

PhET Tips for Teachers Faraday's Electromagnetic Lab

Tips for controls:

- Try these related, simpler sims: [Magnet and Compass](#), [Magnets and Electromagnets](#), [Generator](#), and [Faraday's Law](#)

Important modeling notes / simplifications:

- The flow of electrons is shown. The flow of current is opposite to the direction of the flow of electrons. "Current" is defined as the flow of (imaginary) positive charges. We chose not to complicate the sim by showing both.
- To understand the direction of field in magnet: Electric current is moving charge. Magnetic fields are created by electric currents. The current creating the magnetic field could be the current in a wire or it could be the current created by the motion of electrons in atoms. In a permanent magnet, the electron currents in the atoms are aligned so that the net effect of all the microscopic electron currents is to make a macroscopic current which is just like the current in a solenoid. So you should think of a bar magnet as a bar-shaped solenoid of current. The magnetic field of a bar magnet is exactly the same as the magnetic field of a solenoid since the currents are the same.

Insights into student use / thinking:

- Students may have difficulty understanding and applying the right hand rule to understand the direction of induced current. The modeling notes above may be helpful.
- Students may have difficulty understanding why the field direction inside the magnet is toward the north end. Again, the modeling notes above may be helpful.

Suggestions for sim use:

- For tips on using PhET sims with your students see: [Guidelines for Inquiry Contributions](#) and [Using PhET Sims](#)
- The simulations have been used successfully with homework, lectures, in-class activities, or lab activities. Use them for introduction to concepts, learning new concepts, reinforcement of concepts, as visual aids for interactive demonstrations, or with in-class clicker questions. To read more, see [Teaching Physics using PhET Simulations](#)
- For activities and lesson plans written by the PhET team and other teachers, see: [Teacher Ideas & Activities](#)