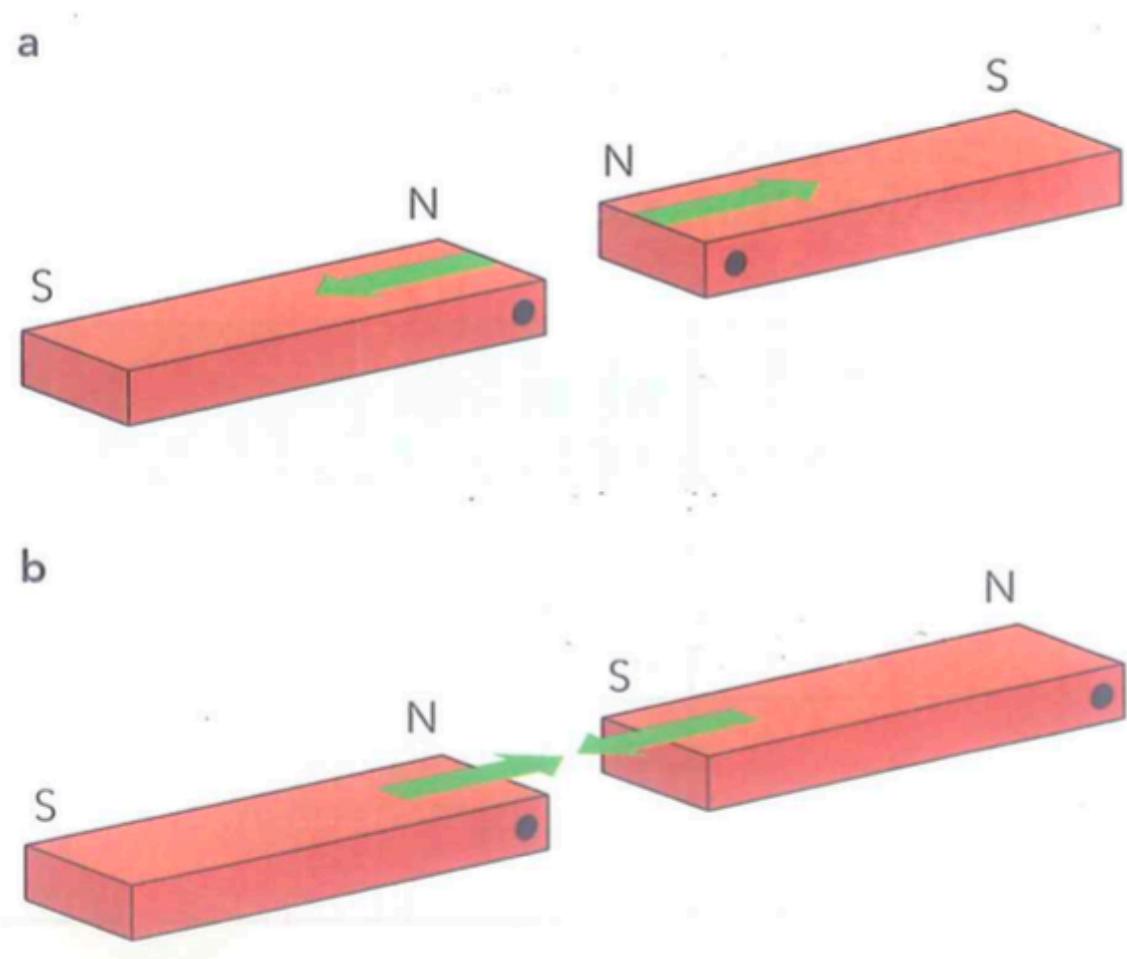
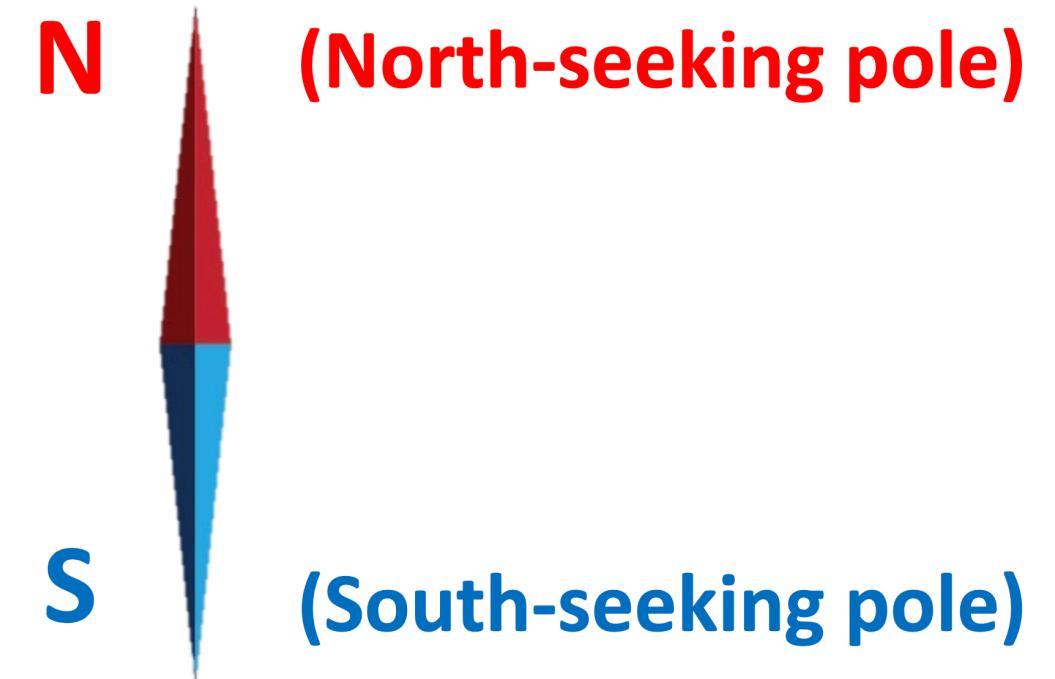
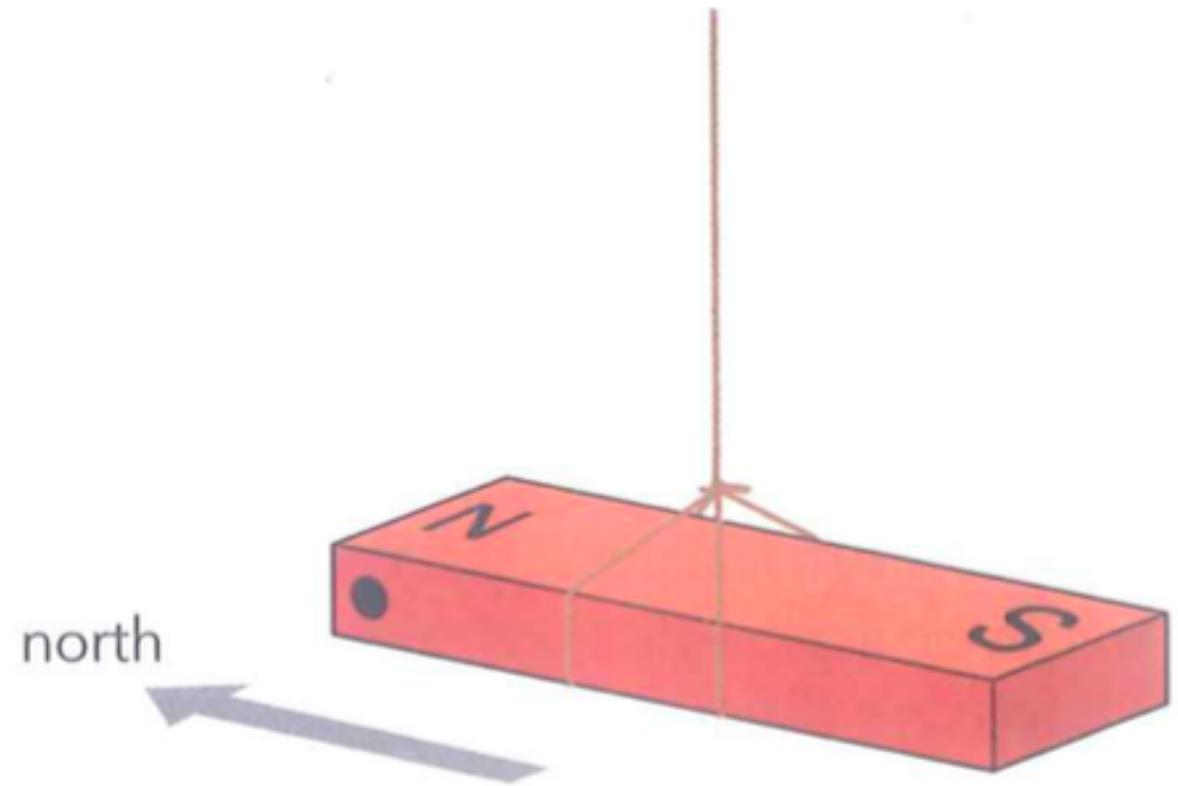


# Chapter 16. Magnetism

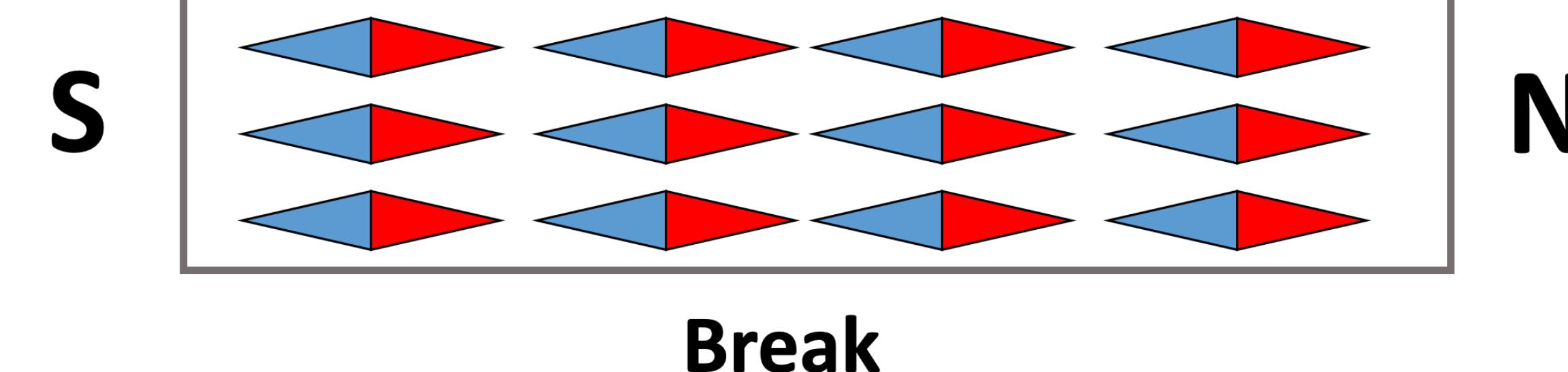
# Permanent Magnets



**Like poles repel**  
**Unlike poles attract**

# Permanent Magnets

What would happen if you cut a bar magnet in half?



Break

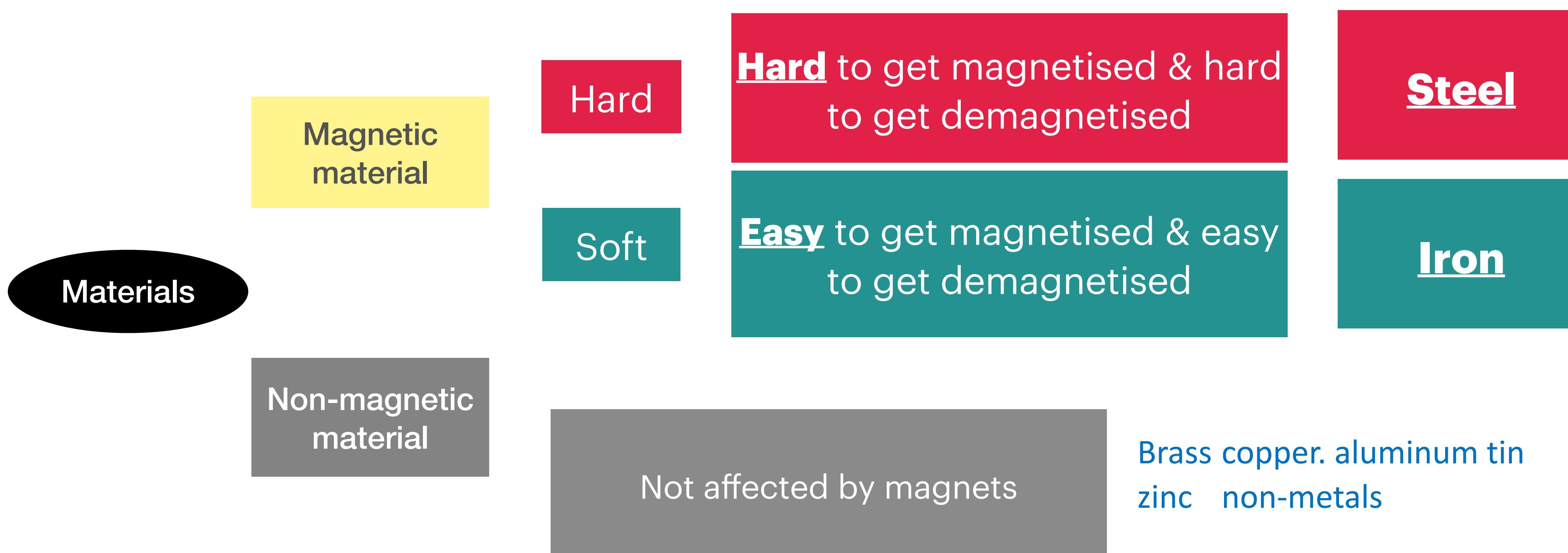


# Magnetic Material

Can magnet attracts other things except for magnets?

→ **Magnetic material** Can be magnetized and be attracted to magnets; (containing **iron, nickel, cobalt**)

**Ferrous metals** (Containing iron, like iron and steel)



# Induced magnetism

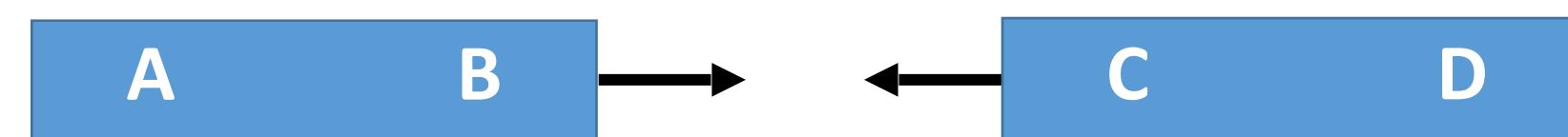
Why magnets can attract magnetic material? What happened when magnetic material attracted by magnets?



# Induced magnetism

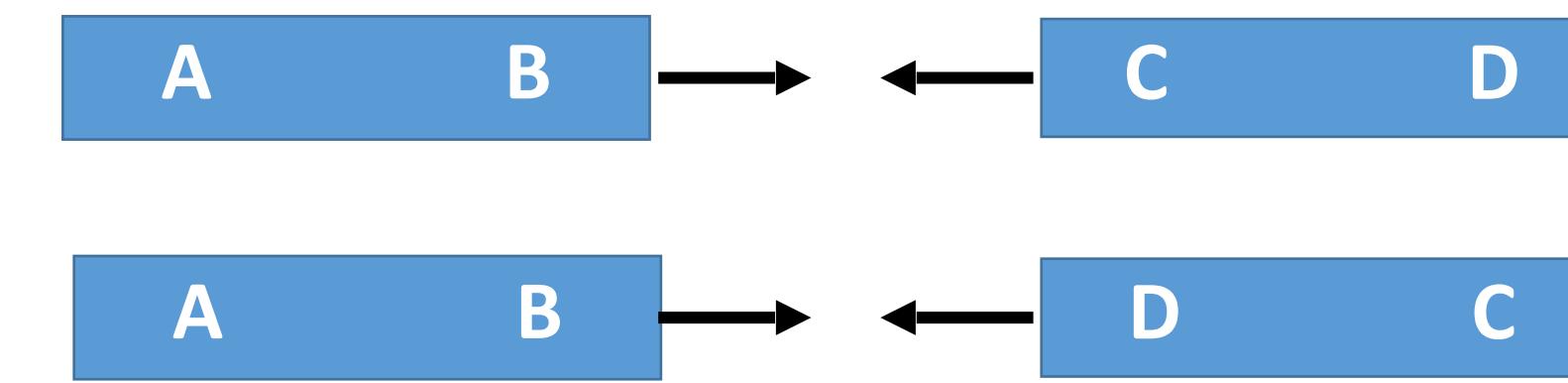
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Situation 1



Attract

Situation 2



Both Attract

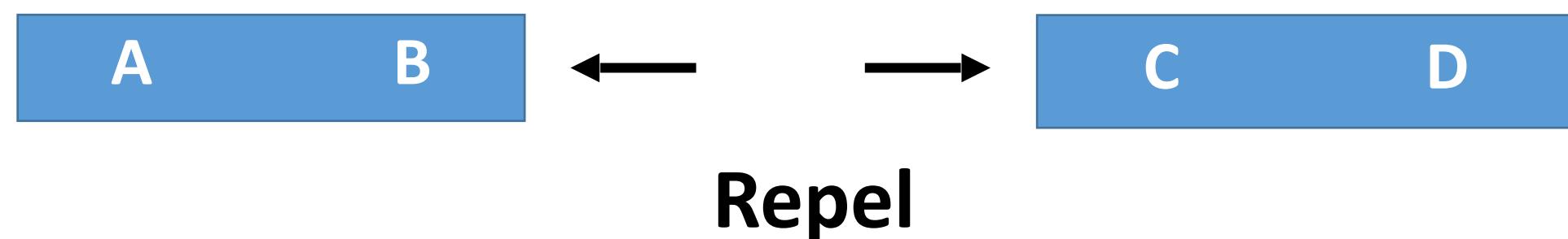
→ There must be **at least one** magnet

→ There is **only one** magnet

# Induced magnetism

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## Situation 3



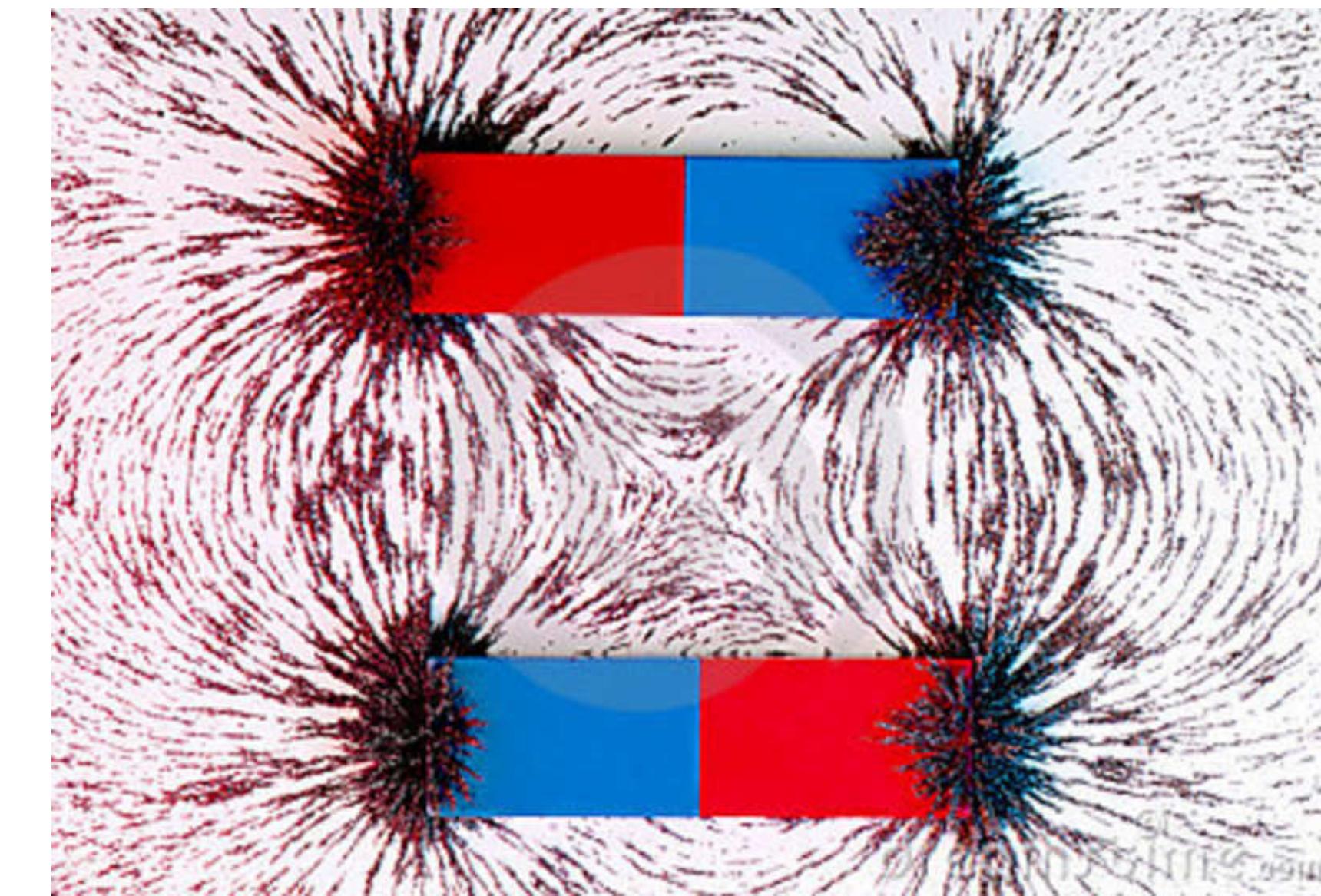
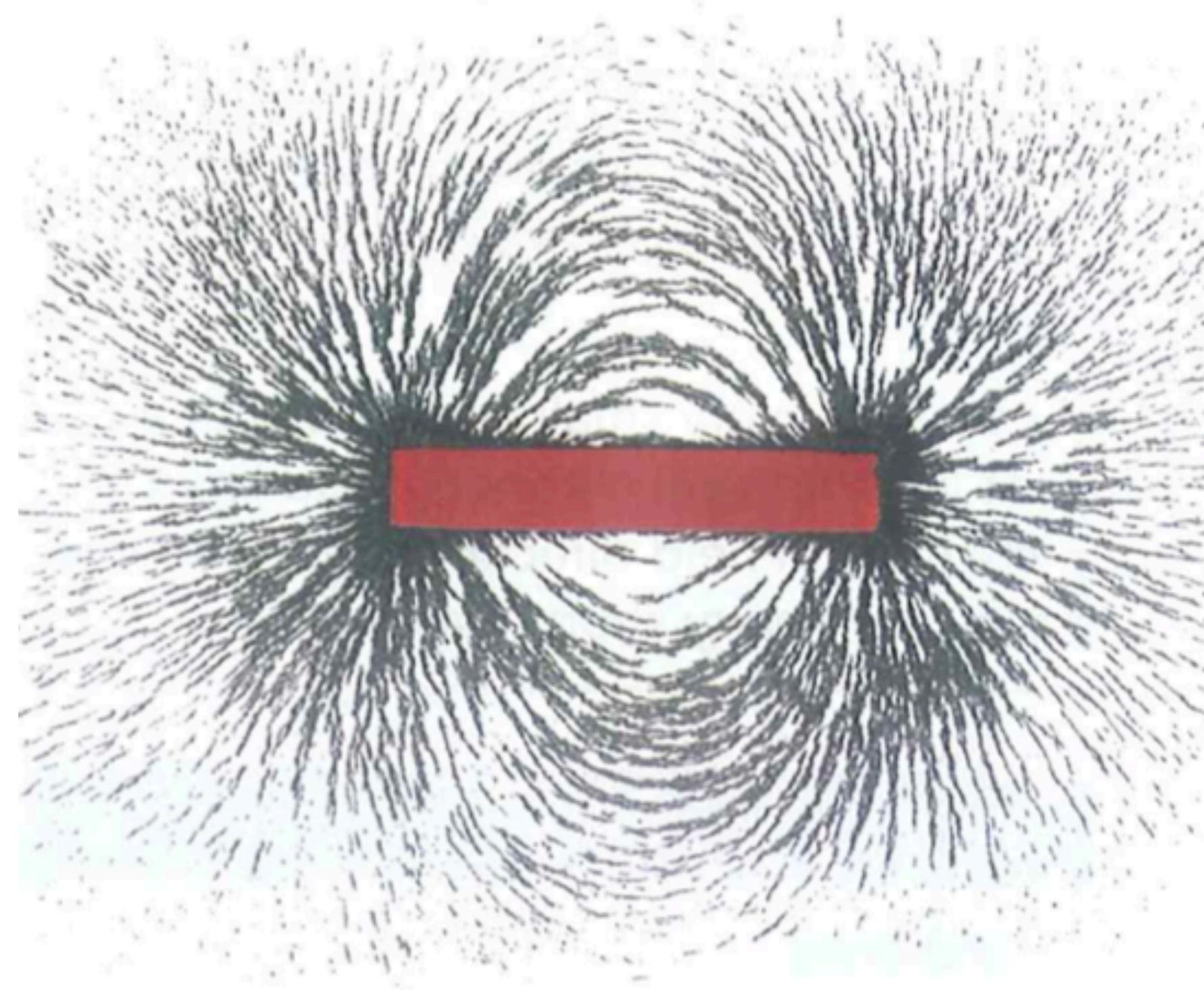
- They must be **both magnets**
- B and C are like poles
- A and D are like poles
- A will attract C
- B will attract D

# Magnetic Field

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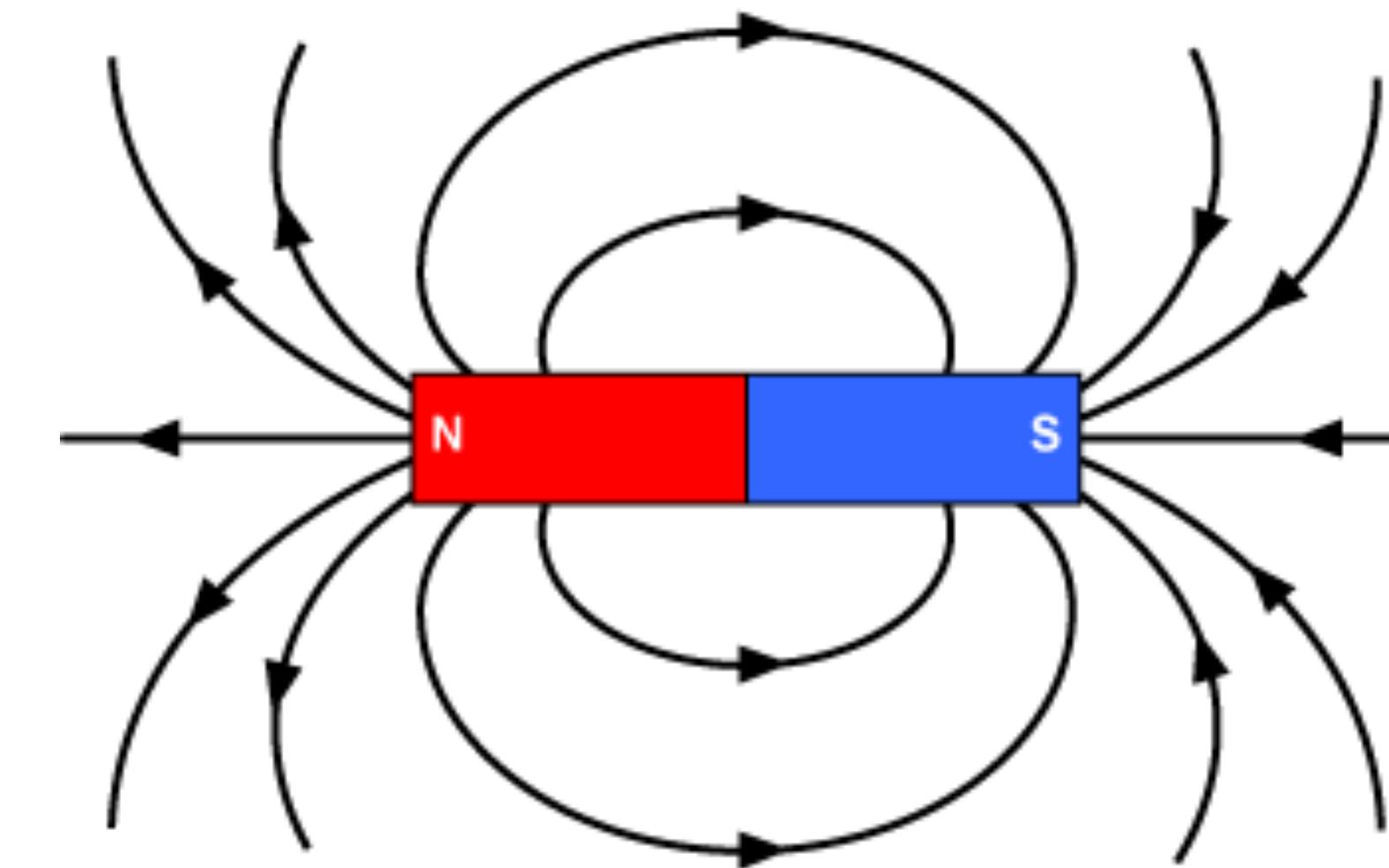
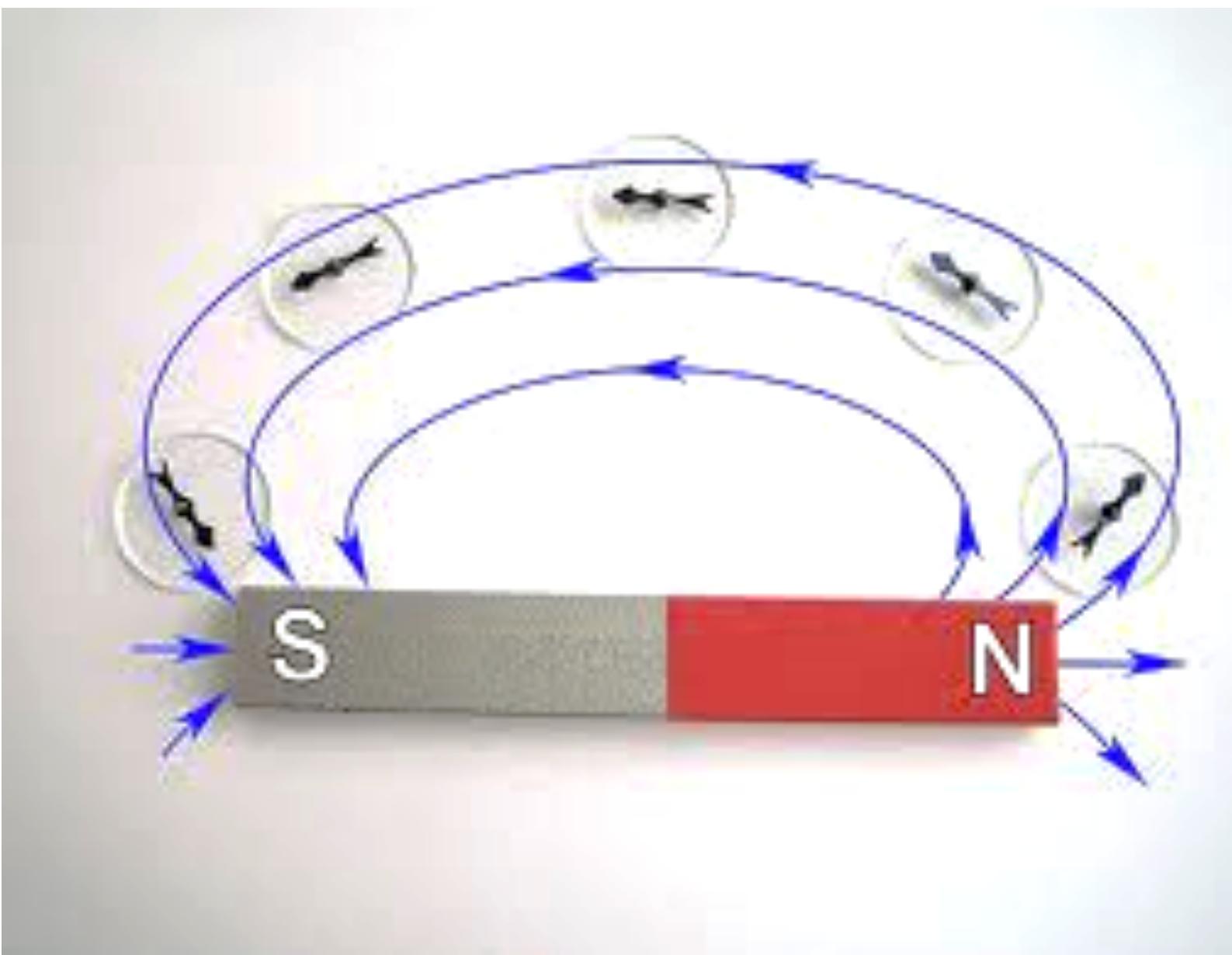
Attraction/repulsion => force, but how does magnets exert force on each other?

**Magnetic field:** Region around the magnet where magnetic materials experience forces



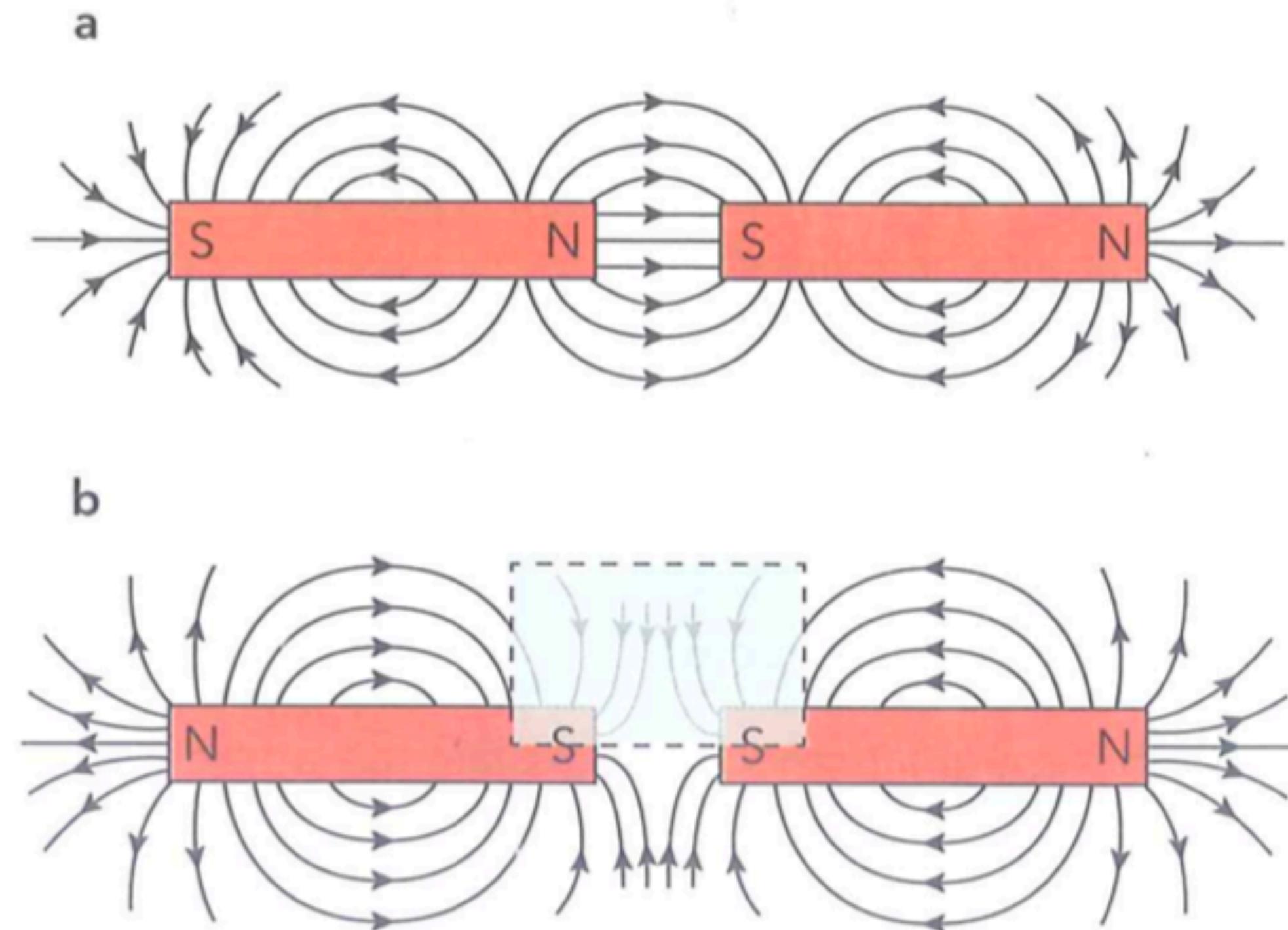
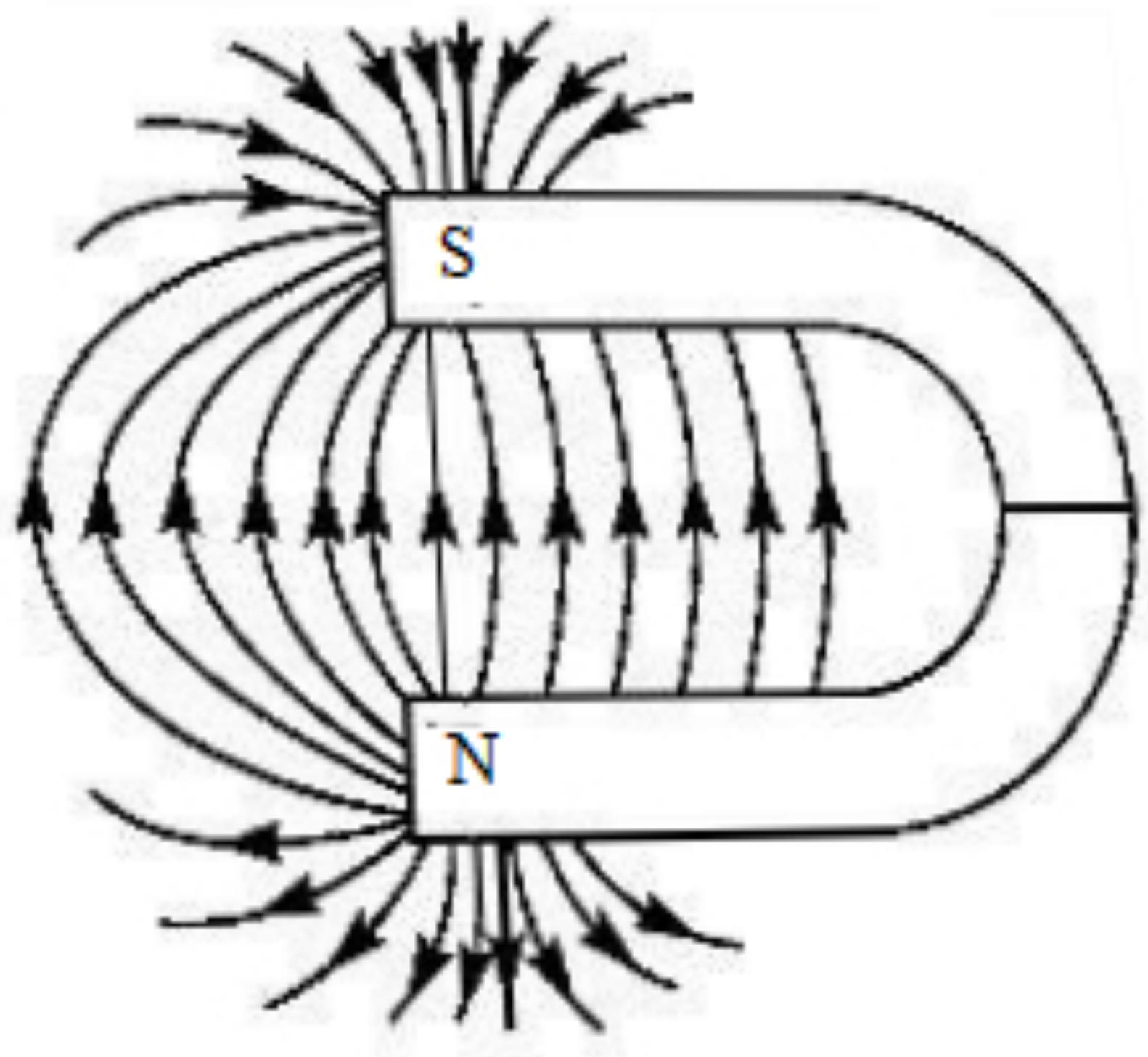
# Magnetic Field Lines

- Magnetic field lines start from N, ends at S (**N → S**)
- Compass (N pole) points to the direction of field lines
- The closer the field lines, the stronger the field



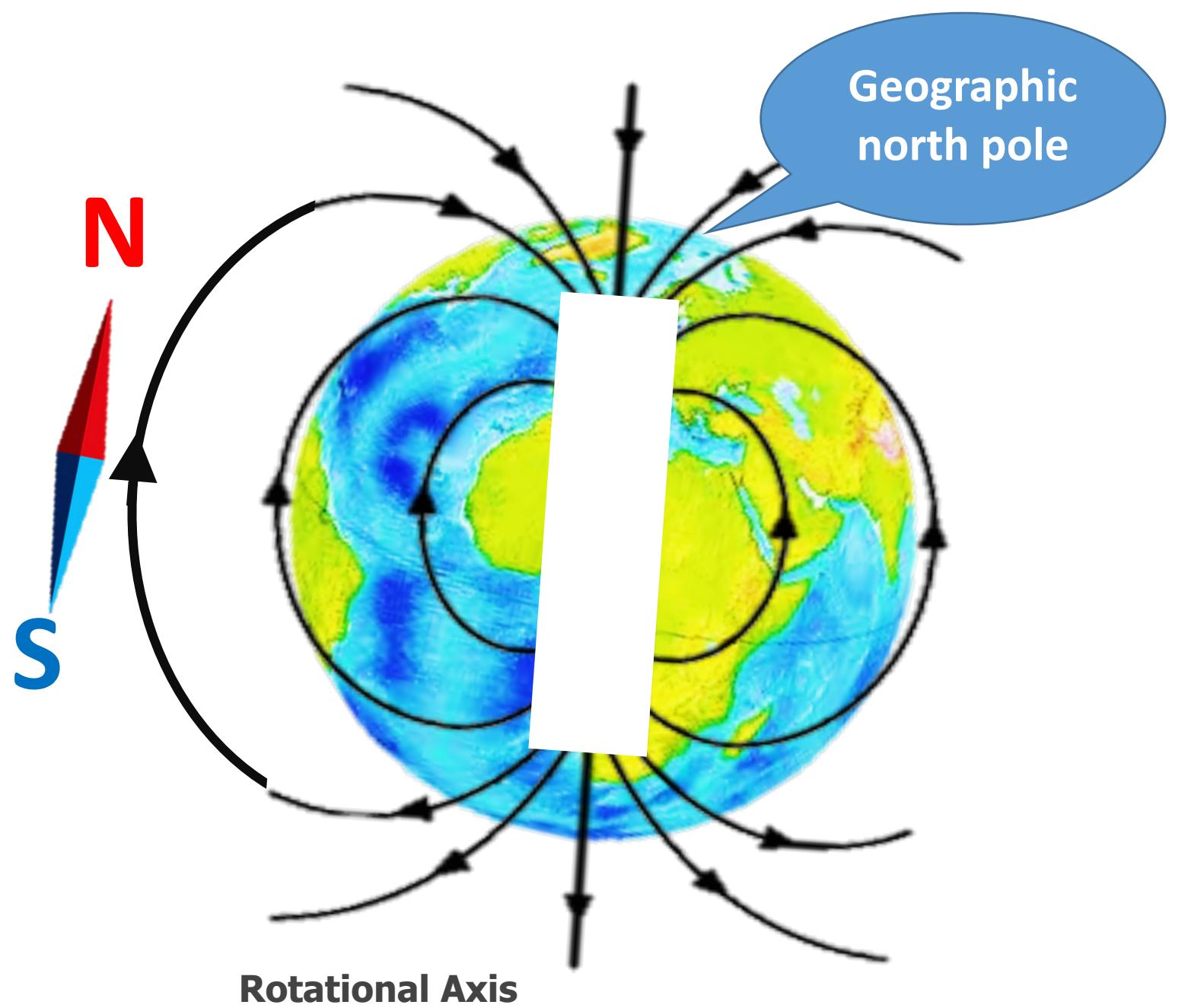
# Magnetic Field Lines

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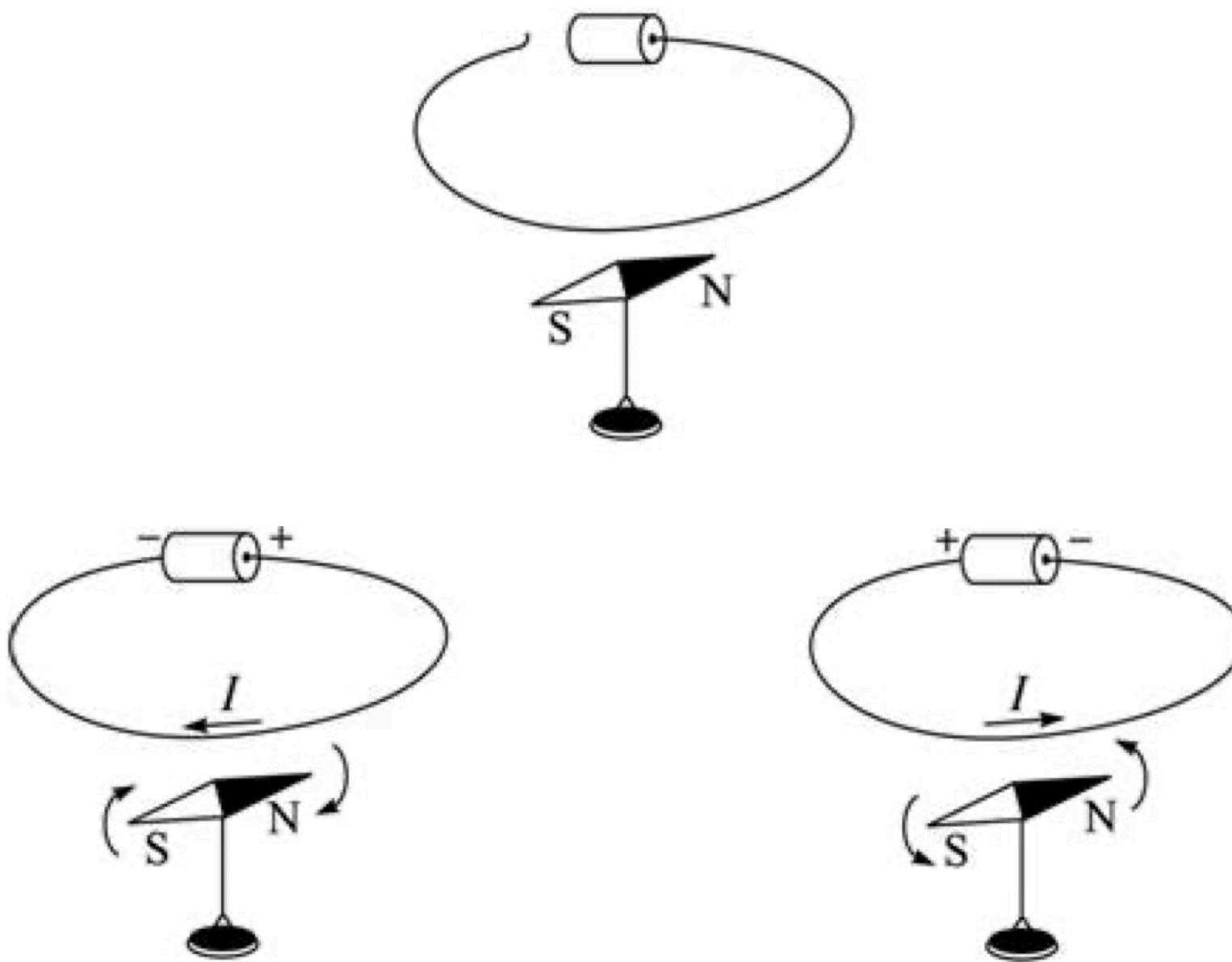


# Magnetic Field Lines

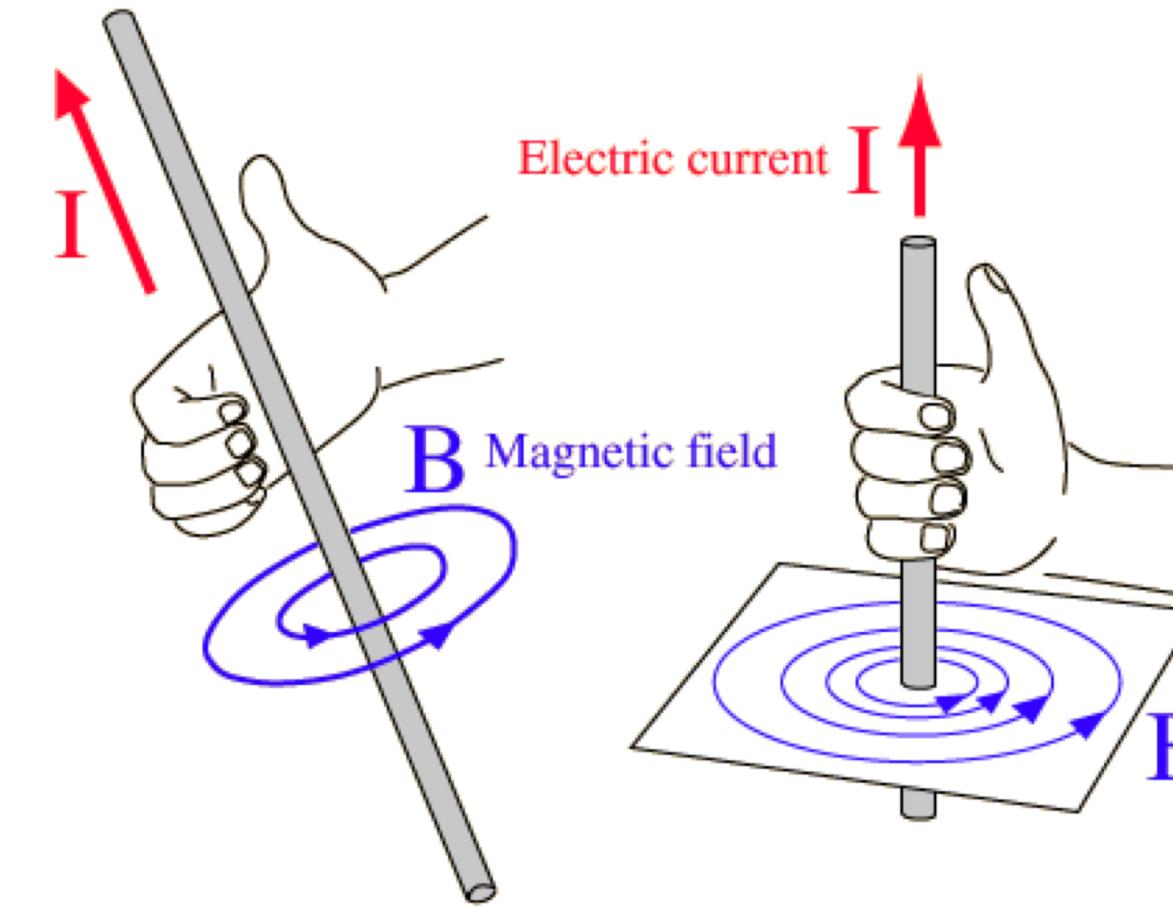
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# Magnetic Field around a Current

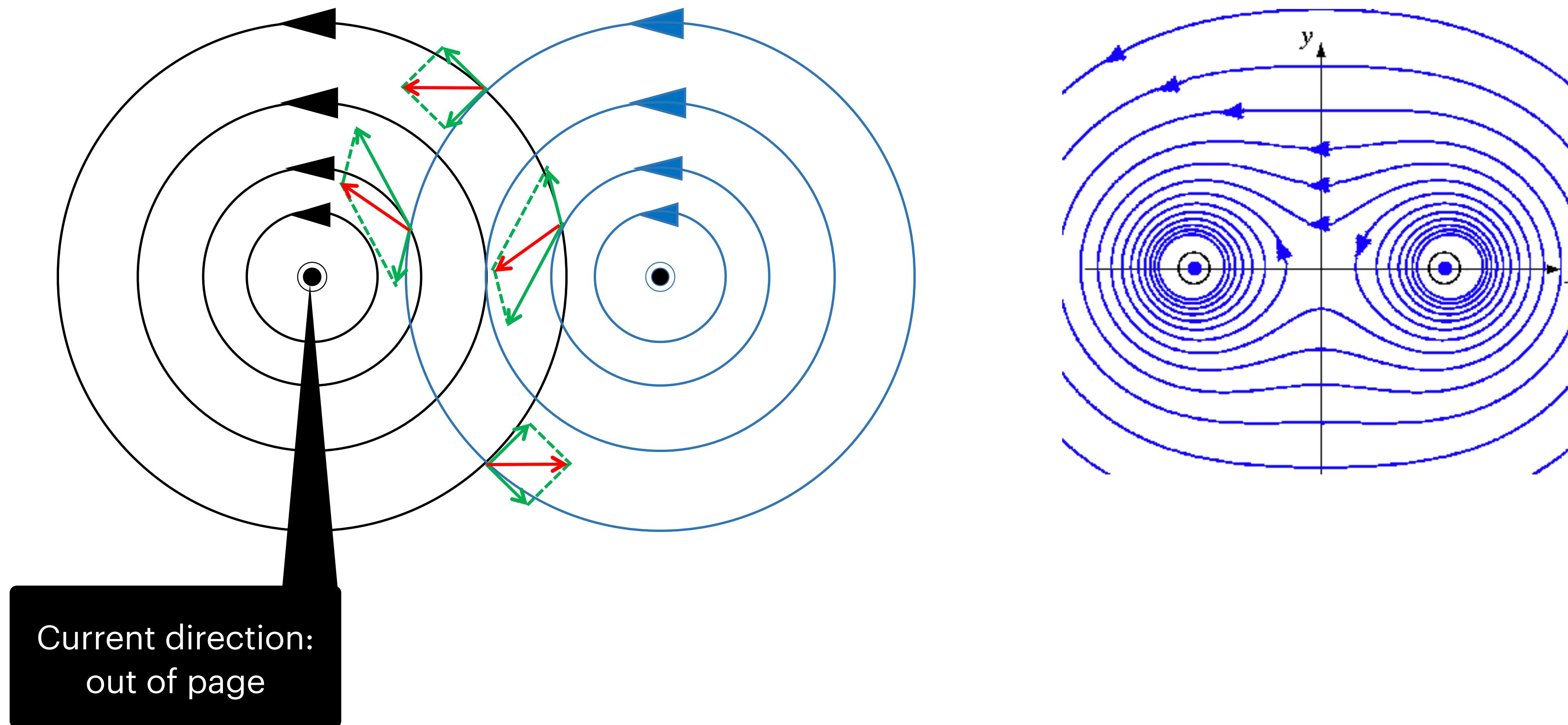


**The Right-hand Grip Rule**

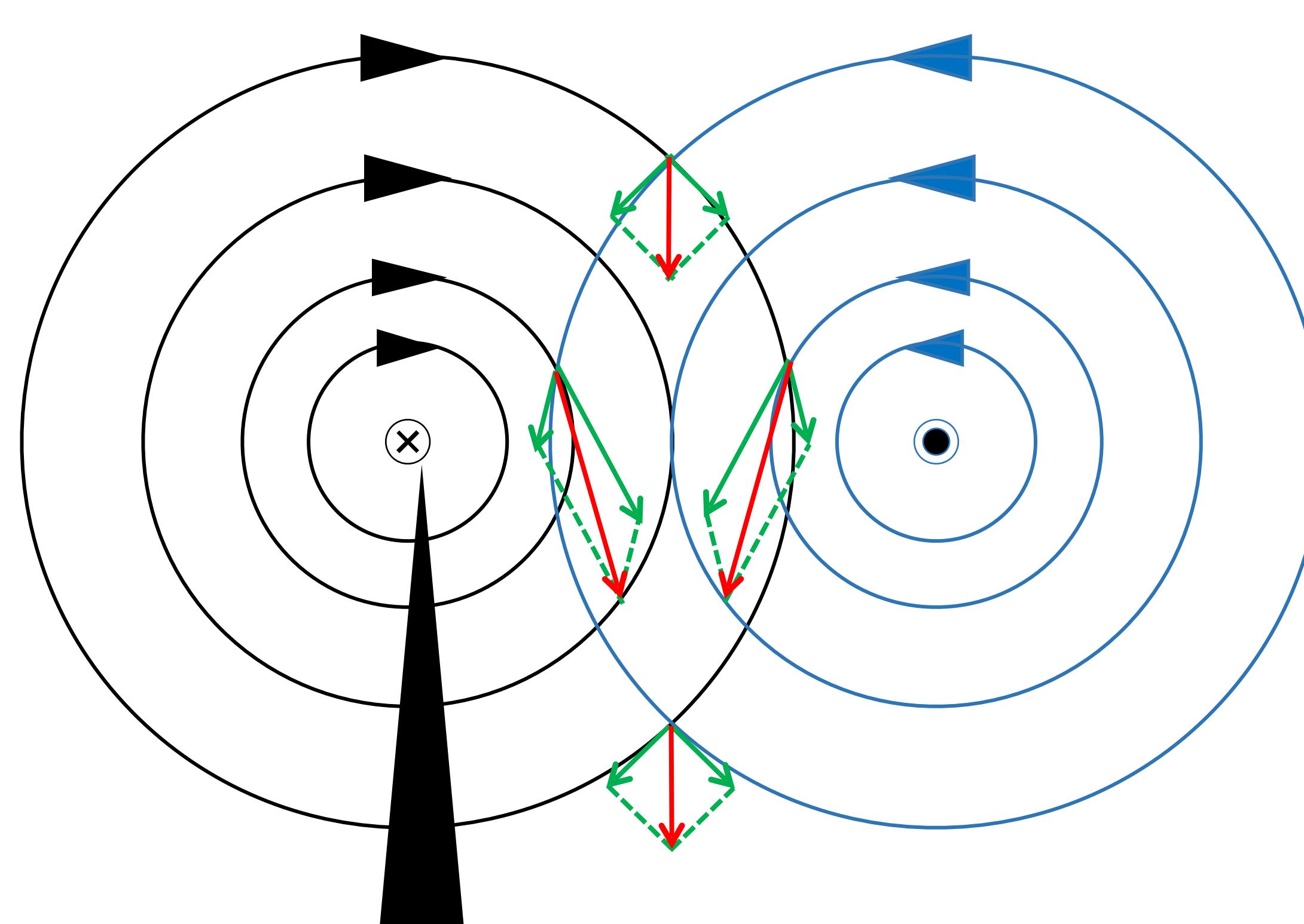


# Magnetic Field around a Current

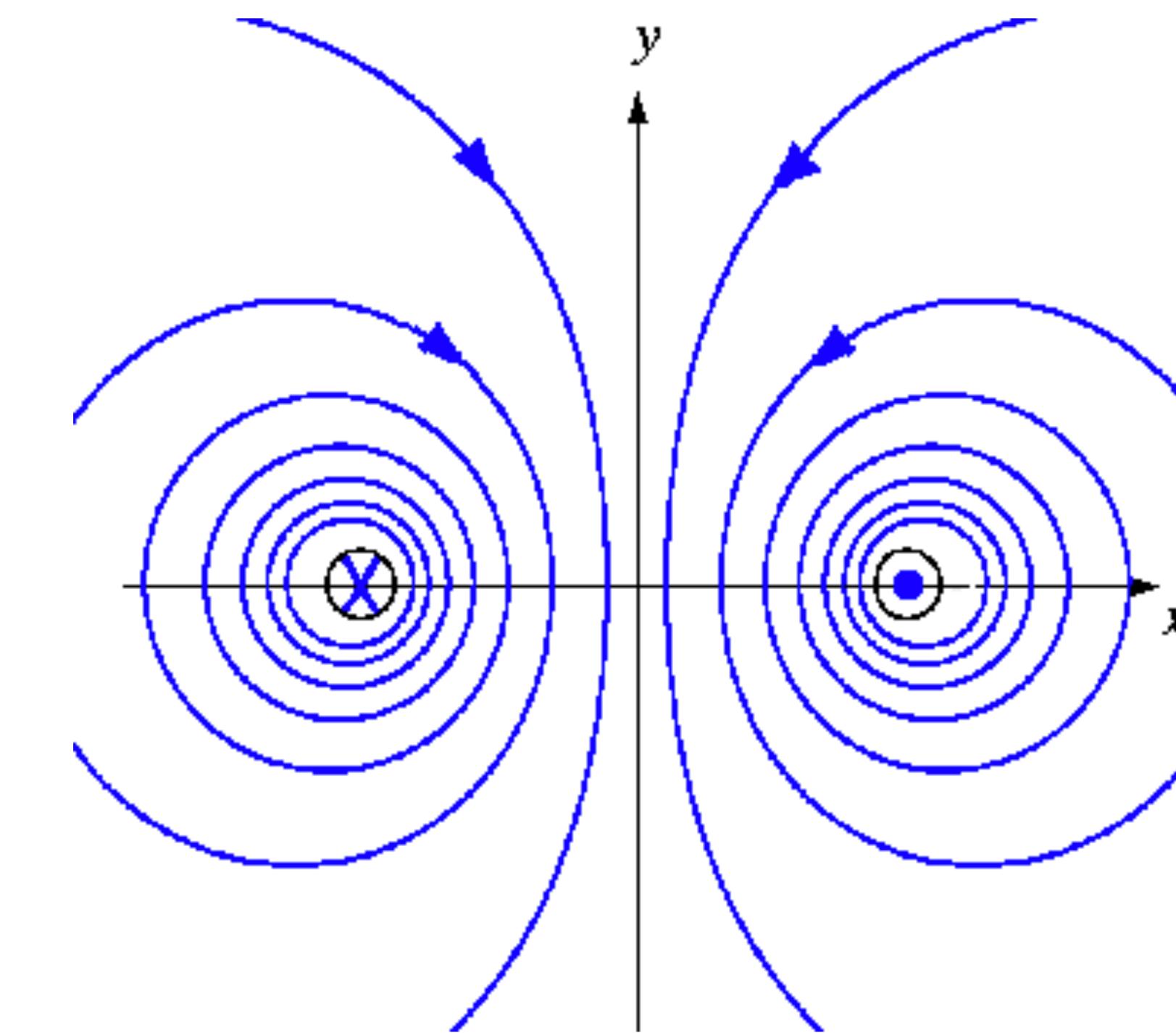
Two metal wire contains same/opposite direction of current, will they attract to each or repel?



# Magnetic Field around a Current

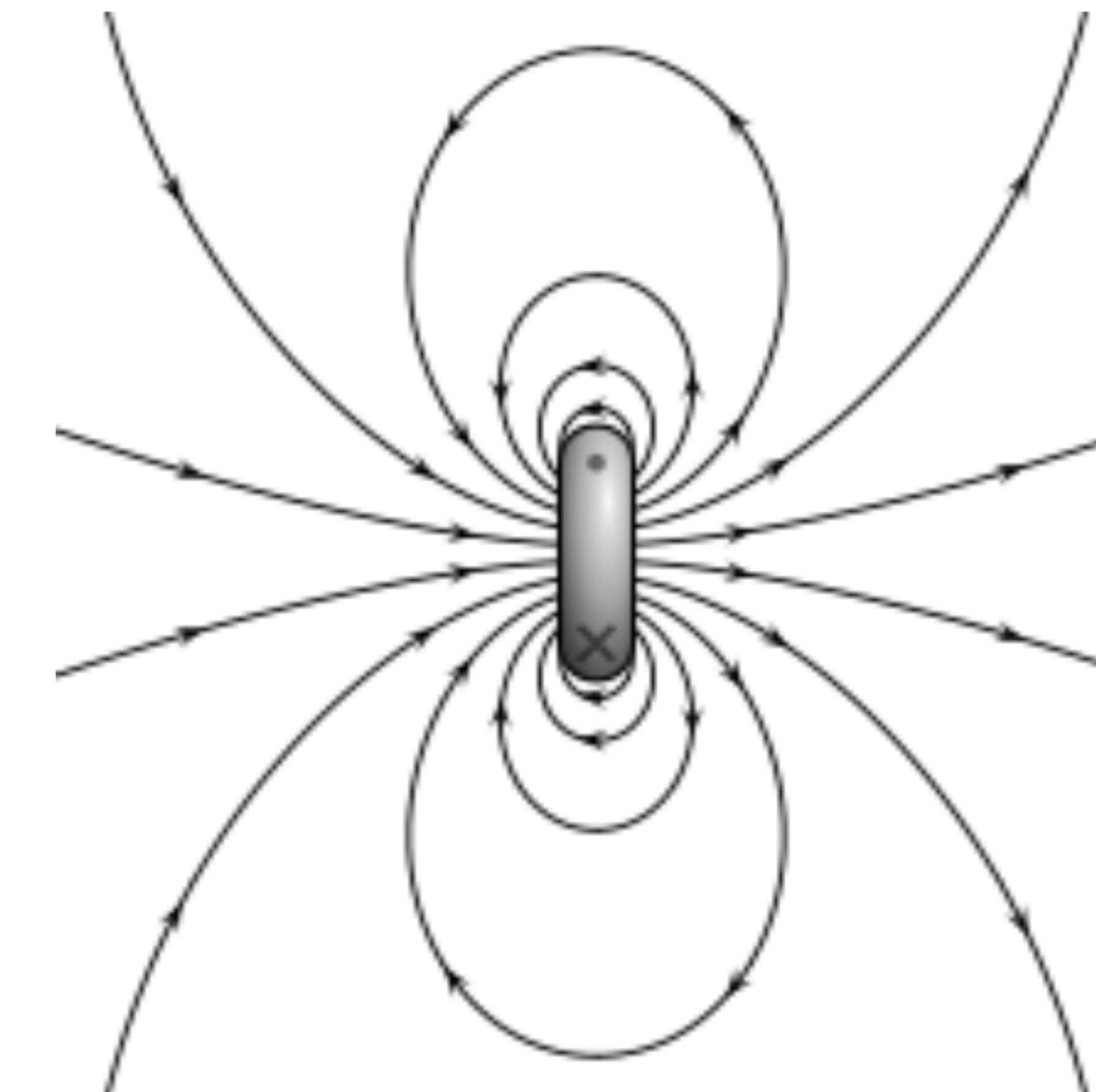
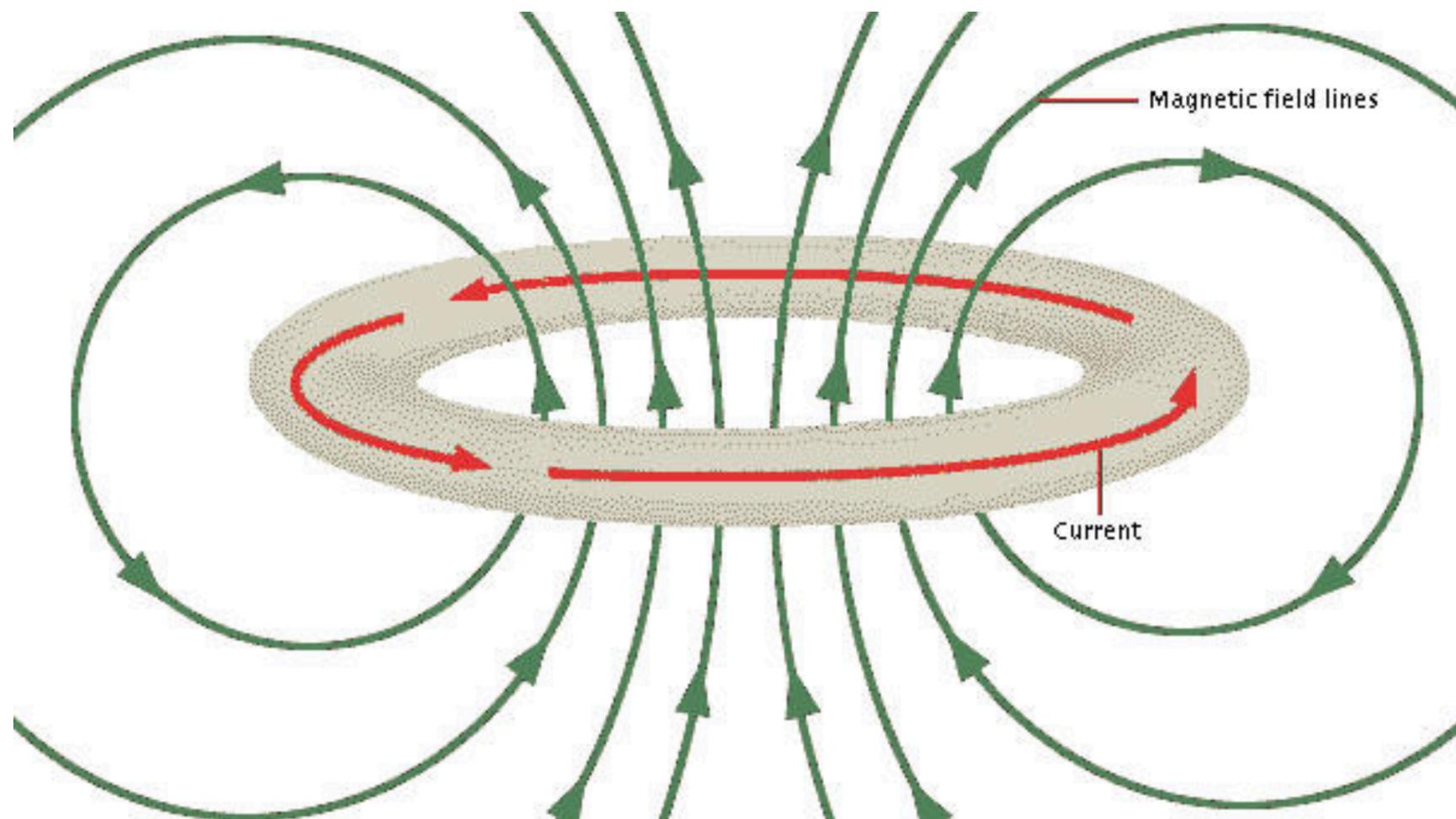


Current direction:  
into page



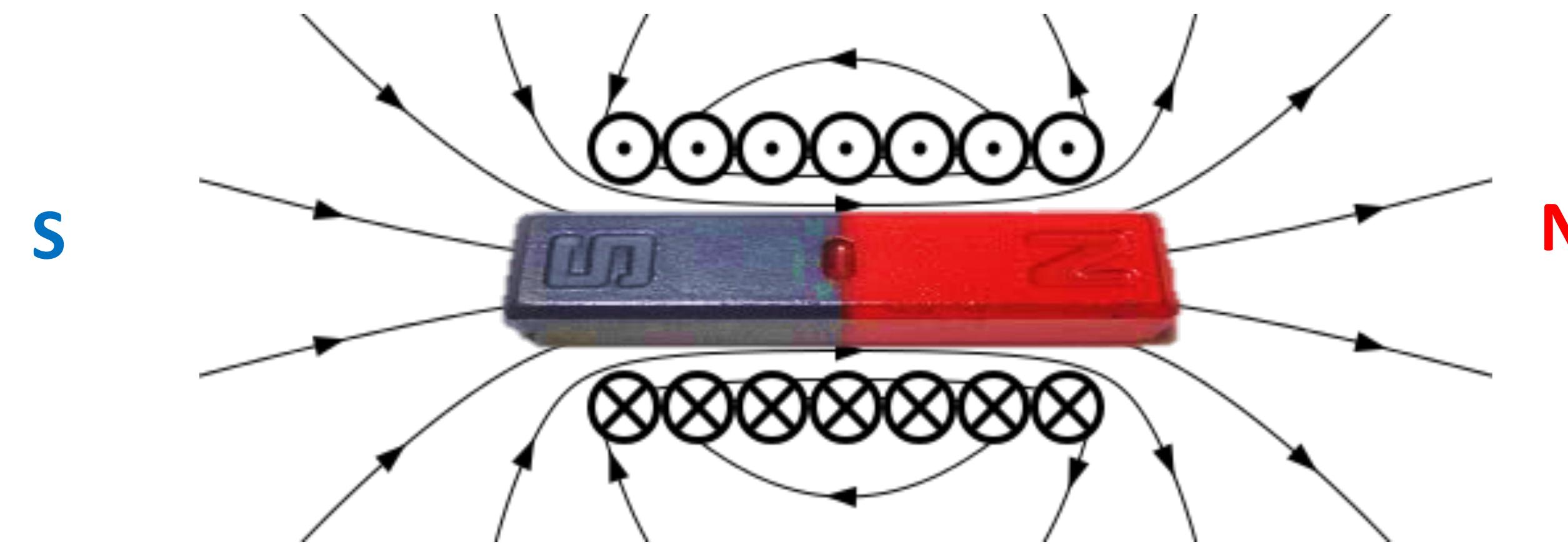
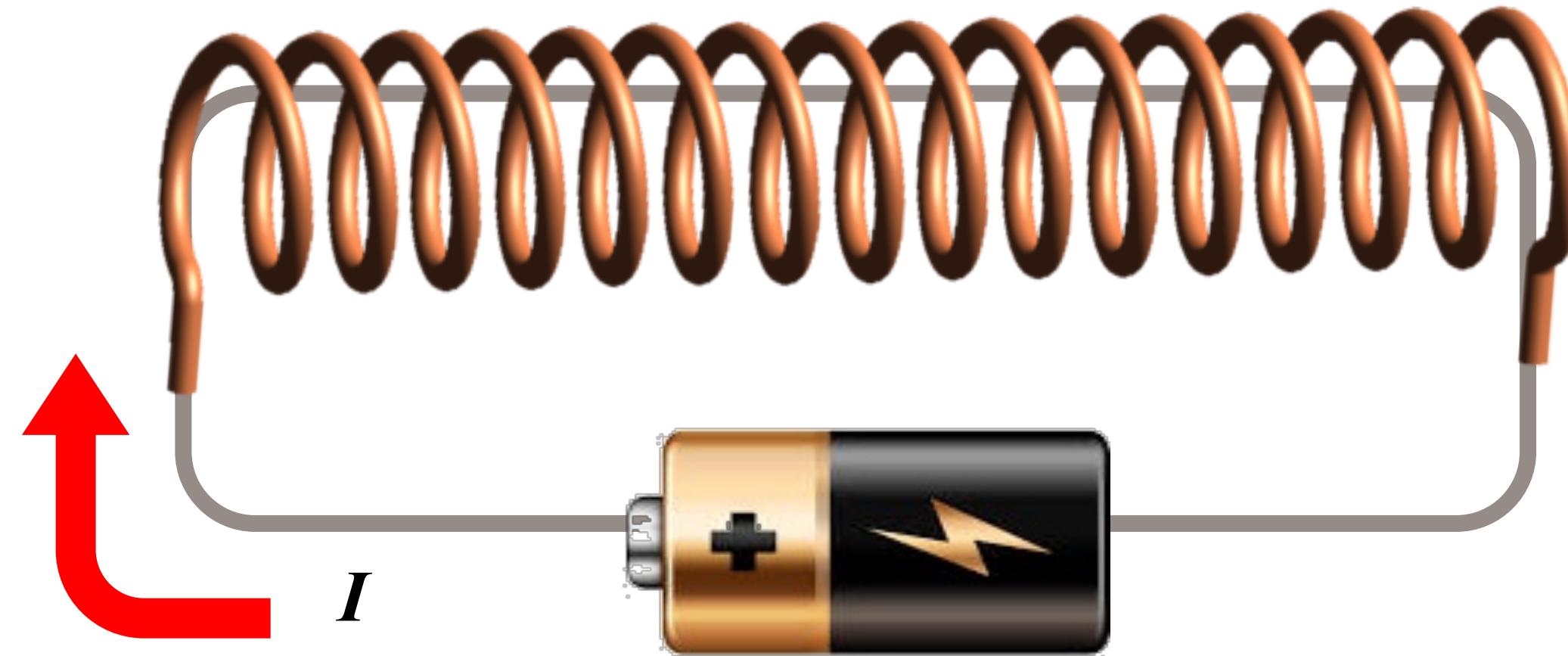
# Magnetic Field around a Current

Can you use what you just learned(magnetic field around a straight current) to determine the magnetic field around a circle current?



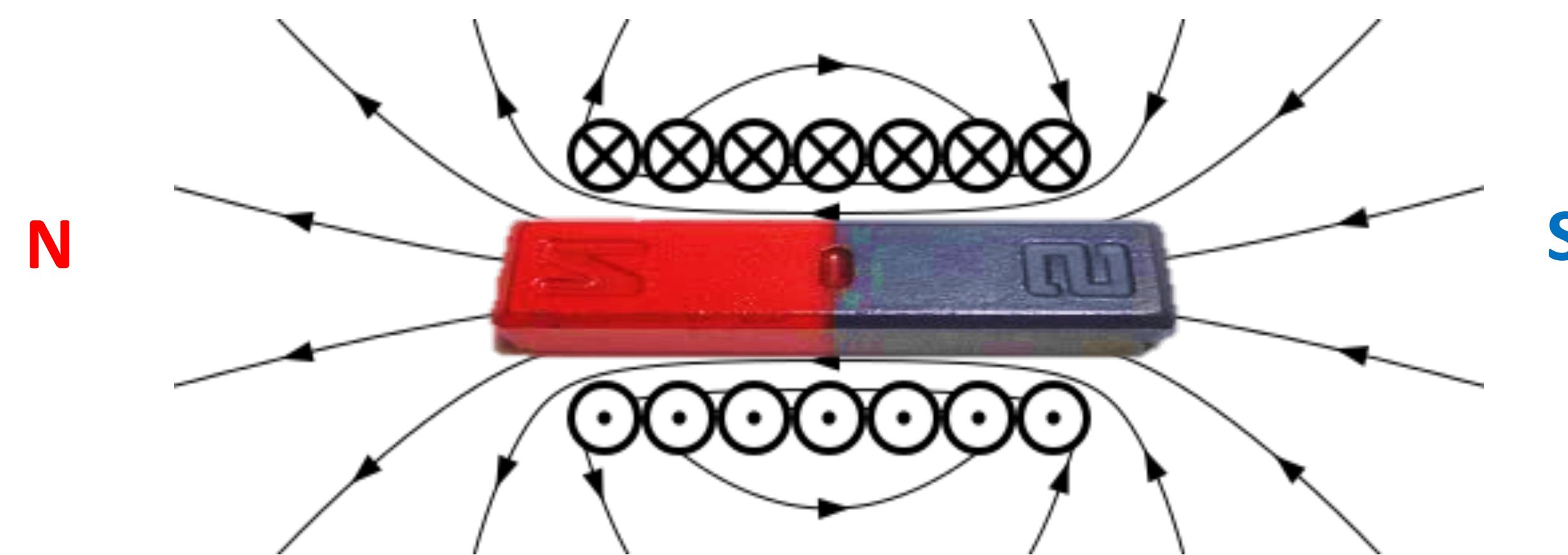
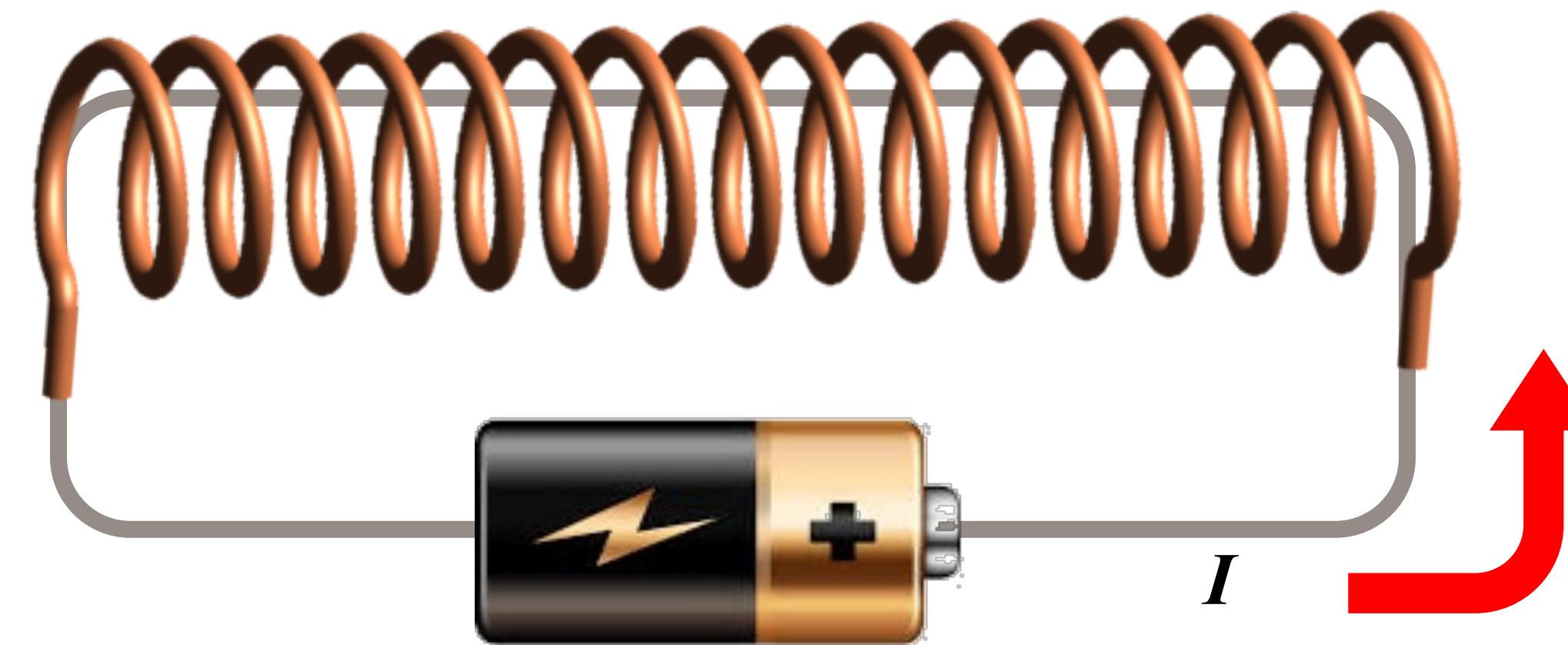
# Electromagnet

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# Electromagnet

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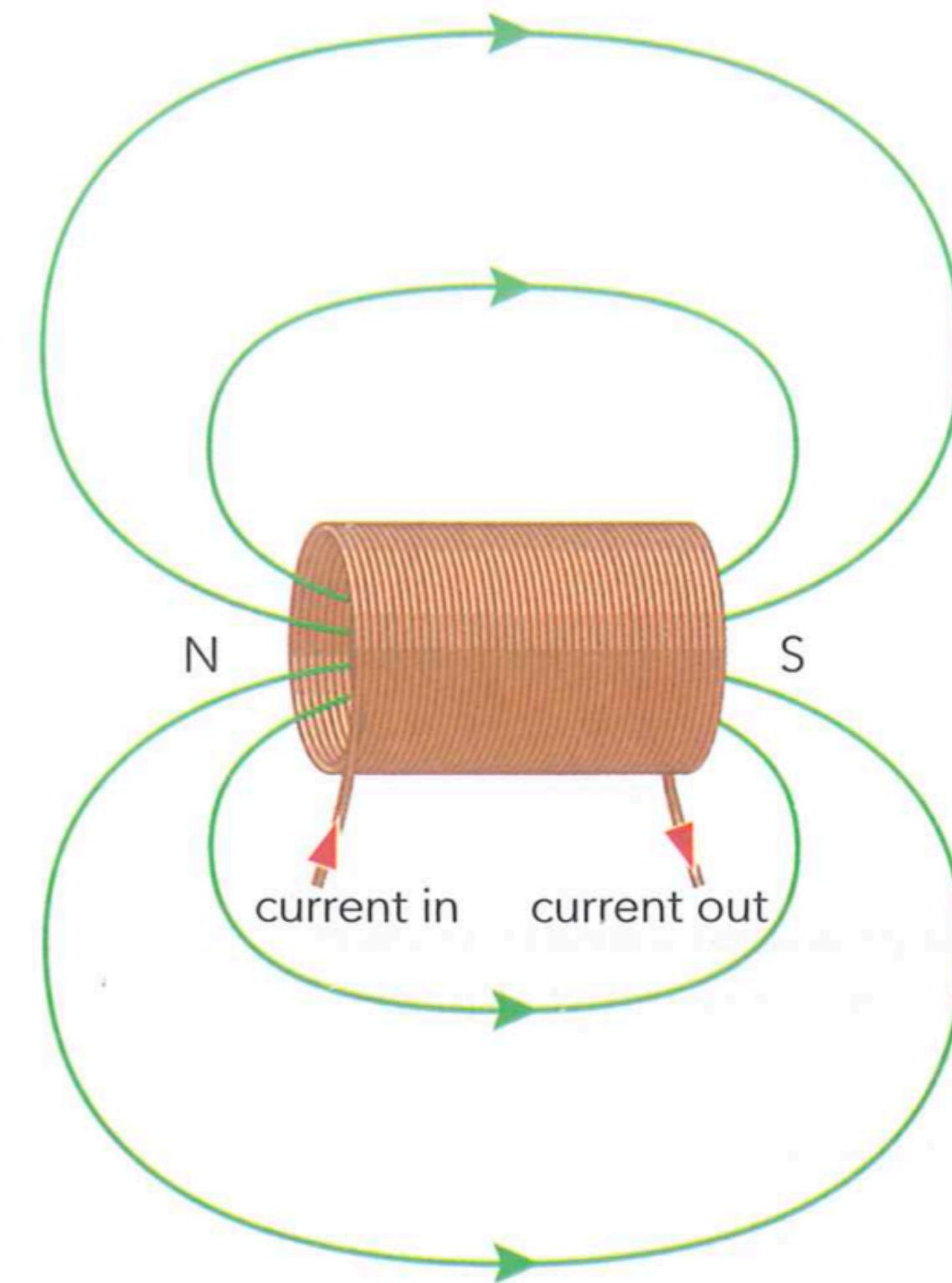


# Electromagnet

Ways to increase the strength of the magnetic field in a solenoid:

1. Increase the current
2. Increase the number of turns on the coil
3. Using a magnetic core

The magnetic field produced by the **current in the coil magnetizes the core** and the strength of the magnetic field is greatly increased.

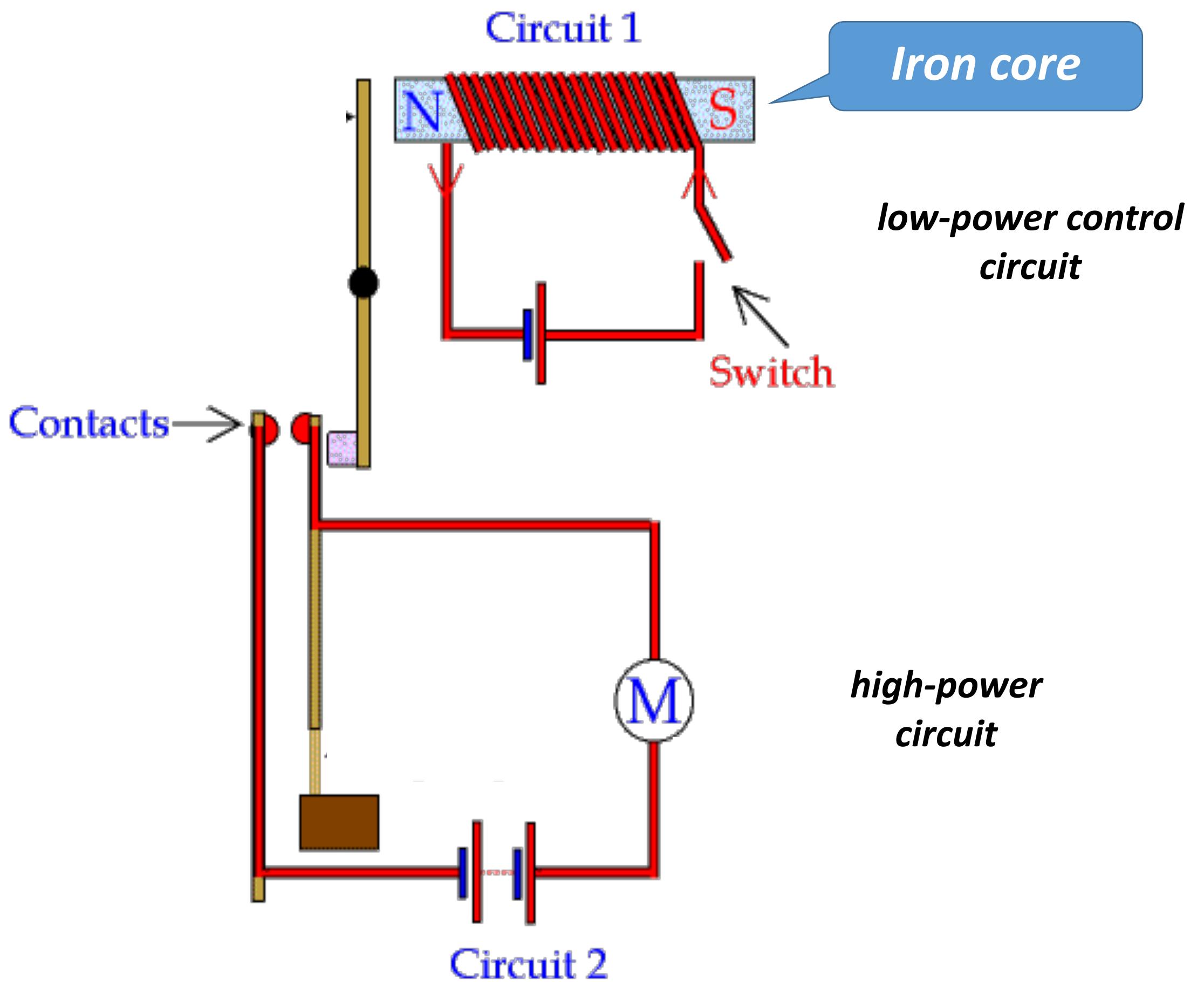
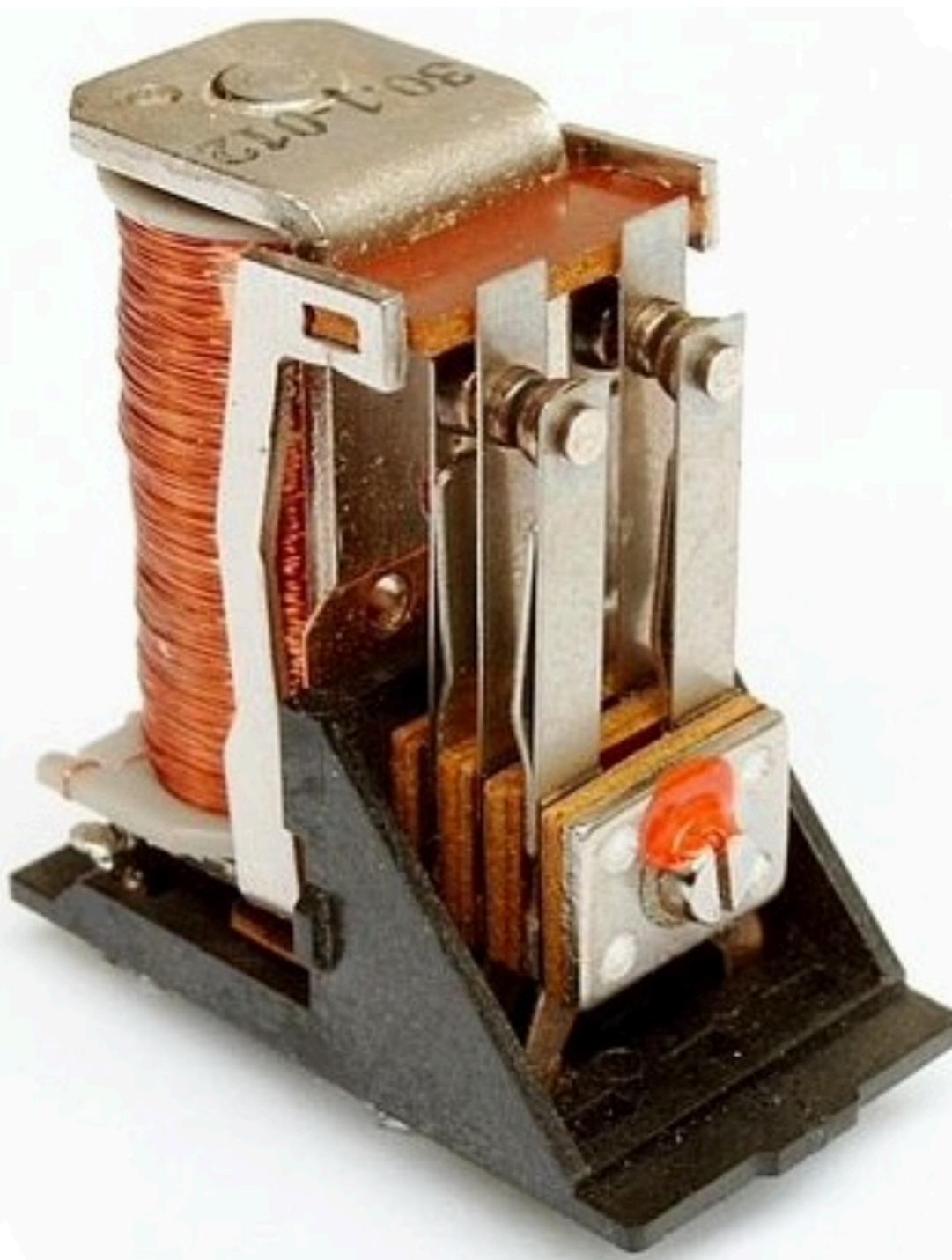


# Applications of Electromagnet

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# Applications of Electromagnet



# Applications of Electromagnet

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