



In Search of a Stellar Dendrite

By AnneMarie Eveland

When my scientific friend told me to look for a “stellar dendrite,” I was puzzled. *What in the world is a stellar dendrite?* The only reference I had to the word “dendrite” was more

biological. I knew it as a part of a nerve cell; that part of the neuron that extends outward from the nerve cell and receives messages from other neurons and transmits them to the nerve cell. I even postulated that perhaps he meant the references to the trees – I think I heard about their dendrites being referred to as their branches. But, we weren’t looking at my body and certainly weren’t looking at trees. So, I was completely baffled.

He must have seen my unblinking blank stare. He chuckled gently; amused at my naïve perplexity, I guess. Then he laughed heartily and said, “It’s what *you* would call a snowflake but it is properly called a *snow crystal* and here is why: At the center of every snowflake is a tiny particle of dust which attracts drops of water that freeze and form crystals. If you look at a snowflake through a microscope, you can see it has a very complex pattern.”

He babbled on, eager to impart his stored-up knowledge: “In the snow crystal, there is a single crystal of ice, within which the water molecules are all lined up in a precise, hexagonal array. All snow crystals display that characteristic six-fold symmetry. A snow crystal appears when water vapor in the air turns into ice without first becoming liquid water. The water droplet freezes or attaches onto a dust particle in the sky, creating the ice crystal. Clouds influence how the crystal is formed. As a crystal falls to earth, the water vapor freezes onto the primary crystal building the six arms of the snowflake. As more water vapor condenses onto a budding snow crystal, it grows and develops and that is how its ornate patterns are created.” I am far from being scientific minded but was intrigued about the process of the making of the crystal. So, I let him continue to fascinate my imagination.

He added, “The exact shape of the final snow crystal is determined by the precise journey it takes through the clouds. All snowflakes (snow crystals) have six arms and, since the six arms all took the same path in their descent down to earth, each experienced the same changes at the same times. So, the six arms of the snow crystal grow in synchrony, yielding a very intricate, yet symmetrical shape. But, since no two snow crystals follow the *exact* same path

and experience other mitigating processes as they tumble down through the clouds, no two snow crystals look *exactly* alike.”

I felt like a youngster getting some fascinating facts of life. I compared my learning appreciation of the snow crystal to our own fingerprints.... Unique to our own hands, no one else's. I had never thought about, nor considered, snowflakes from a scientific viewpoint. I had always seen snowflakes (oops, sorry -- I should use the proper term -- *snow crystals*!) as some simple fun blanket of white forms that clung to the windows only for a second or two and then were gone. I never considered the long mysterious journey from the clouds above me. I was intrigued and wanted to know more about these mysterious and magical forms of winter. So, I asked him, “Are they varied in size and shapes and have they been investigated scientifically?”

“Oh yes,” he replied. “The largest and the most photographed snowflakes are the Stellar Snow Crystals for they grow only in certain temperatures. A Stellar Snow Crystal begins with the formation of a small hexagonal plate and branches out from the six corners when the crystal grows larger. As it tumbles through the clouds, the crystal experiences ever-changing temperatures and humidity and each change makes the arms grow a bit differently. The six arms of a snow crystal all grow independently. But, since they grow under the same randomly changing conditions, all six end up with similar shapes. The process from a water molecule to solid state is called crystallization.

A snowflake, on the other hand, is a more general term. It can mean an individual snow crystal but it can also mean just about anything that falls from the winter clouds. Snow crystals are not frozen raindrops—that is sleet. A snow crystal is a single crystal of ice but a snowflake can be a single crystal or maybe 200 or more stuck together. Often hundreds or even thousands of snow crystals collide and stick together in mid-air as they fall, forming flimsy puff-balls we call snowflakes

I recalled, when I thought of a “snowflake,” I saw a lacy snow crystal called a stellar dendrite. They are the most common type of snowflake with their branching six sided shapes and are, perhaps, the largest snowflakes that fall to earth. They're individual crystals, not multiple flakes stuck together and may be 5 mm or more across. There is no blueprint or genetic code that guides the growth of a snowflake. Yet they appear in these amazingly ornate, symmetrical shapes. The shape of each crystal is not determined by any plan or predetermined design but by different processes that govern its growth behavior. And a snow crystal is one single crystal of ice but snowflakes can be one or as many as 200 stuck together to form big “puff balls.”

I also learned one way the crystal becomes a design is the process of faceting. This causes flat surfaces to appear on the crystal, surfaces that reflect the underlying molecular beautiful patterns. Faceting creates a stable design on the crystal, by the simple, perfect, hexagonal prism. Another process called

branching causes complex structures to grow erratically outward from the ice, and determines the types of “branches.” A third process that happens to the crystal formation is called sharpening. This process makes the crystal grow into thin, flat plates, mostly at +5 degrees F. And then there are the smallest snowflakes, called Diamond Dust Crystals, which might be as small as the diameter of a human hair. The faceted crystals sparkle in sunlight as they float through the air which is how they got their name. They are somewhat rare, appearing in bitter cold weather. I recently read that about a million billion snowflakes fall each second, averaged over a typical year. Of course, this is quite a rough estimate, and I am not going to start counting them to verify this.

Historically, I found that in 1885, American farmer Wilson Bentley, in freezing Vermont winters, attached a camera to his microscope and took what is believed to be the very first photograph of a snowflake. He started with a microscope he got for his 15th birthday. He is noted as the snow crystal photomicrographer who, during his lifetime, captured some 5,000 snow crystal images. More than 2,000 were published in 1931 in his famous book which remains in print to this day. His images are now regarded as having helped shape the world of science photography.

Bentley said, “Snow crystals come to us, not only to reveal the wondrous beauty of the minute in nature, but to teach us that all earthly beauty is transient and must soon fade away....”

With their delicate symmetry, unique crystalline structures and momentary life span, snowflakes have since become the subject of fascination for photographers. Biomedical photographer Michael Peres commented, “It’s fascinating how you are the only person who would ever see that snowflake. It disappears in a second and you just make a record of something that doesn’t exist anymore.

Today, great strides have been made in cameras that can even photograph snow crystals as they fall to earth. And today, with phone apps and magnifying lenses, snowflake photography is more and more used by amateur photographers.

I turned to my friend and exclaimed, “This is plenty of information for me but I still love the focus on the magic and the mystery of my snowflakes -- even if they are here for a moment in time.

“Well,” he said, with a twinkle in his eye as he bid me goodbye, “Now you at least know that dendrites are branchings on the snowflake!”

I smiled, gave him a copy of my poem and said, “I still love the poetry of the snowflakes



SNOWFLAKES by Annemarie Eveland

We are snowflakes, you and I. Unique creative winter ones.
Individually patterned personalities – not one of us alike.
We are angelic singular designs drifting down from heavens,
Holding firmly onto our outwardly frozen solid forms.

But our individual geometric selves we will eventually lose.
Everything that has form will change, tempting us to cling fiercely
To save our form, begging us to believe we are forever losing us.

Eventually, we will look at this ongoing process closely
And see a process more than us - one journey falling into earth.
We are melting together into an essential oneness.

The only safe thing we can do is surrender
And melt magically into each changing moment
Surrender our form and become formless.

So, breathe deep. We are safe. Seek the tenderness within.
Stand delighted in new sun-kissed mornings
Embrace extraordinary newness in ordinary days.
We have only this moment to melt. It will never be again.

It takes courage to trust this process but trust we must.
So, go melt. Do it now. Don't wait. Let go.
Remember who you truly are – a spirit for all seasons.

Annemarie Eveland
(This poem won me second place in an International Poetry Contest)

May your winter be bright and white and may the magic of snowflakes be
always in your hearts!

