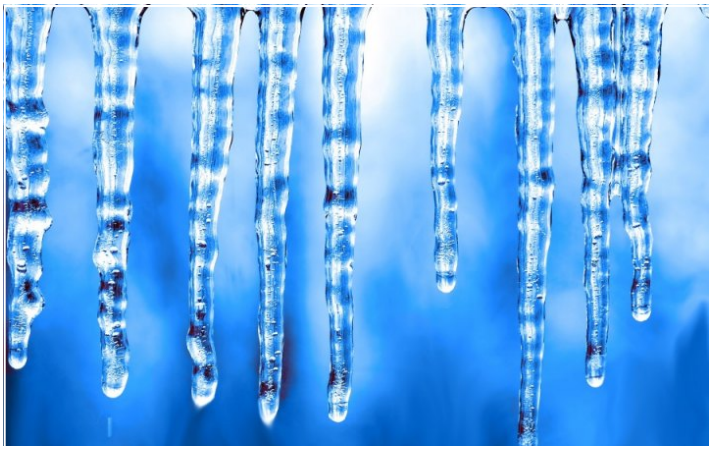
Wonder of the Day **#1801**

How Are Icicles Formed?

131 Comments



SCIENCE — Physical Science

Have You Ever Wondered...

- How are icicles formed?
- What are icicles made of?
- What conditions are required for icicles to form?

Do you like to decorate your house for the winter holidays? As winter break approaches and the weather turns cooler, many people look forward to dressing up their house with boughs of holly and thousands of twinkling lights.

Some of the most stunning winter decorations are provided by Mother Nature. When temperatures drop below freezing and precipitation falls, the eaves of your house can become suddenly adorned with shimmering spikes of frozen water. What are we talking about? Icicles, of course!

If you've ever seen icicles up close, it's clear what they're made of: ice! Their name even gives away their composition. But how do icicles come to be? It's not like spikes of ice fall from the sky and attach themselves to the eaves of your house.

Instead, icicles form through a natural scientific process that requires certain weather conditions. First, you need a source of frozen precipitation, such as snow or ice. If you get a blanket of snow or ice on your roof, there's a decent chance you could see icicles form soon.

Next, you need a combination of below-freezing temperatures and some sunshine. The sunshine is necessary to melt some of the snow or ice to form small water drips. As the water begins to drip off the edge of a surface, such as a roof, the below-freezing air temperature will cause the drops to freeze again, creating the base of a new icicle.

If the process ended there, icicles might look like small, icy warts along your roofline. As you already know, though, icicles eventually take on a long, thin, cone-like shape. Why does that happen?

As the Sun continues to melt snow or ice on the roof, water continues to drip down the slowly-growing icicle. The thin sheet of water slides down the outside of the icicle and gets colder as it reaches the bottom. At the bottom of the icicle, it refreezes and adds to the length of the icicle.

This occurs because the below-freezing air that surrounds the icicle acts like an insulating blanket. Because heat energy rises, this insulating layer of air is thicker at the top, so the top of the icicle stays warmer. Dripping water thus continues to flow toward the bottom of the icicle, where the insulating layer is thinner and allows the drops of water to freeze again.

This thawing and refreezing cycle repeats as long as weather conditions allow, leading to the familiar icicle shape that features a wider base with a long cone that becomes progressively thinner at the bottom. When the water flow that created the icicle stops, the icicle can still change shape. When temperatures are below freezing, some ice can change directly into water vapor, creating a smoother surface along the outside of the icicle.

Recently, some scientists have theorized that an icicle's shape can be described by the same mathematical equation that applies to a similarly-shaped natural feature of many caves: the stalactite. This idea has puzzled many scientists, since the physics of icicle formation is completely different than that of stalactites.

Other scientists believe that icicle formation may be much more complicated than a simple mathematical equation can describe. They believe many other factors, including wind, water impurities, etc., may affect icicle shape. Why bother studying this at all? Some scientists hope to understand icicle formation better, so that improvements can be made to the design of things such as airplane wings and power lines that can be negatively affected by icicles.

Wonder Contributors

We'd like to thank:

gracyn for contributing questions about today's Wonder topic!

Keep WONDERing with us!

Wonder Words (18)

BASE, BOUGH, HOLLY, EAVES, SPIKE, ROOF, DECORATE, BLANKET, EQUATION, STALACTITE, SUNSHINE, PHYSICS, STUNNING, ADORNED, SHIMMERING, COMPOSITION, PRECIPITATION, MATHEMATICAL

Wonder What's Next?

Be sure to bring your fingernails with you to Wonderopolis tomorrow!

Try It Out

Brrr! We hope this Wonder of the Day helped spark your fire for WONDERing! Find a friend or family member to help you explore the following activities:

Want to learn more about icicles and how they form? Jump online to check out the How Do Icicles Form? (http://www.education.com/science-fair/article/icy/) experiment. You'll need a few simple items that you probably already have around the house. It would also be a good idea to get help from an adult family member or friend. Have fun growing your own ice crystals!

Is it winter time where you live? If so, do you have any snow hanging around? If the conditions are just right, get outside and search for some icicles. If the weather isn't cooperating right now, search out some areas where you might expect to find icicles once the snow does fall. Keep an eye on the weather forecast and plan to spend some time experimenting with real icicles the next time the right conditions present themselves.

Feeling crafty? If you've got just three simple ingredients — Borax, hot water, and pipe cleaners — then you've got all you need to make some cool Crystallized Icicle Ornaments

(http://happyhooligans.ca/crystallized-icicle-ornaments-borax-pipe-cleaners/) . Just follow the directions online. Be sure to get plenty of help from an adult family member or friend. Have fun!

Wonder Sources

http://www.livescience.com/1074-icicle-formation-mystery-solved.html

https://www.reference.com/science/icicles-form-79580a9356e2d853#

http://physicsbuzz.physicscentral.com/2011/01/icicle-physics.html

http://wonderopolis.org/wonder/how-are-icicles-formed