**Michael**

**2016-11-5**

**Report about magnet and compass in ancient China**

The first compasses in ancient [Han dynasty](https://en.wikipedia.org/wiki/Han_dynasty) China (actually, the first **equipment that uses magnet** to find the direction is made in *the Period of Warring States*, but the first **compass that use magnetic needle** is made in the Han dynasty) were made of [lodestone](https://en.wikipedia.org/wiki/Lodestone), a naturally magnetized ore of iron. The compass was later used for navigation. Later compasses were made of iron needles, magnetized by striking them with a lodestone. Dry compasses began to appear around 1300 in [Medieval Europe](https://en.wikipedia.org/wiki/Medieval_Europe). This was supplanted in the early 20th century by the liquid-filled magnetic compass.

The magnetic compass is the most familiar compass type. It functions as a pointer to "[magnetic north](https://en.wikipedia.org/wiki/Magnetic_declination)", the local magnetic meridian, because the [magnetized](https://en.wikipedia.org/wiki/Magnetize) needle at its heart aligns itself with the horizontal component of the [Earth's magnetic field](https://en.wikipedia.org/wiki/Earth%27s_magnetic_field). The [magnetic field](https://en.wikipedia.org/wiki/Magnetic_field) exerts a [torque](https://en.wikipedia.org/wiki/Torque) on the needle, pulling one end or pole of the needle approximately toward the Earth's [North magnetic pole](https://en.wikipedia.org/wiki/North_magnetic_pole), and pulling the other toward the [South magnetic pole](https://en.wikipedia.org/wiki/South_magnetic_pole).The needle is mounted on a low-friction pivot point, in better compasses a [jewel bearing](https://en.wikipedia.org/wiki/Jewel_bearing), so it can turn easily.

Magnetic compass is one of the four most important invention in ancient China. It helps ancient China and other counties a lot. It’s a big step in the human history, because with the compass, people can explore and travel much further than before. It helps all the countries in the world to communicate with each other. Until now we are still using many different equipment to help us to find the direction.

But magnetic compass also has disadvantages, “the magnetic compass is very reliable at moderate latitudes, but in geographic regions near the Earth's magnetic poles it becomes unusable. As the compass is moved closer to one of the magnetic poles, the magnetic declination, the difference between the direction to geographical north and magnetic north, becomes greater and greater. At some point close to the magnetic pole the compass will not indicate any particular direction but will begin to drift. Also, the needle starts to point up or down when getting closer to the poles, because of the so-called [magnetic inclination](https://en.wikipedia.org/wiki/Magnetic_inclination). Cheap compasses with bad [bearings](https://en.wikipedia.org/wiki/Bearing_(mechanical)) may get stuck because of this and therefore indicate a wrong direction.

Magnetic compasses are influenced by any fields other than Earth's. Local environments may contain magnetic mineral deposits and artificial sources such as [MRIs](https://en.wikipedia.org/wiki/MRI), large iron or steel bodies, electrical engines or strong permanent magnets. Any electrically conductive body produces its own magnetic field when it is carrying an electric current. Magnetic compasses are prone to errors in the neighborhood of such bodies. Some compasses include magnets which can be adjusted to compensate for external magnetic fields, making the compass more reliable and accurate.

A compass is also subject to errors when the compass is accelerated or decelerated in an airplane or automobile. Depending on which of the Earth's hemispheres the compass is located and if the force is acceleration or deceleration the compass will increase or decrease the indicated heading. Compasses that include compensating magnets are especially prone to these errors, since accelerations tilt the needle, bringing it closer or further from the magnets.

Another error of the mechanical compass is turning error. When one turns from a heading of east or west the compass will lag behind the turn or lead ahead of the turn. Magnetometers, and substitutes such as gyrocompasses, are more stable in such situations.”

### [https://en.wikipedia.org/wiki/Compass🡪Limitations of the magnetic compass]

With a develop of over 2000 years, compasses are still playing a very important role in our life and science. And it’s will surely still important to us in the future.