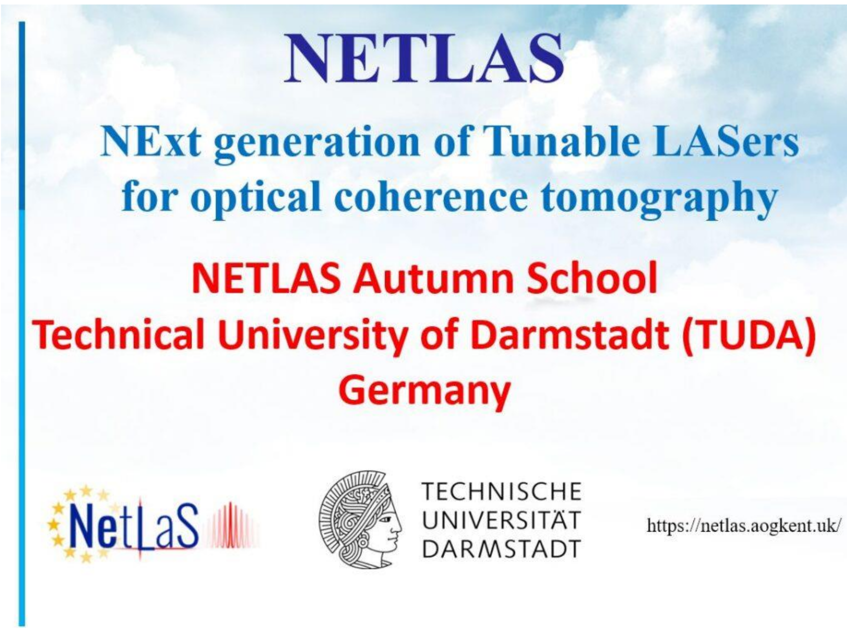
NETLAS NEWSLETTER 4-2022

Autumn School, Technical University of Darmstadt (TUDA)



NETLAS Autumn School is scheduled to take place at Technical University of Darmstadt (TUDA), Germany,

04-07 October 2022

Organizers are preparing the event and more details will follow soon.

SECONDMENTS

PhD7: Irene Rodriguez Lamoso

Host: **Technical University of Darmstadt** (TUDa)

Secondment started 1st of April 2022 at University of Kent, **Applied Optics Group (AOG)** for four months

PhD Project: Large tuning range lasers based on FP-MEMS and MEMS-VCSEL for OCT applications

My project consists in developing MEMS-VCSEL and FP-MEMS in order to obtain a high tuneable swept source for OCT. Both VCSEL-MEMS and FP-MEMS have very interesting characteristics that matches the requirements for SS-OCT. However, both technologies share the same disadvantage that is the lack of power. For this reason, my devices require some kind of amplification for being able to produce OCT images. Our colleague Alejandro Martinez Jimerez's setup has the same need in power with my setup. Due to this issue and a technical problem of the PECVD machine of TU-Darmstadt (main equipment required to produce the MEMS) we decided to develop a simple EDFA that covers our requirements.

Now I am currently in Kent, and in the next months we want to combine the EDFA with Alejandro's system and produce OCT imaging. Our next objective is to use the MEMS-VCSEL from TU-Darmstadt into and OCT system combined with Kent's equipment in order to characterise these devices and produce OCT imaging, where the EDFA will be also included.
What I expect to obtain from this secondment is knowledge of how to practically perform OCT imaging, acquire new data from my devices in order to see their drawbacks and to optimize them, and to publish our results.

Good luck Irene!!

PhD4: Esteban Andres Proano Grijalva

Host: **Technical University of Denmark** (DTU)

Secondment started on 1st of April 2022 at University of Kent, **Applied Optics Group (AOG)** for three months

PhD project: Electrically pumped MEMS VCSEL

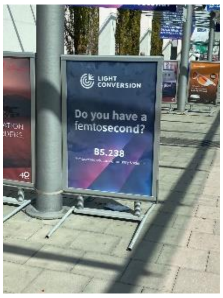
The principal activities would be:

- Characterization of the sensitivity and SNR decay with speed of the MEMS VCSELs from OCTLight. These sources work at a central wavelength of 1060nm and have swept rates of up to 1.7MHz bidirectional.
- Implementation of the MEMS VCSELs in an OCT system.
- Comparison of the phase stability of different sources for OCT.
- Evaluation of the noise sources.

Good luck Esteban!!

LASER World of PHOTONICS 2022

26 -29 April 2022 – Munich, Germany






The LASER World of PHOTONICS 2022 took place in person in Munich from April 26th to April 29th. All companies and industries related to lasers, imaging, optical measurement systems, biophotonics etc. gathered in 6 Halls to present their latest innovations and products available on the market. This year, the World of Quantum was also represented in an entire hall, providing a new insight into future technologies and quantum computers.
More than 900 exhibitors were presents over the 4 days, OCTLight, Optores, Superlum, Innolume, NKT Photonics, to name just a few. The most instructive part was the talks of different companies and academia experts. Few of NETLAS supervisors were also invited to present their work, e.g. Prof. Dr. Robert Huber presented "AI and VR in Megahertz OCT" and Prof. Dr. Kresten Yvind talked about "MEMS VCSELs for OCT".
It was a great opportunity for me and my colleague PhD Student Asim Bashir to visit all our partners from NETLAS and some other big players in the industry, to discuss our project with them and to get some ideas for improvement. We had the chance to expand our scope of interest by discovering new technologies and new companies. Events like this fair are conducive for networking and sales but are limited in terms of research. Nevertheless, it is very interesting to attend at least once, and I recommend it.
On top of all this, I was personally happy to discover the city of my first secondment. A cosmopolitan and safe city, with many parks popular for running, bicycling, or simply hanging out with friends and family. Munich seems to be a city full of opportunities and very lively.

PhD Student Marie Klufts, **Host:** University of Lübeck, Germany

NETWORK EVENTS

Applied Optics Group Seminars on Friday 22nd April 2022

Presentation title: Spectroscopic Optical Coherence Tomography by **Rasmus Eilkær Hansen** from Technical University of Denmark (DTU)

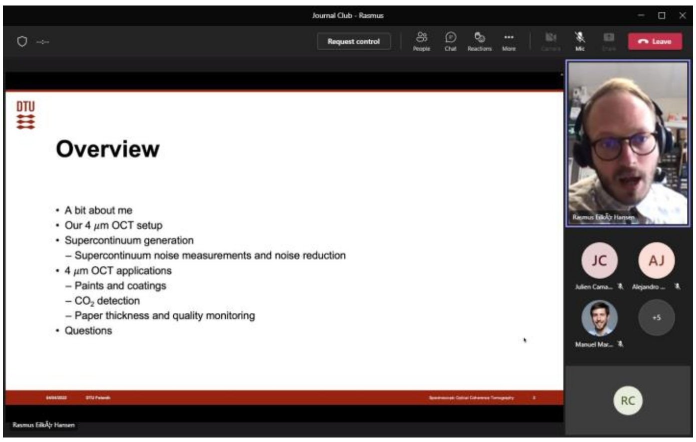
Summary:

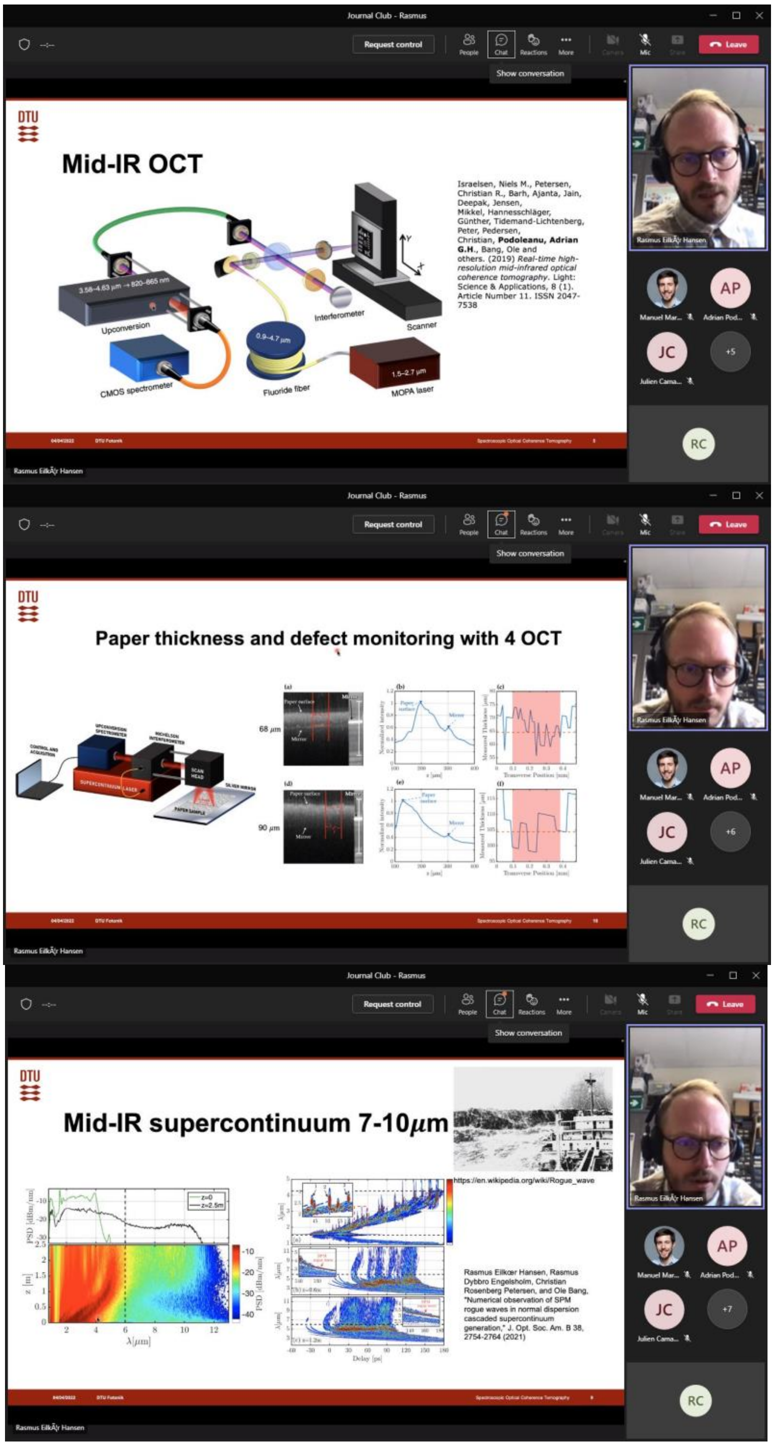
The title of the presentation is the project title of Rasmus' PhD project. The talk concerned the research Rasmus has done so far in his two years at the Technical University of Denmark (DTU). The presentation covered the 4 µm OCT system in the Fiber Sensors and Supercontinuum group at DTU, including the supercontinuum laser source used, and frequency up-conversion which allows using silicon detectors.

A big drawback of most supercontinuum-based OCT systems is the high pulse-to-pulse fluctuations, which reduce the sensitivity of the OCT system. Rasmus discussed the spectral dynamics in supercontinuum generation, and a novel way of reducing the noise when creating a cascaded supercontinuum.

Finally, a few applications of mid-IR OCT were shown, including CO_2 detection (in fact, the only example of spectroscopic OCT in the talk), and paper thickness and quality monitoring.

A few screen-prints from the online Teams presentation are displayed below.

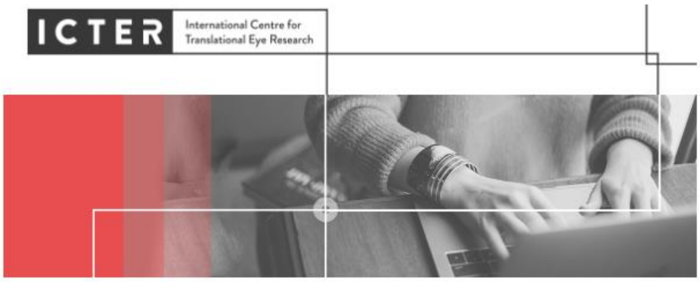




Screen-prints from the online Teams presentation
by **Rasmus Eilkær Hansen** from Technical University of Denmark (DTU)

NETLAS Coordinator Prof. Adrian Podoleanu was invited to deliver a talk for the weekly International Centre for Translational Eye Research (ICTER) Seminar Series

May 5th, 2022, 16:30 CET (15:30 UK time)



International Centre for Translational Eye Research & the Department of Physical Chemistry of Biological

ABSTRACT

The lecture will review technical perspectives of recent developments in optical sources, scanning, tracking and signal processing that with further refinements can be translated to better imaging relevant to ophthalmology, optometry and biosciences. The modern OCT technology for ophthalmology and optometry relies on spectral (Fourier)-domain OCT. I will introduce an OCT method that radically changes the operation of such technology, where the Fourier transform or equivalent is replaced by multiple electrical processors for each optical path difference (OPD) in the sample investigated. I will refer to the opportunities to parallel processing opened by this procedure enabled by the availability of ultra high sped tunable lasers for OCT. I will show how progress in OCTA and tracking for imaging the eye are applied to some specific microscopy applications in biosciences. To the end, I will present our research on two technologies for ultra fast tuning lasers for faster acquisition of OCT data.

https://zoom.us/webinar/register/WN_tMJDjjYMQpWi4v2avDQw5Q.

NETLAS PhD Students recommendations to their peers

Alejandro Martinez from Kent University

The importance of reading thesis apart from papers

We have to understand that papers are the joint report of good results of a specific configuration made by a group of specialists, in conclusion, a high specialized report. That's is excellent and is what enlarges the frontier of knowledge. However, from the point of view of someone that needs to learn the basics and the different approaches to a problem, a paper could be hard to start on. For that reason, the thesis is the leading book to have a broad view of the field, at least the first chapters of the thesis. I have a couple of examples that describe my words in my case.

Figure 1 Picture of George Dobre's thesis

First of all, an introduction for OCT could be the first chapters of the thesis from AOG members such as Manuel ("Spectrometer-based Optical Coherence Tomography Systems with Extended Functionality" M.J. Marques [link]), George Dobre, etc. They all have at least one or even two chapters talking about the principal, and sometimes you can find some outlook and trends.

Another example more related to lasers is the case of "Dissipative Dynamics in Advanced Mode-Locked Fibre Laser Designs" A. Runge 2015 [link]. I had instabilities on the laser I was building during a few months, so I decided to tackle the problem in several ways. The easiest way is to do nothing and evaluate the influence of the instabilities on the OCT. The second way, do some research to find out if this is a known problem. To do that, I had to look back on papers from the topic, and I couldn't understand what was going on, so I went to the mentioned thesis, and my surprise, it described the different scenarios that included instabilities. I watched these specific scenarios in several papers a while ago, but I couldn't make the connection to have the global view. Of course, this wasn't the end, but it gave me the direction to move on. In conclusion, a thesis is an excellent opportunity to zoom out and build your knowledge from the basis.

PUBLICATIONS

Ultra-high-accuracy chromatic dispersion measurement in optical fibers

M. Klufts, S. Lotz, **M. Bashir,** S. Karpf, **R. Huber**

Proc. SPIE 11997, Optical Components and Materials XIX, 119970L

(4 March 2022); https://doi.org/10.1117/12.2608773

Abstract

The chromatic dispersion in optical fibers is a key property for applications where a broadband light source is used and the timing of each individual wavelength is crucial. Counteracting the timing offset introduced by the fiber is a challenge in many applications especially in mode locked lasers. The dispersion parameters need to be measured with high precision. The length of the fiber, the temperature, and the used wavelength will highly impact the amount of dispersion and the accuracy of the measurement. We developed an ultra-high-accuracy dispersion measurement setup at 1080 ± 50 nm considering all the parameters that may influence the measurement. It is based on a home-built wavelength tunable laser where the output is modulated by an electro-optical modulator connected to a 24 GSamples/s arbitrary waveform generator to a complex pattern consisting of pulses and a 4 GHz sine wave. Read More

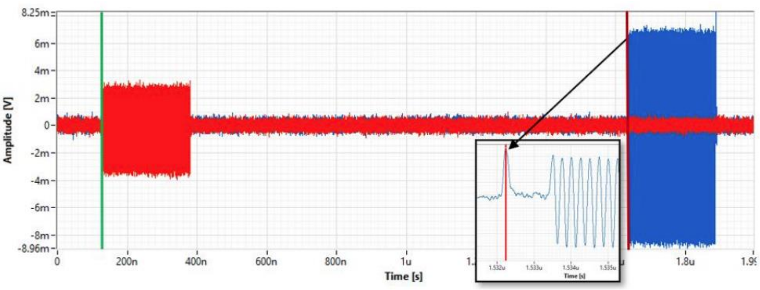


Figure 2. Acquired data after low pass filtering, 10 times interpolation, and mean subtraction at 27°C with 307 m of Hi1060 fiber at 1094.78 nm. The red and blue datasets represent respectively the reference (red) and the sample path (blue). The green and dark red markers are placed at the beginning of each signal, on the first pulse, as shown in the bottom right zoomed area

Thermal behavior and management of membrane external-cavity surface-emitting lasers (MECSELs)

Hoy-My Phung, **Philipp Tatar-Mathes,** Aaron Rogers, Patrik Rajala, Sanna Ranta, **Hermann Kahle, Mircea Guina**

Proc. SPIE 11984, Vertical External Cavity Surface Emitting Lasers (VECSELs) XI, 1198402 (4 March 2022);
https://doi.org/10.1117/12.2610644

Abstract

Thermal simulations based on the finite-element method provide an estimation of what the heat management in membrane external-cavity surface-emitting lasers (MECSELs) is capable of: When considering diamond and SiC heat spreaders, double-side cooling (DSC) leads to gain membrane temperatures that are about a factor two lower than with single-side cooling (SSC). For the thermally worse conductive sapphire, the temperature benefit from DSC can be up to four times lower than with SSC. Diamonds as heat spreaders are recommended over SiC if the power for pumping the gain membrane is three times larger, for instance at 30W at a pump beam diameter of 180 µm. Sapphire can be favored over SiC if the pump power is about five times lower, for instance at 2W. Due to the limited lateral heat flow activity of sapphire, a smaller pump beam diameter of 90 µm is suggested. A super-Gaussian pump beam can be used instead of a Gaussian pump beam to lower the gain membrane maximum temperature by a factor of three. Double-side pumping becomes significantly more important as soon as the gain membrane gets thicker than 1 µm.

Design and characterization of MECSELs for widely tunable (>25 THz) continuous wave operation

Patrik Rajala, **Philipp Tatar-Mathes,** Hoy-My Phung, Jesse Koskinen, Sanna Ranta, **Mircea Guina, Hermann Kahle**

Proceedings Volume 11984, Vertical External Cavity Surface Emitting Lasers (VECSELs) XI; 1198404 (2022)
https://doi.org/10.1117/12.2610649

Abstract

Membrane external-cavity surface-emitting lasers (MECSELs) are vertically emitting semiconductor lasers that combine all the benefits of VECSELs (vertical-external-cavity surface-emitting lasers) with the new degree of freedom in creating gain structures without monolithically integrated distributed Bragg reflectors (DBRs). The absence of the DBR and the substrate, and the use of a very thin gain membrane (typically some hundreds of nanometers), which can be sandwiched between two transparent heat spreaders, represents the best solution for heat removal. The membrane configuration also allows the option of double side pumping, which in turn makes it possible to utilize an extensive amount of quantum well (QW) groups as well as multiple kinds of QWs in a periodic laser gain structure. Read More

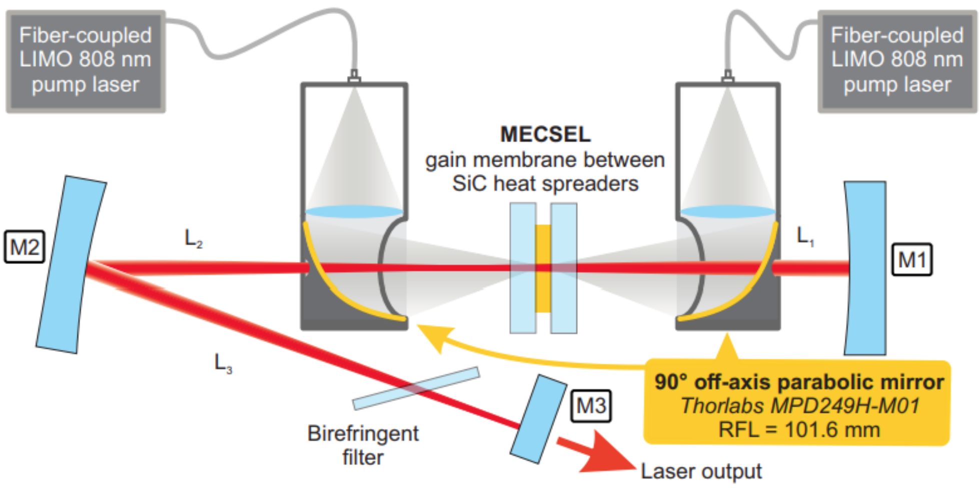


Figure 4. Experimental setup of the MECSEL employing the broadband gain structure and a V-cavity. By using 90◦ offaxis parabolic mirrors with a high-reflection protected gold coating, the pump beam is focused down to a nearly circular pump spot onto the laser-active membrane as illustrated

[Bandgap energy model for GaInNAsSb/GaAs alloys with high N content and strain influence]

Riku Isoaho, Arto Aho, Antti Tukiainen, Turkka Salminen, and **Mircea Guina**

Published in Journal of Crystal Growth
Volume 584, 15 April 2022, 126574
10.1016/j.jcrysgro.2022.126574

Abstract

Bandgap energy of dilute nitride GaInNAsSb/GaAs alloys with N compositions as high as 8% are estimated using a method based on band anti-crossing model used for GaNAs/GaNSb/InNAs/InNSb ternary compounds. The parametrization of the model is defined by fitting with experimental composition and bandgap energy values employing a differential evolution algorithm. The effects of lattice strain on the bandgap energy are taken into account by the model resulting in an accurate prediction of the bandgap energy with an average deviation of only 12 meV compared to the experimental data. The model provides a useful tool for accurate determination of bandgap energies of dilute nitrides, including narrow bandgap, i.e. ~0.7 eV GaInNAsSb alloys, which are becoming increasingly relevant in the development of high-efficiency lattice-matched multijunction solar cells.

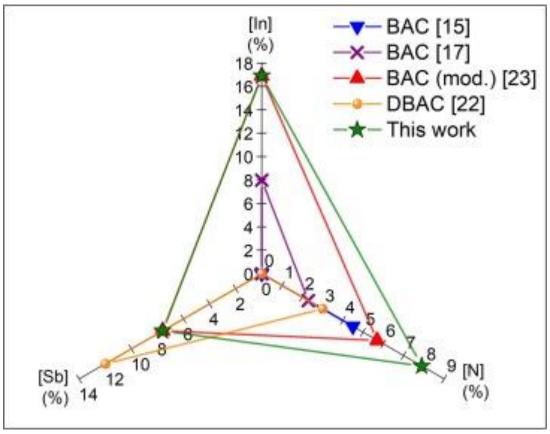


Fig. 1. Comparison of experimental composition ranges used for BAC-modelling of GaNAs, GaInNAs, GaInNAsSb and GaNAsSb reported in literature [15], [17], [22], [23] along with the composition range reported in this work.

Towards ultra-large area vascular contrast skin imaging using multi-MHz-OCT

Madita Göb, Sazgar Burhan, Simon Lotz, Robert Huber

Proc. SPIE 11948, Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XXVI, 1194807 (7 March 2022);

https://doi.org/10.1117/12.2612171

Abstract

We demonstrate ultra-large field of view OCT scanning using standard optics, a X-Y-galvanometer scanner and a synchronously driven motorized XYZ-positioning stage. The integration of a movable stage into our self-built 3.3 MHz- OCT system allows acquiring coherent ultra-large area images, fully leveraging the high speed potential of our system. For fast OCT-angiography, one galvanometer axis scanner is driven in a repetitive sawtooth pattern, fully synchronized to the movement of the linear stage, to obtain multiple measurements at each position. This technique requires exact synchronization, precise repositioning, and uniform movements with low tolerances to ensure a minimum revisitation error. We analyze error and performance of our setup and demonstrate angiographic imaging.

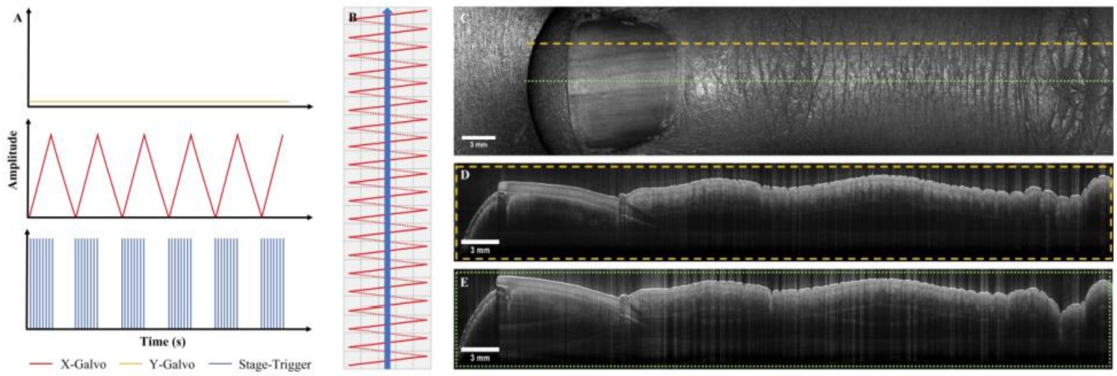


Figure 2 Interoperation mode with movable stage as slow scanning axis. (A) Waveform and trigger signals for the scanning optics and stage and (B) the resulting scan pattern direction (blue arrow indicates continuous stage movement). (C) En face projection of the monolithic large area OCT scan. (D-E) Rotated B-Scans at the color-coded positions with 10x B-scan averaging.

[Ultrafast carrier dynamics in terahertz photoconductors and photomixers: beyond short-carrier-lifetime semiconductors]

Ping-Keng Lu ORCID, Anuar de Jesus Fernandez Olvera ORCID, Deniz Turan, Tom Sebastian Seifert, Nezih Tolga Yardimci, Tobias Kampfrath, **Sascha Preu** and Mona Jarrahi

Published in Nanophotonics, vol. , no. , 2022.
https://doi.org/10.1515/nanoph-2021-0785

Abstract

Efficient terahertz generation and detection are a key prerequisite for high performance terahertz systems. Major advancements in realizing efficient terahertz emitters and detectors were enabled through photonics-driven semiconductor devices, thanks to the extremely wide bandwidth available at optical frequencies. Through the efficient generation and ultrafast transport of charge carriers within a photo-absorbing semiconductor material, terahertz frequency components are created from the mixing products of the optical frequency components that drive the terahertz device – a process usually referred to as photomixing. [Read More]

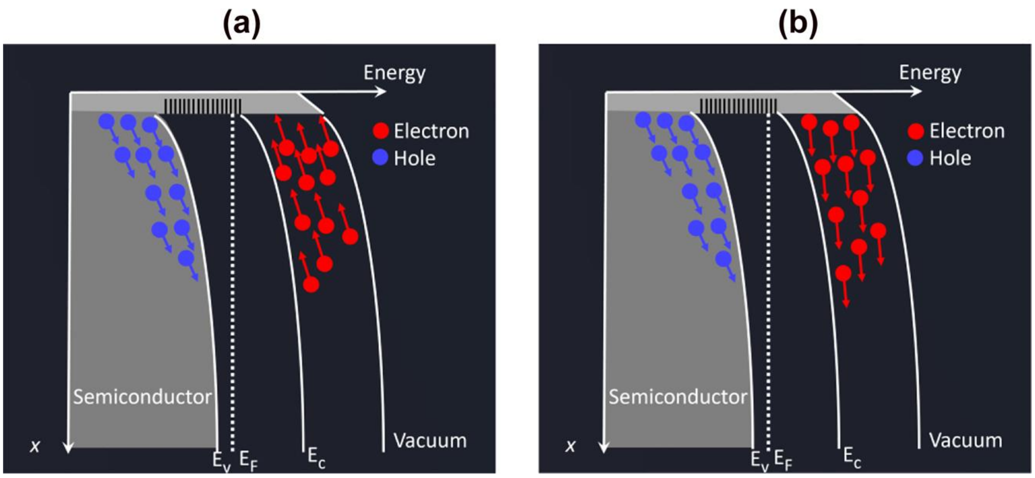


Figure 10: The band structure of a p-type semiconductor surface emitter utilizing (a) the built-in electric field induced near the semiconductor surface and (b) photo-Dember effect.

[AlzEye: longitudinal record-level linkage of ophthalmic imaging and hospital admissions of 353 157 patients in London, UK]

Wagner SK, Hughes F, Cortina-Borja M, Nikolas Pontikos, Robbert Struyven, Xiaoxuan Liu, Hugh Montgomery, Daniel C Alexander, Eric Topol, Steffen Erhard Petersen, Jack Hindley, Axel Petzold, Jugnoo S Rahi, Alastair K Denniston and **Pearse A Keane**

BMJ Open 2022; vol **12, issue 3,** e058552.
doi: 10.1136/bmjopen-2021-058552

Abstract

Purpose Retinal signatures of systemic disease ('oculomics') are increasingly being revealed through a combination of high-resolution ophthalmic imaging and sophisticated modelling strategies. Progress is currently limited not mainly by technical issues, but by the lack of large labelled datasets, a sine qua non for deep learning. Read More

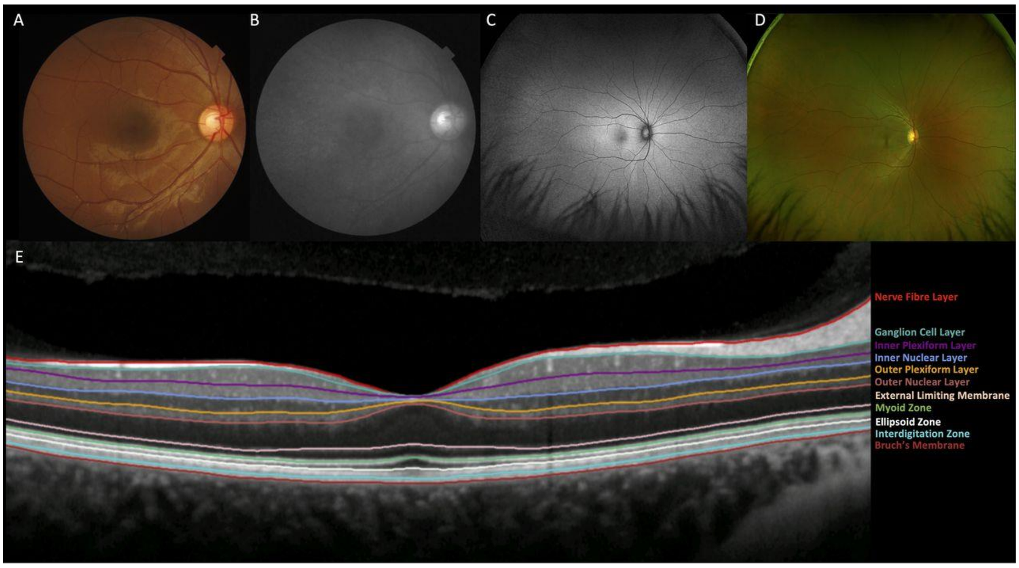


Figure 2: Composite figure showing the major retinal imaging modalities within AlzEye. (A) Colour fundus photograph, (B) red-free photograph, (C) fundus autofluorescence (widefield), (D) pseudocolour photography (widefield) and (E) optical coherence tomography of the central macula illustrating segmentation of the individual sublayers. Consensus nomenclature for the retinal sublayers is indicated.

NETLAS Associated Partner Pearse Keane

Consultant Ophthalmologist and Associate Professor, Moorfields Eye Hospital, London

Biography

Pearse Keane is a consultant ophthalmologist at Moorfields Eye Hospital, London and an associate professor at UCL Institute of Ophthalmology. He is originally from Ireland and received his medical degree from University College Dublin (UCD), graduating in 2002. In 2016, he initiated a formal collaboration between Moorfields Eye Hospital and Google DeepMind, with the aim of developing artificial intelligence (AI) algorithms for the earlier detection and treatment of retinal disease.

In October 2019, he was included on the Evening Standard Progress1000 list of **most influential Londoners**. In 2020, he was listed on the "The Power List" by The Ophthalmologist magazine; **a ranking of the Top 100 most influential people in the world of ophthalmology.**

Pearse leads a clinical research group at UCL and Moorfields which focuses on the development, evaluation, and implementation of artificial intelligence in healthcare, using ophthalmology as an exemplar. You can learn more about Pearse and his work here https://raais.co/speakers-2020-pearse... and you can watch his presentation from the Research and Applied AI Summit 2020, summit which brings together entrepreneurs and researchers who accelerate the science and applications of Artificial Intelligence technology for the common good [here.]()

[Predicting Visual Fields From Optical Coherence Tomography via an Ensemble of Deep Representation Learners](https://doi.org/10.1016/j.ajo.2021.12.020)

Georgios Lazaridis, Giovanni Montesano, Saman Sadeghi Afgeh, Jibran Mohamed-Noriega, Sebastien Ourselin, Marco Lorenzi,
David F. Garway-Heath

American Journal of Ophthalmology, Volume 238, 2022, Pages 52-65, ISSN 0002-9394,

https://doi.org/10.1016/j.ajo.2021.12.020

PURPOSE
To develop and validate a deep learning method of predicting visual function from spectral domain optical coherence tomography (SD-OCT)–derived retinal nerve fiber layer thickness (RNFLT) measurements and corresponding SD-OCT images.

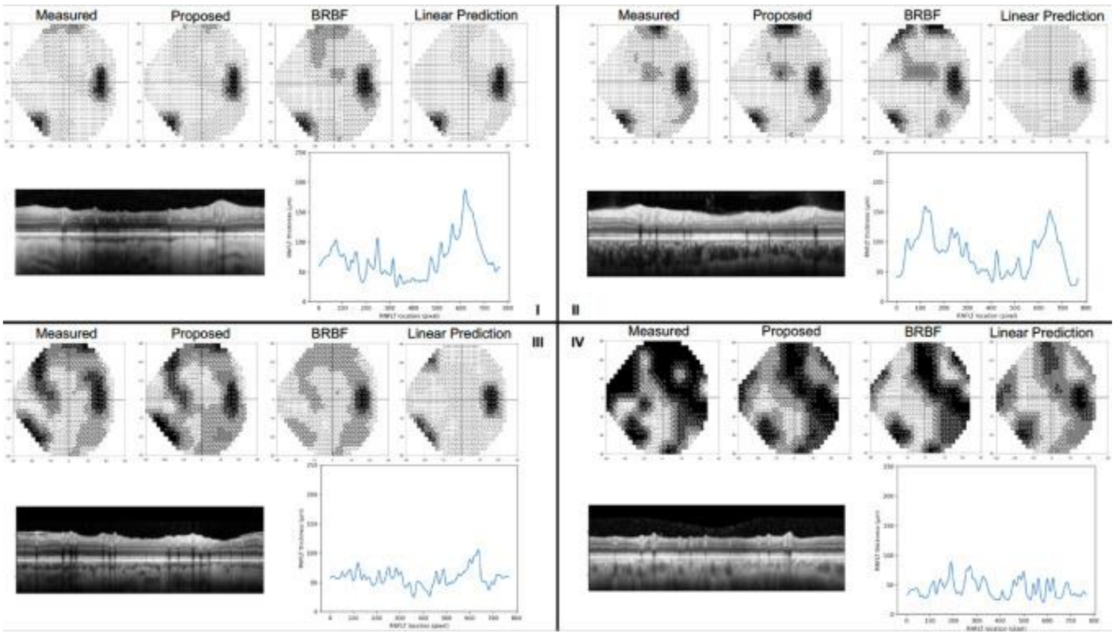


Figure 5. Model predictions for 4 cases from the RAPID data set. For each case (I-IV), the top row shows, from left to right, VF grayscales for the measured VF, the VFs predicted from the proposed ensemble method (model 2), the BRBF, and the classic linear regression, respectively. The row of graphics (below) shows the corresponding OCT image and 768-pixel segmentation RNFLT profile (blue line) used to predict the VFs. BRBF = Bayesian radial basis function, OCT = optical coherence tomography, RNFLT = retinal nerve fiber layer thickness, VF = visual field.

NETLAS Associated Partner
Professor David Garway-Heath,

Moorfields Eye Hospital, London

Biography

David F. Garway-Heath received the M.D. degree on structure/function correlations in glaucoma from the University of London, London, UK, in 2001. He studied medicine at St. Thomas' Hospital, University of London, London, U.K., and undertook his Residency in ophthalmology at Moorfields Eye Hospital, London. He is currently the Glaucoma UK Professor of Ophthalmology for Glaucoma and Allied Studies, Consultant Ophthalmologist at Moorfields Eye Hospital, and Visual Assessment and Imaging Theme Leader at the National Institute for Health Research (NIHR) Biomedical Research Centre for Ophthalmology, Moorfields Eye Hospital NHS Foundation Trust, and UCL Institute of Ophthalmology.

Prof Garway-Heath' current research interests include optic nerve and retinal imaging, psychophysics, tonometry, ocular biomechanics, and mitochondrial function as a risk factor for glaucoma.

Key experience:

- Principal investigator of the UK glaucoma treatment study, a landmark trial in glaucoma management and the first trial in glaucoma to be published in *The Lancet.*

- Inventor of the anatomical map (known as the 'Garway-Heath map') used worldwide in research in structure-function relationship in glaucoma and incorporated into clinical diagnostic tools.
- Inventor of the Moorfields regression Analysis algorithm for one of the earliest imaging diagnostic devices contributing to the worldwide use of imaging in the clinic.
- Theme leader for vision assessment and imaging at the National Institute for Health Research Biomedical Research Centre at Moorfields Eye Hospital and UCL Institute of Ophthalmology.
- Participates in long-term strategic planning for research at Moorfields Eye Hospital and the Institute of Ophthalmology.
- Workstream Lead for the combined new building for Moorfields Eye Hospital and Institute of Ophthalmology.
- Funding for research of more than £7 million over the last 5 years.
- Author of over 200 scientific research papers.

Read More about Other professional achievements

Research interests:

Key research: development and evaluation of techniques for effective diagnosis, monitoring and management of glaucoma; identification of risk factors for glaucoma progression, especially mitochondrial function; and decision-support systems for healthcare delivery services. Listen to David's interview with the American Glaucoma Association.

Health Awareness

News, information and personal stories

Better communication and education are needed for ENT

Dr Taran Tatla

Honorary Secretary, ENT UK,

NETLAS Associated Partner, Northwick Park Hospital, London, UK

ENT conditions are very common, covering everyone from newborns to the elderly. Symptoms are managed by healthcare professionals in community and specialist settings, but even more frequently by parents and patients themselves.

Seeking advice from a healthcare professional

Many sufferers will try home-made or over-the-counter remedies before contacting a professional. Some may have sound scientific basis, but others less so. Using cotton bud sticks to “clean” out ear wax, causing further hearing loss through wax impaction or ear infection, highlights a need for better public education.

Good ENT health starts with avoiding self-harm and balancing appropriate lifestyles, diet and actions. ENT symptoms are commonly caused by environmental and dietary allergens and other seemingly innocuous triggers impacting the sensitive organ linings. Read More

Patent

Method for monitoring time-dependent properties of light during scanning swept-source optical coherence tomography

United States Patent 11,262,185
Huber, et al. March 1, 2022

(12) United States Patent
Huber et al.

(10) Patent No.: US 11,262,185 B2
(45) Date of Patent: Mar. 1, 2022

(54) METHOD FOR MONITORING TIME-DEPENDENT PROPERTIES OF LIGHT DURING SCANNING SWEPT-SOURCE OPTICAL COHERENCE TOMOGRAPHY

(71) Applicant: **OPTORES GMBH**, Munich (DE)

(72) Inventors: **Robert Huber**, Lübeck (DE); **Wolfgang Draxinger**, Lübeck (DE); **Tom Pfeiffer**, Lübeck (DE)

(73) Assignee: **OPTORES GMBH**, Munich (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/260,643**

(22) PCT Filed: **Jul. 19, 2019**

(86) PCT No.: **PCT/EP2019/069473**
§ 371 (c)(1),
(2) Date: **Jan. 15, 2021**

(87) PCT Pub. No.: **WO2020/016399**
PCT Pub. Date: **Jan. 23, 2020**

(65) **Prior Publication Data**
US 2021/0247174 A1 Aug. 12, 2021

(30) **Foreign Application Priority Data**
Jul. 19, 2018 (DE) 102018212100.1

(51) **Int. Cl.**
G01B 9/02 (2006.01)
A61B 3/10 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G01B 9/02091*** (2013.01); ***A61B 3/10*** (2013.01); ***A61B 5/7203*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G01B 9/02091; G01B 9/02041; G01B 9/02083; G01B 9/02069; G01B 9/02004;
(Continued)

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(Continued)

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(Continued)

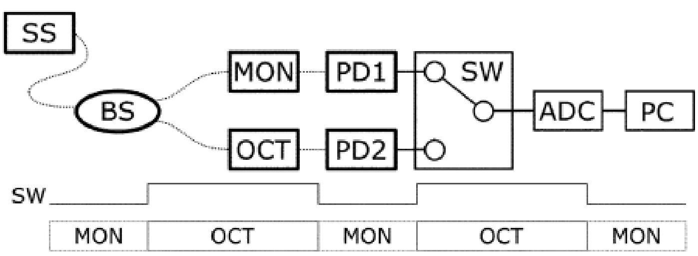
OTHER PUBLICATIONS

Kolb et al. "1060nm FDML laser with centimeter coherence length and 1.67 MHz sweep rate for full eye length and retinal ultra-widefield OCT," Proceedings of SPIE-OSA, Aug. 2017, vol. 10416, 104160J, 8 pages.
(Continued)

Primary Examiner — Dominic J Bologna
(74) *Attorney, Agent, or Firm* — Sheridan Ross P.C.

(57) **ABSTRACT**

A method comprises: splitting laser light into sample light, reference light, and monitor light; routing the reference light into a reference arm of an OCT interferometer; routing the monitor light into a monitor device, which generates at least one optical monitor signal representing at least one time-dependent property of the monitor light; generating at least one electric monitor signal from the at least one optical monitor signal; illuminating in a point-shaped manner a sample with sample light, wherein the illumination point is guided on the surface of the sample along a predetermined trajectory; superimposing the light scattered by the sample with the reference light emerging from the reference arm to
(Continued)



Abstract

A method comprises: splitting laser light into sample light, reference light, and monitor light; routing the reference light into a reference arm of an OCT interferometer; routing the monitor light into a monitor device, which generates at least one optical monitor signal representing at least one time-dependent property of the monitor light; generating at least one electric monitor signal from the at least one optical monitor signal; illuminating in a point-shaped manner a sample with sample light, wherein the illumination point is guided on the surface of the sample along a predetermined trajectory; superimposing the light scattered by the sample with the reference light emerging from the reference arm to generate an electric OCT signal; wherein the at least one electric monitor signal and the electric OCT signal are AD-converted in alternating sequence, in each case equidistantly in time, to form a single digital data stream.

Software Downloads

The Applied Optics Group (AOG), Kent University, develops advanced optical systems for imaging and sensing, with applications in medicine, science and industry. One of our core strengths is in optical coherence tomography for medical imaging, alongside research interests in adaptive optics, microscopy, endoscopy, photoacoustics and spectroscopy. The group also has expertise in high-speed microwave photonics and acousto-, electro- and magneto-optics.

Dr. Mike Hughes – Research

My lab develops high-resolution imaging technology for biomedical applications. We want to make microscopic imaging more accessible and practical in non-traditional settings such as point-of-care imaging. We aim to use computational imaging techniques to achieve performance similar to large and expensive bench-top microscopes, but in low-cost, small form-factor devices.

Some software developed in the lab is also available for download, or you can look at current projects on Github.

NKT Photonics divests its LIOS sensing division to Luna Innovations

NKT Photonics has divested its LIOS sensing business to the American company Luna Innovations Incorporated for a total consideration of EUR 20m. With the divestment NKT Photonics fully focuses on its core business within lasers and fibre optic solutions to the medical & life science, quantum and nano technology, industrial, and aerospace & defence markets. The divested activities comprise sales, development and production including the main site in Cologne, Germany, and the sales office in Portland, USA, and covers 66 employees. The divestment is effective as of March 10, 2022.

Luna Innovations Incorporated is a leader in optical technology, providing unique capabilities in high-performance, fibre optic-based, test products for the telecommunications industry and distributed fibre optic-based sensing for the aerospace and automotive industries. Read More

NetLaS

OCT News

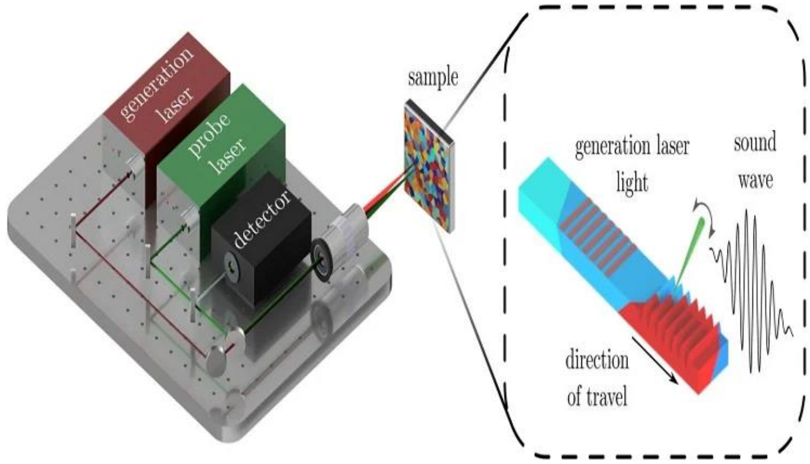
Optical Coherence Tomography News

European OCT Journal Club

Dear students and early career researchers interested in OCT. We would like to invite you to join the **European OCT Journal Club**. The club will be run monthly (the last Friday of the month, 12:30 – 1:30 pm GMT, via zoom). Each month a different person will lead the discussion on a paper of interest. Everyone will receive the paper for discussion a week in advance. The meetings will be informal, so please bring your lunch or coffee, if you like. The overall aims of the meetings are to discuss interesting research, build confidence in speaking about the science, and develop a vibrant community of collaborators and friends. Everyone is welcome.

Please email a.durrani@surrey.ac.uk if you like to join the meeting. The first meeting is planned for **April 29th.**

Best wishes
Abdullah Durrani
Gavrielle Untracht
Danuta Sampson



A new tool to measure material elasticity

The high-energy pulse of light from the laser creates a sound wave that travels along the surface of the material. Precisely measuring the speed of this wave allows the crystal orientation and elasticity to be measured Source: University of Nottingham

The elasticity of materials can now be measured at a microscopic scale by tracking the speed of sound across individual crystals. The spatially resolved acoustic spectroscopy (SRAS++) technique developed at the University of Nottingham, U.K., could be of value in the development of next-generation materials, with potential applications in aerospace engineering and medical implants.

SRAS++ uses high-frequency ultrasound to produce microscopic resolution images of the microstructure and maps the elasticity matrix, or the relationship between stresses and strains in the material. By precisely measuring the speed of sound across the surface of microscopic crystals that compose metal alloys and other materials, their orientation and the material elasticity can be revealed.

Along with the stiffness of the material, the elasticity matrix also provides insight into many important material properties that are hard to measure directly, such as how the material responds to changes in temperature. SRAS++ can provide a crucial tool for new material development as its rapid measurement of the elasticity matrix can guide the discovery of new materials with superior properties. Read More

Optics & Photonics News Magazine
April Issue

- From Lab to Clinic

- Marvelous MIRI

Browse all Issues

Finalists of CTO of the Year and Innovation Professor of the Year 2022 in Finland announced

The CTO Forum is a community for Chief Technology Officers and other technology leaders to learn from their peers and benchmark against the best practices in the field. The Finnish CTO Forum is implemented as a joint undertaking with key partners Business Finland, Technology Industries of Finland and Spinverse.

Since 2011, the CTO of the Year Award has been an annual recognition of the importance of Chief Technology officers to the future competitiveness of Finnish industries. The award has two categories: SMEs and Large enterprises. Moreover, for a second year in a row, there will be an award for the Innovation Professor of the Year. The award was set up to increase the recognition of collaboration between academia and companies.

The finalists for the Innovation Professor of the Year award are Jero Ahola of the LUT University Department of Electrical Engineering, **Mircea Guina of Tampere University, Faculty of Engineering and Natural Sciences** and Heli Skottman of Tampere University, Faculty of Medicine and Health Technology.

READ MORE ABOUT THE WINNERS

New flexible femtosecond laser from NKT Photonics

The aeroPULSE FS10 is NKT's new femtosecond fiber laser: it is flexible and can tune the pulse from 350 fs to 5 ps.

Easy to use

The user interface ensures easy-to-use and intuitive operation. And the compact laser head ensures easy integration in any OEM application allowing the controller to be placed away from the processing area for easy service access and optimum use of system real-estate.
NKT have designed the laser for applications such as:

- Ophthalmic surgery
- Photo-stimulation within optogenetics
- Laser scribing/cutting in fragile materials

In fact, it can be used for any application where excellent beam quality and pointing, high power stability, and reliable performance are key to success.

Meet us at LASER World of PHOTONICS

Curious? Meet us at LASER World of PHOTONICS 2022 in Munich. Come by booth B5.328 to see the systems and have a chat.
For more information about the systems, please contact NKT Sales Managers at sales@nktphotonics.com.

GET THE SPECIFICATIONS

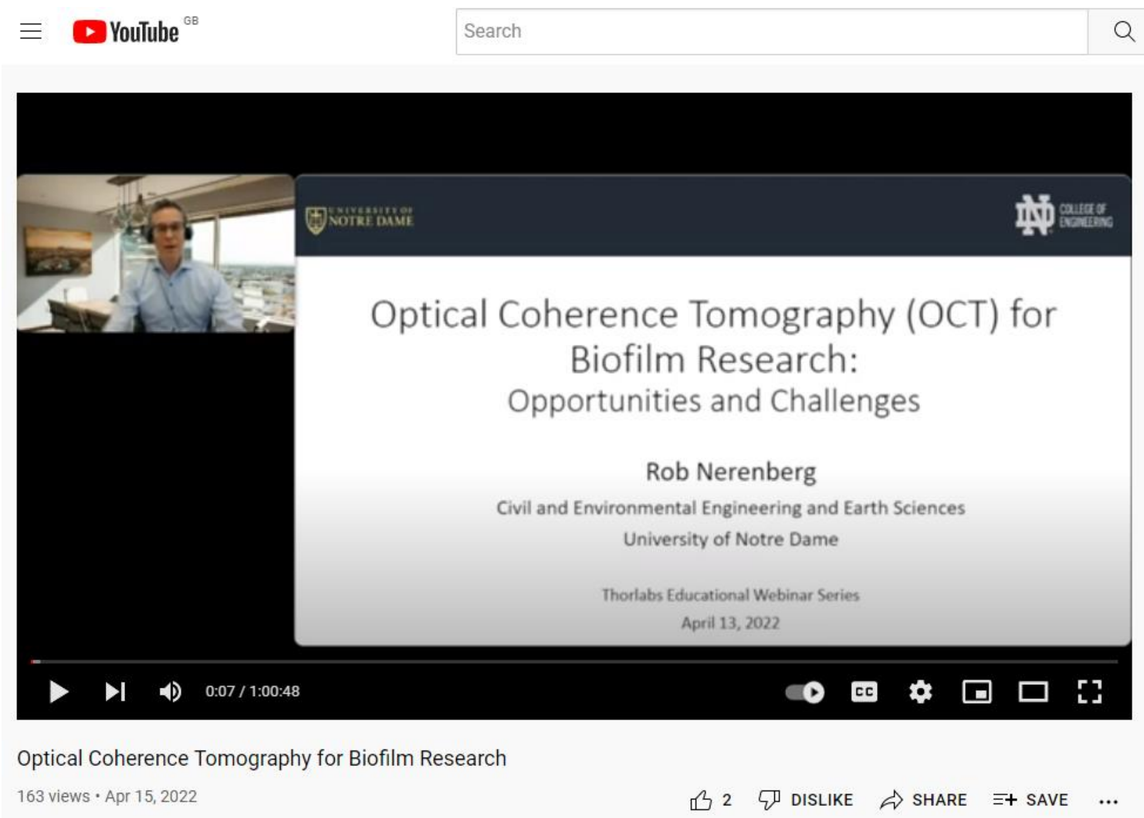
Webinars

We recommend our NETLAS PhD students to attend these upcoming webinars (part of the free Thorlabs webinar series). Thorlabs' Digital Webinars are covering a variety of topics, each with a dedicated live Q&A session, and have a common goal of providing educational, engaging, and valuable content.

NETLAS PhD Students recommendation to their peers

Sacha Grelet, Host: **NKT Photonics**

Thorlabs' webinar about OCT for biofilm research by Dr. Robert Nerenberg



Professor Adrian Podoleanu Career Celebration, Canterbury 26-27 May 2022

We're delighted to announce that an event will take place in Canterbury, UK, on Thursday 26 (afternoon) and Friday 27 May (all day), to celebrate our colleague Prof Adrian Podoleanu's career achievements to date.

http://cc22.aogkent.uk/

While we want to emphasize that Adrian is not about to retire any time soon, it will be nice to mark several decades for him at the University of Kent, driving forward the field of OCT.

Adrian is a pioneering researcher who helped advance greatly the field of Optical Coherence Tomography (OCT). The University of Kent has benefited for many years from Adrian's dedication and enthusiasm and the world-leading quality of his research and its application.

Beyond the opportunity to honour Adrian and his long successful career, this event will also allow the current research students to attend high-quality presentations, present their current work and network with a swathe of high-calibre researchers that this has already attracted.

Since 2005 Adrian has led the Applied Optics Group in the University of Kent (and continues to do so), developing OCT both as a methodology and with applications across a wide range of fields from clinical practice to forensic sciences. He has supervised (and continues to do so) more than 35 postgraduate and visiting researchers during his career at Kent, many of whom have gone on to lead in their fields.

Adrian's leadership in (and of) the community has been widely recognised through editorships, high profile lectures and awards including an ERC Advanced Grant and the order Coroana Romaniei (Order of the Crown), Royal House of Romania, 2017. He is member in the committee of 11 conferences, out of which chaired 6, Board member of 7 journals. He is one of the 8 elected Vice-Presidents of the International Commission of Optics, 2017-2020 and Chair of the Committee awarding IUPAP Young Scientist Prize in Optics, 2017 – 2020. Read More

To register please navigate to
https://kenthospitality.kent.ac.uk/Register/CC22Conference

NETWORK EVENTS

We invite all partners to communicate events and ideas to place in our newsletter

Please send any piece of news, on NETLAS activities or anything else happening that may be of interest to the NETLAS community, to Ramona Cernat: R.Cernat@kent.ac.uk and to Adrian Podoleanu: ap11@kent.ac.uk