Vikings' crystal clear way to find the sun

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VIKING sagas may have been more truthful than we realised. Crystal "sunstones" could have helped Viking sailors to navigate even when cloud or fog hid the sun.

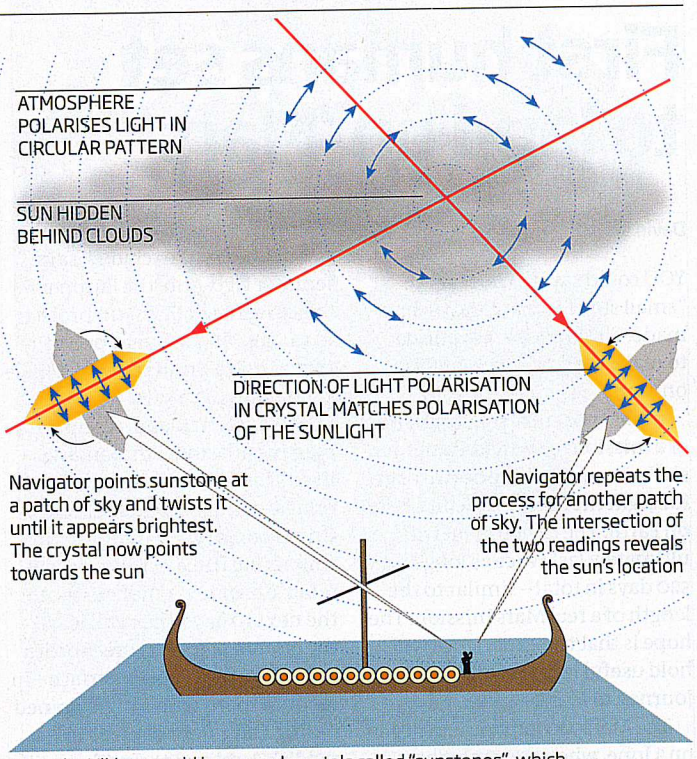
Vikings navigated using sundials calibrated to show the direction of the North Pole. While there is no physical evidence for the navigational techniques adopted on cloudy days, there are references in the Viking sagas to "sunstones" being used.

In 1967, Danish archaeologist Thorkild Ramskou suggested that sunstones may work by creating a pattern of light that revealed the hidden sun's location – although sceptics countered that the method is unwieldy, if not unworkable.

It is only within the last 10 years that Ramskou's theory has been put to the test, and the results, summarised in *Philosophical Transactions of the Royal Society B* (DOI: 10.1098/rstb.2010.0194), claim to demonstrate that the sunstone method does work in cloudy or foggy conditions.

Sunstones – translucent crystals of minerals such as calcite – are potentially useful because both they, and the atmosphere, behave like natural Polaroid filters. This means they polarise light, causing light waves to vibrate in only one plane. Crucially for this navigation technique, the atmosphere leaves sunlight polarised in a series of concentric rings centred on the sun.

It is this pattern that can be detected using a sunstone – at least in theory. When the crystal is pointed skywards and twisted, the theory goes, the light passing through it progressively brightens and dims, depending on whether the crystal's direction of polarisation is aligned or misaligned with the polarisation rings in the atmosphere. When the two are aligned, the crystal appears at its brightest and points towards the sun – even if the sun is hidden. Taking two readings at different points in the sky should enable a navigator to pinpoint the sun's position (see diagram).



How the Vikings could have used crystals called "sunstones", which polarise light, to navigate when the sun was hidden by clouds

Once the position of the sun was established, Ramskou speculated, Viking navigators could hold a lighted torch in the correct position above their sundial, giving them the required shadow reading on the dial.

The question then arises whether enough polarised light passes through clouds to take accurate readings using a sunstone. To find out, Gábor Horváth at Eötvös University in Budapest, Hungary, and colleagues studied polarisation patterns under cloudy skies and foggy conditions in Hungary, Finland and within the Arctic circle.

Using a polarimeter, which determines light's angle of polarisation, Horváth's team found that the atmospheric polarisation patterns can be detected even under cloudy skies or foggy conditions, suggesting that the Vikings could have made use of them. The patterns are difficult to detect under completely overcast conditions, however.

Despite the latest evidence, not everyone is convinced. "The sky is strongly polarised only in certain regions relative to the sun," says Tom Cronin of the University of Maryland, Baltimore, and an authority on polarisation. "If the light is not very polarised, the sunstone won't get [bright or] dark enough [when rotated]," he says. "So I think it would work, but not very accurately."

Also, Horváth and his team have yet to demonstrate that real sunstones – crystals mined in Scandinavia or Iceland – could detect the weak patterns under cloudy skies as effectively as their sensitive polarimeter can, which is something he is now investigating. If they do, Horváth will have compelling evidence that the Vikings possessed both the ways and the means to navigate under cloudy skies. ■

DOUGHOUGHTON/ALAMY

No sun here