

LUMINOUS

Teacher's Guide



Title: *Luminous: Living Things That Light Up the Night*

Author-Illustrator: Julia Kuo

Genre: Juvenile nonfiction

Themes: bioluminescence, predators and prey, biodiversity, pausing to observe nature, light energy, natural and human-made light, light pollution

Suitable for: Ages 4–8, Grades K–3

Common Core Standards:

English Language Arts

College and Career Readiness Anchor Standards for Reading, Writing, and Speaking and Listening; Reading Standards for Literature and Informational Text

R.CCR.1, 2, 4, 7

RL.1.5

RI.K.5; RI.K.6; RI.1.6; RI.2.6; RI.3.5

W.CCR.2, 4, 7, 8

SL.CCR.1, 4, 6

Skills and Competencies:

asking questions

making connections

using sidebars

predicting

observing

using a chart to take notes

inferring

researching a topic

determining the main theme of a book

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Book Summary

Luminous is a poetic exploration of bioluminescence, the light made from living things, and its many forms—including in fireflies and foxfire, fungi and glowworms, deep-sea fish and vampire squids. Julia Kuo's stunning art portrays a young child and adult discovering this natural phenomenon. With simple lyrical text and informative sidebars, this story will introduce readers young and old to science and nature and shines light upon how truly wondrous the world is.





About the Author-Illustrator

Julia Kuo is a Taiwanese-American author-illustrator who has worked with the *New York Times*, the *Wall Street Journal*, and *Science Friday* and has taught illustration courses at Columbia College Chicago and at her alma mater, Washington University in St. Louis. She's illustrated Livia Blackburne's *I Dream of Popo*, Martha Brockenbrough and Grace Lin's *I Am an American: The Wong Kim Ark Story*, and Katrina Goldsaito's *The Sound of Silence*, among others. Julia lives in Seattle, Washington. She has encountered foxfire in Taroko Gorge, looked up at glowworms in the caves of Te Anau, and kayaked through the bioluminescent waters of Point Reyes National Seashore.

A Note from the Author-Illustrator

Dear Reader,

The phenomenon of bioluminescence has intrigued me ever since I saw glowworms in New Zealand. I felt like my eyes were deceiving me. Was I sitting under a vast and starry sky, or was I looking at insect larvae dangling from a cave's ceiling? I wasn't the only one confused; this sticky illusion traps moths and other insects attracted by the light.

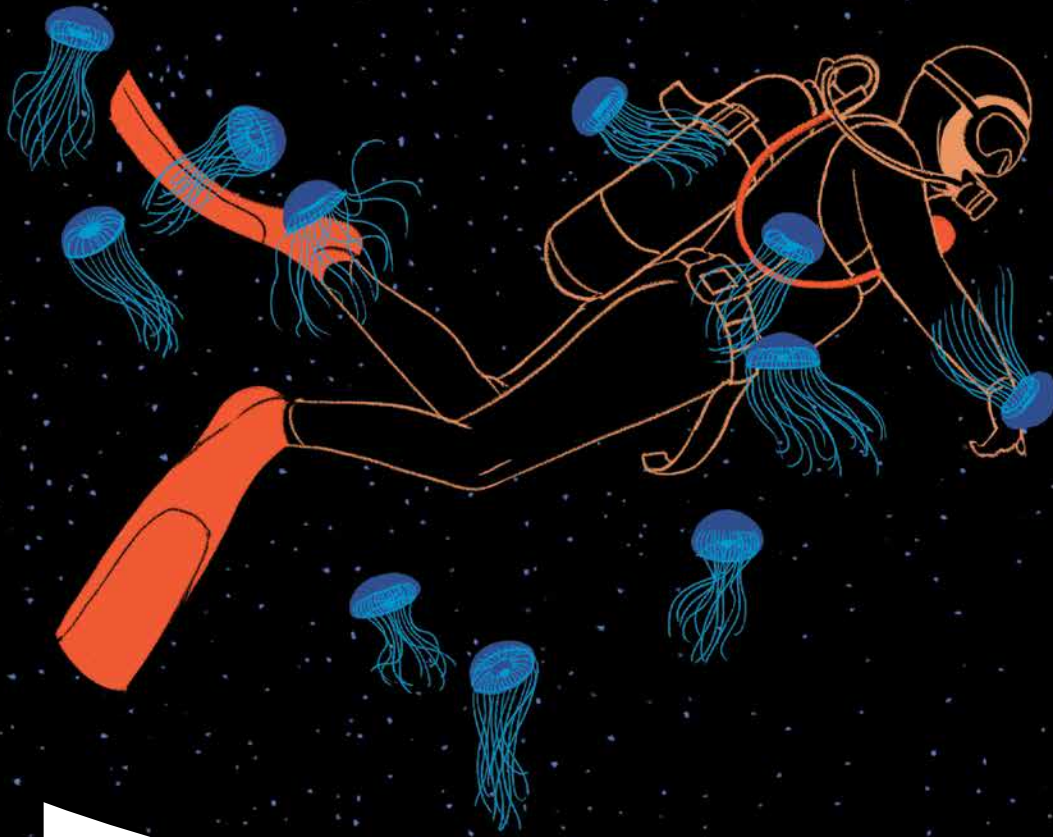
I've since met others also captivated by bioluminescence. Together, we have kayaked among dinoflagellates, marveled over fireflies and foxfire, and now I have even created this book! I am so happy to have shared a bit of this luminous magic with you.

Many bioluminescent organisms produce blue-green light, so this book uses blue-green ink to indicate bioluminescence for almost all the organisms mentioned. In reality, bioluminescence can appear in other colors, such as green, red, and yellow.

I wonder what you might glimpse yourself, when it's dark out!

Enjoy,

Julia








About This Guide

This teacher guide was created by Becky Noelle, an experienced elementary teacher with a bachelor of science specializing in marine biology. Use this guide to help your students fully engage with the book and take time to notice the wondrous world around them.

BEFORE READING

Introducing *Luminous*

Show the class the cover of the book and flip through the pages, so they can get a sense of the illustrations. Ask students the questions below, using the vocabulary that's best for your class. For example, if your students are familiar with the term "illustrations" (or you would like them to become familiar with it), then replace "pictures" in the questions below with "illustrations." Additional teacher directions are included in parentheses after the questions.




-  What do you see in the pictures?
-  How do the pictures make you feel? (Guide students to consider elements like color, light, shading, and shape that affect the mood of the illustrations.)
-  What do you think this book might be about?
-  Do you think this is a fiction or a nonfiction book? How do you know? (Again, use the terms your students are most familiar with. For example, they may be more familiar with "story" versus "information" book, rather than "fiction" and "nonfiction.")
-  How can I find out who the author and illustrator of this book are? (Prompt students to look at the cover and first few pages of the book to find out. This book has an author-illustrator, meaning she created both the words and the pictures.)

Preparing to Learn

Have students draw a Know-Wonder-Learn (KWL) chart in their personal notebooks, or print copies of the template on page 20 of this guide for students to use.

In the first column, have students draw or write what they already know about light. Encourage students to be as specific as they can. For example, if they know of specific animals or plants that produce their own light or the purposes of different light sources, they can list those in the first column of their chart.

Then, have students write questions they have about light in the second column of the chart. Use illustrations from the book to help prompt student questions. Guide students to formulate a variety of types of questions that may have complex answers (i.e., avoiding questions that can be easily answered with “yes” or “no”). Use the question starters below to help:

-  What can...?
-  Why might...?
-  How does...?

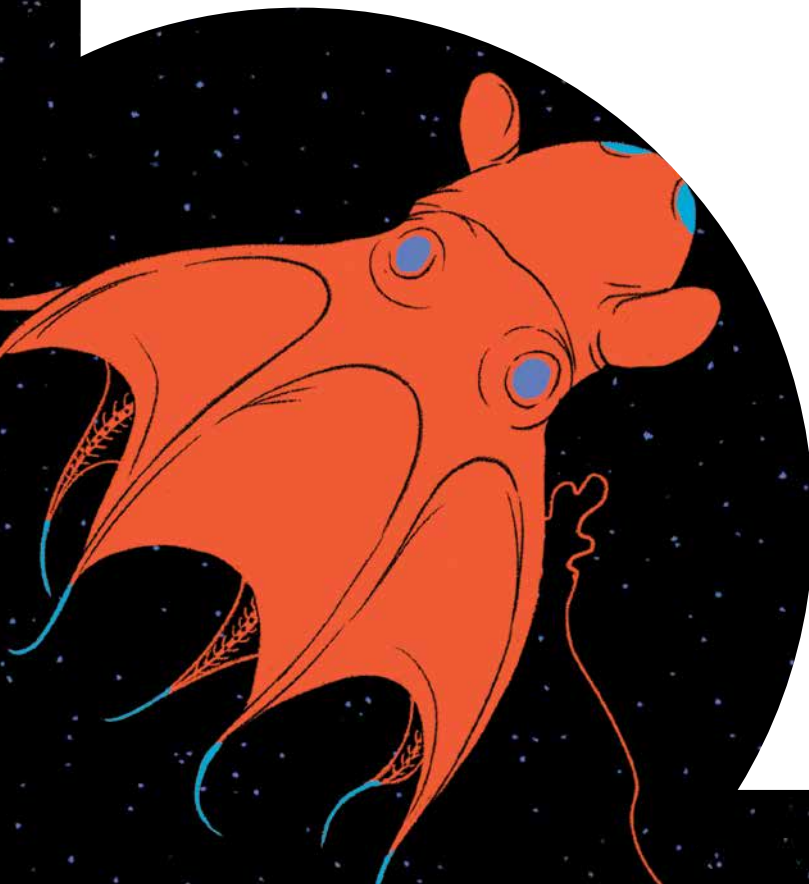
After students fill out the first two columns in their KWL chart, you could have them share what they wrote with a partner. They might learn something new or discover more questions that they’re wondering about as well.

NOTE: Depending on the age and level of understanding of your class, you may want to make the KWL chart more specific to bioluminescence rather than light in general.

Using the Sidebars

Although this book has fictional elements, it also includes a nonfiction text feature called sidebars. Sidebars are used to give additional facts about the topics in the book. Show students the two different kinds of text used on the page and discuss the purpose of each kind. As you read, you can choose to read the story all the way through, only reading the main text and then revisiting the sidebars on a second pass through the book. Or, you can read both the main text and the sidebars on each page as you go through the book for the first time.




Discuss as a class why the author might have chosen to include sidebars in this book.



DURING READING

Looking Closely at the Illustrations

The illustrations in this book include many details, showing the diverse creatures that live in the ocean and on land. As you read the book to the class, pause on certain illustrations, and have students look closely at the picture to see what they notice. Use the questions below that are relevant to the illustration you are discussing.

-  What do you see in this picture?
-  Do you know what kind of creature this is?
(Point at a specific creature on the page.)
-  Have you seen an animal like this before? Where? (Help students make connections either to animals they've seen in real life or animals they've seen in movies and books. For example, students may recognize the deep-sea anglerfish from the movie *Finding Nemo*.)

Note: You could revisit the discussion about illustrations after reading the author-illustrator note on page 6 of this guide. Ask students why the author-illustrator may have chosen to use only blue-green ink to show the bioluminescence when it can come in a number of different colors.



Learning New Words

This book uses some descriptive words that students may not understand. As you read the book to the class, discuss any words that may be unfamiliar to students. The list below includes a few words used in the book that you may want to define. Students can also add words to a personal or class list as you read the book. Then, they can look up the words after the story is finished.

astronauts	disrupted	lure
backbone	distract	one-celled
biodiversity	disturbed	predators
burglar alarm	energy	prey
camouflage	extraordinary	produces
chemical reactions	fungi	shimmer
coordinate	gleam	shine
creature	gradually	sparkle
dangle	human-made	species
dazzle	insects	startle
discovered	luminous	unique

The author uses a number of words throughout the book related to light. Have students identify the words from the list above that are related to light (gleam, dazzle, luminous, shimmer, shine, sparkle).

Recording Learning

Depending on your preference and your classroom routines, students can complete their KWL chart while you read through the sidebars in the book, or they can fill in the final column after you've read the book as a class.

Remind students to be as specific as they can about what they've learned about light while reading the book. Students may want to use some of the facts they've learned to complete further research on a topic that interests them.

Students can also make connections to information they already knew if they hear something from the book that they have written in the first column of their KWL chart.

Have students share what they wrote with a partner to further expand their learning.

AFTER READING

Identifying Predators and Prey

The book introduces readers to the terms “predator” and “prey.” Use the following sorting activity to help students understand these concepts. Students can complete the activity independently or with a partner. For younger students, you could guide a class discussion about each animal in the book and have students glue their pictures on as you decide together if each is a predator or prey.

Introduce students to the topic using the following explanation:

Some of the animals in the book are predators and others are prey. Predators are animals that hunt and eat other animals. Prey are the animals that predators hunt and eat. The book describes some predators that use bioluminescence to catch their prey. It also describes some prey that use bioluminescence to get away from predators.

Print a copy of pages 21 and 22 for each student in your class. Make sure each student also has a pencil, scissors, and a glue stick to complete the activity. Use the following directions to guide students in completing the activity:

1. Write your name at the top of your paper.
2. Cut out the pictures of the animals.
3. For each animal, decide if it is a predator or prey.
4. Put the pictures under either “Predator” or “Prey” on your chart.
5. Glue the pictures onto the paper.

Looking for Light

The book discusses natural and human-made light sources. Use this activity to help students find light sources in their neighbourhood and determine whether they are natural or human-made. Two versions of the scavenger hunt are included at the back of this guide. Younger students can use the first version (page 24); older students can use the more detailed second version (page 25).

1. Print and hand out a copy of page 24 or 25 for each student.
2. Have students write their names on their paper.
3. Explain to students what they will need to add to each column in the chart.
4. Give students clipboards to write on while on their scavenger hunt.
5. Take students on a walk through the neighborhood so they can search for the different kinds of light.



Observing Nature

In the final pages of the book, the author tells readers to “always look, *really* look.” Ask students why it might be important to pay attention to nature and to notice the world around us.

Discuss the topic of biodiversity and explain that biodiversity happens in every natural environment—even the parks and natural spaces in your town or city. Challenge students to see if they can notice the biodiversity around them when they are observing nature. For example, can they find examples of the following?





-  tree
-  bird
-  insect
-  flower
-  mammal (animal with fur)

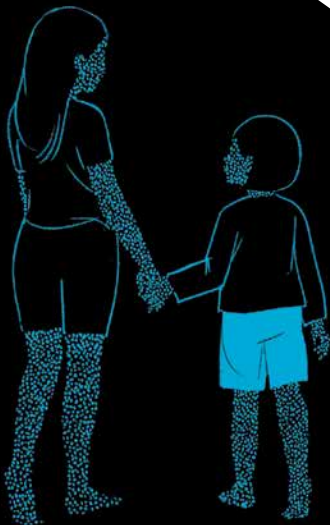
Take students to a quiet spot in nature to practice sitting and observing. Use the following instructions to guide students in the process:

1. Find a quiet spot away from your friends or other possible distractions.
2. Set up your space so you are comfortable and able to sit for a while.
3. Close your eyes and take a slow breath in.

4. Breathe out and let your body relax.
5. Listen for a while with your eyes closed.
6. Open your eyes, and write or draw what you heard while you were listening.
7. Then quietly look around and see what you notice. Pay attention to the nature around you and look past any human-made things.
8. Write or draw what you see around you in nature.





What students will need for their nature observations:

-  notebook with blank pages or piece of paper on a clipboard
-  pencil and eraser (if students want to add color to their drawings, it might be best to complete this part once you have returned to the classroom, so their time in nature is spent focusing on observing)
-  sitting pad (in case the ground is wet or uneven)
-  (if available) a class set of cameras so students can take pictures of the things they observe












When you return to class, have students sit in a circle and share about what they noticed in nature. Use the following questions to guide the conversation. Give everyone a chance to share about their experience. Remind students to listen closely while others are sharing because they could learn about something new that they didn't see or notice while out in nature.

-  Did you notice something you'd never seen before?
What was it?
-  Did you notice anything new about a familiar thing you saw?
-  What kinds of biodiversity did you notice around you (e.g., trees, birds, insects, flowers, mammals)?
-  What might you have missed if you hadn't stopped to look?

Going Beyond the Book

If students are interested in learning more and if time permits, they can use any of the following activity prompts as a starting point to go further.

-  Read the letter from the author-illustrator on page 6 of this guide.
-  Research any questions from the “wonder” column of your KWL chart that weren’t answered in the book.
-  Use the facts you learned from the book (in the last column of your chart) as a starting place to find out more about bioluminescence.
-  Choose a different habitat to find out what kind of biodiversity exists there. Look up what kinds of plants, insects, animals, and fungus live and grow there.
-  The book says that “scientists do not fully understand all the ways that [dinoflagellates] use their light.” Write a list of ways that dinoflagellates might use their light. Then, research online to see what other hypotheses scientists have!
-  Go outside at night and notice how much human-made light you see. Can you find a place that has less human-made light? Write about why light pollution might be a problem for some plants and animals.
-  Practice hiding like prey by playing the game “Camouflage.” (See this website [<https://cveec.wordpress.com/2012/03/15/camouflage/>] or other online sources for instructions to play the game.)

Name: _____

Date: _____

KWL CHART

for *Luminous* by Julia Kuo

What I know about light	What I'm wondering about light	What I learned about light

Name: _____

Date: _____

PREDATOR or PREY

PREDATOR (animals that hunt and eat other animals)	PREY (animals that are hunted and eaten by other animals)



ANGLERFISH



VAMPIRE SQUID



BRISTLEMOUTH
LIGHTFISH



JEWELLED SQUID



CROWN JELLYFISH






DRAGONFISH

Name: _____

Date: _____

PREDATOR or PREY Answer Key

PREDATOR (animals that hunt and eat other animals)	PREY (animals that are hunted and eaten by other animals)
 <p>ANGLERFISH</p>	 <p>VAMPIRE SQUID</p>
 <p>DRAGONFISH</p>	 <p>CROWN JELLYFISH</p>
	 <p>JEWELLED SQUID</p>
	 <p>BRISTLEMOUTH LIGHTFISH</p>

Name: _____

Date: _____

LIGHT SCAVENGER HUNT

Light	Find it!	Draw it!
street light		
stop light		
sunlight		
car lights		
porch light		
Christmas lights		

Name: _____

Date: _____

LIGHT SCAVENGER HUNT

Light Source	Natural or Human Made?	Purpose	Diagram
Example: stop light	human made	to show cars when it is safe to drive	