MAGIC & SCIENCE
STORYTELLING WITH LIGHT

If you want to create stories with light at home or in the theatre, here are some reminders of what you learned and some experiments you can do. Enjoy!

DESIGNER TOOLS

ANGLE What angle is the light source lighting the object from?
- Top Light
- Side Light
- Back Light
- Front Light
- Uplight (source is low with light pointing straight up)

COLOR What color is the light?
- Primary colors in light are: Red, Blue & Green
- Secondary colors in light are: Cyan, Magenta, Yellow

DURATION Length of time for light to come to full or to diminish to blackness

INTENSITY -How bright or dim the light

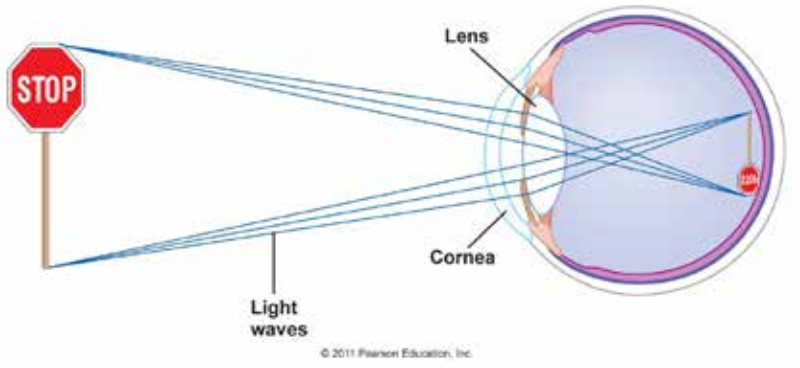
PATTERN AND CONTRAST -Light and shadow. In theatrical lighting, steel or glass patterns that go in lights are called **Gobos**.

HOW WE SEE

SHAPE

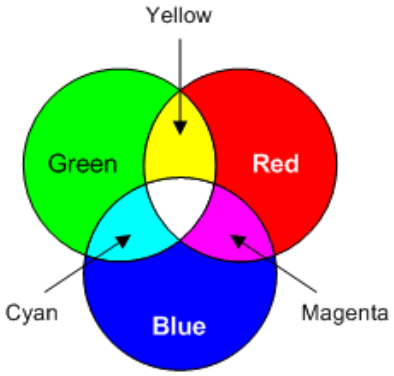
Light rays enter the eye through the cornea. The cornea's refractive power bends the light rays so they pass freely through the pupil the opening in the center of the iris into the eye.

The iris works like a shutter in a camera. It has the ability to enlarge and shrink, depending on how much light is entering the eye. Then the light rays pass thru the lens which works like the lens in a camera.



http://www.visionredefined.net/wp-content/uploads/2015/05/eye-lig.jpg

In a normal eye, the light rays come to a sharp focusing point on the retina which functions like the film in a camera. It captures all of the light rays, processing them into light impulses through millions of tiny nerve endings, then sending these light impulses through over a million nerve fibers to the optic nerve.



Additive Colors of Light

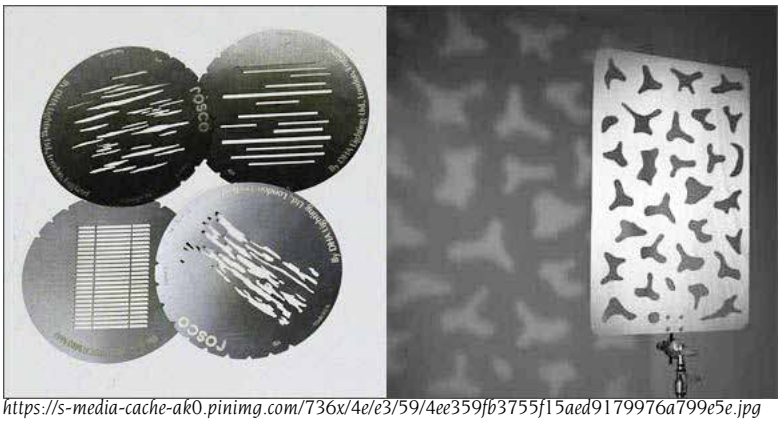
COLOR

The eye interprets color through the **Rods** (greyscale) and **Cones** (Red, Green & Blue)

If you want to learn more about mixing colors, this site has color mixers you can play with: **LSquaredMath.us/colorPrimaries**

Technical Artisans Collective

WHAT IS A GOBO?



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Gobos are a piece of flat steel or glass, which when placed in a lighting fixture projects the image that is on the gobo. The word gobo is an acronym for the phrase "**Goes Before Optics.**" There are specific lighting instruments that can accept gobos. The most common is an ellipsoidal, which are lighting instruments that allow you to focus the light and gobo by moving the lens back and forth in the lens tube. Most gobos are made of steel but more complex patterns and colors can be achieved using glass gobos.

HOW BIG CAN MY GOBO GET?

A lot of times we have to figure out how big our gobo is going to be, what size our image will be when we put our light in a specific place, or what degree lens we need in our unit (known as a 'barrel'.) Weirdly, figuring out our answers doesn't have anything to do with the gobo itself! Instead, we look at the **beam spread** of the lighting fixture we are using and the **distance** from the projection surface (stage floor, back wall, etc.)

• If we know our **Angle** we're shooting from and the **distance** from the surface we can calculate how big the **Beam (and Image)** is.

$$\text{BEAM WIDTH} = \text{ANGLE OF SHOT} \times 0.18 \times \text{DISTANCE}$$

$$157.5 = 35^{\circ} \times 0.18 \times 25'$$

• To calculate what our **Angle** should be to make an **image at a certain size**, we first need to figure the **Multiplying Factor (MF)**

$$\text{MF} = \frac{\text{BEAM WIDTH}}{\text{DISTANCE}} \quad \textbf{OR} \quad \text{MF} = \text{ANGLE OF SHOT} \times 0.18$$

$$6.3 = \frac{157.5}{25'} \qquad 6.3 = 35^{\circ} \times 0.18$$

•Using the **MF** we just found, we can then calculate our **Angle**, or use our **Beam Width** and **Distance** to tell us what angle we need to be at to project an image that size.

$$\text{ANGLE} = \frac{\text{MF}}{.018} \quad \textbf{OR} \quad \text{ANGLE} = \frac{\text{BEAM WIDTH}}{\text{DISTANCE} \times 0.18}$$

$$35^{\circ} = \frac{6.3}{.018} \quad \textbf{OR} \quad 35^{\circ} = \frac{157.5}{25' \times 0.18}$$

RESOURCES

GOBO VIEWER
http://www.rosco.com/gobos/ or the MyGobo app

INTERACTIVE BEAM PHOTOMETRICS
http://www.etcconnect.com/minisite/sourcefour/metrics.html

HOW WE SEE COLOR
ed.ted.com/lessons/how-we-see-color-colm-kelleher

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