Hi-Desert Star

Caught in their web

Biologist learns to love spiders

By Rebecca Unger
Hi-Desert Star

Published: Saturday, August 20, 2011 2:01 AM CDT
YUCCA VALLEY — Or “yucky” valley, depending on your level of arachnophobia.

Dr. Cheryl Hayashi, an associate professor of biology at UC Riverside, specializes in the genetic structure of spider silk. (Rebecca Unger, Hi-Desert Star)

“Spiders keep me up at night!” declared Cheryl Hayashi at the Hi-Desert Nature Museum Brown Bag Lunch lecture Aug. 11. But to Hayashi, that’s a good thing.

The University of California, Riverside, professor developed her fascination for spiders as an undergraduate student earning “pizza money” caring for lab animals. Her job turned out to be feeding a biology professor’s colony of spiders — free-range spiders.

Hayashi illustrated the Mission: Impossible moves she used to step over, under and alongside spider webs without messing them up, and then place fruit flies and crickets on the sticky silks for the hand-size tropical orb weavers.

“When you’re up close and personal with a spider that you feed every day, it’s hard not to notice how important their silk is to every aspect of their life,” observed Hayashi, now a spider silk biologist.

Most people think of webs as bejeweled with morning dew or hanging like crepe from dusty rafters.

But spiders’ complex silks are created for a variety of uses, like “bungee cord” drag lines, wrapping up eggs or dinner, covering tunnels for a cozy retreat, and mating. Even the common web combines several kinds of silks, just as human homes are built using several kinds of materials.

First the spider uses a certain silk to begin attaching a web to a surface. The spider lays down another, temporary, scaffolding silk that it eats for protein when the section of scaffolding is no longer needed.

“Silk proteins are off-scale compared to other proteins,” Hayashi stated. “They are the giants of the protein world.”

Next, one kind of silk makes the web’s outer frame and the strands that radiate from the center. One silk makes the capture spirals, and other makes gooey drops on the spirals and radii. Some spiders even use a sixth kind of silk as “decoration” in the web.

Hayashi’s slideshow presentation included a highly magnified photograph of a spider’s abdomen with spinnerets.

“We stare at this day and night,” Hayashi told her giggling audience. “It’s our favorite part of the spider.”

The spider has three pairs of spinnerets. Each spinneret has several nozzles that she likened to a soft-drink dispenser at a convenience store. Some spiders have thousands of silk glands in their abdomens, and each gland makes only one kind of silk.

These lightweight, high-protein, high-performance silks are very strong and compare to Kevlar and high-tensile steel. The silks achieve a great “toughness” rating by combining strong with stretchy.

The silks might also have a bio-medical application, the spider-ologist explained. Animal studies have shown there is no immune system reaction to implanted spider silk, and less scar tissue grows around medical implants that are coated with spider silk.

“What a cool material this is!” Hayashi declared. “That’s why there is such interest in seeing what we can learn from spider silk and how we can apply it to what we do.”

Gloria Beetle of Joshua Tree is not bugged by the Costa Rica tarantula at the Brown Bag Lunch lecture. "It's a little spiny, but it’s feet were real soft," she remarked. (Rebecca Unger, Hi-Desert Star)