Species Report Card

1 What organism are you exploring. Can you name it and draw it?

Longhorn Beetle (Neocerambyx gigas)

2 What Function does this organism perform which you are interested in? (What does it do?)

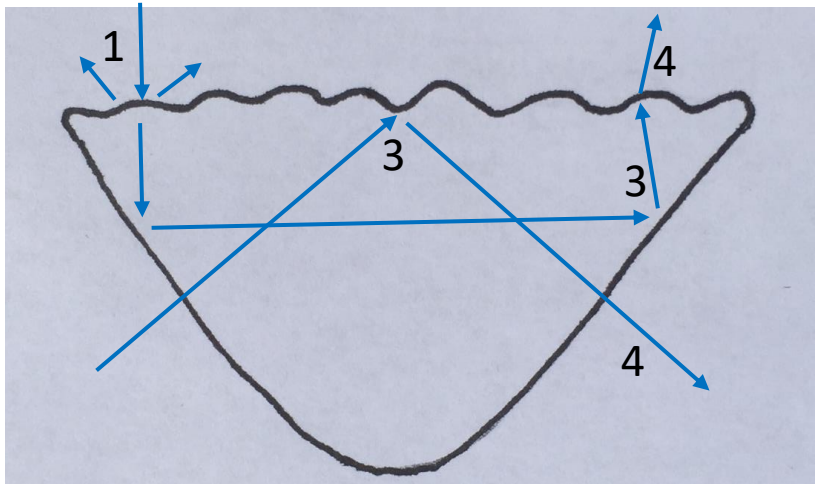
Reflect light.
Emit heat.

3 Describe the strategy this organism uses to deliver the Function you are interested in. (How does it do it?)

Use micro-patterned structures on the forewings to reflect light and emit heat from the body.

This beetle has a super reflective pair of forewings. The wings are covered with microscopic fluffs (they look like tiny hairs) which have a clever structure and shape to reflect light and increase heat emissivity. Each fluff is triangular in cross-section with two smooth sides and one corrugated.

The corrugations help reflect near infrared light more easily, due to the angles created by the corrugations. The triangular shape encourages high internal reflectivity and helps to emit mid-infrared light more easily.



Longhorn Beetle fluff cross-section

1. vis-NIR (near infrared) is reflected displaying Mie scattering.
2. MIR (mid-infrared) absorbed at higher incidence angle.
3. Increased emissivity of MIR at lower incidence angle.
4. MIR passes out.

4 How could this be used to solve your challenge? (translate your strategy into a design principle)

Triangular shapes increase emissivity of infrared light, and corrugation patterns increase reflectivity of near infrared light.