Butterfly proboscis to sip cells

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A butterfly's proboscis looks like a straw -- long, slender, and used for sipping -- but it works more like a paper towel, according to Konstantin Kornev of Clemson University. He hopes to borrow the tricks of this piece of insect anatomy to make small probes that can sample the fluid inside of cells.

Kornev will present his work next week at the 62nd Annual Meeting of the American Physical Society's (APS) Division of Fluid Dynamics will take place from November 22-24 at the Minneapolis Convention Center.

At the scales at which a butterfly or moth lives, liquid is so thick that it is able to form fibers. The insects' liquid food -- drops of water, animal tears, and the juice inside decomposed fruit -- spans nearly three orders of magnitude in viscosity. Pumping liquid through its feeding tube would require an enormous amount of pressure.

"No pump would support that kind of pressure," says Kornev. "The liquid would boil spontaneously."

Instead of pumping, Kornev's findings suggest that butterflies draw liquid upwards using capillary action -- the same force that pulls liquid across a paper towel. The proboscis resembles a rolled-up paper towel, with tiny grooves that pull the liquid upwards along the edges, carrying along the bead of liquid in the middle of the tube. This process is not nearly as affected by viscosity as pumping.

Kornev has been recently awarded an NSF grant to develop artificial

probes made of nanofibers that use a similar principal to draw out the viscous liquid inside of cells and examine their contents.

More information: The presentation, "Butterfly proboscis as a biomicrofluidic system" by Konstantin Kornev et al of Clemson University is at 12:01 p.m. on Sunday, November 22, 2009. Abstract: meetings.aps.org/Meeting/DFD09/Event/110814

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