Next Generation of Nanoscopies in Biosciences - Seven EU Funded Initiatives Presented Approaches and Results in a Public Workshop

The EU funded research project ChipScope has brought together seven EU funded projects in a public workshop to present and discuss current topics of the next generation of nanoscopies in biosciences. The event took place on September 11, during the EUROSENSORS 2018 conference in Graz, Austria

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The workshop has been initiated by the ChipScope project which aims to overcome the limits of diffraction with super-resolution lighting on a chip. It was chaired by Dr. Hutomo Suryo Wasisto from Technische Universität Braunschweig (Germany).

The **ChipScope** project was presented by Prof. J. Daniel Prades from University of Barcelona. Its aim: overcoming the Limits of Diffraction with Super-Resolution Lighting on a Chip. In ChipScope, the consortium will revolutionize optical microscopes with super-resolution capabilities, making them chip-sized, convenient, affordable and ubiquitously available, not only for laboratories working in manifold research fields, but also in everyday life. During the project, very small nanoLEDs of below Abbe limits in size (this is 1000 times smaller than the diameter of a human hair) will be developed and used as light sources for a new microscope, which will be integrated on a chip. The fundamental difference with conventional optical microscopy will be that the illumination is made by extremely small individual light sources instead of a wide illumination field and tiny detectors in the camera. This allows super-resolution (< 50 nm) optical microscopy, which could be used to investigate extremely small structures as viruses, DNA or living cells, in real time. More information: http://www.chipscope.eu/.

The **AdOMiS** project was presented by Prof. Dr. Martin Booth from University of Oxford (UK). Its aim are adaptive optical microscopy systems which can instantly react to and compensate fluctuations while scanning the specimen. First experimental results were demonstrated, illustrating that the application of AO has already enabled enhanced resolution in case of confocal (4Pi), STED, and SIM microscopes. More information: https://cordis.europa.eu/project/rcn/204867_en.html

The **Chromavision** project was presented by Prof. Dr. Erwin Peterman from Vrije Universiteit Amsterdam. It develops a novel technique to do chromosome imaging and manipulation. The platform will allow molecular biologists to automatically isolate individual chromosomes from small tissue or cell samples and have these delivered to a super-resolution imaging system (i.e., the Super-Resolution Correlative Tweezers Fluorescence Microscope (CTFM-SR3D)). More information: http://chromavision.eu/.

The **MolMap** project is led by Prof. Dr. Ralf Jungmann from Ludwig-Maximillians Universität München (LMU) and Max-Planck-Institute (MPI) of Biochemistry. Its aim is to localize and identify arbitrary biomolecules (i.e., proteins,

nucleic acids) and their cellular interactions in a complex tissue microenvironment with high multiplexity (hundreds of targets simultaneously) and ultra-resolution beyond the diffraction limit (< 5 nm). More information: https://cordis.europa.eu/project/rcn/200542_en.html

Prof. Dr. Wolfgang Drexler, head of the Drexler Lab at the Medical University Vienna gave an introduction into the **OCTChip** project. The OCTChip program develops miniaturized and cost-reduced optical coherence tomography (OCT) devices especially for clinical praxis of eye care (ophthalmology). The project proposes the use of photonic integrated circuits (PICs) to reduce both the size and the cost of ophthalmic OCT systems significantly. More information: http://www.octchip.researchproject.at/

Prof. Dr. Marta Fajardo from University of Lisbon introduced the **VOXEL** project. The aim of VOXEL is to provide an alternative to tomography with a disruptive technology enabling 3D X-ray imaging at very low dose. VOXEL aims at prototyping new cameras working either in the soft or hard X-rays that will combine the X-ray penetration and nanometre spatial resolution, easiness to use, afforded by avoiding the rotation of the source or the sample, and extremely low dose for maximum impact on medicine and biology. More information: https://www.ipfn.tecnico.ulisboa.pt/voxel.

Dr. Peter Gnauck from Carl Zeiss Microscopy GmbH presented the **npSCOPE** project which will develop an instrument that couples the extraordinarily high resolution of the recently commercialised helium-ion microscope with sensors for composition (a mass spectrometer) and 3D visualisation (transmitted ion detector). The aim is to more fully characterise individual nanoparticles and their interaction with their biological environments (water, soil, body fluid, human cells and tissue, etc.) and to better understand the risks they might pose to human health or the environment. More information: http://www.npscope.eu/

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