Malagasy Spiders Spin the World's Toughest Biological Material [1]

Submitted on 24 September 2010 - 9:51pm

This article is reproduced by CienciaPR with permission from the original source.

By Michael Price, Science Magazine [2] Like an engineer accounting for a skyscraper swaying in the wind, Madagascar's Darwin's bark spider (Caerostris darwini) spins enormous, river-spanning webs that stretch and contract as the trees to which they're anchored bend this way and that. A new study finds that this spider's silk is the toughest biomaterial yet discovered. All spiders' silk is exceptionally tough, which is the term structural scientists use for the combination of a material's strength—how much weight it can bear before snapping—and elasticity. Fiber for fiber, spider silk is stronger and more elastic than even the synthetic material Kevlar, which is widely used in bulletproof vests. Understanding the properties of spider silk could help engineers synthesize even tougher, lighter-weight materials. For the best results, says Ingi Agnarsson, an entomologist at the University of Puerto Rico in San Juan and the new study's lead author, scientists must figure out which spiders weave the toughest webs. Spiders spin different kinds of silk for different tasks—strong silk for a web's outline, for instance, and sticky silk for capturing prey. Different ratios of various proteins account for silk's strength, elasticity, and stickiness, and each species has evolved its own unique combination of those traits. Of the more than 41,000 spiders currently known, researchers have studied the silk of fewer than 100. Previously, says Agnarsson, researchers studying spider silk tended to look at whichever spiders were most easily available, but he and his research team sought out a spider responsible for architecturally extreme webs. Agnarsson first encountered Darwin's bark spiders nearly 10 years ago as a doctoral student working in the island country off Africa's eastern coast. The spiders' colossal orb webs can span up to 2.8 square meters and are anchored by threads as long as 25 meters. Stretching across rivers and streams, the webs catch insects flying along the watercourse. "I thought, 'Wouldn't it make sense that these webs would have to be particularly tough?' " to maintain their shape and tautness over such long distance, he says. Agnarsson and his team traveled to Madagascar's Andasibe-Mantadia National Park in 2008 and again in 2010, collecting Darwin's bark spiders

and bringing them to a nearby greenhouse where the spiders could spin fresh webs. When they compared Darwin's bark spiders' silk with other spiders' silk, they found that it ranked near the top in terms of strength and was twice as elastic as any other known spider silk, making it the toughest known biological material. The team reported its results online Thursday in PLoS ONE. Randy Lewis, an entomologist at the University of Wyoming in Laramie, says the researchers followed a time-tested strategy of seeking out natural materials with unusual properties, as those materials often surpass humanmade designs. Entomologist John Wenzel at Ohio State University in Columbus says that's because evolution has been in business a lot longer than engineers. "Mother Nature performed this life-or-death experiment millions and millions of times, and these are the spiders that succeeded," he says.

Links
[1] https://www.cienciapr.org/en/external-news/malagasy-spiders-spin-worlds-toughest-biological-material
[2] http://news.sciencemag.org/sciencenow/2010/09/malagasy-spiders-spin-the-worlds.html