

# Motor Effect

## Joshua Gutwill

### September 1998

THIS IS NOT A DEFINITIVE FINAL REPORT

FORMATIVE evaluation studies like this one often:

- **are conducted quickly**, which may mean
  - small sample sizes
  - expedited analyses
  - brief reports
  
- **look at an earlier version** of the exhibit/program, which may mean
  - a focus on problems and solutions, rather than successes
  - a change in form or title of the final exhibit/program

# Motor Effect

## Joshua Gutwill

### September 29, 2005

**Goals:** To assess visitors' interest in and understanding of the Motor Effect exhibit.

**Methods:**

- Age  $\geq$  13 years
- Stand 5 feet from exhibit during first 2 questions
- Let visitors refer back to the label during the interview
- Grab the first person who crosses the bridge. If in a group, try to single out one of them.

**Synopsis of Results:**

- Most visitors found the exhibit neutral to appealing both before and after playing with it.
- Most visitors could identify the different components of the exhibit (except for the power supply).
- Very few (21%) visitors could correctly explain what was happening in the exhibit.
- The causality of what's happening (mat turns on current which interacts with B field) seems the most difficult for visitors.
- Several Vs are unsure what is being powered — is it the wire, the magnet, the lightbulb?

**Questions & Results:**

Excuse me, my name is XXX and I work here. I'm trying to find out what Vs think of one of these exhibits so that we can improve it. Would you be willing to talk with me? It'll take about five minutes.

1. It's this exhibit over here. Before you look at it closely, could you tell me just at first glance, how interesting does the exhibit seem to you?

1	2	3	4	5
<b>Uninteresting</b>	<b>Somewhat uninteresting</b>	<b>Neutral</b>	<b>Somewhat interesting</b>	<b>Interesting</b>
2	1	4	5	3
Pre-interview interest level		Mean N=15 3.4		

2. (a) (If Neutral to Interesting:) Can you say what it is about this exhibit that makes it interesting? (or vice versa)
2. (b) Is there anything about it you (don't) find interesting? (or vice versa)

<b>Why appealing:</b>	N=15
*Red & Green appealing	20%
Magnet / motor are interesting	40%
Bulb is interesting	20%
Mat is interesting	7%

<b>Why not appealing:</b>	
Looks old	27%
Looks drab/boring	40%
Too busy/ confusing	20%
Poor lighting	13%
Make mat more interesting	20%

Now, if I could ask you to spend a few minutes playing with the exhibit, reading about it, whatever, so that you get a bit familiar with it. Then when you're ready, I'd like to talk with you about it.  
[leave them alone with the exhibit]

**[Note: Lost one visitor at this point.]**

To start, I'd like to ask you about the different parts of the exhibit, so we can find out if it's clear what each part does.

3. [Point to curved metal] What do you think this is?

	N=14
<b>*Recognizes magnet</b>	86%

4. [Point to black tube] What do you think this is?

	N=14
<b>Recognizes wire</b>	86%

5. [Point to floor switch] Was it clear that stepping on the mat made the exhibit work?

	N=14
<b>Mat clear</b>	86%

6. [Point to stuff behind the plexiglass] What do you think this stuff is?

	N=14
<b>Motor</b>	36%
<b>Electricity</b>	14%
<b>Power supply</b>	21%
<b>Don't know</b>	29%

7. [Point to red light bulb] What do you think the red lightbulb is for?

	N=14
<b>Bulb is an indicator</b>	100%

OK, now I'd like to ask you about the exhibit as a whole. Go ahead and step on the pad.

8. How do these parts all work together? What do you think is happening here? [follow up with probes]

#### **Correct Responses:**

- Step on the mat, electricity goes through the wire, and because it's in the magnet, it makes the wire move. It's demonstrating the electric motor principle; that's how a motor works.
- Electrical power comes on & it resists the magnet. Magnetic force make electrically charged wire repel. [Do you know why it does that?] No, I don't know. I'd have to read it again.
- Electricity goes from the motor. Current causes the electromagnet to form N & S poles. [Why does the wire jump up?] Because of the electromagnetic force. Force field causes the wire to move. [How?] That's what it's in the middle for. It's being repelled -

#### **Partially Correct Responses:**

- Electric current runs through the wire. Negative & positive force from the magnet makes the wire jump & then goes and turns the light on. [Where does the electricity originate from?] Electric current comes from humans -- whatever voltage is inside of us. I
- Creating a current by stepping on the mat which interacts with the magnet. The wire's jumping out of the way. [Why does it jump?] I don't know exactly. Something about current going sideways or something.
- Showing visitors how an electric motor works. [Why does the wire jump up?] That's hard. Shows different polarity of N & S. I'm not sure. I'm unclear. Difference in polarity causes it to jump between the 2 poles. It's very visual & touch oriented. It shows
- The switch turns on the amp which boosts the magnetic power. The shape of the magnetic flux causes motion in the rotor. [Why does the wire jump up?] Because of the magnetic field generated by the magnet & amplifier.

**Confused Responses:**

- Don't make me think! When you step on the mat, it causes electrical current to flow through. [Why does the wire jump?] Force of electricity going through.
- Not sure what stepping on the mat has to do w making it work. [S: Anything about the wire, & rest of this stuff?] It makes charges go thru it, & makes it move. But I don't know why. There's the mat thing again; I don't know how these things are connected.
- Looking at a magnet from N to S pole. Magnet sucks in. [What does it suck in?] Any metal. But, showing energy from the air hose, it'll pull away from the magnet. Has to do with the Earth -- it goes up [makes analogy here with launching an object into space
- You've got the effect of an electric motor which is powering a magnet - by putting juice to it you make it stronger. [Why does the wire jump into the air?] Because the 2 fields - the polarization - the 2 poles & the two fields [Where are the fields from?]
- Don't know. The two forces make it rise. Is has so much energy that the wire... It creates energy,... The wire creates energy, and the magnet reacts off the energy.
- I'd have to read it several times. But you step on this, & by running this wire between these magnets, you generate a current, & that creates energy that can be used to run something else, like a motor.
- This is not my field. [Why does the wire jump into the air?] The magnet. Something. Not too sure. I don't know.

<b>What happens:</b>	N=14
Magnet gets power	29%
Wire repelled by B field	21%
Current flows	50%
Mentions 2 poles	43%
Wire creates energy	7%

**V probably understands** 21%

Now that you've had some time to play with the exhibit, how interesting would you say it is?

1	2	3	4	5
Uninteresting	Somewhat uninteresting	Neutral	Somewhat interesting	Interesting
0	2	1	7	4

	N=14
Post-interview interest level	3.9
Pre-Post change in Interest	+0.54

9. (If Neutral to Interesting:) Can you say what it is about this exhibit that makes it interesting? (or vice versa)

	N=14
<b>Understand motors</b>	14%
<b>Step on mat &amp; wire jumps</b>	29%
<b>See/feel forces</b>	21%
<b>No Men</b>	36%
<b>N=9tion</b>	

10. Do you have any special interest, knowledge or training in the areas of electricity and magnetism?

	N=14
<b>Has Science Background</b>	36%

11. Is this your first visit to the Exploratorium?      Y      N

	N=14
<b>First visit</b>	50%