Why orb webs are sticky

Orb web stickiness allows a web to keep an insect from escaping until a sider can locate it, run to it, and subdue it, usually by wrapping it with silk. The capture threads that make the web sticky have regularly spaced glue droplets on them. These glue droplets differ in size, with larger spiders having larger droplets.



Each of these sticky droplets are made of a central adhesive glycoprotein core that is surrounded by an aqueous layer that contains water and dissolved chemicals. The aqueous layer also covers a pair of protein flagelliform fibers that support the droplets.



Chemicals in a droplets aqueous layer attract water from the air that keeps the glycoprotein glue sticky and stretchy. This allows the adhesive forces of multiple droplets to be summed in suspension bridge fashion when an insect struggles to escape from the web.



As relative humidity (RH) changes over the course of a day so does the water content and size of glue droplets.



These humidity-related changes affect the performance of the glycoprotein glue at the center of each droplet. As humidity increases, glycoprotein becomes more stretchy and extends further before pulling free of a surface. The pictures below show extended droplets from the same capture thread at two different humidities just before they release from surfaces.

