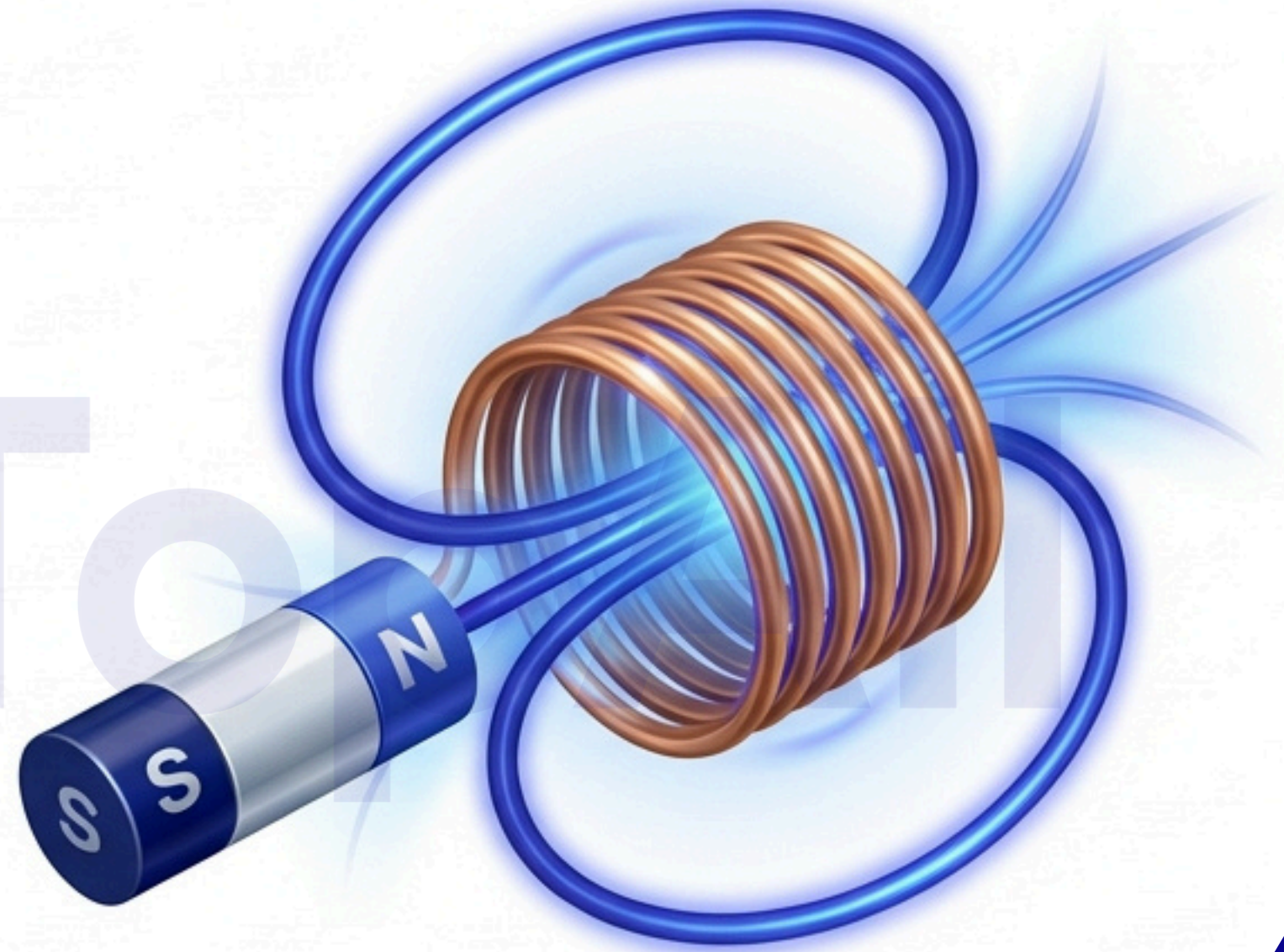


The Experiments of Faraday and Henry

Discovering the origins of Electromagnetic Induction.

How simple experiments with coils and magnets answered a massive question: **Can magnetism create electricity?**

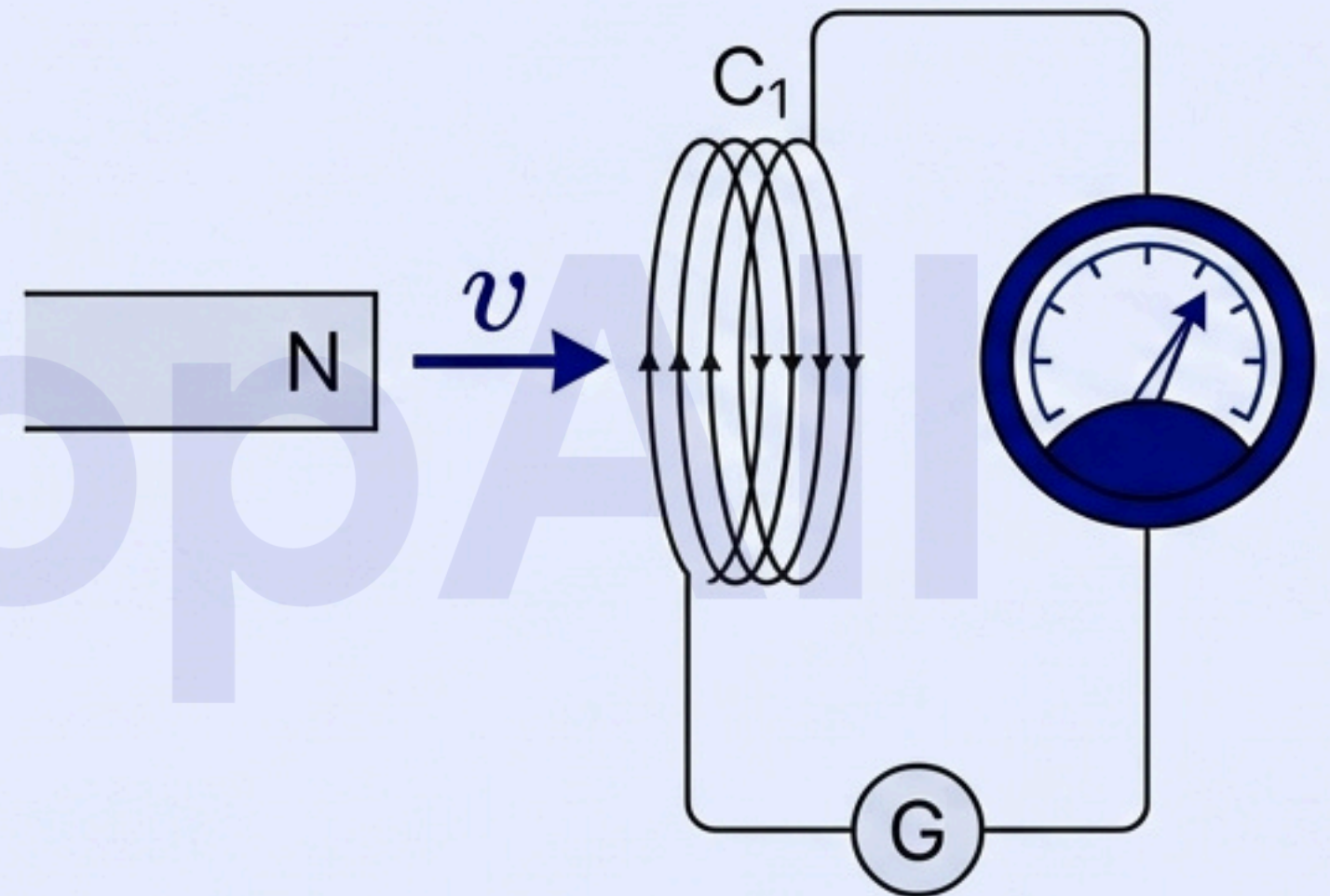


EXPERIMENT 6.1

Motion Creates Current

- When the North pole of a magnet is pushed toward coil C1, the galvanometer (G) deflects.
- This indicates a temporary electric current is induced in the coil.
- Pulling the magnet away causes deflection in the opposite direction.

EXAM TIP: Reversing the magnet's poles (using South instead of North) reverses all deflection directions!



Decoding the Galvanometer: Relative Motion is the Trigger

Moving In



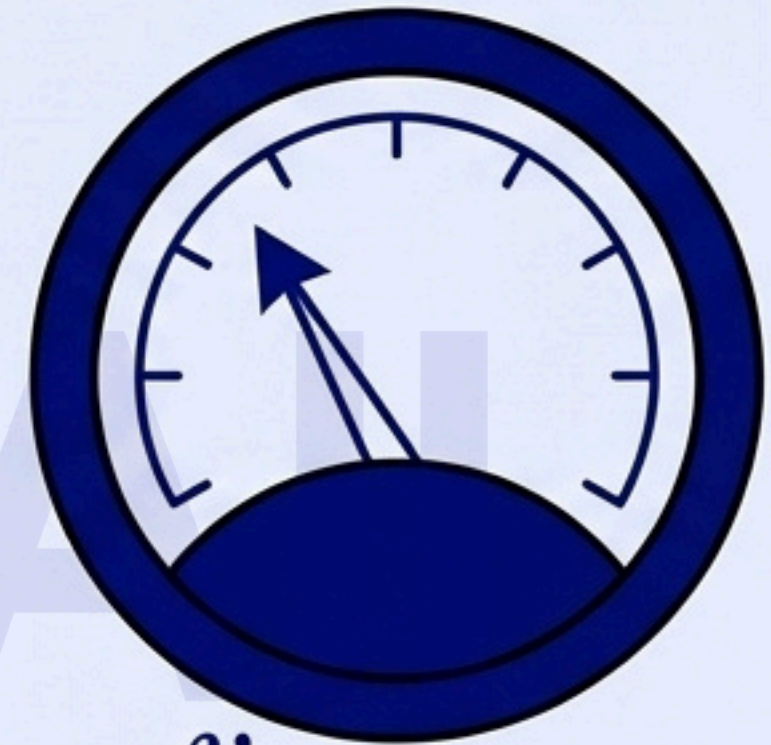
Motion towards coil =
Current induced.

Stationary



Magnet held still =
NO current.

Moving Out



Motion away from coil
= Opposite current.

Note: Moving the coil instead of the magnet produces the exact same effects. Faster motion yields a larger deflection.



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$$E=mc^2$$



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Key Highlights

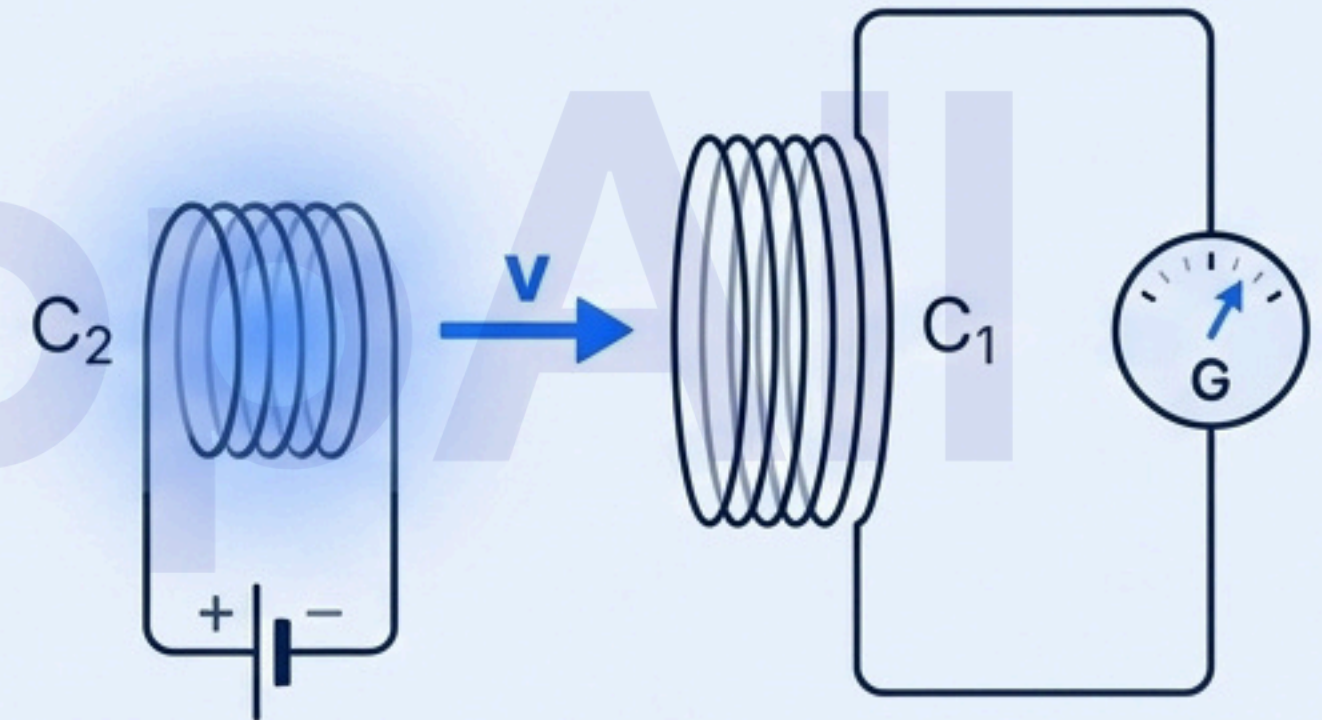
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EXPERIMENT 6.2

Coil-to-Coil Induction

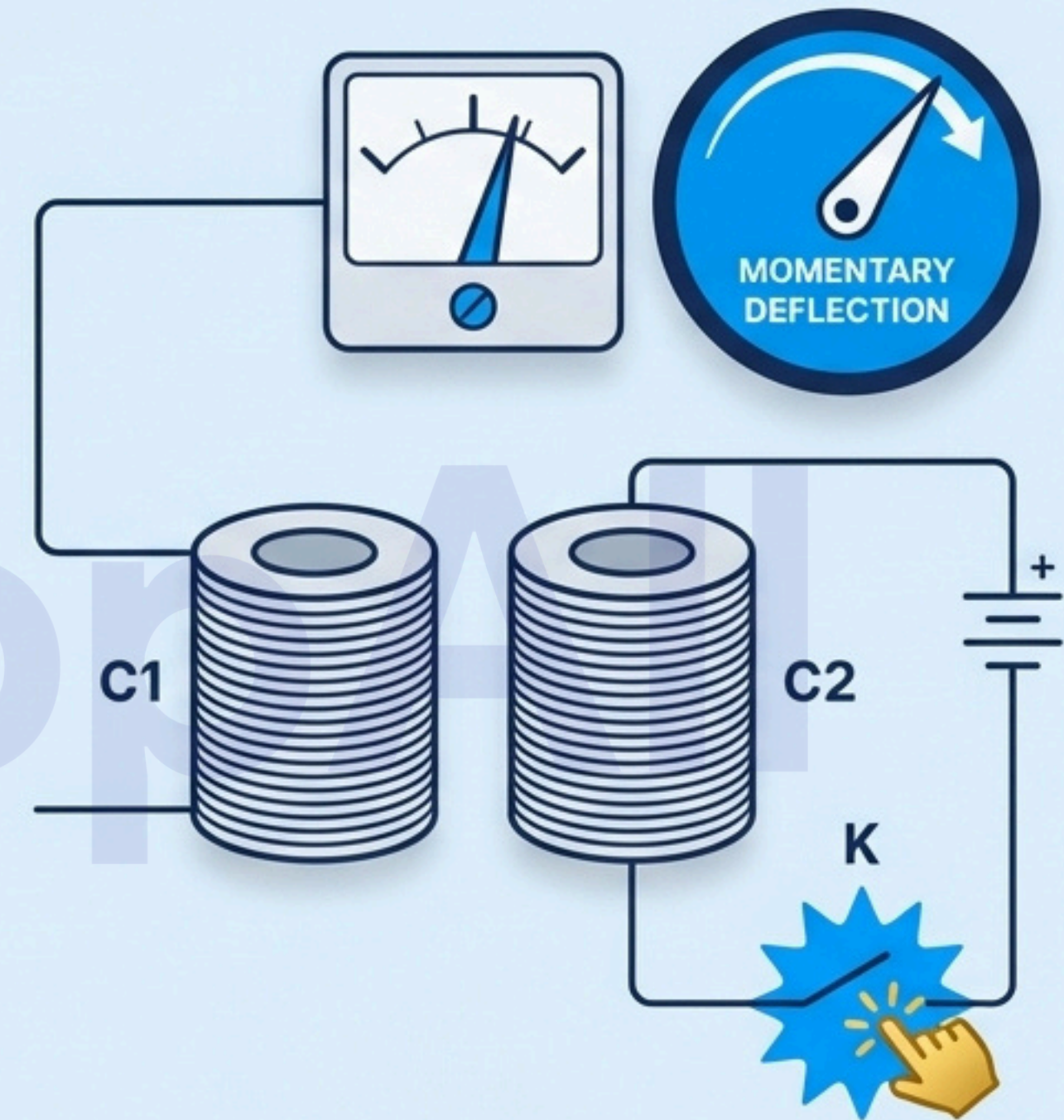
- The bar magnet is replaced by a second coil (C2) connected to a battery.
- C2 produces a steady magnetic field, acting just like a magnet.
- Moving C2 towards or away from C1 induces a current in C1.
- Just like before, holding both coils stationary results in zero deflection.



EXPERIMENT 6.3

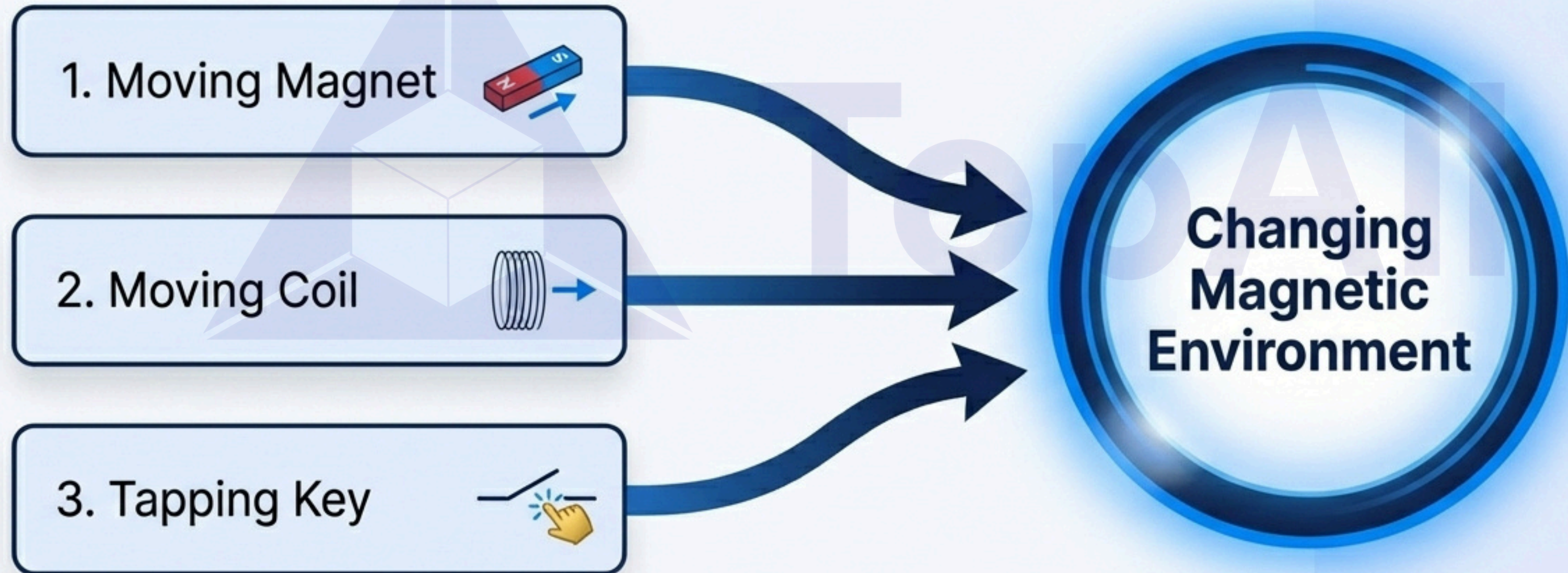
The Tapping Key Effect (No Motion Required)

- Both coils are held perfectly stationary next to each other.
- **Pressing key K:** Momentary deflection in galvanometer (as current rises from zero to max).
- **Holding key K:** No deflection (current is steady).
- **Releasing key K:** Momentary deflection in the opposite direction (as current drops to zero).



The Unifying Principle: What do these have in common?

Physical relative motion is not an absolute requirement for induction. The time rate of change of the magnetic field through the closed coil is what induces the current.



Key Takeaways: Electromagnetic Induction

- ✓ **Induction requires change:** A perfectly steady magnetic field will never induce a current in a stationary coil.
- ✓ **Relative motion works:** Moving a magnet or a current-carrying coil near a closed loop induces a temporary current.
- ✓ **Varying current works:** Switching a nearby current on or off changes the magnetic field, also inducing a temporary current.

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