LUMA

Theatre of
Light

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Theater Etiquette

Each year, thousands of teachers, students, bus drivers, and parents take part in CSB/SJU's Education Series. To make your theater experience the best it can possibly be, we've provided a few helpful hints to follow at the theater.

It is our hope that a review of these procedures will answer any questions that you or your students may have.

- *Please make an effort to bring a minimum of one adult chaperone for every fifteen students.*
- *Prepare your students to enter the theater in single file in the order of seating. Position your chaperones in such a way as to maximize adult supervision of your group.*
- *Trips to the restroom must wait until your group is seated in the theater. Then, if necessary, students may go in small groups with the teacher's permission. Please chaperone younger students.*
- *To make the theater experience enjoyable for all, we do not permit:*
  Food, gum, or drinks
  Radios, cameras, tape or video recorders
  Inappropriate behavior

Following the performance, a member of the CSB/SJU Fine Arts Programming Department will dismiss schools from the theater.

Thank you and enjoy!

LUMA'S History

In the early 1980s, Marlin, Luma's creator, was working in Las Vegas as a comic/juggler and took a magician friend of his, Jeff McBride, on a camping trip into the Arizona desert. That night the marvels of the Milky Way unfolded to Jeff, who had never seen it growing up in the vicinity of New York City. Marlin witnessed the impact of the stars on his friend and, in a moment of play, picked up a burning branch from the firepit. He brandished it about, creating a storm of sparks that rose to meet the night sky. The visual was memorable enough to create further exploration though classes with Rachel Rosenthal in Los Angeles a few years later. Using flashlights and gels, Marlin created a piece that spoke of our loss of the night sky through our overuse of artificial lighting. Starlight that had traveled millions of light years across the universe was being drowned out at the finish line by our city lights. The irony was thick because people want to chase away the dark and instead chased away the lights. However, it wasn't until the late eighties that Marlin would find the birthplace of LUMA: a lava flow on the side of the world's most active volcano.

Before Luma, but after graduating high school, Marlin ran away with the circus, tending to the elephants. By age 19, Marlin started performing professionally as a juggling entertainer. He landed a place in the class of 1976 and attended Ringling's Clown College. Marlin's skill as a juggler won him numerous awards from the International Jugglers Association.

During the 1980s, Marlin lived in the jungles of Hawaii in a two story, 900 square foot tree house of his own design. Marlin learned to live "off the grid." Catching his water from the sky and powering his one light and CD player off his truck battery, Marlin became a "Castaway" from the entertainment industry and the fast lane of Los Angeles. The light at night came only from the stars, the moon, or the glowing volcano illuminating the horizon. Forays out onto lava flows to witness the power of the planet close up became a portal to the present for Marlin. In that moment he realized that "life follows light" and that the whole world would want to see a show like that.

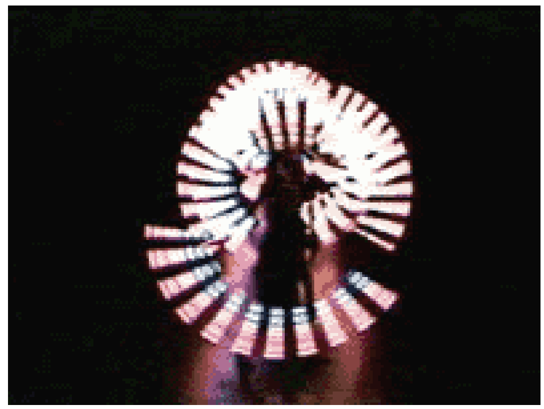
That was in 1987. A year later he teamed up with a dancer and started creating a work called, "The Evolution of Light." That summer, the logo "LUMA" was created by celebrity LA designer Margo Chase, and the show was marketed to the special events industry and corporate producers. Since 1997, the show has gone on to play the Kennedy Center, The Tonight Show, Film Fare Awards in Bombay, India and in theatrical venues from California to New Hampshire, from Florida to North Dakota.

The cast has changed over the years and the work continues to evolve with the intention that it will claim its place as the definitive light show for the industry and reach stellar prominence in the firmament of show business.

Taken from: "LUMA History." (Online) Available. http://www.lumatheatre.com/history.html, Oct. 4, 2002.

LUMA: The Show

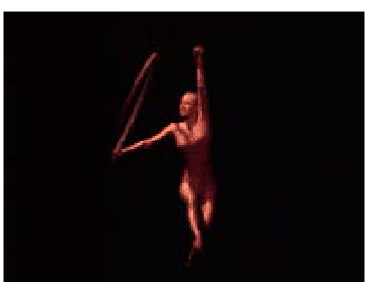
Enter the Theatre of Light and enter into the universe of Luma where we leave your body in the dark and take you out of your mind. Luma takes the viewer to the precipice of their imaginations and beyond into a world of the unknown, the realm of metaphorical light. Here luminous spirals of DNA twirl in the dark, single cells of light multiply to create sprightly phantoms while ghostly illuminated specters fly over the stage.



Luma explores a world of artificial light as soft indoor fireworks explode, carnival rides whirl, screen savers become three dimensional, and commuters garbed in suits of light struggle with their power supply.

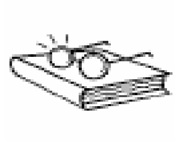
Born in the shadows, Luma sculpts light into dynamic forms that dance, spin, orbit and enchant the viewer. Luma is one of the first shows on the topic of light and how it penetrates every aspect of our lives. Like the moth to the flame, like plants to the sun, all life is drawn to light instinctively. Humans are no exception. Inside each of us is a child who has played with a sparkler or a flashlight under the covers.

Luma takes that delightfully innocent fascination and unfolds it into a show of images that transport the audience into a world where fireflies dance, gods of lightning do battle, moon maidens spin above the clouds, and underwater creatures depict the cycle of life and death.



Let Luma help you shine some light into the other 90% of your brain.

Taken from: "LUMA: The Show." (Online) Available. http://www.lumatheatre.com/theshow.html, Oct. 8, 2002.



The Vocabulary of Light

Concave: Curved, like the inner surface of a sphere.

Convex: Having a surface or boundary that curves or bulges outward, as the exterior of a sphere.

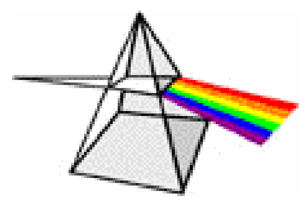
Dispersing: To separate and move in different directions; scatter.

Electromagnetic radiation: Radiation consisting of waves of energy associated with electric and magnetic fields resulting from the acceleration of an electric charge.

Light: Electromagnetic radiation that has a wavelength that may be perceived by the normal unaided human eye.

Photons: a discrete particle having zero mass, a unit of retinal illumination, equal to the amount of light that reaches the retina.

Prism: A transparent body, often of glass and usually with triangular ends, used for separating white light passed through it into a spectrum or for reflecting beams of light.

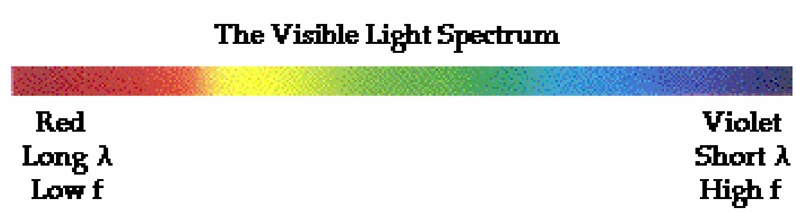


Rainbows: A spectrum of colors usually identified as red, orange, yellow, green, blue, indigo, and violet, that appears in the sky opposite the sun as a result of the dispersion of sunlight in drops of rain or mist.

Reflection: To throw or bend back (light, for example) from a surface.

Refraction: The turning or bending of any wave, such as a light or sound wave, when it passes from one medium into another of different optical density.

Visible light spectrum: Visible light waves are the only electromagnetic waves we can see.



Our Understanding of Rainbows

Rainbows have fascinated, puzzled, and inspired imaginations throughout time. However, it wasn't until the late 1660s that a scientific explanation for the phenomenon was provided.

Sir Isaac Newton performed an experiment in which light was passed through a glass prism. The beam produced a band of colors ranging from red to orange, yellow, green, blue and violet. When he sent the band of colored lights through another prism in the reverse direction, the colored band returned to white sunlight again.

He then reasoned that white light is really a mixture of colored lights and that each color bends differently when passing through a prism. The difference in bending allows for each color to stand out separately and be visible. The band of colored light is thus called a spectrum.

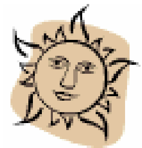
Each color has its own wavelength. The wavelength determines how much each color will bend. Red bends the least and violet the most.

When light hits a raindrop, it is refracted into the colors of the spectrum and then reflected off the back of the raindrop. It is then refracted back again as it leaves. This refracted light leaves the raindrop at an angle of about 42 degrees. Each color emerges at a slightly different angle, depending on its wavelength.

Only one color will be visible from any one raindrop at one time, depending on the angle it is observed by the viewer on the ground.

The colored lights of a rainbow make up only a small portion of that huge spectrum of energy called electromagnetic radiation. The other groups include radio waves, microwaves, infrared light (heat), ultraviolet rays, X-rays, and gamma rays.

Reighn, Nancy S. "Scientific Understanding of Rainbows." (Online) Available. http://www.southjerseynews.com/brainsorm/0900/scientific.html, Oct. 1, 2002.



Name____________________________

Internet Scavenger Hunt: Light

What are the basics of light? What is it that we truly see when the lights come on? Go to www.opticalres.com/kidoptx.html. Click on "light basics" to answer the following questions.

1. What is light?

   ____

2. How does light travel?

   ____

3. What are the straight paths of light called?

   ____

Now go to: www.southjerseynews.com/brainstorm/0900/scientific.html

4. Around what year were rainbows scientifically explained?

   ____

5. What is white light?

   ____

6. What is special about each color?

   ____

Now go to:
www.fi.edu/fellows/fellow7/mar99/light/vocabulary.shtml
According to the vocabulary list, define the following terms:

7. What is a prism?

   ____

8. Rainbows are caused by?

   ____

9. What does a convex lens do?

   ____

LESSON PLANS

An Indoor Rainbow

Grade level: 4 and up

Objective: Learner will demonstrate ability to create a rainbow and identify its parts through discussion.

Materials: A water glass
A flashlight
A round-bottomed flask or some spherical glass container (a round fishbowl would work)
A small piece of cardboard or poster board that fits over the head of the flashlight
A large piece of poster board/tag board

Connection: Students will often see the color spectrum during the Luma performance.

Procedure:

1. Introduce the lesson by saying: "How many of you have ever seen a rainbow? Have you ever noticed that they appear in a variety of places? After a rainstorm; out of a fine mist that your garden hose makes; on the wall when the sun hits a crystal? If you ask people, many will often say that a rainbow is light going through raindrops. That's right, but it's not the whole answer. Today, we will find out how rainbows can be formed and how you can make one yourself."
2. Put the glass, filled with water, near the edge of a table that is full of sunlight (early morning sunlight works best). A rainbow or spectrum should appear somewhere in the room: the floor if early morning sun is used, the wall if later in the afternoon.
3. Ask the class what they see happening to the light. What is the glass doing to it? What is the water doing to it?
4. Explain the following: Our "glass" of water, like the prism, refracts (bends) and disperses (breaks up) light. As the sunlight streams through the window and into the water (the glass of the "glass" helps a bit, too), the light is bent (refracted) and broken up (dispersed). When the light reemerges from the other side of the glass of water, it's heading in a slightly different direction from its original path and is no longer just white light. We see a fantastic spectrum of colors on the floor or wall.
5. Now, repeat the experiment.
6. Cut a narrow slit in the small piece of poster/tag board and tape the piece to the head of the flashlight so that only a small beam appears.
7. Cut a fist size hole in the middle of the large piece of white poster/tag board.
8. Fill the round-bottomed flask or spherical container with water.
9. Shine the narrow beam of light from the flashlight through the hole in the poster board and onto the container. You may need an extra person to hold the container while you shine the light and hold the white poster board.
10. Ask the students what they see on the container side of the poster board as you shine the narrow beam of light onto the water-filled container. Can you position the flashlight and container so that you see a spectrum on the white paper? What is the shape of the spectrum on the piece of poster board? How is this similar to a rainbow in the outdoors? How it is different?

Taken from: Department of Physics and Astronomy, Arizona State University. "Patterns in Nature, Light and Optics." (Online) Available. http://acept.la.asu.edu/PiN/act/activities.shtml, December 15, 1999.

Astronomy and Language Arts

Grade level: 4-8

Objective: Students will write a story about one of the constellations.

Materials: Information on the constellations
Constellation formation pictures
Encyclopedias or Internet access
Writing materials

Connection: Stars are one of the many forms of light. For thousands of years, people have been using stars (and the constellations they are a part of) as a basis for stories and legends.

Procedure:

1. Discuss the elements of tall tales or folk tales with the students. Ask them to brainstorm different characteristics of the stories (e.g., good vs. evil theme, magical elements, "happily ever after" ending). You may also choose to read several tall tales or folk tales to the students. Worthwhile choices include works by Steven Kellogg, including Paul Bunyan and Johnny Appleseed; Swamp Angel by Anne Isaacs; and stories by Verna Aardema, such as How the Ostrich Got its Long Neck and Why Mosquitoes Buzz in People's Ears.
2. After reading several tall tales or folk tales, introduce several constellations to the students. Choose one or two and share the myths of those constellations. (For information on these myths, consult an encyclopedia or http://www.dibonsmith.com/constel.htm)
3. Using pictures of the different constellations, allow students to choose a constellation and read a myth about the constellation. If you choose to emphasize research, you could have students find a picture of their constellations on their own, using library resources or the Internet. Two recommended websites:
   http://www.dibonsmith.com/constel.htm
   http://www.astro.wisc.edu/~dolan/constellations/
4. After students have read their myths, allow them to share their myths with other class members. Remind the students that tall tales and folk tales were passed on mainly by families telling the stories to one another, passing them from generation to generation.
5. After sharing the tall tales or myths, have students share the stories on paper. These could be shared as short stories or children's books and include pictures of the constellation. If time permits, share the stories with younger children.

Go Fly a Kite!

Grade level: 4 and up

Objective: Students will learn about kite history and create a kite of their own.

Materials: Sheets of brightly colored 8 1/2" x 11" typing paper.

8" bamboo barbecue shish kabob sticks.

1 roll of florescent surveyor's flagging plastic tape, available at any hardware store. (crepe paper also works well)

1 roll 1/2" wide masking tape or any type of plastic tape

1 roll of string (at least 200', 6 to 10 feet for each child)

Pieces of 1"x 3" cardboard on which to wind the string

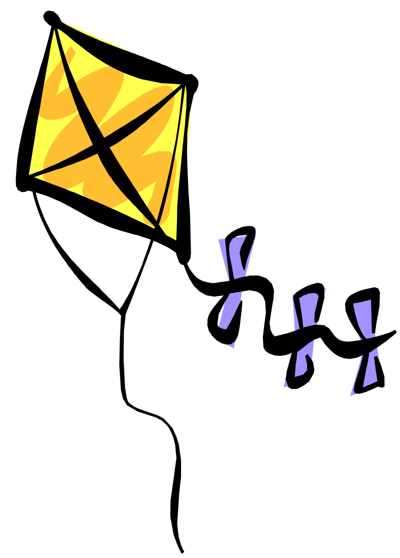
Scissors

Hole punch (optional)

Connection: Many of the effects in the production of LUMA are created using kite mechanisms.

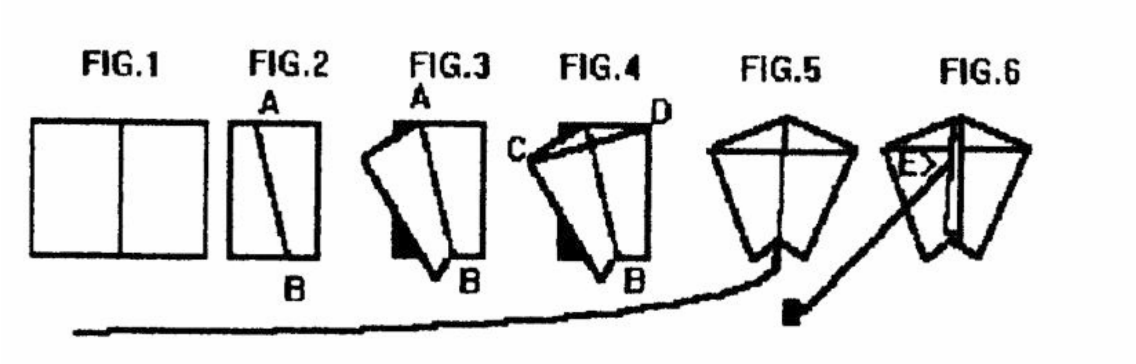
Procedure:

1. Share some of the history of kites with the students. Kites have been around for centuries! The Chinese used kites as far back as two thousand years ago as a military defense tool (the whistling noise they created often frightened the enemy). Their use spread throughout Asia and Europe. One of the most famous kite stories is that of Benjamin Franklin, who flew a kite to prove that lightning is a form of electricity. A bolt of lightning struck his kite and traveled down a wire attached to his kite, causing a spark. The spark proved his theory. Kites were also credited with the development of air travel. Alexander Graham Bell built four-sided kites that he hoped could be built large enough to carry passengers. If time allows, you may want to allow students to research other uses for kites or have them report on one of the many kite festivals that take place throughout the world.



2. Distribute the materials listed above to each student. Working in pairs, or as a large group, complete the following directions.
   a. Fold a sheet of 8 1/2" x 11" paper in half to 8 1/2" x 5 1/2".
   b. Fold again along the diagonal line A in Fig.2.
   c. Fold back one side forming kite shape in Fig.3 and place tape firmly along fold line AB. (No stick is needed here because the fold stiffens the paper and acts like a spine.)
   d. Place barbecue stick from point C to D and tape it down firmly.
   e. Cut off 6 to 10 feet of plastic ribbon and tape it to the bottom of the kite at B.
   f. Flip kite over onto its back and fold the front flap back and forth until it stands straight up. (Otherwise it acts like a rudder and the kite spins around in circles.)
   g. Punch a hole in the flap at E, about 1/3 down from the top point A.

h. Tie one end of the string to the hole and wind the other end onto the cardboard string winder.



3. If you have older students or are interested in making more complex kites, please consult one of the following pages:

- http://kckiteclub.org/DaveEllis/TetKite.htm - plans for building a tetrahedron kite.
- http://kckiteclub.org/DaveEllis/kitemaking.htm - plans for a very inexpensive kite, as well as safety tips for kite-flying and "kite" in other languages.
- http://www.education-world.com/a_lesson/lesson056.shtml - ways to integrate kites into every part of your curriculum.
- For more information on how to fly a kite, consult the following page: http://www.GombergKites.com/howgen.html.

Sources:

"20 Kids * 20 Kites * 20 Minutes." (Online) Available.
http://www.aloha.net/~bigwind/20kidskites.html, Oct. 12, 2002.
"Kites." World Book Encyclopedia. (Online) Available.
http://www.worldbookonline.com, Oct. 12, 2002.

Sundials

Grade level: 4 and up

Objective: Younger students will create a sundial and use it to tell time. Older students will explain why sundials may not always be correct.

Materials: Heavy paper or cardboard
Clay
Craft sticks or old pencils
Pencils
A sunny day

Connection: The sun, our primary source of light, has several uses, including telling time.

Procedure:

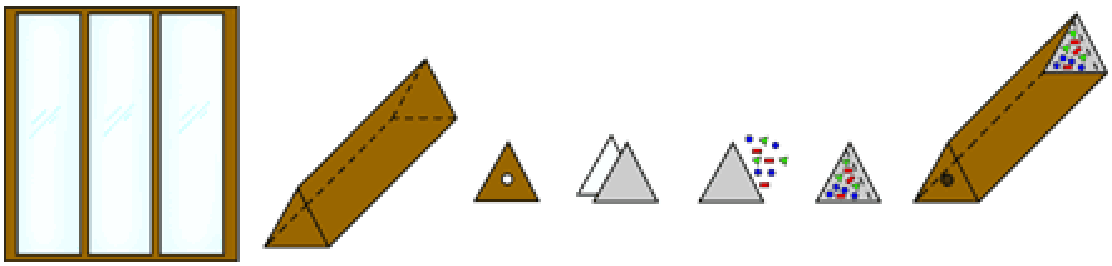
1. Ask students if they have ever seen or know what a sundial is. Explain that a sundial is an instrument that uses the sun to tell time. Remind the students that the sun is our primary source of light. How else can we use the sun in our daily lives?
2. Explain to the students that you will be making a sundial. Give each student a one-inch ball of clay. Place a craft stick or pencil into the clay so that it points straight up. Have the students place the clay in the center of a piece of heavy paper or cardboard. (The paper should be large enough that the entire shadow of the craft stick or pencil can be seen on the paper.) At the top center of the paper, have the students mark the paper with the cardinal directions: north, south, east, and west. Tell the students that the sundials must always face the same direction or they will not have consistent results.
3. On a sunny day, take the sundials outside. Place the side that says "north" towards the north. (If you have access to compasses, you may want to include a lesson on how to read one.) Ask the students to mark where the shadow is. Every hour, repeat this process so there is a mark for each hour.
4. Allow students to take their sundials outside at lunch or recess and see if they can tell the time.
5. Ask older students the advantages and disadvantages of using a sundial. What are some reasons that a local sundial's time may differ from that on your watch? (The sundial might be facing the wrong direction; a difference of a few minutes may be due to the uncertainty of time; time may vary within a time zone. For example, the shadows are at a different place in Chicago than they would be in Minneapolis, but the time is still the same.)
6. For more information, consult: http://www.fi.edu/time/Journey/Sundials/

Source:

http://www-istp.gsfc.nasa.gov/stargaze/Lsundial.htm (Online) Available. Oct. 12, 2002.

Build a Kaleidoscope

Grade level: 4 - 8
Objective: Students will build and create their own kaleidoscope.
Materials: 3 rectangular mirrors of the same size
Clear Saran wrap
Thin white paper
Cardboard or hard tag board
Scissors
Scotch tape
Colored paper
Connection: Students can create patterns of color as seen in the Luma production.



Procedure:

1. Distribute colored paper and have students rip them into tiny pieces. Gather all the tiny pieces and put in a general location.
2. Have the students trace around the mirrors onto the card/tag board. Cut out the three pieces.
3. Tape the cardboards to the 3 mirrors. With the mirrors facing inwards, tape the 3 cardboards together to form a triangular container.
4. Place the cardboard container upwards on a piece of cardboard. Trace the bottom. Cut out the new triangular piece and tape to one side of the container as a base.
5. Take a sharp pencil and poke a hole through the middle of the base. This will be the eyehole.
6. For the other base, trace the triangle onto the saran wrap (use a marker or overhead pen) and the thin white piece of paper. Cut out.
7. Tape the saran wrap and paper to each other, leaving one side open, making a sort of envelope.
8. Have the students place different colored pieces of paper inside the envelope; make sure not to use too many pieces. They should have room to move.
9. Tape the rest of the white paper and saran wrap together, closing the envelope.
10. Tape the new base onto the container.
11. Point the thin white paper base towards the light and spin the container.
12. The mirrors reflect the shapes of the colored piece of paper and make new pattern.

Taken from: "Make a Kaleidoscope." (Online) Available.
http://www.town4kids.com/town4kids/science/explore/kalei.htm, Oct. 10, 2002.

Light Quiz

This quiz is meant to be taken at the end of all the activities. It requires the use of "light vocabulary" unless the students are already comfortable with the terms. Rather than using this quiz as strictly an exam, the leader could always set up a Jeopardy game or hold an individual or group contest in the classroom.

Name:______________________

1. How does light travel?
   a. In groups of ten
   b. In waves
   c. By bus

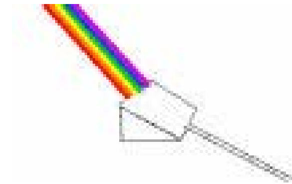
2. What do we call light we can see?
   a. The wave gang
   b. The periodic table
   c. The electromagnetic spectrum

3. What do we call light we can see?
   a. An optical cluster
   b. The visible spectrum
   c. The occulary photonic fraternity

4. How many colors are usually named in the visible spectrum of light?
   a. 5
   b. 6
   c. 7

5. Which of these is easiest for humans to see?
   a. White light
   b. X-rays
   c. Gamma rays

6. What is it called when white light passes through a slit and spreads into colors?
    a. Diffraction
    b. Reflection
    c. Rejection



7. Our atmosphere scatters blue light. What is a direct result of this?
    a. Daylight saving time
    b. Our hair grows
    c. The sky looks blue

8. Which color has the shortest wavelength?
    a. Red
    b. Orange
    c. Violet

9. Which of these is most closely related to a rainbow?
    a. Lasers
    b. The colors you see in an old roast beef
    c. The force

10. When is the best time to see a rainbow?
    a. After a rainstorm
    b. Underwater
    c. In the basement

11. What's really at the end of a rainbow?
    a. Lucky charms
    b. A pot of gold
    c. Nothing, it's refracted light