

MESO-BRAIN initiative receives €3.3million to replicate brain's neural networks through 3D nanoprinting

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The MESO-BRAIN consortium has received a prestigious award of €3.3million in funding from the European Commission as part of its Future and Emerging Technology (FET) scheme. The project aims to develop three-dimensional (3D) human neural networks with specific biological architecture, and the inherent ability to interrogate the network's brain-like activity both electrophysiologically and optically. It is expected that the MESO-BRAIN will facilitate a better understanding of human disease progression, neuronal growth and enable the development of large-scale human cell-based assays to test the modulatory effects of pharmacological and toxicological compounds on neural network activity. The use of more physiologically relevant human models will increase drug screening efficiency and reduce the need for animal testing.

About the MESO-BRAIN project

The MESO-BRAIN project's cornerstone will use human induced pluripotent stem cells (iPSCs) that have been differentiated into neurons upon a defined and reproducible 3D scaffold to support the development of human neural networks that emulate brain activity. The structure will be based on a brain cortical module and will be unique in that it will be designed and produced using nanoscale 3D-laser-printed structures incorporating nano-electrodes to enable downstream electrophysiological analysis of neural network function. Optical analysis will be conducted using cutting-edge light sheet-based, fast volumetric imaging technology to enable cellular resolution throughout the 3D network. The MESO-BRAIN project will allow for a comprehensive and detailed investigation of neural network development in health and disease.

Prof Edik Rafailov, Head of the MESO-BRAIN project (Aston University) said: "What we're proposing to achieve with this project has, until recently, been the stuff of science fiction. Being able to extract and replicate neural networks from the brain through 3D nanoprinting promises to change this. The MESO-BRAIN project has the potential to revolutionise the way we are able to understand the onset and development of disease and discover treatments for those with dementia or brain injuries. We cannot wait to get started!"

The MESO-BRAIN project will launch in September 2016 and research will be conducted over three years.

About the MESO-BRAIN consortium

Each of the consortium partners have been chosen for the highly specific skills & knowledge that they bring to this project. These include technologies and expertise in stem cells, photonics, physics, 3D nanoprinting, electrophysiology, molecular biology, imaging and commercialisation.

[Aston University](#) (UK) Aston Institute of Photonic Technologies (School of Engineering and Applied Science) is one of the largest photonic groups in UK and an internationally recognised research centre

in the fields of lasers, fibre-optics, high-speed optical communications, nonlinear and biomedical photonics. The Cell & Tissue Biomedical Research Group (Aston Research Centre for Healthy Ageing) combines collective expertise in genetic manipulation, tissue engineering and neuronal modelling with the electrophysiological and optical analysis of human iPSC-derived neural networks. [Axol Bioscience Ltd.](#) (UK) was founded to fulfil the unmet demand for high quality, clinically relevant human iPSC-derived cells for use in biomedical research and drug discovery. The [Laser Zentrum Hannover](#) (Germany) is a leading research organisation in the fields of laser development, material processing, laser medicine, and laser-based nanotechnologies. The Neurophysics Group (Physics Department) at [University of Barcelona](#) (Spain) are experts in combing experiments with theoretical and computational modelling to infer functional connectivity in neuronal circuits. The [Institute of Photonic Sciences](#) (ICFO) (Spain) is a world-leading research centre in photonics with expertise in several microscopy techniques including light sheet imaging. [KITE Innovation](#) (UK) helps to bridge the gap between the academic and business sectors in supporting collaboration, enterprise, and knowledge-based business development.

About the FET funding

Horizon 2020 aims to ensure Europe produces world-class science by removing barriers to innovation through funding programmes such as the FET. The FET (Open) funds forward-looking collaborations between advanced multidisciplinary science and cutting-edge engineering for radically new future technologies. The published success rate is below 1.4%, making it amongst the toughest in the Horizon 2020 suite of funding schemes. The MESO-BRAIN proposal scored a perfect 5/5.

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NOTES TO EDITOR

About MESO-BRAIN

The MESO-BRAIN initiative targets a transformative progress in photonics, neuroscience and medicine. The project aims to develop human induced pluripotent stem cell (iPSC)-derived neural networks upon a defined and reproducible 3D scaffold to emulate brain activity and improve our understanding and treatment of conditions such as Parkinson's disease, dementia and trauma. This research, led by Aston University, is a collaboration between Axol Bioscience Ltd. (UK), Laser Zentrum Hannover (Germany), University of Barcelona (Spain), Institute of Photonic Sciences (Spain) and KITE Innovation (UK). The project is funded by the European Commission through its Future and Emerging Technology (Open) programme.

About ICFO

ICFO - The Institute of Photonic Sciences, member of The Barcelona Institute of Science and Technology, is a research center located in a specially designed, 14.000 m²-building situated in the Mediterranean Technology Park in the metropolitan area of Barcelona. It currently hosts 350 people, including research group leaders, post-doctoral researchers, PhD students, research engineers, and staff. ICFOians are organized in 23 research groups working in 60 state-of-the-art research laboratories, equipped with the latest experimental facilities and supported by a range of cutting-edge facilities for nanofabrication, characterization, imaging and engineering.

The Severo Ochoa distinction awarded by the Ministry of Science and Innovation, as well as 13 ICREA Professorships, 18 European Research Council grants and 6 Fundació Cellex Barcelona Nest Fellowships, demonstrate the centre's dedication to research excellence, as does the institute's consistent appearance in top worldwide positions in international rankings.

From an industrial standpoint, ICFO participates actively in the European Technological Platform Photonics21 and is also very proactive in fostering entrepreneurial activities and spin-off creation. The center participates in incubator activities and seeks to attract venture capital investment. ICFO hosts an active Corporate Liaison Program that aims at creating collaborations and links between industry and ICFO researchers. To date, ICFO has created 5 successful start-up companies.