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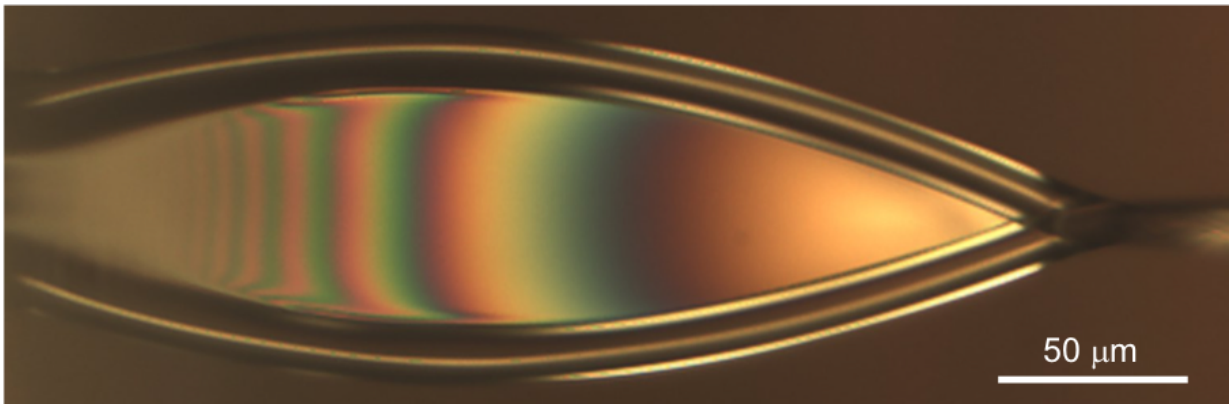
Generation of ultrathin free-flowing liquid sheets

The physics and chemistry of liquid solutions play a central role in science, and our understanding of life on Earth. Unfortunately, key tools for interrogating aqueous systems, such as infrared and soft X-ray spectroscopy, cannot readily be applied because of strong absorption in water. In this talk I will present a microfluidic device that uses gas-dynamic forces to generate free-flowing, sub-micron, liquid sheets which are two orders of magnitude thinner than anything previously reported. These sheets can run in vacuum, and are tunable in thickness from over 1 µm down to less than 20 nm, which corresponds to fewer than 100 water molecules thick. At this thickness, aqueous sheets can readily transmit photons across the spectrum, leading to potentially transformative applications in infrared, X-ray, and electron spectroscopies.