

"Heel" pads of stick insects (*Carausius morosus*) are pressure-sensitive friction pads with little adhesion

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Indian stick insects (*Carausius morosus*) possess two pad types per leg.

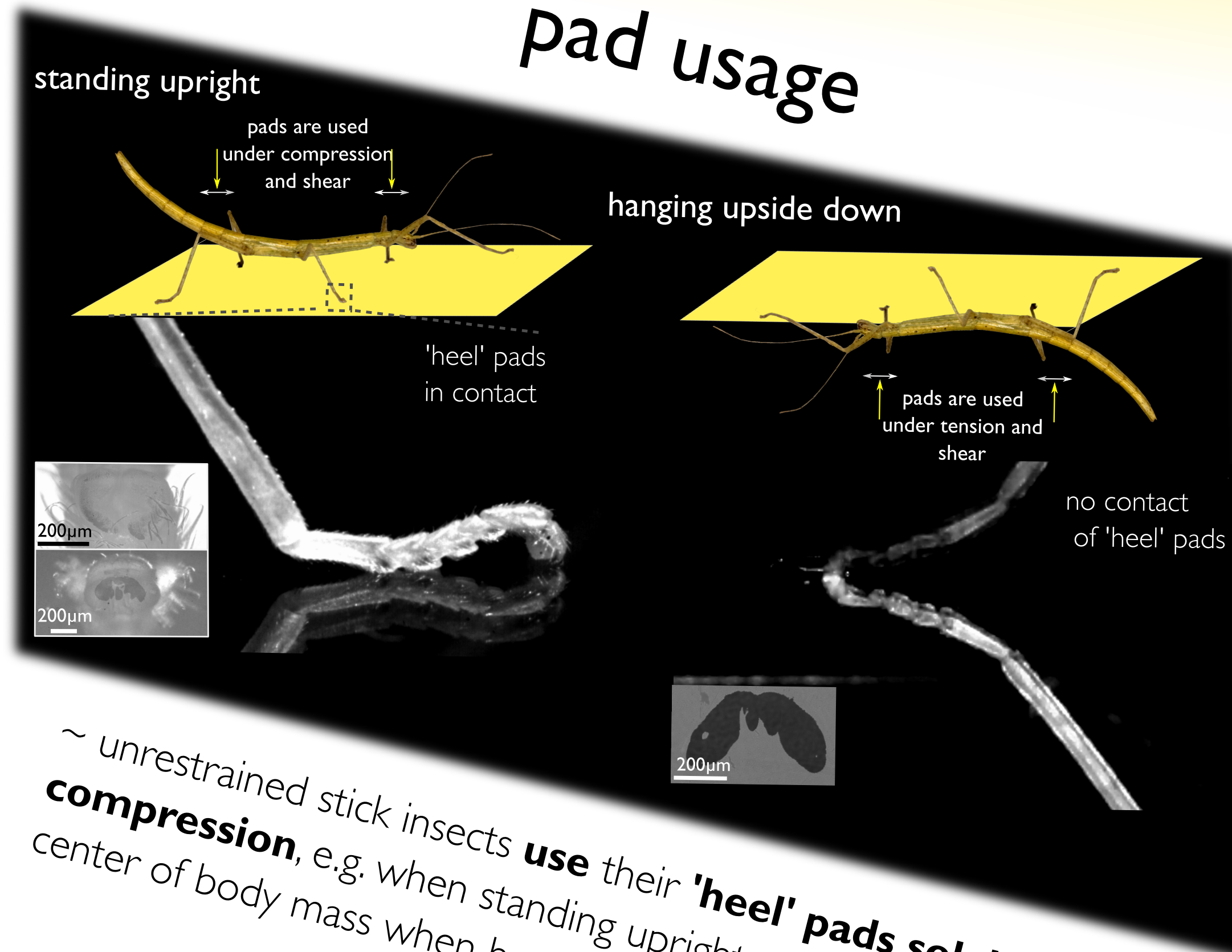
'heel' pads 'toe' pad

pad morphology



~ 'heel' pads are covered with small hairs {acanthae} that taper towards their tip.

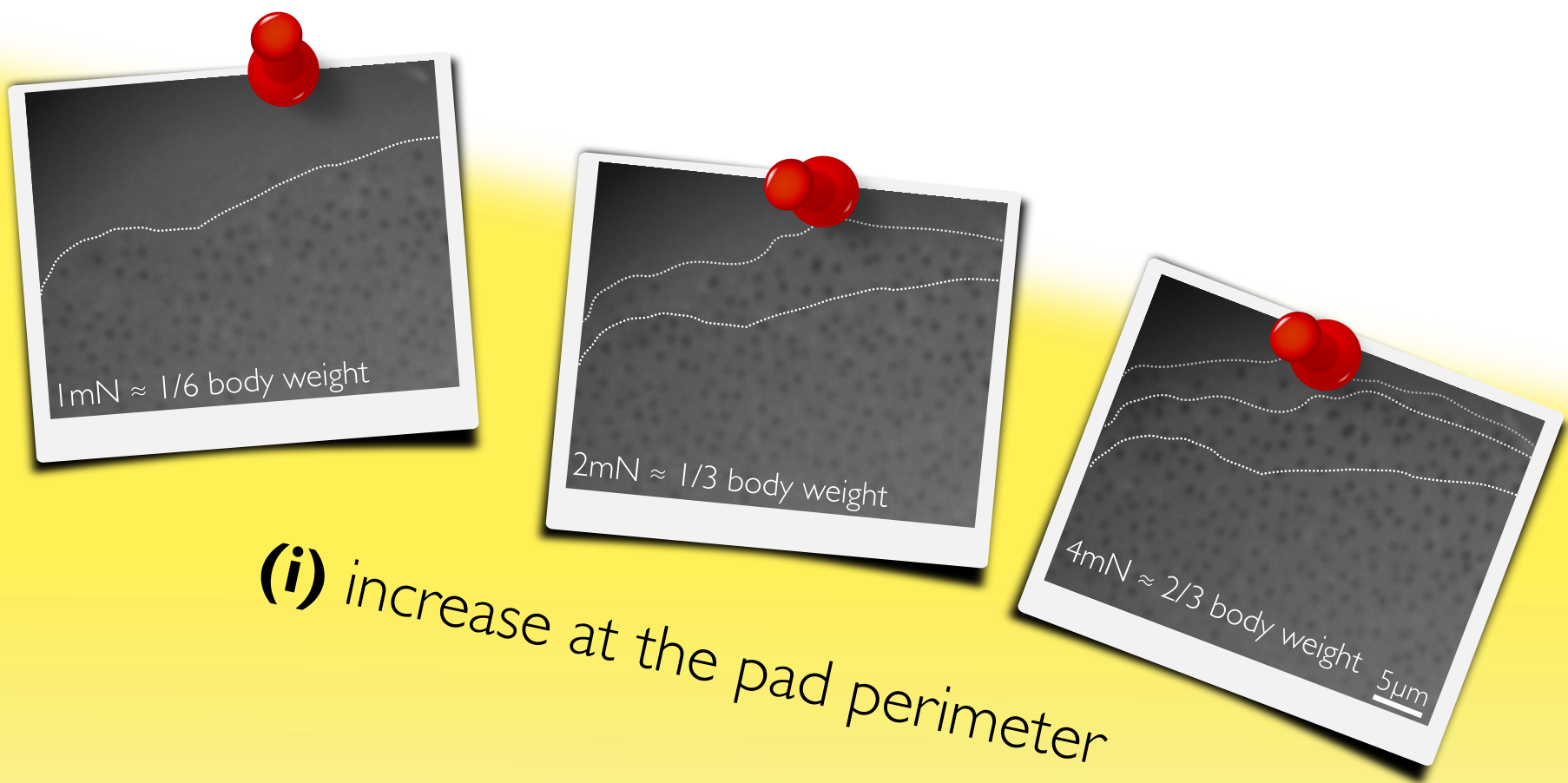
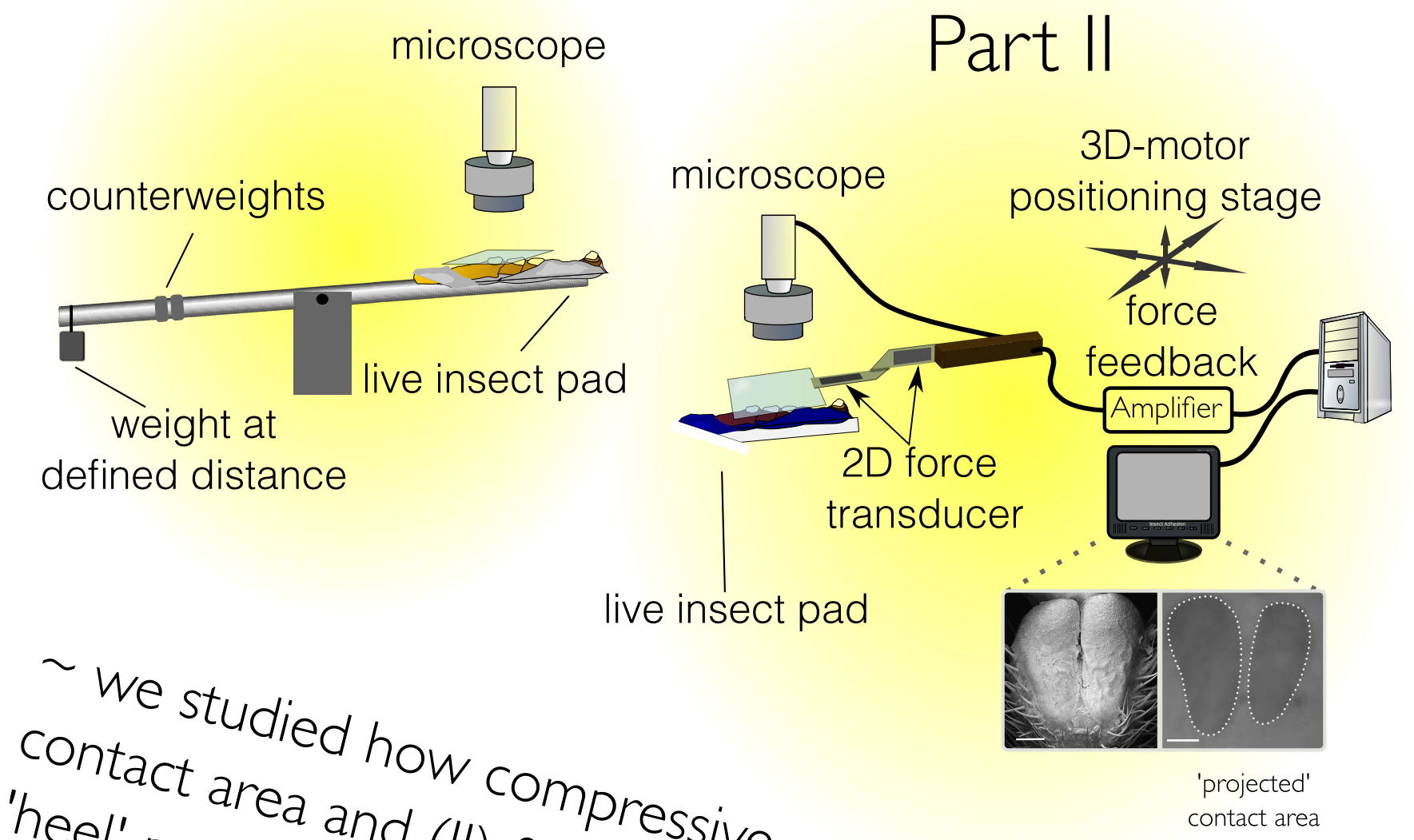
pad usage



'Toe' pads are 'true' adhesive pads, so what is the function of the 'heel' pads?

How does normal load influence performance?

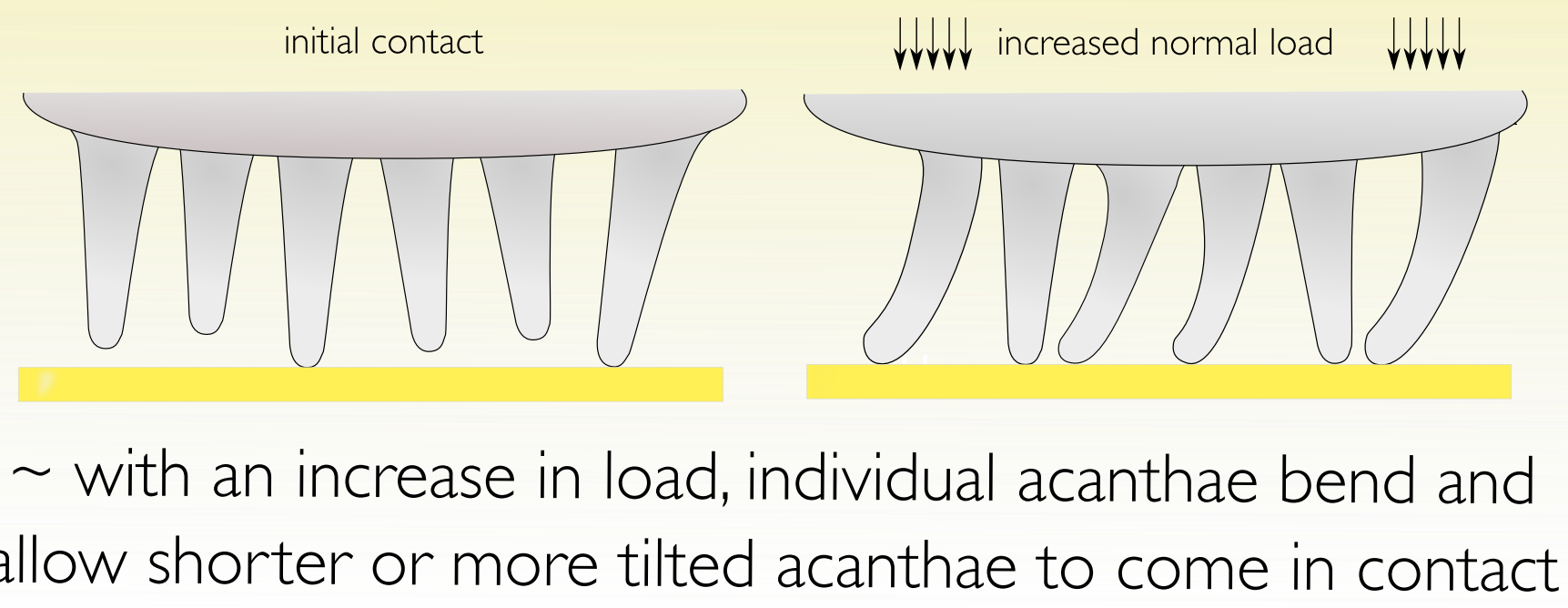
Part I



contact area increases with normal load



Why does normal load increase contact area?

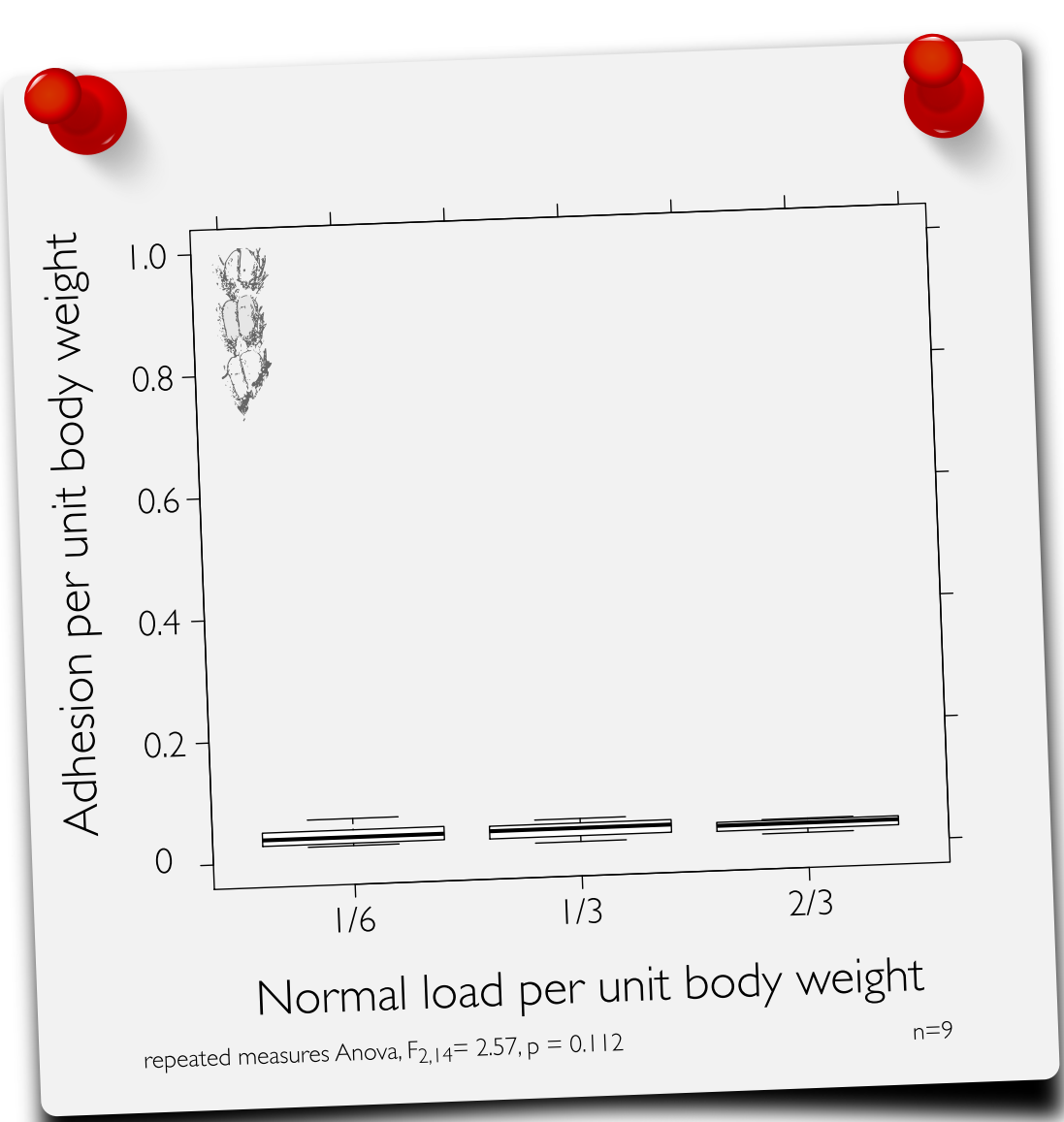


this can be measured as an increase in contrast C:

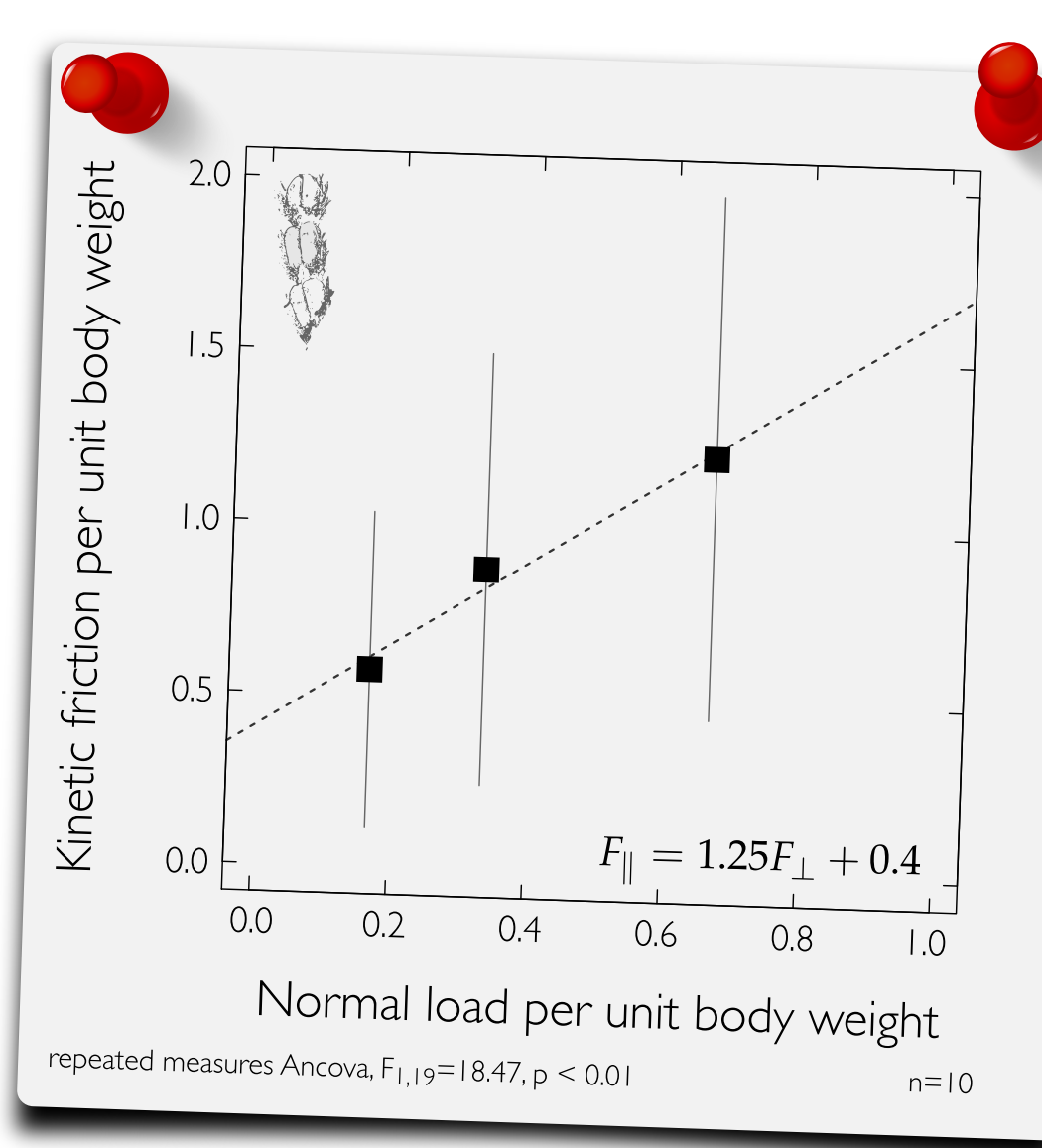
$$C = \frac{B_{BG} - B_{PCA}}{B_{BG}}$$

B_{BG} : brightness of background
 B_{PCA} : brightness of projected pad area

Does the increase in contact area with normal load influence adhesion?



Does the increase in contact area with normal load influence friction?

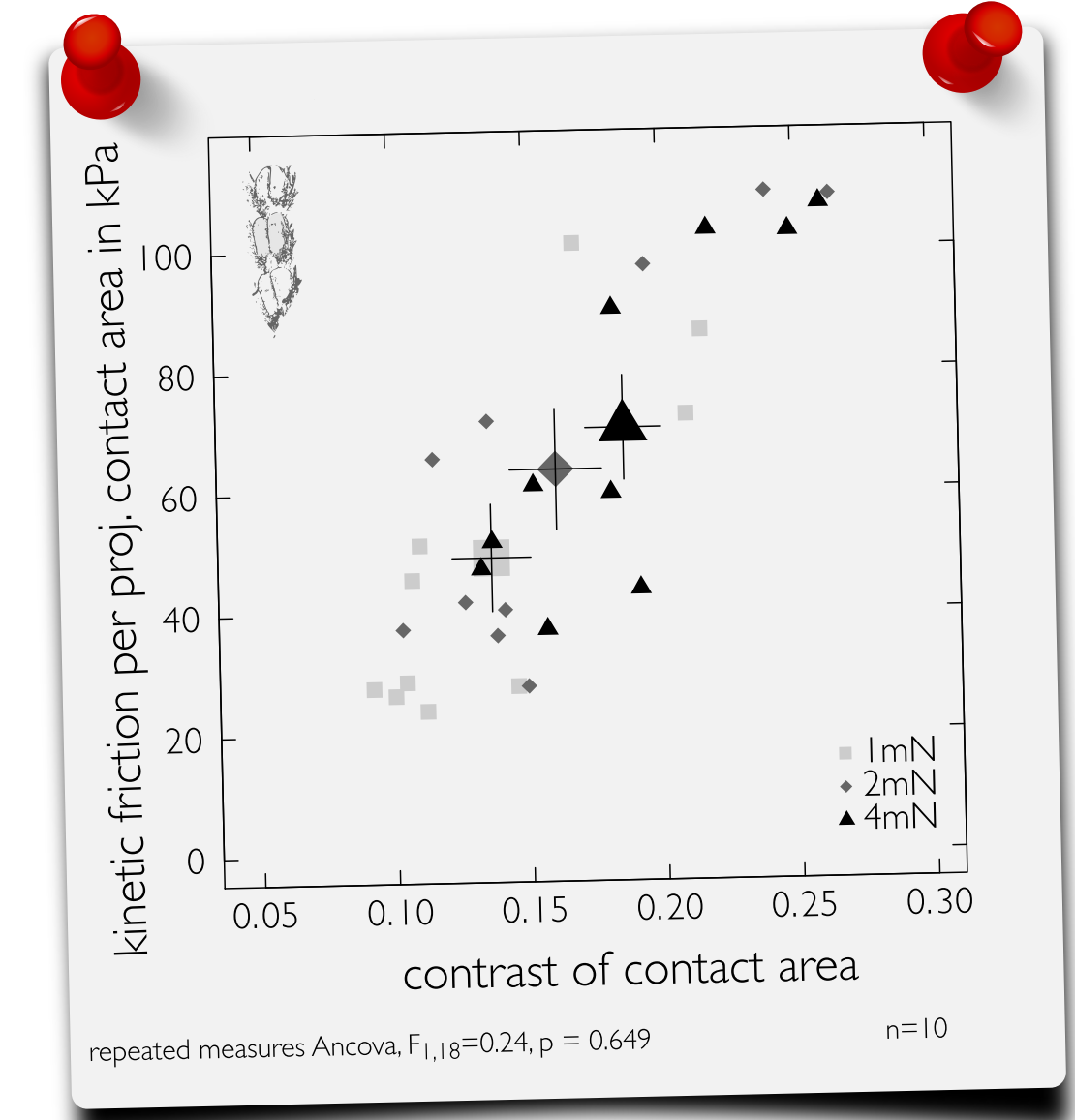


modified law of friction to account for additional load from adhesion:

$$F_{||} = \mu (F_{\perp} + F_A) = \mu F_{\perp} + F_0$$

friction force coefficient of friction normal load microscopic adhesion intercept

Can the increase in contact area explain the increase in friction?



Conclusions

In contrast to adhesive 'toe' pads, 'heel' pads:

- ~ are used solely under compression
- ~ generate little adhesion but large friction, which increases with normal load

'Heel' pads are specialised pressure-sensitive 'friction pads'