



# Insects That Glow and Sing

6<sub>A</sub>

## Introducing the Read-Aloud

10 minutes

### What Have We Already Learned?

5 minutes

Ask students to name the common characteristics of all insects. (six-legs; three body parts of head, thorax, and abdomen; an exoskeleton; two antennae; and sometimes wings) Ask students how ants communicate, or share information, with one another. (antennae—sensory parts for smell and touch) Tell students they are going to learn how some other insects communicate.

Tell students that today's read-aloud is called "Insects That Glow and Sing." The insects they will learn about today communicate by glowing in the dark and singing to one another.

### Vocabulary Preview

5 minutes

#### *Bioluminescence*



#### ◀ Show image 6A-6: Firefly bioluminescence

1. In today's read-aloud, you will hear about a special kind of light called *bioluminescence*.
2. Let's break the word *bioluminescence* into three parts. Say *bio* with me. Say *lumin* with me. Say *escence* with me. Now say *bioluminescence* with me three times.
3. Bioluminescence is a light given off by some plants and animals, such as fireflies.
4. The night sky was filled with the bioluminescence of dancing fireflies.
5. Have you ever seen the bioluminescence of a firefly or another living plant or animal? Tell your partner about it. Try to use the word *bioluminescence* when you tell it. [Examples of bioluminescent plants and animals include jellyfish, glowworms, anglerfish, dinoflagellates, and various mushrooms.]



### ***Tymbals***

#### ◀ **Show image 6A-13: Cicada with tymbals labeled**

1. In today's read-aloud, you will hear about parts of a cicada that make sound, called *tymbals*.
2. Say the word *tymbals* with me three times.
3. Tymbals are thin skins that help produce sounds in some insects. [Point to the tymbals in the image.] A cicada's tymbals are located on its underside, close to its thorax.
4. Vibrating tymbals make the cicadas' loud sounds on a summer night.
5. What musical instrument also has a thin skin that makes sound? (a drum)

### **Purpose for Listening**

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Tell students that they are going to learn about fireflies, grasshoppers, and crickets. Tell them that grasshoppers and crickets depend upon good hearing to communicate with one another, but that they do not hear with ears on the sides of their heads like we do. Ask students to listen carefully to find out where the hearing organs are located on grasshoppers and where they are located on crickets.



## Insects That Glow and Sing

### ◀ Show image 6A-1: Firefly with well-illuminated light

Can you blink, boys and girls? So can I. Does your abdomen light up when you blink? No? Are you sure? How can you tell? If you're blinking, perhaps you just can't see. Turn to your neighbor and ask him or her to watch your abdomen while you blink. Did it glow? No? Well, I'm not really surprised. If humans were able to produce their own light, they might never have invented the electric light bulb. We fireflies have been around long before electricity or even candles. Our light organs, called **lanterns**, are located in our **transparent**, or see-through, abdomens.<sup>1</sup>

1 Lanterns are lights that have a covering over the source of the light, usually made of glass.



### ◀ Show image 6A-2: Fireflies lighting up a forest

When humans first discovered us lighting up the forests, they were amazed by how much light we produced. In ancient China and Japan, people collected us in transparent jars and used us as lanterns to find their way in the dark.<sup>2</sup> They named us fireflies. But we are not flies at all, and our light—unlike a fire—is cold.

2 What does *transparent* mean?

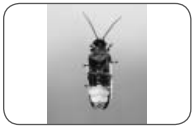
“Cold light” is the way your ancestors explained our beautiful, magical light. Scientists now know that chemical reactions create the light, and they describe this process with a much bigger word. They call it **bioluminescence**. Can you say that? *Bio* means living and *lumin* means light. I think that's a good name for it, don't you? We are living lights!



### ◀ Show image 6A-3: Bioluminescence in the ocean

Other animals and plants glow, or light up like tiny electric bulbs, but most of them live in the ocean. Certain types of squid, jellyfish, corals, and even sharks glow beneath the water. Plants such as algae in the ocean can also glow on the surface of the water. At times, this bioluminescence is so bright that it looks as if someone flipped a light switch beneath the water.

It's less common to find land animals that glow, or give off light. I've told you that we are called fireflies, but do any of you call us by another name? We're also called lightning bugs. But we are neither flies nor bugs. We are beetles—another group of insects. Take a close look and see.



← **Show image 6A-4: Lightning bug**

Like all insects, we have three body parts (head, thorax, and abdomen); six legs; two antennae; an exoskeleton; and, like most insects, two pairs of wings.<sup>3</sup>



← **Show image 6A-5: Firefly larvae**

We undergo a complete metamorphosis—changing from egg to larva to pupa to adult.<sup>4</sup> Some of our eggs and larvae even glow! Have you ever heard of a glowworm? Glowworms are also misnamed. They are not worms at all.<sup>5</sup> The larvae of fireflies and other insects are often called glowworms because they live on the ground like worms do, and they glow in the dark.

3 [Have student volunteers point to these body parts in the image.]

4 What is a complete metamorphosis? (a change that is so big that the insect looks completely different after)

5 At what stage do insects look like worms?



← **Show image 6A-6: Firefly bioluminescence**

In order for any animals to survive, they must reproduce, or have babies. That means we must all work hard to attract mates. Fireflies glow when they are seeking mates. The males fly through the dark, flashing very specific signals to females who sit patiently and wait for them. Our yellowish-green lights stand out against the night sky as we signal one another with special codes. When a female recognizes a male's code as being from the same species,<sup>6</sup> she flashes the same code back to him and the male lands beside her.

Have you ever noticed how some fireflies flash close to the ground with one pattern, but others seem to be higher in the air with a different flash pattern at a slightly later time of night? These are males of different species attracting their own females. Watch us next summer and you will see what I mean.

6 or type



◀ **Show image 6A-7: Grasshopper**<sup>7</sup>

7 [Ask students who has been narrating the read-aloud up to this point. (a firefly) Then ask, based on the image, who they think will be narrating now.]

8 What is the firefly's light organ called? (a lantern)

9 Of course, it may take many years of studying grasshopper sounds to be able to tell them apart.



◀ **Show image 6A-8: Grasshopper's tympanum**

10 [Point to the abdomen in the image. The tympanum is located near where the thorax and abdomen come together, close to where the muscular hind legs attach to the thorax.]



◀ **Show image 6A-9: Grasshopper's wings**

11 [Point to the wings as you read this paragraph.]

Hi there. I bet you're surprised to see me today. I'm not bioluminescent. I don't glow, but I do sing. That's what I want to talk to you about today—other ways that insects communicate, or share information.

Fireflies are silent communicators, flashing their glowing lights back and forth.<sup>8</sup> How do you communicate with one another? You talk, don't you? And what do you use to talk? Your mouths, of course! Although we insects use mouths for eating, just like you, we have no vocal cords, or voice boxes, so we don't use them for talking and singing. Even so, we grasshoppers can be a noisy bunch. Have you ever heard grasshoppers sing on a summer day? You won't hear any words, but you will definitely hear a chorus of sounds. Just like birds, each type of grasshopper produces a different song. If you listen closely, you can tell what type of grasshopper is singing by its song.<sup>9</sup>

Nearly all grasshoppers have two pairs of wings, but we seldom use them for flying because we spend so much of our lives low to the ground. Male grasshoppers use their wings for communicating with one another. Female grasshoppers do not sing, but they listen very carefully. They hear our sounds with tympanum, eardrums on the side of their abdomens.<sup>10</sup>

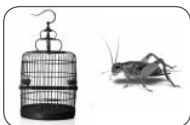
Grasshoppers, locusts, and crickets all make sounds by rubbing body parts together, sometimes two wings and sometimes a leg and a wing.

To make sounds, I lift my wings and rub the front wings together.<sup>11</sup> The vein composed of many tiny teeth on the bottom of one wing rubs against the sharp edge, or scraper, on the top of the other wing. It is a little like rubbing your fingers along the teeth of a comb. As the two parts rub together, the wings vibrate, moving back and forth rapidly to produce the sounds that you hear.



← **Show image 6A-10: Katydid**

You may be familiar with my cousin, the katydid. Katydids have long antennae, just like me. As they rub their front wings together, it sounds like they are calling out “Katy did, Katy did.” Their high-pitched calls become faster and faster as the outside temperature rises. Some people even say that you can tell how hot it is by the number of times per second a katydid chirps. If katydids live in your part of the world and you are patient enough, you may want to try counting the number of chirps you hear every five seconds. Add thirty nine to that number and you may have an accurate reading of the temperature, depending on the species of katydid you are hearing.



← **Show image 6A-11: Cricket cage and cricket**

In some Asian countries, in a tradition that has been practiced for thousands of years, male crickets have been kept in cages as singing pets. Do you know where the ears of a cricket are located? You may remember that female grasshoppers hear with special parts on their abdomens, but crickets have “ears” on their **forelegs**.<sup>12</sup> Both places must seem a little strange to you since your ears are on the sides of your head.

12 The front legs of animals are called forelegs.

Before I leave today, I want to introduce you to another singing insect. These insects are often mistaken for grasshoppers and crickets because they look a lot like us.



← **Show image 6A-12: Cicada**

Does anyone remember what this insect is called? This is a cicada [si-KAY-duh]. Cicadas are related to aphids, leafhoppers, and spittlebugs. Unlike grasshoppers and crickets, many cicadas have strong wings and are fast fliers.

Male cicadas produce incredibly loud songs, but they do not use their legs and wings to make those sounds.



◀ **Show image 6A-13: Cicada with tymbals labeled**

13 To *vibrate* means to move back and forth very fast.

Look closely at the abdomen of a cicada. On its underside, close to the thorax, a cicada has a pair of sound-producing organs called **tymbals**. These ribbed membranes are a little like the skin of a drum. The cicada uses its muscles to vibrate these drum-like organs.<sup>13</sup> The tymbals pop and click as they move in and out. Their sound is amplified, or made louder, inside the mostly hollow abdomen, acting like a drum and creating a loud buzzing song. The shrill sound of hundreds or thousands of cicadas singing together on a warm summer evening may be very, very loud.

Grasshoppers, crickets, and cicadas all use sound to communicate in much the same way that fireflies use their lights. Males attract females for the purpose of mating, making sure that these winged insects will continue to survive.

Next time you gather to discuss insects, you will learn about the largest group of insects on Earth. Can anyone guess what that might be?

## ***Discussing the Read-Aloud***

**15** minutes

### **Comprehension Questions**

**10** minutes

1. *Literal* How do fireflies communicate with one another? (by flashing their lanterns, or lights)
2. *Literal* In what body part is the firefly's lantern located? (the abdomen)
3. *Literal* In which section of the grasshopper are the hearing organs located—the head, the thorax, or the abdomen? (abdomen)
4. *Inferential* The female grasshoppers use their tympanum, or eardrums on the sides of their abdomens, to listen to the male grasshoppers. Why do the males sing to the females? (They are communicating that they want to mate with them.)

5. *Inferential* How do the male grasshoppers make their singing sounds? (They rub body parts together, sometimes wings and sometimes legs and wings together.)
6. *Literal* Where are a cricket's hearing organs located—its abdomen, forelegs, or wings? (on its forelegs)
7. *Inferential* You heard in the read-aloud about a tradition in some Asian countries where crickets are kept in cages. Is it males or females that are caged? Why are they caged? (male; so people can hear them sing)
8. *Inferential* What do grasshoppers, crickets, and fireflies all have in common? (They all have three body parts: head, thorax, and abdomen; six legs; antennae; and an exoskeleton.)

[Please continue to model the *Think Pair Share* process for students, as necessary, and scaffold students in their use of the process.]

I am going to ask a question. I will give you a minute to think about the question, and then I will ask you to turn to your neighbor and discuss the question. Finally, I will call on several of you to share what you discussed with your partner.

9. *Evaluative Think Pair Share:* You learned about an insect today that is called both a firefly and a lightning bug. Which do you think is the better name? Why? (Answers may vary, but discuss the fact that they are neither fly nor bug.)
10. After hearing today's read-aloud and questions and answers, do you have any remaining questions? [If time permits, you may wish to allow for individual, group, or class research of the text and/or other resources to answer these questions.]



## Word Work: Transparent

5 minutes

1. In the read-aloud you heard, “Our light organs, called lanterns, are located in our *transparent*, or see-through, abdomens.”
2. Say the word *transparent* with me three times.
3. *Transparent* describes something that is clear and can be seen through.
4. Windows in buildings are made of transparent glass, allowing us to see whatever is outside the window.
5. Look around the room for a transparent object. Tell me what you see and how you know it is transparent. Use the word *transparent* when you tell about it. [Ask two or three students. If necessary, guide and/or rephrase the students’ responses: “The \_\_\_\_\_ is transparent because it . . . ”]
6. What’s the word we’ve been talking about?

Use an *Antonyms* activity for follow-up. Directions: The opposite of, or antonym of, *transparent* is *opaque*, which means you cannot see through it. I am going to name some objects. If you can see through the object, say, “That is transparent.” If you cannot see through the object, say, “That is opaque.”

1. a clear drinking glass filled with water (That is transparent.)
2. a solid wooden pencil (That is opaque.)
3. a piece of plastic wrap (That is transparent.)
4. a window (That is transparent.)
5. a desk (That is opaque.)



**Complete Remainder of Lesson Later in the Day**



# Insects That Glow and Sing

6<sub>B</sub>

**Note:** Extensions may have activity options that exceed the time allocated for this part of the lesson. To remain within the time periods allocated for this portion of the lesson, you will need to make conscious choices about which activities to include based on the needs of your students.

## Extensions

20 minutes

### ↔ Syntactic Awareness Activity

5 minutes

#### *Adverbs*

**Note:** The purpose of these syntactic activities is to help students understand the direct connection between grammatical structures and the meaning of text. These syntactic activities should be used in conjunction with the complex text presented in the read-alouds. There may be variations in the sentences created by your class. Allow for these variations, and restate students' sentences so that they are grammatical.

1. We know that many verbs are action words. Does anyone remember what type of word describes a verb? [Pause for students to respond.]  
Words that describe verbs are called *adverbs*.
2. In today's read-aloud, you heard about certain plants and animals that glow, or give off light.
3. What words can we use to describe how something glows? [Pause for students to respond.]  
We can say that something glows *brightly* if the light it gives is strong. We can say that something glows *dimly* if the light it gives is weak, or small. *Brightly* and *dimly* are adverbs that describe how something glows.
4. The light of the full moon shines brightly in the night sky. Say *brightly* with me three times.

5. The light of the candle glowed dimly. Say *dimly* with me three times.
6. What are the adverbs we can use to describe how something glows? (*brightly* and *dimly*)
7. I am going to say several things. If what I say is an example of something that glows brightly, say, “That glows brightly.” If what I say is an example of something that glows dimly, say, “That glows dimly.”
  - the sun shining on a clear day
  - a flashlight with batteries that are almost dead
  - a lighthouse light that shows the way for ships in the dark
  - the light from a fire that is almost out
  - a thousand fireflies in your backyard at night
8. What are the words that describe action words called? (adverbs)

### **Insects Journal (Instructional Master 6B-1)**

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**Note:** You may wish to find a video recording about one of the insects from the read-aloud, or an audio recording of katydid, cricket, or cicada sounds to play for students.

- Have students look through various trade books in the classroom book tub for trade books about fireflies, grasshoppers, and crickets. Have them draw a picture of a firefly, grasshopper, and/or cricket in their journals and write one or two sentences about these insects based on something they learned from today’s read-aloud. Tell students that they should also write down any questions they may have about fireflies, grasshoppers, and/or crickets on the back of the page.
- Have students share their drawings, sentences, and questions with their partner or home-language peers. Encourage them to expand upon their vocabulary using richer and more complex language, including, if possible, any read-aloud vocabulary.

- ✈ Have students work in pairs or small groups to look through the book tub or other resources to search for answers to their questions. You may wish to extend this research beyond the classroom book tub to include online resources and/or library resources.

### **Writing an Insect Story: Draft**

**(Instructional Masters 5B-2 and 6B-2)**

**20+ minutes**

- Give each student their planning worksheet (Instructional Master 5B-2). Have students review what they have written on this worksheet. Students may make changes to their plans at this time. You may wish to have students work together in groups so that they can give and receive feedback.
- Tell students that they are going to begin writing their narrative, or story, about the insect they have chosen. Give each student a copy of Instructional Master 6B-2. Remind them that the first sentence should be an introductory sentence. Remind students that the last sentence should be a concluding sentence. You may wish to list beginning, middle, and ending key words on the board for students to choose from to begin their sentences (e.g., *Once, First, Then, Next, After that, Finally, In the end,*).
- Remind students to use capital letters at the beginning of their sentences and the correct punctuation at the end of each sentence.
- Tell students that if they do not finish their drafts today, they may continue during the next lesson.

### **Domain-Related Trade Book**

**20 minutes**

- Refer to the list of recommended trade books in the Introduction at the front of this *Supplemental Guide*, and choose one trade book about grasshoppers or crickets to read aloud to the class. [Suggested trade books are numbered 6, 13, 15, 19, 20, 42 and 45 in the trade book list. Item 48, *Joyful Noise: Poems for Two Voices* includes poems about fireflies, crickets, cicadas, and grasshoppers.]
- Explain to students that the person who wrote the book is called the author. Tell students the name of the author. Explain to

students that the person who makes the pictures for the book is called an illustrator. Tell students the name of the illustrator. Show students where they can find this information on the cover of the book or on the title page.

- As you read, use the same strategies that you have been using when reading the read-aloud selections—pause and ask occasional questions; rapidly clarify critical vocabulary within the context of the read-aloud; etc.
- After you finish reading the trade book aloud, lead students in a discussion as to how the story or information in this book relates to the read-alouds in this domain.
- Provide students with drawing paper, drawing tools, and writing tools. Have students draw one detail or idea from the trade book that is new or different from the read-aloud they heard. Ask students to label their pictures or write a sentence to go along with their drawings. Have students share their drawings and writing with their partner pair or with home-language peers.