Spiders

Background

Spiders are among the most diverse and widespread of all animals. They can be found in almost every habitat, with the exception of the permanently frozen polar-regions. Some spiders are even aquatic. Spiders are also adaptable and can thrive in, on and around human dwellings. Most people are familiar with the common spiders found around their houses and gardens, but many kinds are small, secretive and rarely seen.

Spiders are arthropods and are related to insects and crustaceans. Like crustaceans, spiders have two major body regions: the *cephalothorax* (combined head and thorax) and an abdomen. (A thin waist, the *pedicel*, connects the cephalothorax with the abdomen.) Spiders are unique in many ways. Most of their internal features are attached to the cephalothorax. This includes the mouth, four pairs of legs, and, typically, eight eyes. A pair of leg-like structures, the *pedipalps*, is found between the front legs and the mouth. The pedipalps are usually small, but in tarantulas and a few other spiders, they are so large that they look like a fifth pair of legs. Internally, the cephalothorax contains the brain, a few nerves and blood vessels, and a portion of the digestive system; but muscles that move the legs take up most of the space. The abdomen contains the heart, most of the complex digestive system, and a specialized gill called a *book lung*. The book lung gives the spiders their high degree of adaptability to terrestrial environments. Gills must be kept moist in order to function, so most animals that have them must live near water, or at least in moist places. Since the gills of spiders are internal, they are protected from dehydration, which allows spiders to live in dry environments.

Producing and Using Silk

The ability to produce silk is not unique to spiders. Silk is a protein fiber that is produced by special glands called *spinnerets* that are located in the abdomen of the spider. The silk of some spiders is exceptionally strong –even stronger than a piece of steel of the same diameter- and it can stretch to more than one fourth its length before breaking. Spiders use silk for many aspects of their lives, including catching and storing prey; constructing a home; making a covering for egg cases and, later, an enclosure for the young; running a safety line; and traveling from place to place.

Spiders rarely fall because as they walk along, they occasionally touch their abdomens to the surface and attach a silk dragline. If they begin to fall or are brushed away, the elastic silk line catches them. Then they can either climb back up the line or produce more silk and lower themselves to a safe spot.

One of the most unusual uses of silk is for flight. Some small spiders use a technique called *ballooning* as a means of dispersing the place of birth. The juvenile spiders climb some object, such as a rock, a post, or a tree and begin releasing strands of silk into the air. When there is sufficient wind drag on the strands of silk to lift the small spiders, they release their grip and are carried away on the breeze.

The best-known use of silk is in the construction of spider webs to capture prey. Spider webs are as diverse in structure as the spiders that weave them. Two of the more common types are the *orb webs*, usually constructed in a vertical position across an open area, and the *funnel webs*, with the apex terminating in a crevice or other secret place where the spider hides. Spider webs have sticky fibers that entrap prey and non-sticky fibers that allow the spider to run over the surface without becoming entangled. In both types of webs, the spider sits quietly until an insect becomes caught in the sticky fibers. When the insect struggles to escape, vibrations in the web stimulate the spider to rush forward and seize the prey, which is then eaten or encased in silk and stored for future use.

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Spiders (cont)

Capturing Prey

Most spiders are predators of insects and other arthropods, such as mites and even other spiders. They catch their prey in a variety of ways in addition to the use of webs. Some spiders stalk and jump on their prey. Tarantulas, wolf spiders and some other large nocturnal spiders stand quietly until the prey bumps into the sensory hairs on their legs; then they simply seize the prey. In all these cases, the prey is immediately paralyzed by an injection from the spider's venomous fangs before being eaten or stored. Since the prey is usually not killed but simply immobilized by the venom and since most small insects can live a long time without eating, just a few stored insects can give spiders a good source of live food. With most spiders, eating is accomplished by injecting digestive juices into their prey and later sucking out the digested liquid food. Usually, the hard exoskeletons are not eaten, and these can often be seen on a spider's web.

Reproduction

Reproduction in spiders begins with courtship by the males. With orb spider and other web-builders, the male finds the web of a female and plucks threads with a characteristic rhythm to attract her attention. With other types of spiders the, the male finds and follows the dragline of a female. With other types, especially the jumping spider and spiders with good vision, visual cues such as dancing and leg waving are used to attract the female. A few days after mating, the female lays her eggs and wraps them in a silk sac. In some species, the sac is hidden and the young emerge the following spring; in other species, the eggs hatch within a few weeks. In some species the sac is carried by the female until the young hatch; and in some of these species, the young ride on the back of the female for a few days. After hatching, the young sometimes consume the silk sac. Then, following in the pattern of adult spiders, they become predators, with most living solitary lives.

About Spider Bites

Most spiders in the United States and Canada do not bite, even when provoked those that do bite, typically cause only minor irritation that soon disappears. However, the bite of a few spiders, such as the brown recluse, can cause painful, slow healing wounds. And the bite of the Black Widow, while not causing serious injury at the site of the bite, can result in severe internal pain and even death. Fortunately, very few people are bitten by either of these spiders and most survive, although with painful memories.

In fairness to spiders, it should be pointed out that the only mechanism they have for biting people is the fangs they use to inject enzymes into their prey, and the enzymes that paralyze and digest the prey are the only venoms. No spider is especially equipped to bite or poison human beings. The fact that spiders do bite is a coincidence of nature that allows their normal feeding mechanism to affect us in a negative way. Since some spider bites are dangerous, all spiders should be handled with care-for example, by coaxing them into a jar rather than picking them up.

Spiders in the Classroom

Spiders are among the easiest of animals to keep and study in the classroom. The opportunity to do so can be an exciting learning experience for students and can help improve the image of one of the world's largest group of animals.

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Spiders (cont)

How to Obtain

Since spiders are so widespread and abundant, they can be collected almost anywhere during the warm months. In natural areas, they may be found under rocks, logs or pieces of bark. Also search for them (or their webs, which are the most visible clues to their presence) in gardens, in and around shrubbery, along foundations of buildings, and, of course, in basements. Some kinds of spiders, especially tarantulas, can be purchased from pet stores.

Caring For Spiders

Housing

A quart or gallon glass jar with a screen or hole-punched lid is an ideal container for most spiders. A terrarium is also suitable if it has an appropriate cover. Because of their predatory habits, two spiders cannot be kept in the same container; one will consume the other. Place about 2 inches of moist soil in the container and then add a stick or two so the spider can climb and attach its web. Spiders require some moisture, and they obtain it from their food and from the air. If the soil is sprinkled with water occasionally, the air will be kept appropriately moist for most spiders. Spiders that live in wet places should be provided with a small dish of water.

Diet

Spiders have the ability to survive for extended periods without eating, but they should not be forced to do so unnecessarily. It is difficult to generalize about the amount to feed spiders, so a little experimentation is needed. First, spiders can be fed a variety of insects, including flies, crickets, sowbugs, pillbugs, or even other spiders, but whatever food is used it must be alive. The food should be smaller than the spider being kept. Try feeding the spider once a week. If it eats each time, feed it a little more often. The frequency of feeding will depend on the size of the food. Most spiders can tolerate periods of cool temperatures, so no special attention is required for weekends and vacations.

Observations, Activities and Questions

- Carefully observe and describe a spider. What is its shape? How many legs does it have? Does it have eyes? Does it have antennae?
- If two or more spiders are available, compare them. How are they alike? How are they different?
- Feed a spider and observe how it catches and consumes its prey.
- If a spider makes a web, look at it carefully and describe it. What is the shape of the web? What is the web attached to? How is it attached? Does the spider sit or climb on the web?
- If a spider sheds its skin, examine it carefully with a magnifier.

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