Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Cob-Weaving Spiders Design Attachment Discs Differently for Locomotion and Prey Capture[1] VASAV SAHNI, JARED HARRIS, TODD BLACKLEDGE, ALI DHINOJWALA, The University of Akron — Spiders' cobwebs ensnare both walking and flying prey. While the scaffolding silk can entangle flying insects, gumfoot silk threads pull walking prey off the ground and into the web. Therefore, scaffolding silk needs to withstand the impact of the prey, whereas gumfoot silk needs to easily detach from the substrate when contacted by prey. Here, we show that spiders accomplish these divergent demands by creating attachment discs of two distinct architectures using the same pyriform silk. A "staple-pin" architecture firmly attaches the scaffolding silk to the substrate and a previously unknown "dendritic" architecture weakly attaches the gumfoot silk to the substrate. Gumfoot discs adhere weakly, triggering a spring-loaded trap, while the strong adhesion of scaffolding discs compels the scaffolding threads to break instead of detaching. We describe the differences in adhesion for these two architectures using tape-peeling models and design synthetic attachments that reveal important design principles for controlled adhesion.

[1]National Science Foundation

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Date submitted: 16 Nov 2012 Electronic form version 1.4