Spider Biologist: Transcript

DR. TODD BLACKLEDGE:
Typically, most people would just see a spider web and say, “ooh, gross,” and walk away.

When I see a web I notice the variety of different shapes of webs spun by all the different species of spiders…

I’m Todd Blackledge. I’m an associate professor of Biology at the University of Akron, and I do research on spider silk and spider webs.

FADE UP:
Music: the classic Spider Man TV theme.

DR. TODD BLACKLEDGE:
I do sometimes get called Spiderman. It’s one of the hazards of the profession.

One thing Spiderman did get right is his ability to crawl up walls. There are many spiders that have special adhesive discs on their legs that allow them to crawl up vertical surfaces or even hang from the ceiling, just like Spiderman does.

Spiders are amazingly fascinating organisms to study. In the United States, I think we’re kind of taught as children that we’re supposed to be afraid of them. But they’re just an incredibly diverse group of animals that play incredibly important roles in our ecosystems as predators of insects.

They leave a record in their web of many different behavioral decisions about how to catch food, how to protect themselves from predators, all in this web that can be photographed, measured, and even manipulated for experiments. It makes it a lot easier to work on them and study their behaviors compared to some things like lions in Africa.

DR. TODD BLACKLEDGE (nat sound):
So, here’s a nice little web in this shrubbery...”

I’m here today at the Bath Nature Preserve where the University of Akron has a field station that my laboratory utilizes for its studies of spiders and silk.

I’ll be collecting some spiders and observing webs in the wild.

DR. TODD BLACKLEDGE (nat sound):
So, this oneee…it’s right in here, and it’s a tiny, tiny spider. That’s the spider, right there, and this is the whoooole web. It evolved from a circular orb web, but it now builds this little triangular web.

So here's a daddy long-legs. It's a close relative of a spider, but is not a spider. You can see that it has one body part, and it lacks the venom glands and the spinnerets that spiders have to produce silk. They're also totally harmless.

DR. TODD BLACKLEDGE:
…out in the field, I can actually collect silk threads directly from spider webs.

But in the laboratory, I like to collect the silk straight from the source, from the spider's own spinneret.

This is a multi-step process. First we catch a spider and put it to sleep with a little carbon dioxide gas, so that we can gently strap it onto a petri dish using scotch tape.

This holds the spider immobile so we can move it to a microscope and then visualize the silk thread coming out of the spicket, and pull that silk thread out.

Even though spider silk is amazingly strong and tough, it's still really hard to work with in the laboratory because it's also incredibly thin. A typical silk thread is about fifty times thinner than a human hair. This makes it very delicate to work with and also very difficult to get much of the material.

We collect then samples for mechanical testing that are mounted onto small cardboard mounts. These mounts are moved to a nano-mechanical tester called a nano-bionics, basically a really fancy piece of equipment to pull things apart and break them. The silk is mounted onto the machine, and then pulled apart at a particular speed to see just how strong and stretchy the material really is.

DR. TODD BLACKLEDGE:
…spider silk is an amazing material. There are spiders that spin more than eight different kinds of silks, and some of those silks are stronger than steel, ounce for ounce, while others are as stretchy as a rubber band. Some of them are even adhesive like glues, so this means that they have a toolkit of different types of biological materials that could be used in many different ways for human technology.

When you talk about spider silk being used by humans, the first thing everyone thinks about is bullet-proof vests. But it's unlikely to ever happen. Yes, the silk is tough enough to be woven into a shirt to stop a bullet, but it does so by also being very stretchy. This means it would stop the bullet after the shirt already stretched through a body. Not a very useful way to stop a bullet, unfortunately.

I became interested in the biology of spider silk, because I always enjoyed being outside, and I knew I was interested in science and learning about nature.

DR. TODD BLACKLEDGE (nat sound):
These were all in webs when you got 'em last night? I assume this is some sort of araneus, but I'm not exactly sure.)

I went to Ohio State University, where I got my PhD in entomology. Even though it’s the study of insects, spiders are just close enough that they still let you study them in an entomology program.

My job is great. I get to be outdoors in places like this, and I also get to be in the laboratory making new discoveries all the time. It brings something new every day, even though it also takes a lot of hard work.