

Tiny Predators in Your Backyard

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Spiders grab our attention. Found almost everywhere—in basements, backyards, and parks, and even high in skyscrapers—they engender responses that range from fear to disgust to intrigue. Whatever your reaction, by the end of this essay I hope you can see some of what I find fascinating in spiders, and that you will be inspired by these little predators who are constant companions in our daily lives.

Spiders are members of the class Arachnida, a diverse group of invertebrates that all have four pairs of legs and two major body regions (though these are fused in some groups and appear to be a single region). Other commonly encountered arachnids are harvestmen (or daddy longlegs), mites, ticks, pseudoscorpions with venom in their tiny claws, and scorpions with venom in their not-so-tiny tails.

There are roughly forty thousand described species of spiders worldwide, and approaching four thousand species in the United States. A single house and garden may support more than eighty species.

The vast majority of arachnids are highly efficient predators. In fact, they perform an important ecological service by eating large amounts of insects. To be able to capture live prey they have evolved a phenomenal array of tools. Many arachnids have the capacity to produce venom or silk. Spiders have been around for at least 380 million years and during that time they have

evolved an arsenal of silk types, web structures, and venom chemistries.

Perhaps these predatory tools and the abundance (as many as a million individuals per acre, by some estimates) and conspicuousness of spiders have influenced our cultural legacy of fear of these small animals. Often the first concern people have in encountering a spider is, is it poisonous? Venom is certainly something to be respected if not admired. While the venom of a single spider can contain up to a thousand different components (some of which affect the nervous system of prey or break down cell structures or tissues), only a subset of these are directly bioactive, causing a physical or chemical reaction in the recipient. On the whole, the chemicals in spider venoms are targeted toward insect prey, with the overwhelming majority of spiders presenting no hazard to humans: either they never bite people or their bites are harmless.

Two spiders in the United States that do have the potential to deliver dangerous bites are the brown recluse and the black widow. Despite widespread fear of these spiders, few people are bitten each year, and only a small proportion of bite victims experience more than mild symptoms. Neither spider is aggressive; they are inclined to bite people (and who can blame them?!) only when trapped.

As its name suggests, the brown recluse (*Loxosceles reclusa*) generally keeps away from people. The recluse is

one of eleven closely related species in the United States that live across the Southern and Midwestern states; the majority of species diversity is in the desert Southwest. They are all small and brown, with a distinctive violin-shaped marking on their backs (they are also called fiddleback spiders). Fully grown, the recluse has a legspan roughly equal in length to the diameter of a U.S. quarter. In natural areas, they live under rocks and logs, but have adapted well to living in and around human habitations. Active nocturnal hunters, they retreat during the day to small cottony webs in cracks and crevices or other secluded spots. People vary in the severity of their reaction to bites, but venom of all species of *Loxosceles* can cause necrotic lesions.

The black widow is one of three species in the genus *Latrodectus* that live in the United States. Together, they have a wider range in our country than brown recluse spiders. Black widows are most abundant throughout the South,

but their distribution extends into the Midwest, up the Eastern Seaboard, and in dry areas of the West as far north as Canada. They build exposed tangled webs, leading to their retreats, with silk threads that are relatively tough and twang like a guitar string when plucked. Their bodies are black and shiny, with the classic hourglass marking on their underside. Their venom contains an unusual feature, a vertebrate-active neurotoxin that enables them to catch small reptiles but also causes severe cramping and pain in humans.

Since their primary life agenda is not biting us or our pets, what are the spiders that we see busy doing? They spend much of their time catching dinner, often using elaborate strategies. Once mature, males are pursuing females, often trying to convince them to mate by using complex dances and displays. If they have already mated, females may be guarding their eggs or tending their young, some by carrying them around on their backs. They also spend a sig-



Despite its fearsome reputation, the brown recluse (*Loxosceles reclusa*) avoids contact with people. Photographed in Oklahoma by Bryan E. Reynolds.

nificant amount of time doing apparently little, sitting still in webs or under rocks, perhaps grooming themselves by pulling their legs through their jaws.

One of the most abundant and visible signs of spiders are their webs, whether strung over plants, across a doorway, or in the corner of a shed. There are many different types of webs but orb webs made by members of the family Araneidae are the most instantly recognizable. Orb webs make a lot of engineering sense. They are two-dimensional structures that focus vibrational energy toward a central hub. The spiders either sit on, or maintain a silk-line connection to, the central hub; they are able to detect not only the presence but also the size and activity levels of anything moving in the web, prey and predator alike. Amazingly, most orb-

weaving spiders use different silk for different parts of the web. The silks come from different glands, called the spinnerets, in the silk-spinning organ. A single individual orb-weaving spider can make seven different types of silk, each coming from a different spinneret and each serving a different functional role. For example, the radii (or spokes) of an orb web are made from silk that is not very sticky (“ampullate” silk) whereas silk for the spiral has gluey droplets on it to which prey stick (“aggregate” and “flagelliform” silk).

A second group of web builders associated with houses are the Theridiidae, or cobweb spiders. This is a large family that includes the black widows as well as numerous non-toxic species that are among the most common spiders in houses. Their webs are an irreg-



Different spiders construct a wide range of web styles and shapes, from simple spirals to complex tangles of silk. The feather-legged spider (genus *Uloborus*) makes one of the more distinctive webs. Photographed in Trinidad by Bryan E. Reynolds.



Located on the underside of the abdomen, a spider's spinnerets can produce seven different types of silk. *Araneus pima*, an orb-weaving spider, wrapping prey, photographed in New Mexico by Bryan E. Reynolds.

ular tangle of silk from which lines with gluey droplets at the ends extend down and are attached to a surface below. Hapless prey wandering on the surface bump into them and break the tension of the silk, whereupon the glue sticks to them, pulling them off of the ground as the spider dashes down to bite them and encase them with silk. With this hunting method, larger theridiids such as black widows can capture lizards and snakes! The majority of species catch ants, crickets, and other small arthropods (including other spiders).

Not all spiders ensnare their prey with webs. Two of my favorite backyard spiders, wolf spiders and jumping spiders, both actively wander and use their excellent eyesight to find and stalk prey. Agile and long-legged, wolf spiders (family Lycosidae) use speed to catch prey. Their earth-tone colors and stripes make them hard to spot during the day, but shine a flashlight across your lawn at night and you will almost certainly spot their eyes twinkling like tiny, blue

diamonds on the ground. Wolf spiders are very common, with different species out hunting during day or night.

Jumping spiders (family Salticidae) provide great entertainment. They are active mostly in the daytime and may be found hunting on vegetation or on the ground. Their acute vision means that they see you as well as prey, and some will turn and face you when you get close. As their name suggests they are excellent jumpers. Stalking prey much like a cat, they stop when they see their quarry, then orient and slowly walk toward it, before pouncing and grabbing it in their front legs and jaws. They do use silk as a safety measure, spinning a strand behind them when they jump. If they miss their target while hunting in bushes and trees, the strand will break their fall.

Great eyesight helps both wolf spiders and jumping spiders to hunt efficiently, but they also use their vision in courtship. Many spiders have elaborate courtship displays, but these two stand



Unlike web-building spiders, the free-ranging wolf spiders (family Lycosidae) do not have homes in which to shelter their young. Females carry their offspring on their backs as they hunt. Photographed in Oklahoma by Bryan E. Reynolds.

out. Males in these groups dance for females by waving their legs and tapping them on the ground, sidling back and forth, and sometimes slamming their bodies on the ground. They may also make sound by rubbing various body parts together. Males have striking markings, tufts, and ornamentation, which in jumping spiders can be very colorful with reds, yellows, purples, blues, greens, and iridescence. (They have been referred to as the “butterflies of the spider world.”) Females, of course, watch these courtship displays, with vision so acute that they will respond to video of males replayed on tiny televisions.

Even though they can see you, if you catch them at the right time, spiders will proceed with their courtship rituals right in front of you, offering a small window into the rich world of spider biology in urban areas.

Spiders are inspiring to me because despite their ubiquity, there is so very

much we still don't know about them. It isn't hard to discover entirely new things by simply taking the time to sit down and look at them. Most important, a tremendous diversity of species hang out in houses, on porches, and in urban parks. They are accessible and visible. They are our allies, eating the insects that can attack your plants and suck your blood. I highly recommend that people of all ages acquire the habit of taking the time to benefit from the biology lessons, entertainment, and inspiration freely available from the spiders in your own backyard.

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