

VECTOR ADDITION (RESULTANTS)

Unit 3

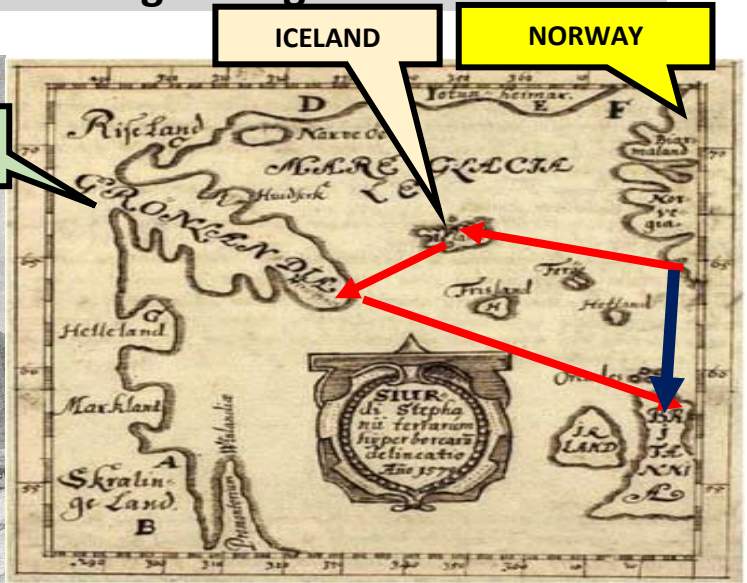
Dr. John P. Cise, professor of Physics, Austin Com. College, Austin Texas USA jpcise@austincc.edu & New York Times 4/6/18

The Crystals That May Have Helped Vikings Navigate Northern Seas

By STEPH YIN, APRIL 6, 2018



GREENLAND



1100 AD Viking map of North Atlantic

A depiction of Erik the Red arriving at Greenland in the 10th century. Researchers theorize that crystals called sunstones aided Viking navigation, even in overcast weather.

When the Vikings left the familiar fjords of Norway for icy, uncharted territories, they were at the mercy of weather. They had no magnetic compasses, and no way to ward off stretches of heavy clouds or fog that made it difficult to navigate by sun. How the explorers traversed open ocean during these times is a mystery that has long captivated scholars. Norse sagas refer to a *sólárstein* or “sunstone” that had special properties when held to the sky. In 1967, a Danish archaeologist named Thorkild Ramskou suggested these were crystals that revealed distinct patterns of light in the sky, caused by polarization, which exist even in overcast weather or when the sun dips below the horizon. Multiple translucent crystals fit the bill, namely calcite, cordierite and tourmaline. None have ever been found at Viking archaeological sites, but a [calcite crystal was discovered in the wreck of a British warship](#) from the 1500s, indicating it **might** have been a tool known to advanced ocean navigator. **A study published Wednesday in Royal Society Open Science advances this idea, suggesting the Vikings had a high chance of reaching a destination like Greenland in cloudy or foggy weather if they used sunstones and checked them at least every three hours.** “This study is an important step forward because it addresses the issue of cloudy conditions in a systematic way,” said Stephen Harding, author of the book “Science and the Vikings” and a biochemistry professor at the University of Nottingham who was not involved in the study.



If Vikings oriented their ship with calcite, according to the researchers, they had a 92 to 100 percent chance of getting within sight of Greenland.

INTRODUCTION: Norway to Iceland is 1472 km. (vector A) at 20° North of west, Iceland to Greenland is 1210 km. (vector B) at 45° south of west, Greenland to England is 2580 km. (vector C) at 30° south of east. See graphic above.

QUESTIONS: (a) Find sum of all the X components of these three vector displacements?, (b) Find sum of all the Y components of these three vector displacements?, (c) Find resultant displacement of these three vector displacements (magnitude and direction needed)? This is the vector Norway to England?

ANSWERS: (a) sum of X components = ~ 4.6 km.
(b) sum of Y components = ~ 1642.15 km,
(c) Resultant R = ~ 1642 due south. (see graphic above)