

3: ENGINEER AN ARTHROPOD





Scientists categorize organisms to make them easier to study. In this activity, youth learn how scientists organize living things, and learn to recognize the essential features of all arthropods.

Your mission today is to sort species scientifically and construct an anatomically correct arthropod.

Preparation

- » Write the secret words for *Telephone Charades Race* on index cards.
- » Collect recycled materials (cereal boxes, toilet paper rolls, bottles, etc.) in advance.

Telephone Charades Race 10 min. | inside

Words will be acted out (like Charades) and passed from one person to the next (like Telephone). No sounds or lip-syncing allowed.

1. In teams of four to six, line up single file, facing backwards.
2. The first player in each line turns around to see the secret word, then taps the next player and acts it out. Once the second player figures out the word, he or she turns to tap the next player.
3. Continue until the last player figures out the word and calls it out. Play up to three rounds.

Secret words: butterfly, spider, mosquito, crab, grasshopper, dragonfly (or choose your own)

Sort it Out 20 min. | inside

Scientists organize living things based on similarities and differences. Practice this using the *Taxonomy* cards provided.

1. Divide into four teams, each with one set of cards.
2. Sort the animals on the cards according to any characteristics you like, except color or size.
3. When you finish, choose a new characteristic and sort again.
4. See how many different ways you can sort the animals in 15 minutes.

Share out: What characteristics did you use to sort the animals? How did you handle any disagreements that came up within your team?

Shared characteristics present clues about how species are related. For example, any organism with an exoskeleton, segmented body, and jointed arms and legs is an **arthropod** (are-throw-pod). Arthropods, such as spiders, butterflies, scorpions, and crabs, make up 80% of all animals and 75% of all living things on our planet.

Kit Materials

A

- » color construction paper
- » [*Engineer an Arthropod* cards](#)
- » [*Engineer an Arthropod* handouts](#)
- » [*Taxonomy* cards](#)
- » tissue paper

B

- » cups
- » pipe cleaners (short only)

C

- » scissors
- » tape

Loose Items

- » SAC notebooks

Materials Not Included

- » recycled materials

Explore More:

[What is an Arthropod?](#)



[Baby, You're an Arthropod!](#)



Engineer an Arthropod 30 min. | inside

Imagine you could engineer a brand-new arthropod. What would it look like? How would it survive in the wild?

1. Working independently or in pairs, select an *Engineer an Arthropod* card to determine your arthropod's environment and sources of food.
2. Use the *Engineer an Arthropod* handout to brainstorm ideas for how your arthropod might look. Each arthropod must have:
 - » All three essential arthropod characteristics: an exoskeleton, a segmented body, and jointed arms and legs.
 - » The right body parts to eat the food sources listed.
 - » The right features to hunt or hide in the environment.
3. Use the materials available to construct your new arthropod.
4. Present your arthropod to the group. Describe the body parts and features that would help it survive in its environment.

Explore More: Watch [What is an Arthropod?](#) (3 min.) to learn more about arthropods, then sing and dance along to [Baby, You're an Arthropod!](#) (4 min.) music video.

Call to Action: Notice features that make the organisms in your neighborhood similar to or different from each other. How many different ways could you sort these organisms?

How did it go?

[Let us know!](#)



Attendance & Feedback: How many youth attended? How did it go? Record notes here, then click or scan the link to let us know.



4: TOOLS OF THE TRADE



Magnified view of a house fly

Scientists use a variety of tools to carefully gather and examine organisms. In this activity, youth practice using scientific collection tools and conduct their first *Bug Safari* observation.

Your mission today is to learn how to use research tools and become an expert at collecting arthropods.

Preparation

- » Load video: [How to Do a Bug Safari](#).
- » Set up the six tool stations.

Dream Job 5 min. | inside

Think about your ideal job.

1. In your notebook, list the tools you would need for that job.
2. Compare your list with a partner.

Share out: What types of tools do different jobs require? Why are these tools necessary?

Tools of the Trade 15 min. | inside

At the California Academy of Sciences, citizen and community scientists like you collect organisms from nature to learn about the diversity of life on Earth. They use scientific tools to gather and examine organisms carefully.

Follow the *Tools of the Trade* station cards to practice using the collection tools. The tools will be organized into stations. Visit the tool stations in small groups. Each group spends a few minutes at each station.

- » **Aerial Net:** Move your net back and forth in the air where you see flying arthropods. Twist the net a little so that whatever you catch doesn't fly out.
- » **Beating Sheet:** Place or hold the beating sheet under a bush or tree branch, then gently shake or tap the plant so arthropods fall out.
- » **Pooter:** Set up your pooter by connecting the shorter tube to the mesh hole and the longer tube to the clear hole. Hold the longer tube near an arthropod and gently inhale until it is in the jar. The mesh hole blocks arthropods from entering your mouth. Do not share straws.
- » **Brush, petri dish, and foam:** Place a petri dish close to an arthropod and use a brush to gently coax it into the dish. Place the foam gently on top to secure the arthropod in place. Avoid touching arthropods with your hands.

Note: Do not use a petri dish with live moths and butterflies because it can damage their wings. Never destroy a web to collect

Kit Materials

A

- » [Bug Safari and iNaturalist guide](#)
- » [Tools of the Trade station cards](#)

B

- » brushes
- » paper straws

D

- » magnifying lenses
- » magnifying loupe

F

- » foam circles
- » petri dishes

Loose Items

- » aerial net
- » beating sheets
- » pooters
- » SAC notebooks

Materials Not Included

- » digital device (with camera)





a spider. Instead, just take a photo.

- » **Loupe and camera:** Place the loupe directly onto the petri dish so that you can look through it and see the arthropod in the center. Focus the loupe first, then hold the camera lens directly against it. Make sure the lens focuses on the arthropod before you take a photo. Shine a light sideways on your arthropod to get a better quality image.
- » **Magnifying lens:** Hold the lens to your eye and move yourself closer to the object you are looking at until the object's details come into focus.

Share Out: Which tool was most difficult to use? What questions do you still have about the tools? Are there any strategies that you discovered while using the tools?

Bug Safari 30 min. | outside

Watch [How to Do a Bug Safari](#) (2 min.). Now you are ready for your first *Bug Safari*. Each time you record observations, be sure to note where you are looking.

In teams, use your tools to gently collect arthropods. Use a digital device to take photos. Then, release the animals.

Look under logs and bricks, behind sheds, under or near benches. Be sure to trade collection tools and record what you find in your notebooks. Collecting will get easier with practice.

Bug Safari keys to success:

- » Be careful not to injure the animals. As scientists, it is important to treat every specimen with respect and protect life wherever possible.
- » Always use tools—not your hands—to collect arthropods. Always use an empty petri dish for each arthropod.
- » Return everything—dead or alive—when you are done. If your arthropod is alive, get as close as possible to the spot where it was collected. Coax it out of the petri dish onto the ground. Do not drop it from above.

Critter Chronicles 10 min. | outside or inside

It is important for scientists to document their research experience. As a club, you will create a *Critter Chronicles* video to summarize your findings for each *Bug Safari*. Have fun with your video! Try different presentation styles and formats like a news report, talk show, or nature documentary. In Activity 11, you'll watch all of your *Critter Chronicles* videos to review what you have discovered, so be specific.

Record a 1-2 minute *Critter Chronicles* video. Make sure to:

[How to Do a Bug Safari](#)



1. Describe your procedure. Where did you go? What did you do?
2. Report on your findings. What types of arthropods did you collect? How many? Where?
3. What challenges came up when trying to collect? What strategies would you recommend for next time?
4. Save each video on your digital device so that you can watch them again in Activity 11.

From now on, remember to record a *Critter Chronicles* video after each *Bug Safari*.

Explore More: Next time, you'll upload your photos so that other citizen and community scientists can help identify them. Watch [Observe Nature with iNaturalist](#) (1 min.) to see what to expect.

Call to Action: Scientists are always looking to improve their techniques. Try to invent a new tool or method to help you collect arthropods.

Attendance & Feedback: How many youth attended? How did it go? Record notes here, then click or scan the link to let us know.

Explore More:
[Observe Nature with iNaturalist](#)



How did it go?
[Let us know!](#)

