

SCIENCE learning springboards

Pappus

Pinecone science: hygrometers

Measuring humidity using pinecones

What can you learn from a pinecone?

Pinecones are the procreative parts of pine trees. Male versions produce pollen, and pollinated female forms yield seeds. Pinecones open and close depending on the humidity. Thanks to the pinecone's cells responding to water in the air, it can be used as a hygrometer! When the humidity rises and rain is likely then the pinecone closes up, and vice versa when the weather is dry the pinecone opens up.

Why does a pinecone open in dry weather when the seeds need moisture to germinate?

When it's rainy or humid, pinecone is closed to protect the seeds escaping as being so light the seeds will become waterlogged, and they will travel only a short distance from the original source. In dry weather the cone opens to disperse seeds in the air far away from the original tree. It is the pinecone's adaptations that provide a better environment for seed dispersal. The seeds can travel best when the air is warm and dry.

Pinecone in a bottle trick: place a narrow pinecone into a narrow-necked bottle. Fill the bottle with water and leave it until the pinecone has completely opened up. Pour away any remaining water. You now have a pinecone 'ship in a bottle' – how on earth did it get in there?



Experiment 1:

You will need several pine seeds and water. Soak several pine seeds in the water and keep several dry.

Place a dry seed on the palm of your hand and blow it. How far did it go? Repeat the experiment with one of the soaked seeds.

- Discuss the differences you observe.

Experiment 2:

You will need two pinecones and two glasses large enough to hold the cones. Set up your experiment by putting one pinecone in each glass. Then fill one glass with water; leave the other one dry.

Record how long it takes for the wet pinecone to close and then reopen once you've poured its water away.

How does the pinecone do that?

The outer and inner parts of the pine scales have different abilities to absorb moisture from the surroundings. Under dry conditions, the outer parts of the cones' scales dry out and let more water through than the inner parts, causing the cone to open.



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Experiment 3:

You will need a piece of thick paper, crayons or markers, scissors, and glass with water.

Draw several flower shapes, of different sizes, on the thick paper. Decorate the flowers, cut them out and bend the petals towards the centre of the flower. Place the folded flower onto the water surface. Observe how the flower begins to open slowly until it finally opens completely.

How does the paper flower do that?

The paper is also made from wood, so it still retains the ability to absorb water. As the wood fibres absorb water, they swell slightly, causing the flower to open.



A Weather House: the ability of natural fibres to react to humidity is the basis of the traditional Weather Houses. The male and female figures move on a balance bar that is suspended by a fibre of wool or a strand of hair. The strand relaxes or shrinks depending on the ambient humidity. When the moisture content in the air is high, the strand relaxes and one of the wooden figures will pop out into view. When the air is dry, the strand will shrink, and the other figure will emerge.

