



Title	PEAR: Accelerating the in-depth understanding of biomedical processes at the nanoscale via a novel real-time, optical limit-breaking imaging technology
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PEAR offers an innovative solution for the next generation of microscopy. The method achieves imaging beyond the far-field diffraction limit (~ 200 nm) via addressable plasmonic elements, which act similar to sensor pixels, offering below 25 nm spatial resolution.

The photonic chip contains an electronically addressable array of metallic nano-elements, acting as quasi-pixels. These pixels can be switched from "on-resonance" to "off-resonance" via a modulated current. This modulation results in appreciable changes of the electric near-field strength above the pixels, which can be detected via optical heterodyne detection.

The ability to rapidly address these active plasmonic elements and to encode information in the way the pixels are addressed enables retrieval of spatial information in the far-field, leading to sub-diffraction-limit imaging. Because of the known, nano-localised addressability of the modulation, a dedicated computer algorithm is capable of extracting the contained information. A second benefit of the pixel-addressing is the resulting capability to read-out all the spatial information in one step, which leads to unprecedented speed of image acquisition hence providing real-time imaging of biological systems at the nanoscale level.

This award-winning solution is bio-compatible and can easily be retrofitted into existing commercially available microscopes and will provide a greatly improved in-depth understanding of subcellular mechanisms and even macromolecular reactions in real-time.

In order to provide evidence for the capabilities of our new invention we have chosen to focus onto the transfer mechanism of melanin granules by filopodia as a relevant proof of concept.