

STEAM ACTIVITY

THAUMATROPE & PHENOKISTOSCOPES

Have you seen a Disney movie or a cartoon on TV? You probably know that those are animations. But what does animation mean?

Animation is a way of making a movie from many still images. The images are put together one after another, and then played at a fast speed to give the illusion of movement. Most animations are played at a speed of twenty-four to sixty images every second. Each image becomes one frame of the movie.

Animation is a great example of STEAM.

Science: Persistence of Vision. How do our eyes and brain work together to create the illusion of a moving image?

Technology: The machines used for animation help us to create images and tell stories.

Engineering: Engineers design and create the tools and machines we use for animation.

Art: Artists create the images we see on screen.

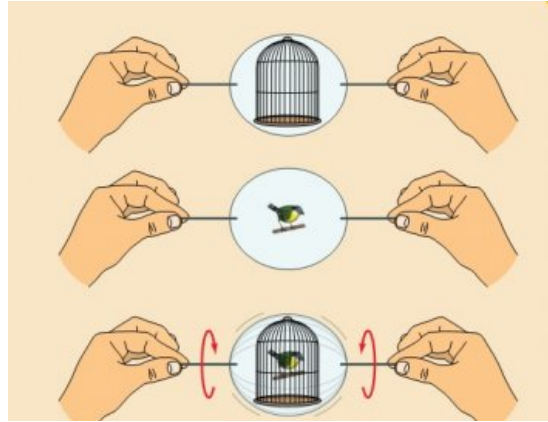
Math: Most animations require 24-60 frames per second. Animators use math to figure out how many pictures they need to create the animation.

How does it work?

Animation works because of a trick of the human eye called the **persistence of vision**. When light is used or controlled in the proper way, the eye "remembers" an image it has seen for a split second. If the image is replaced quickly enough with one that is only slightly different (in the proper way), a two-dimensional graphic can appear to be moving.

In the late 19th century, people began creating mechanical devices like **thaumatropes** and **phenakistoscopes** that made the effect more sophisticated.

Thaumatrope



A **thaumatrope** is a disk with a picture on each side is attached to two pieces of string. When the strings are twirled quickly between the fingers the two pictures appear to blend into one due to the persistence of vision.

A **thaumatrope** can also be made with a folded rectangle that is attached to stick or a straw. When the stick is turned quickly, the pictures appear to blend.

Examples of common thaumatrope pictures include a bare tree on one side of the disk, and its leaves on the other, or a bird on one side and a cage on the other. The name translates roughly as "wonder turner", from Ancient Greek

VIDEO EXAMPLES OF THAUMATROPE

https://www.youtube.com/watch?v=3nhBMigFN_w

<https://www.youtube.com/watch?v=yeV89RafMKU>

Materials:

- Card stock
- Templates
- Scissors
- Pencil, markers, crayons
- Straw or other stick-like object (chopstick, pencil, dowel, etc.)
- Hole puncher
- Rubber bands or string

THAUMATROPE TEMPLATES

Round templates with various images:

<http://aplusaequalz.blogspot.com/2012/01/thaumatrope-how-to.html>

Square template with Alice in Wonderland images

<https://popgoesthepage.princeton.edu/files/2015/11/Alice-thaumatrope-template.pdf>

Square template with fish and duck images

[https://s-media-cache-](https://s-media-cache-ak0.pinimg.com/originals/a5/c1/47/a5c147e9decb63de6e447e3b222afeee.png)

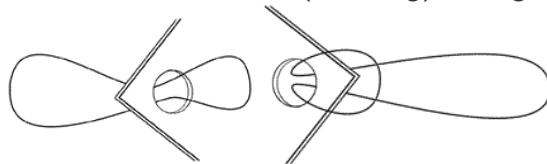
[ak0.pinimg.com/originals/a5/c1/47/a5c147e9decb63de6e447e3b222afeee.png](https://s-media-cache-ak0.pinimg.com/originals/a5/c1/47/a5c147e9decb63de6e447e3b222afeee.png)

Blank template-round

<http://momspark.net/wp-content/uploads/2013/10/thaumatropecircle.jpg>

Thaumatrope Instructions:

1. Trace and cut out a 2"-3" circle from card stock (or cut 2 from paper and glue onto manila folder or other stiff backing).
Or
Print and cut out a template.
2. Draw two images that "go together" on each side. For example: An empty fish bowl on one side, a fish on the other. Make sure one image is upside down.
3. Punch holes on either side of the circle.
4. Thread rubber bands (or string) through the holes and secure.



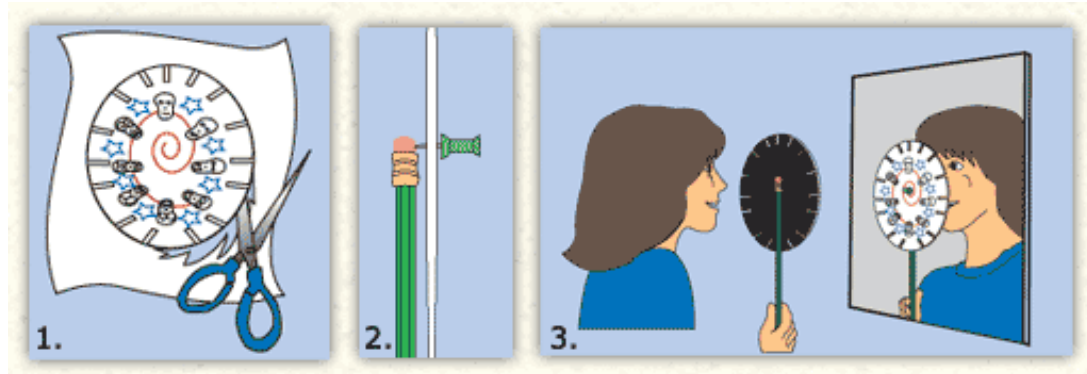
5. Spin your thaumatrope and see what happens!

Variation: Use a stick instead of rubber bands.

1. Cut a rectangle that is 4"x 2" from card stock (or cut two 3" circles).
Or use a template
2. Fold the card stock in half.
3. Draw an image on each side (this time it DOES NOT need to be upside down).
4. Unfold the card stock.
5. Tape or glue the straw or chopstick on one side of the card stock.
6. Fold the card stock over again and tape or glue it closed.
7. Spin the stick in your hands and see what happens!

Phenakistoscope

Pronounced FEN A KISS TOE SCOPE



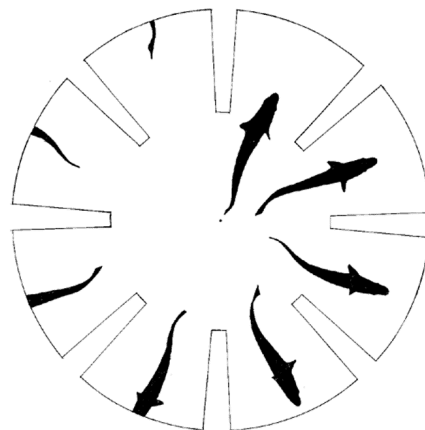
Phenakistoscopes are low-tech animation devices that are often referred to as "animation wheels." Just like the thaumatrope, the phenakistoscope uses "persistence of vision." The human brain does not see a light until a tenth a second after the light is turned on. The image persists (lasts) about a tenth of a second after the light is turned off. The spinning slits on the phenakistoscope, allow your eyes and brain to quickly see a series of still pictures. Each picture is slightly different. The image is presented to the eye before the previous image fades out in your head. This tricks your brain into thinking the image is moving.

The name phenakistoscope comes from the Greek words phenax, meaning 'deceiver,' and scopein, 'to see'. It was developed in 1833 by Joseph Plateau as a toy that would make stationary images appear to be animated, These ideas eventually led to the development of cinema.

How to make a Phenakistoscope

Materials:

Cardstock (or paper and file folder)
Scissors
Pencil, Markers, Crayons
Blank Template
Thumbtack
Pencil with Eraser
Mirror
Templates



Blank Phenakistoscope Template

https://nellisipila.files.wordpress.com/2012/12/phenakistoscope_template.jpg

Swimming Trout Template

<https://www.sccgov.org/sites/parks/Education/PublishingImages/50360troutwhlpc.gif>

Walking Raccoon Template

<https://www.sccgov.org/sites/parks/Education/PublishingImages/50368raccoonwhlpc.gif>

Galloping Elk Template

<https://www.sccgov.org/sites/parks/Education/PublishingImages/50377elkwhlpc.gif>

Directions:

1. Print out the template. You can begin with the pre-drawn templates then use the blank template to create your own animation. The template can be printed onto cardstock or printed on paper then glued to a stiffer material like a file folder.
2. Cut out the template.
3. If you're creating your own animation, draw a picture in each section of the circle. The images should be only slightly different. Start with something simple: a dot, a face, stick figures, etc.
4. Use a thumbtack to carefully attach the phenokistoscope to the pencil eraser. Make sure the circle spins freely.
5. Hold the phenokistoscope up to a mirror. Look through one of the gaps. Spin the circle, while continuing to look straight ahead. It should look as if your image is animated! You might have to experiment with where you look and the speed that you spin the circle.

Note to teachers: For more animation projects and activities check out the great lesson plans from PIXAR IN A BOX.

<http://letslassothemoon.com/2015/09/09/equations-behind-pixar-movies/>