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How Do Snowflakes Form?

Water crystallization and atmosphere conditions in action

Snowflakes are the result of symmetrical crystallization of water molecules as they turn into ice crystals. Water molecules, when pass to crystalline solid state, such as in ice and snow, form weak bonds (called hydrogen bonds) in which two hydrogen atoms tend to attract neighboring water molecules. When the temperature drops below the freezing point, the water vapor molecules form hydrogen bonds into a solid state, which exhibits the lowest-energy, an open framework that has a basic symmetrical, hexagonal shape of the snowflake. The higher the symmetry, the more stable the crystal, because this maximizes attractive forces and minimizes the repulsive ones. The crystallization process is like tiling a floor in accordance with a specific pattern: once the pattern is established and the first tiles are put in place, then all the others go in the predetermined pattern to maintain symmetry. Water molecules simply put themselves to fit the spaces and keep symmetry; this way, the different arms of the snowflake appear. There are many different types of snowflakes ("no two snowflakes are alike") because a differentiation occurs due to specific forming circumstances: atmospheric conditions, notably temperature and humidity; and in the atmosphere, where conditions are very complex and variable. A crystal might begin to grow in one manner and then trasformations in temperature or humidity, after minutes or seconds, change the growth pattern. The hexagonal symmetry prevails, but the ice crystal may form a different branching pattern. The atmosphere changes take place over a large area, so the snowflakes in a region are alike. The variability in the atmosphere produces the wide variety of snowflake shapes: from prisms and needles to the common lacy snowflakes.