

ICFO Participates in three new EIC Pathfinder projects

ICFO collaborates in the early stage development of future technologies as part of international consortia of researchers

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With its Pathfinder programme, the European Innovation Council (EIC) supports the exploration of bold ideas for radically new technologies. It welcomes the high-risk / high gain and interdisciplinary cutting-edge science collaborations that underpin technological breakthroughs.

Pathfinder goes beyond what is already known encouraging visionary thinking that can open up promising avenues towards powerful new technologies.

ICFO participates in three separate projects that were funded in the May 25, 2021 call. 868 proposals were evaluated in this call, with 56 projects in total funded to develop novel technologies for future applications across a very wide range of topics. Selected projects will receive not only grants, but also access to tailored-made coaching under the EIC business acceleration services.

TWISTEDNANO: Twisted nanophotonic technology for integrated chiroptical sensing of drugs on a chip

Consortia: University of L'Aquila (IT- coordinator), **ICFO (Attoscience and Ultrafast Optics group leader ICREA Prof at ICFO Dr Jens Biegert)**, EPFL - Ecole Polytechnique Federale d Lausanne, (CH), MPL - Max Planck Institute for The Science of Light (DE), CNRS - Cente national de la recherche scientifique (FR), Dompe Farmaceutici S.p.A. and Forese Biosystems (IT)

The search for new drugs requires reliable, ultra-sensitive and fast techniques to identify, refine and test small volumes of chiral drug candidates for clinical trials. This project responds to this need through the development of next-generation miniaturized devices that allow the characterization of small quantities of chiral drugs with a volume of a few nanoliters through light, revolutionizing the technological detection tools for the discovery of new drugs and nanomedicine at the source. The academic partners involved are European leaders in the field of nanophotonics, ultrafast spectroscopy and nonlinear optics. The highly multidisciplinary research team will focus on the development of innovative optofluidic devices that will allow to overcome the current sensitivity limits for chiral sensing.

PLAST CELL: A multiplexed biomimetic imaging platform for assessing single cell plasticit (Plastomics) and scoring of tumour malignanc

Consortia: CRG (ES- coordinator), **ICFO (SLN Team leader Dr Pablo Loza-Alvarez)**, Institut Hospital del Mar d'Investigacions Mediques-IMIM (ES), EMBL-EBI, EMBL's European Bioinformatics Institute(UK), Cherry Biotech-CHB (FR)

Metastasis, the dissemination of primary tumour cells to distant organs, is the cause of more than 90% of cancer-related deaths. It remains a major clinical challenge with poor treatment options. Cell plasticity is considered a key hallmark of metastatic cells and therapy resistance by enabling cell adaptation to adverse conditions. This project aims at developing a radically new technology platform to categorize and score cancer cell plasticity at the single cell level. This integrates a multiplexed biomimetic 3D micro-environment platform with full control to mimic the diverse physiologically relevant biomimetic culture conditions. The academi partners involved are European experts in the fields of cellular biophysics, bioengineering advanced fluorescence imaging, computer vision, and biomedical sciences. The researc team will focus on the better understanding of the cancer cell plasticity and its relationshi with metastasis.

TROPHY: ulTRafast hOlograPHic FTIR microscopy

Consortia: Politecnico di Milano (IT- coordinator), **ICFO (Molecular Nanophotonics group led by ICREA Prof Dr Niek van Hulst)**, Consiglio Naxional Della Ricerche (IT) Lyncee Tec SA (CH), Universitatsklinikum Jena (DE), Univ Exeter (UK), Univ Cambridge (UK)

Many human pathologies such as cancer are due to complex biochemical alterations that

start at a sub-cellular level and lead to progressive changes that result in a heterogeneous tumor composition. The polyclonality of tumor cells hampers the diagnosis and the therapy giving rise to tumor clones that lead to therapy resistance and promote metastases. An accurate diagnosis of tumor biopsies to identify these particular cell clones is crucial to provide targeted therapy tailored to the tumor characteristics, to improve the patient outcomes and increase survival rates.
For this vision to come true, we introduce the TROPHY project as a paradigm shift in vibrational microscopy, combining the best of Fourier transform (FT)-IR and Digital Holography Microscopy (DHM). Exploiting photo-thermal contrast, TROPHY borrows from FT-IR the use of time-domain interferometry to obtain a high spectral resolution from broadband excitation and from DHM highly sensitive and quantitative detection of the refractive index (phase) change. Combined with artificial intelligence algorithms, this technology will enable quantitative concentration imaging of molecular biomarkers with high spatial resolution, high chemical selectivity and high speed, with a transformative impact on medical research and clinics.

As novelties under the fully-fledged EIC, Pathfinder projects benefit from interactions with EIC Program Managers and can receive additional funding for testing the innovation potential of their research outputs or for working across projects for portfolio actions. In addition, promising results can receive substantial follow up funding through the EIC Transition scheme to create a commercial venture, or use the Fast Track scheme to access the EIC Accelerator for bring innovations to market.