and lack of formal education, was widely respected in scientific circles. He was voted membership in the American Association for the Advancement of Science and was honored with a fellowship in the American Meteorological Society. I've already noted his co-authorship of a monumental book; he also wrote many articles on the subject during his life and his monographs on snow, frost and dew were well known. The treatment given the subject in Encyclopedia Americana was written by...you guessed it—Wilson A. Bentley.

It was really a thrill this autumn to get directions to the old farmhouse he

lived in, drive out to it and take a close look. My hope of having the current resident home when I was there didn't come true; I'd loved to have had a tour of it. A snowflake pattern from one of his photographs is painted near the peak of the main part of the house.

I ate lunch in Jericho, sat in the park in Jericho Center and soaked in the view of majestic Mt. Mansfield. Both are especially beautiful villages on a fall day. Even though it was mid-autumn, there was an unmistakable hint that winter wasn't far away.

I visited the Bentley Museum in the Old Red Mill and learned of where he was laid to rest after his death on Christmas Eve in 1931. The little cemetery is just a bit south of Jericho Center, in a very rural setting in Vermont.

And as you read this today, Snowflake Bentley is under several feet of snow. We can hope his soul is where the snowflakes he so dearly loved are made. ❄

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