

Spiders and Webs

BACKGROUND

WEBS AND THEIR WEAVERS

Among nature's beautiful designs, few can surpass the intricate beauty of a spider web glistening with dewdrops in the early morning sun. And few are so immediately and obviously functional. To watch a fly's unsuccessful twisting and turning in the sticky strands of a web is to observe an effective food-trapping device in action.

To many, spiders are far less worthy of admiration than their webs, but in fact, spiders are marvelous creatures. Some people think spiders are insects, but this is not so. They are related to insects in that both are **arthropods**, having jointed legs and external skeletons, but much of the similarity ends there. Spiders have two body parts (**cephalothorax** and abdomen), and insects have three (head, **thorax**, and abdomen). Spiders have eight legs, but insects have only six. Most insects possess both **antennae** and wings, whereas spiders lack both. Spiders have **pedipalps**, appendages located between the jaws and the front legs, but insects do not. These pedipalps are sense organs that also function as sex organs in males.

Spiders belong to the class Arachnida, as do scorpions, mites, and daddy longlegs (harvestmen). The scientific name is derived from the Greek word for spider, Arachne, which commemorates the name of a legendary Greek maiden who challenged the Goddess Athena's spinning ability and was turned into a spider for her audacity.

The English word spider is a corruption of "spinder," one who spins. Almost all spiders can spin silk and are able to do so from birth. The spinning organs are finger-like projections called **spinnerets** that can be extended, withdrawn, compressed, and to some extent, aimed. They are located near the end of the abdomen on the undersurface. These spinnerets are tipped with many "spigots" from which the silk is released. The silk is produced from glands within the abdomen; as the fluid leaves the spider's body, it hardens quickly to form the

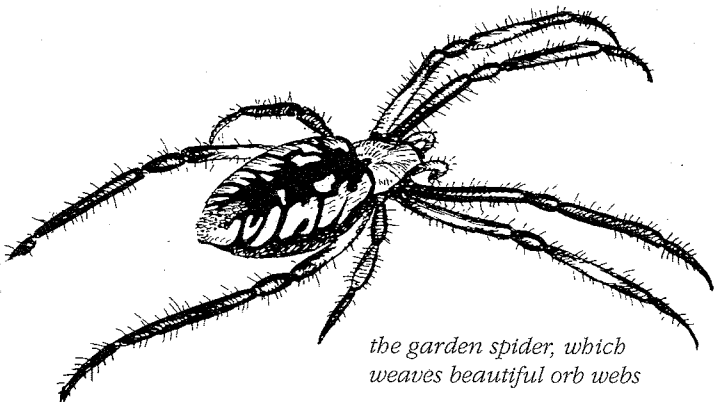
familiar silken thread. Scientists have identified at least seven different kinds of spider silk, each used for a specific purpose.

Spider silk has considerable strength and elasticity. A rope of spider's silk one inch thick would be stronger than a one-inch steel cable. Some of the threads will stretch nearly one-half their length before they break. The thinnest lines are only one-millionth of an inch wide, and thus invisible to humans, but other lines are much heavier.

Not all spiders spin webs, but those that do, use them to catch insects. When an insect is caught in a web, the spider (often hiding off to the side) feels its struggles to escape. A spider can determine from the pattern and strength of the vibration whether **prey** has been caught, a mate is signaling his arrival, or a **predator** is approaching. Generally, if an insect is caught, the spider rushes toward the prey and injects it with venom or throws a strand of silk over it to disable it. Many spiders wrap their prey in silk to trap and store them before eventually ingesting them. Spiders have small mouths and cannot eat solid food. They must either inject digestive fluids into the insect's body or secrete these fluids over it to dissolve the tissues that they then suck in. If an unpalatable insect is caught, the spider will cut the threads around it until the insect drops out of the web.

Webs vary greatly in complexity and structure, but there are a few fairly common and distinctive types. Sheet webs are easily recognized. The principal part of the web consists of a more or less closely woven sheet in a single, usually horizontal, plane. A funnel web is similar to a sheet web, the difference being that a funnel descends from the web to form the spider's hiding place. A large family of common spiders weaves cobwebs. These tangled, irregular webs are sometimes made under or in objects like leaves or stonewalls. The black widow spider is a cobweb weaver.

The large conspicuous webs often seen on tall grass or suspended between dead tree branches during the summer are orb webs. These resemble large wheels and sometimes have a zigzag band of silk running through the middle that is thought to serve as a lure for flying insects because it reflects ultraviolet light just like a flower. The characteristic design of this kind of web includes a number of supporting spokes made with dry and inelastic silk on which has been spun a spiral of sticky elastic thread. The spider does not become entangled in its web because it steps only on the dry spokes and not on the sticky lines. Also, many web-spinning spiders secrete an oil that prevents them from sticking to their webs.



the garden spider, which weaves beautiful orb webs

COMMON WEB TYPES

One of the most familiar orb weavers is the black and yellow garden spider. Some species of orb spiders such as this one remain at the center of the web. Others hide in a nearby retreat where they can feel the vibrations of struggling prey along a so-called trap line that is stretched tightly from the center of the web to the den. The sensitivity of the spider to these vibrations, and its ability to interpret them, is remarkable.

Despite the effectiveness of silken webs for catching food, some spiders do not build webs, but instead stalk or ambush their prey. Wolf spiders, jumping spiders, and fishing spiders all go out and hunt their prey, whereas crab spiders wait in ambush for unsuspecting insects.

During the late summer and early fall, web-spinning spiders are apt to make or repair their web every day, as large insects, once entangled, quickly destroy the webs. Most of this activity takes place around sundown. Often spiders will eat the old web before spinning a new one.

Besides being used for webs, silk is also used for draglines. Wherever the spider goes, it always plays out a silken line that acts as a securing thread, preventing falls and helping spiders to escape predators. Young spiders of most species (and adults of very small ones) spin unattached draglines in conditions of warm, fairly still air. Rising air currents lift the dragline and carry it away with the spider in tow. This is called ballooning, and it helps spiders reach new habitats. Additionally, some spiders use silk as a coating around their egg masses. Others line their burrows with silk. Some water spiders even use silk to trap air under water.

It would seem logical that spider silk, being so abundant and strong, might be used commercially by humans. It is usable as fabric material in the same way as the silk of the silkworm. Although using spider silk has been tried, it was found to be impractical. One of the main problems is that spiders are cannibalistic, making it difficult to rear and feed large numbers in a small space. Therefore, you will have to observe these creatures and their wonderful silk creations in the natural world, or perhaps in your very own kitchen corner.

Suggested References:

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