MOON
Light for a better quality of life

Multimodal Optical Diagnosis of Ocular and Neurodegenerative Disease
Demographic Change:

More people aged above 65 will have to be supported by fewer working age people. As global healthcare expenditures are also expected to grow disproportionately, this means that working age people will have to bear significantly higher financial burdens. Photonic technologies can help absorb some of these burdens, offering a potential 20% cost reduction.*

*Photonics21 Strategic Research Agenda Lighting the way ahead, Cited from the Multiannual Strategic Roadmap 2014-2020; European Technology Platform Photonics21
Demographic development and medical care

A global emerging conflict that is already visible

The demographic development of an aging society has a double impact on medical care:
• The number of patients increases due to the prevalence of age-related diseases
• The number of medical professionals decreases with a particular effect on specialists

Europe 2025

High prevalence of typical age-related diseases

Age-group of medical specialists

Europe 2050
MOON target

Provide an easy accessible, non-invasive platform for screening age-related diseases through the eye

- Neurodegenerative Diseases
  - Target Alzheimer’s Disease

- Ophthalmic Diseases
  - Target Age-related Macula Degeneration

Brain diseases affect retina
Ophthalmic care is a relevant part of this health care challenge

Ophthalmic care has a large fraction of age-related diseases that often lead to severe vision impairment → increasing demand

WHO: “Health systems face unprecedented challenges in meeting the current and projected demands of eye care needs.”

„In Germany alone visual impairment and blindness cause annual costs of at least €49.6 billion from a societal perspective“

Dementia is now the 7th leading cause of mortality globally and, as we know from previous World Alzheimer Reports, one of those with the highest cost to society. There is a perfect storm gathering on the horizon and governments all over the world should get to grips with it.

Governments globally must urgently start to measure and record diagnosis more accurately. **Accurate measurement of diagnosis rates is the key to treatment, care and support, to healthcare system preparedness, and to challenging stigma.**

Healthcare systems must invest in, and improve, diagnostic capabilities, moving towards precision diagnosis, to **eradicate high levels of misdiagnosis.**

- 55 million people living with dementia
- Forecasts reaching 78 million by 2030
- Less than 25% globally diagnosed, in lower income countries 10%.
MOON – Consortium

**Academic Partner**

Medical University of Vienna, Vienna, Austria
Leibniz Institute of Photonic Technology, Jena, Germany
Netherlands Organisation for Applied Scientific Research TNO, Den Haag, Netherlands

**Industry Partner**

Carl Zeiss AG, Oberkochen, Germany
Innolume GmbH, Dortmund, Germany
Horiba Jobin-Yvon, S.A.S., Longjumeau, France
MOON – Value Chain
MOON — Technology

Multimodal OCT and Raman spectroscopy platform (MOON 2)

Ultra-Wide-field MHz OCT and OCT Angiography platform (MOON 1)
MOON — Technology

Multimodal OCT and Raman spectroscopy platform (MOON 2)

all partners contributed
MOON — Clinical translation

Several Clinical Studies for Validation of MOON technology have been initiated

MOON 1

• Study on several eye diseases including AMD, diabetic retinopathy, vessel occlusion has been completed
• New study including 250 diabetes patients is ongoing
  • supported by Prof. Andreas Pollreisz (MD) General Hospital Vienna, Eye Clinics

MOON 2

• Ongoing study on AMD patients at different stages (same clinical collaborator as for MOON 1)
• Ongoing study on Alzheimer’s compared to mild cognitive impairment patients
  • Prof. Gerhard Garhöfer (MD), assoc. Prof. Doreen Schmidl (MD), Dep. for Clinical Pharmacology, MUW
  • Prof. Elisabeth Stögmann (MD), Dept. Neurology, MUW
  • Prof. Rupert Lanzenberger (MD), Dept. Psychiatry and Psychotherapy, MUW
  • Prof. Tatjana Traub-Weidinger (MD), Dept. Nuclear Medicine
Several Clinical Studies for Validation of MOON technology have been initiated

MOON 1
• Total of 120 patients or 240 eyes measured so far

MOON 2
• Total of 35 patients / 70 eyes / > 600 Raman spectra already measured so far
MOON – Achievements

- World-wide first clinical grade Ultra-Wide field OCT and OCTA operating at MHz A-scan rate substantially extends the options for ophthalmic diagnostics
- World-wide first documented non-resonant Raman spectra recorded from human retina in-vivo
- Demonstration of validity of Raman spectroscopy fingerprints to distinguish between retinas of wildtype and Alzheimer’s mouse models
- Clinical grade multimodal imaging platform combing OCT, Raman spectroscopy and IR fundus imaging in a single device for structural, molecular, and functional imaging
- Development of platform independent multimodal retina phantom - reference for OCT and fundus imaging benchmarking and for quality control
- Akinetic laser technology for phase stable OCT operation and flexible speed setting

• MOON has opened the door to a fully non-invasive and molecularly sensitive diagnosis through the eye as basis for early diagnosis as well as personalized treatment.

• Studies are already in preparation as well as ongoing to cover other neurodegenerative diseases (Parkinson’s, Multiple Sclerosis,… ) and ophthalmic diseases (glaucoma, diabetic retinopathy,...) than Alzheimer’s and AMD respectively.

• New OCT generation developed in MOON set to change diagnostics in ophthalmology is on route-to-market

Outlook  Light for a better quality of life