OPTAPHI *Optical Sensing using Advanced Photo-Induced Effects*

A European Double Doctorate Training Network

OPTAPHI Newsletter - February 2022

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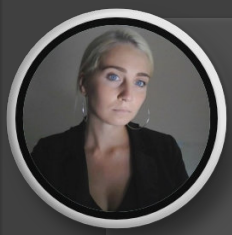
Welcome to the first newsletter of the OPTAPHI Training Network, a multi-disciplinary European Double Doctorate programme. OPTAPHI combines integrated photonics technologies such as semiconductor lasers and photonic integrated circuits, with advanced spectroscopy techniques such as photo-acoustic and photo-thermal spectroscopy, to realise the next generation of optical sensing systems for environmental, agri-food and industrial process monitoring applications.

A lot has happened already within the network, which we will update you on in future newsletters; for now, we would like to take the opportunity to focus on the most important part of the network - the Early Stage Researchers! All 14 have been recruited and we are delighted to introduce them to you here. Stay tuned for lots more news in upcoming issues, and be sure to visit the OPTAPHI website to learn more about the network.

Meet the OPTAPHI Early Stage Researchers



Elena Kniazeva

Elena obtained her bachelor's and master's degrees at ITMO University, Saint-Petersburg. Her bachelor's degree was in optical technologies and materials during which she developed a red phosphor to create LEDs which can emit warm white light. Her Master's degree was obtained in light-guided photonics (fiber optics) where she developed a fiber bending sensor based on tilted Fiber Bragg gratings, which worked in reflection mode. She also has work experience in scientific communication at a museum devoted to holography (as a guide and later promoted to public relations specialist).

Project 1.1: Compact diode-laser based QEPAS sensors for UAVs

Università degli studi di Bari Aldo Moro
Bari, Italy

Université de Montpellier
Montpellier, France

Davide Pinto

Davide Pinto obtained his M.Sc. Degree (cum laude) in Materials Science and Technology in 2020 from the University of Bari. In the same year, he won a European Joint Doctorate in the OPTAPHI Project (Horizon 2020) at the Vienna University of Technology (TUW) and Université de Montpellier (UM). His current research activity is focused on the development of trace gas sensors based on photothermal spectroscopy for BTEX detection, as well as on the growth process of Quantum Cascade Lasers emitting in the long-wavelength infrared spectral region.

Project 1.2: Long wavelength PTS for BTEX detection

Technische Universität Wien
Vienna, Austria

Université de Montpellier
Montpellier, France

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Gautham Paikkath

I am Gautham Paikkath, a Marie Skłodowska-Curie PhD researcher under Dr. William Whelan-Curtin, Dr. Stephen Hegarty and Prof. Antonella D'Orazio. I completed my integrated MSc in Photonics in the International School of Photonics, Cochiin University of Science and Technology (CUSAT) in India. My previous work includes "Femtosecond autocorrelation of Ti:Sapphire laser" as part of a mini-project, "Design of 456 nm quasi-3 level blue pulsed laser for underwater communication" as part of my Young Scientist Research Scholarship, and "Photorefractive polymers for dynamic holography" as part of my Masters project.

Project 1.3: Photonic crystal hybrid lasers for intra-cavity QEPAS and PTS

Munster Technological University
Cork, Ireland

Politecnico di Bari
Bari, Italy

Kumar Kinjalk

Kumar Kinjalk was born in India in 1993. After high school graduation, he enrolled in the Department of Electronics Engineering at Indian Institute of Technology Dhanbad (IIT Dhn), where he obtained a bachelor's degree in 2015. After three years of entrepreneurship, he enrolled again for a masters in optoelectronics and optical communication engineering at IIT Dhn and graduated in 2020. His thesis focused on design and development of optical sensors using fiber Bragg gratings. In his free time, he likes to take long walks but he also enjoys cooking and watching thriller and science fiction movies.

Project 1.4: Long-wavelength QCLs for BTEX and propane detection through QEPAS

Université de Montpellier
Montpellier, France

Università degli studi di Bari Aldo Moro
Bari, Italy

Yide Zhang

Yide is currently a Marie Skłodowska-Curie Early Stage Researcher in the OPTAPHI double doctorate programme. His project will be carried out at the Technical University of Vienna in Austria, and the Centre for Advanced Photonics & Process Analysis at Munster Technological University in Ireland. Yide received his B.Sc. in Optical Information Science and Technology & Public Administration from Ocean University of China. Then he completed his M.Sc. in Optics and Photonics at Karlsruhe Institute of Technology, Germany, in 2021.

Project 1.5: Generation & detection of photo-thermal & photo-acoustic waves in solids for advanced near-field IR imaging

Technische Universität Wien
Vienna, Austria

Munster Technological University
Cork, Ireland

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Gabriele Biagi

Gabriele obtained his masters degree in Electronic Engineering at Polytechnic of Bari. During his MSc he carried out an internship entitled "Atmospheric turbulence impact on the continuous-variable quantum key distribution with space-ground optical links" at Onera (the French national aerospace research centre) in the Optics and Associated Techniques Department, in collaboration with the Quantum Information Team at the Sorbonne University, Paris. He graduated at Polytechnic of Bari developing a thesis at the University of Glasgow, where he designed Silicon Nitride gratings for biosensing applications.

Project 2.1: Ultra-compact QEPAS by integrating cantilever hybrid laser with quartz tuning fork

Munster Technological University
Cork, Ireland

Università degli studi di Bari Aldo Moro
Bari, Italy

Giulia Malvicini

Giulia is currently a Marie Skłodowska-Curie Early Stage Researcher in OPTAPHI, under the supervision of Dr. Liam O'Faolain and Prof. Dr. Bernhard Lendl. Her project combines spectroscopy based on advanced photo-induced effects with integrated photonics for optical sensing. She received her M.Sc. in Photonics (2019) at University of Pavia (Unipv), Italy, after an internship in the Biophotonics group at Tyndall National Institute, Cork. At Tyndall, she worked on developing wavefront-shaping techniques to improve acousto-optical imaging for biomedical applications. Besides her photonics background, she obtained her B.Sc. in Electronic and Computer Engineering (2017) at Unipv.

Project 2.2: QEPAS and PTS using low cost telecoms wavelength lasers for food analysis

Munster Technological University
Cork, Ireland

Technische Universität Wien
Vienna, Austria

Jesús Hernán Mendoza Castro

Jesús Hernán Mendoza Castro received his title as B.Sc. and M.Sc. in Electronic Engineering from the Industrial University of Santander, Colombia in 2015 and 2019 respectively, working on the applications of orbital angular momentum (OAM) of light in classical/quantum communications. He did a research stay on OAM in stimulated Brillouin scattering processes at Nano Institute - the University of Sydney in 2018. In OPTAPHI he is studying high Q-factor photonic cavities for sensing applications in a joint Ph.D. programme between Politecnico di Bari and Technische Universität Wien.

Project 2.3: High Q-factor photonic cavities for PTS

Politecnico di Bari
Bari, Italy

Technische Universität Wien
Vienna, Austria

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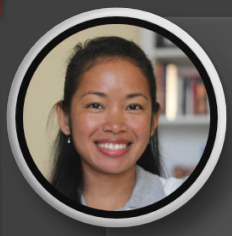


Savda Sam

Savda obtained her Bachelor's degree in Electrical and Electronic Engineering from Institute of Technology Cambodia (ITC). She worked for three years as assistant lecturer at ITC before moving to Italy to pursue her Master's degree in Electronic Engineering (Photonics curriculum) at University of Pavia. She wrote her Master's thesis on "Realization of an all Fibre Interferometer for Time-Energy Quantum Entanglement Experiments". In OPTAPHI she will work on Project 2.4 under the supervision of Dr. Liam O'Faolain and Prof. Dr. Bernhard Lendl. Her research interests include Nanophotonics, Nonlinear Optics and Quantum Photonics.

Project 2.4: Intra-cavity PTS with optical feedback for isotopic verification of food origin

Munster Technological University
Cork, Ireland

Technische Universität Wien
Vienna, Austria

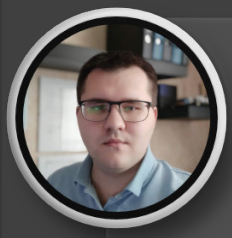
Anton Sukhinets

Anton obtained his M.Sc. degree (cum laude) in Physics in 2018 from the St. Petersburg National Research University of Information Technologies, Mechanics and Optics. He was a research assistant at the Leibniz Institute of Photonic Technology from 2019 to 2020. Since October 2020, he is a double-degree Early Stage Researcher between the University of Bari and TU Wien. Most recently, his research activity is focused on the development of a bow-tie cavity resonator for trace gas sensing and sensors based on quartz-enhanced photoacoustic spectroscopy.

Project 3.1: Intra-cavity QEPAS for isotope analysis

Università degli studi di Bari Aldo Moro
Bari, Italy

Technische Universität Wien
Vienna, Austria



Artem Vorobev

In 2015 Artem received his bachelor's degree with honours at the Kazan National Research Technical University named after A.N. Tupolev-KAI (KNRTU-KAI) in the speciality 11.03.01 Radio engineering. In 2017, at the same university, he received a master's degree with honours in the speciality 11.04.01 Radio engineering. Until 2020, he was engaged in scientific research on measuring the quality of vegetable oils by optical and microwave methods at the Research Laboratory "NIL-15" of the Department for Radio-Electronic and Information-Measuring Tools in KNRTU-KAI. Now he is a student of the double Ph.D. course of the OPTAPHI consortium. His research interests include optoelectronics, microwave electronics and embedded systems.

Project 3.2: 2D materials for hybrid laser wavelength tuning

Politecnico di Bari
Bari, Italy

Munster Technological University
Cork, Ireland

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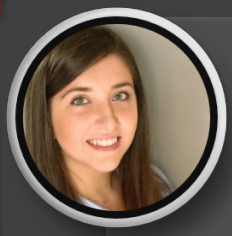


Giovanna Ricchiuti

Giovanna received both her B.Sc. Degree in Electronics and Telecommunications Engineering and her M.Sc. Degree in Electronics Engineering from Polytechnic University of Bari (Italy) in 2019. Currently, she is a Marie Skłodowska-Curie Early Stage Researcher in the OPTAPHI Double-Degree Ph.D. program. Her project will be developed both at Technical University of Vienna, Austria as the recruiting host and at Centre for Advanced Photonics & Process Analysis Munster Technological University, Ireland as co-host. Her research interests include laser dynamics, spectroscopy techniques and optoelectronics.

Project 3.3: Trace water detection in organic solvents using PTS

Technische Universität Wien
Vienna, Austria

Munster Technological University
Cork, Ireland

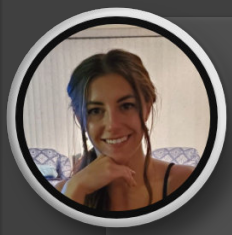
Michele Paparella

Michele received his M.Sc. in Telecommunication Engineering (2020) at Polytechnic University of Bari, Italy after an internship in the Nanophotonics group at CAPPA, Cork. He is currently a Marie Skłodowska-Curie Early Stage Researcher as part of the OPTAPHI European training network. His project is focused on the monolithic integration of III-V semiconductor lasers on silicon platform and light coupling in passive waveguides. The final device will be used for gas detection in industrial processes. His project will be carried out in cooperation with University of Montpellier (recruiting host university) and Polytechnic University of Bari (co-host university).

Project 3.4: Hybrid III-V lasers on silicon for low-cost MIR gas sensing

Université de Montpellier
Monrpellier, France

Politecnico di Bari
Bari, Italy



Jordan Fordyce

Jordan received her Master's degree in physics from the University of British Colombia in Vancouver, Canada in 2020. She was working with ultra-fast, shaped femtosecond laser pulses to study the dynamics of molecules embedded inside helium nanodroplets. After this project, she wanted to focus on photonics to complement her optics background. Now she is a Marie Skłodowska-Curie fellow working within the OPTAPHI network, pursuing her PhD by working on the design and fabrication of tunable, single mode interband cascade lasers that will be used for gas sensing. Her project is part of a collaboration between the University of Montpellier and Munster Technological University.

Project 3.5: Single-mode interband cascade lasers for petro-chemical process monitoring

Université de Montpellier
Monrpellier, France

Munster Technological University
Cork, Ireland

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