Finding Direction
How the compass changed the world

“And by the oracle of truth below,
The wondrous magnet, guides the wayward prow.”

— William Falconer, “The Shipwreck” (1756)

> Every now and then, we all need help finding our way to where we’re going. Mariners knew this all too well centuries ago while navigating the often-treacherous seas.

That’s how the compass—the instrument containing a freely suspended magnetic element that reveals the direction of the horizontal component of the Earth’s magnetic field—came to be during the Age of Discovery. It went on to play a pivotal role in the economic, scientific, military and political developments of modern history.

“The magnetic compass was the first technological invention after the wheel to change the world,” writes Amir D. Aczel in his book The Riddle of the Compass (Harcourt, 2001).

Like gunpowder and paper, the compass originated in China and then became widely used in the West. The first references to an “iron fish” suspended in water pointing south appeared in 1040 in the manuscript Wu Ching Tsung Yao. Around that same time, a magnetic direction-finding device for land navigation was recorded in a Song Dynasty book.

Later, Chinese alchemists used lodestones—magnetic iron ore that aligns itself in a north-south direction—in their fortune-telling boards. Early compasses with lodestones were square slabs with markings for the four cardinal direction points and the constellations.

How exactly the magnetic compass made its way to Europe from China is a bit murky, but trade routes through the Islamic world apparently played a significant role. The compass first surfaced in the Mediterranean region around the early 14th century and afforded seafarers the opportunity to utilize the Earth’s magnetic field rather than simply rely on physical landmarks on shores.

The compass enabled trade to be conducted throughout the year (even from November to mid-March when visibility was limited), thus contributing to the creation of Italian city-states and European empires along the Atlantic. It ushered in the Great Age of Exploration (1400-1550), with the likes of Columbus and Magellan.

In the 17th century, English astronomer Edmund Halley undertook expeditions to measure the Earth’s magnetic variations across the Atlantic’s northern and southern regions. Halley produced the first isogonic chart. It showed how the angle between the magnetic north and the Earth’s true north varies at different points in the Atlantic, and is still used today when geophysicists want to validate their magneto-hydrodynamic models of the Earth’s core.

By the 19th century, the compass, replete with self-lighting, was an instrument mounted on all ships. Scottish scientist Sir William Thomson updated the compass with a needle placed on fine silk threads through a light skeleton card, alleviating the friction on the instrument’s pivot.

In addition, liquid compasses, because of their steadiness, became commonly used on sea vessels during this era. Shortly after the start of the 20th century, the gyroscopic compass—a spinning gyroscope that keeps a compass directed toward the Earth’s true north—was invented.

“The compass allowed mariners to chart the oceans and establish sea routes traversing the entire globe,” writes Aczel. “We use the same sea routes today, and they connect the world’s economies to one another.”

Even today, in the age of the Global Positioning System, ships and planes continue to be equipped with compasses in case of technical difficulties.