Exploiting a Little-Known Force

Surface tension, which governs the dynamics at the boundary between water and air, is what allows some bugs to walk on water. The mechanisms driven by surface tension involve trigonometry, differential geometry, and differential equations, and are being investigated in order to design more efficient structures, such as hulls with reduced drag. The research is being done by biologists, physicists, mathematicians, and engineers, who form a dynamic human interface that is attempting to understand and harness an important interface in the natural world.

Surface tension also plays a significant role in the transmission of disease. Recent experiments conducted by mathematicians using high-speed video show that droplets emitted by sneezing or coughing are carried in a gas-liquid cloud. The smaller droplets, which may penetrate respiratory tracts more easily, travel 5-200 times farther in the cloud than they would on their own and can reach ventilation ducts meters away. The experiments have guided the development of a class of mathematical models of these clouds based on multiphase flow dynamics incorporating the momentum, buoyancy, and turbulence involved. Results from the experiments should suggest improvements in the designs of classrooms, airplanes, and hospital rooms that would reduce the risk of the transmission of disease-carrying particles.

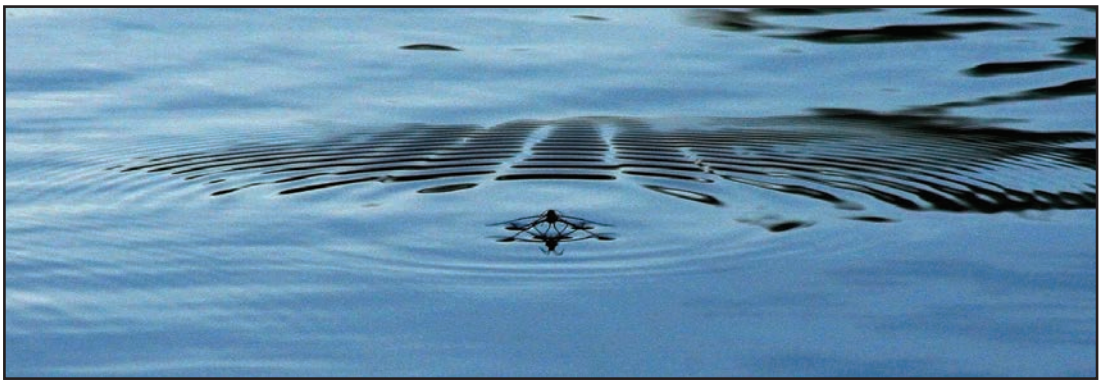

Photo: Christine Walsh

For More Information: "Water's Tough Skin," Elizabeth Pennisi, *Science*, March 14, 2014.

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