

# Show Stopper

*Strobe-illuminated animation illusions*



## Materials

- \_\_ Incandescent lamp
- \_\_ Strobe Light (school has one, you'll need to find a back-up)
- \_\_ Rotator (school has one)
- \_\_ Spin-Image discs (school has them; maybe design a few of your own!)
- \_\_ Low-frequency tuning fork (100 Hz-150 Hz) and tuning fork hammer
- \_\_ Other fast-vibrating or fast-spinning things (school has a nice small fan, find other things if you can)
- \_\_ Optional: Variac AC power attenuator (school has one; it will likely be used for another exhibit)

- AC!
- Shade zone or dark

## A Few Specifics

- \_\_ Science Kit's "Constant Speed Stroboscope Rotator"
- \_\_ Science Kit's "Stroboscopic Discs"
- \_\_ High-quality adjustable strobe light—the \$10 Spencer Gift model won't do

- PERCEPTION
- OPTICS

## Introduction

Normal lamp light is shone on a fast-spinning image and the image is a blur. A strobe light is then shown on the same image and the frequency is adjusted until the image seems to stop.

## Assembly (and practice)

The lamps and rotator need access to AC outlets. Spin-image disks attach to the rotator via a knurled clamp nut and washer assembly. (Practice getting discs on and off, and design a method to keep it from "walking" while the discs are spinning.) Also investigate the workings of the small fan and design a method to keep it from "walking."

## To Do and Notice

Observe the spinning blurred image using the normal lamp. Then turn off the normal lamp and turn on the strobe light. Adjust the frequency of the strobe light until the image appears to stop. Also try stopping the tuning fork and other things that move too fast to see under normal lighting conditions.

## What's Going On? (and research)

Our vision has certain limitations. One is "spatial resolution." We are unable to resolve things that are either too small or too far away. [WHY?] The other is "temporal resolution." Things that move too fast become a blur. [WHY?]

Normal illumination sends a continuous stream of light to the fast-moving object. Our brains cannot resolve the infinite images sent to our eyes each second. The strobe light sends out distinct flashes. Our eyes get a finite number of images each second. When the flash rate matches the spin rate or vibration rate, we see the object at the same point in its cycle over and over again—it appears to be stopped!

## Show Stopper

The pre-printed spin-images give interesting animation effects when illuminated by strobe flashes of particular frequencies. Find out the basics of how animation turns a sequence of still images into an apparent moving scene.

### OTHER STUFF

- Make photocopies of each pattern so you can show the still version while the pattern is spinning.
- The variac can be used to control the speed of the rotator.
- We have a fitting that will allow the patterns to be spun on a regular power drill. Try to make a second spinner with a power drill.