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**From Nano to Micro: Importance of Structure and Architecture in Spider Silk Adhesives**[1] VASAV SAHNI, ALI DHINOJWALA, The University of Akron — Spiders have developed outstanding adhesives over millions of years of evolution for prey capture and locomotion. We show that the structure and architecture of these adhesives play an important role in the adhesion. The adhesive produced by orb-weaving spiders to capture prey (viscid glue) is laid on a pair of silk fibers as micron-size glue drops composed of salts and glycoproteins. By stretching single drops, we show that viscid glue behaves like a viscoelastic solid and that elasticity is critical in enhancing adhesion caused by specific adhesive ligands by over 100 times. Comparing viscid glue with gumfoot glue, the glue produced by cob-weavers, the evolutionary descendants of orb-weavers, showed that, in spite of being produced in homologous aggregate glands, gumfoot glue behaves like a viscoelastic liquid. Moreover, gumfoot glue is humidity-resistant and viscid glue is humidity-sensitive. We use a synthetic strategy to spin beads-on-a-string (BOAS) architecture to mimic the adhesive properties of spider silk. Using these mimic threads, we show that the BOAS structure adheres more than a cylindrical structure during contact (collision of prey) and during separation (escape attempt of prey). These results inspire design of novel tunable adhesives.

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Ali Dhinojwala
The University of Akron

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