The Wonder Fiber

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It is almost inevitable that when one thinks of spiders one also thinks of spider webs, for wherever a spider goes, it leaves a silken thread. If its power to make a dragline were suddenly lost, the spider would be in a hazardous situation. It could not drop suddenly and silently from a disturbed leaf to the safety of the vegetation below or protect its eggs and young. Some spiders would be unable to make insect traps, suspend bridges from one place to another, or balloon away from its cannibalistic siblings.

Common Garden Spider
(Argiope Trifasciata)
Photograph by Dr. Everett Cashatt

How the Fiber is Made

Fossilized spiders found in the Mohave Desert provide evidence that this ability to produce silk goes as far back as the Oligocene Epoch (37 million years ago). This fine, ancient fiber, made of scleroprotein or “hard protein,” is drawn into a filament by spinnerets as it is secreted in liquid form from silk glands. Each type of gland produces its own kind of silk that hardens into a silvery strand upon being drawn through the tiny pores at the end of the body.

While most spiders have six spinnerets with hundreds of flexible spinning tubes on each, the number varies. In addition, the spider uses its feet to handle the silk. Individuals of one group of spiders each have a comb of hair on the rear feet for manipulating the fibers and a sieve-like plate in front of the spinnerets over which they pull the fibers. The woolly surface produced entangles insects as they struggle to free themselves. Working without any visual contact, these

eight-legged spinners deftly combine fibers into various threads suitable for trap lines, sperm webs, ballooning lines, and cocoons.

How the Fiber is Used

Although delicate in appearance, this silk is among the strongest of natural fibers, with enough tensile strength and elasticity to allow it to stretch 20 to 25 per cent its original length without breaking. It has been said that a rope of spider silk one inch thick would be three times stronger that the same rope made out of iron. This incredible strength is a source of wonder when one considers that a single fine fiber, although not uniform in thickness, may be only one millionth of an inch in diameter and invisible to the naked eye. Of course, spiders also produce thicker fibers.

Because of its extremely narrow gauge and durability, spider silk was used in optical instruments (such as gun sights) during World War II. Since then, however, technology has given us platinum filaments and glass engravings that are more uniform and do not sag in moist weather.

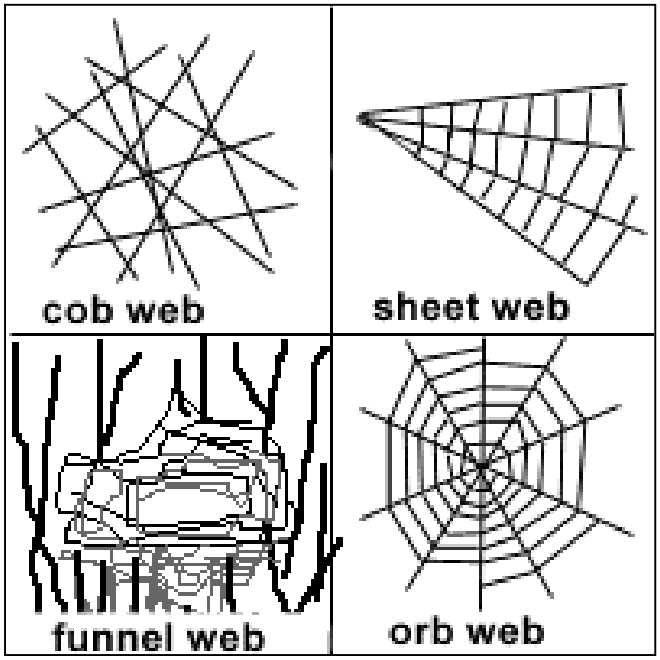
The south sea islanders put spider webs to more basic uses. The strong, elastic webs have long been used there to make fishing seines and ropes. In New Guinea, loops of bamboo are covered with webs and used as seines. These are made by placing a looped bamboo pole where a spider will spin its large web over it or by twisting the bamboo loops through many webs, making a matted seine for lifting as much as three or four pounds of prawns, shrimp, or fish.

In northern Queensland, fishing lines are formed by twisting and turning the tips of thin branches through webs until foot-long web ropes dangle from them. Bits of crushed spider are then put on the end of the tangled filaments and strewn in the water to attract the fish. As the small fish rise to the bait, their teeth become ensnared in the silk, and they are easily pulled from the water. Other interesting things Queensland islanders are waterproof hats and bags, the latter strong enough to carry such things as arrowheads, tobacco, and dried poisons.

As a modern textile, spider silk cannot compete with that of the silkworm; for although the former is a strong fiber, it has uneven thickness, is unable to stand up under the weaving process, is difficult to handle, and lacks the luster of silk. Silkworms are also more efficient as silk producers and are easier to house and feed. While it takes 400 spiders only 75 minutes to make enough silk for one square

yard of goods, 400 silkworms can make twice that much in the same amount of time with less space and care.

Web Patterns



The silk spider webs, on the other hand, provide man with the best natural insect traps to be found. Each web-building spider has its own lacy, inherent web pattern — cobwebs or mesh webs found almost everywhere, but especially in corners of buildings; beautiful, symmetrical orb webs, suspended vertically between upright objects; funnel webs hanging in the grass or shrubbery; sheet webs spread on the grass or bushes with criss-crossed trap lines over them.

The insect-snaring strands of the webs are formed when a spider draws a sticky thread from a spinneret, then plucks it with its foot and lets it snap back, setting up rhythmic waves that produce evenly-spaced globules along the thread. Only insects with detachable hairs or scales escape these viscid beads.

A true wonder fiber, prodigious amounts of spider silk are made each year, for spiders are endlessly spinning everywhere — in deserts and lakes, on mountain tops and in valleys, in the heat of the tropics as well as the frigid air of the polar regions.