

Introduction to Magnetism

Until 1820 scientists knew of no relationship between electricity and magnetism. In July of that year, a Danish physicist, Hans Christian Oersted, accidentally discovered that a flow of electric current through a conductor produced magnetic effects. After one of his lectures at the University of Copenhagen, Oersted by chance placed a current-carrying wire parallel to and directly above a suspended magnetic compass needle. To his surprise, he saw the compass turn and point in the direction perpendicular to the length of wire.

A magnetic field produced by an electric current is described as an **electromagnetic field**. The direction of this field is determined by the direction of current flow, and is always at right angles to the conductor through which the current is moving. The strength of the field depends on two factors:

- The size of the current
- The arrangement of the conductor

As we shall see, the electromagnetic effect can be greatly strengthened by using coils of wire rather than straight lengths, and also by placing a core of ferromagnetic material such as iron within the coil of wire.

The principles of electromagnetism formed the basis for the development of most modern electric devices and machines; today, the electromagnetic effect is employed in electric bells, telephones, relays, solenoids, electromagnets, loudspeakers, motors, meters and generators.

Magnetic field due to a current in a long straight conductor

The direction of the lines of force of an electromagnetic field surrounding a long straight conductor is shown in Figure 2.6.

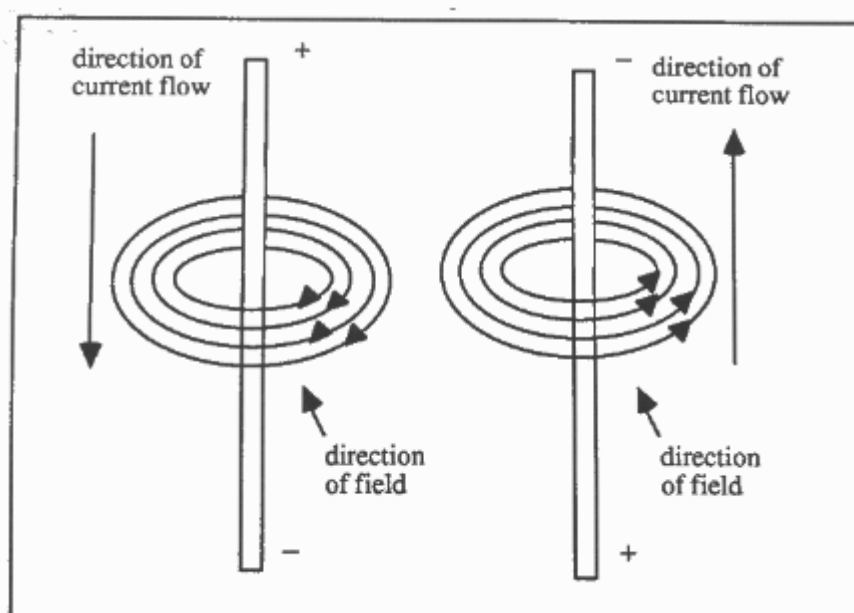


Figure 2.6 Magnetic field surrounding a long straight conductor