

Dragonfly: A Powerful New Multi-Modal Microscopy Platform

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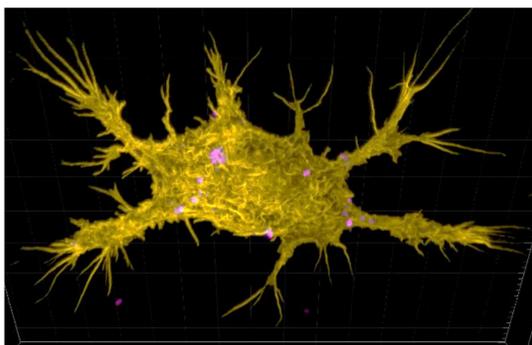


Figure 1. Volume rendered confocal image of a murine macrophage labelled with AlexaFluor 488 Phalloidin: showing phagocytosis of E.coli bacteria (pink) labeled with AlexaFluor 594. The image was acquired with Dragonfly in confocal mode (40 μm pinhole), and Nikon 100X 1.42 oil objective. Courtesy Dr Graeme Whyte (Herriot Watt University) and Dr Ann Wheeler (MRC IGMM, Edinburgh)

Dragonfly is a new multi-modal imaging platform designed and manufactured by Andor Technology. It features Andor's next generation microlens spinning disk engine with field number 22 mm, dual pinhole (40, 25 μm) and patented Borealis™ illumination system, for high throughput, uniformity and stability. Dragonfly represents a significant evolution in confocal imaging, being 10-20 times faster than point scanning solutions, with sensitivity between 2 and 5 times greater, low phototoxicity, excellent linearity and wide (16 bit) dynamic range. The imaging wavelength range of 425-850 nm supports high levels of multiplexing, while NIR (650-850 nm) can be used to reduce scattering and auto-fluorescence in thick or uncleared tissue specimens. Unlike previous generation products, Dragonfly is capable of wide field laser illumination for single molecule imaging and localization microscopy: excitation zoom optics deliver up to 2 kW/cm^2 when high power density is needed; a motorized astigmatic lens can be inserted in the imaging path for 3D single molecule localization or tracking; zoom imaging optics combine with camera selection to deliver Nyquist sampling for a broad range of objectives from 100X down to 20X. Compatible cameras include award winning iXon Ultra 888, 1 MPixel back-illuminated EMCCD and Zyla 4.2 plus, 4 MPixel scientific sCMOS with a peak QE of 82%. Dragonfly also supports optional TIRF imaging with a patented optical design for simultaneous matching of penetration depth at multiple wavelengths.

Dragonfly is complemented by a new software platform, Fusion, which includes real-time 3D visualization and GPU-accelerated deconvolution. Deconvolution delivers optical section and diffraction-limited imaging performance for thinner specimens, such as yeast, and also provides significant resolution and contrast enhancement in confocal stacks. Dragonfly is a highly flexible platform for the widest range of specimen types, delivering excellent speed and image quality from single molecules to yeast and organoids to embryos. In this paper we will quantify the performance and illustrate Dragonfly's use across a broad spectrum of applications.