

The scientific benefits of Rudolph's red nose

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Summary: We're all familiar with the story of Rudolph the Red-Nosed Reindeer by Robert L. May, but scientifically speaking, what are the optical benefits of a shiny red nose on a foggy Christmas Eve?

FULL STORY



This image shows a paper mache of Rudolph the Red-Nosed Reindeer, which once graced the Chicago lawn of his creator, Robert L. May, Dartmouth class of 1926.

Credit: Photo by Eli Burakian, class of 2000, Dartmouth College

We're all familiar with the story of Rudolph the Red-Nosed Reindeer by Robert L. May (a class of 1926 Dartmouth alumnus), but scientifically speaking, what are the optical benefits of a shiny red nose on a foggy Christmas Eve?

In a paper just published by *Frontiers for Young Minds*, Nathaniel J. Dominy, Professor of Anthropology at Dartmouth, explores this very question. By citing research by other scientists on the unique eyes and vision of Arctic reindeer, Dominy explains why Rudolph is able to lead Santa and his team of eight tiny reindeer through the thick Arctic fog.

Dominy points out that Arctic reindeer (scientific name *Rangifer tarandus tarandus*) can see ultraviolet light, which is invisible to humans and most mammals--a trait that comes especially handy in mid-winter when the sun is low on the horizon and the high scattered light from the atmosphere is mainly blueish and ultraviolet. In addition, the reflective tissue (tapetum lucidum) in reindeer eyes changes from a rich golden color during the summer months to a deep blue color during the winter months. This tissue (which causes eye

shine at night) helps nocturnal animals see in the dark, and a blue one is expected to improve their ability to see blue light. Yet, fog extinguishes blue light more readily than red light, which may make it especially difficult for Santa's reindeer to see blue effectively, never mind fly.

This is where Rudolph's luminescent (glowing) nose comes into play, as it serves as an excellent fog light for navigating his fellow reindeer. Given that the redness of Rudolph's nose is similar to red holly berries, Dominy was able to estimate the color of light emitted from Rudolph's nose by measuring the color of holly berries. He found that Rudolph's nose is probably the maximum level of redness that mammals are able to see, which may explain why Rudolph's nose is effective as a fog light.

According to Dominy, Rudolph's nose also poses a problem. Reindeer noses are extremely vascular, which causes them to lose body heat through their noses. A glowing nose could cause excessive heat loss for Rudolph, putting him at risk of hypothermia. "It is therefore imperative for children to provide high-calorie foods to help Rudolph replenish his energetic reserves on Christmas Eve," says Dominy. As a result of the unique properties of Rudolph, it is no wonder that with a nose so bright, he is able to effectively guide Santa's sleigh.

Story Source:

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1. Nathaniel J. Dominy. **Reindeer Vision Explains the Benefits of a Glowing Nose**. *Frontiers for Young Minds*, 2015; 3: 18 DOI: 10.3389/frym.2015.00018

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