



SICB 2020: ABSTRACT SUBMISSION

FINALISATION DATE: 21st August 2019

DUE DATE: 4th September 2019

TOPICS:

B.01 Adhesion

B.02 Bioinspired Engineering and Biomimetics

B.10 Movement through and of fluids

KEYWORDS:

1. Adhesion
2. Insects
3. Keyword of choice: Surface Tension

AWARDS AND FUNDINGS I'M ELIGIBLE FOR:

1. The American Microscopical Society (AMS) Best Student Oral & Poster Presentations In Microscopy ([Website](#))
2. Best Student Presentation Program (Posters category in Division of Insect Zoology or Division of Comparative Biomechanics. Additional requirements! [Website](#))
3. Charlotte Mangum Student Support Program ([Website](#))

TENTATIVE ABSTRACT:

Many insects rely on the ability to cling to plants with a wide range of surface properties. Insects achieve this feat by using specialised adhesive pads located on their feet. The adhesive performance of these pads is usually attributed to capillary forces, as they are covered in a thin film of liquid. However, conclusive evidence in support of this hypothesis is scarce.

Here, we determine the surface tension of the pad secretion of Indian stick insects (*Carausius morosus*), in an effort to provide information critical for a quantitative assessment of wet adhesion models. We overcome the limits posed by the minute quantity of the secretion by using Interference Reflection Microscopy (*IRM*) to image individual droplets deposited on transparent coverslips. *IRM* utilises destructive and constructive interference of monochromatic light, which results in fringe patterns that correspond to height contour lines of the imaged droplets. These fringe patterns can be converted into a height profile via a contrast detection algorithm, so reconstructing 3D profiles from 2D light

microscopy images. Contact angles can then be extracted by fitting a spherical cap to the height profiles.

On silane-coated glass slides ranging from hydrophilic to hydrophobic, the contact angles of the secretion varied between 6° and 15° . These results are indicative of a liquid with low surface tension which wets even hydrophobic surfaces. Indeed, application of the *Owens-Wendt* theory suggested that the liquid's surface tension has a negligible polar component, consistent with previous results. A simple wet adhesion model based on the estimated surface tension fails to account for key features of the attachment performance of these insects, suggesting that capillary forces may not be its sole origin.

CHARACTER COUNT: 1993/2000