NATURALIST'S

CORNER SNOWFLAKES

We have all seen paper cutout snowflake patterns and drawings in blue and white depicting the very symbol of winter, but how many of us have really looked at snowflakes up close and personal? We take the proverbial word for it that snowflakes are six-sided and no two are alike, but have we looked with our own eyes? Thankfully, one does not need any special equipment ~ just the right time and perhaps an inexpensive magnifying glass.

Try it! Next time you see snow falling, go outside with a dark-colored jacket and that magnifying glass. Wait until your coat no longer melts the flakes and then watch closely as they accumulate on your sleeve. If the temperature is below freezing and the flakes are not in clumps, you'll be dazzled by the assortment of hexagonal needles and plates.

In the late 1800's a Vermont farmer,William Bentley, was enthralled enough with snowflakes to set up a camera outside and photograph them. He eventually published a book containing 2,000 of his photographs, and so demonstrated to the world that no two snowflakes are exactly alike. With the approach of winter we too can seize the opportunity to detect this diversity. As naturalists, we wonder how it is that snowflakes should be so varied. First, we need to know why snowflakes have that sixsided symmetry. The crystalline form of any mineral is determined by its intrinsic molecular structure. So it follows that as a common earth mineral, water has a characteristic crystalline structure, which happens to be six-sided, thus: In the right conditions, six molecules of water (H_2O) form into a hexagonal groups, the six oxygen atoms forming a ring held together by paired "arms" of hydrogen atoms. This intrinsic molecular structure is piled up until we see it reflected in the crystalline structure of snow.

Snow is comprised of water, but not by liquid water freezing into ice. Rather, a snowflake "grows," as water vapor (a gas), skipping the liquid phase entirely, condenses directly onto an ice core. Snowflakes start out as simple hexagonal plates. All flakes would look like this were there not varying conditions in the cloud. As snow falls through the clouds, the six tips of the plates attract a greater percentage of the vapor molecules, so the tips become exaggerated. Since no two snowflakes take the same path through the different temperatures and humidity levels of the clouds, the accumulation pattern is never identical on separate flakes; thus, snowflakes are unique. At the same time, since the accumulation pattern is identical on the six branches of any individual flake as it falls through the cloud, symmetry results. Just like there are optimal conditions for observing wildflower diversity (not December and January!), there are optimal conditions for observing snowflakes. Hexagonal plates and small dendritic (branched) flakes form at just below freezing. At 20ºF, hexagonal columns and needles take shape. Colder yet, the largest dendritic plates are formed at around zero. If the snowflake has experienced melting during its journey, it falls as sleet ~ nondescript chunks of ice. Manmade snow on ski slopes actually is made from water in a liquid state, not water vapor, and so resembles sleet. Of course snowflakes are not alive, yet they can be said to exhibit characteristics ascribed to living things. You've observed that oak tree silhouettes share a common look, distinct from that of pine. Yet no two oak trees have identical contour and shape. Just so, though the hexagonal pattern is intrinsic to the very nature of a snowflake, each flake exhibits a unique variation on that common configuration.

Where does the water for snowflakes come from? It comes from evaporated bodies of water and from life itself. Each living thing on this planet ~ grass, trees, ants, cardinals, flying squirrels, and you, too ~ burn food and release water, breathed out as a waste product. You exhale about a liter of water vapor a day. The water you breathe out rains or snows back to earth, usually in about a week's time. The snowflake you catch on your sleeve, statistically speaking, contains about 1,000 water molecules that were once in you ~ yes, you personally! This may seem a striking circumstance, but then consider that your endowment of 1,000 molecules makes up only a quadrillionth (1 followed by 15 zeros!) of that tiny snowflake. Wow, you could be looking at metabolized spaghetti dinner from last week or a tiny percentage of your own body mass burned off while taking that walk with the Naturalists' Club last weekend! Interests of naturalists are broad. We embrace the world through close observation of birds, wildflowers, planets of the solar system, and sand grains. Add to that now a deepened appreciation of the diversity exhibited in the crystalline form of one mineral, water! May you have the renewed wonder of a child when snow falls round you this winter.

` ~*~*Sonya Vickers* ~*~