= Snowflake =

A snowflake is either a single ice crystal or an aggregation of ice crystals which falls through the Earth 's atmosphere . They begin as snow crystals which develop when microscopic supercooled cloud droplets freeze . Snowflakes come in a variety of sizes and shapes . Complex shapes emerge as the flake moves through differing temperature and humidity regions , such that individual snowflakes are almost always unique in structure . Snowflakes encapsulated in rime form balls known as graupel . Snowflakes appear white in color despite being made of clear ice . This is due to diffuse reflection of the whole spectrum of light by the small crystal facets .

= = Formation = =

In warmer clouds an aerosol particle or " ice nucleus " must be present in (or in contact with) the droplet to act as a nucleus . The particles that make ice nuclei are very rare compared to nuclei upon which liquid cloud droplets form ; however , it is not understood what makes them efficient . Clays , desert dust and biological particles may be effective , although to what extent is unclear . Artificial nuclei include particles of silver iodide and dry ice , and these are used to stimulate precipitation in cloud seeding .

Once a droplet has frozen , it grows in the supersaturated environment , which is one where air is saturated with respect to ice when the temperature is below the freezing point . The droplet then grows by deposition of water molecules in the air (vapor) onto the ice crystal surface where they are collected . Because water droplets are so much more numerous than the ice crystals due to their sheer abundance , the crystals are able to grow to hundreds of micrometers or millimeters in size at the expense of the water droplets . This process is known as the Wegener ? Bergeron ? Findeisen process . The corresponding depletion of water vapor causes the droplets to evaporate , meaning that the ice crystals grow at the droplets ' expense . These large crystals are an efficient source of precipitation , since they fall through the atmosphere due to their mass , and may collide and stick together in clusters , or aggregates . These aggregates are usually the type of ice particle that falls to the ground . Guinness World Records list the world 's largest (aggregate) snowflakes as those of January 1887 at Fort Keogh , Montana ; allegedly one measured 15 inches (38 cm) wide . Although this report by a farmer is doubtful , aggregates of three or four inches width have been observed . Single crystals the size of a dime (17 @.@ 91 mm in diameter) have been observed .

The exact details of the sticking mechanism remain controversial . Possibilities include mechanical interlocking , sintering , electrostatic attraction as well as the existence of a " sticky " liquid @-@ like layer on the crystal surface . The individual ice crystals often have hexagonal symmetry . Although the ice is clear , scattering of light by the crystal facets and hollows / imperfections mean that the crystals often appear white in color due to diffuse reflection of the whole spectrum of light by the small ice particles . The shape of the snowflake is determined broadly by the temperature and humidity at which it is formed . Rarely , at a temperature of around ? 2 ° C (28 ° F) , snowflakes can form in threefold symmetry ? triangular snowflakes . The most common snow particles are visibly irregular , although near @-@ perfect snowflakes may be more common in pictures because they are more visually appealing . It is unlikely that any two snowflakes are alike due to the estimated 1019 (10 quintillion) water molecules which make up a typical snowflake , which grow at different rates and in different patterns depending on the changing temperature and humidity within the atmosphere that the snowflake falls through on its way to the ground .

= = = Symmetry = = =

A non @-@ aggregated snowflake often exhibits six @-@ fold radial symmetry . The initial symmetry can occur because the crystalline structure of ice is six @-@ fold . The six " arms " of the snowflake , or dendrites , then grow independently , and each side of each arm grows independently . Most snowflakes are not completely symmetric . The micro @-@ environment in which the snowflake grows changes dynamically as the snowflake falls through the cloud , and tiny changes in

temperature and humidity affect the way in which water molecules attach to the snowflake . Since the micro @-@ environment (and its changes) are very nearly identical around the snowflake , each arm can grow in nearly the same way . However , being in the same micro @-@ environment does not guarantee that each arm grow the same ; indeed , for some crystal forms it does not because the underlying crystal growth mechanism also affects how fast each surface region of a crystal grows . Empirical studies suggest less than 0 @.@ 1 % of snowflakes exhibit the ideal six @-@ fold symmetric shape .

= = Uniqueness = =

Snowflakes form in a wide variety of intricate shapes , leading to the popular expression that " no two are alike " . Although possible , it is very unlikely . Initial attempts to find identical snowflakes by photographing thousands of them with a microscope from 1885 onward by Wilson Alwyn Bentley found the wide variety of snowflakes we know about today . In 1988 , Nancy Knight was documenting snowflakes for the National Center for Atmospheric Research and found two identical snowflakes of the hollow column type . It can have many sides from 5- (a number on beyond)

= = Use as a symbol = =

The snowflake is often a traditional seasonal image or motif used around the Christmas period , especially in Europe , the United States and Canada . It represents the traditional White Christmas . During this period , it is quite popular to make paper snowflakes by folding a piece of paper several times , cutting out a pattern with scissors and then unfolding it .

Snowflakes are also often used as symbols representing winter or cold conditions . For example , snow tires which enhance traction during harsh winter driving conditions are labelled with a snowflake on the mountain symbol . A stylized snowflake has been part of the emblem of the 1968 Winter Olympics , 1972 Winter Olympics , 1988 Winter Olympics , 1998 Winter Olympics and 2002 Winter Olympics .

In heraldry , the snowflake is a stylized charge , often used to represent winter or winter sports .

Three different snowflake symbols are encoded in Unicode : " snowflake " at U + 2744 (?) ; " tight trifoliate snowflake " at U + 2745 (?) ; and " heavy chevron snowflake " at U + 2746 (?) .

= = Gallery = =

A selection of photographs taken by Wilson Bentley (1865 ? 1931) :