

# Vocabulary

- Color:** The quality of an object or substance with respect to light reflected by the object, usually determined visually by measurement of hue, saturation, and brightness of the reflected light.
- Perception:** The act of apprehending by means of the senses or of the mind; cognition or understanding.
- Light:** Something that makes things visible or affords illumination; electromagnetic energy to which the eyes react.
- Pigment:** A colored substance that when added to a liquid becomes paint, ink, etc.
- Medium:** A specific kind of artistic technique or means of expression as determined by the materials used or the creative methods involved: *the medium of lithography*. The materials used in a specific artistic technique: *oils as a medium*.
- Media:** The plural of medium

# Pre-Visit Activity: ART TALK

Please view the two reproductions with your class and lead a discussion using the following questions as guidelines. There are no “right” answers. The questions are meant to guide the group discussion. Students will revisit and discuss the original works at BAM. The vocabulary in this packet will aid discussion.

Research and experience have shown that students feel more comfortable when they can connect with something familiar once they arrive at the Museum. The students are excited to find “their” works of art while they are at BAM. They enjoy sharing their insights from the classroom discussion with the docent and making valuable comparisons between the textbook-like reproductions and the original works of art.

## Painting with Light and Color

Artist Stephen Knapp creates *lightpaintings* using light and glass to reflect and refract light on the walls of buildings. In this tour, students will view Knapp’s *lightpaintings* and learn about the scientific and artistic process of using light as a medium for artwork. Students will compare and contrast Knapp’s work with artwork from BAM’s Permanent Collection, learn about the properties of light and color, and understand how artists use shadow to create works of art. Students will discuss perception and explore the science of light and color before experimenting with colorful materials and light in the studios.

Stephen Knapp

***What Isn’t Is***, 2009

light, glass, stainless steel

Courtesy of the Artist

- What do you think this artwork is made out of? How can you tell?

Artist Stephen Knapp calls the type of artwork he makes *lightpaintings*.

- What does the word *lightpainting* tell you about the artwork or how it was made?
- Where do you think the light is coming from?

To make his *lightpaintings*, the artist uses special pieces of glass attached to the wall and shines one light through them. When the light passes through the special type of glass, it separates the white light into several colors or reflects specific colors of light.

- What colors are being reflected onto the wall? What shapes?
- Do you think the artist planned to have certain colors reflect onto the wall? Why or why not?
- What happens to the colors when they overlap?
- What do you notice about the shadows in the artwork?
- Why do you think the artist wanted the shadow to look like a frame?

Mark Wethli

***Morning***, 1991

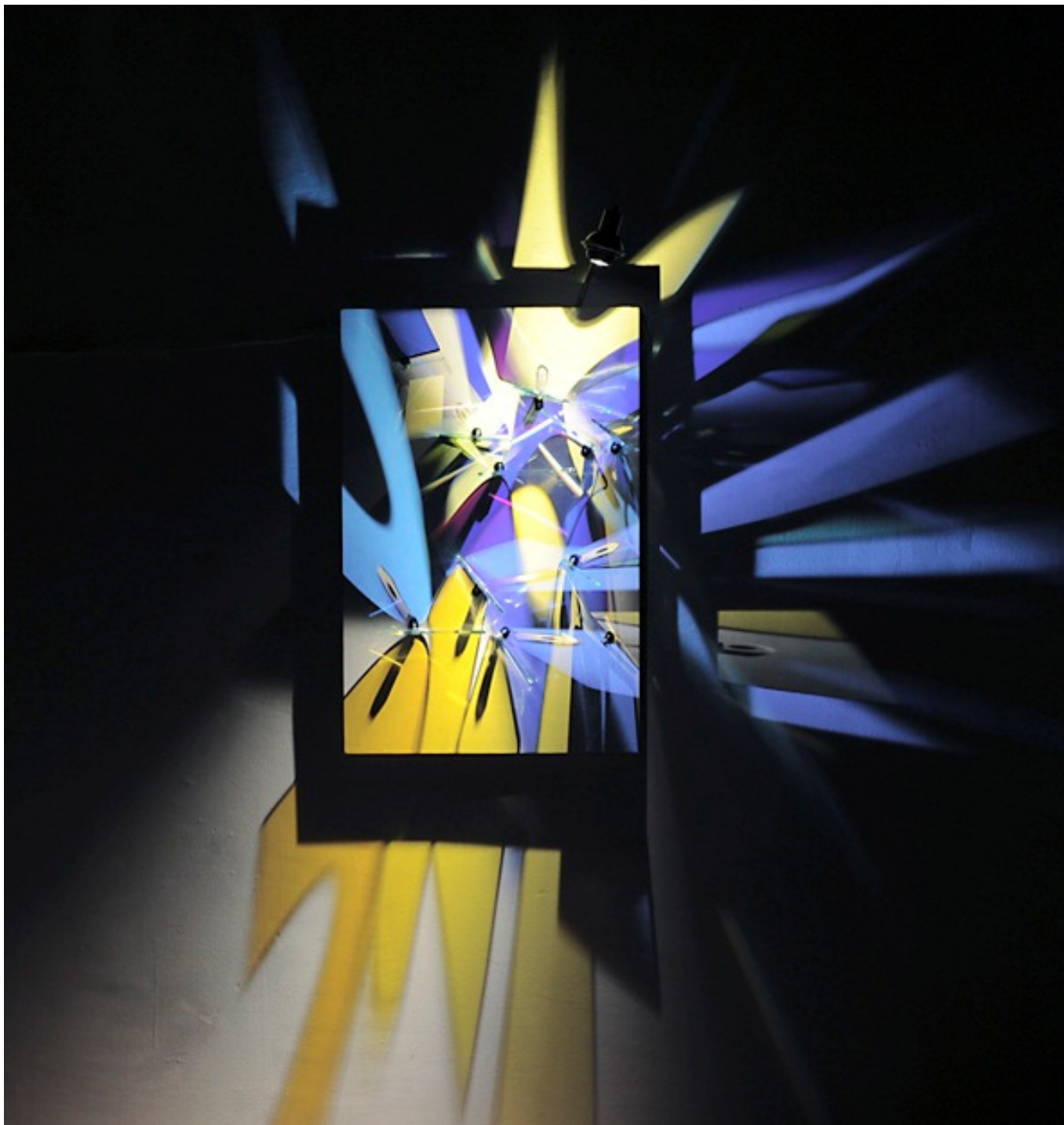
oil on canvas

Gift of M. Gary Bettis

- What do you notice about the artwork?
- What kind of place do you think this is?
- Where is the light coming from? How can you tell?
- How is artwork different from the one we just looked at? How is it similar?
- What do you notice about the shadows? How would they change if the curtains in the window were open?
- What time of day do you think it is?
- How would light change if it was a different time of day?

The two images may also be accessed through our website, [www.boiseartmuseum.org](http://www.boiseartmuseum.org)  
under Education – Teacher Resources – Pre-Tour Teaching Packets – PAINTING WITH LIGHT AND COLO

## Pre-Tour Image



Stephen Knapp  
***What Isn't Is***, 2009  
light, glass, stainless steel  
Courtesy of the Artist

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Mark Wethli  
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# Curricular Connections

## *Constructing Curriculum with Painting with Light and Color*

### **Social Studies, History, Geography**

- Have students research colors and their symbolic meanings in cultures around the world. Have students identify the geographic location of these cultures on a world map in the classroom. Have students share their research project in a visual presentation or paper discussing what they learned.
- Have students discuss the history of pigments and dyes. Students can also research the history of pigments in artwork. Visit the following website for an interactive timeline and history of pigments: <http://www.webexhibits.org/pigments/index.html>.
- Discuss the role of color as it applies to clothing, gender and cultural or traditional events. Ask students to consider questions about the social and symbolic roles of color such as why girls are associated with pink and boys with blue or why wedding dresses are traditionally white. Have students also learn about how color relationships change between various cultures and countries. Discuss how students' perceptions would change if color associated with certain events or roles are changed. Hold up images of people in different societal roles dressed in the traditional colors they are associated with in our culture, and then hold up the same image with the clothing now changed to a different color. For example, the color of a judge's robes could switch from black to red. Ask students to record their ideas about the person's role in society as the color of their clothing changes.
- Have students research the history of color theory and the color wheel. Make a short timeline showing the origins of color theory and how artists and designers use color theory today.
- Have students research how quality of light is affected in different weather conditions (fog, sun, haze, etc.) and geographic locations.

### **Reading and Writing**

- Discuss how color can be used to express mood or emotion. Ask students to select a color and write a poem that describes the emotion or mood of the color they selected. Each student should make a list of words associated with their color and use these words to write a poem. Students can wear their color to class and recite their poem aloud.
- Stephen Knapp's *lightpaintings* rely on our perception of light through sight. Discuss the five senses: touch, taste, sound, smell and sight. Ask students to choose which of these senses they feel is the most important. Then, have students choose which of these senses they feel is the least important. Students can write a paragraph supporting their opinions about the most and least important sense. Challenge students to write from the perspective of a person who does not have one of the senses. What would life be like without one of the five senses? What activities would be more challenging? How could they overcome these challenges?
- Stephen Knapp created a site-specific installation for the Boise Art Museum, but has also created artwork for outdoor and public spaces. Have students choose and research a local public artwork and have them write questions for an imaginary interview with the artist.
- Have students write a haiku or poem describing a specific color. See if other students can identify the correct color after listening to the short poem.

## Math

- Have students explore the geometry of a refracting prism. Visit the following website for an explanation of dispersion and prisms: <http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/prism.html>
- Stephen Knapp's *lightpaintings* can be considered both two-dimensional and three-dimensional as light is reflected onto a flat surface and pieces of glass are attached to the wall. Have students discuss the difference between two-dimensional and three-dimensional works of art and explore dimension by studying and comparing lines, planes, and forms.
- Compare and contrast wavelengths of sound and light. Have students draw the wavelengths of different sounds and measure the length between the tips of the wavelengths. Similarly, have students draw the wavelengths of the colors in the rainbow, or ROYGBIV, after discussing the visible spectrum. Students can determine how the length of the wavelength correlates to the type of sound or color of light. For more resources including a worksheet for students to fill out, visit the following website for a lesson plan involving frequency and ROYGBIV from NASA: <http://imagine.gsfc.nasa.gov/docs/teachers/lessons/roygbiv/roygbiv.html>

## Science and Physics

- Have students experiment with light, shadow and time. Students can learn about how the shadow cast from the sun tells us what time it is by tracking the shadow cast from a stick in the ground outside. (It must be sunny outside and a clear sky is ideal so that clouds do not interfere with the shadow). Students can trace or measure the movement of the cast shadow each hour and record the change.
- Have students learn about the optical relationship between light and color. Explain that what we see as color is the refraction and reflection of light. Have students experiment with how light is bent, reflected or refracted when cast through water, glass, prisms, mirrors and other materials that demonstrate these principles. Visit the following website for a step-by-step lesson plan: [http://www.teachengineering.org/view\\_lesson.php?url=http://www.teachengineering.org/collection/cub/lessons/cub\\_soundandlight/cub\\_soundandlight\\_lesson6.xml](http://www.teachengineering.org/view_lesson.php?url=http://www.teachengineering.org/collection/cub/lessons/cub_soundandlight/cub_soundandlight_lesson6.xml). Students can also learn about sight and perception by making a model of the eye, complete with lenses, cones and rods.
- Discuss the difference between light waves and sound waves. Have students experiment with both types of waves. Then, discuss how waves travel through a variety of materials. What are soundproof walls made from and how do they absorb sound? What material would absorb light? Assign a different material to each student and have them experiment with the effects of light and sound on this material.
- Explore light and color by having students create a kaleidoscope using recycled materials.
- Discuss the chemistry involved in the creation of pigments and dyes. Use the following lesson plans with high school students to experiment with chemistry and color mixing with pigment and light: [http://www.artic.edu/aic/education/sciarttech/global\\_pages/g1.3.html](http://www.artic.edu/aic/education/sciarttech/global_pages/g1.3.html) and [http://www.artic.edu/aic/education/sciarttech/global\\_pages/g1.4.html](http://www.artic.edu/aic/education/sciarttech/global_pages/g1.4.html).
- Stephen Knapp uses a special type of glass that contains dichroic filters in his *lightpaintings*. Discuss the meaning of the term “dichroic”, which originates from “di” meaning “two”, and “chroic”, related to “chroma” or “color”. Have students learn about how dichroic filters allow only certain colors of light to pass through and reflect other colors.

## Technology

- Students can explore the chemical makeup of glass and answer the following questions: How is glass manufactured? How is glass created in nature?
- Discuss how technological advances have allowed scientists to break the sound barrier and compare this to the technology that would be needed to travel faster than the speed of light. What would it take for a human to travel faster than the speed of light? Have students research this

question and determine whether they think it is possible. If so, students should answer how long they think it will be before humans are able to achieve this feat. If not, students should explain why they came to this conclusion.

- Have students research the history of lighting and lamps. Students can explore and discuss the various technological inventions that were necessary to establish modern lighting. Visit the following website for more information:  
[http://inventors.about.com/od/Istartinventions/a/lighting\\_2.htm](http://inventors.about.com/od/Istartinventions/a/lighting_2.htm)
- Discuss the difference between convex and concave lenses. Have students create a list of items that use different types of lenses. Some examples might include a camera, glasses or magnifying glasses. Have students divide into small groups and choose one of these items. Each group can list the various ways we use the specific item, an explanation of why their item is important and what life would be like without it. Students can also create a timeline showing the history of item and how it has developed and been used in modern science.

## **Arts**

- Discuss color theory in art and have students create their own color wheel. Have students practice mixing colored pigments using paint or watercolors.
- Discuss lighting and architecture. Have students consider how lighting affects the look of a room, and how curators and people who work in art galleries arrange artwork and lighting. Students can make a drawing that shows how they would arrange lighting to illuminate works of art based on the angle of the light and physical placement of the object. Discuss the challenges involved in working with light, architectural spaces and artwork.
- Have students explore the history of shadow plays and shadow puppets in theatre. Students can write a short play individually or working together in groups and act it out using shadow puppets.
- Have students view examples of mosaics and stained glass and discuss how both art forms use light and color. Have students create their own mosaic using colored pieces of tile or ceramic and plaster or a stained glass artwork using different colored tissue paper.

## **Related Web Sites**

### ***For Teachers***

<http://www.stephenknapp.com/> - Artist Stephen Knapp's official website with images of his work, an artist biography and articles.

<http://www.crayola.com/lesson-plans/detail/color-kaleidoscopes-lesson-plan/> - A lesson plan for students to make kaleidoscopes and learn about visual perception.

<http://www.learner.org/teacherslab/science/light/> - Resources and lesson plans for teaching about light and color.

<http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Optics.Guide.html> - Educator Guide from NASA that contains color and light activities.

<http://www.nga.gov/education/schoolarts/matisse.shtm> - An explanation of how artists such as Matisse and Seurat use color and light in their artwork.

[http://www.practicalphysics.org/go/AllExperiments.html?get\\_all=true](http://www.practicalphysics.org/go/AllExperiments.html?get_all=true) - Classroom science experiments relating to light and similar topics.

<http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/prism.html>- A website that presents the physics behind prisms.

<http://www.artic.edu/aic/education/sciarttech/index.html> - A course entitled *Art, Science and Technology* offered to public school science teachers from the Art Institute of Chicago, featuring lesson plans, videos and resources that relate art to chemistry, earth science and physics curricula.

### ***For Teachers and Kids***

<http://tlc.howstuffworks.com/family/science-projects-for-kids-spectrum-of-colors.htm> - TLC Family's Science Projects for Kids website that includes lesson plans for interactive learning experiences about color and light.

<http://www.fi.edu/color/color.html> - The Franklin Institute's resources for learning about light and color with easy-to-understand definitions and explanations of scientific terms.

[http://www.exploratorium.edu/exhibits/mix\\_n\\_match/](http://www.exploratorium.edu/exhibits/mix_n_match/) - An interactive game that demonstrates how colors in light are mixed.

[http://pbskids.org/curiousgeorge/games/mix\\_and\\_paint/mix\\_and\\_paint.html](http://pbskids.org/curiousgeorge/games/mix_and_paint/mix_and_paint.html) - An interactive game for younger children to mix paint colors and fill in pictures.

[http://www.zefrank.com/dtoy\\_vs\\_byokal/](http://www.zefrank.com/dtoy_vs_byokal/) - An interactive game for children to create their own virtual kaleidoscope.

[http://inventors.about.com/od/lstartinventions/a/lighting\\_2.htm](http://inventors.about.com/od/lstartinventions/a/lighting_2.htm)- Detailed timeline of the history of lighting and lamps.

[http://www.practicalphysics.org/go/Experiment\\_124.html](http://www.practicalphysics.org/go/Experiment_124.html) - Demonstration on how to measure the wavelength of light.

<http://www.webexhibits.org/pigments/index.html> - An interactive timeline about the history of pigments and colored media used by artists.

# Post-Visit Activity: MAKE IT!

## *Painting with Light and Color*

*To extend the museum experience  
and connect the tour to your curriculum,  
consider using or adapting this lesson plan suggestion.*

### Color and Light in Painting

#### Introduction

In this Make-It Activity, students will create a painting using basic principles of color-mixing and value to express qualities of light and color.

#### Materials

White, black, red, blue and yellow acrylic or watercolor paint

Paint brushes

Palette

Paper, canvas or other surface for painting

A lamp or other primary light source

Objects for still life (can be found objects or geometric shapes such as a sphere, cube or cone)

#### Instructions

- Explain to students that they will be making their own painting using the primary colors, red, blue and yellow. Have students experiment with mixing these paint colors on a piece of paper or blank surface. As a group, discuss color mixing: red and yellow make orange, blue and yellow make green and red and blue make purple. Additional colors can be made by making various combinations of red, yellow and blue with orange, green and purple.
- Arrange a group of objects as a still life in the center of the classroom and shine a light source over top or from a particular angle at the objects. Any overhead classroom lights or other sources of light should be turned off or minimized as much as possible for best results. Let students choose a place in the classroom from which to view the objects and make their artwork.
- To begin, give each student a large piece of paper, canvas or other surface for their painting. Have students lightly sketch the still life on their surface using pencil.
- Once students have completed their sketch, give each student a palette with a small amount of white, black, red, blue and yellow paint. Students can mix the primary colors of paint on their palettes to make the colors they need for their painting. To add darker values, students can use black to mix darker shades of color. For lighter values, students can mix lighter shades of color using white. Students can experiment with finding the exact shades they need on their palettes.
- As students paint, ask them to consider the light source on the objects they are painting. Is the light shining on the objects from above, below or from a different angle? Where does the light fall on the objects from their perspective? (This will change depending on where they are seated in the classroom). Remind students to consider the shadows created by objects. Students should incorporate highlights and shadows according to where the light source falls upon the objects.
- To finish, have students add any remaining colors needed so that the entire sheet of paper, canvas or surface they are painting is filled. Let the students' paintings dry completely before displaying them in the classroom.

## **Project Applications and Extensions**

### ***Social Studies, History, Geography***

- Have students research artists throughout history who have explored color theory and/or use of light or value in their work. Examples may include artists from the past such as Caravaggio and Seurat. Students can select an artist, and write a biography about their selected artist, describe how they explored color in their artwork and find images of their artwork that show examples of this. Students can also take into consideration the dates in which the artist lived and how the artwork of the particular artist's time was influenced by other artists, scientists or society.

### ***Reading and Writing***

- Discuss the various definitions of the word perspective in relation to literature. Use books read in class as examples and have students determine which perspective the author has told the story from. Have students practice writing short stories from various perspectives.
- Have students practice descriptive writing in relation to color. Students can begin by choosing a color and describing objects or things that are the same color without revealing its name. For example, if a student selects red they can describe objects such as apples, fire trucks or other objects that are typically that color without mentioning the word "red". Students can also write a poem about a color or assign names that describe various shades of color from paint samples, for example, "cinnamon" or "honeydew".

### ***Math***

- Display the students' paintings in one large group and have students try and guess which angle their classmates were viewing the still life from. Have students find the place they were sitting in the classroom relative to the still life. Have one student represent a ninety degree angle. Students can measure the approximate angle at which they are sitting from the student who is ninety degrees from the still life.
- Discuss perspective in relation to the students' paintings. Ask students to consider how the distance from the object and angle at which they sat affected their perspective. Have students determine where the horizon line would be located on their painting. Students can make another drawing that shows one-point or two-point perspective. Visit the following website for a definition of terms and basic principles of perspective drawing: <http://www.homeschoolarts.com/per-l1-1.htm>

### ***Science and Physics***

- Have students research how we perceive, or see, objects as certain colors. Discuss the meaning of terms such as reflection, absorption and refraction and how they relate to the color of objects.
- Compile a list of objects and have students categorize them according to how they are effected by light.

### ***Technology***

- Explore how color theory is used in web design. Have students find educational websites or websites relating to a specific topic they are studying in class and compare and contrast how color is used in the design of the website.
- As a class, discuss the different types of artificial light, such as LED lights, glow sticks, incandescent and fluorescent light bulbs, and research how these sources of light were invented, how they have changed over time, and how they are used.

### ***Arts***

- Have students make their own color wheel showing primary, secondary and tertiary colors.
- Have students choose a color and compose or select a short piece of music that they feel reflects the emotion or mood of their chosen color. Students can play their piece of music and have their classmates guess the color associated with it.

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