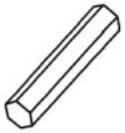
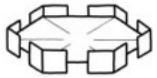
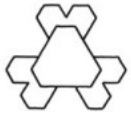
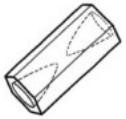
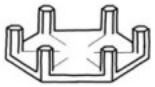
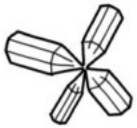
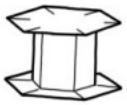
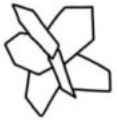
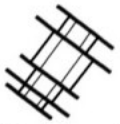
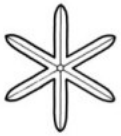
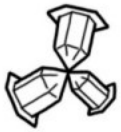
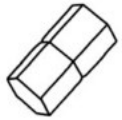
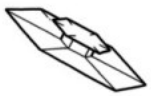
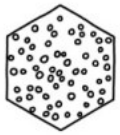
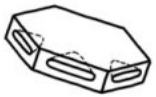
Snow Crystals

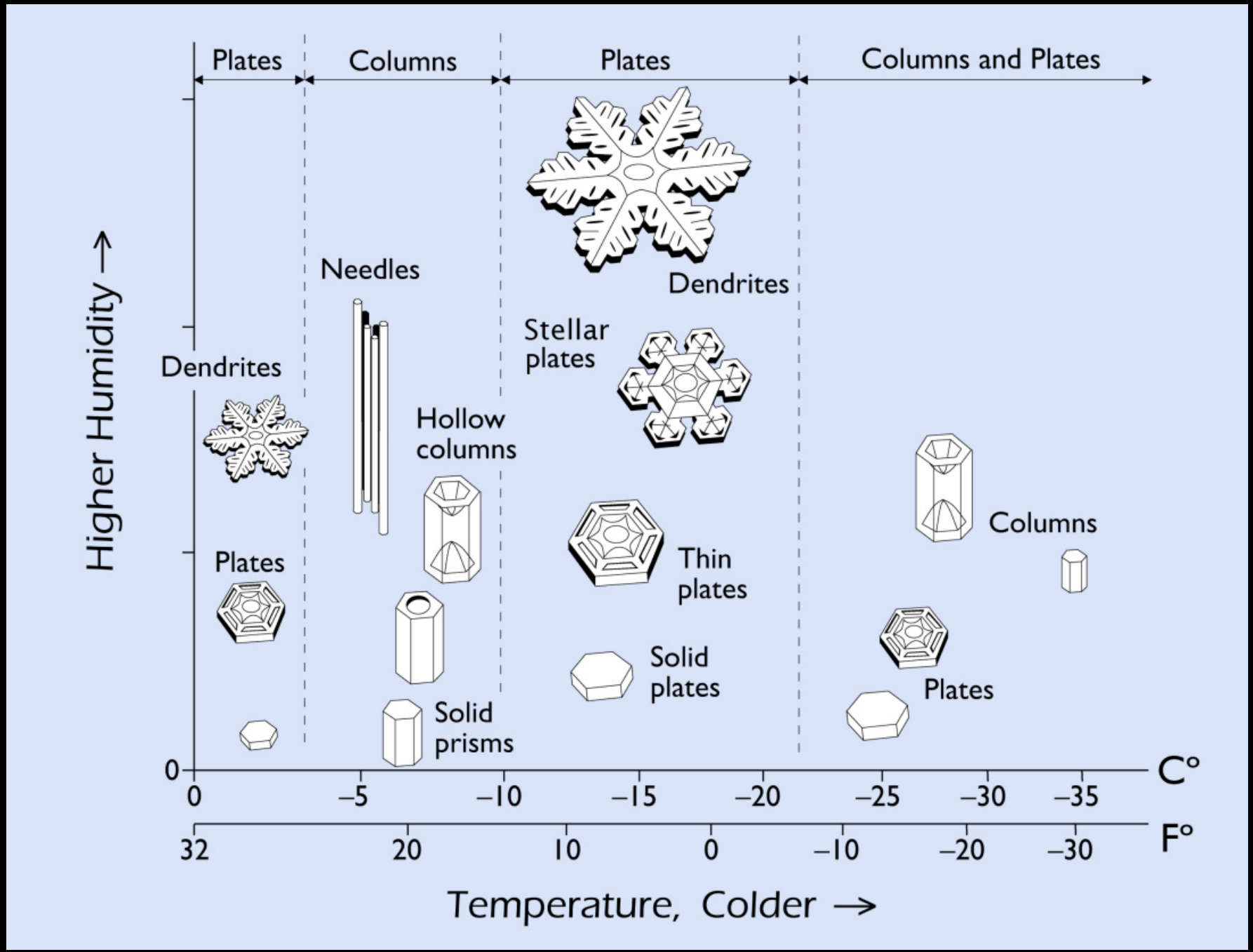
A Study in Symmetry

The Nature of Snowflakes

- A snow crystal is a single crystal of ice arranged in a precise hexagonal array
- A snowflake is a broader term describing a great many forms of winter precipitation, from individual crystals to conglomerates of hundreds to thousands of crystals
- A snow crystal forms from frozen water vapor directly and can continue to develop as more vapor condenses onto the crystal
- Temperature and humidity directly influence the development of the crystal as it makes its way down through the cloud

 Simple Prisms	 Solid Columns	 Sheaths	 Scrolls on Plates	 Triangular Forms
 Hexagonal Plates	 Hollow Columns	 Cups	 Columns on Plates	 12-branched Stars
 Stellar Plates	 Bullet Rosettes	 Capped Columns	 Split Plates & Stars	 Radiating Plates
 Sectored Plates	 Isolated Bullets	 Multiply Capped Columns	 Skeletal Forms	 Radiating Dendrites
 Simple Stars	 Simple Needles	 Capped Bullets	 Twin Columns	 Irregulars
 Stellar Dendrites	 Needle Clusters	 Double Plates	 Arrowhead Twins	 Rimed
 Fernlike Stellar Dendrites	 Crossed Needles	 Hollow Plates	 Crossed Plates	 Graupel

Types of Snowflakes ... SnowCrystals.com


Plates
Columns
Plates
Columns and Plates
Higher Humidity →
Dendrites
Needles
Dendrites
Stellar plates
Hollow columns
Columns
Plates
Thin plates
Solid plates
Plates
Solid prisms
0
C°
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–5
–10
–15
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–25
–30
–35
F°
32
20
10
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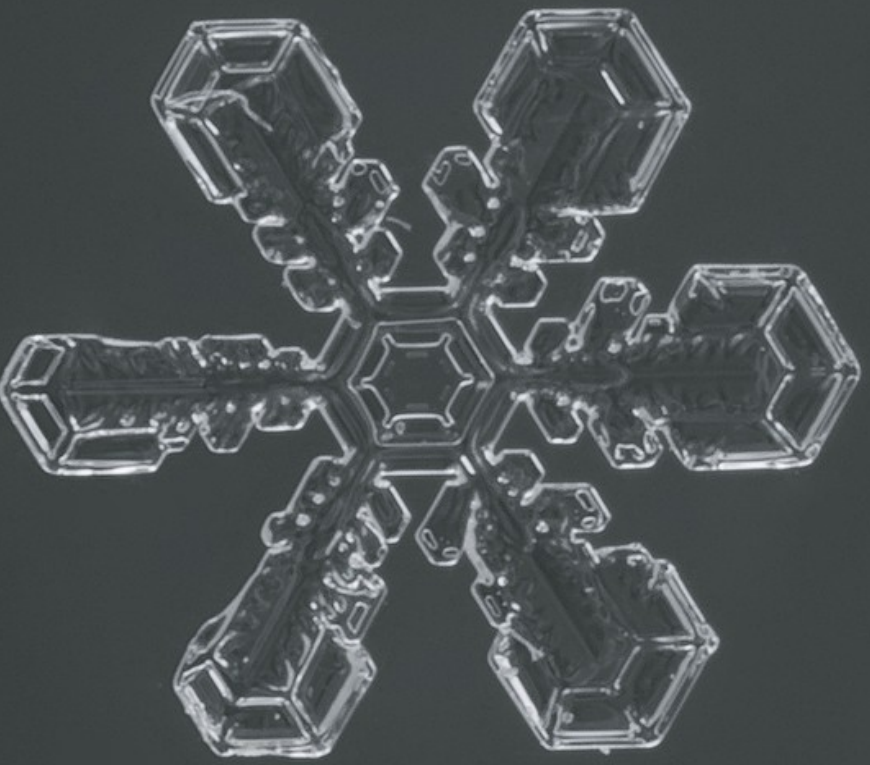
–10
–20
–30
Temperature, Colder →



The snow crystal starts as a simple six sided hexagonal prism

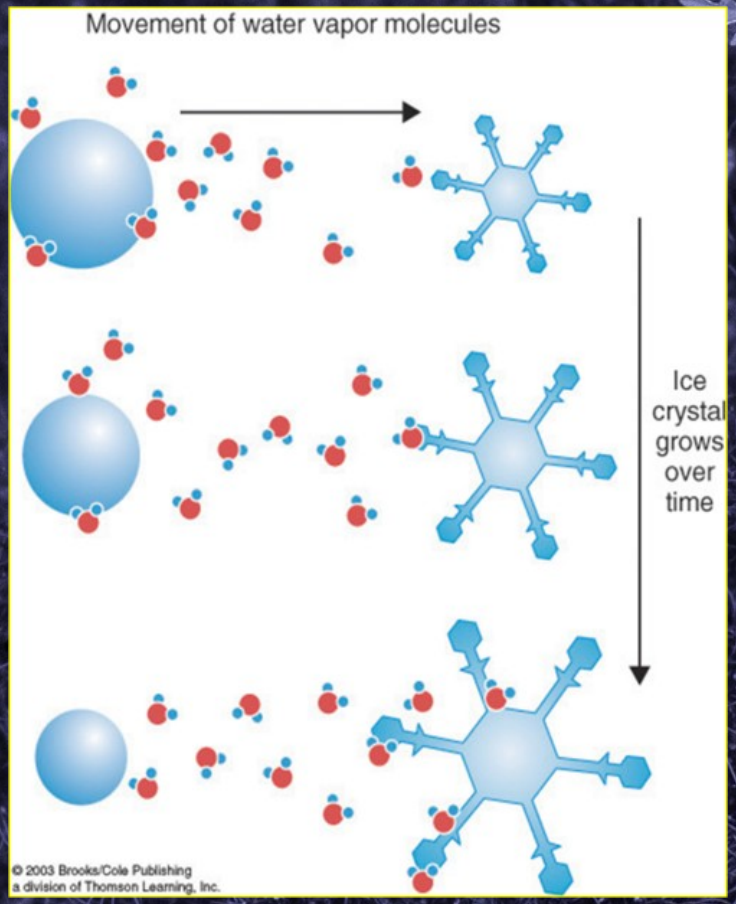
As the crystal grows, it can branch out, form facets and sharpen into thin, flat planar structures

Each branch of the crystal develops independently but as they are grown in the same environmental conditions, they tend to look similar

Contrary to popular belief, most snow crystals are not perfectly symmetrical, irregular crystals are far more common

The corners of the hexagonal prism jut out from the crystal, exposing them to more water vapor from the surrounding air which causes them to grow faster

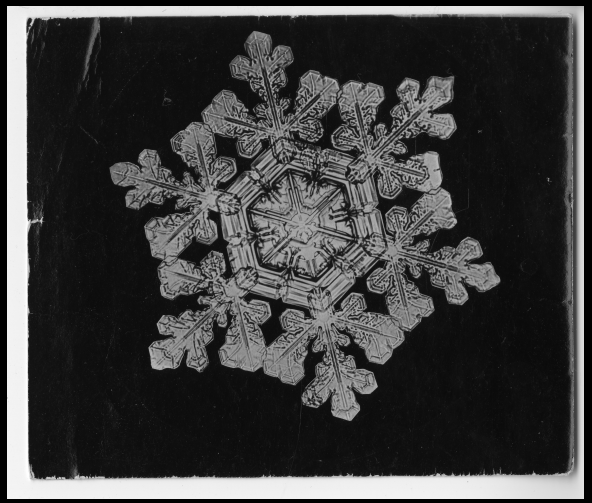
Thus, complex forms grow from a seemingly simple shape



The first serious approach to document the intricate form of snow crystals was made by Wilson 'Snowflake' Bentley

The self taught farmer-scientist used a microscope and camera to produce thousands of images in rural Vermont in the late 1800's and into the 20th Century

500 of his images are archived in the Smithsonian Institute



His book *Snow Crystals*
ISBN 9780486202877, Dover Publications; documents over 2300 specimens

My approach for photographing snow crystals

First attempts mirrored my insect technique, hand held camera with macro lens with extension tubes and flash with diffuser

Flash synch speed (1/250th), moderate ISO and small aperture

Focusing by moving the camera slowly forward and back

Varying exposure by adjusting flash power, ISO and flash distance

Changing camera and flash angles to try to reveal more structure

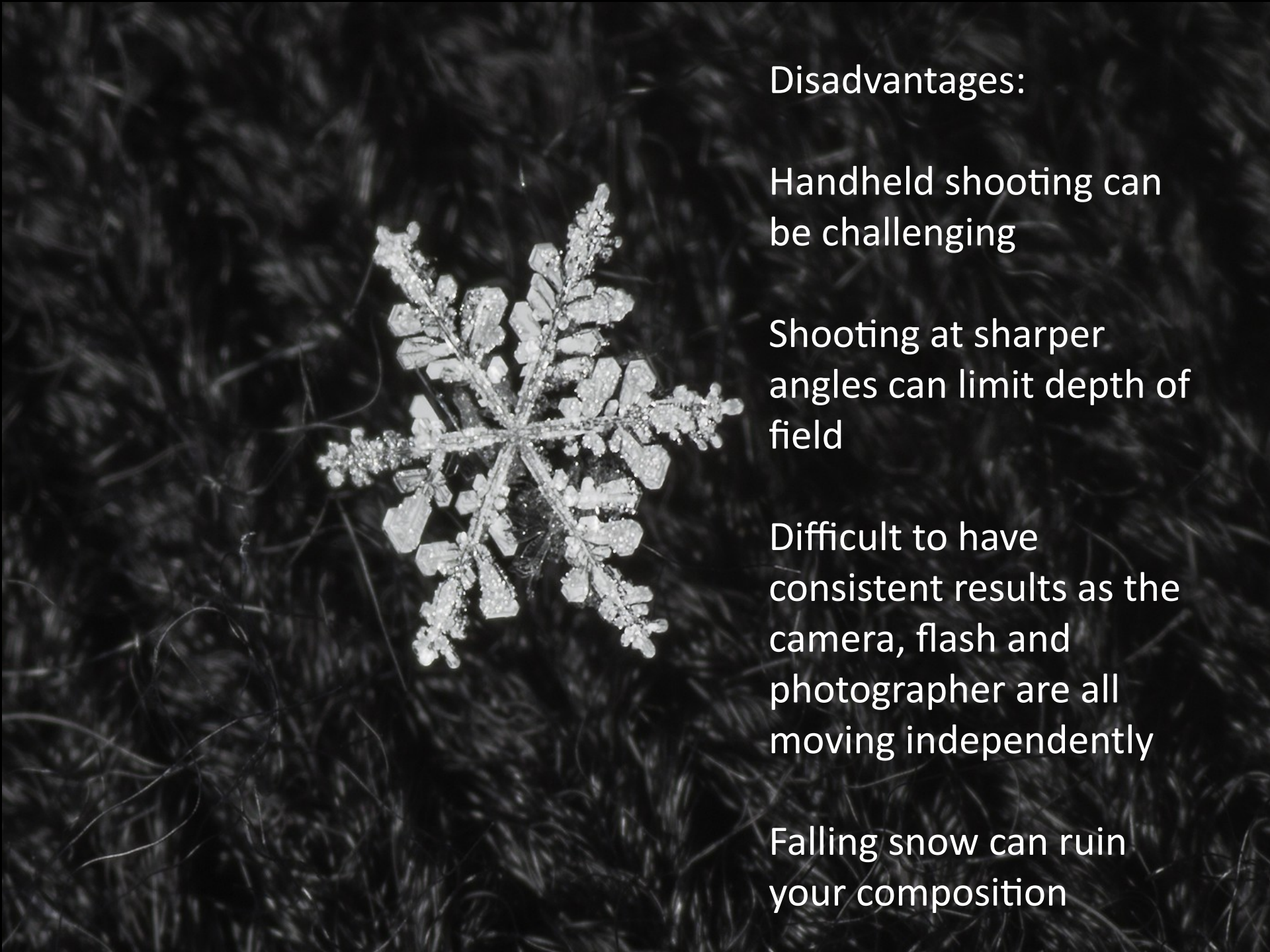
Shooting falling snow on a dark fleece mitten, moving the mitten on a solid surface to isolate a good specimen

Advantages of this technique:

Simple setup, lower cost, freedom of movement

Fleece mitten provides an interesting 'topography' for the specimens

Angles provide depth



Disadvantages:

Handheld shooting can be challenging

Shooting at sharper angles can limit depth of field

Difficult to have consistent results as the camera, flash and photographer are all moving independently

Falling snow can ruin your composition

See Don Komarechka's site skycrystals.ca for the best images of this technique along with his exceptional macro work at donkom.ca

Don uses image stacking handheld at 5x macro combining up to 50 images to show complete front to back clarity

2nd approach goals:

Isolate crystals better to clean up the composition

Allow for more varied backgrounds

Better control the image plane to maximize depth of field

Remove the snow from the horizontal plane to eliminate the problem of additional falling snow from ruining the image

Solution:
photograph on a vertical glass plane

Using a soft clamp to secure a clear glass filter, use a second clamp to secure that assembly to a pan-tilt tripod

This becomes a vertical stage that snow crystals are affixed to


IRWIN
QUICK-E
IRWIN
QUICK-E
OFF
ON
MENU
INFO.
AF-ON
START/
STOP
SET
LOCK
21/21
100-1482
ISO 100
RAW
1"3
F11


IRWIN
QUICK-G
IRWIN
QUICK-GRIP
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MENU
INFO.
AF-ON
START/
STOP
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SET
LOCK
21/21
OFF
100-1482
1"3
F11
ISO 100
RAW

Snow is lightly swept onto a clean, dark surface

Alternatively, falling snow can be allowed to fall onto said surface

Individual snow crystals are then selected and isolated and transferred to the clear filter using a small soft artist brush

Two brushes often work better as the crystals will sometimes not easily transfer to the glass

If the snow doesn't lift easily, one can sometimes breath on the brush to warm it just above air temperature allowing the crystal to adhere

Background materials of different color can be readily changed out simply by holding them behind the filter at a distance

Advantages:

Flat plane of focus

Isolated subject

Steady platform

Live view focus

Easily changed background colour

Falling snow won't ruin composition

Disadvantages:

Fiddly transfer of crystals

Wind is more problematic

Glass needs frequent cleaning

Risk of damaging specimen is higher