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Chipseope, a new super-resolution microscope for molecular biology

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For decades, the resolution of optical microscopy has been limited by the diffraction of light to features larger than 250 nm, barring the study of the cell interior structure, and thus the spatial organization of cell nuclei. Super-resolution techniques finally raised the limitation for optical observation, with techniques like STED, STORM, PALM, etc., opening new horizons to direct study, though requiring costly and bulky setups. A new microscope is being developed which directly addresses the problems of current super-resolution setups, by developing a completely new approach to super-resolution microscopy. The new microscope uses individually addressable semiconductor nano Light Emitting Diode (nanoLED) arrays to reach super-resolution capabilities, using spatially resolved illumination instead of spatially resolved detection. An extremely sensitive Single Photon Avalanche Diode fabricated in CMOS technology is used as the sensor, providing fast response capabilities. This allows the microscope to be used for fluorescence lifetime detection and shadow imaging. Genomics laboratories would benefit from the inexpensive and portable concept of this microscope. The microscope is being developed in the European Project Chipseope which runs until December 2020 and is formed by SMEs, universities and research organisations under the leadership of the University of Barcelona. Other partners are the Technical University of Braunschweig in Germany, the University Tor Vergata in Rome, the company Expert Ymaging in Barcelona, the Austrian Institute of Technology, the Medical University of Vienna and the FSRM Swiss Foundation for Research in Microtechnology.

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