

Muse®

Color Me Curious

Impressionist painter Claude Monet once proclaimed, “Color is my day-long obsession, joy and torment.”

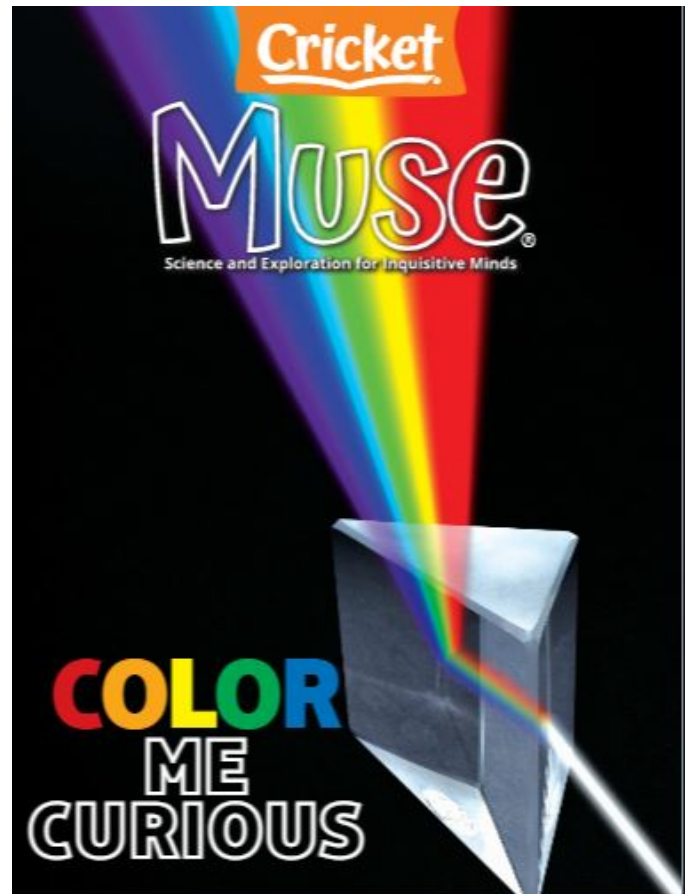
This month’s issue of MUSE is equally color-obsessed and full of information on the science of color and the palette of emotional responses colors can evoke.

CONVERSATION QUESTION

How does color enrich our world?

TEACHING OBJECTIVES

- Students will learn about the connection between light and color.
- Students will learn how a color created by accident has benefited science and the fashion industry.
- Students will learn about the perception of color.
- Students will construct explanations regarding the refraction and reflection of light.
- Students will examine problem-and-solution relationships.
- Students will classify information from a nonfiction text.
- Students will examine the relationship between science and poetry.
- Students will contribute a page to a class book that details accidental discoveries.
- Students will create a presentation that demonstrates how artists use color to communicate emotion.



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **Prying Colors Apart**
Expository Nonfiction, ~1150L
- **Miraculous Mauve**
Expository Nonfiction, ~1040L
- **Do You (Really) See Red?**
Expository Nonfiction, ~990L

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Prying Colors Apart

pp. 10–13, Expository Nonfiction

In 1665, English scientist Isaac Newton discovered that sunlight contains within it all the colors of the rainbow. Students will learn how this discovery led to our understanding of natural and synthetically produced colors.



RESOURCES

Constructing Explanations: Over the Rainbow

OBJECTIVES

- Students will learn about the connection between light and color.
- Students will construct explanations regarding the reflection and refraction of light.
- Students will examine the relationship between science and poetry.

KEY VOCABULARY

- **prism (p. 12)** a transparent glass or plastic object that usually has three sides and that separates the light that passes through it into different colors
- **pigment (p. 12)** a natural substance that gives color to animals and plants
- **extract (p. 13)** a substance you get by removing it from something else

ENGAGE

Conversation Question: How does color enrich our world?

Explain that in order to see a rainbow, you need two ingredients: sunlight and raindrops. Present a glass prism and tell students that raindrops act like tiny prisms. Allow students to observe that when sunlight passes through the prism, some of the light is bent (refracted) more than the other portions. Light leaving the prism spreads out to a continuous band of colors called a spectrum. Ask students to name all the colors on the spectrum (ROYGBIV). Then introduce the article.

INTRODUCE VOCABULARY

Present this as a *Jeopardy!*-style learning activity. Provide the class with only the definitions of the key vocabulary terms. Have them read and discuss. Inform students that they will revisit these definitions after reading and pose *Jeopardy!* questions using words from this vocabulary-rich article. (What is a **prism**? What is **pigment**? What is an **extract**?) Have them formulate 17 more answers needing questions, for a total of 20, and share with other classes as a post-reading activity.

READ & DISCUSS

Have students read the article and answer the questions below.

1. What did Isaac Newton discover about sunlight?
2. How do the colored rays of the spectrum differ from one another?
3. Where does the color we see come from?
4. What causes iridescent blues and greens in nature?
5. How did Tyrian purple become a status symbol in ancient Rome, Greece, and Phoenicia?

SKILL FOCUS: Constructing Explanations

INSTRUCT: Students will construct explanations that demonstrate their understanding of the dispersion of light. Have students work in pairs to reread the article and discuss the content. When they are feeling confident with the new material presented in the text, instruct them to complete the *Constructing Explanations: Over the Rainbow* graphic organizer individually. Then have partners compare their responses.

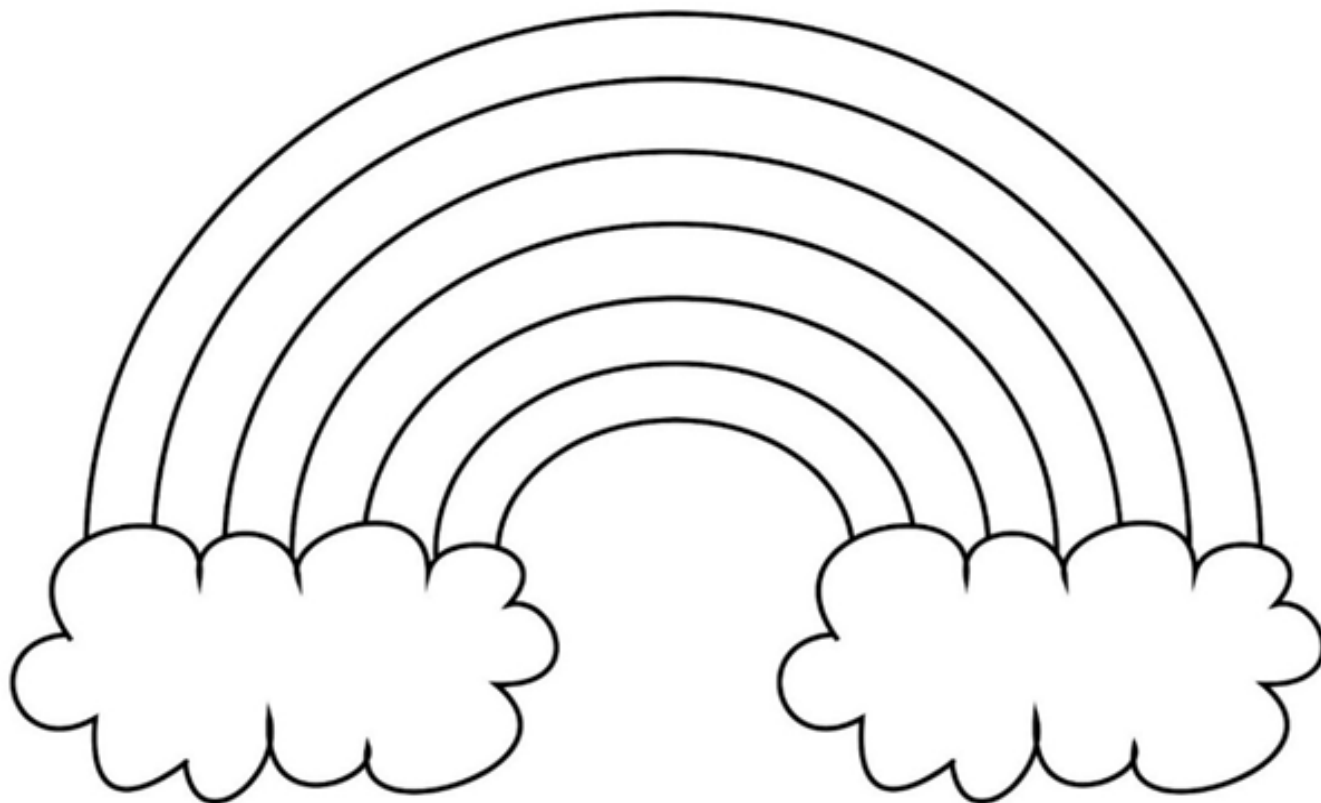
ASSESS: Collect the worksheet to assess individual understanding of the topic.

EXTEND

Poetry The article begins with a line of poetry from John Donne. Although many consider science and poetry to be opposites, some argue that science was born in poetry. Poetry was the first written way that societies addressed existential questions and universal insight. Science and poetry are also both saturated with metaphors (figures of speech that describe one thing by comparing it to another). Review phrases in which scientists use everyday expressions to explain their theories: brain as “computer,” genetic “blueprint.” Have students research the connection between science and poetry and write a three-line poem using metaphors to explain a specific scientific phenomenon.

Over the Rainbow

Construct Explanations Shade the arcs of the rainbow using the correct colors. Then explain how light is dispersed and what role it plays in creating the colors we see. Also explain why red has a bigger arc than violet. (Helpful words: *vibration, wavelength, reflection, refraction*)

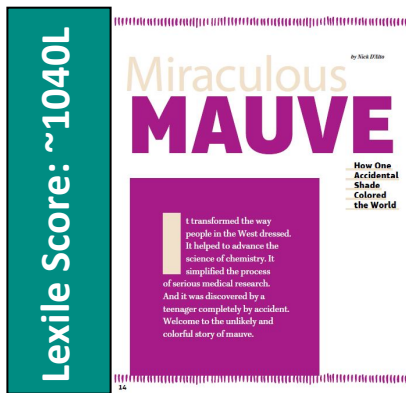


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Miraculous Mauve

pp. 14–17, Expository Nonfiction

This article details the particularly interesting discovery of the highly desired pale purple shade known as mauve. Students will gain an understanding of the chemistry involved in producing colors.



RESOURCES

Problems and Solutions: Color My World

OBJECTIVES

- Students will learn how a color created by accident has benefited science and the fashion industry.
- Students will examine problem-and-solution relationships.
- Students will contribute a page to a class book that details accidental discoveries.

KEY VOCABULARY

- **mauve** (p. 14) a light or medium purple color
- **chemistry** (p. 14) a science that deals with the structure and properties of substances and with the changes they go through

ENGAGE

Conversation Question: How does color enrich our world?

Generate interest in the topic by combining color words and alliteration. Have students supply an alliterative adjective before each primary color. For example, *raging red*. Then, encourage students to list less-conventional colors, such as *terrific tangerine*. Give the class five minutes to brainstorm as many alliterative color phrases as they can. Invite students to share. Then introduce “Marvelous Mauve.”

INTRODUCE VOCABULARY

Post the key terms and discuss the definitions. Then display the following questions and have students supply the correct answers:

1. Where would you be most likely to see the color mauve in nature?
a) desert b) sunset c) tundra d) rainforest
2. What would a chemist be most likely to study?
a) Venus b) Indian Ocean c) zinc d) life cycle of a butterfly

Students must support their reasoning and explain how they eliminated the other choices.

READ & DISCUSS

Have students read the article and answer the questions below.

1. What was the relationship between Perkin and von Hofmann?
2. What were Perkin and von Hofmann trying to accomplish?
3. What was Perkin’s “happy accident”?
4. What was “mauve mania”?
5. What scientific breakthroughs did Perkin help facilitate?
6. To whom is the Perkin Medal awarded?

SKILL FOCUS: Problems and Solutions

INSTRUCT: Inform students that they will be working in pairs to reread the article and highlight passages that explain how solutions that were developed to solve specific problems also led to accidental discoveries. Distribute copies of the *Problems and Solutions: Color My World* worksheet. Review the activity directions with students. Then have students continue to work in pairs to complete the worksheet.

ASSESS: Have partners get together with other pairs to compare and evaluate responses.

EXTEND

Science Many of the world’s most important discoveries involved a combination of knowledge and accident. Inform students that penicillin, an important antibiotic, was discovered accidentally when a scientist noticed a mold growth in the Petri dishes in his lab. Have students research an accidental discovery and create a page for a class book titled *Happy Accidents*. Each page should include the name of the scientist who made the discovery, what the scientist was trying to do when the accidental discovery occurred, details about the resulting discovery and its benefits, and an illustration.

Color My World

Problems and Solutions Read the statements and explain why they were the source of problems at the time. Then record the solutions. Include any accidental discoveries that occurred as a result of the research.

Statement: The only medicine available during the 19th century to treat malaria was quinine. (p. 16)

Why was this a **problem**?

Explain the **solutions** to the problem and the accidental discoveries they led to.

Statement: Dyes used to color fabrics all relied on natural materials. (p. 16)

Why was this a **problem**?

Explain the **solutions** to the problem and the accidental discoveries they led to.

Statement: Blue is especially hard to make because it is a rare color in nature. (p. 17)

Why was this a **problem**?

Explain the **solutions** to the problem and accidental discoveries they led to.

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Do You (Really) See Red?

pp. 39–41, Expository Nonfiction

Figuratively and literally, our world is alive with color. This article explores our emotional and cultural responses to color and explains the difficulties of validating the science of color psychology.



RESOURCES

Classifying Information: True Colors

OBJECTIVES

- Students will learn about the perception of color.
- Students will classify information from a nonfiction text.
- Students will create a presentation that demonstrates how artists use color to communicate emotion.

KEY VOCABULARY

- **repulse** (p. 39) to cause dislike or disgust in someone
- **emotional response** (p. 40) an emotional reaction, such as happiness or fear, to a given stimulus

ENGAGE

Conversation Question: How does color enrich our world?

Post these two sentences on the board: *I'm feeling blue. I'm seeing red.* Ask students to discuss the meanings of the color words in these sentences. Then ask them what emotions they associate with green and black. Present the article “Do We (Really) See Red?” and tell students they will learn about the connection between colors and emotions.

INTRODUCE VOCABULARY

Post and discuss the key terms and their definitions. Guide students to contribute to a collective list of emotional responses. According to experts, there are seven emotional expressions universal to people all over the world: happiness, sadness, surprise, fear, anger, disgust, and contempt. All other emotions are variations of these. Which emotional response is directly related to the word *repulse*? Invite students to share a time when they felt repulsed. What caused this emotion?

READ & DISCUSS

Reinforce comprehension of the concepts in the article by using the following prompts to direct discussion.

1. How do we perceive color?
2. Explain how the following professionals use color: artists, advertisers, interior decorators, fashion designers.
3. Why is it difficult to conduct legitimate color research?
4. What caused stronger emotional responses than basic color?
5. Explain the results of the Xavier University study that gave children the choice between standard- or fluorescent-colored toys?
6. How do appropriate color choices for certain situations vary among cultures?

SKILL FOCUS: Classifying Information

INSTRUCT: Elicit from students that the main idea of the article is to provide readers with information about the psychology, culture, and the use of color. Present the *Classifying Information: True Colors* worksheet and tell students that they will be matching color words and categorizing the hues. Have them try to correctly match the color words with the emotions and classify colors *without* referring to the article.

ASSESS: After students have completed the worksheet, have them use the display on article page 41 to check their responses. How many items did students match correctly using descriptions alone?

EXTEND

Art The article explains that Pablo Picasso created dark, blue-toned paintings to convey his deep sadness after the death of a friend. Many famous artists exhibit an instinctive understanding of the emotional properties of color. Van Gogh used warm yellows to create an energetic image that radiates feelings of joy in “Sunflowers.” Have students choose any artwork and create a simple presentation discussing how the artist used color to communicate an emotion or create a mood.

True Colors

Classifying Information Match the description on the right with the correct color on the left.

- | | |
|---------------------|---|
| 1. _____ white | A. creativity, royalty, mystery, wealth |
| 2. _____ yellow | B. passion, love, anger, danger |
| 3. _____ orange | C. professional, serious, mature, conservative |
| 4. _____ red | D. sophisticated, mysterious, power, luxury |
| 5. _____ pink | E. happiness, cheerfulness, spontaneity, hope |
| 6. _____ brown | F. communication, compassion, fresh |
| 7. _____ black | G. femininity, romance, tenderness, sensitivity |
| 8. _____ purple | H. innocence, purity, sterility, light |
| 9. _____ blue | I. calmness, spirituality, security, sadness |
| 10. _____ turquoise | J. nature, wistful, genuineness, trust |
| 11. _____ green | K. vitality, enthusiasm, friendship, energy |
| 12. _____ gray | L. calming, refreshing, nature, relaxing |

Classify the colors listed above as either *warm* or *cool* by writing them in the chart below.

WARM	COOL