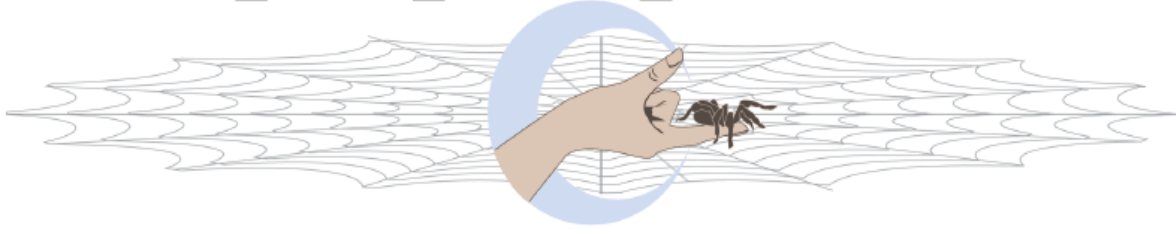


EIGHT LEGGED ENCOUNTERS



IV. BUILD A BURROW

GOAL: To learn about the history of spiders and their silk. Specifically, this activity highlights the fact that spiders have been around and using silk before insects took to the air.

BACKGROUND: Spiders and their relatives are among the earliest animals known from the fossil record. *Attercopus fimbriunguis* is a 380 million year old (Devonian) fossil that was originally believed to be a spider. Although scientists contend that *Attercopus* produced silk, it is not considered a spider because it did not have spinnerets; it may have been the ancestor of today's spiders or at least a close common ancestor. Among the living spider, the oldest Mesothelae fossil is 290mya (Permian).

Mesothelae have remained unchanged for ~300my. As such, examining the living Mesothelae may give us insights into spiders of the past. There is only one family of living Mesothelae (Liphistiidae) with 5 genera and ~89 species. They are restricted to Southeast Asia, China, and Japan and are the most basal of all living spiders.



They are morphologically distinct because of the segmented plates on their abdomen and the location of their spinnerets - in the middle of their abdomen. They also have 8 spinnerets.

Living Mesothelae dig burrows in moist soil and line their burrows with silk. They then build a trapdoor using soil protein to glue various materials together. They hide in the burrows, which offer protection from predators and prey. Their

trapdoor also creates a membrane between underground and above-ground air which moderates humidity and even protects from short-term flooding.

Mesothelae are entirely nocturnal. Some keep at least one foot in their door, waiting to sense and capture prey. Others use silk to extend their hunting ground beyond their doorstep. They lay down 6 - 8 'trip lines' that radiate a few centimeters from their door. These lines are slightly raised and passing prey "trip" on these lines, sending a vibration back to the spider so that it knows when and where to pounce.



Mesothelae also use silk for egg protection.

The oldest Mygalomorph fossil is 240mya (Triassic) and the oldest Araneomorph fossil is 225mya (Triassic).

MATERIALS:

- Door hangers
- Foam strips
- Pre-cut pieces of fishing line
- Glue
- Tuning forks

PROCEDURES:

- Choose one doorhanger.
- Choose one foam strip.
- Roll the foam strip up into a circle and place it so that it rests within the opening of the door hanger (use glue if necessary). Make sure the strip sticks above the doorhanger – this is your burrow’s turret.
- At *each* opposite corner of the doorhanger (the corners opposite the hole), make a small (~.5cm) cut diagonally towards the center so that each corner has an identical cut.
- Take two pre-cut pieces of fishing line and make a small knot at one end of each of them.
- Lodge the knot underneath the cut and pull the fishing line tight so that the fishing line is captured.
- Pull the non-knotted end of the fishing line through the burrow opening.
- Hold each of your fishing lines (*i.e.* silk strands) in between the fingers of each of your hands underneath the “burrow”.
- Close your eyes and ask someone to use a tuning fork to touch one of the silken trip lines.
- Can you tell where the vibration is coming from? Do you think you would successfully capture your prey?