Functional Microscopy of Individual Neurons in the Living Human Retina

Fact Sheet

Project Information

FunMicroRetina

Grant agreement ID: 101170453

DOI
10.3030/101170453

EC signature date
19 February 2025

Start date
1 June 2025

End date
31 May 2030

Funded under
European Research Council (ERC)

Total cost
€ 1 999 998,00

EU contribution
€ 1 999 998,00

Investment in EU policy priorities

Digital agenda	●	Clean air	◐
Artificial Intelligence	◐	Climate action	◐
Biodiversity	○		

Coordinated by
STICHTING VU
Netherlands

Objective

Subcellular, functional imaging of neurons in living humans could revolutionize biomedical research and prove valuable in the clinic. With optical techniques, subcellular resolution is achievable and although the eye provides optical access to the retinal neurons, the size of the eyes pupil currently prevents subcellular resolution in all optical imaging techniques of the living retina. In this project, I will develop a

novel tomographic microscopy technique and use it to demonstrate at least a 4-times better resolution for retinal tomography compared to the state-of-the-art. For the first time, a resolution below 1 m will be achieved for imaging of the living human retina. For this, I will use innovative structured illumination and reconstruction techniques that project coherent light through the sclera (transscleral) or the skull (transcranial), allowing for unprecedented resolution in 3-D retinal tomography. My method will use interferometric detection with noiseless amplification and exploit recent computational methods to reconstruct and correct the data.

In addition to morphology, my technique will also assess the functional state and activity of neurons after optical stimulation of the photoreceptors. For this, I will harness changes in phase and speckles of the image data caused by physiological processes. This imaging will be non-invasive and without contrast agents.

With this technology, I want to enable researchers and clinicians to study the detailed structure and function of individual neurons and their interactions in the living human eye with microscopic 3-D tomography. This revolutionary approach may provide new insights into human physiology and aid in the diagnosis and treatment of ophthalmic and neurological conditions.

With a strong background in high-performance computational imaging methods, their application to retinal imaging, and experience in both industry and academia, I am uniquely qualified for this groundbreaking research.

Fields of science (EuroSciVoc)

natural sciences > physical sciences > optics > **microscopy**

medical and health sciences > clinical medicine > **ophthalmology**

medical and health sciences > basic medicine > **physiology**

Keywords

Optical Imaging | Retina Imaging | Optical Coherence Tomography | Microscopy | Structured Illumination | Neurology | Ophthalmology

Programme(s)

HORIZON.1.1 - European Research Council (ERC) MAIN PROGRAMME

Topic(s)

ERC-2024-COG - ERC CONSOLIDATOR GRANTS

Call for proposal

ERC-2024-COG

See other projects for this call

Funding Scheme

HORIZON-ERC - HORIZON ERC Grants

Host institution

STICHTING VU

Net EU contribution

€ 1 999 998,00

Total cost

€ 1 999 998,00

Address

DE BOELELAAN 1105
1081 HV Amsterdam
Netherlands

Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

Beneficiaries (1)

STICHTING VU

Netherlands

Net EU contribution

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