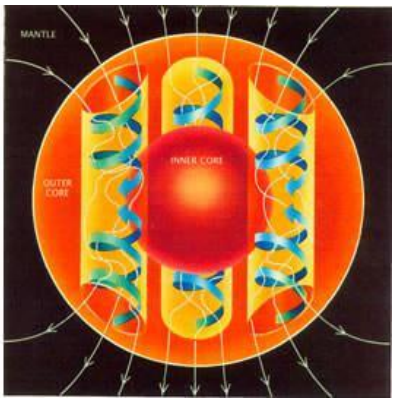
effect (caused due to the rotation of the earth), gives rise to **self-sustaining (geodynamo)** Earth's magnetic field.

Mechanism

- Earth's magnetic field is generated in the **earth's outer core**.
- Lower pressure than the inner core means the metal in the outer core is **fluid**.
- The temperature of the outer core ranges from 4400 °C in the outer regions to 6000 °C near the inner core.
- Heat sources include energy released by the compression of the core, energy released at the inner core boundary as it grows (latent heat of crystallisation), and radioactivity of potassium, uranium and thorium.
- The differences in temperature, pressure and composition within the outer core cause **convection currents** in the molten iron of the outer core as cool, dense matter sinks while warm, less dense matter rises.
- This **flow of liquid iron** generates **electric currents**, which in turn produce **magnetic fields**.
- Charged metals passing through these fields go on to create electric currents of their own, and so the cycle continues. This **self-sustaining loop** is known as the **geodynamo**.
- The **spiral movement** of the charged particles caused by the **Coriolis force** means that separate magnetic fields created are roughly aligned in the same direction, their combined effect adding up to produce one vast magnetic field of the planet.



Convection currents in the outer core. Spiral motion is caused due to the Coriolis Effect. (Wikipedia)

2.2 Magnetic poles

- A magnet's North pole is thought as the pole that is attracted by the Earth's North Magnetic Pole when the magnet is suspended so it can turn freely.
- Since opposite poles attract, **the North Magnetic Pole of the Earth is the south pole of its magnetic field**.
- Magnetic dipole field (simple north-south field like that of a simple bar magnet) is usually aligned fairly closely with the Earth's rotation axis; in other words, the magnetic poles are usually **fairly close to the geographic poles, which is why a compass works**.
- However, the dipole part of the field **reverses** after a few thousand years **causing the locations of the north and south magnetic poles to switch**.

The terms magnetic north and magnetic south are not to be confused with geographic north and geographic south, and geomagnetic north and geomagnetic south.

2.3 Geomagnetic reversal

- A geomagnetic reversal or a reversal in earth's magnetic field is a change in a planet's magnetic field such that the **positions of magnetic north and magnetic south are interchanged**.
- Based on **palaeomagnetism** (magnetism in rocks that was induced by the earth's magnetic field at the time of their formation), it is observed that over the last 20 million years, magnetic north and south have flipped roughly every 200,000 to 300,000 years.
- **The reversal is not literally 'periodic' as it is on the sun, whose magnetic field reverses every 11 years**.
- The time between magnetic reversals on the Earth is sometimes as short as 10,000 years and sometimes as long as 25 million years.
- And the time it takes to reverse could be about a few hundred or a few thousand years.
- The magnetic poles emerge at odd latitudes throughout the process of the reversal.

Normal and Reversed field