

GENERAL SCIENCE

Splendor of Winter

Fragile geometric crystals of snow and ice, symbols of winter, can ornament a Christmas evergreen with more beauty than man's artificial decorations.

By BARBARA TUFTY

➤NOW COMES the dark season of the year, when the sun has traveled to regions south of the equator, and its long rays barely warm the frozen lands to the north.

Cooling temperatures bring crystals of ice, frost and snow over the northern earth, robbing plants of their foliage and fruits, and threatening man and other creatures with cold, hunger and inconvenience.

In the Northern Hemisphere, the shortest day of all the year is Sunday, Dec. 22, when, at precisely 9:02 a.m. EST, the sun's rays will fall directly on a point in the Atlantic Ocean about 800 miles east of Rio de Janeiro, Brazil. Here the rays will touch the Tropic of Capricorn, that imaginary line 23 degrees south of the equator, and the farthest point south that the perpendicular rays of the sun will travel.

Now life in the north seems at its lowest ebb, with the sun only a dull red ember, skimming low over the horizon.

Woods and Fields Quiet

In the woods and fields, there is little noise. Squirrels, chipmunks, mice and groundhogs lie silent in their burrows, asleep in a hibernating trance that slows their life processes. Geese, ducks, warblers and many singing birds have long since left the naked shrubs and trees in their southward search for sun and warmth.

Insects are stilled, their empty gossamer bodies crushed under the snow, or their eggs and larvae resting out the cold season under the porch steps or deep in the frozen ground. Only animals such as the deer, the great cats and the hardy crows roam the silent wilderness in search of food.

It is the time of year when the world seems to lie silent, drab, dark and dead. Yet one has only to stand quietly in the woods or in his back yard to hear the crackling and grinding or watch the shimmer of a special world that is very much alive—a scientific world of water crystals that push, grow, shatter, ebb and flow with amazing precision and austere beauty.

Crystals of Ice

Along the edge of a stream, pond or mud hole, ice crystals stretch their transparent lace over the water. From bleak overhanging branches, long streamers of icicles point frozen fingers toward the ground, while six-sided snowflakes fall soft as a baby's breath from the white moving sky. In the great bays, inlets and fjords, the ripples and waves of the sea are frozen into huge blocks of ice.

The mere freezing of water, man's most essential fluid, is a miracle staggering in its

significance. When the surrounding temperatures drop, water molecules begin to arrange themselves in crystalline form and, as many metals do when cooled, contract.

The density or weight of the water increases as it becomes colder—up to a certain point, when it decreases, and the ice becomes lighter than the fluid water. That critical point is 39.2 degrees Fahrenheit, when the icy molecules seem to "expand," trapping air molecules in their frosty structures, and forming chunks of ice which float with about nine-tenths of the bulk submerged under the surrounding water.

This basic phenomenon of floating ice, so commonplace that people take it for granted, saves the world from slowly being frozen to death. For if the ice would continue to become more dense, it would sink to the bottom of the ponds, the rivers, the great seas, and settle there in dark frigid silence where the warm rays of the returning spring sun could not reach it.

Fortunately for us, however, ice floats; and each spring the sun unlocks much of it and gives back to the earth its fluid water—basic element of all protoplasm, from the one-celled Protozoa to the most complex organism, man.

Another marvel of winter is the eternally created, briefly lasting and unendingly varied snowflake—a mathematically precise

crystal that keeps its basically six-sided shape as it falls thousands of feet through gray skies.

Snowflakes are not frozen water, like hail or sleet. They are lacy growths of water vapor formed around minute particles in the air, such as dust, clay minerals or perhaps meteor dust.

Certain points on the growing crystal tend to grow faster than other portions, explain meteorologists at the U.S. Weather Bureau, and the six points of the star-like flake emerge, each crystal with its own original pattern of beauty.

Pattern of Snowflakes

The intricate and unduplicated patterns of millions and millions of snowflakes depend upon the random manner with which water vapor molecules attach themselves to the ice nucleus. Temperature helps shape the pattern, as do humidity, speeds of air currents, and curvature of the nucleus particle.

Snow crystals take on remarkable shapes—austerly simple or fantastically complex. At temperatures around 24 degrees Fahrenheit, the flakes assume shapes of needles, prisms or pyramids.

As the temperature lowers to around 10 degrees Fahrenheit, they are in the form of platelets, or six-sided patterns with no protruding points.

At temperatures of six degrees Fahrenheit and below, dendritic crystals are formed—some of the most beautiful designs in the world. The exquisite lacelike patterns have



FROZEN SCULPTURE—Billions of fragile snow crystals, no two of them ever found alike, each winter create scenes of quiet beauty.

often been copied for fabric designs, jewelry and ornamentation.

It is actually snowing at all times high in the atmosphere—even on summer days over the temperate zones or over the tropics. In cirrus clouds 60,000 to 70,000 feet high, ice crystals form which may melt or evaporate before they reach the ground. Everlasting snow keeps brushing against mountain peaks poking high in the air, such as Mt. McKinley, Mt. Fujiyama, or Ruwenzori, the "Mountains of the Moon" which lie near the equator in east Africa.

Snowflakes usually fall individually, but if the temperature is just above freezing, they might collide and cling together as they fall, sometimes forming a flake four inches in diameter. On reaching the ground, the flakes gradually lose their crystal shape and become ice granules.

Eskimos have a subtle appreciation for snow forms that shows up in their language. They seldom say the simple word "snow," preferring to use specific names for specific types of snow—soft snow, snow crystals, falling snow, snow freezing as it falls, deep snow, snow for making houses, drifting snow, uneven snow after drifts, and many other types of snow.

The idea of a transient beauty, forming once, only to be lost forever in a few minutes is strangely appealing. But a method has been perfected by Vincent J. Schaefer, research consultant in Schenectady, N. Y., to preserve these fragile crystals.

The basic equipment needed is well-chilled black velvet, glass slides, a solution of polyvinyl formal resin dissolved in

ethylene dichloride, which can be bought at a pharmacy, and patience.

The method is simple: catch the flakes on the velvet, dip a glass rod in the solution and put a drop onto a slide. Immediately touch a captured snowflake gently with the rod and transfer it to the drop on the slide. The solvent evaporates in a few minutes, leaving the resin film covering the crystal without distorting it.

Ice crystals from the refrigerator can be preserved also, as well as the frost that creeps across window panes in delicate patterns of ferns, fungi and Christmas trees.

Winter Peace

Winter offers other spectacles of beauty that have long been regarded as symbols of renewed hope and life at a time when the world seems dark. High in the branches of oak trees hang bunches of mistletoe with shining green leaves and white translucent berries.

Winter is the season when the female holly tree bears her young—clusters of gay red berries. Across the snowy fields, the strange plant called the Christmas rose puts forth seven or eight white roselike blooms tinged with pink—not a rose at all, but a member of the crowfoot family.

The splendor of iridescent crystals on an iced evergreen; the shining of bright stars at night through frosted bare branches; the exquisite shapes of snow, frost and ice upon silent trees reflect nature's own profound peace and beauty—unmarred by noise and clutter of civilization.

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AGRICULTURE

New Aid For Crops

► FARMERS ARE URGED to save their steps and use the air to count their sheep, watch their crops or inspect their forests.

Modern technology offers man new benefits in surveying his lands by taking photographs from the air.

Aerial photography can greatly benefit agriculturists, foresters, soil specialists and agricultural geographers—if the technique is handled properly, said Prof. Robert N. Colwell of the University of California, Berkeley.

To the trained eye, photographs can show the amount of vigor of crops growing in each field, he told the 12th annual meeting of the Agricultural Research Institute in Washington, D. C.

Loss of vigor due to black stem rust on wheat or oats, or blight on potatoes, or frostbite on artichokes can be indicated on photographic film sensitive to the near-infrared part of the spectrum—at wavelengths ranging between 700 and 900 millimicrons.

Infrared photography is excellent for detecting the loss, but not for determining which agent is responsible for the loss.

Agricultural soils can be classified and mapped by this method. Photographed landforms, drainage and erosion patterns and vegetation often give valuable clues to aid the soil chemist in his field work.

Aerial photography can determine certain

diseases on cereal crops, tomatoes, cotton, orange trees, peach trees and pear trees; as well as the extent of flood water damage to crops, houses, barns, machinery and roads; and the damage on crops and grasses caused by drought.

Horses and cattle on the open range can be counted on aerial photos, even at scales as small as 1/20,000—provided they are in full sunlight and not hidden. Sheep, goats, pigs and other smaller animals can be counted, but on larger photographic scales. Color films are being used to determine how plump these animals are, so the farmer can plan taking them to market.

Surveys of forest ranges can be made with aerial photography, stated Dr. Colwell, who stressed the dangers of trying to use this system without knowing how. Many workers, he said, have had "miserably unsuccessful" first efforts because they have expected too much from the technique and have known too little of how to use this great boon to modern agriculture.

Man has been making aerial photographs for more than one hundred years—from first from balloons and then from aircraft.

But the technique was not used for agriculture benefits until 25 or 30 years ago, he said. Since then there has been a steady increase in the amount of useful information these photographs give agriculturists.

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AGRICULTURE

Plant Diseases May Be Stored In Seeds

► TINY SEEDS, those compact storage houses for future generations of plants, also can store many plant diseases.

The disease is usually a fungus but occasionally a bacterium, nematode or virus, stated Dr. W. F. Crosier, department of seed investigations of the University of Cornell at Geneva, Switzerland.

If the disease is located deep within the seed, it is protected from damage and drying and can live as long as the embryo. If it is borne immediately underneath the seed-coat, the disease may die within one or two years, said Dr. Crosier who has been working on seeds of sweet peas, asters, bells of Ireland and many other flowers.

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AGRICULTURE

Valuable Fruit Tree Stock From Russia

► BUD SHOOTS from wild apple, pear and cherry trees were some of the new fruit tree stock brought back recently from Russia by two United States horticulturists who were the first American plant explorers allowed in Russia since 1929.

Drs. John L. Creech and Donald H. Scott of the U.S. Department of Agriculture also brought back cultivated varieties of many fruits that can stand exceptionally cold weather. The wild and cultivated fruit collections should prove valuable to U.S. breeders in their search to develop hardier, more drought-resistant root stocks.

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Nature Note

► OF ALL the familiar Christmas greens, none is appreciated quite as much by all generations as the semiparasitic evergreen bush with white berries called the mistletoe.

With the holly, it was the favored plant for the winter celebration of the Druids, who originated the term "Yule." Later, Christian missionaries made mistletoe a part of the celebration of Christmas.

In ancient days the mistletoe was a symbol of the mysteries of religion, because the plant itself was mysterious even to the wise men of the day. It grew on other trees, with no root that could be seen; it had no flowers and yet bore fruit; no one could tell how it got from one tall tree to another.

Nowadays botanists know that it is a semi-parasitic plant robbing from its host; it has tiny inconspicuous yellow flowers that become white berries, and its seeds are transported from tree to tree because the sticky pulp found in the berries sticks to the beaks of birds.

Although scientists have exploded the mystery of the mistletoe, they adhere to pagan tradition when they see a pretty girl under mistletoe at Yuletide.

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