

Santa and the Scientists

Children all over the world puzzle over Santa's magical journey on Christmas Eve and the early hours of Christmas morning. And all children ask the same questions:

'How does such a fat, jolly man get down the chimney? How does Santa visit all the children in a single night?'

We can use ideas from science to find if such amazing achievements are physically possible. We can also apply scientific thinking to other areas of the Christmas Story. For example, what was the Star of Bethlehem? Or, taking another thread of the story, is there any way that tales of a virgin birth can have a scientific explanation?

There are other aspects of Christmas that we can usefully think about in scientific terms. The time it takes to cook a turkey depends on thermodynamics. The reason that Christmas tree lights can be so dangerous can be explained using basic electricity. Biochemistry helps explain the effects of drinking a little too much alcohol at the office party. Psychology can help explain why Christmas can be such a stressful time. Physics explains why some snowmen melt more quickly than others. Biology has an explanation for Rudolf's red nose. But science cannot explain the magic that children find in Christmas.



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What you need to do:

You are going to produce an illustrated talk, web page or Powerpoint presentation on one aspect of the science of Christmas. You need to describe the element of the story that you are considering by retelling the basic story in your own words. Having done this you can apply your science! The few examples listed below might help you get started – but use your own imagination.

How does Santa get round all the houses in one night?

Points that might help Santa:

- He has about twenty four hours to do this because some part of the Earth is always dark – when it's daytime in New York it may be night in London.
- Einstein's theory of Special Relativity predicts that as a body travels faster time slows down – so if Santa goes fast enough his watch will almost stand still.

Points that might hinder Santa:

- In Antarctica the Sun never sets in late December.
- Einstein's theory of Special Relativity predicts that as a body travels faster it gets more massive. Santa would become very, very massive if he moved quickly enough to visit all those houses. Of course, this could explain why he looks so fat.

What was the Star of Bethlehem?

Start off by looking at the biblical sources, then suggest and discuss possibilities. These include a supernova, a comet or an unusual grouping of the planets.

Why do some snowmen melt more quickly than others?

The air temperature is obviously important, but the packing of the snow has a big effect as well. For example, snowballs are harder to make when the snow is particularly cold because the warmth of the hands doesn't melt the snow crystals together.

Why do turkeys take so long to cook?

In order to 'cook' meat must reach a certain temperature. For turkey meat this is about 70⁰ C. Turkey meat is a reasonably good insulator so it takes sometime for the energy to transfer from the outside of the bird to the inside. Shoving a metal spike into the bird can speed up the process because metal is a good conductor of thermal energy. Stuffing the bird will slow the cooking because the hot air can't get inside the bird.

Resources which might help you:

Roger Highfield's book [Can Reindeer Fly](#) is an excellent first resource. There are also many useful websites – but you will get fed up with grinning Santas and dodgy-looking reindeer!