NETLAS NEWSLETTER 8-2021

This newsletter marks the great achievement in terms of recruitment, we welcome the last but not the least ESR, Ifte, to NETLAS!

PhD2: Ifte Khairul Alam Bhuiyan

Host: Tampere University
Secondment: Superlum Diodes and University of Kent, Applied Optics Group (AOG)

PhD Project: New spectral range semiconductor emitters for OCT/spectroscopy

The doctoral research works will be focused on innovative solutions for developing novel semiconductor lasers for fast, narrow linewidth, stable phase and wide tuning bandwidth swept sources used in optical coherence tomography (OCT).

More concretely, the responsibilities include development of waveguide semiconductor gain diodes for laser sources at NIR and mid-IR wavelengths. The experimental work of the project will be primarily taken place in clean-room fabrication area, and it will also include testing and application developments in OCT systems in collaboration with NETLAS partners.

Previous education:

During my Bachelor Studies in Applied Physics at the University of Dhaka in Bangladesh, the final thesis in the field of Biomedical Physics had highly influenced me to choose a research career to be able to contribute for the society. Later on, joining the Master's program in Micro and Nano Systems at the Technische Universität Chemnitz (TUC) in Germany had opened an excellent opportunity to conduct an academic research project in Photonic Integration at the IFW Dresden. The project had shaped me well in a European culture and motivated me to explore the exciting research domain of Photonics. Further, my Master's Thesis, focused on the development of optical waveguide-based optogenetic probing technology, had trained me to reach a cross platform of optoelectronics and biophotonic technologies. The thesis work was performed with Professor Ulrich T. Schwarz at the Physics Institute in collaboration with OptoGenTech GmbH and ZFM Chemnitz.

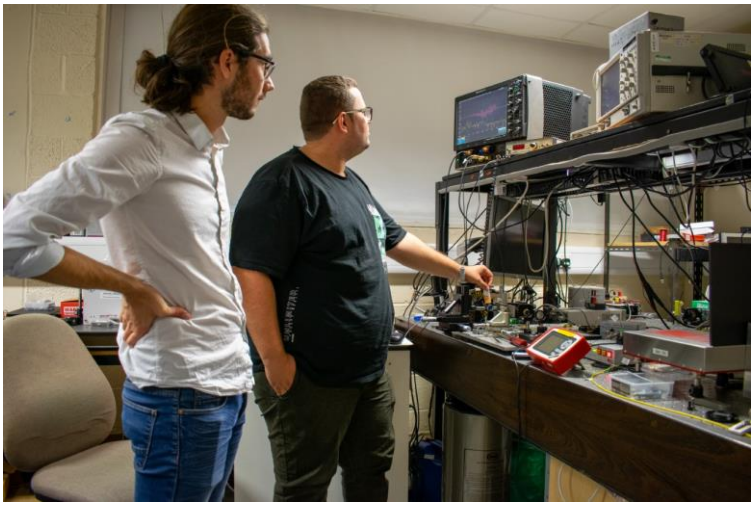
NETLAS PhD Student Sacha Grelet's experience during his secondment at Applied Optics Group (AOG), University of Kent, UK

'My PhD project is split between the laser company NKT Photonics in Denmark and the University of Kent in the United Kingdom. The plan is to first build an innovative laser in the Danish company's labs: a fast swept-source based on new supercontinuum technologies and time stretching. Then, we ship it to the Applied Optic Group (AOG) in the UK to test its potential for Optical Coherence Tomography (OCT).

After many months, the travel restrictions were lifted and I was able to travel overseas for two months to conduct the experiment. There, I collaborated with another PhD student from NETLAS, Alejandro Martinez-Jimenez. He welcomed me in the AOG and helped me to familiarize myself with the laboratory, the equipment, and the university administration (by far the most difficult).
Using the new light source, we managed to produce an OCT A-scan of tape samples at 80 MHz, a record speed at this wavelength. Using a very fast KTN scanner, we produced en-face images at 400 Hz, one image each 2.5 ms: fast enough to take 40 pictures of a single eye blink.

More than conducting one experiment, this trip was also the opportunity to meet PhD students from NETLAS, Rene Riha and Gopika Venugopal, and other PhD students, post-doctorates, and professors of the group. At their contact, I learned a lot about OCT, on the theory but mostly regarding the practicalities and the data processing. I was amazed by the quality and the variety of research that the group, small compared to other research facilities, can deliver.

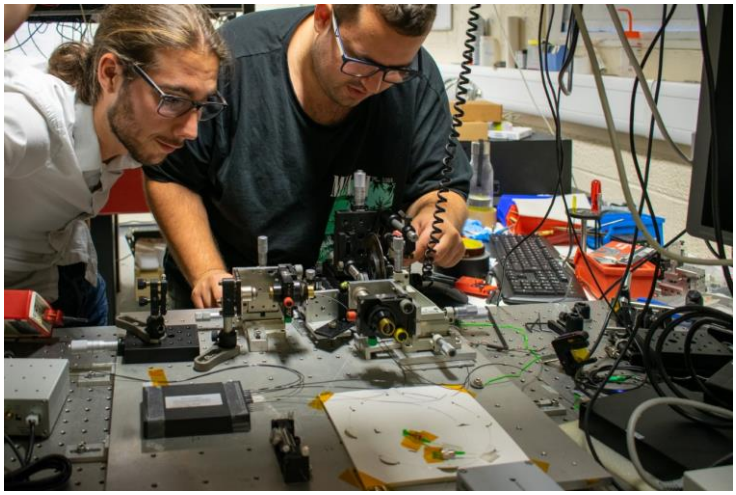
During my stay, I added the chance to discover the culture of the British who, like the Danes, nourish a deep love for historical heritage. From the majestic cathedral of Canterbury to the restoration of the Battle of Hastings, it was a lovely dive into history. I will also remember the friendly Irish community in Canterbury and their training sessions of the traditional Gaelic football.
Thank you to the whole AOG for welcoming me and I'm looking forward to returning there again '☺



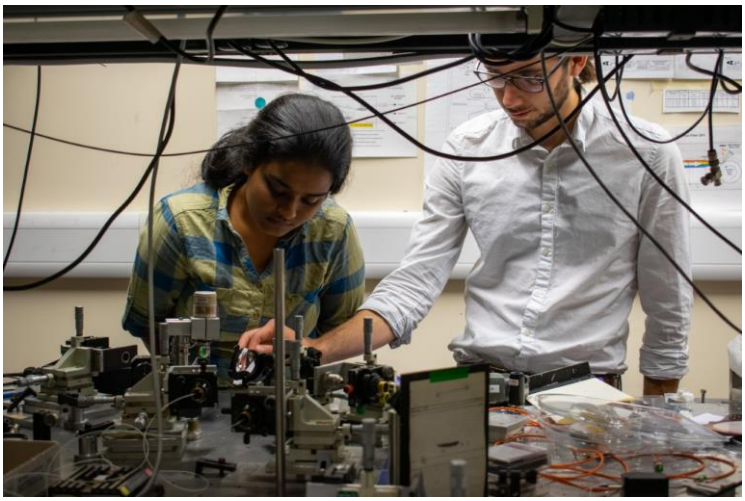
NETLAS PhD Students Sacha Grelet (left) and

Alejandro Martinez (right)

working in the lab at Kent University



Sacha and Alejandro working very hard



NETLAS PhD Students Gopika Venugopal (left)

and Sacha Grelet (right)

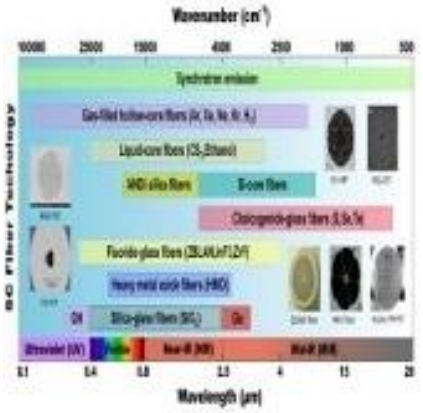
working in the lab at Kent University

Part of the AOG team (from left to right): Julien Camard, Mike Hughes, Adrian Bradu, Gianni Nteroli, Ramona Cernat, Adrian Uceda, Manuel Marques, Adrian Podoleanu, Gopika Venugopal, Rene Riha, George Dobre, Sacha Grelet and Alejandro Martinez

AOG NETLAS Team

October 2021

PUBLICATIONS

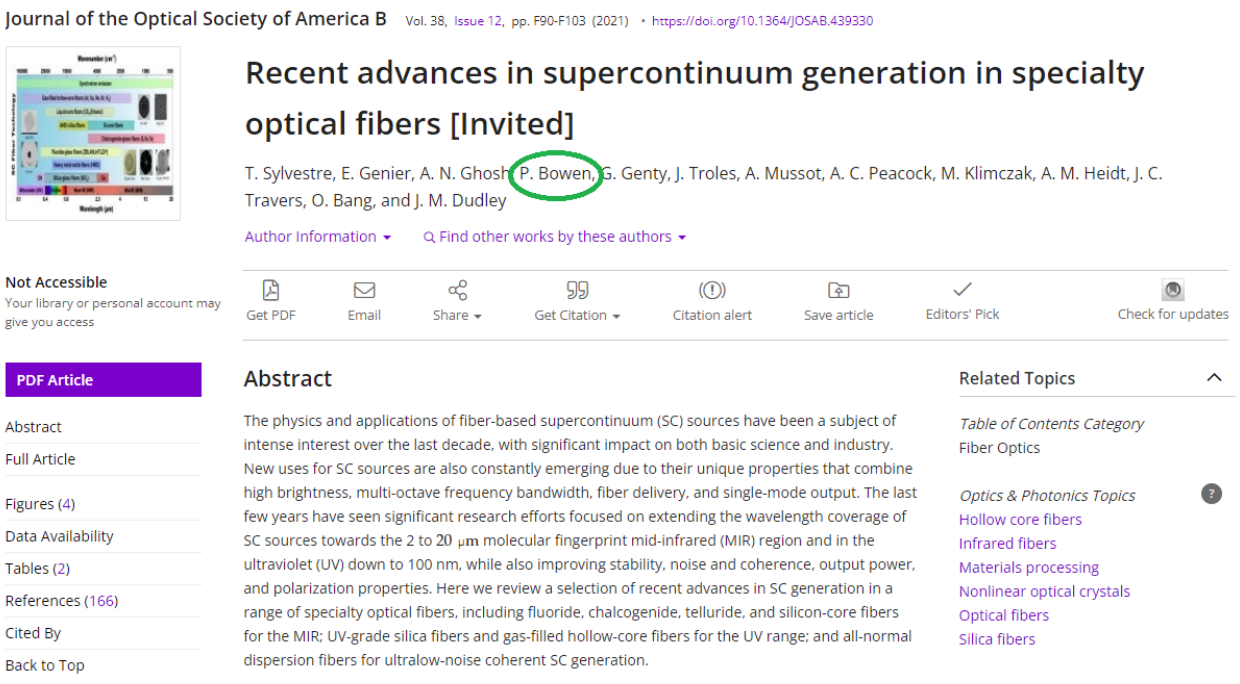


Recent advances in supercontinuum generation in specialty optical fibers [Invited]

T. Sylvestre, E. Genier, A. N. Ghosh, **P. Bowen,** G. Genty, J. Troles, A. Mussot, A. C. Peacock, M. Klimczak, A. M. Heidt, J. C. Travers, O. Bang, and J. M. Dudley

Journal of the Optical Society of America B Vol. 38, Issue 12, September 2021, pp. F90-F103 (2021)

https://doi.org/10.1364/JOSAB.439330



Journal of the Optical Society of America B Vol. 38, Issue 12, pp. F90-F103 (2021) • https://doi.org/10.1364/JOSAB.439330

Recent advances in supercontinuum generation in specialty optical fibers [Invited]

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Abstract

The physics and applications of fiber-based supercontinuum (SC) sources have been a subject of intense interest over the last decade, with significant impact on both basic science and industry. New uses for SC sources are also constantly emerging due to their unique properties that combine high brightness, multi-octave frequency bandwidth, fiber delivery, and single-mode output. The last few years have seen significant research efforts focused on extending the wavelength coverage of SC sources towards the 2 to 20 μm molecular fingerprint mid-infrared (MIR) region and in the ultraviolet (UV) down to 100 nm, while also improving stability, noise and coherence, output power, and polarization properties. Here we review a selection of recent advances in SC generation in a range of specialty optical fibers, including fluoride, chalcogenide, telluride, and silicon-core fibers for the MIR; UV-grade silica fibers and gas-filled hollow-core fibers for the UV range; and all-normal dispersion fibers for ultralow-noise coherent SC generation.

Related Topics

Table of Contents Category
Fiber Optics

Optics & Photonics Topics
Hollow core fibers
Infrared fibers
Materials processing
Nonlinear optical crystals
Optical fibers
Silica fibers

High performance low-bandgap (0.8 eV) single junction GaInNAsSb solar cells incorporating Au-based back surface reflectors

Riku Isoaho, Timo Aho, Arto Aho, Antti Tukiainen, Jarno Reuna, Marianna Raappana, **Mircea Guina**

Solar Energy Materials and Solar Cells, Volume 234, January 2022, 111413

https://doi.org/10.1016/j.solmat.2021.111413

ELSEVIER

Solar Energy Materials and Solar Cells

Volume 234, January 2022, 111413

High performance low-bandgap (0.8 eV) single junction GaInNAsSb solar cells incorporating Au-based back surface reflectors

Riku Isoaho, Timo Aho, Arto Aho, Antti Tukiainen, Jarno Reuna, Marianna Raappana, Mircea Guina

Optoelectronics Research Centre, Physics Unit, Faculty of Engineering and Natural Sciences, Tampere University, P.O. Box 692, FI-33014, Tampere, Finland

Received 25 March 2021, Revised 7 September 2021, Accepted 22 September 2021, Available online 7 October 2021.

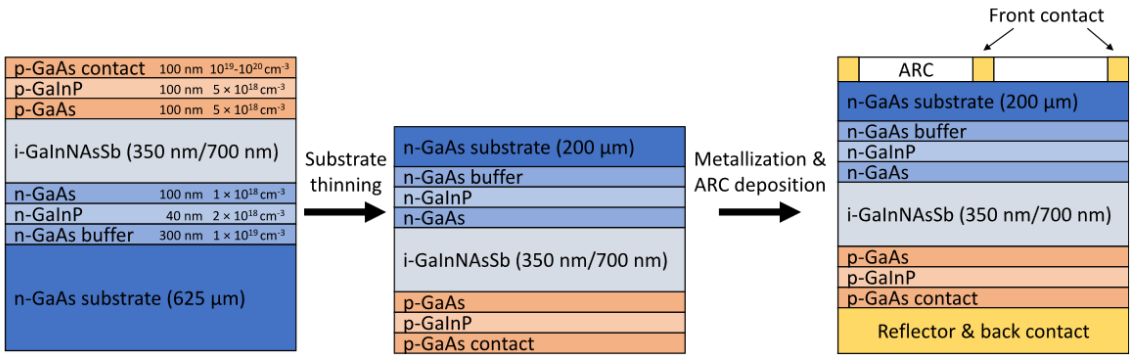
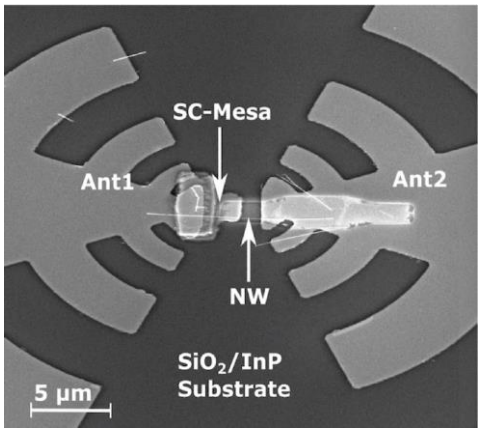


Fig. 1. Solar cell structure with simplified process flow.



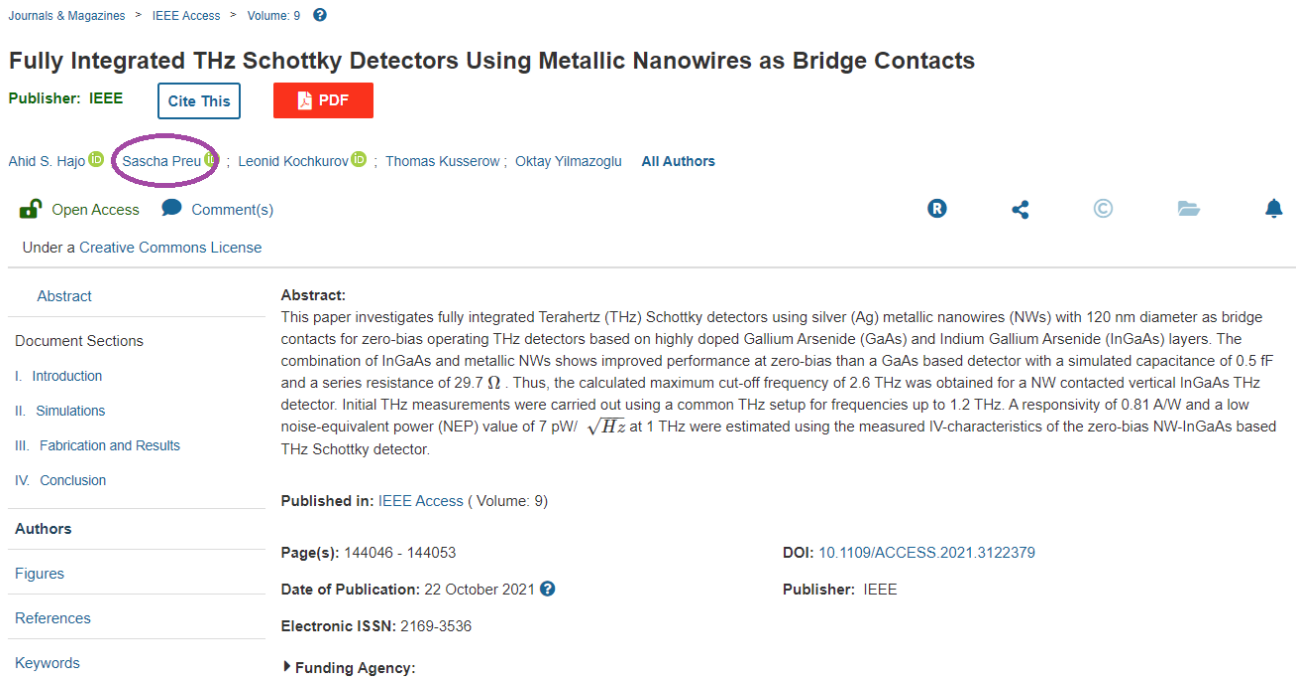
SEM image of the fabricated Schottky detector with a log-periodic broadband THz antenna. The NW has a diameter of 120 nm.

Fully Integrated THz Schottky Detectors Using Metallic Nanowires as Bridge Contacts

A. S. Hajo, **S. Preu,** L. Kochkurov, T. Kusserow and O. Yilmazoglu

IEEE Access, vol. 9, pp. 144046-144053, 2021

DOI: 10.1109/ACCESS.2021.3122379



Journals & Magazines > IEEE Access > Volume: 9

Fully Integrated THz Schottky Detectors Using Metallic Nanowires as Bridge Contacts

Publisher: IEEE | Cite This | PDF

Ahid S. Hajo | Sascha Preu | Leonid Kochkurov | Thomas Kusserow | Oktay Yilmazoglu | All Authors

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Abstract

Document Sections

I. Introduction

II. Simulations

III. Fabrication and Results

IV. Conclusion

Authors

Figures

References

Keywords

Abstract:

This paper investigates fully integrated Terahertz (THz) Schottky detectors using silver (Ag) metallic nanowires (NWs) with 120 nm diameter as bridge contacts for zero-bias operating THz detectors based on highly doped Gallium Arsenide (GaAs) and Indium Gallium Arsenide (InGaAs) layers. The combination of InGaAs and metallic NWs shows improved performance at zero-bias than a GaAs based detector with a simulated capacitance of 0.5 fF and a series resistance of 29.7 Ω . Thus, the calculated maximum cut-off frequency of 2.6 THz was obtained for a NW contacted vertical InGaAs THz detector. Initial THz measurements were carried out using a common THz setup for frequencies up to 1.2 THz. A responsivity of 0.81 A/W and a low noise-equivalent power (NEP) value of 7 pW/ $\sqrt{Hz}$ at 1 THz were estimated using the measured IV-characteristics of the zero-bias NW-InGaAs based THz Schottky detector.

Published in: IEEE Access (Volume: 9)

Page(s): 144046 - 144053

Date of Publication: 22 October 2021

Electronic ISSN: 2169-3536

DOI: 10.1109/ACCESS.2021.3122379

Publisher: IEEE

Funding Agency:

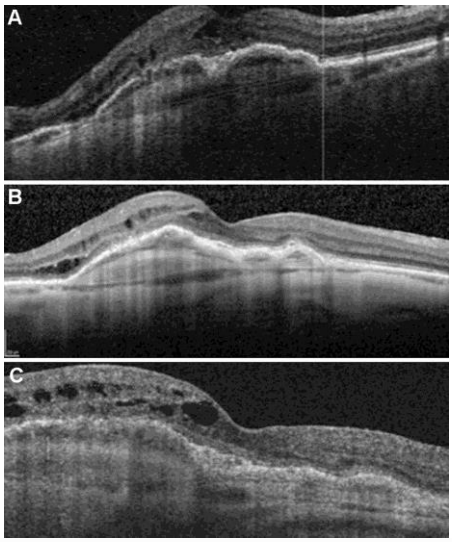
Electrically-operated buried-heterostructure nanocavity laser with sub-20 μA threshold current

Aurimas Sakanas, Andrey Marchevsky, Evangelos Dimopoulos, Meng Xiong, Yi Yu, Kristoffer S. Mathiesen, Elizaveta Semenova, Jesper Mørk, and **Kresten Yvind**

Conference on Lasers and Electro-Optics, OSA Technical Digest (Optical Society of America, 2021), paper STu2C.3

https://doi.org/10.1364/CLEO_SI.2021.STu2C.3

Agreement Between Spectral-Domain and Swept-Source Optical Coherence Tomography Retinal Thickness Measurements in Macular and Retinal Disease

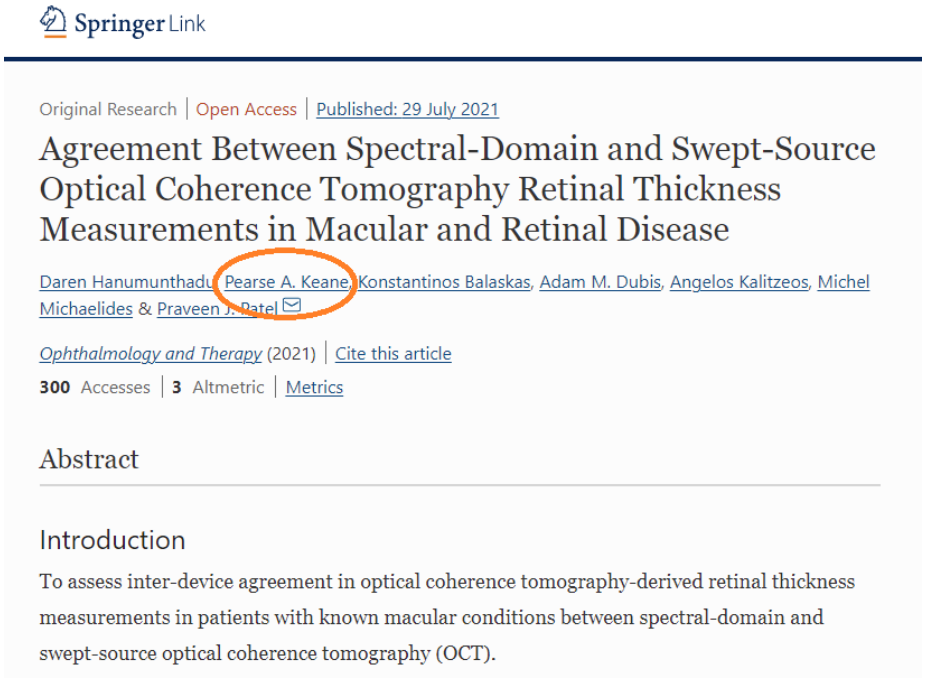


Optical coherence tomography images of example subject in the Adaptive Optical Coherence Tomography and Adaptive Optics Imaging in retinal disease (ACAD Study) acquired with Optovue (**A**), Spectralis (**B**) and Topcon (**C**)

Hanumunthadu, D., **Keane, P. A.,** Balaskas, K. *et al.*

Ophthalmol Ther (2021)

https://doi.org/10.1007/s40123-021-00377-8



Springer Link

Original Research | Open Access | Published: 29 July 2021

Agreement Between Spectral-Domain and Swept-Source Optical Coherence Tomography Retinal Thickness Measurements in Macular and Retinal Disease

Daren Hanumunthadu, Pearse A. Keane, Konstantinos Balaskas, Adam M. Dubis, Angelos Kalitzeos, Michel Michaelides & Praveen J. Patel

Ophthalmology and Therapy (2021) | Cite this article

300 Accesses | 3 Altmetric | Metrics

Abstract

Introduction

To assess inter-device agreement in optical coherence tomography-derived retinal thickness measurements in patients with known macular conditions between spectral-domain and swept-source optical coherence tomography (OCT).

Re-evaluating diabetic papillopathy using optical coherence tomography and inner retinal sublayer analysis

Josef Huemer, Hagar Khalid, Daniel Ferraz, Livia Faes, Edward Korot, Neringa Jurkute, Konstantinos Balaskas, Catherine A. Egan, Axel Petzold & **Pearse A. Keane**

Eye (2021). https://doi.org/10.1038/s41433-021-01664-1

Article | Open Access | Published: 09 July 2021

Re-evaluating diabetic papillopathy using optical coherence tomography and inner retinal sublayer analysis

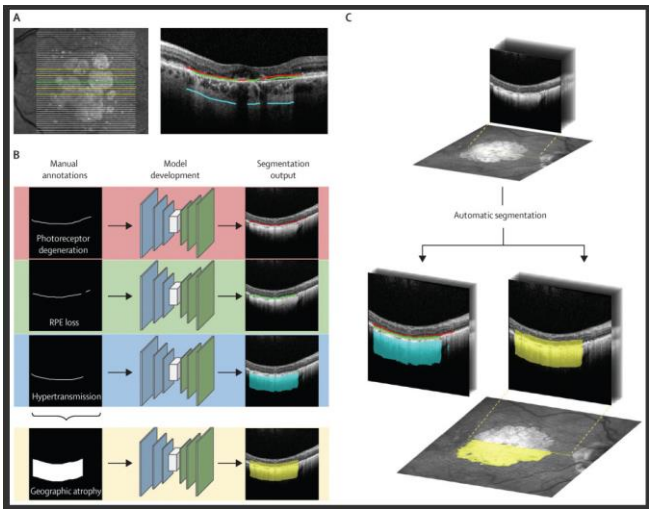
Josef Huemer, Hagar Khalid, Daniel Ferraz, Livia Faes, Edward Korot, Neringa Jurkute, Konstantinos Balaskas, Catherine A. Egan, Axel Petzold & Pearse A. Keane

Abstract

Background/Objectives

To re-evaluate diabetic papillopathy using optical coherence tomography (OCT) for quantitative analysis of the peripapillary retinal nerve fibre layer (pRNFL), macular ganglion cell layer (mGCL) and inner nuclear layer (mINL) thickness.

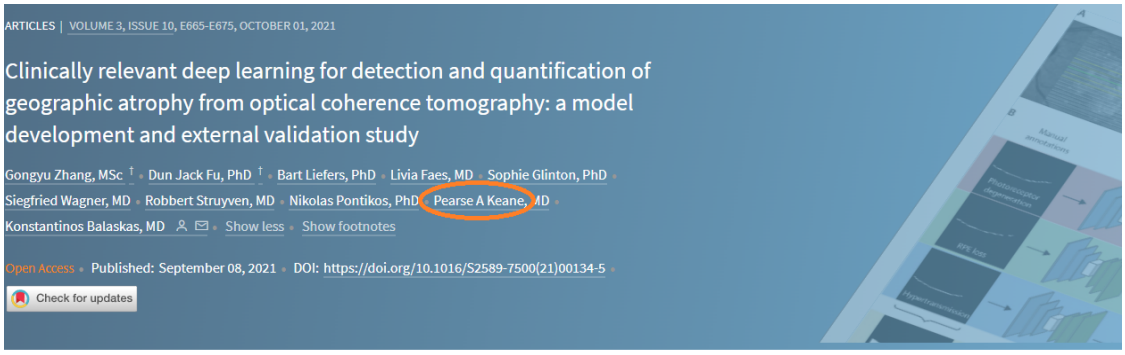
Clinically relevant deep learning for detection and quantification of geographic atrophy from optical coherence tomography: a model development and external validation study



Development of a deep-learning model for automatic segmentation of geographic atrophy and its constituent retinal features

Gongyu Zhang, Dun Jack Fu, Bart Liefers, Livia Faes, Sophie Glinton, Siegfried Wagner, Robbert Struyven, Nikolas Pontikos, **Pearse A. Keane,** Konstantinos Balaskas,

The LANCET Digital Health VOLUME 3, ISSUE 10, E665-E675, OCTOBER 01, 2021
DOI:https://doi.org/10.1016/S2589-7500(21)00134-5

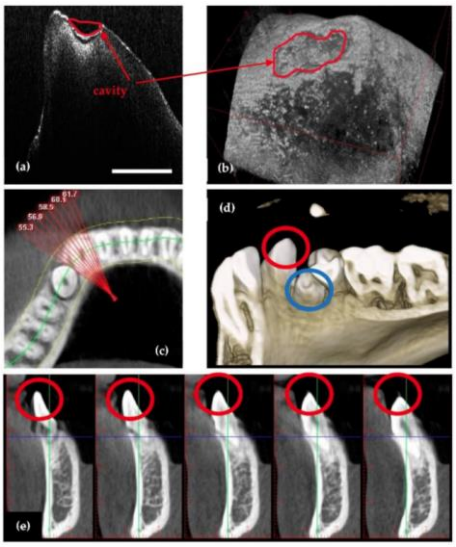


Summary

Background

Geographic atrophy is a major vision-threatening manifestation of age-related macular degeneration, one of the leading causes of blindness globally. Geographic atrophy has no proven treatment or method for easy detection. Rapid, reliable, and objective detection and quantification of geographic atrophy from optical coherence tomography (OCT) retinal scans is necessary for disease monitoring, prognostic research, and to serve as clinical endpoints for therapy development. To this end, we aimed to develop and validate a fully automated method to detect and quantify geographic atrophy from OCT.

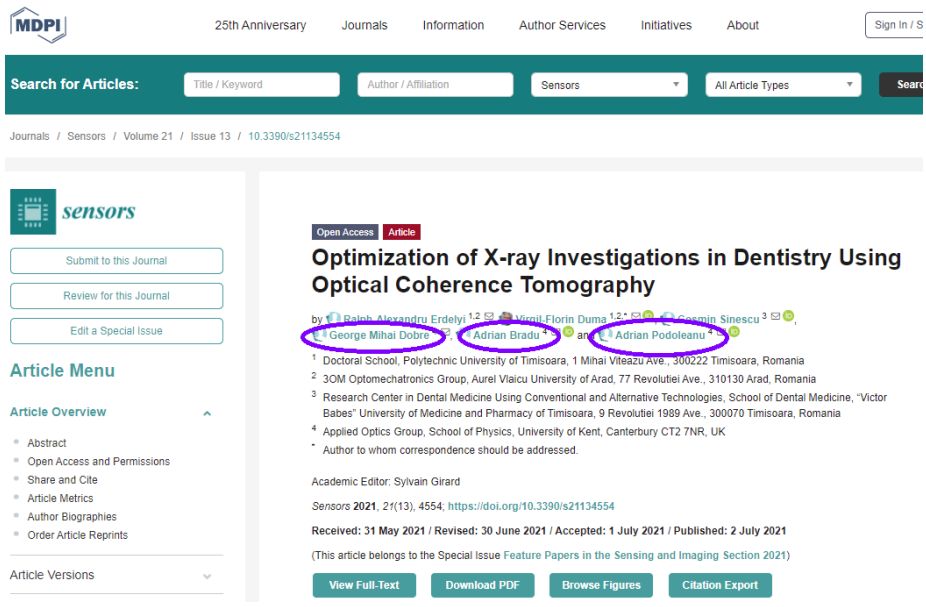
Optimization of X-ray Investigations in Dentistry Using Optical Coherence Tomography



Ralph-Alexandru Erdelyi, Virgil-Florin Duma, Cosmin Sinescu, **George M.Dobre, Adrian Bradu, and Adrian Podoleanu**

Example of a case where OCT spots a small cavity on the enamel level of the tooth: (a) OCT B-scan; (b) OCT 3D reconstruction; (c) 3D CBCT axial view of the tooth; (d) 3D rendering of CBCT; (e) 3D CBCT sagittal view of the tooth (the latter taken at different, successive depths into the hard tissue). Scale: 1 mm.

Sensors **2021**, *21*(13), 4554; **https://doi.org/10.3390/s21134554**



Nanomedicines and microneedles: a guide to their analysis and application

Rachel E. Sully, Colin J. Moore, Hemda Garelick, Eriketi Loizidou, **Adrian G. Podoleanu** and Vladimir Gubala

Anal. Methods, 2021, **13**, 3326-3347 (Tutorial Review)

DOI: 10.1039/D1AY00954K

DOI: 10.1039/D1AY00954K (Tutorial Review) *Anal. Methods*, 2021, **13**, 3326-3347

Nanomedicines and microneedles: a guide to their analysis and application

Rachel E. Sully [a*abc], **Colin J. Moore** [d], **Hemda Garelick** [b], **Eriketi Loizidou** [b], **Adrian G. Podoleanu** [c] **and Vladimir Gubala** [a]

[a]*Medway School of Pharmacy, Universities of Greenwich and Kent, Anson Building, Central Avenue, Chatham, ME4 4TB, UK. E-mail: res91@kent.ac.uk*

[b]*Department of Natural Sciences, Middlesex University, The Burroughs, Hendon, London NW4 4BT, UK*

[c]*School of Physical Sciences, University of Kent, Ingram Building, Canterbury, Kent CT2 7NH, UK*

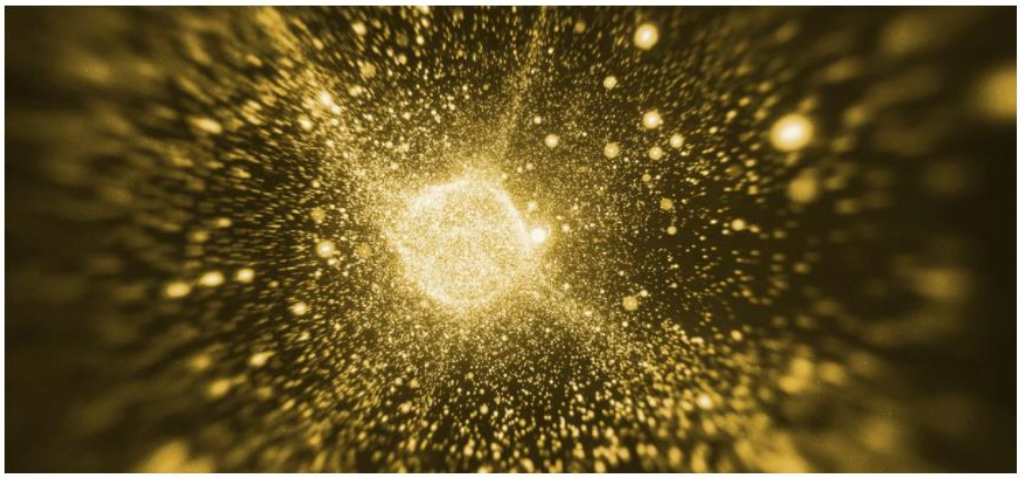
[d]*Drug Discovery and Development, Istituto Italiano di Tecnologia, Via Morego 30, 16136 Genova, Italy*

Received 4th June 2021 , Accepted 7th July 2021

First published on 27th July 2021

Abstract

The fast-advancing progress in the research of nanomedicine and microneedle applications in the past two decades has suggested that the combination of the two concepts could help to overcome some of the challenges we are facing in healthcare. They include poor patient compliance with medication and the lack of appropriate administration forms that enable the optimal dose to reach the target site. Nanoparticles as drug vesicles can protect their cargo and deliver it to the target site, while evading the body's defence mechanisms. Unfortunately, despite intense research on nanomedicine in the past 20 years, we still haven't answered some crucial questions, *e.g.* about their colloidal stability in solution and their optimal formulation, which makes the translation of this exciting technology from the lab bench to a viable product difficult. Dissolvable microneedles



LASERS FOR DIPOLE TRAPPING

Dipole trapping is fundamental when you work with ultra-cold atoms and molecules for, e.g., optical clocks and quantum computers.

Do you have a favorite atom for dipole trapping? Maybe Strontium? Rubidium?

For dipole trapping, we recommend stable high-power lasers that give you light in well-defined wavelength ranges. This is exactly what you get from our Koheras BOOSTIK combined with the stable wavelength conversion module, the Koheras HARMONIK.

Get more details

We have collected a bouquet of stories for you, as different as the colors of fall leaves. Stories about supercontinuum white light lasers, single-frequency lasers, and ultrafast lasers.

Enjoy!

For the Inkscape users

Scientific Inkscape: Extensions for figure editing and resizing

Scientific Inkscape is a set of Inkscape extensions designed for editing scientific figures, making common tasks easier.

1. **Scale Plots**: Changes the size or aspect ratio of a plot without modifying its text and ticks. Especially useful for assembling multi-panel figures.
2. **Flatten Plots**: A utility that eliminates much of the structure generated by common plot generation programs, making most figures far easier to edit.
3. **The Homogenizer**: Quickly sets uniform fonts, font sizes, and stroke widths in a selection.
4. **Combine by Color**: An extension that fuses paths of the same color and style together into a single path. Handy for speeding up operations on plots with thousands of similar elements, like markers.
5. **Auto-Exporter**: Automatically exports SVG files in a directory and keeps them updated.
6. **Text Ghoster**: Adds a semi-transparent background to text so that it can be overlayed with data.

All were written by David Burghoff at the University of Notre Dame. If you find it useful, tell your colleagues!

MOVEMBER CHALLENGES

NETLAS PhD Students **Sacha Grelet** and **Alejandro Martines,** and AOG PhD Student **Julien Camard,** are joining a movement to grow a Mo this Movember to raise funds and awareness for men's health.

We are raising funds and awareness this Movember for all the dads, brothers, sons and mates in our lives. We need your help. Please donate to support men's health.

Since 2003, Movember has funded more than 1,250 men's health projects around the world, challenging the status quo, shaking up research and motivating men to take action for their health.

To view their OCTEAM team & to donate to support their cause please visit

https://uk.movember.com/team/2414249

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.

Coming Soon! Polarization Explained: Mathematics, Applications, and Best Practices

In this final part of our light characterization series, Manfred Gonnert will further define and characterize polarization. He will provide application examples to help with laser beam alignment, understanding polarization-handedness, manually measuring Stokes parameters, and preventing unwanted interference.

Presented by Manfred Gonnert, Team Leader, Light Detection and Analysis

Conduct Polarization Measurements with a Polarimeter System

Thorlabs Previously Recorded Webinars

Thorlabs' Digital Webinar series began in mid-2020. Each webinar and Q&A session is recorded and added to the archive on Thorlab's web page.

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