BIOMIMETICS

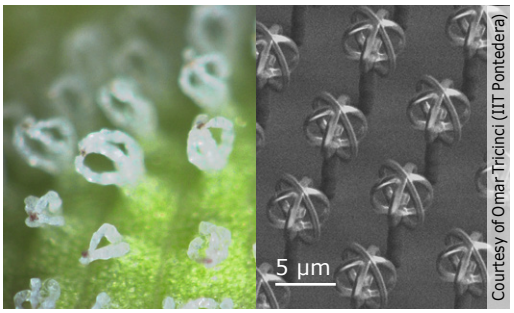
Natural systems with millions of years of evolution inspire technological innovation in the design and development of functional and smart materials. Nanoscribe's Photonic Professional *GT2* offers highest resolution in 3D printing and geometric design freedom to emulate biological structures at nano-, micro- and up to millimeter scales. Shape, size and distribution of the structures can be easily changed in order to investigate and optimize materials. Due to structural design at the microscale, materials can adopt properties such as hydrophobicity, elasticity or coloration – mimicking intricate architectures and finest features observed in nature.

SUPERHYDROPHOBIC SURFACES

Challenge: 3D micropattern capable of air retention, hydrophobicity and water condensation required for fog collection inspired by salvinia molesta leaves.

Solution: Periodic arrays of crown-like hairs, hundred times smaller than the natural model, are printed. Structures are stable when submerged in water and air trapping is demonstrated.

Source: DOI: 10.1021/acsami.5b07722

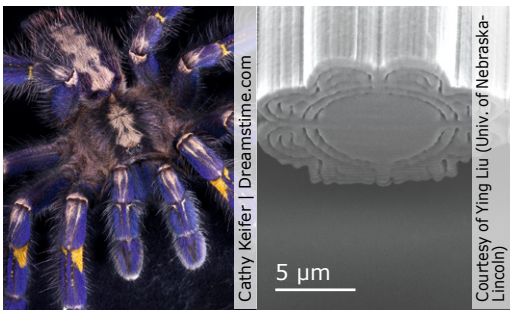


NONIRIDESCENT PHOTONIC NANOSTRUCTURES

Challenge: Tarantula hair-like nanostructured material which exhibits angle independent reflectance spectra due to microscale rotational symmetry and hierarchy.

Solution: Hierarchical multilayer cylinders are fabricated out of a transparent polymer material with layer thicknesses of 300 nm and layer spacing of 450 nm that show a green hue up to 70° incidence angle.

Source: DOI: 10.1002/adom.201600599

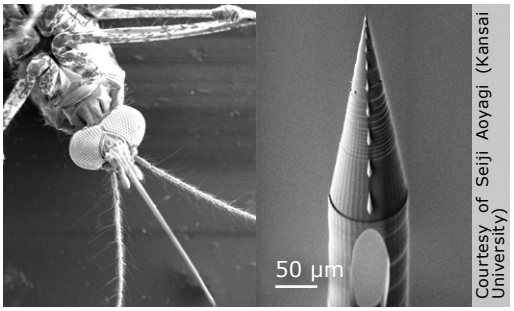


MICRONEEDLES FOR PAINLESS BLOOD COLLECTION

Challenge: Microneedles mimicking the mosquito's proboscis for painless and easy insertion into the skin without bending or collapsing due to reduced puncturing resistance.

Solution: Microneedle halves of mm-length are printed with sharp tips, spikes and small holes. Two assembled halves advance alternately and can penetrate artificial skin to suck blood.

Source: DOI: 10.1109/TRANSDUCERS.2015.7180876

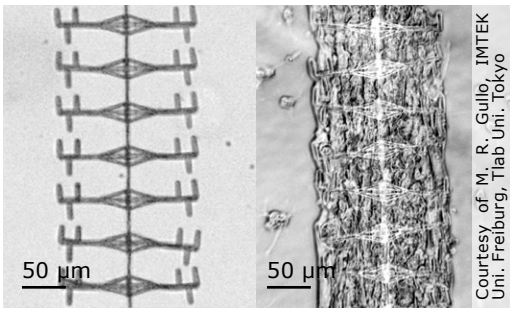


CELL-ACTUATED HYDROGEL MICROSKELETON

Challenge: Stable and deformable hydrogel scaffold that allows selective cell adhesion and differentiation of C2C12 cells into mature muscle fibers that contract and relax when voltage is applied.

Solution: The printed microskeleton is made of a PEGDA-based hydrogel mixed with PETA which promotes stiffness and protein adhesion. The cell-seeded bio-MEMS system deforms reversibly under electrical stimulus.

Source: DOI: 10.1109/MEMSYS.2017.7863350



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