

NATURE DETECTIVES

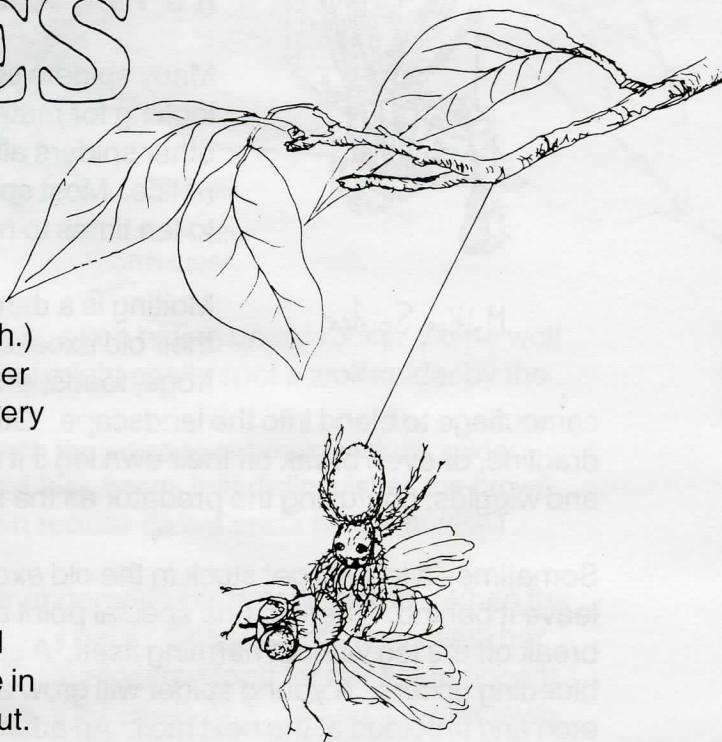
Fall 2002

Sensational Spiders

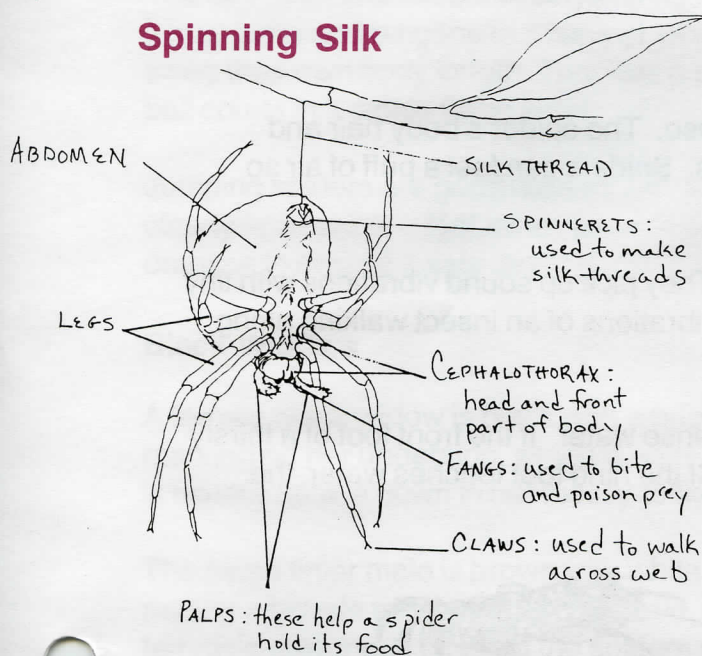
Go ahead; open your mouth. Did a fly buzz in? If not, thank a spider. (One is likely hiding within arm's reach.) Spiders save us from being swarmed by flies and other insects. If you could weigh all the bugs spiders eat every year, that weight would be more than the combined weight of all the people on earth.

There are tens of thousands of spider species living everywhere except in the ocean and on Antarctica. In the spring of 1999, the Denver Museum of Nature and Science started a study to discover which spiders live in Colorado. They expect to take several years to find out. So far, they have found over 230 different species including one never discovered anywhere before.

Scientists are finding spiders that protect crops from insect invasions, and they are looking for medicinal uses of spider venom. But the most amazing thing scientists are studying is the way spiders make silk.



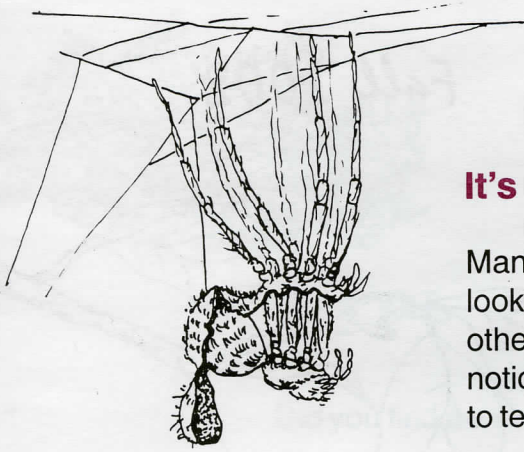
Spinning Silk



Spider silk starts as a liquid made in special glands inside the spider's body. Different glands make different kinds of silk. The glands connect to finger-like spinnerets, and the silk strands come out spigots on each spinneret. A single silk thread has strands from two or more spigots. Spiders combine different strands for different kinds of silk including web-making silk, sticky silk, egg-sac silk, shelter silk, prey-wrapping silk, and more. No spider makes every kind of silk. Some don't even make webs. But all spiders make dragline silk, the strongest, stretchiest spider thread. Spiders spin it behind them for a tiny emergency bungee cord. Dragline is what makes the fictional spider-man able to leap from building to building.

Perhaps the most famous fictional silk spinner is Charlotte, the heroic spider in E.B. White's classic tale, Charlotte's Web. Mr. White clearly knew spiders are sensational.

Pull Out and Save



Molting Spider

It's Fall, And Spiders Seem To Be Everywhere

Many spiders seen this time of year are males running around looking for mates. Spiders have been busy eating insects and other spiders all summer, finally getting big enough for us to take notice. Most spiders live only a year, and they have molted three to ten times to reach full size by the end of the summer.

Molting is a dangerous time for spiders. As they are pulling out of their old exoskeleton, they are especially easy prey for birds, frogs, toads, and other spiders. Molting spiders need their great camouflage to blend into the landscape. Other times they can drop instantly out of reach on a dragline, or even break off their own leg if it is caught in an enemy's grip. The lost leg twitches and wiggles, confusing the predator as the spider escapes.

Sometimes a leg will get stuck in the old exoskeleton when a spider molts, and the spider must leave it behind. There is one special point on each of the spider's legs where the spider can break off the leg without harming itself. A special mechanism seals the break so that no bleeding occurs. A young spider will grow a new leg folded up inside the shortened exoskeleton and unfolded at the next molt. An adult spider will continue living just fine with seven legs

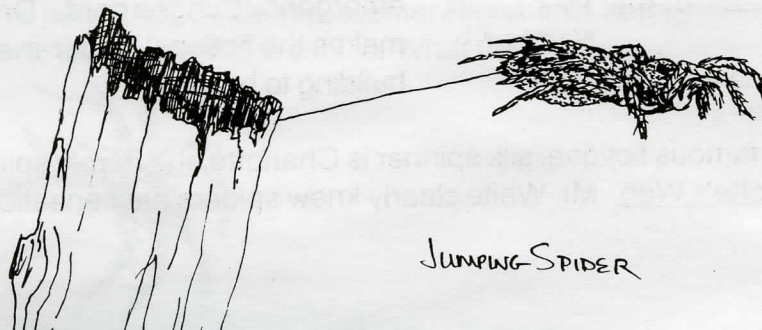
If a leg is torn off rather than separated at the special point, blood will flow from the wound. Unless the spider acts quickly, it will bleed to death. (A spider's blood is pale blue, not red like ours.) The spider pulls at the injured leg with its other legs until it breaks off at the special point, and the bleeding stops. Before rushing off, leaving the broken leg behind, the spider might first suck out the juices from the leg.

Spider Sensitivities

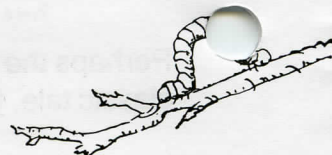
A spider's sense of touch is its most well developed sense. The spider's body hair and spines are extremely sensitive to touch and to vibrations. Spiders can feel a puff of air so gentle that it only stirs one hair.

Spiders do not have ears, but have very good hearing. They pick up sound vibrations with tiny hairs on their legs and bodies. A spider can "hear" the vibrations of an insect walking along the ground or onto a web.

A spider tastes and smells with its feet. Their feet also sense water. If the front foot of a thirsty spider touches water, the spider steps forward to drink. If the hind foot touches water, the spider turns around and drinks.



JUMPING SPIDER



Wolf Spiders

The brown or grayish wolf spiders are fierce hunters; they have keen eyesight and are swift runners.

Non-web spinners, these miniature predators don't wait for their victims to come to them. They stalk their prey, race forward,

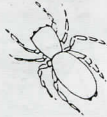
attack, and kill. Most of their time is spent on the ground, often hiding under rocks. Some wolf spiders hunt at night. If you take a flashlight outside you might easily spot a wolf spider by the reflection from its eyes.

(Wolf spiders are not poisonous but are often confused with the poisonous brown recluse spider. Wolf spiders do not have the violin-shaped marking behind their heads that distinguishes the brown recluse. Wolf spiders are common in Colorado, but brown recluse do not occur here naturally.)



Female wolf spiders carry an egg sac attached to their abdomen until hatching time. When the spiderlings hatch, the tiny babies climb onto their mother's back. If they fall off, they climb her legs and rejoin the others. The mother wolf spider spits up digested food for her spiderlings to eat. After about a week of riding on their mother's back, the babies drop off and wander away on their own.

Jumping Spiders

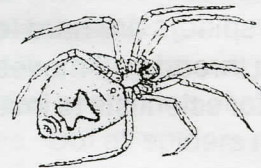


Jumping spiders are black and have heavy thick bodies and legs. Jumping spiders do not spin webs. They use silk from their spinnerets to line shelters under leaves, bark, or rocks. You can often find the common jumping spider in your garden or windowsill. If you do spot one, it may jump and be gone in a blink of an eye. Many jumping spiders can jump as far as forty times their own body length. That feat is comparable to you jumping the length of two basketball courts in a single flying leap!

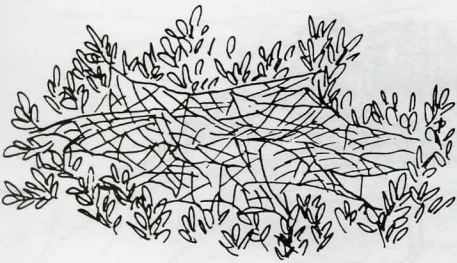
Jumping spiders are good hunters with the best eyesight of any spider. They can spot prey clearly from about a foot away, pounce catlike, and bite to kill. As the spider jumps, it anchors a dragline to ensure a safe landing.

Black Widows

A female black widow is black with a bright red hourglass marking on her underside, which is easy to see since she is usually upside down in her messy-looking, strong, and sticky web.



The much tinier male is brown with white and reddish markings on its side. Sometimes after mating a female widow will eat the male, hence the name "black widow." People fear the female's poisonous bite, but the spiders rarely bite. Black widows like to stay hidden. They can sometimes be found in fallen branches, basements, sheds, and other dark protected areas. Like all Colorado spiders, they try hard to avoid contact with people.



SHEET WEB

Spider Web Hunt

Go on a spider web hunt. See how many styles of webs you can find. Different species of spiders make uniquely shaped webs. From the time they are hatched, spider babies instinctively make their own kind of web.

Did you find a web that isn't illustrated here? Draw the web you found.

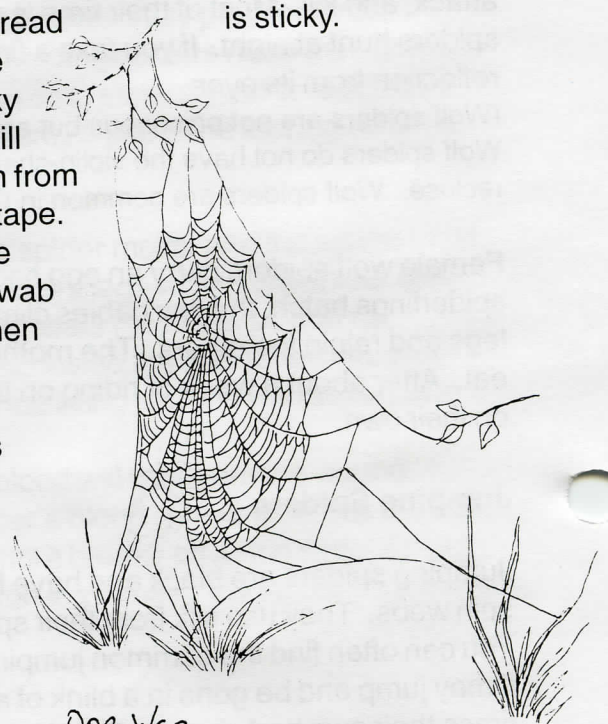


FUNNEL WEB

Spider webs are made of different kinds of silk. Not every thread is sticky. The sticky threads have glue drops spread along the silk like beads on a necklace. The spiders can walk on the non-sticky threads or around the sticky beads to quickly get to prey to kill it. If they do step in a sticky spot, oil on their feet keeps them from sticking tight. You can try this yourself with a piece of sticky tape. Use a cotton swab to be your insect leg. When you touch the tape with the tip of the swab, the tape sticks. Now, dip the swab in cooking oil to make it like a spider leg. What happens when you touch the oily tip to the tape?

Spiders remake their webs often because dust quickly ruins the stickiness. What happens if you put a little talcum powder or flour on your sticky tape and touch the dry cotton swab to it?

An orb-weaving spider can remake her whole huge web in a half-hour. Spiders often eat the old web recycling the protein to produce new spider silk.



ORB WEB

Artificial Spider Silk

Spider dragline silk can stretch for 50 miles before it breaks, and it is stronger than steel. Spider silk is resistant to bacteria and mold, and it is made without toxic chemicals. There could be lots of uses for such material. People are trying to invent ways to make it without spiders since spiders are hard to keep in large numbers. Liquid spider silk changes into strong, elastic thread as it moves through the spigots on the spiders' spinnerets. That action is the hard part for scientists to imitate.

In some parts of the world, people use natural spider web to make fishing nets. Inventors think one of the first things they would make from artificial spider web is fishing line. Other plans include: bullet-proof vests, parachute cords, replacement ligaments and tendons, sutures to stitch up cuts, car bumpers, and even bridge cables. What uses for man-made spider silk can you imagine?

