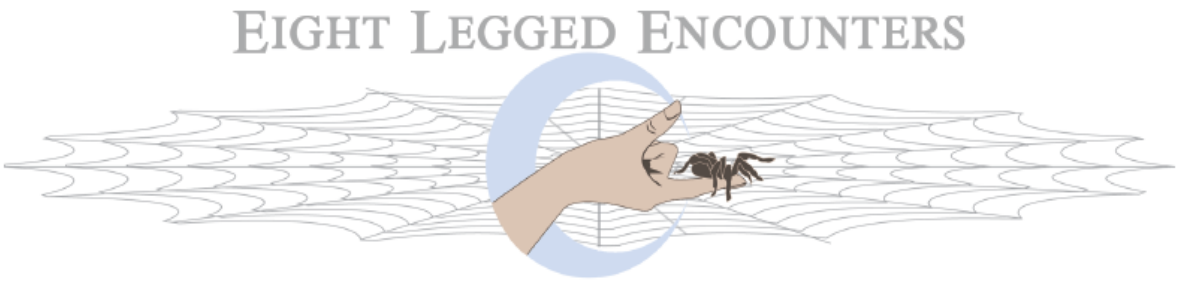
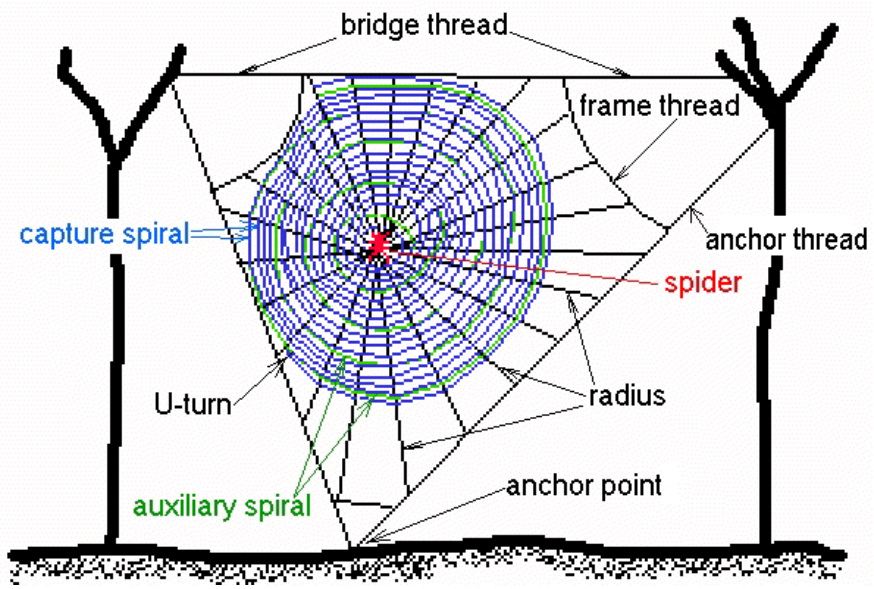


VI. WEAVE A WEB

GOAL: This station invites participants to think about how orb-weaving spiders go about building their web and how web structure and use of silk from specific glands might facilitate prey capture.

BACKGROUND: Not all spiders construct webs, but they all use silk in one way or another (*e.g.* dispersal, nest lining/construction, diving bell construction, guide lines, cocoons, etc.). Spiders can have up to seven different types of silk glands (*Major Ampullate gland, Minor Ampullate gland, Flagelliform gland, Aciniform gland, Tubuliform gland, Pyriform gland,* and *Aggregate gland*), each of which produces silk or glue with distinct properties.

Orb-weaving spiders are hypothesized to share a common ancestor (*i.e.* the orb web is *monophyletic*), with an ancestral orb web consisting of a horizontal orb constructed out of *cribellate* silk. The evolution of *flagelliform silk* (core silk produced by *flagelliform glands* coated with sticky droplets produced by *aggregate glands*), along with a vertical web orientation, is suggested to be a *key innovation* in the diversification of the Araneoid spiders. An orb web consists of ***bridge, anchor***, and ***frame threads***; a non-sticky ***radius***, an ***auxiliary spiral***, and a ***capture spiral***.



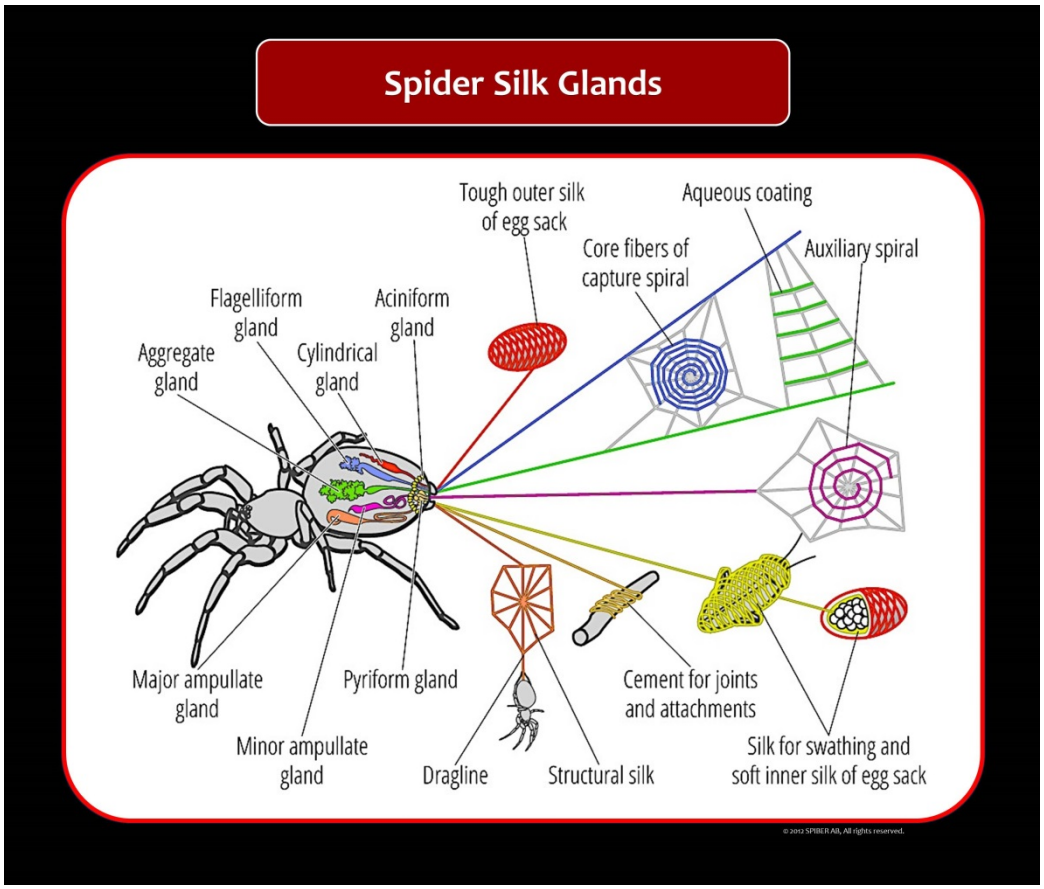
Orb-weavers use four distinct types of silk to construct an orb web. The **anchor and frame threads** are produced by the **Major Ampullate glands**. This silk has high tensile strength and absorbs kinetic energy well. **The temporary capture spider, or auxillary spiral**, is produced by the **Minor Ampullate glands**. This silk is highly elastic. The core silk for the **capture spiral** is produced by the **flagelliform glands** and coated with sticky droplets produced by the **aggregate glands**. Finally, the **pyriform glands** produce a type of glue that is used to attach silk strands together during web construction.

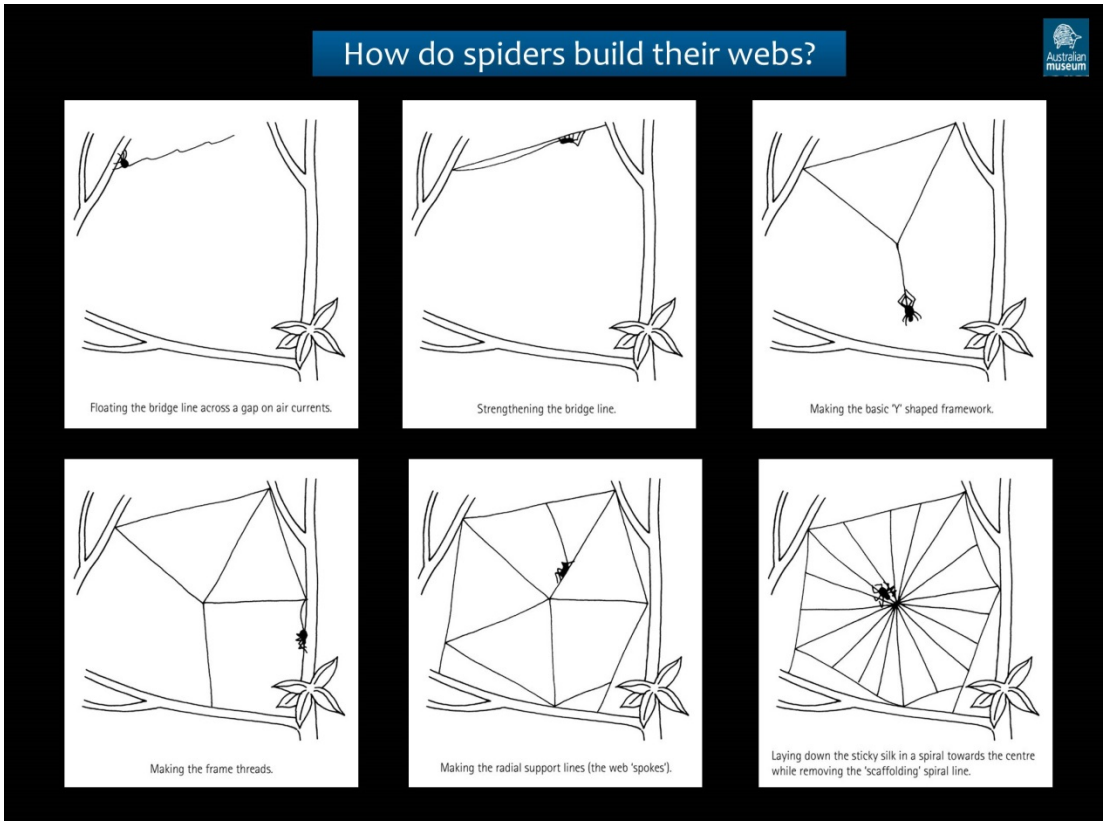
MATERIALS:

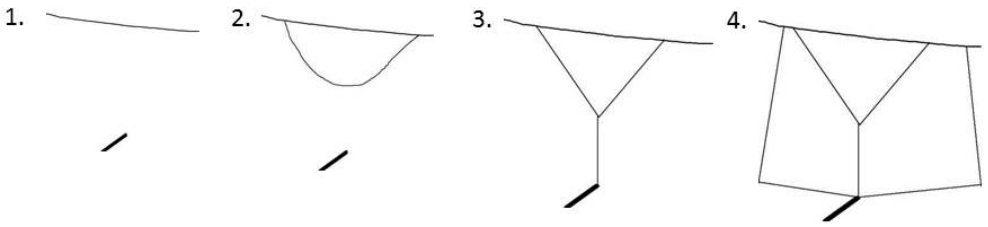
- Sheets of plastic canvas
- Plastic children's sewing needles
- Black yarn
- Green yarn
- Blue yarn

PROCEDURE:

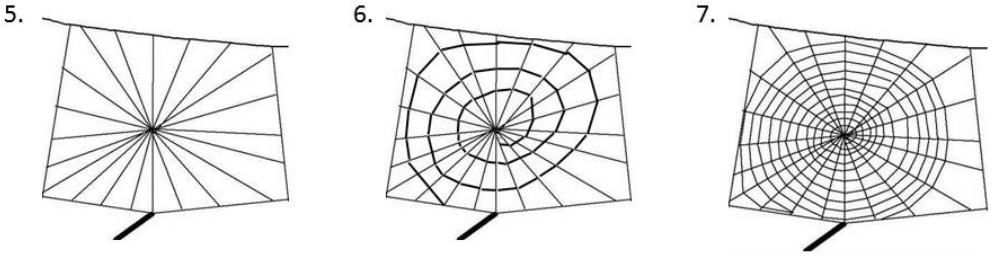
- On the tabletop, make available numerous diagrams depicting how orb-weaving spiders construct their webs.
- Ask participants to think about how they might get their first strand of silk from one tree to another.
- Invite them to use different colored yarn to represent the different types of silk that an orb-weaving spider uses in constructing their web.







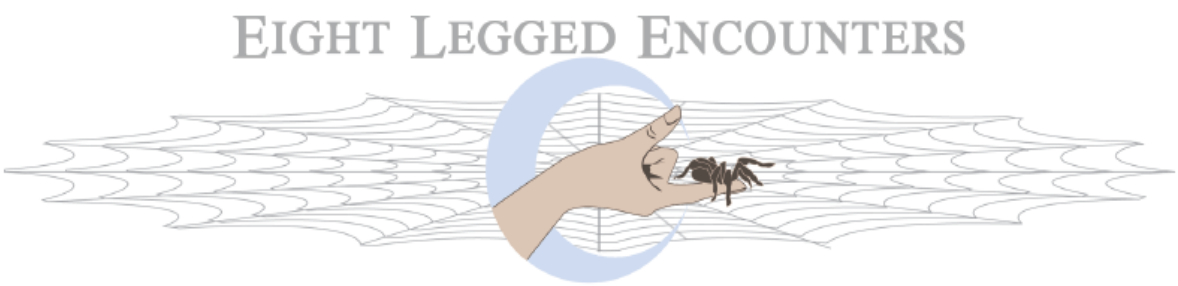
All radii and frame threads are make from silk from the Major Ampullate Gland.



Anchor threads and radii are in place.

This temporary capture spiral is make from silk from the Minor Ampullate Gland.

This capture spiral is made from sticky silk from the Flagelliform gland



VII. CATCH A MOTH

GOAL: This game illustrates one of many unusual hunting strategies exhibited by spiders and highlights the diversity of ways in which spiders can use silk.

BACKGROUND: Bolas spiders are orb-weaving spiders that no longer build typical orb webs. Instead, these spiders have evolved a unique hunting strategy that involves placing a sticky drop of silk at the end of a silken line (referred to as a 'bolas'; thus their name). This sticky droplet contains chemicals that mimic the pheromones of moths, thus luring unsuspecting males to their ultimate death! As a male moth approaches, looking for what it believes to be a mate, the spider swings it bolas and lassos the moth out of the air! One species of bolas spider, *Mastophora hutchinsoni*, has been shown to even adjust its pheromone blend in line with the activity patterns of two local moths: (i) the bristly cutworm moth and (ii) the smoky tetanolita moth. The spider produces components of both species' pheromones at all times, but as the bristly cutworm moth becomes less active over the course of the night, the spider decreases its emissions of that species' pheromone blend! The young of *M. hutchinsoni* neither build orb webs nor use bolas, but instead ambush prey from the underside of leaf margins.

MATERIALS:

- A horizontal strand of fishing line string between two poles (~10 ft across, depending on how many participants you want to be able to play at a time).
- Homemade "moths" attached by fishing line, hung at various heights, along the horizontal strand.
- Moths can be made from foam pieces, "noodles", pipe cleaners, cloth, etc. and need only have a piece of Velcro on their underside.
- The opposite piece of Velcro should be attached around a Ping-Pong ball (*i.e.* the droplet of sticky silk), which should be attached to a thicker white string creating the spider's bolas.
- A line of colored tape can be placed on the floor a few feet from where the moths are hanging.
- On display near this activity, or associated with this activity, it would be ideal to have a video loop of spiders using silk in different ways to capture prey.

PROCEDURE:

- Participants are given a bolas (Ping Pong ball attached to a string) and are instructed to stand with their toes behind the colored tape line.