Within a week of hearing of Oersted's discovery in Copenhagen, the French physicist Andre Ampere related the direction of the magnetic field to the direction of the current by what is now known as the **right-hand grip rule**. See Figure 2.7. This states that if the wire is imagined as gripped in the right hand, with the thumb pointing along the wire in the direction of the conventional current (positive to negative), then the direction of the fingers gives the direction of magnetic flux.

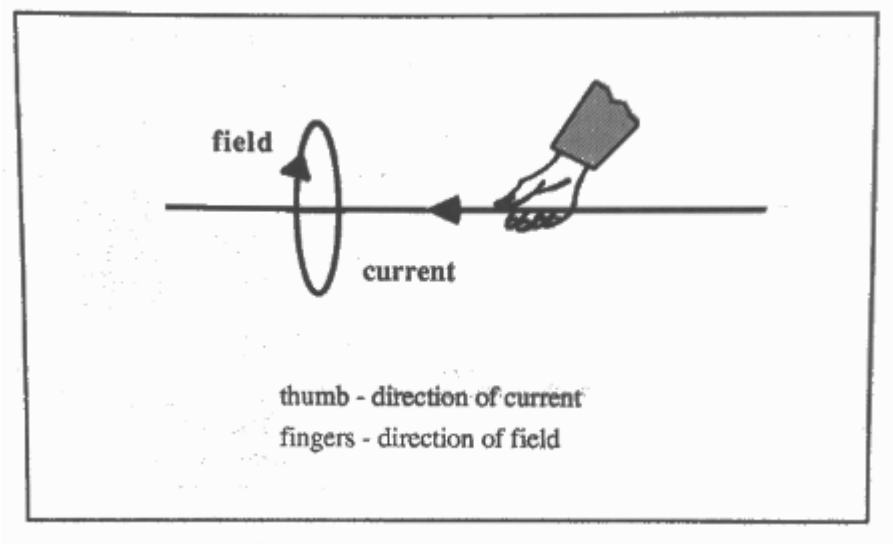

Figure 2.7 Illustration of the right-hand grip rule

An alternative method is the **corkscrew rule**, which states that the direction of the magnetic field surrounding a current-carrying wire is the same as that in which a corkscrew must be turned in order to move it in the direction of the conventional current.

In drawing diagrams of the magnetic field patterns around current-carrying conductors, it is often convenient to imagine the current in the conductor as either flowing into or out of the page as shown in Figure 2.8. Imagine an arrow placed in the conductor with a dot representing the tip of the arrowhead and a cross representing the tail feathers.

Ampere contributed much to the early study of electricity. After a lifetime dogged by personal tragedy, the sorrowful epitaph he chose for his gravestone read: *Felix tandem*. (Happy, at last.) His name is now remembered in the unit of electric current, the ampere (A) or amp for short.

Magnetic field due to a current in a solenoid

Ampere showed that if a current-carrying wire is closely wound in the shape of cylindrical coil – he called this arrangement a *solenoid* – it generated a magnetic field similar to that of a bar magnet, with one end of the coil acting like the north pole and the other like the south pole. See Figure 2.9.