

ART to ZOO

Ideas for Educators from the Smithsonian Institution, Office of Elementary and Secondary Education, Washington, D.C. September 1994

Under the Spell of...*Spiders!*

Little Miss Muffet was a wimp. Imagine getting all worked up just because a little spider comes along and sits down beside you. ■ Granted, we *are* talking about an animal with a certain alien quality: a beast with a bunch of beady eyes and lots of creeping, crawling legs; a creature that dangles in the darkness, lurking about in tangled retreats that seem to veil forgotten corners with a silky foreboding. And yes, we're talking about an efficient and highly skilled predator—a creator of clever snares, nets, and traps; a poison-fanged, hairy-bodied killer with a propensity for sucking the very life out of its victims... ■ OK, maybe Miss Muffet's reaction was somewhat understandable. And maybe most of us have had a similar reaction to spiders at one time or another. But for all their unearthly physical features and unusual habits, spiders, with just a few notable exceptions, are benign creatures—unless you happen to be an insect or some other small prey animal.

Spiders are also endlessly fascinating. They offer plenty of teachable moments that can span the curriculum, and we've tried to provide some of those moments in this issue of *ART TO ZOO*. It's our hope that, as you work through the activities, your students will gain a new respect for spiders. Maybe they'll even want to get to know the next eight-legged silk spinner that comes along and sits down beside them.

Teacher Background

Spiders, numbering some 34,000 known species, belong to a huge group of invertebrates called **arthropods**. So do insects, crustaceans, centipedes, millipedes, and other animals characterized by jointed legs (which is what the word "arthropod" means) and an exoskeleton.

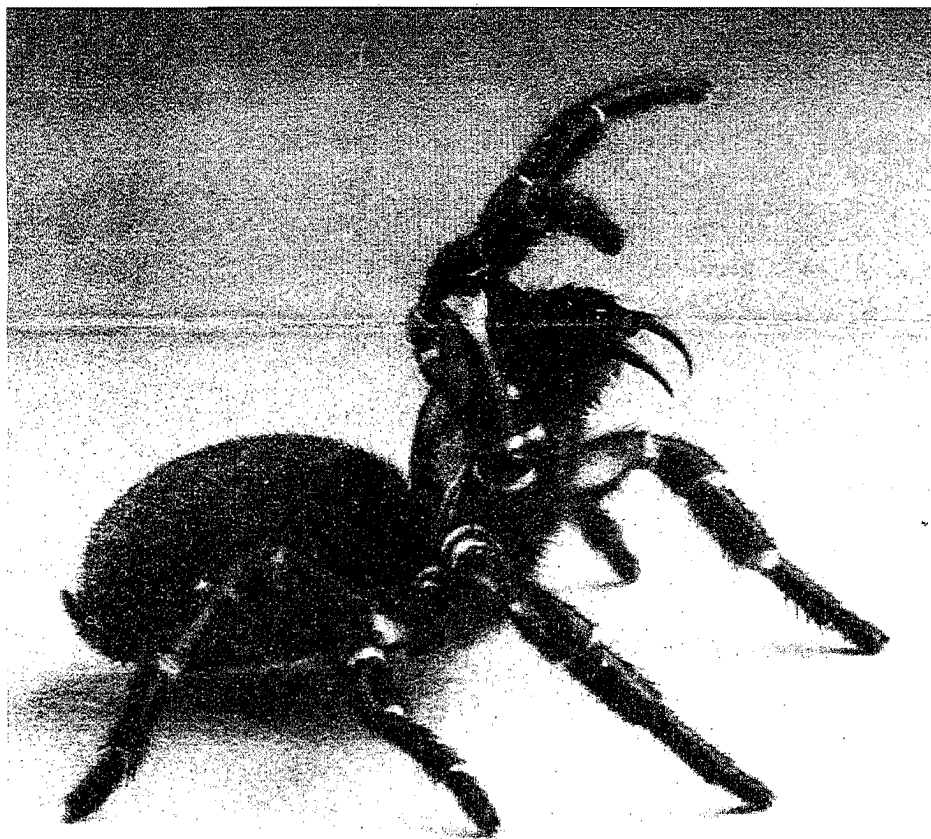
A lot of people think spiders are insects, but the two are only distantly related. Spiders share a closer kinship with scorpions, ticks, mites, daddy-long-legs, and other arthropods that have, as their most obvious characteristic, eight legs arranged in four pairs. (Insects, in contrast, have six legs arranged in three pairs.) These eight-legged arthropods are called **arachnids**.

Besides having eight legs, spiders and other arachnids have an extra pair of appendages called **pedipalps** (see the labeled spider picture on page 3). Pedipalps are a little like hands: They help arachnids feel their surroundings and hold on to prey and other objects. Most arachnids, including spiders, also have a special breathing system called **book lungs**. This unique respiratory "design" is named for its resemblance to the stacked pages of a book.

Spider Specifics

But there's more to a spider than eight legs, pedipalps, and book lungs. Here's a look at some other spider characteristics.

□ **Basic Body Plan**—Spiders have two main body parts—the **prosoma** (also called the cephalothorax) and the **abdomen** (also called the opisthoma). These are joined by a short, narrow stalk called the **pedicel**. A spider's eyes, legs, and chelicerae (i.e., its jaws, which are equipped with poison glands and fangs), are attached to the prosoma—there's no separate head, per se. A spider's silk-releasing organs, called **spinnerets**, are attached to the far end of the abdomen.



This Sydney funnel web of Australia and New Zealand is one of the few examples of a spider that's extremely dangerous to humans. Its potent venom can kill. Photo by Chip Clark, National Museum of Natural History, Smithsonian Institution.

The number of body parts helps to distinguish spiders from other arachnids and arthropods. For example, daddy-long-legs, those spindly-legged arachnids often confused with spiders, have only one body part (abdomen). And insects have three (head, thorax, and abdomen).

□ **Eyes Everywhere**—Most spiders have eight eyes, arranged in rows in a pattern characteristic of particular groups of spiders. An expert can often identify a spider just by looking at its eye pattern.

Interestingly, having lots of eyes doesn't correspond to good vision in most spiders. In fact, by human standards, spiders have lousy eyesight. But great vision isn't particularly important for the spiders that build webs—at least, not as far as catching a meal is concerned. Their prey, after all, comes to them. Spiders that actively stalk their prey, on the other hand, generally have better vision than their web-weaving relatives.

□ **Silk Spinners**—Spiders aren't the only arthropods with the ability to produce silk. Certain insects, such as silk moth larvae, do so as well. But no other animal uses silk to create traps for catching prey.

Spider silk—made up of protein—is produced in glands inside the abdomen. Each silk gland leads to a particular spigot that opens to the outside through one of several paired spinnerets. A spider "reels out" silk by gently pulling it out of a spigot with its two hind legs.

□ **Silks of Different Kinds**: Different silk glands produce different kinds of silk with different purposes. For example, female spiders produce a certain kind of silk to create their egg sacs. And the webs of many spiders are made up of a couple of different kinds of silk—one for the web's basic framework and another, sticky variety that makes getting away that much harder for trapped insects.

Although all spiders make silk, not all of them spin webs to catch their dinner. For more about the different ways spiders catch their prey, see "In Pursuit of Prey" on page 2.)

□ **Making Sense of Spider Senses**: What would life be like if you could taste through your legs and hear with your hair? If you can imagine such a concept, then you might have some inkling of what it must be like to be a spider.

Spiders, in fact, *do* taste, and also smell, through special sensory organs on their legs, as well as on their pedipalps. And they hear—or, more specifically, they sense vibrations—through hairs and tiny slits distributed over much of their body.

□ **Picking Up Vibes**: A spider's sensitivity to vibrations is finely tuned. For example, spiders can distinguish between different types of prey hitting their webs—say, a moth from a fly from a honeybee. This sensitivity to motion "tells" a spider what to expect so it will know how to handle a potentially dangerous meal.

The ability to tell one vibe from another also comes in handy during courtship: The males of web-building species often woo females by plucking a species-specific pattern on the females' webs. If a male simply blundered into a female's web without first introducing himself, he would risk becoming her meal instead of her mate.

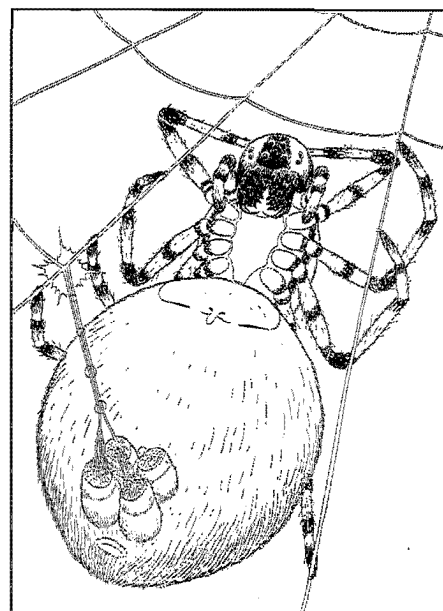


Illustration by Bob McLeod, Marvel Entertainment Group Inc.



Illustration by Bob McLeod, Marvel Entertainment Group Inc.

In Pursuit of Prey

All spiders are carnivorous, and insects make up the bulk of most spiders' food. But just about any small invertebrate is fair game for a hungry spider—other spiders included. Even a few vertebrates, such as frogs, small fish and birds, and rodents, occasionally find themselves in the fangs of these formidable predators. (You *bet* there are some big spiders out there.)

Spiders are amazing food-catching machines. Even the most common methods and “tools” they use to make a living—your basic web, for example—are marvels of evolutionary ingenuity. Here's an overview of some of the ways spiders do what they do best:

☐ **Silken Snares:** When most people think of spider webs they probably think of the spoked, roundish, and more-or-less regular constructions called orb webs. Although these beautiful webs may look like they'd take their tiny architects all day to design and build, many orb weavers can whip one out in less than thirty minutes. Orb weavers and other web spiders build a new web every day, recycling their silk supply by eating the old web.

Orb webs may be the most elegant of the silken snares, but they certainly aren't the only ones. There are lots of variations on the theme, from elaborate tunnels and tubes to the tangled cobwebs house spiders build in the corners of your ceiling. There's also the minimalist approach of bolas spiders, who manage to catch their prey on a single silken line that they hurl at passing prey.

☐ **Lurking for Lunch:** Web weavers are rather sedate creatures much of the time. But when the vibrations of a struggling creature signal a catch, they spring to life and head for the action. Experience and an oily coating on their feet help spiders avoid getting stuck as they skirt across the threads of their web.

Once a spider reaches its prey, it usually subdues the animal by biting it, injecting a paralyzing poison, and wrapping it in silk—or, conversely, by wrapping it in silk and then giving it a poisonous bite. If times are plentiful and the spider isn't particularly hungry, it may save its prey for later. But if it is hungry, it starts digesting its meal—*before* actually consuming it.

☐ **Spit and Suck:** Pre-digestion is a must for spiders, who don't have a mouthful of teeth to help them break down their food. To start the digestion process, a spider spits up a drop of liquid from its intestinal tract and deposits it onto the prey animal, momentarily marinating it in digestive juices. Then, with help from powerful contractions in its throat and stomach, the spider sucks in a portion of its liquified meal. It repeats this “spit and suck” process until nothing but the hard, indigestible parts of the victim remain.

☐ **Webless Wanderers:** About half of all spiders don't build webs to catch their meals. Instead, they either lie in ambush for their

prey or, in a few cases, they actively stalk it down. These webless spiders are often called “wandering” spiders, a reference to the fact that they are less sedentary (though not by much, in some cases) than their web-building relatives.

Many wanderers, such as wolf spiders, do build a kind of silken nest—either wedged among vegetation or in a shallow burrow—but this nest doesn't serve as a bug snare. Instead, it's a hiding place, called a retreat, within which the spider waits for passing prey. When it sees or feels movement nearby, the spider rushes out of its retreat, pounces on the animal, and delivers a paralyzing bite. Then it uses the same basic feeding techniques as web weavers, digesting the animal in advance and sucking in its liquid meal.

Growing Up a Spider

Being a spider means, for the most part, being alone all of your life. That's because spiders, with only a few exceptions, are naturally solitary creatures. They do manage to socialize long enough to court and breed, although even this amount of interaction has its drawbacks for some spiders: After performing their vital services, the male members of a few species become the female's next meal. Such is life—and death—when you're a spider.

☐ **Spider Moms:** Within a few weeks after mating, female spiders are ready to lay their eggs. Many enclose the eggs in a silk sac, called an *egg case*, that protects them and maintains the correct temperature and humidity for their development. Other females forego building an elaborate case, laying the eggs instead inside their retreats and covering them with a few silk threads.

Female spiders lay anywhere from a few dozen to several hundred eggs, depending on the species. Once the eggs are laid and the egg case complete, some spiders move on, leaving the future of their progeny to the whims of chance. Others stay with the egg case and guard it until the eggs hatch. And a few, such as wolf spiders, take mothering much further: They carry their egg case, attached to their spinnerets, wherever they go. Then, for a week or so after her spiderlings hatch, a female wolf spider carries her young around too—as many as a hundred or so, all crowded onto her back.

☐ **Up, Up, and Away:** For many spiders, life starts out with a far-flung adventure. After they hatch, and when they're little more than speck-sized, the spiderlings travel with the wind to strange new lands on a tiny silk filament that they spin for this special purpose.

This spider “flight,” called *ballooning*, can take young spiders high into the atmosphere (ballooning spiders have been caught from airplanes!) and hundreds of miles from their place of origin. Many of the spiderlings don't make it—they end up in water, for example, or in a hungry bird's belly—but enough survive to set up shop wherever they may land.

Spiders Invade National Museum of Natural History!

Spiders are all over the place these days at the Smithsonian's National Museum of Natural History. That's because they're the focus of a new exhibit called—well, *Spiders!*

Sponsored by a generous grant from the Marvel Entertainment Group Inc.—the creators of *Spiderman* comics—*Spiders!* features lots of eight-legged, silk-spinning arachnids in all their spellbinding (and sometimes even slightly gory) glory. Among other things, visitors can watch a tongue-in-cheek horror-style flick featuring incredible footage of some of the more bizarre methods spiders employ to catch their dinner. They can gawk at a claymation tarantula named Tallulah as she reveals sensational spider secrets, or quietly contemplate an exquisite spider-web mural as it shifts from a daytime to a nighttime scene.

Spiders! has plenty of appeal for teachers and their students. In a special learning center within the exhibit, called Spider Lab, everyone from the most computer-savvy kids to the technically intimidated can try their hand at a program that allows users to build and compare spider webs—right on the computer screen. Spider Lab visitors can also add their own artistic contributions to a larger-than-life spider mural. They can check out real spiders under a microscope, solve spider math problems focusing on multiples of eight (the number of legs and eyes spiders have), and visit the reading area to browse through the latest in spider literature.

There's something for everybody at the *Spiders!* exhibit, which runs through January 2, 1995 at the National Museum of Natural History. After that the exhibit will be on the road, traveling around the country under the direction of the Smithsonian Traveling Exhibition Service (SITES). Here's where *Spiders!* is currently scheduled to be over the next several years:

Time	Place
<i>1995–1996</i>	
March 11–June 4	American Museum of Natural History New York, New York
July 1–September 24	Cranbrook Institute of Science Bloomfield Hills, Michigan
October 21–January 14, 1996	Royal Ontario Museum Toronto, Ontario
February 10, 1996–May 5 (tentative)	Academy of Natural Sciences Philadelphia, Pennsylvania
June 1–August 25	California Academy of Sciences San Francisco, California
September 21–December 15	Bishop Museum Honolulu, Hawaii
<i>1997–1998</i>	
January 11–April 6	Cincinnati Museum of Natural History Cincinnati, Ohio
May 3–July 27 (tentative)	Fernbank Museum of Natural History Atlanta, Georgia
August 23–November 16 (tentative)	Museum of Science and History Jacksonville, Florida
December 13–March 8, 1998 (tentative)	Dallas Museum of Natural History Dallas, Texas

Lesson Plan

Step 1: Creatures From Planet X

Objectives:

- ☐ describe several physical characteristics of spiders
- ☐ discuss spider habits

Materials:

- ☐ copies of “Creatures from Planet X” profile (on Pull-Out Page)
- ☐ art supplies
- ☐ pictures of spiders
- ☐ “Tallulah Tarantula” script (on Pull-Out Page)

Subjects:

- ☐ science, art, language arts

Here's an entertaining and educational way to introduce a unit on spiders.

Procedure:

- Tell the students to imagine a mystery planet—Planet X—where millions of fascinating life forms exist. Explain that among these life forms is a particularly bizarre and amazing group of creatures.
- Hand out copies of the creature profile and tell the children that the list represents basic data about these strange creatures.
- Review any vocabulary from the profile that the students may be unfamiliar

with, such as *appendages*, *receptors*, *disperse*, and so on.

4. Have each person use the profile information to draw a picture of one or more of the creatures. Encourage students to elaborate on their drawings by putting the creature in some kind of context. For example, they could draw the creature within its habitat, in the process of catching a meal or eating, or hatching from an egg.

5. Tell the students to think about what they'd call such a creature if they were the scientist who discovered it. (If they want, they can label their drawings with the creature's name and features.)

6. Have the students share their artwork. Then tell them that actual photographs exist of the creatures from Planet X. Show the kids pictures of spiders and reveal that Planet X is Earth. Ask them if any of their drawings look like spiders.

Extend the Activity!

Try the following ideas to reinforce your students' knowledge of spider characteristics.

Art and Language Arts

Hand out copies of the “Tallulah Tarantula” script from the Pull-Out Page. Explain that the script describes some of the ways spiders perceive the world. After giving the kids time to read the information, have them illustrate Tallulah's monologue in a comic-book style presentation.

Math

Have students work in groups to create spider math problems. The problems can be either straightforward or fanciful. Here are a couple of examples:

There were five spiders in the garden and each of them ate twelve insects. How many insects did they eat in all?
(5 x 12 = 60)

Yesterday the spider eye doctor had a busy day. He examined a total of 352 eyes. How many spiders came in for an exam yesterday?
(352 total ÷ 8 eyes per spider = 44 spiders)

Have the groups quiz each other by exchanging their problems. (Once the groups have completed a set of problems, you might also want to have them check each others’ work.)

Math problems adapted with permission from materials developed by Rod Baer for use in Spider Lab, a learning center within the Smithsonian’s Spiders! exhibit.

Step 2: Spiders and Insects

- Objectives:
- ☐ name several differences between spiders and insects
 - ☐ define *arthropod* and name several examples of these animals
 - ☐ define *arachnid* and name several examples of these animals

- Materials:
- ☐ pictures of spiders and insects
 - ☐ copies of “Creepy Crawly Checksheet” (on Pull-Out Page)

- Subject:
- ☐ science

Lots of people confuse spiders with insects. Here’s a way to help your students review the differences—and similarities—between the two.

Procedure:

- Assign the students into small groups and provide each group with several clear pictures of insects and spiders. (Provide the same number of each—for example, four pictures of spiders and four of insects.) Don’t tell the kids that some of the animals are spiders and some are insects.
- Give the groups time to observe the pictures. Then tell the kids that the pictures represent two different kinds of animals. Have the kids divide the pictures into the two kinds of animals they think the pictures represent.
- Ask the students what the two kinds of animals are and go over their groupings. Then ask, “Are spiders a kind of insect?” (No.) Don’t discuss the differences between spiders and insects at this point.
- Hand out copies of the “Creepy Crawly Checksheet” from the Pull-Out Page and have the students complete it by placing check marks in the appropriate column for each characteristic. (They can work alone or in groups.) Discuss any vocabulary the students aren’t familiar with, such as *exoskeleton*, *metamorphosis*, and *pedipalps*. (Without telling the kids whether spiders or insects have pedipalps, explain what they are using the introductory paragraphs of the teacher background.) Also be sure to tell the kids that they should base their answers on whether *most* spiders and insects have a particular characteristic. For example, most adult insects have wings—but some such as ants do not. The students should put a check mark in the “wings” column for insects, even though ants and certain other insects are wingless.
- When the students are finished, use some of the pictures you handed out earlier to emphasize the specific characteristics of spiders and insects. Go over the “spiders”

and “insects” columns on the checksheet. (See chart answers, below.) Then explain that, even though spiders and insects are two different types of animals, they have some things in common. Discuss the answers to the “both” column, and point out that there should be only two checks in the “neither” column, under “endoskeleton” and “warm-blooded.”

- Explain that all animals that have an *exoskeleton* (i.e., invertebrates), segmented (also called “jointed”) legs, and are cold-blooded are called *arthropods*. Besides spiders and insects, the arthropod grouping includes crustaceans (shrimp, crabs, lobsters, and their kin), millipedes and centipedes, horseshoe “crabs,” and others. Most arthropods also lay eggs. (A few give birth to live young.)
- Tell the kids that spiders belong to a group of arthropods called *arachnids*. Use the information under the introductory paragraphs of the teacher background section to describe arachnids.

Step 3: Spy on a Spider

- Objectives:
- ☐ name and describe the physical features of a spider
 - ☐ describe some of the places where spiders live

- Materials:
- ☐ copies of “Spider Parts” (on Pull-Out Page)
 - ☐ pictures of spiders
 - ☐ live spiders (optional)
 - ☐ jars (optional)
 - ☐ old hosiery (optional)
 - ☐ rubber bands (optional)
 - ☐ insect net (optional)
 - ☐ magnifying glasses (optional)

- Subject:
- ☐ science

There’s nothing like the real thing when it comes to observing animals and where they live. Try this activity to help your students learn more about spiders and their habitats. (Keep in mind that you’ll have better luck with the activity in seasons other than winter, since by then most spiders have either died or gone into hibernation.)

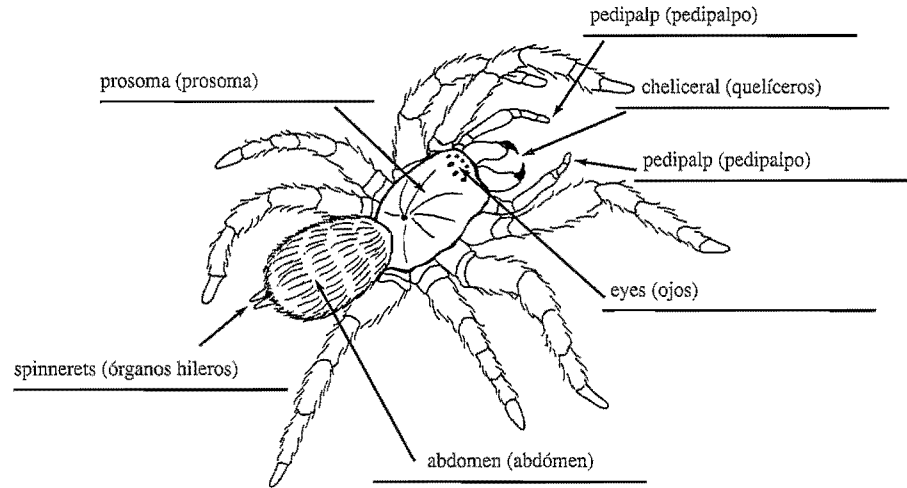
Answers to the Creepy Crawly Checksheet

Who Has What?	Spiders	Insects	Neither	Both
Wings		✓		
Endoskeleton			✓	
Exoskeleton				✓
Antennae		✓		
Six legs		✓		
Eight legs	✓			
Two main body parts	✓			
Three main body parts		✓		
Segmented legs				✓
Pedipalps	✓			
Eat only meat	✓			
Young hatch from eggs				✓
Go through metamorphosis		✓		
Cold-blooded				✓
Warm-blooded			✓	
Some catch prey in webs	✓			

Spider Search Data Chart

Spider	Description of spider (color, approximate size, and any special marks)	Where found?	Dead or alive?	In web?	Description of web	Any prey?	Other comments
1							
2							
3							
4							
5							
6							

Answers to “Spider Parts”



Part A—Spider Parts

Preparation:

If possible, catch several spiders—one for each group of three or four students—before starting this activity. One way to find spiders is to simply sweep through vegetation with an insect net. (Don’t try to handle the spiders directly. Most spiders don’t move very quickly, so once a spider is in the net you should be able to gently “persuade” it into a jar.) Put each spider in its own jar and cover the top of the jars with a piece of old hosiery, held firmly in place with a rubber band. Also put a couple of small sticks inside each jar (some spiders will spin a small web between them). Jot down where you found each spider so you can return it to its natural habitat later.

Try not to keep the spiders for longer than a day. If you need to keep them longer, add a moist cotton ball to each jar so they can drink.

Note: Keep in mind that most spiders, while not poisonous to humans, are capable of biting. It’s fairly easy to avoid being bitten if you avoid directly handling the spider. Under no circumstances should you attempt to capture either a black widow, brown recluse, or other poisonous spider. If you’re unsure about what these spiders look like, remember to look at their pictures in a field guide or other book before capturing your spiders. Also remind the kids to keep the covers securely on the jars.

Procedure:

- Using the information in the teacher background section, introduce the kids to the

basic characteristics of spiders. As much as possible, use pictures or photos of spiders to point out the two main body parts, eight eyes, fangs, and other parts.

- Hand out copies of “Spider Parts” and have the kids fill in the blanks. Go over their answers (see labeled picture, below).
- Assign the students into small groups and give each group one of the live spiders you caught earlier. If possible, have the students use magnifying glasses to try and find the spiders’ two main body parts, chelicerae (jaws), spinnerets, pedipalps, and all eight eyes. Also ask the groups if they can find the identifying feature of arthropods (the “joints” in the legs).
- If you collected the spiders on the school grounds, have the students help you return them to where you found them.

Part B—Spider Search

Procedure:

- Create a data sheet that the students can take with them on a spider search. (See the example, below.)
- Assign the kids into small groups and explain that each group will be searching for spiders. With the students’ help, make a list on the chalkboard of places to look for spiders. Remind the students that spiders often hang out in corners, crevices, and other hidden places.
- Hand out the data sheets and review any information that may be unfamiliar. For example, for the “web description” column, explain that different kinds of spiders spin different kinds of webs. (For that matter, some spiders don’t spin webs at all—see “Webless Wanderers” in the teacher background section.) Some spiders, called orb weavers, build orb webs (the “typical” spider web). Others build funnel webs, sheet webs, cobwebs, and so on.

Tell the students that they should write a description of any webs they find in the “web description” column. If it’s an orb web they should say so. If it’s any other kind of web they can describe its appearance briefly. (They don’t have to determine exactly what kind of web it is.) If a spider is in the web, they should describe what it’s doing.
- Take the groups outside and give them 30 minutes or so to search for spiders and fill out their data sheets. You might want to consider having an adult accompany each group. (*Caution: Be sure to warn the kids in advance to avoid touching the spiders. Also caution them to be careful when turning over rocks or logs. They should never put their hands underneath these objects. And for the sake of the creatures for whom the rocks or logs are home, they should always turn the objects back over when they’re finished.*)
- After the search, discuss the students’ data. You might want to encourage them to create graphs portraying, for example, the locations with the highest concentrations of spiders, the numbers of web versus non-web spiders, and so on.

“Spy on a Spider” is adapted from activities developed by Caroline Maier and Dr. Petra Sierwald for the Delaware Museum of Natural History.

WOULD YOU BELIEVE...

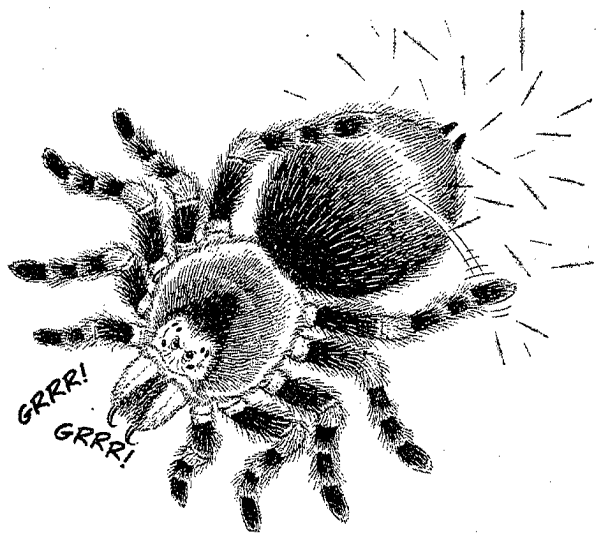


Illustration by Bob McLeod, Marvel Entertainment Group Inc.

The smallest spiders are tiny specks: As adults, they're less than a millimeter long—legs and all. The biggest spiders have a four-inch-long (10-cm) body and a leg span that stretches more than ten inches (25 cm).

The male European house spider can run 330 times its own body length in ten seconds. To do the same thing, you'd have to run farther than the length of six football fields in the same amount of time.

A spider under attack can cut its losses by deliberately breaking off a leg. A shut-off valve at the joint seals the wound. Many spiders can grow a new leg to take the place of the old one.

In certain South American cultures, people roast and eat tarantulas. The meat is said to have a nutty flavor.

Tarantulas can send predators packing with poisonous, barbed hairs. The spiders use their hind legs to aim a cloud of these tiny, painful "spears" at their attackers.

Certain spiders have a unique way of hiding: They look like bird droppings! Their appearance keeps them safe from predators. And their prey doesn't realize that the "droppings" are dangerous.

Bolas spiders are cowboy arachnids: They use a single silken line—dabbed at its end with a droplet of spider glue—as a kind of lasso. When an insect comes close, they swing the line around a few times and then throw it at their intended prey.

Net-casting spiders catch their meals by building a tiny web between their four front legs and throwing the web over passing prey.

(movies such as *Arachnophobia*, for example), and the potential of a few spiders to harm humans.

During the discussion, ask whether people's negative reactions to spiders are justified. Be sure to point out that most spiders are harmless to people, and that spiders, as a group, perform important ecological functions. For example, they help to keep insect populations in balance. And in turn, they provide food for birds, lizards, and other spider predators.

2. Tell the kids to imagine they're a spider. Now tell them to imagine that, as they're crawling along one day, they see a little girl sitting on a tuffet, eating her curds and whey. When they sit down beside the little girl, she becomes frightened and runs away.

Next have the students imagine that they're not just any spiders—they're spiders that can talk! Ask, "what would you say to the little girl to change her negative opinion of spiders?"

3. Have the kids write a dialogue between Little Miss Muffet and the spider who sat down beside her. They should write the dialogue from the point of view of the spider, who is trying to explain to Miss Muffet why she needn't be afraid of most spiders, and why she should appreciate their role in the world.

Tell the students that they must include at least three factual statements about spiders in their dialogues—either general information from the teacher background about physical characteristics, habits, where spiders live, and so on, or specific information about particular spider species that the kids research themselves. They should also include in their dialogues at least one spider-related bit of history or folklore. (They can either do their own research or use the information from the previous activity ("Facts, Feats, and Folklore").

4. Have pairs of students perform the dialogues.

Resources

Books

GENERAL REFERENCE:

Biology of Spiders by Rainer F. Foelix. Harvard University Press 1982; new edition expected in 1995.

Spiders and Their Kin edited by Herbert S. Zim. Golden Press, 1968; numerous editions.

CHILDREN'S BOOKS:

The Lady and the Spider by Faith McNulty. Harper Trophy, 1986. (A Reading Rainbow story about a spider living in a backyard garden.)

Someone Saw a Spider—Spider Facts and Folktales by Shirley Climo. Thomas Y. Crowell, 1985.

Spider by Michael Chinery. Troll Associates, 1991. (Life story of the garden spider.)

A Spider Might by Tom Walther. Sierra Club Books/Charles Scribner's Sons, 1978. (Describes common urban and suburban spiders.)

Spiders. 1982. Illa Pollendorf. Childrens Press. (General spider information accompanied by good photos.)

Posters

Four spider posters, entitled "Armed and Dangerous," are available from the Smithsonian Institution. Each poster presents an up-close photo and scientifically accurate information about four of the world's most venomous spiders (black widow, brown recluse, Sydney funnel web, and tropical wandering spider). Cost is \$5.00 each; \$20.00 for the set of four. All orders must be prepaid. Make checks payable to Smithsonian Institution and include \$4.00 per order for shipping and handling. Send orders to: Smithsonian Institution Traveling Exhibition Service Publications Office, Department 0564 Washington, D.C. 20073-0564

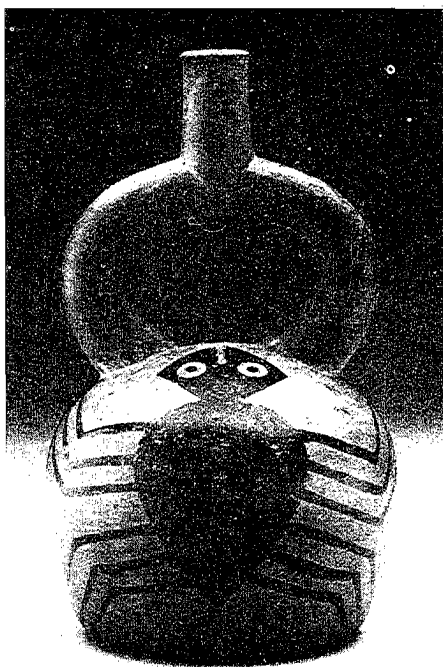
The Smithsonian Institution

Anacostia Neighborhood Museum
Arthur M. Sackler Gallery
Arts and Industries Building (Experimental Gallery)
Cooper-Hewitt National Museum of Design
Freer Gallery of Art
Hirshhorn Museum and Sculpture Garden
National Museum of African Art
National Museum of the American Indian
National Air and Space Museum
National Museum of American Art and Renwick Gallery
National Museum of American History
National Museum of Natural History
National Portrait Gallery
National Postal Museum
National Zoological Park
Smithsonian Environmental Research Center
Smithsonian Tropical Research Institute

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This Peruvian vessel, dating from between 100 and 300 A.D., depicts a spider with a few extra legs. Courtesy of the Art Institute of Chicago.

4 Step 4: Facts, Feats, and Folklore

Objectives:

- ☐ list three fascinating spider facts
- ☐ state several folkloric sayings and beliefs about spiders

Materials:

- ☐ copies of the information in the boxes entitled "Would You Believe..." and "Fantastic Folklore"

Subjects:

- ☐ science, art, folklore

In this activity your students can use spider facts, fallacies, and folklore to create an entertaining bulletin board or other display.

Procedure:

1. Hand out copies of the information under "Would You Believe..." and "Fantastic Folklore." Explain that all of the information

under "Would You Believe" is true. Most of the folkloric information, on the other hand, is superstition, although it's possible that a couple of the sayings may have a grain of truth to them. For example, it's possible that spiders, being sensitive to changes in barometric pressure, might resume web-building when stormy weather starts to clear up (see the first saying). But by and large, superstitious sayings about spiders are just that: superstitions.

2. Have each student illustrate one or more of either the true statements from the "Would You Believe..." sheet or the folklore information.

3. Have the students use their illustrations to design a bulletin board or other display. You may want to have them do a little research on their own so they can add other fascinating spider facts, feats, and folklore.

Step 5: Let's Hear It for Spiders!

Objectives:

- ☐ list several reasons why spiders are often misunderstood
- ☐ write a dialogue

Subjects:

- ☐ science, language arts, history

People's reactions to creeping, crawling critters are often based on misunderstanding and fear. By writing a dialogue between Little Miss Muffet and the spider that sat down beside her, your students can explore their own feelings about spiders while examining reasons why spiders deserve their appreciation.

Procedure:

1. Ask the students what their first reaction is when they see a spider. Then lead a group discussion focusing on possible reasons that people react negatively to spiders. Reasons include fear and misunderstanding, spiders' strange or scary appearance, media hype

Fantastic Folklore

*When spiders spin their webs 'fore noon,
sunny weather's coming soon.*

*If a spider crawls into your pocket,
you will always have money.*

*If a spider hangs over your head,
you will get a letter.*

*Spider webs floating at autumn sunset,
Night frost to follow—on this you can bet.*

*If a spider builds its web across your
door, you can expect company.*

*If you walk into a spiderweb,
you will meet a friend that day.*

*Kill a spider, bad luck yours will be
Until of flies you've swatted fifty-three.*

*If you step on a spider,
you'll bring on rain.*

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Use with Step 1:

A Profile Of...

The Creatures from Planet X

Physical Characteristics:

- Body in two main parts
- Hair covers most of body; sometimes thick, but usually sparse
- Two sharp fangs
- Four pairs of walking appendages, each with seven joints
- Two smaller appendages, often used for grasping, located near fanged jaws
- Some individuals very colorful; others blend into surroundings

Senses:

- Taste and smell occur through receptors on legs
- Hearing occurs throughout body, via receptors on hairs
- Vision surprisingly poor in most individuals, despite large number of eyes

Habits:

- Prefer living alone—often in dark, hidden places
- Eat only meat
- Many create traps for catching food; others stalk prey
- Kill or stun prey by injecting poison
- Feed by sucking juices out of prey

Breeding and Offspring:

- Males court females by sending special vibration signals
- Young hatch from eggs
- After hatching, some young disperse by sailing high into atmosphere and traveling on currents to new areas
- Young shed skin as they grow

P U L L - O U T P A G E

ART TO ZOO

Septiembre de 1994

Traducción de Orlando Lizama

Use con Paso I

Un perfil de...

Las Criaturas Del Planeta X

Características físicas:

- Cuerpo con dos partes principales
- El pelo cubre la mayor parte del cuerpo, a veces es grueso, pero generalmente escaso
- Dos filosos colmillos
- Cuatro pares de apéndices para caminar, cada uno con siete coyunturas
- Dos apéndices menores, ubicados cerca de los comillos, a menudo usados para agarrar
- Algunos individuos son muy coloridos; otros se mimetizan o se confunden con lo que les rodea

Sentidos:

- El gusto y el olfato se encuentran en receptores en las patas
- El oído está en todo el cuerpo y en receptores en los pelos
- Sorprendentemente la visión es mala en la mayoría de los individuos, pese a su gran cantidad de ojos

Hábitos:

- Prefieren vivir solos, con frecuencia en la oscuridad, en lugares ocultos
- Comen solamente carne
- Muchos crean trampas para conseguir alimento, otros acechan a su presa
- Matan o aturden a su presa inyectándole veneno
- Se alimentan libando los jugos de su presa

Reproducción y Crías:

- Los machos cortejan a las hembras mediante vibrantes señales especiales
- Después de salir del huevo algunas crías se dispersan flotando por los aires y viajando con la corriente hacia otros lugares
- Al crecer esas crías se van despojando de su piel

Tallulah Tarantula Tells All

Darling, you'd think that with eight eyes, I'd see just about anything that moves.
But for me, seeing is definitely not believing!

So...what's a spider to do? Well, darling, I'll tell you some of my sense-sational secrets.

With every step that my legs take, I get to taste—and smell—what I'm stepping into.
You better believe that I watch where I walk!

You're probably wondering how in the world I hear.
Well, darling, I just perk up my hairs. Hairs?!
Yes, dearheart. Just about every one of my gorgeous hairs senses vibrations.

Now maybe you think I'm just a little—well, out of my senses.
But take it from me: Life's *soooo* fascinating for us spiders.
After all, who else can taste with their legs and hear with their hair!

*Adapted from a claymation video appearing in **Spiders!**, a traveling exhibition produced by the Smithsonian Institution.*

P U L L - O U T P A G E

Talula La Tarantula Nos Cuenta Todo

Cariño, tú pensarías que con ocho ojos yo puedo ver todo lo que se mueva.
Pero, para mi, definitivamente ¡ver no es para creer!

Así es ¿qué hace una araña?- Bueno, cariño.
Te voy a contar un cuento sensacional...

Con cada paso que dan mis patas, yo le tomo el gusto y huelo todo aquello sobre lo que
me paro. No lo creerás, pero ¡cuando yo camino estoy mirando!

Probablemente estés preguntándote cómo lo hago para escuchar. Bueno, cariño.
Sólo tengo que parar mis pelos. ¿Pelos? ¡Si, cariño!. Virtualmente cada uno de mis
pelos es un fabuloso receptor de vibraciones.

Tal vez estés pensando que he perdido el buen sentido. Pero créeme.
La vida es muuuuy fascinante para nosotras las arañas.
Porque..¿quién acaso puede saborearse con los pies y escuchar con el pelo?

*Adaptado de un video que aparece en **Spiders!** (Arañas), una exposición que se presenta en el
Museo de Historia Natural del Smithsonian hasta el 2 de enero de 1995.*

Use with Step 2:

Creepy Crawly Checksheet

Who Has What?	Spiders	Insects	Neither	Both
Wings				
Endoskeleton				
Exoskeleton				
Antennae				
Six legs				
Eight legs				
Two main body parts				
Three main body parts				
Segmented legs				
Pedipalps				
Eat only meat				
Young hatch from eggs				
Go through metamorphosis				
Cold-blooded				
Warm-blooded				
Some catch prey in webs				

P U L L - O U T P A G E

Use con Paso II

Datos Horripilantes

¿Quien Tiene Que?	Arañas	Insectos	Ninguno	Ambos
Alas				
Endoesqueleto				
Exoesqueleto				
Antenas				
Seis patas				
Ocho patas				
Dos partes principales del cuerpo				
Tres partes principales del cuerpo				
Patas segmentadas				
Pedipalpos				
Comen colo carne				
Las crías se reproducen por huevos				
Pasan por una metamorfosis				
Sangre fría				
Sangre caliente				
Algunos cogen su presa de las telarañas				

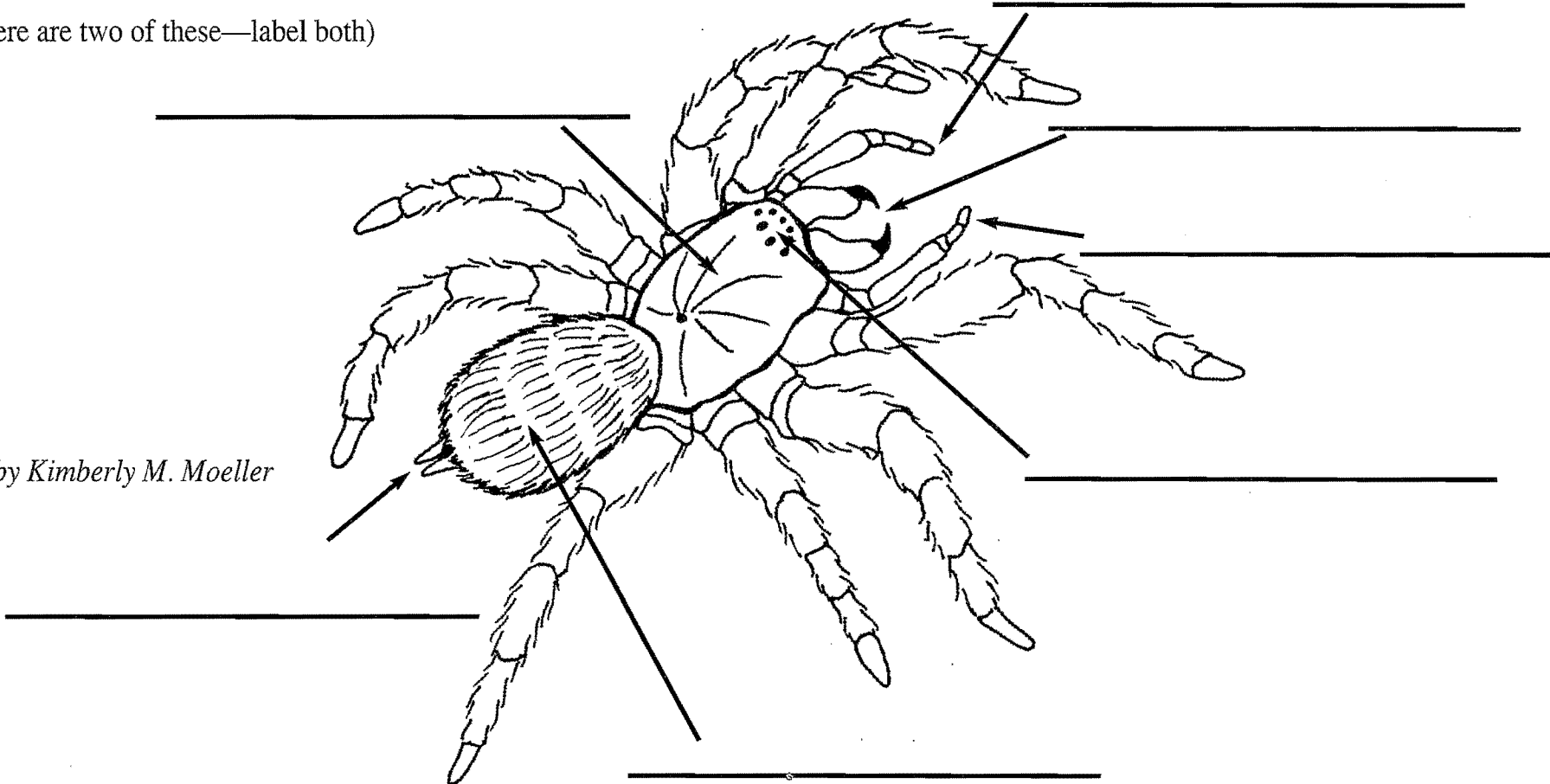
Use with Step 3:

Spider Parts

Which part is which? Use the words below to identify what's what on a spider. Just write the correct word in the correct blank—but be careful: There are more words to choose from than you need!

- abdomen
- prosoma
- eyes
- pedipalp (there are two of these—label both)
- chelicerae
- spinnerets
- head
- invertebrate
- thorax
- wings

Illustration by Kimberly M. Moeller



P U L L - O U T P A G E

Use con Paso III

Partes de una Araña

¿Qué parte es cual?. Utiliza las palabras que siguen a continuación para identificar lo que hay en una araña. Solo escribe la palabra correcta en el espacio correcto...pero ten cuidado. Hay más palabras para elegir que las que tú necesitas.

- abdómen
- prosoma
- ojos
- pedipalpos
- quelíceros
- órganos hileros
- cabeza
- invertebrados
- tórax
- alas

