

The Viking lodestone compass

The first magnets

The first magnets were not invented, but rather were found from a naturally occurring mineral called magnetite. Traditionally, the ancient Greeks were the discoverers of magnetite. There is a story about a shepherd named Magnes whose shoe nails stuck to a rock containing magnetite. There is an alternate story about a region of Macedonia called Magnesia as the starting point. I remember being taught that the Greeks discovered naturally occurring magnets of magnetite in Turkey. Magnetite occurs all over the world, but there are especially large deposits in Scandinavia. The Vikings invented the first practical magnetic compass and used it extensively in their travels to colonize or in war. This enabled them to cross oceans to reach the new world and to invade England at will, even in the dense fog. The Vikings kept the existence of the magnetic compass a secret. The Chinese also invented the magnetic compass, probably earlier than the Vikings. After commercial trade with China was started by the Italians, especially after Marco Polo's trip, the magnetic compass was introduced to the rest of Europe. This made possible the exploration of the oceans by the Europeans, although the Norsemen had a monopoly for almost 500 years and thus a big head start. Today all ships large and small use magnetic compasses to navigate.

The mineral magnetite is an iron oxide that is easily magnetized when it forms. Magnetite is also known as Lodestone.

The lodestone compass

While it is true that the Vikings (like many other medieval mariners) were unable to precisely measure longitude (east-west distance), they had many very sophisticated techniques tailored for sailing in the northern latitudes (latitude is north-south distance). The most important navigational aid used by the Viking navigator was the Sun herself. In the far northern seas, the sun indicates not only east (at sunrise) and west (at sunset), but at noon the sun is due south, and in the months when the sun does not set below the horizon, the position of the sun at midnight indicates due north. Since the northern seas are often foggy or subject to overcast weather, an ingenious Viking developed a navigational tool not equalled until the development of polarized glass: this was the sunstone, a crystal of Iceland spar or andulacite which naturally polarized light. This enabled the Vikings to locate the position of the sun even when it was screened by clouds, and many a Northern mariner wore his sunstone around his neck as a lucky talisman.

Another navigational tool was the ancestor of the compass. This was *lodestone*, a naturally occurring magnetic ore. The lodestone was used with an iron needle (the needle was stroked several times in a single direction across the lodestone to magnetize the needle) and the needle then inserted in a piece of straw and floated in a bowl of water. The floating needle would indicate north/south. The earliest documentation for this primitive compass dates to 1213 or so, but was probably in use even during the pagan era (800 to 1000 A.D.)

Yet another important tool was the *sol-skuggjáfjöl* or "sun-shadow board," a semi-circle of wood, mounted on a handle so that the flat edge was nearest the handle and the curved portion uppermost. Along the curved edge were a series of inscribed lines, giving the device the appearance of some sort of sun-dial. This tool was used as a kind of crude sextant to navigate using a technique called comparative latitude. The device was used to make measurements between the bottom of the sun's disc and the horizon at noon each day. The further north one sailed, the lower the sun would appear at noon (the point of greatest distance above the horizon), and the further south one sailed, the higher the sun. If the measurements on successive days decreased, the ship was heading in a northerly direction, while if the measurements increased, then the ship was headed southward.

Another important navigational technique used by the Vikings was *latitude sailing*. Since the coastline of Norway runs basically north-south, experienced sailors knew that if one sailed north or south to a particular point on the Norwegian coast, then struck due west from that point, then the ship would always arrive at its destination if it maintained the straight westerly course. For instance, Sturla Þórþarson in his version of *Landnámabók* (c. 1275) states that in order to reach Hvarf, Greenland one would first sail to Bergen, Norway, then sail due west, and in time the ship would arrive very near to Hvarf. Using the sextant device described above would facilitate this procedure, since all one would need to do is mark the altitude of the noon sun before leaving Norway. Each subsequent day at noon the distance between the sun and the horizon would be measured again. If the altitude was greater than the starting mark, the ship had sailed too far to the south; if the height was less than the mark, the ship had wandered north of the proper course. With this information, the navigator could correct his course until the sun-height measurement was back to the original mark. While the Vikings could not measure longitude, they used time as a measurement of distance, knowing that a certain number of "days' sailing" would bring their ship to port.

In addition to the Sun, the Viking seaman also relied upon the Pole Star to show him true North when the midnight sun of the arctic did not obscure the stars, and his use of astronomical data extended to a very sophisticated understanding that the tides were caused by the moon and varied with His waxing and waning (remember, to the Vikings Sunna the Sun is female, while Mani the Moon is male).

Like other medieval sailors, the Vikings also relied heavily upon empirical experience gained from their predecessors and from their own voyages. In many places, the Baltic and North Seas are shallow enough to be sounded for depth using a lead weight attached to a line. Increasing shallowness of the ocean floor indicated that the ship was nearing land, and it was oftentimes useful to attach wax to the weight in order to sample the seabed, for the color and nature of the sand or mud could also act as a kind of "landmark" to indicate to the experienced seaman his whereabouts. Observation of birds or of whales could also provide important clues that land was near: Floki Vilgertharson used consecrated ravens released from his ship (much like a latter-day Noah with his doves) in order to locate Iceland, and *Landnamabok* notes that the presence of birds and whales marks the southern edge of Iceland. Another important clue for the navigator were the low-lying fog or cloud-banks indicating land on the horizon, for the westward

path outbound from Norway passes the Shetlands, the Orkneys, the Faroes, Iceland and Greenland, and each of these served as signposts for the sailor passing them westward bound.

One of the most important tools available to the Viking navigator was personal experience gained from having been in a place, combined with such wisdom imparted to him by those he trusted. In *Konungs skuggsjá*, there is a passing of such nautical wisdom from father to son:

'About 7 November the east wind breathes heavily and violently, as if mourning a recent loss. The southeast wind knits his brows under the hiding clouds and blows the froth violently about him. The south wind blows vigorously. The southwester sobs forth the grief of his soul in heavy showers, leads forth very heavy winds, wide-breasted waves, and breakers that yearn for ships.'

The tides vary in accordance with the phases of the moon. When the moon is full or new the tide is greatest; when at its quarter phases it is weakest. Every seven days the tide changes, for the tide rises approximately one seventh part daily from the time when the rise begins (when the moon waxes from first quarter to full); and after it turns and begins to diminish (when the moon wanes from full to third quarter), it ebbs in the same way during the next seven days. Merchants are scarcely able to notice these changes because the course of the moon is so swift; for the moon takes such long steps both in waxing and waning that for that reason few men can determine the divisions of its course.

- *supplied*