ARVO Outreach Tools

How to prepare an optical illusion-themed exhibit at a science exhibition

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How to prepare an optical illusion-themed exhibit at a science exhibition

Introduction

The purpose of this guide is to clearly lay out the steps necessary to host an exhibit at a science exhibition that demonstrates five optical illusions to K-12 students and adults. (Examples of the illusions and their explanations can be found in Appendix 1.)

There are three main tasks in preparing for the event: navigating the event logistics, recruiting and communicating with volunteers, and preparing the demonstrations.

Prerequisites

Organizers will need the following:

1. A budget
    a. For a simple table at a local science fair, the budget will range from **tens to a few hundred US dollars.** Primary costs will be from reserving space at the event, printing handouts of your demonstrations, buying/printing materials to display the optical illusions, and reimbursing your volunteers.
    b. For a higher impact presence, or for a large event like a science exposition/festival, the budget will range **from a minimum of several hundred - to a more typical several thousand - US dollars.** Costs can vary widely depending on the price of reserving a booth and other resources at the exhibition, production of handouts, etc.
2. A minimum of two volunteers per shift (three to five hours long).
3. The ability to transport exhibit materials and volunteers to and from the exhibition site.

1. Six months before the event

1.1 Set budget

Identify the amount of money you have to spend on the event. Place money in an account used only for event-related expenses.

1.2 Reserve space at event

Space can disappear quickly - reserve your spot as soon as you know you'll be attending the event.

1.3 Identify potential volunteers

Volunteers could include staff and students in your department or institution, ARVO members who live within 50 miles of the event, etc. The Member Directory tool in ARVOConnect is a great way to identify members by state/country and institution.

2. Four months before the event

2.1 Alert the community

Send a save-the-date email to the pool of potential volunteers. Include a brief description of the event and the need for volunteers.

2.2 Start planning staffing requirements

Identify how many volunteers you will need to staff the exhibit for the duration of the event. At least two volunteers are recommended to staff the exhibit at all times. Each shift should be three to five hours long.

2.3 Build volunteer-only community on ARVOConnect

Communicating with a large number of volunteers via email can get overwhelming. An easier communication venue to share ideas, files, and event details is a volunteer-only community on ARVOConnect. Add volunteers as they sign up.

3. Three months before the event

3.1 Begin event promotion

Include a description of the event and a request for volunteers in your department or institution e-newsletters. Repeat the request for volunteers is subsequent emails and e-newsletters until you reach your desired number of volunteers.

3.2 Choose method of displaying optical illusions at event

Depending on your budget, there are multiple ways to display the optical illusions students and adults will see at your exhibit.

1. Use the ARVO office poster garden wall

   The ARVO office has high-resolution, two-foot square images of the five optical illusions used in this guide (see Appendix 2 for pictures of the poster garden in use). These squares can be shipped to you for your outreach event and assembled on site to provide an attractive, 10' - long back wall to your exhibit. This option is only open to events held in the continental US. Please contact ARVO staff at outreach@arvo.org ASAP if interested.

2. Print posters of optical illusions

   The optical illusion images can be printed on posters (similar to those used at the ARVO Annual Meeting) and hung from poster board.

3. Use a tri-fold display board

   Pin your optical illusion images to the display board and have the board stand upright on a table. This is the least expensive option.

3.3 Order exhibit components from exhibition organizers (for large science exhibition/festival only)

Suggested items to order: two chairs; table with tablecloth (to place handouts); carpeting and padding; metal cage with lock (to secure volunteer valuables, exhibit handouts). If you intend to print posters, you'll also need to order one or more poster boards to hang your posters on.

4. Two months before the event

4.1 Introduce demonstrations to volunteers and request feedback

Share the demonstrations provided in this guide with your volunteers and ask for their thoughts. Invite them to suggest other optical illusion demonstrations that are appropriate for the audience, quick, simple, and cheap.

5. One month before the event

5.1 Finalize demonstration handout design and submit print order to print shop

If your volunteers decide to use different handouts than the ones provided here, the final designs need to be finished. Estimate the number of handouts you'll need for each demonstration and submit the files to a print shop for printing.

While printing the handouts from home or work may be cheaper, the quality of the handouts will be better if produced professionally. This decision should be made based on your budget.

5.2 Ask for volunteer shift preferences

If your event is more than just a few hours long, multiple shifts of volunteers will be necessary. Ask your volunteers to identify which shifts would be the best, second best, third best, etc., for their schedule.

6. Three weeks before the event

6.1 Get volunteer contact information and share your own

Get cell phone numbers - not work or home numbers - from all your volunteers. In addition, provide your own number so you can contact each other if necessary.

6.2 Announce volunteer work schedule

Let everyone know when they're scheduled to be at the event.

6.3 Share details of event logistics with volunteers

Announce times and places to meet for the event or start of each volunteer shift. Provide directions and maps as necessary. If you're able to reimburse your volunteers for food and travel expenses, share that information as well. Suggest attire (comfortable shoes strongly recommended).

7. Two weeks before the event

7.1 Have exhibit display ready

If you're using a tri-fold display board to show your optical illusions, have it built and ready for transport. If you're printing posters to hang on poster boards, print them and check for errors. If you've requested the ARVO poster garden, make sure it arrived safely and practice assembling it.

8. One week before the event

8.1 Gather everything you'll need for exhibit

In addition to the handouts and display material, plan to bring with you things like tape, a camera, trash bags, throat lozenges, hand sanitizer, and tissues/paper towels.

9. Day before the event

9.1 Setup posters/poster garden at event site

If setup time is offered before the event, take advantage of it to build the poster garden, pin your posters to the poster board, or put up your trifold display board. Arrange the rest of your exhibit space.

10. After the Event

10.1 Thank you and feedback

Thank your volunteers for their time and ask them for their feedback on the event. Prompt them with a few questions you really want answers to in order to make a future event run even better.

10.2 Pay outstanding bills and reimbursements

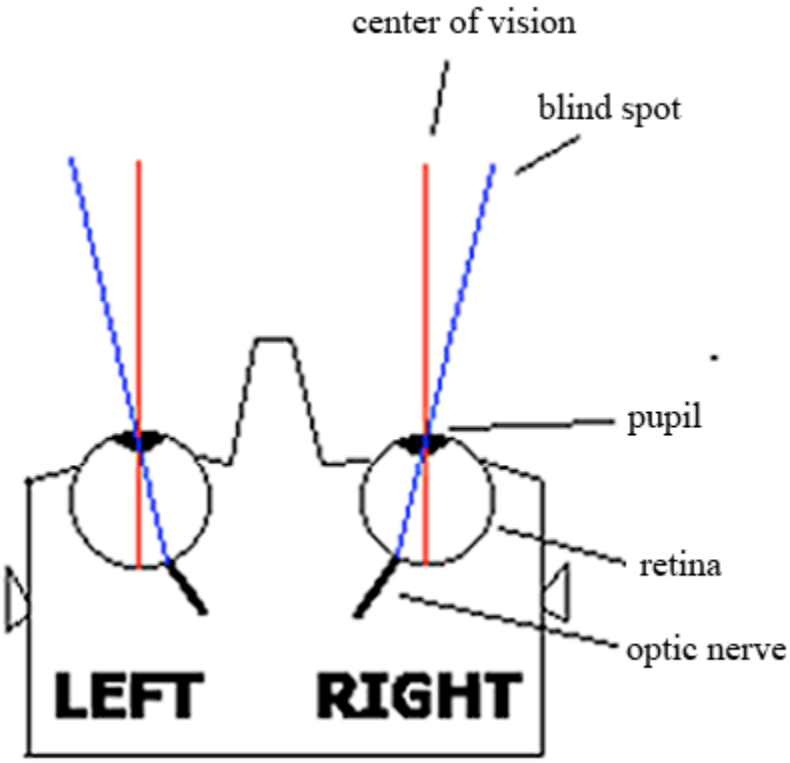
Complete any payments related to the event and reimburse your volunteers in a timely manner.

Appendix 1: Optical illusions and explanations used in this toolkit

Find your blind spots!

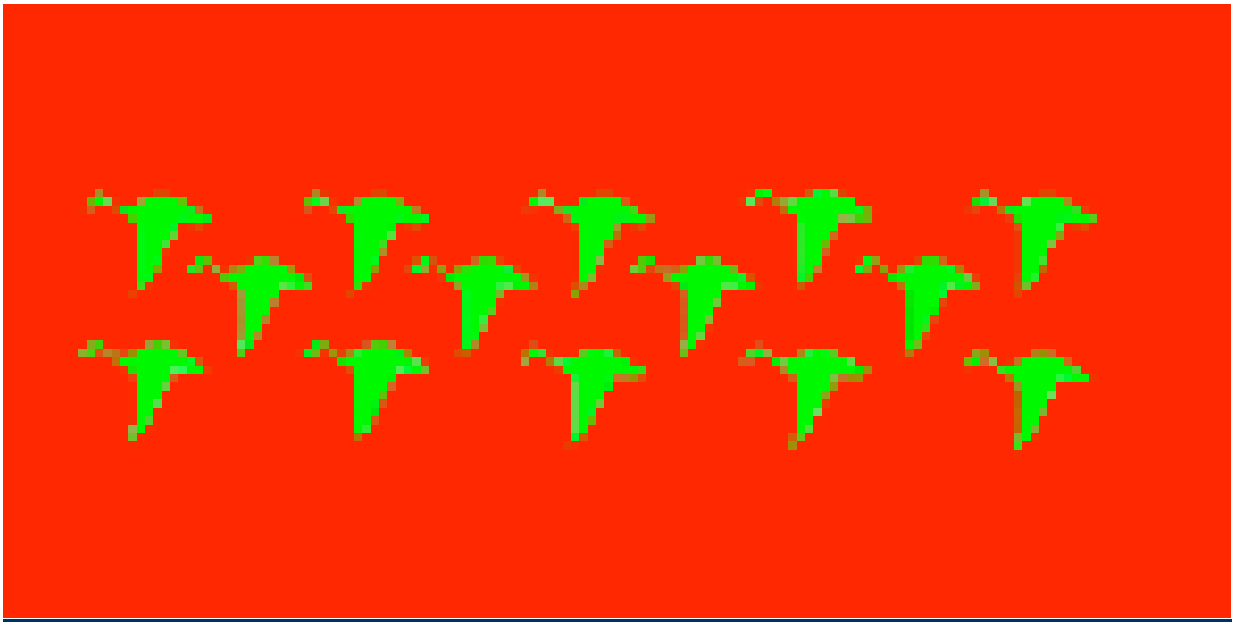
Look around. Do you see a blind spot anywhere? Maybe the blind spot for one eye is at a different place than the blind spot for the other (this is actually true), so you don't notice it because each eye sees what the other doesn't.

To find your blind spots, close your left eye and stare at the cross mark on the other side of this page with your right eye. Off to the right you should be able to see the spot. Don't LOOK at it; just notice that it is there off to the right. If it's not, move farther away; you should be able to see the dot if you're a couple of feet away. Now slowly move toward the piece of paper. Keep looking at the cross mark while you move. At a particular distance (probably a foot or so), the spot will disappear (it will reappear again if you move even closer). The spot disappears because it falls on the optic nerve (see picture).



As you can see, you have a blind spot at least as big as the spot in the diagram. What's particularly interesting though is that you don't SEE it. When the spot disappears you still don't SEE a hole. What you see instead is a continuous white field (remember not to LOOK at it. If you do, you'll see the spot instead). What you see is something the brain is making up, since the eye isn't actually telling the brain anything at all about that particular part of the picture.

Vision scientists study our blind spots and what effects they have on our vision.



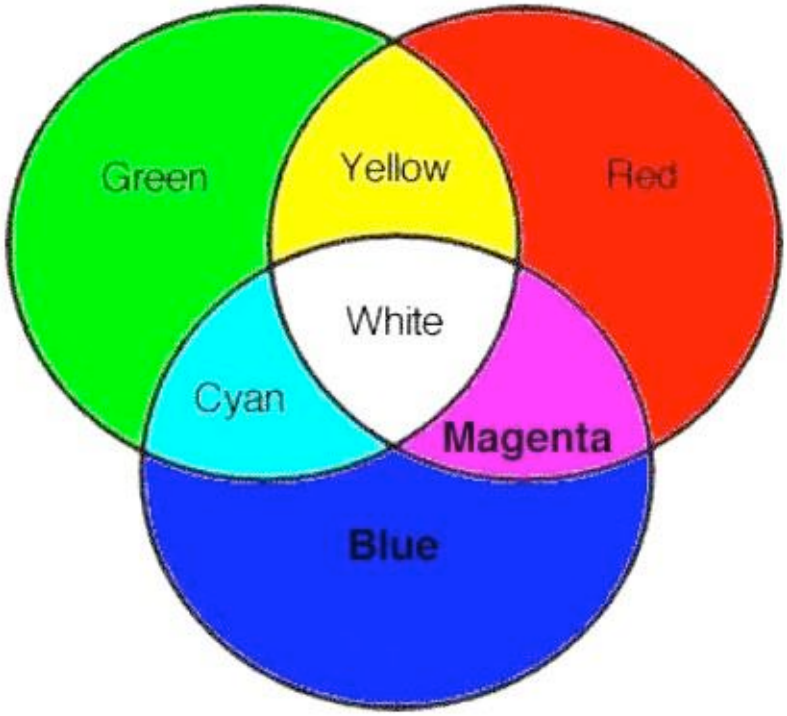
X

Cone Fatigue

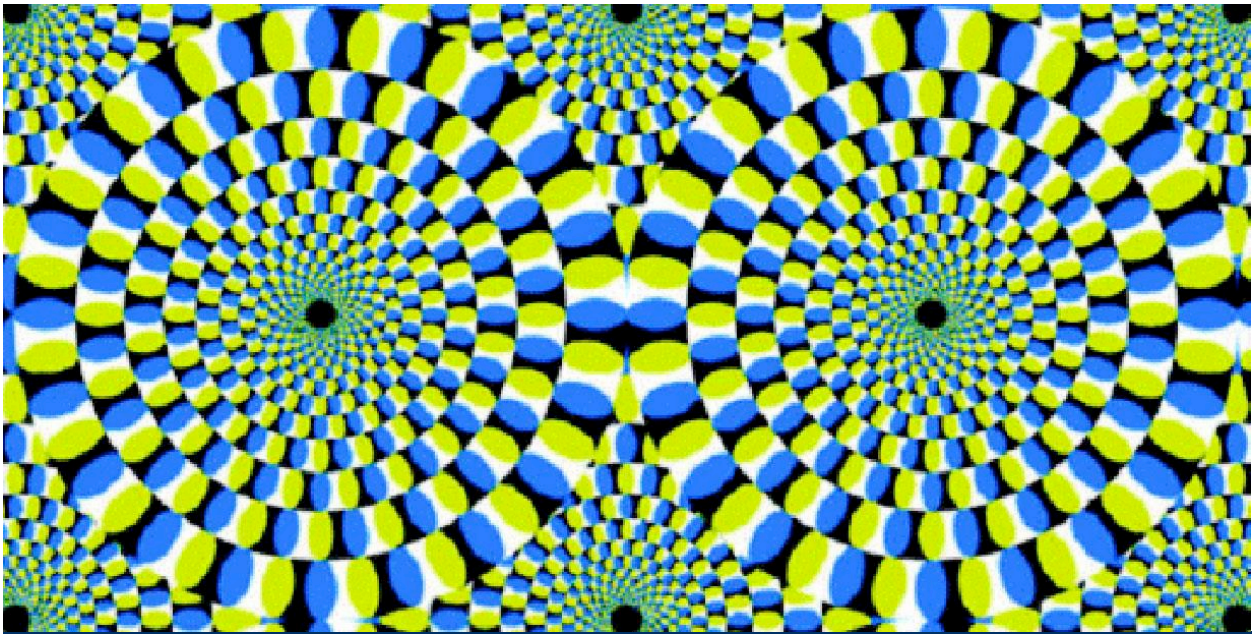
Stare at the image on the other side of this page for 20 seconds and then look at a blank white area. The after image you see has the opposite colors of the picture you just stared at due to "cone fatigue."

The eye contains special cells called photoreceptors that detect light. We have two types of photoreceptors - rods and cones. Rods can detect light and dark while cones are good at detecting colors such as red, green and blue. When you stare at a specific color for too long, the cells that detect that color will get tired, or fatigued. The after image is a result of all your photoreceptors not being in balance. As the photoreceptors become less tired, which takes between ten and thirty seconds, the balance is recovered and the after image disappears.

When red, green and blue are added together we see white (see picture below). If you stare at something red, your red cones will get tired. If you then look at something white, you will see an afterimage that is cyan, the complementary color of red. If you stare at something green, the afterimage will be magenta. Once the cones recover from fatigue and become active again, the after image disappears.



Vision scientists study why photoreceptors get fatigued and how they recover.



Rotating wheels:

The wheels on the other side of this page appear to move – even though in reality they are utterly stationary.

The illusion is so strong that many people feel nauseous if they look at the image for more than a few moments – and may feel ill for some time afterwards.

Notice that only those wheels in your peripheral vision appear to rotate. When you look directly at one of the wheels, you can't 'catch' it moving!

Each wheel in the illusion is made up of four colored elements: black, blue, white and yellow – in that order.

The critical feature for making the wheels rotate is the differences in the levels of luminance (light) between adjacent elements.

This means that the illusion also works well when printed in black and white.

What's happening in your brain?

For many years scientists have known we have specific cells in our brains that fire when we look at something moving in a particular direction. These cells are called direction-selective neurons.

When scientists examined this illusion they found something quite remarkable.

Direction-selective neurons begin firing when looking at this illusion. This is particularly exciting because up until now, scientists thought this type of brain neuron could only be activated by seeing something that was really moving (either on-screen or in the real world).

Vision scientists think the cells that detect motion actually interpret the rollers as if they were really moving. Clearly, we have a lot more to learn before we completely understand how our eyes and brain work!

Appendix 2: Pictures of poster garden in use