

Biomimicry and Bats!

DEVELOPED BY:



NGSS Alignment

These slides address standard 1-LS1-1

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Please see the Teacher's Key for notes about the information presented here

Go here for more information:

<https://ngss.nsta.org/DisplayStandard.aspx?view=pe&id=49>



Presentation Outline

Before Starting: Learn about bats and sound

Kickoff discussion: Can bats inspire inventions that help humans?

Lesson 1: Echolocation

Lesson 2: Echolocation inspired-inventions

Lesson 3: Robo-bat, bats inspire improved flying machines!

Lesson 4: Students create bat-invention! (Includes review of bat features)

ANY DAY – Meet a bat scientist, Kristen Lear



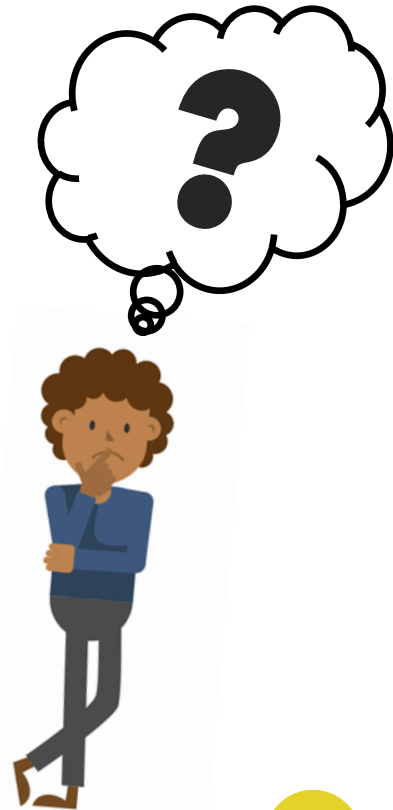
Kickoff Discussion

Can bats inspire inventions
that help humans?



Question: Can understanding
BATS' bodies and behaviors
help us build things to help
people???

Discuss as a class





Let's learn more about bats to help us think about whether bats can inspire inventions that can help people.

Lesson ONE

Echolocation

Some people say bats are blind,
but that's not true. They CAN see.



**BUT bats fly around at night.
It's hard to see in the dark.**

Can you see in the dark?



Many bats use a special way to get around and find food in the dark...

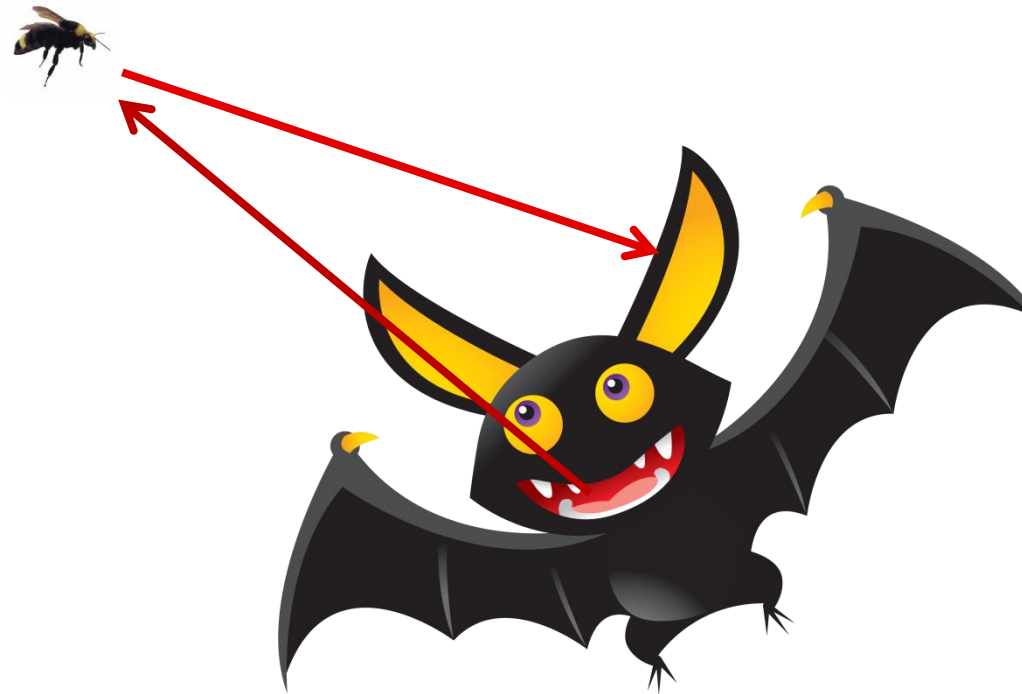
What is it???



Bats get around in the dark using... **Echolocation!**

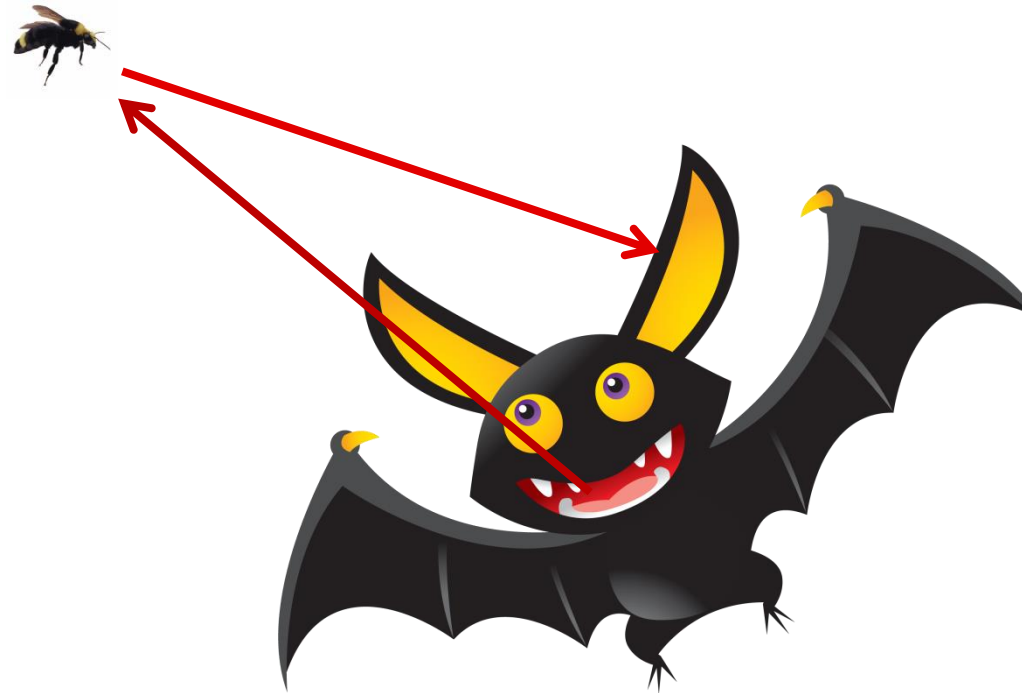
Bats make sounds with their mouths that bounce off things or “echo”.

This helps them know where things are in the dark!



Breaking Down ECHOLOCATION

1. Sounds come from the bat's **MOUTH**.
2. The sounds hits an object (here, a fly).
3. The sounds echo back to the bat's **EARS**.
4. From this sound echo, the bat knows the location of the object!



Discuss as a class!

ECHOLOCATION VIDEO 1

Echolocation Explainer: “Bat Echolocation” by Incredible Bats

Discuss what you learned!

(If link above doesn't work, copy and paste this link:

https://www.youtube.com/watch?time_continue=86&v=kp5jyZtoTlg&feature=emb_logo)

ECHOLOLOCATION VIDEO 2

Cartoon Video: Jumpstart Bat Echolocation Song

Discuss what you learned!

*(If link above doesn't work, copy and paste this link:
<https://www.youtube.com/watch?v=Hr-Y2Tt8gFE>
or google "Jumpstart Bat Echolocation")*



Lesson TWO

Bat and Echolocation- Inspired Inventions

Can understanding bat echolocation help humans?

Bats use echolocation to function in the dark.

Can what we know about echolocation be used to help people who are blind?



The Question:

Can knowing about echolocation help us build better devices to help people with limited sight?



Many blind people use canes

Can a CANE echolocate???

Can a watch?





What would a cane have to do to echolocate? Discuss!

There IS an Echolocating Cane!

The cane mimics bat echolocation to help people who are blind to get around!



More About the Echolocating Cane

The cane sends off signals and “vibrates” when something is in front of it.

Then the person knows to avoid the object!



Echolocating watch!

Watch [this video](#) to learn about a watch inspired by echolocation!

(Device Helps Blind 'See' Like a Bat” from Associated Press)

This helps people who are blind navigate in a way similar to bats!

*(If link above doesn't work, copy and paste this link:
“<https://www.youtube.com/watch?v=SUGFZH9EVDA>”)*



Lesson THREE

Another Bat-inspired Invention: Robo-bat



People have been
inspired by bats in
other ways too!



What else is special about bats that might inspire people?


First of all, bats can fly



And they have unique wings

- **Flexible wings** mean bats can switch directions easily while flying!





Are bat wings different than
the wings of other animals?
Discuss as a class.

Example: Bat wings are different than bird wings

- Bat wings use less energy than bird wings



Bats have unique wings

- [See a video of bat wings here!](#)

Video is called: “Bats take flight” from Science Friday

Link to copy and paste:

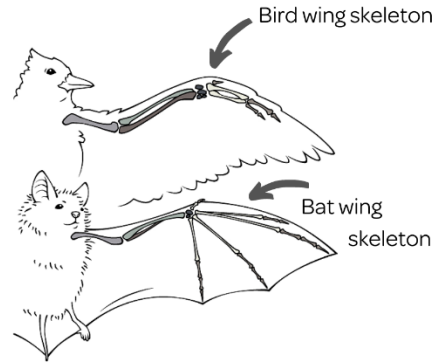
<https://www.youtube.com/watch?v=BNNAxCuaYoc>

Student Activity: Compare Bat vs. Bird Wings!

ELEMENTARY SCIENCE MADE EASY™ Activity-Based Curriculum That Meets Your Classroom Needs
Life on Earth

BAT WINGS VS. BIRD WINGS

What is similar and different between a bat wing and a bird wing?



Write 2 or more things that are SIMILAR between bat and bird wings

Write 2 or more things that are DIFFERENT between bat and bird wings

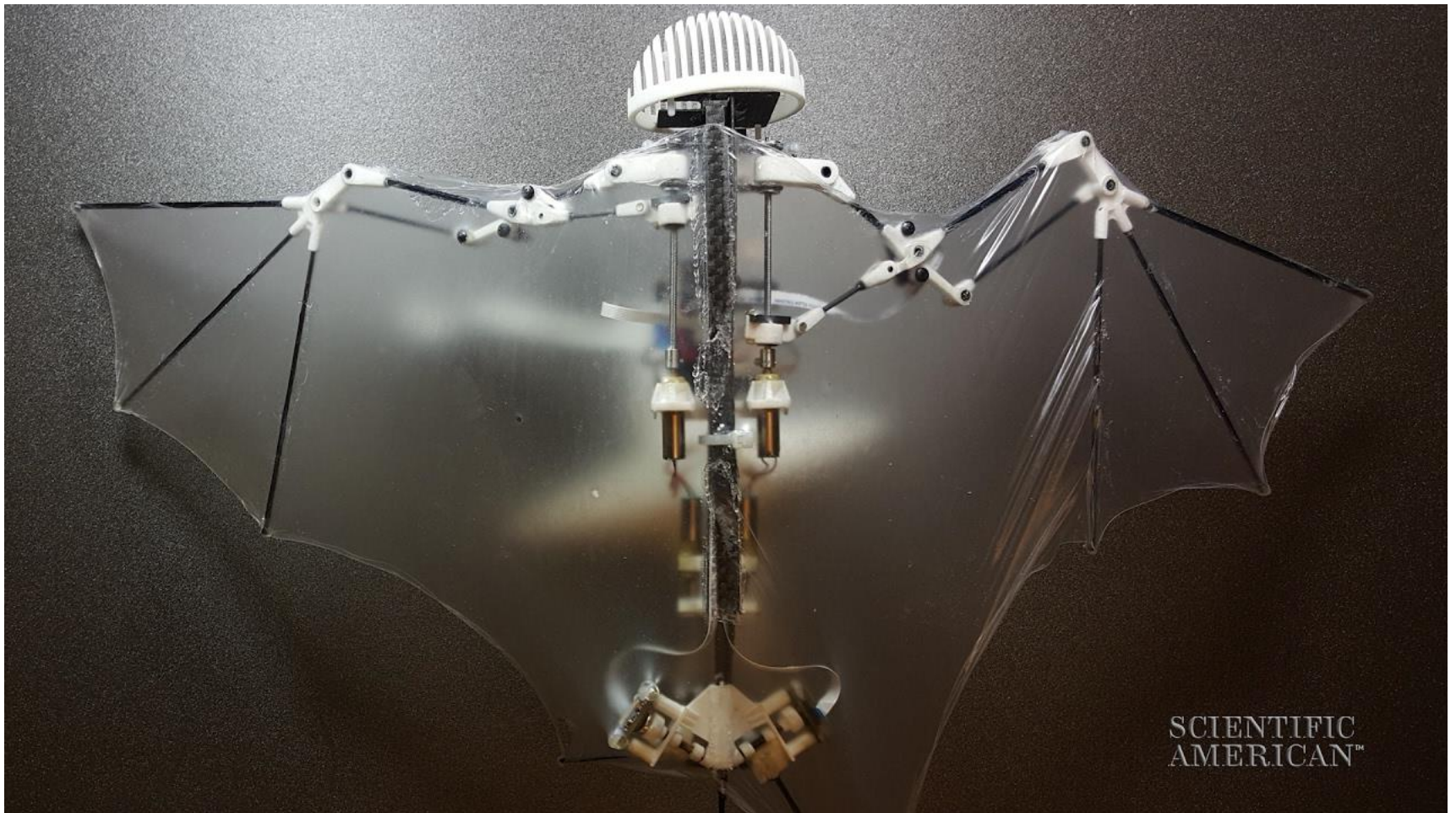
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A Question:

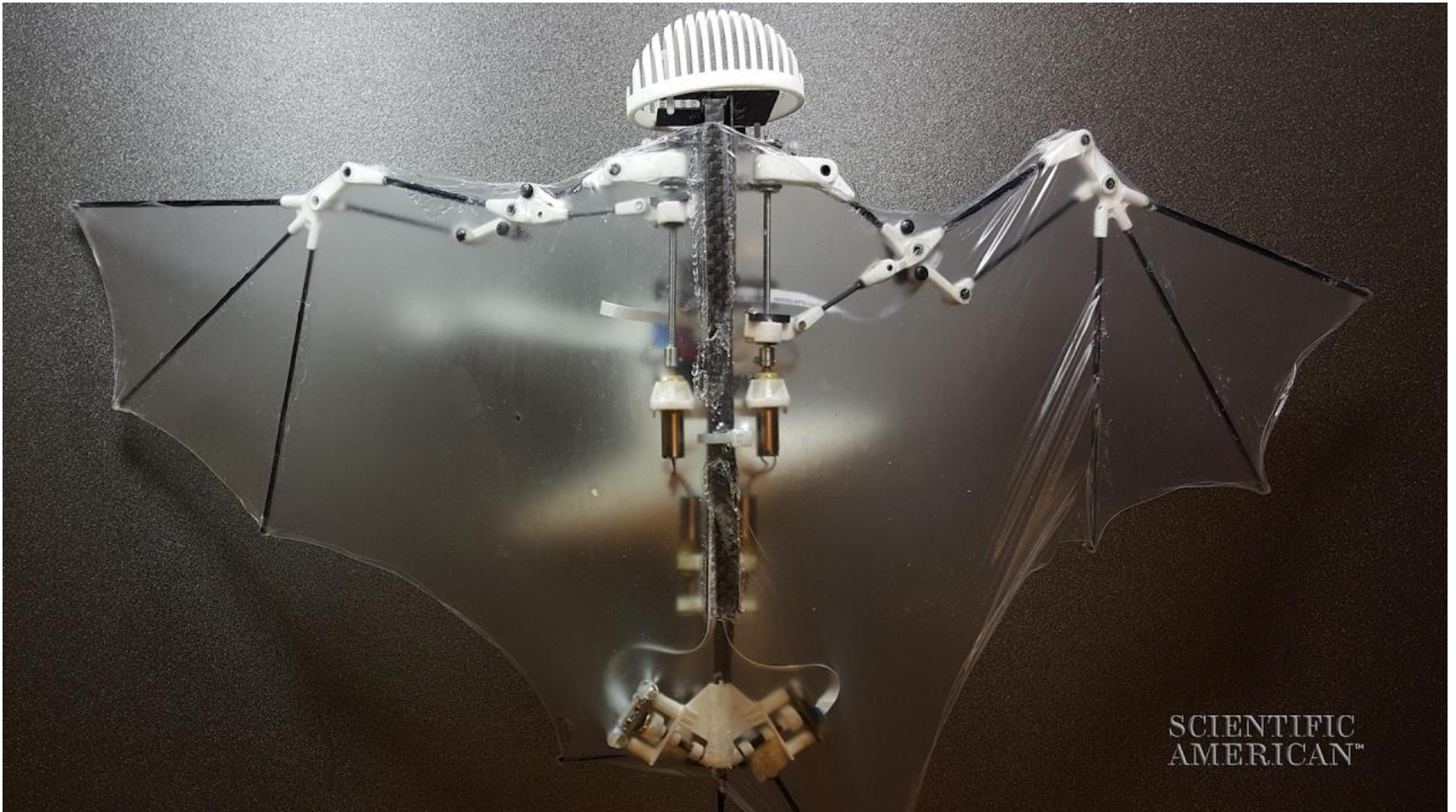
Can we mimic bats unique wings to make a helpful invention?



Introducing ... the Robo-Bat!



Do its wings look like a bat's wings?



SCIENTIFIC
AMERICAN™

Watch the Robo-Bat fly! Video 1

- See a video of Robo-Bat here!

Called “Robo-bat Flaps Like a Real Thing” by Scientific American. Link <https://www.youtube.com/watch?v=QyuWbNrX3v4>

See a Robo- “wing”! Video 2

- An older but excellent video, [Meet a “Ro-bat” wing here](#)

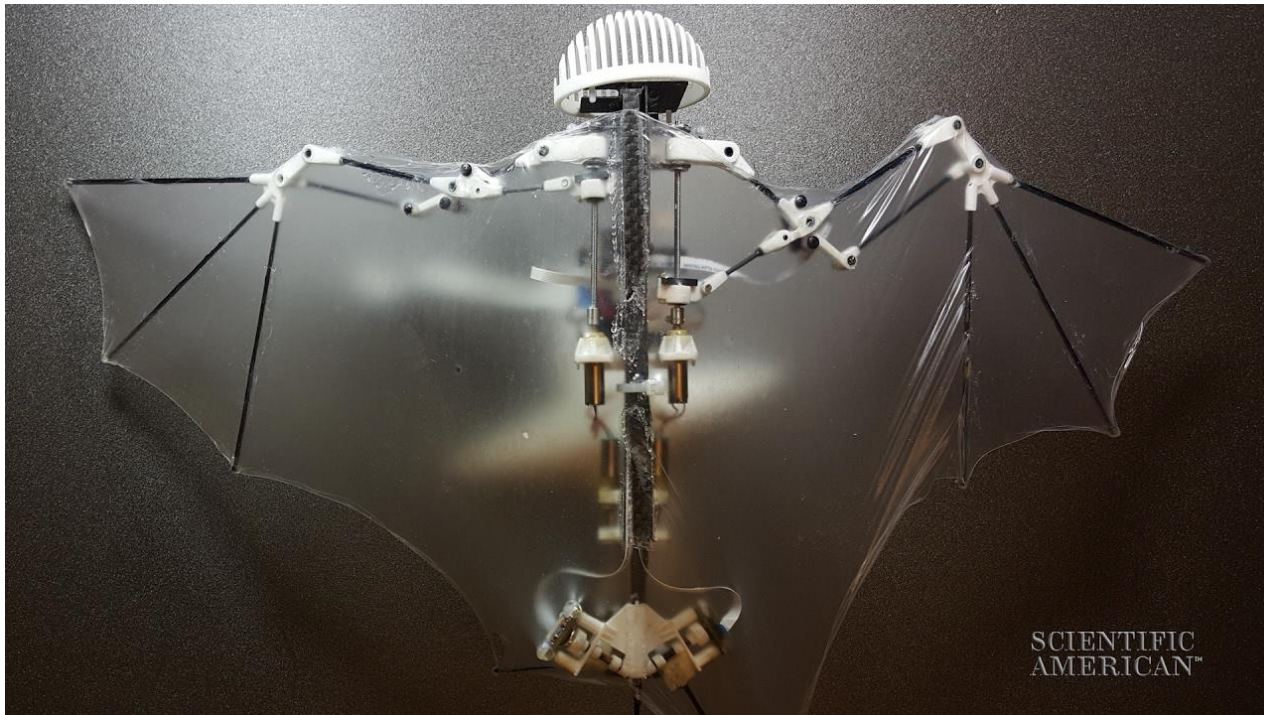
Called “Meet Ro-Bat, Brown University’s Robotic Wing” Link
<https://www.youtube.com/watch?v=R1iYXXaKvDE>

We already have small machines that fly...

drone



... but our learning about bats helps us build better flying machines!



What can we use the Robo-Bot for?

We can build machines that are safer and use less energy!

These “Bat Bots” can be used in search and rescue missions to help save people

How else could the Robo-Bats be used to either help people, animals, or the environment? Discuss as a class



Lesson FOUR

You design an invention
inspired by BATS

Biomimicry

Humans often look to nature to solve problems.

When we design things that mimic animals or plants, like the echolocating cane or the Robo-Bat, it is called **biomimicry!**

Biomimicry: Your turn!

You learned about echolocating canes and watches, and the Robo-bat.

Can you think of another way to help people or solve a problem that is inspired by bats?

Do you have an idea for a bat-inspired invention?

Biomimicry: What would you make?

To help you get inspired, let's learn/review information about bats!

How do bats survive?

What other body parts and behaviors do bats have to help them survive?



Discuss as a class!

Bats have wings!



Wings let bats fly!



Bats fly to get from place to place and to search for food. This helps them survive.

Bat behavior: bats hang upside down!



Hanging upside down lets bats:



1. Sleep in places birds or other animals don't (less competition for sleeping space).

**Hanging upside
down lets bats:**



**2. Sleep or hide in places predators
are unlikely to look, like caves!**

**Hanging upside
down lets bats:**



3. Fly away quickly. Bat bodies can launch most quickly from an upside-down position.

Bats also: Sleep in large groups to stay warm



Bats fly in large groups to stay protected from predators



Bats' sharp teeth help them eat and defend themselves



Bats' big ears help them hear

This is a Townsend's Big-eared bat



Bats' fur helps them stay warm

Do you see the fur?



Do bats inspire you?



Do bats inspire you?

**Can you think of your own
invention inspired by bats?**

Design one now!

Review! Bats:

- **Have wings to fly**
- **Have sharp teeth to eat and protect themselves**
- **Have fur to keep warm**
- **Have big ears to hear**
- **Sleep and fly in large groups for protection (flying) and warmth (sleeping)**
- **Sleep upside down (to hide, have good sleeping spots, and to be able to fly away quickly).**

Meet a Bat Scientist!

Meet a Bat Scientist!

Kristen Lear Bat Conservationist



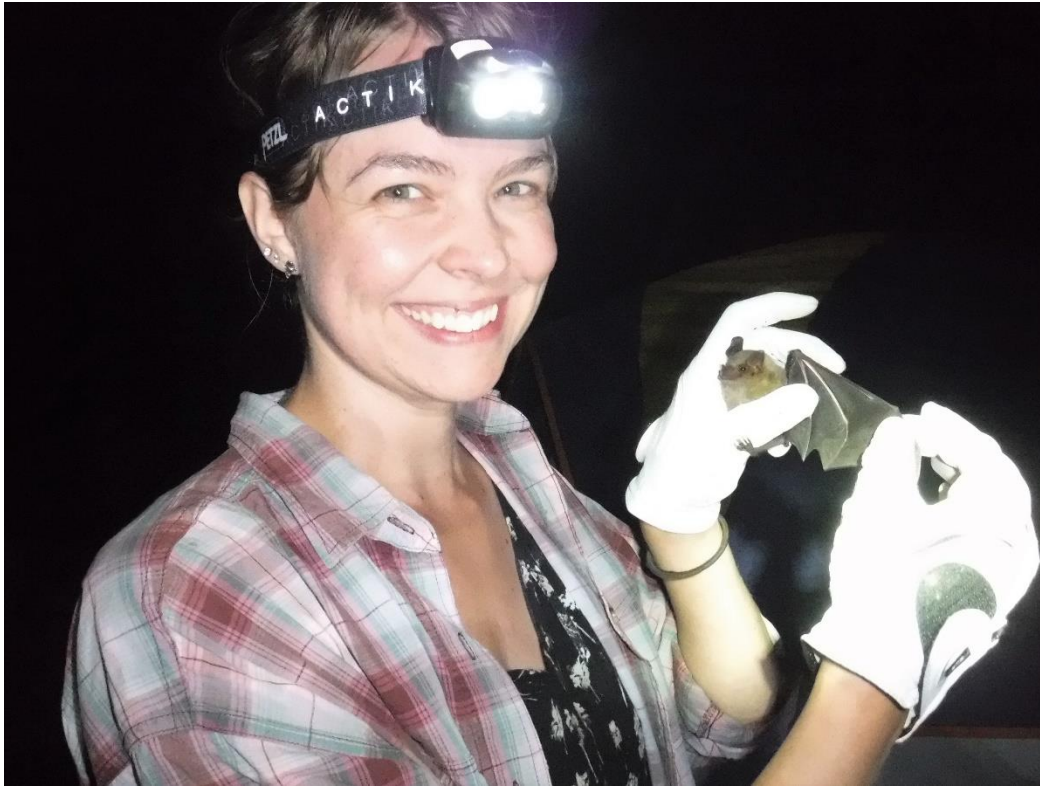
Meet a Bat Scientist!

Kristen building bat houses in 6th grade!

It's NEVER
too early to
start!



Ms. Lear co-created this lesson!



She thinks YOU
would make a
great scientist or
inventor!

[Visit her website here](#) –
you can even e-mail her!

You might also be interested in learning about Dr. Susan Tsang

DR. SUSAN TSANG
Born 1987

Susan is a **RESEARCHER** and **SCIENCE DIPLOMAT**. She studies and protects giant fruit bats in Southeast Asia.

Susan hikes around forests and mangrove trees to understand giant fruit bats.

"Science can take you anywhere so don't be afraid to explore!"

As a science diplomat, she helps governments protect wildlife.



Find out more about her
at
[STEMTradingCards.org/
dr-susan-tsang](https://STEMTradingCards.org/dr-susan-tsang)