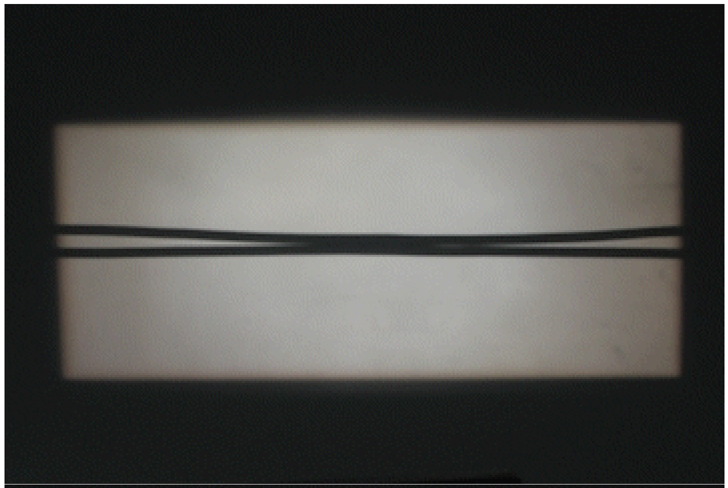
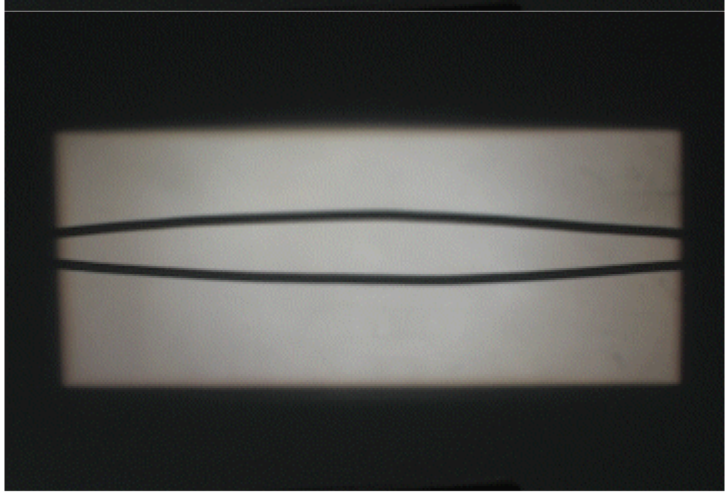
Answer #295

Part I: The answer is (a): when the currents are in the same direction, the wires will move together, as seen in an mpeg video by clicking your mouse on the photograph at the left below.





Part II: The answer is (b): when the currents are moving in the opposite direction, the wires will move apart, as seen in an mpeg video by clicking your mouse on the photograph at the right above.

This answer can be explained by using the two right hand rules for the magnetic field created by an electric current and the force on a charge moving in a magnetic field:

Suppose that the currents are both moving from left to right. Using the the right hand rule, the magnetic field created by the upper wire in the photograph due to that left-to-right current will be into the paper at the location of the lower wire. (If the thumb of your right hand points in the direction of the positive current, your curved fingers will point in the direction of the magnetic field around the wire.) The **V**x**B** (Lorentz) force on the second wire will then be in the plane of the paper directed toward the first current. Using the right hand rule for the force on a current in a magnetic field, we see that the force on the lower wire in the photograph is directed toward the upper wire. (Curl the fingers of your right hand from the direction of the positive current (through the smaller angle) to the direction of the magnetic field, and your thumb will point in the direction of the **V**x**B** force vector.

Using this argument you can also see that the force on the upper wire is directed in the plane of the wires toward the lower wire.

This argument can be repeated in the case of antiparallel currents to show that the force will *separate* the wires rather than pulling them together.

Click here for alternative versions of left hand rule for the force on a charge moving in a magnetic field and the right hand rule for the magnetic field produced by an electric current.

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Question of the Week

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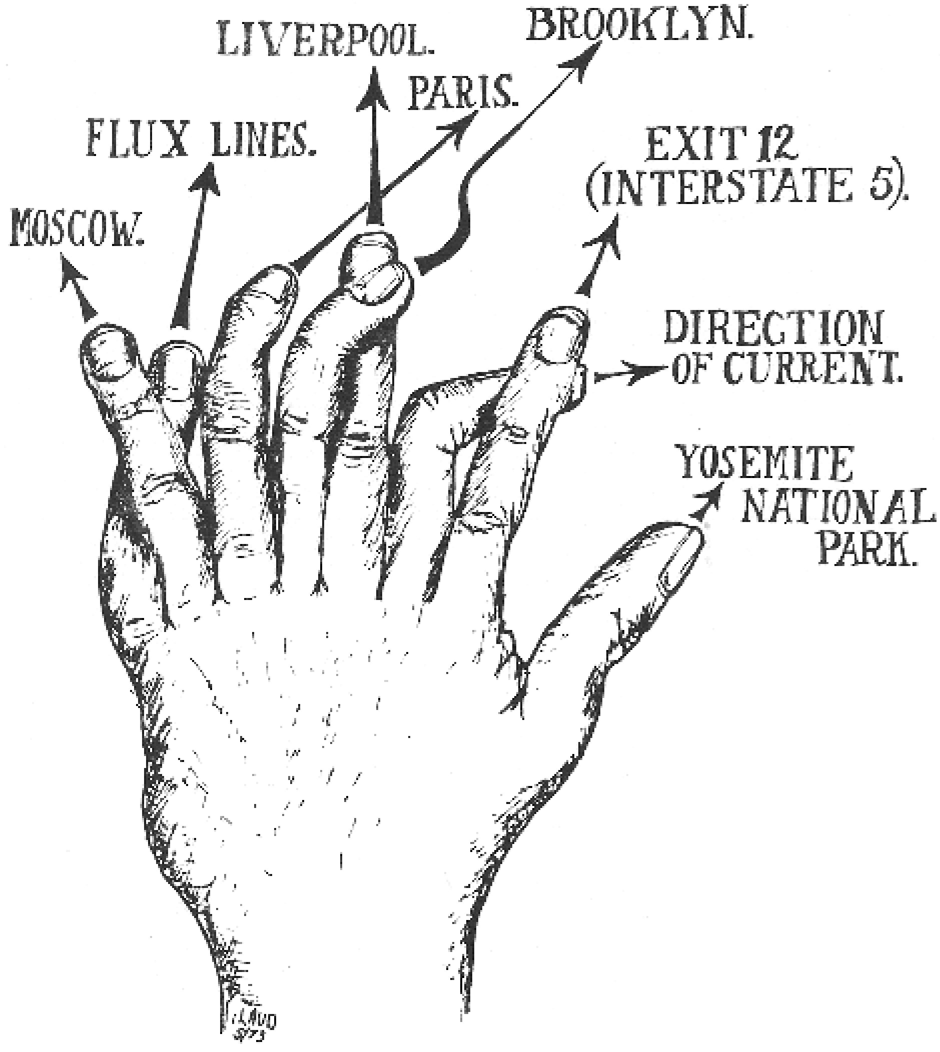
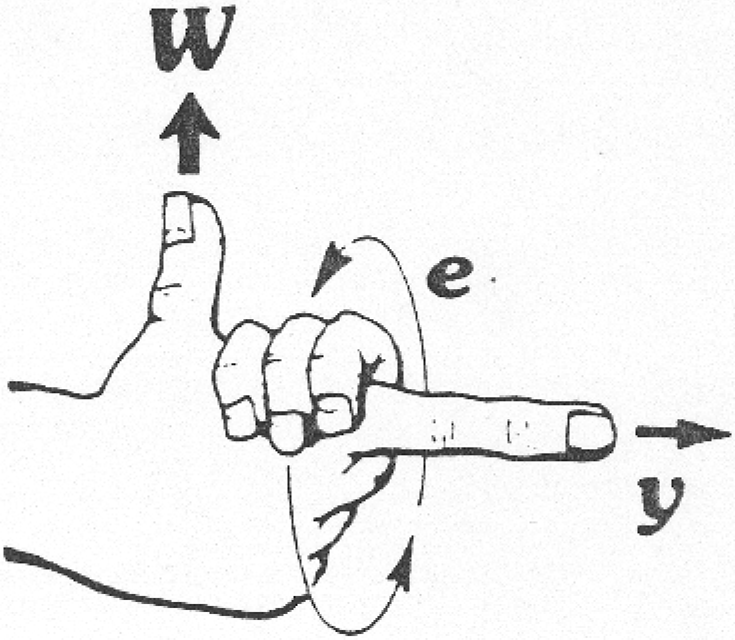
For questions and comments regarding the *Question of the Week* contact
Dr. Richard E. Berg by e-mail or using phone number or regular mail address
given on the Lecture-Demonstration Home Page.

THE LEFT-HAND RULE.





FLEMING'S RIGHT HAND RULE