BROWSING THE 3D-NANOCOSM OF LIVE CELLS

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Controlling a 3D digital microscope with maximal speed and minimal photodamage resembles flying a supersonic jet fighter over a densely populated city. One needs to keep an eye on a vast number of parameters, and one needs quick and precise commands based on the feedback obtained from sensors inside the microscope and data obtained with its help.

We will demonstrate a microscope comprising a man-machine interface, which allows the user to interact with the microscope solely by using a mouse and an iPad, whereby the division of labor between the right hand (mouse) and the left hand (iPad) resembles that of a pianist playing the piano. At all times the user overlooks all measuring parameters at a glance, and in changing any of these parameters the user obtains immediate feedback about the feasibility of the command input.

The microscope allows a plurality of imaging modes, ranging from fast overview-imaging of extended areas using strobed LED-transillumination to TIRF, FRET and 3D Superresolution SIM using dynamic two-dimensional illumination patterns.

A smooth and fast workflow is assured by the integrated OpenGL and OpenCL based image processing, which exploits the impressive performance of modern GPUs. It allows accomplishing tasks like shading and dark image correction, histogram calculation or evaluation of Superresolution SIM raw images in real time. Navigating in overview scans containing several gigapixel of image data is possible at high frame rates. Gray value scaling and pseudo color palettes can be changed on the fly, even when looking at very large data sets.