Viscosity measurements of minute volumes of the insect pad secretion via dewetting

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Many insects stick to surfaces using footpads which leave minuscule amounts of a liquid behind.

**Experimental design:**
- inverted microscope & custom-built temperature controller to record dewetting at various temperatures

**Question:**
What is the functional significance of the pad secretion?

**Hypothesis:**
The secretion may aid attachment via viscosity & capillarity.

**Challenge:**
How can its physical properties be determined given there is so little of it?

**Solution:**
Dewetting, i.e. spontaneous rupture of liquid film, allows for viscosity measurements of minute liquid volumes.

$\eta(T) \propto \gamma \nu(T)$

Dewetting speed, $\nu(T)$: a competition between surface tension, $\gamma$, which tends to minimize the liquid's surface area & viscosity, $\eta$, which resists flow.

$\eta_a$ is the viscosity at ambient temperature (20°C)

**OUTLOOK**

**SURFACE EFFECT**
Investigate dewetting on surfaces with various surface energies to enable measurements of large contact angles

**ACCLIMATION ASSUMPTION**
Test adjustment of secretion's chemical composition & hence viscosity, in insects living in high temperature environments.

**"WET" ADHESION MODEL**
Adhesion & friction $\propto$ viscosity

Quantify temperature-induced changes in frictional & adhesive forces & compare with temperature-dependence of the pad secretion's viscosity.