

On cloudy days, navigation by Vikings shined

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Mysterious crystals known as sunstones showed way, researchers believe

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Vikings might have navigated foggy seas using crystals to analyze light from the sky, a trick similar to what honeybees do to stay on course on cloudy days, researchers suggest.

Scientists are now planning experiments to see if they can replicate these practices.

The Vikings dominated the North Atlantic from 900 to 1200 by skillfully navigating across the open sea. For instance, when the sun was out, archaeologists found the Vikings could have navigated with the aid of sundials — by tracking the sun's trajectory in the sky from east to west, they would've been able to locate north.

But how did the Vikings navigate when the sun was obscured by fog or clouds that could last for days along key parts of their sailing routes? A controversial answer proposed by Danish archaeologist Thorkild Ramskou in 1967 was the use of mysterious crystals known in Viking sagas as sunstones.

To understand how sunstones might have worked, one first can think of all light waves as either rippling up and down, left and right, or at any angle in between, a property known as [polarization](#). Scientists conjectured that sunstones were naturally occurring crystals that served as polarizing filters — they blocked out all light except for that polarized in specific directions. Although it's unclear what sunstones might have been made of, researchers suggest they could have been composed of cordierite, tourmaline or calcite, all common stones in Scandinavia.

The idea is that ancient mariners looked up through these sunstones on overcast days, when the entire sky looked equally bright. Light making its way through a cloudy sky is often polarized — if the way the crystal was angled matched the polarization of this light, the sky would look brighter, but if not, it would look darker. By rotating the sunstones to and fro, the sky would thus appear to periodically brighten and fade. Then, by looking for the patch of sky that was brightest regardless of the clouds, [Vikings](#) could have identified where the sun was and then have used the sundial to figure out which direction was north.

For instance, in the Viking saga, "The Legend of Sigurd," it reads, "The weather was very cloudy, it was snowing. Holy Olaf, the king ... asked Sigurd to tell him where the sun was. After Sigurd complied, he grabbed a sunstone, looked at the sky and saw from where the light came, from which he guessed the position of the invisible sun."

It turned out that Sigurd might have been right.

Scientists have found that honeybees, [ants and other insects](#) can use polarized light to navigate under cloudy skies as well, potentially lending this idea some weight. However, these claims regarding Viking sunstones were never tested, and the concept has many supporters and skeptics, said biophysicist Gabor Horvath at Eotvos University in Hungary.

To see if Vikings actually could use sunstones for navigation, Horvath and his colleagues measured the patterns of polarized light seen in clear, partly cloudy, totally overcast and foggy skies while in Tunisia, Finland, Hungary and the high Arctic. Their findings suggest the polarization of sunlight can in fact be detected through foggy and overcast skies.

"We found that up to 5 to 10 percent of the incoming light near the horizon is polarized," researcher Susanne Akesson, an animal navigation specialist at Lund University in Sweden, told LiveScience. "We now have demonstrated that the Vikings at least in theory could have used sunstones under overcast and foggy conditions to pinpoint the position of the sun."

The researchers are now planning experiments with students using potential sunstone crystals to see if they can in fact determine the sun's location on overcast days, Akesson said.

The scientists detailed their findings online Jan. 31 in the journal *Philosophical Transactions of the Royal Society B*.

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