Snow˙noise

Snowflake shapes have intrigued such scientific luminaries as Tene Descartes, Robert Booke, Johannes Kepler, and Antony van Leeuwenhoek. The sheer abundance of snowflakes and their endless variations on a hexagonal theme supply ample material for study and philosophic contemplation. Snowflakes are generated when atmospheric water is cooled below its freezing point by either an invasion of cold air, or a sudden updraft into cooler elevations. The water doesn't freeze; it enters a supercooled (or undercooled) state until it finds a solid substrate upon which it can condense. Snowflake formation then takes place upon air-borne microscopic dust particles acting as nuclei for condensation. As in other chemical reactions, the rapidity of snowflake growth is dependent upon temperature, pressure, and concentration of reactants. However, the snowflake's final geometry is a fractal pattern, and is less predictable. Just as one coastline differs from another by the random erosion events each has experienced, so random meteorological events arising during crystallization yield those limitless complexities found in snowflake crystals. The effortless appearance of these natural fractals and their quiet beauty justify continued scientific appreciation. No two snowflakes are ever exactly the same (neither are two lightning bolts). Though two such patterns may have the same overall shape, if you look closely you will see that they differ in the details of their structure. The same is true for other natural fractals as well. Each example is unique, because the chances are almost zero that exactly the same sequence of random events will occur in the growth of two different patterns, such as two snowflakes.

A mathematical fractal, by contrast, is constructed according to a set of fixed rules which do not involve any random processes. Given the fixed rules, the resulting structures are always identical to one another. The earliest preserved illustration of snowflakes is by Olaus Magnus in 1555. Others interested in snowflakes were Descartes (in Discours de la Methode, 1635) and Leuwenhoek (and there were, and are many more).
It seems that at present there is no accepted explanation why many snowflakes have a very symmetrical, hexagonal structure, though the details are quite different for different flakes. In fact, there is still research going on in this field. The basic structure comes from the properties of the water molecules, no doubt. The problem is that the aggregation process from the supercooled steam of the cloud is plausibly a local one. Hence there is no obvious reason why it should conserve the symmetry of the growing snowflake.

Serious study of snow crystals was performed in 1910 by a Russian meteorologist who identified 246 types. In 176 days of observation. in the 1930s Japanese meteorologist Ukichiro Nakaya consolidated the list to seventy-nine categories of crystals plus anomalies and oddballs he called "mavericks". In 1951 the international commission on snow and ice simplified things immensely by devising a classification system recognizing seven basic forms of snow crystals: plate crystal, stellar crystal, column, needle, spatial dendrite, capped column and irregular crystals.

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