Potential Applications of Light Robotics in Nanomedicine

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We have recently pioneered a new generation of 3D micro-printed light robotic structures with multi-functional biophotonics capabilities. The uniqueness of this light robotic approach is that even if a micro-biologist aims at exploring e.g. cell biology at nanoscopic scales, the main support of each micro-robotic structure can be 3D printed to have a size and shape that allows convenient laser manipulation in full 3D – even using relatively modest numerical aperture optics. An optical robot is typically equipped with a number of 3D printed "track-balls" that allow for real-time 3D light manipulation with six-degrees-of-freedom. This creates a drone-like functionality where each light-driven robot can be e.g. joystick-controlled and provide the user a feeling of stretching his/her hands directly into and interacting with the biologic micro-environment. The light-guided robots can thus act as free-floating probes to monitor micro-biologic processes and provide spatially targeted mechanical, chemical or even optical stimuli that would otherwise be impossible to achieve in a full 3D biologic environment.

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