

Keynote:
Microstructures on the surface of semiaquatic insects: discovering bio-diversity for bio-inspired engineering.

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Semiaquatic insects, like water striders, serve as examples for bio-inspired engineering. The knowledge in this field has been largely limited to mid-size water striders from the Palearctic. Here, we will present results of our ongoing studies on micro-structures on the surface of legs of less-studied water striders, such like the giant water strider, *Gigantometra gigas*, water striders from the genera *Ptilomera*, and others. We will argue show that the current bio-engineering perspective on water strider legs and on micro- and nano-structures crucial for locomotion on water surface is oversimplified because it ignores an important diversity of micro-morphologies. We will present how the distribution of hairs (setae) on the surface of legs is asymmetrical with longer hairs located on the bottom (ventral) leg surface that interacts with water. Those hairs are especially developed in the largest semi-aquatic insects. This may be related to their function of capturing air sheath (air bubble) around the legs during jumping when legs break the water surface and move in the water. In water striders from the genus *Ptilomera* those hairs are shaped like long ribbons that help in rowing on the surface of fast flowing creeks (without breaking the surface), while they play no role in supporting the insect on the water surface. Finally, in all water striders, *Gerridae*, the ventral surface of hindlegs is covered by leaf-shaped (scale-like) setae that tightly overlap creating a “beam” of a smooth surface, and we will discuss its hypothetical functions. Additionally, we will compare the fast locomotion in ripple bugs, *Velidae*, powered by drag forces created by midleg micro-fans that penetrate the water with water striders that do not penetrate water surface. We hope that as biologists, we can help engineers in advancing the field of bio-inspired engineering by presenting this diversity of structures on the semiaquatic bugs’ legs.