

## Electromagnetic Induction

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## Currents Create Magnetic Fields

- 1820 Hans Christian Oersted found that magnetism was produced by current-carrying wires.

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1832

## Electromagnetic Induction

- When a magnet is plunged into the coil, voltage is induced in the coil and charges in the coil are set in motion.

Joseph Henry

Michael Faraday

Voltage is induced in the wire loop either when the magnetic field moves past the wire or the wire moves through the magnetic field.

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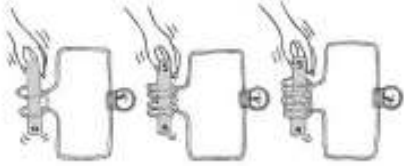
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## More Loops - More Voltage



- more difficult to push the magnet into a coil with more loops because the magnetic field of each current loop resists the motion of the magnet.

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## Faraday's Law

- The induced voltage in a coil is proportional to the product of
- the number of loops
- and the rate at which the magnetic field changes within those loops.

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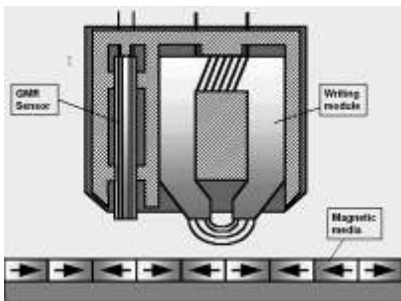
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## Magnetic Media

- Computer Hard Drive



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## Faraday's Law the Flip Side



- A magnetic field is created in any region of space in which an electric field is changing with time.
- The magnitude of the induced magnetic field is proportional to the rate at which the electric field changes.
- The direction of the induced magnetic field is at right angles to the changing electric field.

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## Let there be light ...

- An electric field is created in any region of space in which a magnetic field is changing with time.
- A magnetic field is created in any region of space in which an electric field is changing with time.
- Voila... electromagnetic waves

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