Faraday's Law (Creating current with magnets)

TOPICS AND FILES

E&M Topic

Electromagnetic induction; Faraday's Law

DataStudio File

79 Induction - Magnet.ds

EQUIPMENT LIST

Qty	Items	Part Numbers
1	PASCO Interface (for one sensor)	
1	Voltage Sensor	CI-6503
1	AC/DC Electronics Lab	EM-8656
1	Bar Magnet, Alnico	EM-8620
1	Pad (for stopping the bar magnet when it falls)	

INTRODUCTION

The purpose of this activity is to measure the potential difference induced in a coil of wire by a bar magnet dropping through the center of the coil. Use the voltage sensor to measure the induced potential. Use *DataStudio* to record and display the data.

BACKGROUND

When electricity is passed through a conducting wire, a magnetic field can be detected near the wire. Micheal Faraday was one of the first scientists to reverse the process. The essence of his work is decribed in the following statement.

A changing magntic field in the presence of a conductor induces a voltage in the conductor.

When a magnet is passed through a coil there is a changing magnetic flux through the coil that induces an electromotive force (EMF) in the coil. According to Faraday's Law of Induction:

$$\epsilon = -N\frac{\Delta\phi}{\Delta t} \tag{1}$$

where ϵ is the induced EMF, N is the number of turns of wire in the coil, and $\frac{\Delta\phi}{\Delta t}$ is the rate of change of the flux through the coil.

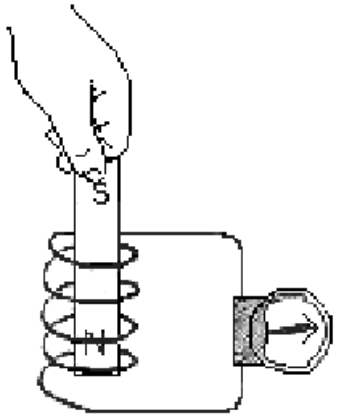

Figure 1

In this activity, a plot of the EMF versus time is made and the area under the curve is found by integration. This area represents the flux since the following is true.

$$\epsilon \Delta t = -N \Delta \phi \tag{2}$$

CAUTION: Note: During this experiment, keep the magnet away from the computer and from computer disks.

