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Multiphoton induced nano- and micro-processing in cells and tissues

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Multiphoton microscopy performed with a femtosecond pulsed Ti:sapphire laser in the near infrared (NIR) is a useful tool not only to image cells and tissues with a subcellular resolution but to perform highly precise nanosurgery. Cell organelles like mitochondria, membranes or chromosomes, single cells and intratissue compartments can be manipulated and optically knocked out. Single cells of tumor-sphaeroids were eliminated efficiently inside the sphaeroid without damaging the neighbouring cells. Single organelles of those cells were treated with the nanoscalpel, without damaging the cell itself. Human tooth material was ablated with cuts below 1 µm. The nanoscalpel may become a useful instrument for micro- and nano-manipulating and surgery in several fields of science, including targeted transfection.