

Lesson 3: History of Moving Images

Overview:

This lesson will give you and your students an overview of the evolution of the camera. It will also explain how camera functions are comparable to the human eye. To better understand animation and the moving image, students will make a flip book.

Skills Taught: reading and writing, history, science, technology, media, art

Lesson Goals: Students will gain an understanding of the basic function of the eye and its correlation to a camera, how images “move”, and rudimentary animation and its relationship to story boarding.

What you will need: paper, colored pencils or pens, stapler or tape

Materials: digital slide show, worksheet

Prep: read lesson and watch slide show

Class time: 45 Minutes

Activities: perception, flip book

Vocabulary & Terms:

Sight and the Camera

Cornea

Iris

Pupil

Retina

Pinhole Camera

Camera Obscura (in slideshow only)

Still Camera (in slideshow only)

Moving Picture Camera (in slideshow only)

Video Camera (in slideshow only)

Digital Camera (in slideshow only)

Persistence of Vision

Frame Rate

Beta Movement

Zoetrope

Flip Book



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Sight and the camera

Let's think of the camera as an eye. The camera was modeled to work like an eye, and both have similar mechanisms.

The eye has the following components:

Cornea- The transparent front part of the eye which covers the iris, pupil, and anterior chamber.

Iris- The thin, circular structure in the eye, responsible for controlling the diameter and size of the pupil.

Pupil- The pupil is a hole located in the center of the iris of the eye that allows light to enter the retina.

Retina- The vertebrate retina is a light-sensitive tissue lining the inner surface of the eye.

The lens of the eye acts like the lens in a camera, helping to focus light to the back of the eye. The very back of the eye is lined with a layer called the retina which acts very much like the image sensor in a camera. The retina is a membrane containing photoreceptor nerve cells that line the inside back wall of the eye. The photoreceptor nerve cells of the retina change the light rays into electrical impulses, which are sent through the optic nerve to the brain, where an image is perceived.

Activity: How Light Affects your Eye

Step 1: Choose a partner.

Step 2: Partner one covers their right eye with their hand for 30 seconds, then uncovers it.

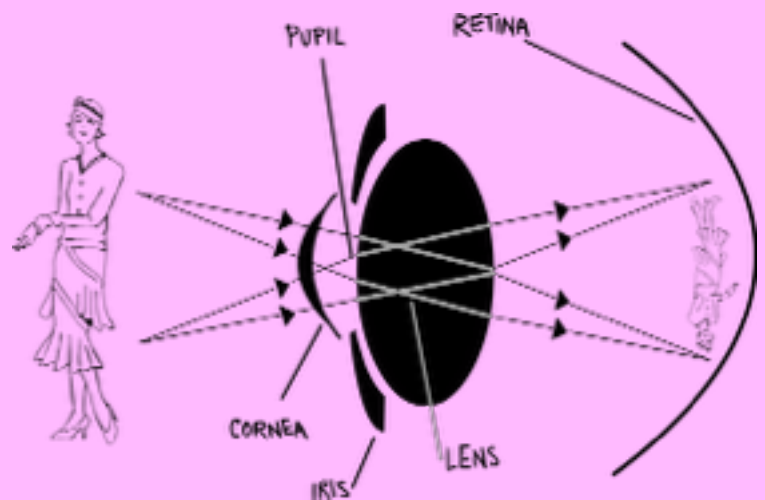
Step 3: Partner two observes closely as partner one uncovers their eye.

Step 4: Notice what happens to the eye.

What happens to light when it enters your eye?

Light bounces off the lady and enters your eye passing through the cornea, iris, pupil and lens. As it passes through the cornea nothing much happens, but the pupil changes size, getting larger or smaller depending on the amount of light entering the eye. If there is too much light the pupil gets smaller to protect your sight. When the light hits the lens it is refracted or bent, and the image flips upside down.

The inverted image lands on the retina and is sent to the brain, where it is turned right side up. For a more detailed description please visit <http://faculty.washington.edu/chudler/bigeye.html>



What is Persistence of Vision?

Persistence of vision is a commonly-accepted, although somewhat controversial theory, which states that the human eye always retains images for a fraction of a second (around 0.04 seconds). This means that everything we see is a subtle blend of what is happening now and what happened a fraction of a second ago.

In film and video, this phenomena is widely believed to account for our ability to perceive a sequence of frames as a continuous moving picture. However this idea was debunked in years ago, and there is no scientific evidence to suggest that persistence of vision works in this way. Rather, it is thought that the illusion of continuous motion is caused by an unrelated phenomena called *beta movement* (the brain assuming movement between two static images when shown in quick succession).

Despite the disproving of this theory, persistence of vision continues to be incorrectly taught in schools as the *physiological* mechanism behind film and video's illusion of movement. Persistence of vision is still the accepted term for this phenomenon in the realm of cinema history and theory.

During the late 1800's and early 1900's, it was scientifically determined that a frame rate of less than 16 frames per second caused the mind to see flashing images. A flip book, however, uses rates as low as ten frames per second or even slower and we are still able to perceive motion. Modern theatrical film runs at 24 frames a second. This is the rate for both traditional film and digital cinema systems.

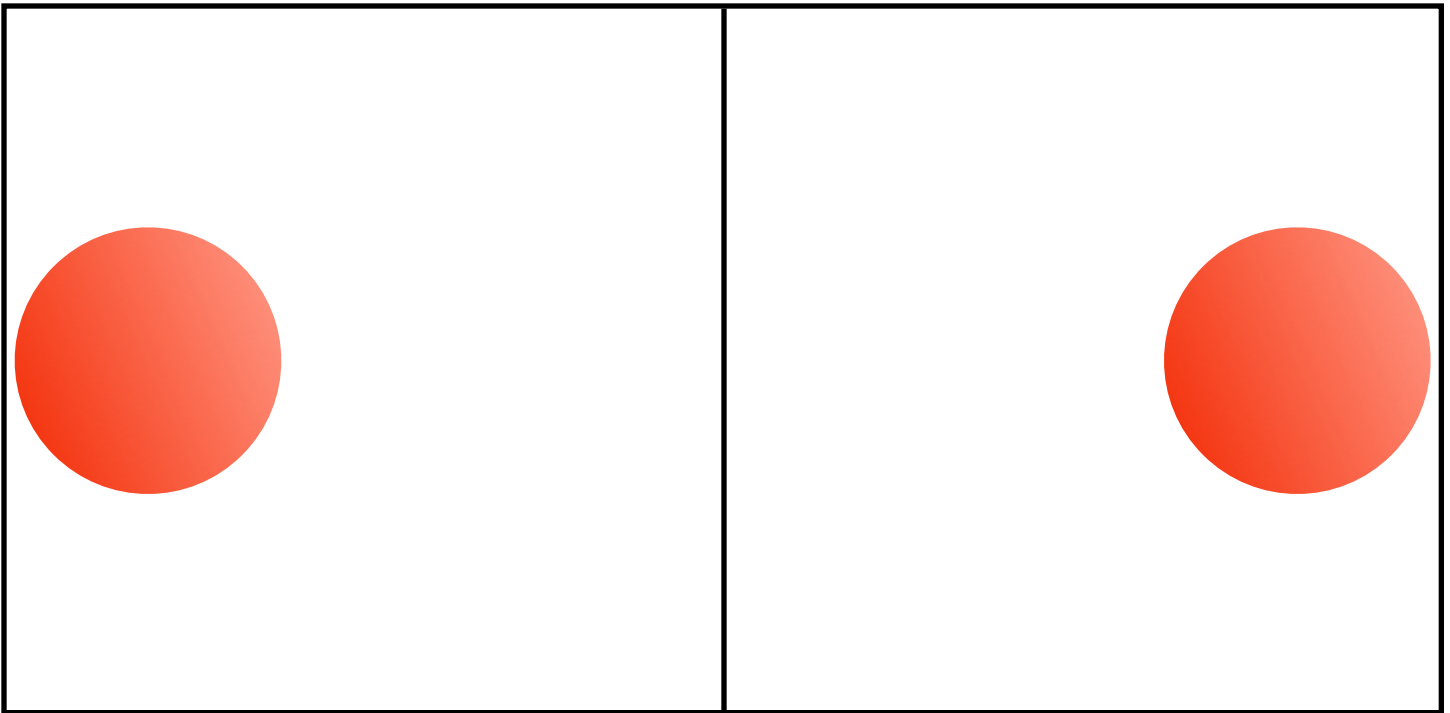
What is a Zoetrope?

A zoetrope is a device that produces an illusion of animation in an image through a succession of static pictures. The word is from the greek language with "zoe" meaning life, and "trope" meaning turn. This translates loosely to "wheel of life". A zoetrope is made up of a spinning cylinder with vertical slits on the sides. Below these slits are individual images, or sequences of drawings or photographs. The viewer spins the cylinder and looks through the vertical openings at the pictures on the opposite side. The vertical openings prevent the images from blurring together and allow the viewer to see a rapid succession of images, which creates the illusion of motion. This process is equivalent to a motion picture. The earliest recorded use of a Zoetrope was in China around 180 AD by Ting Huan. The modern day Zoetrope was invented by William George Horner, a British mathematician. The scientific concepts behind the zoetrope influence all subsequent motion picture devices.



What is Beta Movement?

Beta Movement is a perceptual illusion "whereby two or more still images are combined by the brain into surmised motion." Psychologist Max Wertheimer discovered this through an experiment in which he projected two successive images before an audience. The first image was a ball on the left side of the screen, and the second was the same ball on the right side of the screen. When the viewers were asked what they saw, they claim that they saw a ball move from left to right. They did not actually see this movement happen, but the cognitive process of perception links the two images in time and causality. The Beta Phenomenon can also create an illusion of motion toward, or away from, an audience by changing the size of the object from large to small or small to large.



Please refer to the lesson 3 slide show for a “moving” demonstration of Wertheimer’s discovery.

What is a Flip Book?

A flip book is a book with a sequence of hand drawn images that progress forwards or backwards gradually from one page to the next, so when the user turns or "flips" the pages the images appear to be animated.

Video examples:

<http://vimeo.com/7776303>

<http://www.youtube.com/watch?v=i5arPhlI58c&feature=related>

In the examples above, the image transforms over time-- the longer you flip, the more things change.



Activity: Flip Book

Have your students make a flip book about the topic that they will document on the day of filming.

After they have made the flip books, make sure they pass them around and get to experience each other's work.