

# LEAF LITTER

## It's a Critter's World

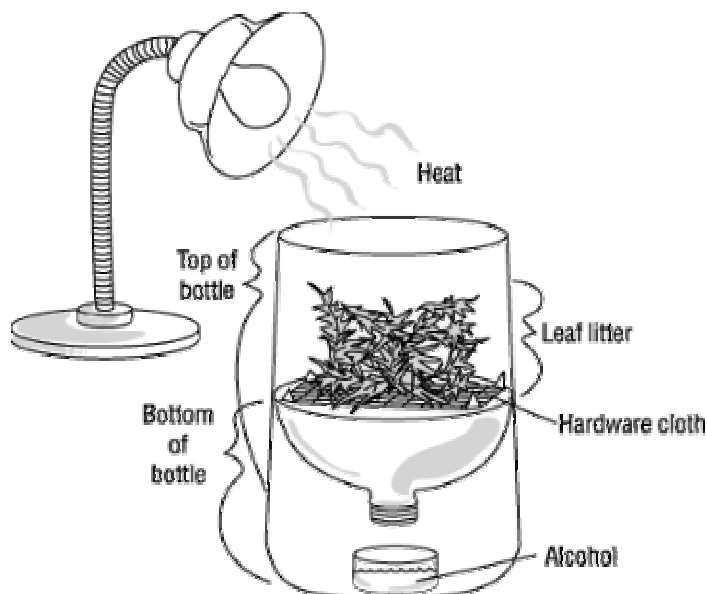
### TEACHER



### Activity Overview

Arthropods are animals that have hard outer skeletons and legs that have joints. The largest group of arthropods is called insects, like butterflies, bees, ants, beetles, and flies. One of the places you can find arthropods is in leaf litter. Leaf litter may also contain other types of arthropods like arachnids, better known as spiders, centipedes, millipedes, and more.

In this activity, students will collect leaf litter, and then use a Berlese Funnel and a lamp to separate the arthropods. When they place leaf litter in the funnel and the light is turned on, the animals migrate away from the heat. Students will collect them in a bottle below the funnel. They will then sort the species of arthropods and use a TI-73 Explorer™ to make a "circle graph" showing the different groups represented in their collection.



Conclusion: Students will observe the various species of arthropods in their leaf litter. Different samples differ in abundance (number of individuals) and diversity (number of species).

### Activity at a Glance

Grade: 4-9  
Subject: Science  
Category: Life Science  
Topic: Living Things, Fungi, Plants, Animals.

### Time Required

- Three 45-minute periods

### Level of Complexity

- High

### Materials

- T-73 Explorer™
- Safety goggles
- Leaf Litter
- Plastic bag
- Rubber gloves
- Magnifying lens
- Paper towel
- Arthropod Identification Chart
- Berlese Funnel made out of the following:
  - 2-liter soda bottle (preferably clear plastic with the label removed)
  - Piece of hardware cloth with a mesh of ¼ inch (10 in x 10 in)
  - Desk lamp or similar light source (with a 20 to 40 watt light bulb)
  - Small jar or dish (2 cm deep) to catch the litter critters
  - Alcohol (rubbing alcohol is fine)
  - Scissors



TI-73 Explorer™



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### Concept Background

- Arthropods, such as ants, fill many roles in the tropical rainforest ecosystem. Arthropods are consumers of leaves, and are consumed by other animals. They also break down leafy debris and recycle other animals' wastes.
- Arthropods outnumber every other living thing on Earth and predate the dinosaurs. They have been around for at least 350 million years. There could be as many as 10 million arthropod species living in tropical rainforests around the world.
- Some arthropods live in the canopy of a rainforest and use leaves for food. Others can be found in the soil and decaying leaf litter of the forest floor. They can be found where dead leaves and pine needles accumulate.
- Arthropods fill many roles in the tropical rainforest ecosystem. They eat leaves and are eaten by other animals. They also break down leafy debris and recycle other animals' wastes.
- Scientists can catch arthropods by picking them off leaves or sweeping nets back and forth along the canopy. Scientists sometimes beat branches with sticks and collect the arthropods that fall into a tray below.
- Another way to catch arthropods is by using a Berlese Funnel on soil or leaf litter samples. A light bulb overhead gently heats the litter in the funnel, driving the arthropods downward. Eventually, they fall through the screen, and into a vial of alcohol. The alcohol kills and preserves the arthropods so scientists can study them.
- Scientists identify the arthropods that they have found by comparing them to other arthropods in collections and book illustrations.

### Preparation and Classroom Management Tips

- This activity requires planning ahead. Use the *Berlese Funnel Instructions* to help students build a Berlese Funnel.
- This activity requires three class periods plus 24 hours to extract critters from samples: one class period to build Berlese funnel, one class period to collect leaf litter samples, one class period for analyzing samples and discussing results.
- Although this activity focuses on arthropods, students may find other types of critters in their leaf samples such as earthworms and snails.
- Arthropods will die when they fall into the alcohol. You may want to discuss this with your class beforehand to determine if any students have a problem with the experiment.
- This activity works well with students working in groups, or as a demonstration. Make sure there are as many Berlese funnels and lamps as there are leaf litter samples. Alternatively, different teams can collect and extract the samples at different times, and the Berlese funnel can be washed and re-used over, and over again.
- You may consider collecting leaf samples in several places and in different weather conditions, so that the students can compare a more diverse range of arthropod communities. This will require extra time to build a sufficient number of Berlese funnels.

### National Education Standards

*Science Standard A: Science as Inquiry*  
Students design and conduct a scientific investigation. They use appropriate tools and techniques to gather, analyze, and interpret data. Students communicate scientific procedures and explanations.

*Science Standard C: Life Science*  
Students should develop an understanding about the structure and function of living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, and the diversity and adaptations of organisms.

*Math Standard: Numbers and Operations*  
Students should develop an understanding of numbers: ways to represent and manipulate them, the relationships among different numbers, and between number systems. Students should develop and implement strategies to estimate results and judge reasonableness of their results.

*Math Standard: Data Analysis and Probability*  
Students should develop an understanding about how to collect, organize, display, and interpret data. Students should also be able to apply the basic concepts of probability.

*Geography Standard 4: Places and Regions*  
Students should understand the physical and human characteristics of places.

*Geography Standard 8: Physical Systems*  
Students should understand the characteristics and spatial distribution of ecosystems on the Earth's surface.

*English Language Arts Standard 8*  
Students use informational resources to gather, synthesize, and communicate information.



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- It is best to study the critters when they are “fresh,” that is, right out of the alcohol. Already tiny, they tend to shrivel up when dried out. You can store the samples in containers with alcohol.
- You may consider building the Burllese Funnels and collecting leaf litter in advance.
- Encourage students to answer the questions in Data Analysis in their *Journal*.
- Create your own student questions for use on your students' TI graphing devices using the Texas Instruments StudyCard applications. For more information, go to

<http://education.ti.com/us/product/apps/studycards/scresources.html>.

### Data Analysis

- 1** Q. Which type of arthropod has the greatest number of individuals?  
A. *Answers will vary.*
- 2** Q. Which type of arthropod has the least number of individuals?  
A. *Answers will vary.*
- 3** Q. Write a paragraph comparing your results with the results of a different team in your classroom. How do you think the characteristics of each site (Step 2d) might explain any differences between types of arthropods and number of individuals? (Hint: Use the circle graphs to compare types of arthropods and number of individuals.)  
A. *Answers will vary. The types of arthropods and number of individuals should depend on the characteristics of each site, such as amount and type of vegetation. If the leaf samples were collected at the same location it is likely that students will observe similar types of arthropods.*
- 4** Q. Which type of arthropod has the largest percentage?  
A. *Answers will vary.*
- 5** Q. Which type of arthropod has the smallest percentage?  
A. *Answers will vary.*
- 6** Q. According to your data and the research article what role do you think the arthropods you collected play in your local ecosystem?  
A. *Answers will vary. Arthropods fill many roles. They eat leaves and are eaten by other animals. They also break down leafy debris and recycle other animals' wastes.*

# TEACHER

### Vocabulary

**Arthropod** An animal with a hard outer skeleton (exoskeleton) and jointed legs.

**Biodiversity** A measure of the number and variety of species within a region.

**Brown food web** A food web that starts with bacteria and fungi breaking down dead leaves, animal carcasses, and waste products. This kind of food web also includes microbivores that eat the bacteria and fungi, as well as the animals that prey upon the microbivores.

**Canopy** The layer of a forest made up of the tops of tall, leafy trees. Rainforest canopies usually reach heights of 18 to 30 meters (approximately 60 to 100 feet).

**Consumer** An organism that eats other organisms to get its food.

**Decomposer** A bacterium or fungus that feeds on and breaks down dead plant or animal matter, making nutrients available to the ecosystem.

**Endemic** Living only in a certain region.

**Entomologist** A scientist who studies insects and other arthropods.

**Epiphyte** A plant that gets its moisture and nutrients from the air and rain and usually grows on another plant.

**Exoskeleton** The hard outer covering of an arthropod.

**Frass** Solid insect waste products.

**Green food web** A food web made up of species that feed on plants or prey upon species that feed on plants.

