



LESSON 1

What Gives You Goosebumps?

Author R.L. Stine has written countless scary stories in his career, including the spooky tales in the *Goosebumps* series. Why do we love stories that frighten us? And what exactly causes us to get goosebumps when things get downright creepy? Launch this lesson to help your students discover the science behind scares.

OBJECTIVE Students will use text evidence to construct an explanation for human survival adaptations and conduct an inquiry on physical reactions to fear.

TIME REQUIRED 45 minutes

MATERIALS Activity Sheet A

STEPS

- 1) Distribute Activity Sheet A. Direct students to read the passage and answer the questions.
- 2) Organize students into pairs or small groups to conduct an inquiry. Have them select one of the questions below to research. Can groups find an evolutionary explanation for their chosen fear or behavior?

- Why do our palms sweat when we are nervous or scared?
- Why do some humans develop phobias, like a fear of spiders or heights?
- Why do we sometimes wake suddenly because we think we are falling?
- Why do we shout when we're startled?
- Why do some humans enjoy being scared, like riding a roller coaster, reading a scary story, or visiting a haunted house?
- Why do we jump when we get scared?
- Why are we afraid of the dark?

- 3) Discuss the section of the reading passage that explains that goosebumps appear to be an evolutionary leftover, a reaction that was once useful for human survival but isn't anymore. Ask your students to describe evolutionary explanations for the fear or behavior they researched. Can your students find related ideas and theories in each other's research?

- 4) Challenge students to design a cool adaptation that they think would be more helpful or useful for human survival. Conclude the activity by having students share their ideas with the class or in small groups. Have students make suggestions to build on each other's ideas.





LESSON 2

Make a Scary Soundtrack

Moviemakers use all sorts of tricks to up the fright factor of their films. Spooky music, eerie silences, and thrilling sound effects are designed to increase the creepiness of scary scenes. This activity explores the science of sound waves and guides students to make their own score that scares!

OBJECTIVE Students will explore the amplitude and frequency of sounds and diagram simple sound wave models. Then students will create brief movie scripts and record their own mini soundtrack.

TIME REQUIRED 45 minutes

MATERIALS Activity Sheet B

STEPS

1) Source spooky sounds, such as this video of haunted sound effects: bit.ly/hauntedsoundeffects. Play only the audio for students. Can your students guess what they'll be learning about today? Explain that they'll be learning more about the science of sound, especially the spooky kind!

2) Distribute Activity Sheet B and replicate the sound wave models from the activity sheet on your smart board.

3) Discuss each of the four model sound waves with your class: loud sounds, soft sounds, high-pitched sounds, and low-pitched sounds. Help your students form the link between the formal and common terms: amplitude (volume) and frequency (pitch, or how high or low the music note).

4) Have students create comparisons between the sets of waves. Prompt for:

- Amplitude is modeled by the height of the wave. A louder sound has a taller wave; a softer sound has a shorter wave.
- Frequency is modeled by the width of the wave. A higher-pitched sound has waves that are narrower; a lower-pitched sound has waves that are wider.

5) Have students complete their activity sheets using the sound waves provided as a guide. Explain that their waves should reflect changes in the amplitude or frequency of the sound.

6) Next, tell students that they'll be writing their own short scene for a scary film and creating the sound effects. Prompt them to write a spooky paragraph using their own ideas or one of the writing prompts below:

- We were finishing our experiment in science class, when all of a sudden, the lights went out ...
- The chest looked old. Really old. I wiped away the dust and cobwebs with my hand. I undid the latch and opened the lid...
- I'd definitely heard a noise. It was coming from upstairs. I tiptoed slowly in the darkness, up the staircase...

7) Have students research how audio engineers create sound effects for film and television. Ask them to use their research to identify 3–5 opportunities to add sound effects to their scenes. Can your students use resources found in the classroom to create these sounds?

8) After students create their sounds, ask them to diagram sound waves for each sound effect. Wrap up by having students present their scenes and spooky audio to the class.



NAME _____

What Gives You Goosebumps?

Have you ever had goosebumps—where your hair stands on end and your skin becomes bumpy like the skin of a plucked chicken? Have you ever wondered why we get them? Think like a scientist and let's find out.



When we become chilled, excited, or frightened, our bodies produce adrenaline, a hormone that makes our heart beat faster, prepares our lungs to take in more oxygen, and causes our pupils to dilate. And you know what else? Adrenaline causes tiny muscles beneath our skin to contract, tugging at the roots of the hairs that cover our bodies. This is when our hair stands on end and gives us “goosebumps.”

Scientists believe that our bodies react to fear and excitement as a means of survival. Many thousands of years ago, if a human heard a strange sound in the forest or was afraid of an animal attack, adrenaline would prepare their body for a fight-or-flight response.

Having bumps on your skin doesn't seem like a particularly useful survival adaptation for a human who feels cold or threatened. However, scientists believe

that more than one million years ago, when the human body was covered in a thicker coat of hair, having a “hair-raising experience” served two main purposes. First, hair that stood on end and settled back into place had the ability to trap a layer of air next to the skin, insulating against the cold. Second, hair that stood on end would give a human the appearance of being larger and more intimidating in case of an attack.

Because humans aren't covered in hair like they used to be, it was hard to know if these two hypotheses are true, which is why naturalist and biologist Charles Darwin observed animals in nature and designed experiments to answer some of his own questions about the usefulness of goosebumps as an evolutionary adaptation in animals. Whatever the reasoning, our bodies' physical reactions are intriguing clues to our evolutionary history.



“Hair-Raising” Questions

On the back of this paper, answer the following:

1. What causes goosebumps to form?
2. Explain two reasons scientists believe humans get goosebumps.
3. Write a sentence or two explaining the meaning of these key terms: fight-or-flight response, evolutionary adaptation, hypotheses.
4. Do a bit of research. Who was Charles Darwin? How did he observe the goosebumps phenomenon in animals in nature? What experiments did he design to test his hypotheses on goosebumps?

NAME _____

Make a Scary Soundtrack

Filmmakers use all sorts of tricks to up the scare-factor of their movies with spooky music, eerie silences, and frightening sound effects. Let's learn more about the science of scary sound!



Directions Examine these sound wave models. Look at how **amplitude** (the volume of sound) is modeled. Then look at **frequency** (how high- or low-pitched a sound is).

<p>Quiet sound</p>	<p>AMPLITUDE</p>	<p>Loud sound</p>
<p>High-pitched sound</p>		<p>Low-pitched sound</p>
<p>FREQUENCY</p>		

Compare each set of sound wave models. What do you notice when you compare them? _____

Now you try! Use the sound wave models, the examples, and the control sound wave to create your own scary sound waves!

<p>Control sound wave</p> <p>[This sound wave has medium amplitude and frequency]</p>	Whispering
<p>Ghost woo-oo</p>	Scream
<p>Rat squeaking</p>	A creaking door...that slams shut!
<p>Thunder clap</p>	Scary sound of your choice _____